Attachment

0CAN110302

Request for Clarification of Additional Information

Request for Clarification of Additional Information

NRC Question

Clarification - Request for Additional Information (RAI) Question 1:

a. Did you limit your search to only safe shutdown cables? If so, please provide a list of all cables (including non-safe shutdown and associated circuits) containing thermoplastic materials.

ANO Response

Table 1 of the August 11, 2003, RAI response presented the results of a search for all thermoplastic cables (i.e., search not limited to safe shutdown cables.) Therefore, no additional list is required.

NRC Question

b. The cable and raceway numbers you provided do not give us the information necessary for evaluating the effects of having thermoplastic cables versus thermoset cables. Please provide a list of the equipment that is associated with the thermoplastic cables, and whether that equipment is necessary for achieving and maintaining safe shutdown conditions. You should specify whether the cables are power or control cables, if the power cables are ac or dc, and the voltage of the power cables.

ANO Response

Tables 1 and 2 of the RAI response provided the list of thermoplastic cables. The cables are instrumentation cables. None of the identified cables/components are required to achieve safe shutdown. The listed cables are:

2M035AC – This cable is part of the Reactor Trip and ESF Response Time test circuit.

2I037D and 2I037E – These instrumentation cables were utilized for measuring boron concentration in the letdown line. Note: the associated instrument (2AT-4813) is no longer in service.

2I386C1 & 2I386D1 – These instrumentation cables provide conductivity measurements for the Make-up Water tanks (2T41A & B).

RJR001C, RJR001D and RJR001E – These instrumentation cables are associated with one channel of source range excore neutron detectors. This channel of instrumentation (NI-1A) is not in routine use but can be placed in service after calibration.

RJR001J, RJR001K and RJR001L – These instrumentation cables are associated with one channel of power range excore neutron detectors.

NRC Question

c. *The fire scenarios described in your response of August 11, 2003, did not specify which cables and/or equipment are likely to suffer fire damage and did not provide us with the effects of fire damage on equipment. Please provide us with a list of equipment and cables that could suffer fire damage. In addition, evaluate the effects that fire damage would have on the equipment that is associated with cables likely to sustain damage.*

ANO Response

The files for safe shutdown equipment (and cables) for zones 104-S, 2040-JJ, 2091-BB and 2100-Z are contained on the enclosed compact disc. These were the four zones referenced in the August 11, 2003, RAI that contained thermoplastic cable. In addition, the applicable file for 99M is also included. The safe shutdown analysis assumes that the listed components have failed in the worst case position (e.g., a normally open valve that should remain open in order to achieve safe shutdown is assumed to fail closed.) This assumption may require crediting manual operation of specific components to ensure (from an analytical viewpoint) that safe shutdown can be achieved. When evaluating the feasibility of any required manual action, a circuit analysis was performed to ascertain whether fire damage could cause the specific spurious operation assumed to occur by the safe shutdown analysis.

NRC Question

Clarification - RAI Question 2:

a. *In order for us to review the basis for your timing estimates, please provide a copy of Reference 23, "Entergy Nuclear Engineering Analysis Calculation EAD-NS-92/015.R0," Revision 0.*

ANO Response

Calculation NEAD-NS-92/015.R0 Revision 0 is included on the enclosed CD.

NRC Question

b. *On page 8 of your response to RAI Question 2, you stated that the timing for the simulator operator actions were on pages 98-99 of your July 3, 2003, submittal (0CAN070302). With respect to Table 32, "Summary of Selected Actions for Maintaining Core Cooling During Simulated Fire," on page 99, and the discussion on pages 97-100, it is difficult to discern which conditions, or indications in the control room are prompting the operators to perform the manual actions (in the control room and locally) to maintain core cooling during a fire. Please provide the time line or chronological sequence of each of the simulated operator recovery action from the time of cue, in a graphical line format.*

ANO Response

The table below is an excerpt of Table 32 from the July 3, 2003, submittal and is included for reference.

#	Selected Actions, Requests or Cues	Location	Basis	Operator Response	Crew 1 Clock time from loss of A4	Crew 1 Time from cue to action
1	Loss of A4 bus signal	MCR	Fault simulated	Investigate A4 bus locally	8:39:39	0:02:21
2	Multiple alarms	MCR	Fault simulated	Manual Reactor trip	8:39:49	0:00:12
3	(CV CV2617 EFW Pump Turbine K3 Steam from SG B) 1	Auto	Auto Response to Trip (Low SG level)	Observe start /note overfill	8:42:01	0:10:59
4	C10 CSI-DG2 LOCK OUT, EDG2	MCR	Prevent additional damage to A4	Action in response to A4 breaker fault	8:41:38	0:01:22
5	Investigate A4 bus notes fire	Local	Simulated fire noted	Noted fire - as part of simulation script	8:42:00	0:04:00
6	(BK D1512CV2663 P7A TURB STM ADMISSION VLV POWER) OPEN	Fire	Fire induced breaker failure	Preempted by manual trip and EFW auto start	8:44:40	0:00:00
7	Establish (dispatch) Fire Brigade	MCR	Fire procedure	Setup team and read script	8:46:00	0:03:00
8	(CV CV2800 EFW P-7B Suction from CST) 0	Fire	Simulated failure	Turn off P7B to protect pump	8:49:14	0:08:46
9	C09 HS2805 STOP, EFW PUMP P7B, HS-2805 TRUE	Local	Represents manual control	Introduced into simulation upon local call	8:55:00	0:02:00
10	Local manual control of EFW 7A (throttle 2620 and 2627)	Local	Back off EFW flow to prevent over fill	Adjust SPEED CNTR on EFW P7A, HIC-6601) 0.85	8:53:00	0:16:00
11	Call for site area emergency	MCR	In procedures	Verify location on declaration of Site Area Emergency	9:06:00	0:02:20
12	D1512 - (CV2663 P7A turbine steam admission valve power) OPEN from breaker room	Local	New attachment to prevent spurious closure	Fire damage over by this time		
13	D5241 - (CV2667 P7A turbine steam admission valve power) OPEN from breaker room	Local	New attachment	Fire damage over by this time		
14	Manual start of HPI from A3	Local	Restore injection pump operation	Use local control	9:04:00	0:22:00
15	Go to A3 and be ready to Check equipment	Local	Protect A3 safety bus	At location ready for action	9:32:00	0:02:00
16	Check position of A-306	Local	Protect A3 safety bus		9:38:00	0:02:00

This sample timeline is based on the data from Crew 1 which did not have the revised procedure. Therefore, items 12 and 13 are not applicable. The last column provides the time taken to complete the action from the initial cue.

T = 0:00:00 (8:39:39) Control Room indicators indicate a loss of the green train 4160V electrical bus (A4). An auxiliary operator is dispatched to investigate the A4 bus. The operator reaches the scene at T = 0:02:21.

T = 0:00:10 (8:39:49) The loss of A4 causes multiple alarms in the control room. Based on the numerous alarms a manual reactor trip is initiated at T = 0:00:22. Subsequently, all control rods are fully inserted.

T = 0:01:59 (8:41:38) To prevent additional damage to the A4 switchgear, the green train emergency diesel lock-out is initiated. Operating this switch prevents the green diesel from connecting to the A4 switchgear at T = 0:03:21.

T = 0:02:21 (8:42:00) Auxiliary operator reports fire in the A4 switchgear room.

T = 0:02:22 (8:42:01) The steam driven EFW pump (P7A) automatically starts due to low steam generator level. Control room operator observes the start of the pump and continues to monitor steam generator level for signs of overfill (see T = 0:13:21). Note: The electric driven EFW pump (P7B) also starts on low steam generator level.

T = 0:05:01 (8:44:40) As a result of fire damage, power is lost to CV2663 (steam inlet to P7A). The pre-fire plan notes that CV2663 may require manual operation (if necessary, breaker D1512 would be opened to deenergize the circuit and the handwheel would be utilized to open the valve). Since the low steam generator level caused the EFW system to actuate, CV2663 opens (on EFIC) prior to power being lost to the valve (i.e. at T = 0:02:22). Thus, no local action is required.

T = 0:06:21 (8:46:00) Fire Brigade is notified of fire and dispatched to the A4 switchgear room.

T = 0:09:35 (8:49:14) Due to fire damage, the suction valve (CV2800) for P7B spuriously closes.

T = 0:13:21 (8:53:00) Control Room operator observes rising steam generator level. An operator is dispatched to manually throttle the P7A discharge valves (CV2620 and CV2627). The valves are throttled per control room direction to maintain steam generator level at T = 0:29:21. At this point, decay heat is being adequately removed from the reactor via the EFW system.

T = 0:15:21 (8:55:00) Control Room operator recognizes that suction to P7B has been impacted and turns pump off in an attempt to prevent pump damage at 0:17:21.

T = 0:24:21 (9:04:00) Control Room operator notes pressurizer level decrease. Red train HPI pump (P36A) does not respond to remote control due to loss of control power to switchgear. An operator is dispatched to start P36A from the A3 switchgear. Including auxiliary lube oil pump alignment, RCS injection is initiated at T = 0:46:21.

T = 0:26:21 (9:06:00) Site area emergency is declared and announced at 0:28:41.

T = 0:52:21 (9:32:00) Operator is dispatched to A3 switchgear to monitor/control operation of P36A. and other A3 breakers.

T = 0:58:21 (9:38:00) Breaker A306 position is verified to ensure that P36A is operating. At this point, decay heat is being removed by the EFW system (P7A) and RCS level is being maintained by the HPI pump (P36A).

NRC Question

Clarification - RAI Question 5

a. *Please provide all CFAST input files for all fire simulations.*

ANO Response

The CFAST input files are included on the enclosed CD.

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 0B-QR-ACP-P012	Flow Path:

ID: B5141A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: N/A
B51 TO Y11 BREAKER ALTERNATE AC SOURCE
Component in Area? Yes
Cables in Area:
RPB5141AA

Flow Path: 0B-QR-ACP-P014 | Flow Path:

ID: B5315
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: N/A
B53 TO Y13 BREAKER TO INVERTER
Component in Area? Yes
Cables in Area:
RPB5315AA

Flow Path: 0A-QR-ACP-P074 | Flow Path:

ID: C539
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: RS1
CONTROL PANEL EFIC INDICATION PANEL
Component in Area? Yes
Cables in Area:
RCRS116A

Flow Path: 0A-XR-DEP-P020 | Flow Path:

ID: D15
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: D01
125V DC MCC
Component in Area? Yes
Cables in Area:
RPD0121A1 RPD0121A2

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train   Green Train

Flow Path: 1A-DR-DGS-S020   Flow Path:

ID: VEFM24A
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: HVAC   Bus: MCCB51
D-G ROOM EXHAUST FAN
Component in Area? No
Cables in Area:
PWR LOST 104-S   RCB5122D   RPB5122A
RPB5122B   RPB5122C

Flow Path: 2A-DR-DGS-S021   Flow Path:

ID: VEFM24B
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: HVAC   Bus: MCCB51
D-G ROOM EXHAUST FAN
Component in Area? No
Cables in Area:
PWR LOST 104-S   RCB5123D   RPB5123A
RPB5123B   RPB5123C

Flow Path: 0A-DR-DGS-S022   Flow Path:

ID: TV7901A
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: HVAC   Bus: B51
DIESEL GENERATOR ROOM EXHAUST FAN DAMPER
Component in Area? No
Cables in Area:
PWR LOST 104-S

ID: TV7901B
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: HVAC   Bus: B51
DIESEL GENERATOR ROOM EXHAUST FAN DAMPER
Component in Area? No
Cables in Area:
PWR LOST 104-S

Flow Path: 0A-ZR-ECW-P003   Flow Path:

ID: VUC14D
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: HVAC   Bus: MCCB51
SOUTH ELEC. EQUIP. ROOM UNIT COOLER
Component in Area? Yes

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train   Green Train

Flow Path: 2A-QR-ICP-P072   Flow Path:

ID: SPDS-A
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: Bus: 2Y26
SPDS COMPUTER AND DISPLAYS
Component in Area? No

Cables in Area:

C378A7F	C378A7H

Flow Path: 0B-KR-LVP-P001   Flow Path:

ID: B51
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: LCB5
480 VOLT ESF MCC
Component in Area? Yes

Cables in Area:

RPB521A1	RPB521A2	RPB521B1
RPB521B2	RPB521C1	RPB521C2
RPB521D1	RPB521D2	RPB521D3
RPB521D4		

ID: B5145
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: N/A
B51 TO D03A BREAKER TO BATTERY CHARGER
Component in Area? Yes

Cables in Area:

RPB5145A	RPB5145B	RPB5145C

Flow Path: 0B-KR-LVP-P002   Flow Path:

ID: B52
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: LCB5
480 VOLT ESF MCC
Component in Area? Yes

Cables in Area:

RPB532A1	RPB532B1	RPB532C1
RPB532D	RPB532D1	

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train

Flow Path: 0A-KR-LVP-P003

ID: B53
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: LCB5
480 VOLT ESF MCC
Component in Area? Yes

ID: B5311
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: N/A
MCC B53 MAIN BREAKER
Component in Area? Yes

Green Train

Flow Path:

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train

Flow Path: 1A-LR-MPS-P002

ID: CV1270
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: MPS   Bus: MCCB51
RCP P32D CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No

Cables in Area:

PWR LOST 104-S   RCB51131D   RCB51131G
RCB51131H   RPB51131B

ID: CV1271
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: MPS   Bus: MCCB51
RCP P32C CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No

Cables in Area:

PWR LOST 104-S   RCB51132D   RCB51132G

ID: CV1272
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: MPS   Bus: MCCB51
RCP P32B CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No

Cables in Area:

PWR LOST 104-S   RCB51133D   RCB51133G
RPB51133B

ID: CV1273
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: MPS   Bus: MCCB51
RCP P32A CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No

Cables in Area:

PWR LOST 104-S   RCB51134D   RCB51134G
RPB51134B

Green Train

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 1A-MR-MPS-P003

ID: LRS1001
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: C539/RS1
Pressurizer Level requires LT1001, TE1001A, & C539. Isolated at C539.
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI011AB

ID: LT1001
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539
PRESSURIZER LEVEL XMTR TO SPDS-A VIA C539, NNI, & LRS1001.
Component In Area? No
Cables in Area:
PWR LOST 104-S RJI011T

Flow Path: 2B-MR-MPS-P003

ID: TE1001A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539
PRESSURIZER TEMPERATURE TO SPDS-A (COMP. LEVEL) VIA C539
Component In Area? No
Cables In Area:
PWR LOST 104-S RJI011U

Green Train

Flow Path:

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 1A-LR-MPS-P004

ID: CV1214
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB51
LETDOWN COOLER E29A DISCHARGE VALVE
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5153C RCB5153F
RCB5153G RPB5153A

ID: CV1216
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB51
LETDOWN COOLER E29B DISCHARGE VALVE
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5154C RCB5154F
RCB5154G RPB5154A

Green Train

Flow Path:

Flow Path: 1A-LR-MPS-P007

ID: SV1079
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Pressurizer High Point Vent Series Isolation. Paired withSV1077.
Component in Area? No
Cables in Area:
RCR190T

Flow Path:

Flow Path: 2A-LR-MPS-P007

ID: SV1077
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Pressurizer High Point Vent Series isolation. Paired withSV1079.
Component in Area? No
Cables in Area:
RCR190S

Flow Path:

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train | Green Train

Flow Path: 0B-LR-MPS-P014 | Flow Path:

ID: SV1073
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Reactor High Point Vent Parallel isolation. Paired with SV1074.
Component in Area? No
Cables in Area:
RCR190M

Flow Path: 0B-LR-MPS-P015 | Flow Path:

ID: SV1071
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Reactor High Point Vent Parallel isolation paired withSV1072.
Component in Area? No
Cables in Area:
RCR190L

Flow Path: 0C-LR-MPS-P016 | Flow Path:

ID: SV1083
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Steam Generator E24A High Point Vent. Parallel isolationPaired with SV1084.
Component in Area? No
Cables in Area:
RCR190P

Flow Path: 0C-LR-MPS-P017 | Flow Path:

ID: SV1081
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Steam Generator E24A High Point Vent. Parallel isolationPaired with SV1082.
Component in Area? No
Cables in Area:
RCR190N

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train | Green Train

Flow Path: 0D-LR-MPS-P018 | Flow Path:

ID: SV1093
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Steam Generator E24B High Point Vent. Parallel isolationPaired with SV1094.
Component in Area? No
Cables in Area:
RCR190R

Flow Path: 0D-LR-MPS-P019 | Flow Path:

ID: SV1091
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: D11
Steam Generator E24B High Point Vent. Parallel isolationPaired with SV1092.
Component in Area? No
Cables in Area:
RCR190Q

Flow Path: 1A-MR-MPS-P021 | Flow Path:

ID: CV1219
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB51
RCS LOOP A HIGH PRESSURE SAFETY INJECTION ISOLATION VLV
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5151C RCB5151D
RPB5151A

Flow Path: 2A-MR-MPS-P022 | Flow Path:

ID: CV1220
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB51
RCS LOOP A HP SAFETY INJECTION ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5152C RCB5152D
RPB5152A

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 3A-MR-MPS-P023

ID: CV1278
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B52
RCS Loop A High Pressure Safety Injection Isolation Valve
Component in Area? No

Cables in Area:
RCB5213C RCB5213D RCB5213F
RPB5213A

Green Train

Flow Path:

Flow Path: 4A-MR-MPS-P024

ID: CV1279
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B52
RCS Loop A High Pressure Safety Injection Isolation Valve
Component in Area? No

Cables in Area:
RCB5214C RCB5214D RCB5214F
RPB5214A

Flow Path:

Flow Path: 0A-MR-MPS-P040

ID: PM64A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B57
Primary Makeup Pump PM36A Lube Oil Pump.
Component in Area? No

Cables in Area:
PWR LOST 104-S

Flow Path:

Flow Path: 0A-MC-MPS-P041

ID: PM36B(C)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: A3/A4
Primary Makeup Pump PM36B Common Power Feeder.
Includes Disconnect Switch.
Component in Area? No

Cables in Area:
GPA803A

Flow Path: 0A-MC-MPS-P041

ID: PM36B(C)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: A3/A4
Primary Makeup Pump PM36B Common Power Feeder.
Includes Disconnect Switch.
Component in Area? No

Cables in Area:
GPA803A

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 1A-MR-MPS-P041

ID: PM36B(R)
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: A3
Primary Makeup Pump Red Power Feed. Includes Disconnect Switch.
Component in Area? No
Cables in Area:

A802B	RA204B	RPA307A

Green Train

Flow Path:

Red Train

Flow Path:

Green Train

Flow Path: 2A-MG-MPS-P041

ID: PM36B(G)
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: A4
Primary Makeup Pump Green Power Feed. Includes Disconnect Switch.
Component in Area? No
Cables in Area:

A801B	GPA407A	RA204A

Red Train

Flow Path: 1A-MR-MPS-P062

ID: CV1405
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B51
Reactor Bldg. Sump Recirculation Isolation Valve.
Component In Area? No
Cables in Area:

PWR LOST 104-S	RCB51112C	RCB51112D
RPB51112A		

ID: CV1407
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB51
BORATED WATER TANK OUTLET VALVE
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCB5164C	RCB5164D
RCB5164E	RCB5164F	RPB5164A

Green Train

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 0D-DR-MVP-P012

ID: CV3806
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB52
DIESEL GEN K4A HT EXCH COOLING WATER OUTLET VLV NC OPEN ON D-G ST
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCB5231C	RCB5231D
RCB5231E	RPB5231A	

ID: PM16A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: DG Bus: MCCB51
EMERGENCY DIESEL FUEL TRANSFER PUMP
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCB5114C	RPB5114A

Green Train

Flow Path:

Flow Path: 1A-NR-NIS-P000

ID: NI501
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: NIS Bus: C539/RS1
Source Range #1 Indicator fromNE501 via C539. Isolated at C539.
Component in Area? No
Cables in Area:

PWR LOST 104-S	R208G

Flow Path:

Flow Path: 1A-NR-NIS-P001

ID: NE501
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: NIS Bus: RS1/C539
SOURCE RANGE #1 TO NI503 OR SPDS-A
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCR208B	RJR208D1
RJR208D2	RJR208D3	RJR208E1
RJR208E2	RJR208E3	RJR208F1
RJR208F2	RJR208F3	RJR208F4

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train		Green Train	
Flow Path: 1A-PC-RCS-P001		Flow Path: 1A-PC-RCS-P001	
ID: H11		ID: H11	
DCD (Links):	Status: As Built	DCD (Links):	Status: As Built
DCD (SSData):	Status: As Built	DCD (SSData):	Status: As Built
System: MVP Bus: X02		System: MVP Bus: X02	
RCP PM32A FEEDER BREAKER		RCP PM32A FEEDER BREAKER	
Component in Area? No		Component in Area? No	
Cables in Area:		Cables in Area:	
H11J		H11J	
ID: H22		ID: H22	
DCD (Links):	Status: As Built	DCD (Links):	Status: As Built
DCD (SSData):	Status: As Built	DCD (SSData):	Status: As Built
System: MVP Bus: X02		System: MVP Bus: X02	
RCP PM32B FEEDER BREAKER		RCP PM32B FEEDER BREAKER	
Component in Area? No		Component in Area? No	
Cables in Area:		Cables in Area:	
H22J		H22J	
Flow Path: 1B-PR-RCS-P042		Flow Path:	
ID: PT1042			
DCD (Links):	Status: As Built		
DCD (SSData):	Status: As Built		
System: RCS Bus: RS1/C539			
RCS LOOP A PRESSURE TO PR1042 OR SPDS-A VIA C539			
Component in Area? No			
Cables in Area:			
PWR LOST 104-S RJP0727B			
Flow Path: 1B-PR-RCS-P043		Flow Path:	
ID: PR1042			
DCD (Links):	Status: As Built		
DCD (SSData):	Status: As Built		
System: RCS Bus: RS1/C539			
RCS PRESSURE RECORDER FROM PT1042 VIA C539. Isolated at C539.			
Component in Area? No			
Cables in Area:			
PWR LOST 104-S RJP0727C			

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 0A-SC-RHR-P010

ID: CV1050
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: MCCB52
DECAY HEAT REMOVAL HEADER CCA-8-12 ISO VLV
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCB5255D	RCB5255E
RCB5255G	RCB5255H	RCB5255J
RPB5255A	RPB5255B	RPB5255C

Flow Path: 0A-SR-RHR-P030

ID: CV1434
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B57
Component in Area? No
Cables in Area:

RCB5741D	RCB5741D1

ID: CV1436
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B57
Component in Area? No
Cables in Area:

RCB5742D	RCB5742D1

Green Train

Flow Path: 0A-SC-RHR-P010

ID: CV1050
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: MCCB52
DECAY HEAT REMOVAL HEADER CCA-8-12 ISO VLV
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCB5255D	RCB5255E
RCB5255G	RCB5255H	RCB5255J
RPB5255A	RPB5255B	RPB5255C

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 0A-SR-RHR-P031	Flow Path:

ID: CV1401
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: MCCB51
LP SAFETY INJECTION HEADER ISOLATION VLV
Component in Area? No

Cables in Area:

PWR LOST 104-S	RCB51114D	RCB51114E
RCB51114F	RPB51114A	RPB51114B
RPB51114C		

ID: CV1428
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B53
DECAY HEAT COOLER E35A OUTLET CONTROL VALVE
Component in Area? No

Cables in Area:

RCB5335C	RCB5335F	RCB5335G
RPB5335A		

Red Train	Green Train
Flow Path: 0A-SR-RHR-P050	Flow Path:

ID: CV3822
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB51
DECAY HEAT COOLER E35A SW INLET VALVE
Component in Area? No

Cables in Area:

PWR LOST 104-S	RCB5182C	RCB5182D
RCB5182E	RPB5182A	

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train

Flow Path: 2A-VR-SGS-P011

ID: TE1111
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: RCS   Bus: C539/RS1
RCS Loop A Hot Leg to TI1111 or SPDS.
Component in Area? No
Cables in Area:
PWR LOST 104-S   RJR196D

ID: TI1111
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: RCS   Bus: C539/RS1
RCS Loop A Hot Leg. Requires TE1111 and C539. Isolated at C539.
Component in Area? No
Cables in Area:
PWR LOST 104-S   RJR196E

Green Train

Flow Path:

Red Train

Flow Path: 1A-GR-SGS-P012

ID: CV2646
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: RA1
EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24A CONTROL VALVE
Component in Area? No
Cables in Area:

RCRA106AC	RJI423A1	RJI423D1

Green Train

Flow Path: 1A-GG-SGS-P012

ID: CV2627
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: MCCD15
EMERGENCY FEEDWATER FROM P7A TO STEAM GENERATOR E24A ISOLATION VALVE
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCD1522C	RCD1522D
RCD1522E	RCD1522F	RPD1522A1
RPD1522A2	RPD1522A3	RPD1522A4
RPD1522A5		

Red Train

Flow Path: 4A-VR-SGS-P012

ID: TE1117
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: RCS   Bus: RS1/C539
RCS LOOP A PUMP C COLD LEG TO SPDS-A VIA C539
Component in Area? No
Cables in Area:
PWR LOST 104-S   RJR200D

Green Train

Flow Path:

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path: 1A-GR-SGS-P013	Flow Path: 1A-GG-SGS-P013
ID: CV2648 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: RA1 EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24B CONTROL VALVE Component in Area? No Cables in Area: RCRA106AD RJI423B1 RJI423D2	ID: CV2620 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCCD15 EMERGENCY FEEDWATER FROM P7A TO STEAM GENERATOR E24B ISOLATION VALVE Component in Area? No Cables in Area: PWR LOST 104-S RCD1514C RCD1514D RCD1514E RCD1514F RPD1514A1 RPD1514A2 RPD1514A3 RPD1514A4 RPD1514A5
	ID: CV2626 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCCB63 EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24B ISOLATION VALVE Component in Area? No Cables in Area: GCB6335B GPB6335A
Flow Path: 3A-VR-SGS-P013	Flow Path:
ID: TE1012 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: RS1 RCS LOOP A HOT LEG TO BUF. A2-3-1 OR XI Component in Area? No Cables in Area: RJR009L	
Flow Path: 3A-GR-SGS-P014	Flow Path:
ID: CV2869 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCCB51 EFW FLOW TEST ISOLATION FOR P7B Component in Area? No Cables in Area: PWR LOST 104-S RCB5134B RCB5134C RCB5134D RPB5134A	

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 1A-VR-SGS-P015

ID: LI2618
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1
Steam Generator E24A Lower Range Level. Requires LT2618 and C539. Isolated at C539.
Component in Area? No
Cables in Area:
RJI419A

ID: LT2618
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1
STM GEN E24A LOW RANGE LEVEL EFIC CHAN A OR SPDS-A VIA C539
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI419A2

Flow Path: 1A-VR-SGS-P016

ID: LI2620
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1
Steam Generator E24A Upper Range Level. Requires LT2620 and C539. Isolated at C539.
Component in Area? No
Cables in Area:
RJI419B

ID: LT2620
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539
STM GEN E24A UPPER RANGE LEVEL EFIC CHAN A OR SPDS-A.
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI419B2

Flow Path: 4B-VR-SGS-P022

ID: TE1144
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539
RCS LOOP B PUMP B COLD LEG TO SPDS-A VIA C539
Component in Area? No
Cables in Area:
PWR LOST 104-S RJR204D

Green Train

Flow Path:

Flow Path:

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train | Green Train

Flow Path: 1A-VR-SGS-P024 | Flow Path:

ID: PI2618A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: PNLRS1
STM GEN E24A PRESSURE REQUIRESPT2618A AND C539
ISOLATED AT C539.
Component in Area? No
Cables in Area:
RJI419C

ID: PT2618A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539
STM GEN E24A PRESSURE EFIC CHAN A OR SPDS-A
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI419C1

Flow Path: 1B-VR-SGS-P024 | Flow Path:

ID: PR2667A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1
Steam Generator E24B Pressure Requires PT2667A and C539.
Isolated at C539.
Component in Area? No
Cables in Area:
RJI419F

ID: PT2667A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539
STM GEN E24B PRESSURE EFIC CHAN A OR SPDS-A.
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI419F1

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train

Flow Path: 1B-VR-SGS-P025

ID: LI2667

DCD (Links) :   Status: As Built

DCD (SSData):   Status: As Built

System: SGS   Bus: RS1

Steam Generator E24B Lower Range Level. Requires LT2667 and C539. Isolated at C539.

Component in Area? No

Cables in Area:

RJI419D

ID: LT2667

DCD (Links) :   Status: As Built

DCD (SSData):   Status: As Built

System: SGS   Bus: RS1/C539

STM GEN E24B LOW RANGE LEVEL EFIC CHAN A OR SPDS-A.

Component in Area? No

Cables in Area:

PWR LOST 104-S   RJI419D2

Green Train

Flow Path:

Flow Path: 1B-VR-SGS-P026

ID: LI2669

DCD (Links) :   Status: As Built

DCD (SSData):   Status: As Built

System: SGS   Bus: RS1

Steam Generator E24B Upper Range Level. Requires LT2669 and C539. Isolated at C539.

Component in Area? No

Cables in Area:

RJI419E

ID: LT2669

DCD (Links) :   Status: As Built

DCD (SSData):   Status: As Built

System: SGS   Bus: RS1/C539

STM GEN E24B UPPER RANGE LEVEL EFIC CHAN A OR SPDS-A.

Component in Area? No

Cables in Area:

PWR LOST 104-S   RJI419E2

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 0A-VR-SGS-P029	Flow Path:
ID: CV2676 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: MCCB51 STEAM GENERATOR E24A STEAM DUMP TO ATM (CV2668) BLOCK VALVE Component in Area? No Cables in Area: B5172B B5172D B5172F B5172G B5172L PWR LOST 104-S	
Flow Path: 0B-VR-SGS-P029	Flow Path: 0B-VG-SGS-P029
ID: CV2668 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: PNLRS1 ATMOSPHERIC DUMP VALVE STM GEN E24A Component in Area? No Cables in Area: I443A RJI423C	ID: CV2618 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: PNL RS2 ATMOSPHERIC DUMP VALVE STM GEN E24B (E/P - 2618) Component in Area? No Cables in Area: I442A
Flow Path: 2A-GR-SGS-P039	Flow Path: 2A-GG-SGS-P039
ID: PM7B DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: A3 EMERGENCY FEEDWATER PUMP MOTOR DRIVEN Component in Area? No Cables in Area: RCA311H	ID: PM7A DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: NONE EMERGENCY FEEDWATER PUMP TURBINE DRIVEN Component in Area? No Cables in Area: GCI428L

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 1A-GR-SGS-P041	Flow Path:

ID: CV2663
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: D15
P7A STM ADMISSION VALVE EFIC CHANNEL A
Component in Area? No

Cables In Area:

PWR LOST 104-S	RCD1512B	RCD1512C
RCD1512D	RCD1512F	RPD1512A2
RPD1512A3	RPD1512A4	RPD1512A5
RPD1512A6		

ID: SV2663
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: D15
PM7A Steam Admin Bypass Valve EFIC Channel A
Component in Area? No

Cables In Area:

PWR LOST 104-S RCD1512E

Red Train — Flow Path: 2A-GR-SGS-P041

ID: CV2667
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: MCCB52
EMERGENCY FEED PUMP P7A TURBINE STEAM SUPPLY FROM E24A ISOLATION VALVE
Component in Area? No

Cables In Area:

PWR LOST 104-S	RCB5241C	RCB5241H
RCB5241J	RPB5241A	

Green Train — Flow Path: 2A-GG-SGS-P041

ID: CV2617
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: MCCB62
EMERGENCY FEED PUMP P7A TURBINE STEAM SUPPLY FROM E24B STOP VALVE
Component In Area? No

Cables in Area:

GCB6241C

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 2A-GR-SGS-P043

ID: CV2803
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB51
EMERG FEEDWATER PUMP P7B SERVICE WATER SUCTION VALVE
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5193C RCB5193E
RPB5193A

ID: CV3850
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB51
SERVICE WATER HEADER TO EMERG FP P7B ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5194C RCB5194E
RPB5194A

Green Train

Flow Path:

Red Train

Flow Path: 1A-GR-SGS-P044

ID: CV2800
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB51
EMERG FEEDWATER PUMP P7B CONDENSATE SUCTION VLV
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5173C RCB5173E
RPB5173A

Green Train

Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train

Flow Path: 0C-GR-SGS-P045

ID: LRS4204
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: CFW Bus: C539/RS1
Requires LT4204 and C539. Isolated at C539.
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI452B

ID: LT4204
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: CFW Bus: C539/RS1
Cond. Storage TK T41B Level to LRS4204 or SPDS.
Component in Area? No
Cables in Area:
PWR LOST 104-S RJI452A

Green Train

Flow Path:

Flow Path: 0A-GR-SGS-P050

ID: MSIV-A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: D11
MAIN STEAM ISOLATION VALVE Control Circuit Channel A (SV611,SV721)
Component in Area? No
Cables in Area:

RCM021J	RCM021K	RCM021R
RCM021S	RCM021T	RCM021U
RCM021V	RCM021W	RCM021Y1

Flow Path: 0A-GG-SGS-P050

ID: MSIV-B
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: D21
MAIN STEAM ISOLATION VALVE CONTROL CIRCUIT CHANNEL B (SV711,SV621)
Component in Area? No
Cables in Area:

GCM022J	GCM022K	GCM022R
GCM022S	GCM022T	GCM022U
GCM022V	GCM022W	GCM022Y1

Flow Path: 0A-GR-SGS-P051

ID: CV2680
DCD (Links) : PC 985000B201 Status: New
DCD (SSData): Status: As Built
System: CFW Bus: MCCB51
MAIN FEEDWATER TO E24A CONTAINMENT ISOLATION (NOT COI)
Component in Area? No
Cables in Area:

PWR LOST 104-S	RCB5124D	RCB5124E
RCB5124F	RCB5124G	RCB5124H
RCB5124K	RPB5124A	RPB5124B
RPB5124C		

Flow Path: 0A-GG-SGS-P051

ID: CV2630
DCD (Links) : PC 985000B201 Status: New
DCD (SSData): Status: As Built
System: CFW Bus: MCCB61
MAIN FEEDWATER TO E24B CONTAINMENT ISOLATION (NOT A COI)
Component in Area? No
Cables in Area:

GCB6124E	GCB6124H

Fire Zone: 104-S   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0A-WG-SWS-P002 ID: CV3824 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: sw Bus: B2144 SW return to lake isolation valve Component in Area? No Cables in Area: B2144D
Flow Path: 0A-WR-SWS-P014 ID: CV3640 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCCB52 SERVICE WATER PUMP DISCHARGE CROSSCONNECT VALVE P4B-P4C Component in Area? No Cables in Area: RCB5223C RCB5223F RPB5223A ID: CV3646 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCCB52 SERVICE WATER PUMP DISCHARGE CROSSCONNECT VALVE P4A-P4B Component in Area? No Cables in Area: PWR LOST 104-S RCB5224C RCB5224F RPB5224A	Flow Path:
Flow Path: 1A-WR-SWS-P031 ID: SG1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCCB51 SLUICE GATE DARDANELLE TO BAY A Component in Area? No Cables in Area: PWR LOST 104-S RCB5253F1 RPB5253A1	Flow Path:

Fire Zone: 104-S Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 2A-WR-SWS-P031	Flow Path:

ID: SG5
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB52
SLUICE GATE EMERGENCY POND TO BAY A
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5212C RPB5212B

Flow Path: 1A-WR-SWS-P033	Flow Path:

ID: SG3
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB52
SLUICE GATE BAY A TO BAY B
Component in Area? No
Cables in Area:
PWR LOST 104-S RCB5251C RPB5251A

Fire Zone: 2040-JJ   Unit: 2   Status: As Built

Red Train

Flow Path: OO-CR-1EP-P003

ID: 2B52
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: LC2B5
480V ESF MOTOR CONTROL CENTER
Component in Area? Yes

ID: 2B532
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus:
MCC 2B52 MAIN BREAKER
Component in Area? No
Cables in Area:

R2B532A	R2B532B	R2B532C
R2B532D	R2B532E	R2B532F
R2B532G		

Green Train

Flow Path:

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train | Green Train

Flow Path: 1A-BR-1EP-P040 | Flow Path:

ID: 2A308
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: PNL2D23
DG 1 OUTPUT BREAKER POWER CABLES ROUTED WITH 2A3
Component In Area? No

Cables in Area:
R2A308H

ID: 2E11
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DG Bus: PNL2D23
DIESEL GENERATOR 2K4A LOCAL PANEL
Component In Area? No

Cables in Area:

R2G100E	R2G100F	R2G102E
R2G102H	R2G102N	R2G104C
R2G104D	R2G106J	R2G106K
R2G106L		

ID: 2PM16A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DG Bus: MCC2B53
EMERGENCY DIESEL FUEL TRANSFER PUMP
Component In Area? No

Cables in Area:
R2B53K3A R2B53K3D

Flow Path: 1A-BR-1EP-P050 | Flow Path:

ID: 2K4A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DG Bus:
DIESEL GENERATOR AND AUXILIARIES
Component In Area? No

Cables in Area:
R2B52B1A R2B52B1B R2B52B1C

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: 5A-RR-CVC-P003 ID: 2CVC115 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: NONE CHARGING PUMP HPSI HEADER ISOLATION VALVE MANUAL VALVE Component in Area? Yes	Flow Path:
Flow Path: 1A-RR-CVC-P005 ID: 2PM36A DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: MCC2B52 CHARGING PUMP Component in Area? Yes Cables in Area: R2B52A5A R2B52A5B R2B52A5C R2B52A5F R2B52A5G R2B52A5N R2B52A5P	Flow Path: 1A-RG-CVC-P005 ID: 2PM36B DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: MCC2B62 CHARGING PUMP Component in Area? Yes Cables in Area: G2B62A5A G2B62A5B G2B62A5C
Flow Path: 2A-RC-CVC-P006 ID: 2PM36C(C) DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: N/A CHARGING PUMP Component in Area? Yes Cables in Area: O2B54A4A O2B54A4B O2B54A4C	Flow Path: 2A-RC-CVC-P006 ID: 2PM36C(C) DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: N/A CHARGING PUMP Component in Area? Yes Cables in Area: O2B54A4A O2B54A4B O2B54A4C
Flow Path: 2A-RR-CVC-P006 ID: 2PM36C DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: MCC2B54 CHARGING PUMP RED PWR CABLES TO 2C838 Component in Area? Yes ID: 2PM36C(R) DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: 2B54 CHARGING PUMP Component in Area? Yes	Flow Path: 2A-RG-CVC-P006 ID: 2PM36C(G) DCD (Links): Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: 2B64 CHARGING PUMP Component in Area? Yes

Fire Zone: 2040-JJ   Unit: 2   Status: As Built

Red Train	Green Train
Flow Path: 1A-RR-CVC-P009	Flow Path: 1A-RG-CVC-P009
ID: 2CV4920-1	ID: 2CV4921-1
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: CVCS Bus: MCC2B52	System: CVCS Bus: MCC2B52
2T6A SHUTOFF VALVE	2T6B SHUTOFF VALVE
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
R2B52K4A R2B52K4C R2B52K4E	R2B52F1A R2B52F1C R2B52F1E
Flow Path: 2B-RC-CVC-P009	Flow Path: 2B-RC-CVC-P009
ID: 2CV4950-2	ID: 2CV4950-2
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: CVCS Bus: MCC2B62	System: CVCS Bus: MCC2B62
REFUELING WATER TANK TO CHARGING PUMP VALVE	REFUELING WATER TANK TO CHARGING PUMP VALVE
Component in Area? Yes	Component in Area? Yes
Cables in Area:	Cables in Area:
G2B62F2G G2B62F2H	G2B62F2G G2B62F2H
Flow Path: 2B-RR-CVC-P010	Flow Path: 2B-RG-CVC-P010
ID: 2CV5649-1	ID: 2CV5650-2
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: Bus: 2B52	System: Bus: 2B62
SUMP RECIRC HDR ISOLATION VALVE	SUMP RECIRC HEADER ISOLATION VALVE
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
R2B52G3C R2B52G3E R2B52G3F R2B52G3X	G2B62G3E G2B62G3X
Flow Path: 1A-BR-DGS-S010	Flow Path:
ID: 2VEFM24A	
DCD (Links): Status: As Built	
DCD (SSData): Status: As Built	
System: HVAC Bus: MCC2B52	
D-G ROOM EXHAUST FAN	
Component in Area? No	
Cables in Area:	
R2B52C6A R2B52C6B R2B52C6C R2B52C6D R2B52C6G	

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train

Flow Path: 2A-BR-DGS-S010

ID: 2VEFM24B
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: HVAC Bus: MCC2B52
D-G ROOM EXHAUST FAN
Component in Area? No
Cables in Area:
R2B52C7D R2B52C7G R2B52C7E
R2B52C7H

Green Train

Flow Path:

Flow Path: 1A-BR-DGS-S012

ID: 2TCDM8689-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: HVAC Bus: MCC2B52
D-G ROOM EXHAUST FAN DAMPER
Component in Area? No
Cables in Area:
R2B52B5A

Flow Path:

Flow Path: 2A-BR-DGS-S012

ID: 2TCDM8687-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: HVAC Bus: MCC2B52
D-G ROOM EXHAUST FAN DAMPER
Component in Area? No
Cables in Area:
R2B52B5A

Flow Path:

Flow Path: 0B-SC-SCS-P010

ID: 2CV5038-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
SHUTDOWN COOLING RETURN HEADER 2GCB-5 ISO VLV
Component in Area? No
Cables in Area:
R2B52E5B R2B52E5C R2B52E5D

Flow Path: 0B-SC-SCS-P010

ID: 2CV5038-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
SHUTDOWN COOLING RETURN HEADER 2GCB-5 ISO VLV
Component in Area? No
Cables in Area:
R2B52E5B R2B52E5C R2B52E5D

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train

Flow Path: 2C-SR-SCS-P023

ID: 2CV5037-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
LPSI HEADER DISCHARGE TO RCS LOOP (2P32B) STOP VALVE
Component in Area? No
Cables in Area:
R2B52H1A R2B52H1C R2B52H1D

Green Train

Flow Path:

Red Train

Flow Path: 1C-SC-SCS-P031

ID: 2SV5093-3
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: PNL2Y2
2CV5093 SOLENOID VALVE SHUTDOWN HX OUTLET FLOW CONTROL VALVE
Component in Area? No
Cables in Area:
2I063C 2Q022C

Green Train

Flow Path: 1C-SC-SCS-P031

ID: 2SV5093-3
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: PNL2Y2
2CV5093 SOLENOID VALVE SHUTDOWN HX OUTLET FLOW CONTROL VALVE
Component in Area? No
Cables in Area:
2I063C 2Q022C

Red Train

Flow Path: 1C-SC-SCS-P032

ID: 2SV5091-3
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: PNL2Y2
2CV5091 SOLENOID VALVE SHTDN HX BYPASS
Component in Area? No
Cables in Area:
2I064E 2Q021C

Green Train

Flow Path: 1C-SC-SCS-P032

ID: 2SV5091-3
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: PNL2Y2
2CV5091 SOLENOID VALVE SHTDN HX BYPASS
Component in Area? No
Cables in Area:
2I064E 2Q021C

Red Train

Flow Path: 0A-SR-SCS-P041

ID: 2CV5612-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: CSS Bus: MCC2B52
SPRAY HEADER ISOLATION VALVE
Component in Area? No
Cables in Area:
R2B52G4A R2B52G4C R2B52G4D

Green Train

Flow Path: 0A-SG-SCS-P041

ID: 2CV5124-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
LPSI PUMP 2P60B MINI. FLOW STOP VALVE
Component in Area? No
Cables in Area:
R2B52A3A R2B52A3C R2B52A3D

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: 0A-SR-SCS-P060	Flow Path: 0A-SG-SCS-P060
ID: 2CV1400-1 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B52 SW HEADER NO.1 TO ESF EQUIPMENT LOADS Component in Area? No Cables in Area: R2B52J1A R2B52J1C R2B52J1D	ID: 2CV1406-2 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B62 SW HEADER NO.2 TO ESF EQUIPMENT LOADS Component in Area? Yes Cables in Area: G2B62J1A G2B62J1C
ID: 2CV1445-1 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B52 SW TO LPSI PUMP 2P60A COOLER 2E52A Component in Area? No Cables in Area: R2B52F2A R2B52F2C R2B52F2D	ID: 2CV1446-2 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B61 SW TO LPSI PUMP 2P60B COOLER 2E52B Component in Area? No Cables in Area: G2B61M3A G2B61M3C
ID: 2CV1453-1 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B52 SHUTDOWN HX 2E35A SW INLET VALVE Component in Area? No Cables in Area: R2B52G1A R2B52G1C R2B52G1D	ID: 2CV1456-2 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B62 SHUTDOWN HX 2E35B SW INLET VALVE Component in Area? No Cables in Area: G2B62G1A G2B62G1C
Flow Path:	Flow Path: 0B-GG-SGS-P022
	ID: 2CV1076-2 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCC2D26 EFW FROM 2P7A TO SG 2E24B FLOW CONTROL VALVE Component in Area? No Cables in Area: G2D26C1A G2D26C1B G2D26C1C G2D26C1H G2D26C1J G2D26C1K
Flow Path:	Flow Path: 0A-GG-SGS-P030
	ID: 2C143 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: N/A Bus: PNLRS2 EMERG FEEDWATER PUMP 2P7A TURBINE CONTROL PANEL Component in Area? No Cables in Area: G2S105E G2S105F G2S105G G2S105J G2S105K G2S105M

Fire Zone: 2040-JJ   Unit: 2   Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: OA-GG-SGS-P042

ID: 2SV0317-2
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: PNL2D24
EMERGENCY FEED PUMP TURBINE BEARING WATER INLET
Component in Area? No
Cables in Area:
G2S067C   G2S067G

Red Train

Flow Path:

Green Train

Flow Path: OA-GG-SGS-P043

ID: 2CV0340-2
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: MS   Bus: MCC2D26
EMERGENCY FEED PUMP 2P7A TURBINE STEAM INLET VALVE
Component in Area? Yes
Cables in Area:
G2D26B1A   G2D26B1B   G2D26B1C
G2D26B1K   G2D26B1L   G2D26B1M

Red Train

Flow Path: 1A-GR-SGS-P051

ID: 2CV0795-2
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: MCC2D26
EMERG FEEDWATER PUMP 2P7A CONDENSATE SUCTION VLV
Component in Area? No
Cables in Area:
G2D26B3A   G2D26B3B   G2D26B3D
G2D26B3F   G2D26B3G   G2D26B3K
G2D26B3L   G2D26B3M

Green Train

Flow Path: 1A-GG-SGS-P051

ID: 2CV0711-2
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: MCC2D26
EMERG FEEDWATER PUMP 2P7A SVC WATER SUCTION VLV
Component in Area? No
Cables in Area:
G2D26B2A   G2D26B2B   G2D26B2E
G2D26B2F   G2D26B2L   G2D26B2M
G2D26B2N

Red Train

Flow Path: 1B-GR-SGS-P051

ID: 2CV0789-1
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: MCC2B53
EMERG FEEDWATER PUMP 2P7B CONDENSATE SUCTION VLV
Component in Area? No
Cables in Area:
R2B53D2A   R2B53D2D

Green Train

Flow Path: 1B-GG-SGS-P051

ID: 2CV0716-1
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: EFW   Bus: MCC2B53
EMERG FEEDWATER PUMP 2P7B SERVICE WATER SUCTION
Component in Area? No
Cables in Area:
R2B53D1A   R2B53D1F

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train

Flow Path: 1A-GR-SGS-P090

ID: 2LIS1937
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: CFW Bus: 2Y1
CONDENSATE STORAGE TANK 2T41A LEVEL
Component in Area? No
Cables in Area:
2I366C

Green Train

Flow Path: 1A-GG-SGS-P090

ID: 2LIS1977
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: CFW Bus: 2Y2
CONDENSATE STORAGE TANK LEVEL
Component in Area? No
Cables in Area:
2I383C

Flow Path: 0A-RR-SIS-P002

ID: 2CV5101-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
HOT LEG INJECTION THROTTLING VALVE
Component in Area? No
Cables in Area:
R2B52L5A R2B52L5D R2B52L5E

Flow Path:

Flow Path: 1A-RR-SIS-P003

ID: 2CV5035-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
HPSI HEADER #1 DISCHARGE TO RCS LOOP (2P32B) STOP VALVE
Component in Area? No
Cables in Area:
R2B52F3A R2B52F3C R2B52F3D

ID: 2CV5075-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SI Bus: MCC2B52
HPSI HEADER #1 DISCHARGE TO RCS LOOP (2P32D) STOP VALVE
Component in Area? No
Cables in Area:
R2B52F4A R2B52F4C R2B52F4D

Flow Path:

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: OA-WR-SWS-P021	Flow Path:
ID: 2CV1418-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B54 SW PUMP CROSSOVER VALVE P4B - P4A Component in Area? No Cables in Area: R2B54D3E	
ID: 2CV1419-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B54 SW PUMP CROSSOVER VALVE P4B - P4A Component in Area? No Cables in Area: R2B54E3E	
Flow Path:	Flow Path: OA-WG-SWS-P024
	ID: 2CV1474-2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B62 SW RESVR TO 2P4C Component in Area? No Cables in Area: G2B62H3A G2B62H3C
Flow Path: OA-WC-SWS-P040	Flow Path: OA-WC-SWS-P040
ID: 2CV1472-5 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B64 2P4B SLUICE GATE Component in Area? No Cables in Area: R2B54H4C	ID: 2CV1472-5 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B64 2P4B SLUICE GATE Component in Area? No Cables in Area: R2B54H4C
Flow Path: 2A-WR-SWS-P060	Flow Path:
ID: 2CV1541-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCC2B53 SERVICE WATER RETURN TO EMERGENCY POND Component in Area? No Cables in Area: R2B53J3A R2B53J3C	

Fire Zone: 2040-JJ Unit: 2 Status: As Built

Red Train

Flow Path: 1A-WR-SWS-P070

ID: 2CV1481-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B52
SERVICE WATER RETURN TO DARDANELLE
Component in Area? Yes
Cables in Area:
R2B52H2A R2B52H2C R2B52H2D

Flow Path: 1A-WC-SWS-P070

ID: 2CV1460
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: N/A
SERVICE WATER DISCHARGE TO RESERVOIR
Component in Area? Yes

Flow Path: 3B-WR-SWS-P081

ID: 2CV1543-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B54
SW HDR NO.1 DISCH TO COOLING TOWER BASIN
Component in Area? No
Cables in Area:
R2B54H2A R2B54H2E

Green Train

Flow Path: 1A-WG-SWS-P070

ID: 2CV1480-2
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B62
SERVICE WATER RETURN TO DARDANELLE
Component in Area? Yes
Cables in Area:
G2B62L5A G2B62L5C

Flow Path: 1A-WC-SWS-P070

ID: 2CV1460
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: N/A
SERVICE WATER DISCHARGE TO RESERVOIR
Component in Area? Yes

Flow Path:

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: OO-CR-1EP-P001 ID: 2B53 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: LVP Bus: LC2B5 480V ESF MOTOR CONTROL CENTER Component In Area? Yes Cables In Area: R2B514A R2B514B R2B514C R2B514D R2B514E R2B514F R2B514G	Flow Path:
Flow Path: 1A-BR-1EP-P040 ID: 2PM16A DCD (Links): Status: As Built DCD (SSData): Status: As Built System: DG Bus: MCC2B53 EMERGENCY DIESEL FUEL TRANSFER PUMP Component In Area? No Cables In Area: R2B53K3A R2B53K3D R2B53K3E	Flow Path: 1A-BG-1EP-P040 ID: 2PM16B DCD (Links): Status: As Built DCD (SSData): Status: As Built System: DG Bus: MCC2B63 EMERGENCY DIESEL FUEL TRANSFER PUMP Component In Area? No Cables In Area: G2B63K5A
Flow Path: 00-FC-ACP-P000 ID: SPDS DCD (Links): Status: As Built DCD (SSData): Status: As Built System: ACP Bus: 2Y26 POWER SUPPLY TO SPDS COMPUTER Component In Area? No Cables In Area: 2Y0106J 2Y0106J1 2Y0106K 2Y0106K1 2Y0106L	Flow Path: 00-FC-ACP-P000 ID: SPDS DCD (Links): Status: As Built DCD (SSData): Status: As Built System: ACP Bus: 2Y26 POWER SUPPLY TO SPDS COMPUTER Component In Area? No Cables In Area: 2Y0106J 2Y0106J1 2Y0106K 2Y0106K1 2Y0106L
Flow Path:	Flow Path: 0A-DG-ACP-P001 ID: 2RS2 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EEC Bus: 2Y22 120V AC DISTR. PNL VITAL BUS 2 Component In Area? No Cables In Area: G2Y01028 G2Y01029

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0A-EG-ACP-P001 ID: 2Y22 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EEC Bus: MCC2B61 120 VAC INSTRUMENT INVERTER CHANNEL NO. 2 (GREEN) Component in Area? Yes Cables in Area: G2Y01026 G2Y01027 G2Y0107A G2Y0107B
Flow Path: 0B-FC-ACP-P001 ID: 2B54J9 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B54 INVERTER 2Y26 BACKUP AC SUPPLY Component In Area? No Cables in Area: 2Y0106E 2Y0106F	Flow Path: 0B-FC-ACP-P001 ID: 2B54J9 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B54 INVERTER 2Y26 BACKUP AC SUPPLY Component in Area? No Cables in Area: 2Y0106E 2Y0106F
Flow Path: 2A-ER-ACP-P001 ID: 2B53E1 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B53 INVERTER 2Y11 BYPASS AC SUPPLY Component in Area? Yes Cables in Area: R2Y0101T R2Y0101U	Flow Path: 2A-EG-ACP-P001 ID: 2B61C1 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B61 INVERTER 2Y22 BYPASS AC SUPPLY Component in Area? No Cables in Area: G2Y01021 G2Y01022
Flow Path: 0A-FC-ACP-P002 ID: 2Y26 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EEC Bus: 2D03 120 VAC INSTRUMENT INVERTER SPDS COMPUTER POWER SUPPLY Component in Area? Yes Cables in Area: 2Y0106G 2Y0106G1 2Y0106H 2Y0106H1	Flow Path: 0A-FC-ACP-P002 ID: 2Y26 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: EEC Bus: 2D03 120 VAC INSTRUMENT INVERTER SPDS COMPUTER POWER SUPPLY Component in Area? Yes Cables in Area: 2Y0106G 2Y0106G1 2Y0106H 2Y0106H1

Fire Zone: 2091-BB   Unit: 2   Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 3A-EG-ACP-P002 ID: 2B64E1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B64 SPARE Component in Area? No
Flow Path:	Flow Path: 0B-DG-ACP-P004 ID: 2RS4 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: 2Y24 120V AC DISTR. PNL VITAL BUS 4 Component in Area? No Cables in Area: B2Y01048 B2Y01049
Flow Path:	Flow Path: 0C-EG-ACP-P004 ID: 2Y2224 DCD (Links) : PC 985000B200 Status: New DCD (SSData): Status: As Built System: EEC Bus: MCC2B61 120 VAC INSTRUMENT INVERTER Component in Area? Yes Cables in Area: G2Y0107C G2Y0107D
Flow Path: 2A-FC-ACP-P004 ID: 2B53C3 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B53 INVERTER 2Y26 PRIMARY AC SUPPLY Component in Area? Yes Cables in Area: 2Y0106A 2Y0106B 2Y0106C	Flow Path: 2A-FC-ACP-P004 ID: 2B53C3 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B53 INVERTER 2Y26 PRIMARY AC SUPPLY Component in Area? Yes Cables in Area: 2Y0106A 2Y0106B 2Y0106C

Fire Zone: 2091-BB　　Unit: 2　　Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 2B-EG-ACP-P004 ID: 2B61C2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B61 SPARE Component in Area? No ID: 2B61N4 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B61 INVERTER 2Y2224 BYPASS AC SUPPLY Component in Area? No Cables in Area: G2Y0107E G2Y0107F
Flow Path:	Flow Path: OB-EG-ACP-P004 ID: 2Y24 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: MCC2B61 120 VAC INSTRUMENT INVERTER CHANNEL NO. 4 (BLUE) Component in Area? Yes Cables in Area: B2Y0107G B2Y0107H G2Y01046 G2Y01047
Flow Path:	Flow Path: 0A-DG-ACP-P010 ID: 2C384 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: N/A Bus: 2C384 ALTERNATE SHUTDOWN INSTRUMENTATION PANEL Component in Area? No Cables in Area: G2Y0102A G2Y0102B G2Y0102C
Flow Path: 0A-FC-DEP-P012 ID: 2VUC30 DCD (Links) : PC 985000B201 Status: New DCD (SSData): ER-ANO-2001-0555-000-00 Status: New System: ACP Bus: 2B53 Room 2130 cooler (SPDS), 2VE6 required Component in Area? No Cables in Area: 2B53C4A	Flow Path: 0A-FC-DEP-P012 ID: 2VUC30 DCD (Links) : PC 985000B201 Status: New DCD (SSData): ER-ANO-2001-0555-000-00 Status: New System: ACP Bus: 2B53 Room 2130 cooler (SPDS), 2VE6 required Component in Area? No Cables in Area: 2B53C4A

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: 00-DR-DEP-P031	Flow Path: 00-DG-DEP-P031
ID: 2D27	ID: 2D26
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: EED Bus: 2D01	System: EED Bus: 2D02
125 VOLT DC MOTOR CONTROL CENTER	125 VOLT DC MOTOR CONTROL CENTER
Component in Area? Yes	Component in Area? Yes
Cables in Area:	Cables in Area:
R2D0121A R2D0121B	G2D0221A G2D0221B
Flow Path: 1A-PC-RCS-P001	Flow Path: 1A-PC-RCS-P001
ID: 2H12	ID: 2H12
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: MVP Bus: 2X02	System: MVP Bus: 2X02
RCP 2PM32D FEEDER BREAKER	RCP 2PM32D FEEDER BREAKER
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
2H12S	2H12S
ID: 2H22	ID: 2H22
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: MVP Bus: 2X02	System: MVP Bus: 2X02
RCP 2PM32C FEEDER BKR	RCP 2PM32C FEEDER BKR
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
2H22S	2H22S
Flow Path:	Flow Path: 0B-GG-RCS-P017
	ID: 2TE4716
	DCD (Links): Status: As Built
	DCD (SSData): Status: As Built
	System: RCS Bus: PNL2Y2
	2P32D COLD LEG TEMP (WIDE RANGE)
	Component in Area? No
	Cables in Area:
	2I010G

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train			Green Train		
Flow Path: 3A-LR-RCS-P034			Flow Path: 3A-LG-RCS-P034		
ID: 2CV4698-1			ID: 2CV4740-2		
DCD (Links):		Status: As Built	DCD (Links):		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: RCS	Bus: MCC2D27		System: RCS	Bus: MCC2D26	
PRESSURIZER ECCS VENT CONTROL VALVE			PRESSURIZER LTOP RELIEF ISOLATION		
Component in Area? No			Component in Area? No		
Cables in Area:			Cables in Area:		
R2D27A3A	R2D27A3B	R2D27A3C	G2D26A3A	G2D26A3B	G2D26A3C
R2D27A3D	R2D27A3E	R2D27A3F	G2D26A3D	G2D26A3E	G2D26A3F
R2D27A3J			G2D26A3J		

Flow Path: 0A-GC-SGS-P008			Flow Path: 0A-GC-SGS-P008		
ID: 2CV1040-1			ID: 2CV1040-1		
DCD (Links):		Status: As Built	DCD (Links):		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: SGS	Bus: MCC2B53		System: SGS	Bus: MCC2B53	
MSIV 2CV1010 BYPASS			MSIV 2CV1010 BYPASS		
Component in Area? No			Component in Area? No		
Cables in Area:			Cables in Area:		
R2B53B1A	R2B53B1C	R2B53B1H	R2B53B1A	R2B53B1C	R2B53B1H

Flow Path: 0A-GR-SGS-P019			Flow Path:		
ID: 2CV1052					
DCD (Links):		Status: As Built			
DCD (SSData):		Status: As Built			
System: SGS	Bus: 2B53				
SG-B ATMOSPHERIC DUMP ISOLATION VALVE					
Component in Area? No					
Cables in Area:					
R2B53D3A	R2B53D3C	R2B53D3D			
R2B53D3E					

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train

Flow Path: 0A-GR-SGS-P021

ID: 2CV1025-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2B51
EFW FROM 2P7B TO SG E24A FLOW CONTROL VALVE
Component in Area? No
Cables in Area:
R2B51N2D

Flow Path: 0B-GR-SGS-P022

ID: 2CV1036-2
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2B63
EFW FROM 2P7B TO SG 2E24B ISOLATION VALVE
Component in Area? No
Cables in Area:
G2B63H1A G2B63H1C

ID: 2CV1075-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2B53
EFW FROM 2P7B TO SG 2E24B FLOW CONTROL VALVE
CONTROL VALVE
Component in Area? No
Cables in Area:
2B53J2Q R2B53J2C R2B53J2H
R2B53J2M R2S064D R2S064P

Green Train

Flow Path: 0A-GG-SGS-P021

ID: 2CV1026-2
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2D26
EFW FROM 2P7A TO SG 2E24A FLOW CONTROL VALVE
Component in Area? No
Cables in Area:
G2D26A4A G2D26A4B G2D26A4C
G2D26A4H G2D26A4J G2D26A4K
G2D26A4L

ID: 2CV1037-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2D27
EFW FROM 2P7A TO SG 2E24A ISOLATION VALVE
Component in Area? No
Cables in Area:
R2D27B1A R2D27B1B R2D27B1C
R2D27B1G R2D27B1H R2D27B1J
R2D27B1K R2D27B1L

Flow Path: 0B-GG-SGS-P022

ID: 2CV1039-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2D27
EFW FROM 2P7A TO SG 2E24B ISOLATION VALVE
Component in Area? No
Cables in Area:
R2D27B2A R2D27B2B R2D27B2C
R2D27B2G R2D27B2H R2D27B2J
R2D27B2K R2D27B2L

ID: 2CV1076-2
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCC2D26
EFW FROM 2P7A TO SG 2E24B FLOW CONTROL VALVE
Component in Area? No
Cables in Area:
G2D26C1A G2D26C1B G2D26C1C
G2D26C1H G2D26C1J G2D26C1K
G2D26C1L

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: OA-GG-SGS-P043 ID: 2CV0340-2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: MS Bus: MCC2D26 EMERGENCY FEED PUMP 2P7A TURBINE STEAM INLET VALVE Component in Area? No Cables in Area: G2D26B1A G2D26B1B G2D26B1C G2D26B1E G2D26B1K G2D26B1L G2D26B1M G2D26B1N
Flow Path: 1B-GR-SGS-P044 ID: 2CV1000-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SGS Bus: MCC2B53 STEAM GENERATOR 2E24A EMERG FP TURBINE HEADER ISOLATION VALVE Component in Area? No Cables in Area: R2B53B2A R2B53B2C R2B53B2D	Flow Path:
Flow Path: 1A-GR-SGS-P051 ID: 2CV0795-2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCC2D26 EMERG FEEDWATER PUMP 2P7A CONDENSATE SUCTION VLV Component in Area? No Cables in Area: G2D26B3A G2D26B3B G2D26B3C G2D26B3D G2D26B3F G2D26B3K G2D26B3L G2D26B3M G2D26B3N	Flow Path: 1A-GG-SGS-P051 ID: 2CV0711-2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCC2D26 EMERG FEEDWATER PUMP 2P7A SVC WATER SUCTION VLV Component in Area? No Cables in Area: G2D26B2A G2D26B2B G2D26B2C G2D26B2E G2D26B2F G2D26B2H G2D26B2L G2D26B2M G2D26B2N G2D26B2P
Flow Path: 1B-GR-SGS-P051 ID: 2CV0789-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCC2B53 EMERG FEEDWATER PUMP 2P7B CONDENSATE SUCTION VLV Component in Area? No Cables in Area: R2B53D2A R2B53D2C R2B53D2D R2B53D2F	Flow Path: 1B-GG-SGS-P051 ID: 2CV0716-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCC2B53 EMERG FEEDWATER PUMP 2P7B SERVICE WATER SUCTION Component in Area? No Cables in Area: R2B53D1A R2B53D1C R2B53D1E R2B53D1F R2B53D1H

Fire Zone: 2091-BB Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: 2A-WR-SWS-P060	Flow Path:

ID: 2CV1541-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B53
SERVICE WATER RETURN TO EMERGENCY POND
Component in Area? No
Cables in Area:
R2B53J3A R2B53J3C R2B53J3D

Red Train	Green Train
Flow Path: 3B-WR-SWS-P081	Flow Path:

ID: 2CV1543-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B54
SW HDR NO.1 DISCH TO COOLING TOWER BASIN
Component in Area? No
Cables in Area:
R2B54H2A R2B54H2E

Fire Zone: 2100-Z   Unit: 2   Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 00-CG-1EP-P001

ID: 2B63
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: LCB6
480V ESF MOTOR CONTROL CENTER
Component in Area? No

Cables in Area:

G2B614A	G2B614B	G2B614C
G2B614D	G2B614E	G2B614F
G2B614G		

Red Train	Green Train
Flow Path:	Flow Path: 00-CG-1EP-P002

ID: 2B61
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: LCB6
480V ESF MOTOR CONTROL CENTER
Component in Area? No

Cables in Area:

G2B621A	G2B621B	G2B621C
G2B621D	G2B621E	G2B621F
G2B621G		

ID: 2B61D1
DCD (Links) : PC 985000B201   Status: New
DCD (SSData): PC 985000B201   Status: New
System: LVP   Bus: LCB6
FEED TO INSTR PWR PNL XFMR 2X12
Component in Area? No

Cables in Area:

G2B61D1A	G2B61D1B	G2B61D1C

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 00-CG-1EP-P003

ID: 2B62
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: LCB6
480V ESF MOTOR CONTROL CENTER
Component in Area? No

Cables in Area:

G2B632A	G2B632B	G2B632C
G2B632D	G2B632E	G2B632F
G2B632G		

ID: 2B632
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus:
MCC 2B62 FEEDER BREAKER
Component in Area? Yes

Flow Path:	Flow Path: 00-CG-1EP-P004

ID: 2B64
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: LCB6
480V ESF MOTOR CONTROL CENTER
Component in Area? Yes

Cables in Area:

G2B622A	G2B622B	G2B622C
G2B622D	G2B622E	G2B622F
G2B622G	G2B622H	

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train

Flow Path: 2A-CR-1EP-P010

ID: 2B5
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: SWGA3
480V ESF MOTOR CONTROL CENTER
Component in Area? No
Cables in Area:

R2D2309A R2D2309B

Green Train

Flow Path: 2A-CG-1EP-P010

ID: 2B6
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: SWG2A4
480V ESF MOTOR CONTROL CENTER
Component in Area? Yes
Cables in Area:

G2A401A G2A401B G2A401C
G2A401D G2A401E G2B612C
G2D2409A G2D2409B

ID: 2B612
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: PNL2D24
2B6 MAIN SECONDARY BREAKER FROM 2X26/2A4
Component in Area? Yes

Flow Path: 1A-AR-1EP-P040

ID: 2A3
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: 2DG1
4.16KV ESF SWITCHGEAR
Component in Area? No
Cables in Area:

R2D2304A R2D2304B

Flow Path: 1A-AG-1EP-P040

ID: 2A4
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: 2DG2
4.16KV ESF SWITCHGEAR
Component in Area? Yes
Cables in Area:

G2A408A G2A408B G2A408C
G2A408D G2A408E G2A408F

Flow Path: 1A-BC-1EP-P040

ID: 2A902
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: DG Bus:
2A9 Switchgear bkr.to bkr. 2A410.
Component in Area? No
Cables in Area:

2A902A 2A902B

Flow Path: 1A-BC-1EP-P040

ID: 2A902
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: DG Bus:
2A9 Switchgear bkr.to bkr. 2A410.
Component in Area? No
Cables in Area:

2A902A 2A902B

Fire Zone: 2100-Z   Unit: 2   Status: As Built

Red Train

Flow Path: 1A-BR-1EP-P040

ID: 2A308
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP   Bus: PNL2D23
DG 1 OUTPUT BREAKER   POWER CABLES ROUTED WITH 2A3
Component in Area? No
Cables in Area:

R2A308J	R2A308K	

ID: 2E11
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DG   Bus: PNL2D23
DIESEL GENERATOR 2K4A LOCAL PANEL
Component in Area? No
Cables in Area:

R2A03Q	R2A03T	R2G102J

ID: 2PM16A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DG   Bus: MCC2B53
EMERGENCY DIESEL FUEL TRANSFER PUMP
Component in Area? No
Cables in Area:

R2B53K3D	R2B53K3E	

Green Train

Flow Path: 1A-BG-1EP-P040

ID: 2A408
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP   Bus: PNL2D24
DG 2 OUTPUT BREAKER   POWER CABLES LISTED WITH 2A4
Component in Area? Yes
Cables in Area:

G2A408G	G2A408H	G2A408J
G2A408K		

ID: 2E21
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DG   Bus: PNL2D24
DIESEL GENERATOR 2K4B LOCAL PANEL
Component in Area? No
Cables in Area:

G2A04M	G2A04N	G2A04P
G2A04Q	G2A04R	G2A04T
G2G101E	G2G101F	G2G101G
G2G101H	G2G103D	G2G103E
G2G103G	G2G103H	G2G103J
G2G103N	G2G105C	G2G105D
G2G107J	G2G107K	G2G107L

Flow Path: 2A-AR-1EP-P040

ID: 2A309
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP   Bus: PNL2D23
2A3 TO 2A1 TIE BREAKER
Component in Area? No
Cables in Area:

R2A309Q	R2A309R	R2A309S

Flow Path: 2A-AG-1EP-P040

ID: 2A409
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP   Bus: PNL2D24
2A4 TO 2A2 TIE BREAKER
Component in Area? Yes
Cables in Area:

2A409A	2A409B	2A409C
2A409D	2A409E	2A409F
G2A409N	G2A409Q	G2A409R
G2A409S		

ID: 2D2404
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED   Bus: 2D02
BREAKER CONTROL PWR TO 2A4 FROM PANEL 2D24.
Component in Area? No
Cables in Area:

G2D2404A	G2D2404B	

Fire Zone: 2100-Z   Unit: 2   Status: As Built

Red Train

Flow Path: 3A-AR-1EP-P042

ID: 2A310
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: PNL2D23
2A3 TO 2A4 TIE BREAKER
Component in Area? No
Cables in Area:
2A310A 2A310B 2A310C
2A310D 2A310E 2A310F

Green Train

Flow Path: 3A-AG-1EP-P042

ID: 2A410
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: PNL2D24
2A4 TO 2A3 TIE BREAKER
Component in Area? Yes
Cables in Area:
G2A410G

Flow Path:

Flow Path: 1A-BG-1EP-P050

ID: 2D2402
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: 2D02
EDG CONTROL POWER FROM 2D24
Component in Area? No
Cables in Area:
G2D2402A

ID: 2D2406
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: 2D02
FIELD FLASH FROM 2D24
Component in Area? No
Cables in Area:
G2D2406A

ID: 2D2408
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: 2D02
EDG CONTROL POWER FROM 2D24
Component in Area? No
Cables in Area:
G2D2408A

Flow Path: 0B-FC-ACP-P001

ID: 2B54J9
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: MCC2B54
INVERTER 2Y26 BACKUP AC SUPPLY
Component in Area? No
Cables in Area:
2Y0106E 2Y0106F

Flow Path: 0B-FC-ACP-P001

ID: 2B54J9
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: MCC2B54
INVERTER 2Y26 BACKUP AC SUPPLY
Component in Area? No
Cables in Area:
2Y0106E 2Y0106F

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train	Green Train
Flow Path: 0A-FC-ACP-P002	Flow Path: 0A-FC-ACP-P002
ID: 2Y26	ID: 2Y26
DCD (Links) : Status: As Built	DCD (Links) : Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: EEC Bus: 2D03	System: EEC Bus: 2D03
120 VAC INSTRUMENT INVERTER SPDS COMPUTER POWER SUPPLY	120 VAC INSTRUMENT INVERTER SPDS COMPUTER POWER SUPPLY
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
2Y0106G 2Y0106G1 2Y0106H	2Y0106G 2Y0106G1 2Y0106H
2Y0106H1	2Y0106H1
Flow Path:	Flow Path: 3A-EG-ACP-P002
	ID: 2B64E1
	DCD (Links) : Status: As Built
	DCD (SSData): Status: As Built
	System: LVP Bus: MCC2B64
	SPARE
	Component in Area? Yes
Flow Path:	Flow Path: 3B-EG-ACP-P005
	ID: 2B64E2
	DCD (Links) : Status: As Built
	DCD (SSData): Status: As Built
	System: LVP Bus: MCC2B64
	INVERTER 2Y24 PRIMARY AC SUPPLY
	Component in Area? Yes
Flow Path: 1A-RR-CVC-P005	Flow Path: 1A-RG-CVC-P005
ID: 2PM36A	ID: 2PM36B
DCD (Links) : Status: As Built	DCD (Links) : Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: CVCS Bus: MCC2B52	System: CVCS Bus: MCC2B62
CHARGING PUMP	CHARGING PUMP
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
R2B52A5N	G2B62A5N

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 2A-RG-CVC-P006 ID: 2PM36C(G) DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: CVCS Bus: 2B64 CHARGING PUMP Component in Area? No Cables in Area: G2B64A4A G2B64A4B G2B64A4C G2B64A4F G2B64A4N G2B64A4P
Flow Path: 2B-RR-CVC-P009 ID: 2PM89B DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SI Bus: SWG2A4 HIGH PRESSURE SAFETY INJECTION PUMP Component in Area? No Cables in Area: 2A406D G2A406A G2A406B G2A406C G2A406F G2A406H	Flow Path:
Flow Path:	Flow Path: 0A-DG-DEP-P001 ID: 2B64D3 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B64 CHARGER 2D32A MAIN FROM MCC2B64 Component in Area? Yes Cables in Area: G2B64D3C ID: 2D32A DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EED Bus: MCC2B64 BATTERY CHARGER Component in Area? No Cables in Area: G2B64D3A G2B64D3B
Flow Path:	Flow Path: 0B-DG-DEP-P001

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 0A-DG-DEP-P002

ID: 2B61N1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: LCB6
2B61 FEED TO 2D32B VIA X-FER SWITCH 2S22
Component in Area? No
Cables in Area:
G2B61N1A G2B61N1B

Red Train

Flow Path: 0A-DR-DEP-P004

ID: 2B54H3
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: MCC2B54
CHARGER 2D34 MAIN FROM MCC2B54
Component in Area? No
Cables in Area:
R2B54H3A R2B54H3B R2B54H3C

Green Train

Flow Path:

Red Train

Flow Path: OA-FC-DEP-P013

ID: 2D33
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: MCC2B54
BATTERY CHARGER
Component in Area? No
Cables in Area:
2B64E5A 2B64E5B 2B64E5C

Green Train

Flow Path: OA-FC-DEP-P013

ID: 2D33
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: MCC2B54
BATTERY CHARGER
Component in Area? No
Cables in Area:
2B64E5A 2B64E5B 2B64E5C

Red Train

Flow Path: 00-DR-DEP-P031

ID: 2D27
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: 2D01
125 VOLT DC MOTOR CONTROL CENTER
Component in Area? No
Cables in Area:
R2D0121A R2D0121B

Green Train

Flow Path:

Red Train

Flow Path: OA-DC-DEP-P040

Green Train

Flow Path: OA-DC-DEP-P040

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 1B-DG-DEP-P061 ID: 2B64C3 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC2B64 CHARGER 2D34 ALT. FEEDER FROM MCC2B64 Component in Area? Yes Cables in Area: 2B64C3C
Flow Path:	Flow Path: 1B-GG-DEP-P062
Flow Path:	Flow Path: 00-CG-IEP-P001 ID: 2B614 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC 2B63 FEEDER BREAKER Component in Area? Yes
Flow Path:	Flow Path: 00-CG-IEP-P002 ID: 2B621 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC 2B61 FEEDER BREAKER Component in Area? Yes
Flow Path:	Flow Path: 00-CG-IEP-P004 ID: 2B622 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: MCC 2B64 FEEDER BREAKER Component in Area? Yes

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 2A-CG-IEP-P010

ID: 2A401
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: PNL2D24
2A4 TO 2X26 SUPPLY BKR
Component in Area? Yes

ID: 2X26
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: SWG2A4
480 V LOAD CENTER 2B6 TRANSFORMER
Component in Area? Yes

Flow Path: 1A-CR-IEP-P011

ID: 2B513
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: PNL2D23
2B5 TO 2B6 TIE BREAKER
Component in Area? No

Cables in Area:

O2B513A	O2B513B	O2B513C
O2B513D	O2B513E	O2B513F
O2B513G	O2B513H	O2B513J
O2B513K	O2B513L	O2B513M
O2B513N	O2B513P	

Flow Path: 1A-CG-IEP-P011

ID: 2B613
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: PNL2D24
2B6 TO 2B5 TIE BREAKER
Component in Area? Yes

Cables in Area:

G2B613C

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train		Green Train	
Flow Path: 1A-PC-RCS-P001		Flow Path: 1A-PC-RCS-P001	
ID: 2H12		ID: 2H12	
DCD (Links) :	Status: As Built	DCD (Links) :	Status: As Built
DCD (SSData):	Status: As Built	DCD (SSData):	Status: As Built
System: MVP Bus: 2X02		System: MVP Bus: 2X02	
RCP 2PM32D FEEDER BREAKER		RCP 2PM32D FEEDER BREAKER	
Component in Area? No		Component in Area? No	
Cables in Area:		Cables in Area:	
2H12S		2H12S	
ID: 2H22		ID: 2H22	
DCD (Links) :	Status: As Built	DCD (Links) :	Status: As Built
DCD (SSData):	Status: As Built	DCD (SSData):	Status: As Built
System: MVP Bus: 2X02		System: MVP Bus: 2X02	
RCP 2PM32C FEEDER BKR		RCP 2PM32C FEEDER BKR	
Component in Area? No		Component in Area? No	
Cables in Area:		Cables in Area:	
2H22S		2H22S	

Flow Path:		Flow Path: 0B-GG-RCS-P017	
		ID: 2TE4716	
		DCD (Links) :	Status: As Built
		DCD (SSData):	Status: As Built
		System: RCS Bus: PNL2Y2	
		2P32D COLD LEG TEMP (WIDE RANGE)	
		Component in Area? No	
		Cables in Area:	
		2I010G	

Flow Path: 0B-SC-SCS-P010		Flow Path: 0B-SC-SCS-P010	
ID: 2CV5086-2		ID: 2CV5086-2	
DCD (Links) :	Status: As Built	DCD (Links) :	Status: As Built
DCD (SSData):	Status: As Built	DCD (SSData):	Status: As Built
System: SI Bus: MCC2B62		System: SI Bus: MCC2B62	
SHUTDOWN COOLING RETURN ISOLATION VALVE		SHUTDOWN COOLING RETURN ISOLATION VALVE	
Component in Area? No		Component in Area? No	
Cables in Area:		Cables in Area:	
G2B62E5D G2B62E5L G2B62E5M		G2B62E5D G2B62E5L G2B62E5M	
G2B62E5N		G2B62E5N	

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0A-SG-SCS-P040 ID: 2PM60B DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SI Bus: SWG2A4 LOW PRESSURE SAFETY INJECTION PUMP Component in Area? No Cables in Area: G2A405A G2A405B G2A405C G2A405F G2A405H
Flow Path:	Flow Path: 0A-SG-SCS-P041 ID: 2CV5613-2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: CSS Bus: MCC2B62 SPRAY HEADER ISO VLV Component in Area? No Cables in Area: G2B62G4F
Flow Path: 1B-GR-SGS-P051 ID: 2CV0789-1 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: MCC2B53 EMERG FEEDWATER PUMP 2P7B CONDENSATE SUCTION VLV Component in Area? No Cables in Area: R2B53D2G	Flow Path:

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train

Flow Path: 1A-WR-SWS-P010

ID: 2CV1425-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: Bus:
Component in Area? No
Cables in Area:
R2B54D5A R2B54D5C

Green Train

Flow Path: 1A-WG-SWS-P010

ID: 2CV1427-2
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: Bus:
Component in Area? No
Cables in Area:
G2B64C1A G2B64C1C G2B64C1D

ID: 2PM4C
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: SWG2A4
SERVICE WATER PUMP
Component in Area? No
Cables in Area:
G2A402A G2A402B G2A402C
G2A402E G2A402F

Flow Path: OA-WR-SWS-P021

ID: 2CV1418-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B54
SW PUMP CROSSOVER VALVE P4B - P4A
Component in Area? No
Cables in Area:
R2B54D3A R2B54D3C

ID: 2CV1419-1
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B54
SW PUMP CROSSOVER VALVE P4B - P4A
Component in Area? No
Cables in Area:
R2B54E3A R2B54E3C

Flow Path: OA-WG-SWS-P021

ID: 2CV1421-2
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
SW PUMP CROSSOVER VALVE P4B - P4C
Component in Area? No
Cables in Area:
G2B64C4A G2B64C4C G2B64C4D
G2B64C4E G2B64C4G

ID: 2CV1422-2
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
SW PUMP CROSSOVER VALVE P4B - P4C
Component in Area? No
Cables in Area:
G2B64F2A G2B64F2C G2B64F2D
G2B64F2E G2B64F2G

Fire Zone: 2100-Z | Unit: 2 | Status: As Built

Red Train

Flow Path: OA-WR-SWS-P024

ID: 2CV1470-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B54
SERVICE WATER TO INTAKE STR.
Component in Area? No
Cables in Area:
R2B54E4A R2B54E4C

ID: 2CV1471-1
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B54
SERVICE WATER EMERG POND TO 2P4A
Component in Area? No
Cables in Area:
R2B54G1A R2B54G1C

Green Train

Flow Path: OA-WG-SWS-P024

ID: 2CV1475-2
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
SW FROM EMERG POND TO INTAKE
Component in Area? No
Cables in Area:
G2B64H3A G2B64H3C G2B64H3D

Flow Path:

Flow Path: 0A-WG-SWS-P030

ID: 2PM4B(G)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: 2A4
SERVICE WATER PUMP
Component in Area? No
Cables in Area:
G2A403A G2A403E G2A403F
G2A403P

Fire Zone: 2100-Z Unit: 2 Status: As Built

Red Train

Flow Path: OA-WC-SWS-P040

ID: 2CV1472-5
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
2P4B SLUICE GATE
Component in Area? No
Cables in Area:

G2B64H4A	G2B64H4C	G2B64H4D
G2B64H4H	G2B64H4K	R2B54H4A
R2B54H4H	R2B54H4K	

ID: 2CV1473-5
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
INTAKE STRUCTURE SLUICE GATE
Component in Area? No
Cables in Area:

G2B64B5A	G2B64B5C	G2B64B5D
G2B64B5H	G2B64B5K	R2B54B5A
R2B54B5C	R2B54B5H	R2B54B5K

Green Train

Flow Path: OA-WC-SWS-P040

ID: 2CV1472-5
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
2P4B SLUICE GATE
Component in Area? No
Cables in Area:

G2B64H4A	G2B64H4C	G2B64H4D
G2B64H4H	G2B64H4K	R2B54H4A
R2B54H4H	R2B54H4K	

ID: 2CV1473-5
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCC2B64
INTAKE STRUCTURE SLUICE GATE
Component in Area? No
Cables in Area:

G2B64B5A	G2B64B5C	G2B64B5D
G2B64B5H	G2B64B5K	R2B54B5A
R2B54B5C	R2B54B5H	R2B54B5K

Room Number: 2100-Z Unit: 2 Status: As Built

Red Train

Green Train

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0A-QG-ACP-P001 ID: RS2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: Y22 120V AC R. PROT. ENG. SFGDS CH2 DISTR. PNL. Component in Area? No Cables in Area: GCY2200A GCY2200B ID: Y22 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: D02 INVERTER-REACTOR PROTECTION SYSTEM CHANNEL 2 Component in Area? Yes Cables in Area: GCD0242AA GCD0242AB
Flow Path:	Flow Path: 0A-QG-ACP-P002 ID: RS4 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: Y24 120V AC R. PROT. ENG. SFGDS CH4 DISTR. PNL. Component in Area? No Cables in Area: BCY2400A BCY2400B
Flow Path:	Flow Path: 0B-QG-ACP-P002 ID: Y24 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: D02 INVERTER-REACTOR PROTECTION SYSTEM CHANNEL 4 Component in Area? Yes Cables in Area: BCY2500C BCY2500D GCD0222AC
Flow Path:	Flow Path: 0C-QG-ACP-P003 ID: Y25 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: D02 INVERTER-REACTOR PROTECTION SYSTEM CHANNEL 2 Component in Area? Yes Cables in Area: GCY2500A GCY2500B

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0B-QG-ACP-P012 ID: B6315 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: N/A B63 TO Y25 BREAKER ALTERNATE AC SOURCE Component in Area? No Cables in Area: GPB6315AA
Flow Path:	Flow Path: 1B-QG-ACP-P013 ID: D0222A DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EED Bus: D02 DC SUPPLY FROM D02 TO Y24 Component in Area? No Cables in Area: GCD0222AD
Flow Path:	Flow Path: 0A-QG-ACP-P015 ID: Y28 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EEC Bus: D02 INVERTER Component in Area? Yes Cables in Area: GCD0241BA GCD0241BB PWR LOST I
Flow Path:	Flow Path: 2B-QG-ACP-P016 ID: B6134A DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: N/A B61 TO Y28 BREAKER ALTERNATE AC SOURCE Component in Area? No Cables in Area: GPB6134AA
Flow Path:	Flow Path: 2A-QG-ACP-P017 ID: B6543 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: N/A B65 TO Y22 BREAKER FOR INVERTER Component in Area? Yes Cables in Area: GPB6543A

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path: 0A-QR-ACP-P074 ID: C539 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: RS1 CONTROL PANEL EFIC INDICATION PANEL Component in Area? No Cables in Area: PWR LOST I	Flow Path: 0A-QG-ACP-P074 ID: C540 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: Y28 CONTROL PANEL EFIC INDICATION PANEL Component in Area? No Cables in Area: GCY2801A
Flow Path: 0A-XR-DEP-P020 ID: D15 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EED Bus: D01 125V DC MCC Component in Area? No Cables in Area: RPD0121A1 RPD0121A2	Flow Path: 0A-XG-DEP-P020 ID: D25 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EED Bus: D02 125V DC MCC Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 0A-XG-DEP-P040 ID: D21 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EED Bus: D02 125V DC DISTR PANEL NO. 2 PANEL Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 00-XG-DEP-P060 ID: RA2 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EED Bus: D02 125V DC SFGDS ACT. SYS. CTL. DISTR. PNL 2 Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 1A-DG-DGS-S020 ID: VEFM24C DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: HVAC Bus: MCCB61 D-G ROOM EXHAUST FAN Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 2A-DG-DGS-S021 ID: VEFM24D DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: HVAC Bus: MCCB61 D-G ROOM EXHAUST FAN Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 0A-DG-DGS-S022 ID: TV7902A DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: HVAC Bus: B61 DIESEL GENERATOR ROOM EXHAUST FAN DAMPER Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I ID: TV7902B DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: HVAC Bus: B61 DIESEL GENERATOR ROOM EXHAUST FAN DAMPER Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I
Flow Path: 1A-QR-ICP-P073 ID: EFIC-A DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: RS1/RS3 EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM Component in Area? No Cables in Area: PWR LOST I	Flow Path: 1A-QG-ICP-P073 ID: EFIC-B DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: EFW Bus: RS2/RS4 EMERGENCY FEEDWATER INITIATION AND CONTROL SYSTEM Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 0A-KG-LVP-P001 ID: B621 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: LVP Bus: N/A MCC B61 MAIN BREAKER Component in Area? Yes

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 1A-KG-LVP-P001

ID: B61
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: LCB6
480 VOLT ESF MCC
Component in Area? No
Cables in Area:

GPB621A1	GPB621A2	GPB621B1
GPB621B2	GPB621C1	GPB621C2
GPB621D	PWR LOST 99-M	PWR LOST I

ID: B6145A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: N/A
B61 TO Y24 BREAKER ALTERNATE AC SOURCE
Component in Area? No
Cables in Area:
GPB6145AA

Red Train	Green Train
Flow Path:	Flow Path: 0B-KG-LVP-P002

ID: B614
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: N/A
MCC B62 MAIN BREAKER
Component in Area? Yes

ID: B62
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: LCB6
480 VOLT ESF MCC
Component in Area? No
Cables in Area:

GPB614A1	GPB614B1	GPB614C1
GPB614D	PWR LOST 99-M	

Red Train	Green Train
Flow Path:	Flow Path: 0A-KG-LVP-P003

ID: B63
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: LCB6
480 VOLT ESF MCC
Component in Area? No
Cables in Area:
PWR LOST 99-M

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train

Flow Path: 0A-KC-LVP-P004

ID: B55
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: B5 B6
480 VOLT ESF MCC DUAL SUPPLY: LCB5 OR LCB6 LCB5 IS NORNAL SUPPLY
Component in Area? Yes
Cables in Area:

GPB5621A1	GPB5621B1	GPB5621B2
GPB5621C1	GPB5621C2	GPB5621D

ID: B56
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: B5 B6
480 VOLT ESF MCC DUAL SUPPLY: LCB5 OR LCB6 LCB5 IS NORMAL SUPPLY
Component in Area? Yes
Cables in Area:

RPB522A1	RPB522A2	RPB522B1
RPB522B2	RPB522C1	RPB522C2
RPB522D		

ID: B5611
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: MCCB56
480V MCCB56 MANUAL TRANSFER SWITCH B5-B6
Component in Area? Yes
Cables in Area:

GCB5611C	GCB5611D	GCB5611E
GCB5611F	PWR LOST 99-M	PWR LOST I

Flow Path:

Green Train

Flow Path: 0A-KC-LVP-P004

ID: B55
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: B5 B6
480 VOLT ESF MCC DUAL SUPPLY: LCB5 OR LCB6 LCB5 IS NORNAL SUPPLY
Component in Area? Yes
Cables in Area:

GPB5621A1	GPB5621B1	GPB5621B2
GPB5621C1	GPB5621C2	GPB5621D

ID: B56
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: B5 B6
480 VOLT ESF MCC DUAL SUPPLY: LCB5 OR LCB6 LCB5 IS NORMAL SUPPLY
Component in Area? Yes
Cables in Area:

RPB522A1	RPB522A2	RPB522B1
RPB522B2	RPB522C1	RPB522C2
RPB522D		

ID: B5611
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: MCCB56
480V MCCB56 MANUAL TRANSFER SWITCH B5-B6
Component in Area? Yes
Cables in Area:

GCB5611C	GCB5611D	GCB5611E
GCB5611F	PWR LOST 99-M	PWR LOST I

Flow Path: 0A-KG-LVP-P005

ID: B634
DCD (Links) :   Status: As Built
DCD (SSData):   Status: As Built
System: LVP   Bus: N/A
MCC B65 MAIN BREAKER
Component in Area? Yes

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 1A-KG-LVP-P005

ID: B65
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: B5
480 VAC Motor Control Center
Component in Area? Yes
Cables in Area:

GPB634A1	GPB634A2	GPB634B1
GPB634B2	GPB634C1	GPB634C2
GPB634D		

ID: B6533
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: N/A
B65 TO D04B BREAKER TO BATTERYCHARGER
Component in Area? Yes
Cables in Area:

GPB6533A	GPB6533B	GPB6533C

Red Train	Green Train
Flow Path:	Flow Path: 2A-KG-LVP-P005

ID: B622
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: N/A
MCC B55/B56 FEEDER FROM LC B6
Component in Area? Yes
Cables in Area:

GPB622A1	GPB622A2	GPB622B1
GPB622B2	GPB622C1	GPB622C2
GPB622D		

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path: 0B-KR-LVP-P010

ID: B512
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: D11
B5 MAIN BREAKER FROM X5
Component in Area? No
Cables in Area:
GCB512E RCB512C

ID: D1109
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: PNLD11
D11 BRANCH FEEDER TO B5
Component in Area? No
Cables in Area:
RCD1109A

Green Train

Flow Path: 0B-KG-LVP-P010

ID: A401
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: D21
A4 TO X6 SUPPLY BREAKER
Component in Area? Yes
Cables in Area:
GCA401D GCA401E GCA401F
PWR LOST I

ID: B6
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: SWGA4
480 VOLT ESF MCC
Component in Area? Yes
Cables in Area:
GPA401A PWR LOST 99-M PWR LOST I

ID: B612
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: D21
B6 MAIN BREAKER FROM X6
Component in Area? Yes
Cables in Area:
GCB612C GCB612E PWR LOST I
RCB612D

ID: D2109
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: PNLD21
D21 BRANCH FEEDER TO B6
Component in Area? No
Cables in Area:
GCD2109A

ID: X6
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: LVP Bus: SWGA4
480 VOLT ESF LC B6 SUPPLY TRANSFORMER
Component in Area? Yes
Cables in Area:
PWR LOST 99-M PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train			Green Train		
Flow Path: 1C-KR-LVP-P011			Flow Path: 1C-KG-LVP-P011		
ID: B513			ID: B613		
DCD (Links) :		Status: As Built	DCD (Links) :		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: LVP	Bus: D11		System: LVP	Bus: D21	
B5 TO B6 TIE BREAKER			B6 TO B5 TIE BREAKER		
Component in Area? No			Component in Area? Yes		
Cables in Area:			Cables in Area:		
GCB513F	RCB513E		GCB613F	GCB613G	GPB613A1
			GPB613A2	GPB613A3	GPB613B1
			GPB613B2	GPB613B3	GPB613C1
			GPB613C2	GPB613C3	GPB613D
			PWR LOST I	RCB613E	RCB613H

Red Train			Green Train		
Flow Path:			Flow Path: 1A-LG-MPS-P002		
			ID: CV1274		
			DCD (Links) :		Status: As Built
			DCD (SSData):		Status: As Built
			System: MPS	Bus: MCCB61	
			RCP CONTROLLED BLEEDOFF ISOLATION VALVE		
			Component in Area? No		
			Cables in Area:		
			PWR LOST 99-M	PWR LOST I	

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 1A-LG-MPS-P003

ID: SV1270
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: PNLD21
RCP P32D CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST I

ID: SV1271
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: PNLD21
RCP P32C CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST I

ID: SV1272
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: PNLD21
RCP P32B CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST I

ID: SV1273
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: PNLD21
RCP P32A CONTROLLED BLEEDOFF ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path: 1A-MR-MPS-P003

ID: LRS1001
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: C539/RS1
Pressurizer Level requires LT1001, TE1001A, & C539. Isolated at C539.
Component in Area? No
Cables in Area:
PWR LOST I RJI011AB

Green Train

Flow Path: 1A-MG-MPS-P003

ID: LIS1002
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: C540/Y28
Pressurizer Level Requires LT1002, TE1002A, & C540. Isolated at C540.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

ID: LT1002
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: Y28/C540
PRESSURIZER LEVEL XMTR TO SPDS-B VIA C540, NNI, & LIS1002.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Flow Path: 2B-MR-MPS-P003

ID: TE1001A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539
PRESSURIZER TEMPERATURE TO SPDS-A (COMP. LEVEL) VIA C539
Component in Area? No
Cables in Area:
PWR LOST I

Flow Path: 2B-MG-MPS-P003

ID: TE1002A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: Y28/C540
PRESSURIZER TEMPERATURE TO LI1003 OR SPDS-B (COMP LEV) VIA C540
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Flow Path:

Flow Path: 1A-LG-MPS-P004

ID: CV1221
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB61
LETDOWN LINE CONTAINMENT ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0B-LG-MPS-P014 ID: SV1074 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: RCS Bus: D21 Reactor High Point Vent Parallel Isolation. Paired with SV1073. Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 0B-LG-MPS-P015 ID: SV1072 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: RCS Bus: D21 Reactor High Point Vent Parallel isolation paired withSV1071. Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 0C-LG-MPS-P016 ID: SV1084 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: RCS Bus: D21 Steam Generator E24A High Point Vent. Parallel isolationPaired with SV1083. Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 0C-LG-MPS-P017 ID: SV1082 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: RCS Bus: D21 Steam Generator E24A High Point Vent. Parallel isolationPaired with SV1081. Component in Area? No Cables in Area: PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0D-LG-MPS-P018 ID: SV1094 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: RCS Bus: D21 Steam Generator E24B High Point Vent. Parallel isolationPaired with SV1093. Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 0D-LG-MPS-P019 ID: SV1092 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: RCS Bus: D21 Steam Generator E24B High Point Vent. Parallel isolationPaired with SV1091. Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 1A-MG-MPS-P021 ID: CV1284 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: MPS Bus: B62 RCS Loop B High Pressure Safety Injection Isolation Valve Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 2A-MG-MPS-P022 ID: CV1285 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: MPS Bus: B62 RCS Loop B High Pressure Safety Injection Isolation Valve Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 3A-MG-MPS-P023

ID: CV1228
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB61
RCS LOOP B HP SAFETY INJECTION ISOLATION VLV
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Flow Path:

Flow Path: 4A-MG-MPS-P024

ID: CV1227
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB61
RCS LOOP B HP SAFETY INJECTION ISOLATION VLV
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Flow Path: 0A-MR-MPS-P040

ID: PM36A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: SWGA3
PRIMARY MAKEUP PUMP P36A
Component in Area? No
Cables in Area:
RCA306D

ID: PM64A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B57
Primary Makeup Pump PM36A Lube Oil Pump.
Component in Area? No
Cables in Area:
RCB5721D RCB5721D1

Flow Path: 0A-MG-MPS-P040

ID: PM36C
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: SWGA4
PRIMARY MAKEUP PUMP
Component in Area? No
Cables in Area:
GCA406D GCA406E GCA406G
GCA406H GCA406J GCA406K
GPA406A PWR LOST 99-M PWR LOST I

ID: PM64C
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B65
Primary Makeup Pump PM36C Lubeoil pump.
Component in Area? No
Cables in Area:
GCB6514C GCB6514D GCB6514E
GCB6514F GPB6514A PWR LOST 99-M
PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path: 0A-MC-MPS-P041

ID: PM64B(C)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B5/B6
Primary Makeup Pump Aux lube oil pump PM64B common feeder. Includes transfer switch B801.
Component in Area? No
Cables In Area:
B801B B801B1

Flow Path: 1A-MR-MPS-P041

ID: PM36B(R)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: A3
Primary Makeup Pump Red Power Feed. Includes Disconnect Switch.
Component in Area? No
Cables In Area:
GCA307M

Flow Path:

Green Train

Flow Path: 0A-MC-MPS-P041

ID: PM64B(C)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B5/B6
Primary Makeup Pump Aux lube oil pump PM64B common feeder. Includes transfer switch B801.
Component in Area? No
Cables In Area:
B801B B801B1

Flow Path:

Flow Path: 2A-MG-MPS-P041

ID: PM36B(G)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: A4
Primary Makeup Pump Green Power Feed. Includes Disconnect Switch.
Component in Area? No
Cables In Area:

GCA407E	GCA407H	GCA407J
GCA407K	GCA407L	GCA407M
GCA407N	GPA407A	PWR LOST 99-M
PWR LOST I		

ID: PM64B(G)
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: B6
Primary Makeup Pump Aux Lube oil pump green feed (P64B). Including transfer switch B801
Component in Area? No
Cables In Area:

GCB6515C	GCB6515D	GCB6515E
GCB6515H	GPB6515A	

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 1A-MG-MPS-P062

ID: CV1406
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B61
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

ID: CV1408
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MPS Bus: MCCB61
BORATED WATER TANK OUTLET VALVE
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Red Train

Flow Path:

Green Train

Flow Path: 0A-FG-MVP-P001

ID: A409
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: D21
A4 TO A2 TIE BREAKER
Component in Area? Yes
Cables in Area:

A409A	A409B	A409D
GCA409C	GCA409F	GCA409G
PWR LOST I		

Red Train

Flow Path: 0B-FR-MVP-P010

ID: D1104
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: PNLD11
D11 BRANCH FEEDER TO A3
Component in Area? No
Cables in Area:
RCD1104A RCD1104B

Green Train

Flow Path: 0B-FG-MVP-P010

ID: A4
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: MVP Bus: DG2
4.16 KV SWITCHGEAR
Component in Area? Yes
Cables in Area:
GPA408A GPA408B

ID: D2104
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: EED Bus: PNLD21
D21 BRANCH FEEDER TO A4
Component in Area? No
Cables in Area:
GCD2104A GCD2104B

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train			Green Train		
Flow Path: 0D-DR-MVP-P012			Flow Path: 0D-DG-MVP-P012		
ID: K4A			ID: CV3807		
DCD (Links) :		Status: As Built	DCD (Links) :		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: DG	Bus: PNLD11		System: SW	Bus: MCCB62	
DIESEL GENERATOR & AUXILIARIES			DIESEL GEN K4B HT EXCH COOLING WATER OUTLET VLV NC OPEN ON K4B ST		
Component in Area? No			Component in Area? No		
Cables in Area:			Cables in Area:		
RCA11C	RCA11D	RCE11C	PWR LOST 99-M	PWR LOST I	
			ID: K4B		
			DCD (Links) :		Status: As Built
			DCD (SSData):		Status: As Built
			System: DG	Bus: PNLD21	
			DIESEL GENERATOR & AUXILIARIES		
			Component in Area? No		
			Cables in Area:		
			GCA12C	GCA12D	GCE21C
			GCG200E	PWR LOST I	
			ID: PM16B		
			DCD (Links) :		Status: As Built
			DCD (SSData):		Status: As Built
			System: DG	Bus: MCCB61	
			EMERGENCY DIESEL FUEL TRANSFER PUMP		
			Component in Area? No		
			Cables in Area:		
			PWR LOST 99-M	PWR LOST I	

Red Train			Green Train		
Flow Path: 0D-DR-MVP-P013			Flow Path: 0D-DG-MVP-P013		
ID: A308			ID: A408		
DCD (Links) :		Status: As Built	DCD (Links) :		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: MVP	Bus: RA1		System: MVP	Bus: RA2	
DG 1 OUTPUT BREAKER			DG 2 OUTPUT BREAKER		
Component in Area? No			Component in Area? Yes		
Cables in Area:			Cables in Area:		
GCA308C	RCA308G		A408M	GCA408C	GCA408D
			GCA408G	GCA408J	PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train			Green Train		
Flow Path: 1C-FR-MVP-P014			Flow Path: 1C-FG-MVP-P014		
ID: A310			ID: A410		
DCD (Links):		Status: As Built	DCD (Links):		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: MVP	Bus: D11		System: MVP	Bus: D21	
A3 TO A4 TIE BREAKER			A4 TO A3 TIE BREAKER		
Component in Area? No			Component in Area? Yes		
Cables in Area:			Cables in Area:		
GCA310C	GPA310A	GPA310B	GCA410C	GCA410D	GCA410J
			PWR LOST I		
Flow Path: 1A-NR-NIS-P000			Flow Path: 1A-NG-NIS-P000		
ID: NI501			ID: NI502		
DCD (Links):		Status: As Built	DCD (Links):		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: NIS	Bus: C539/RS1		System: NIS	Bus: C540/Y28	
Source Range #1 Indicator fromNE501 via C539. Isolated at C539.			Source Range #2 Indicator fromNE502 via C540. Isolated at C540.		
Component in Area? No			Component in Area? No		
Cables in Area:			Cables in Area:		
PWR LOST I	R208G		PWR LOST 99-M	PWR LOST I	
Flow Path: 1A-NR-NIS-P001			Flow Path: 1A-NG-NIS-P001		
ID: NE501			ID: NE502		
DCD (Links):		Status: As Built	DCD (Links):		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: NIS	Bus: RS1/C539		System: NIS	Bus: Y28/C540	
SOURCE RANGE #1 TO NI503 OR SPDS-A			SOURCE RANGE #2 TO NI504 OR SPDS-B		
Component in Area? No			Component in Area? No		
Cables in Area:			Cables in Area:		
PWR LOST I			PWR LOST 99-M	PWR LOST I	
Flow Path: 2A-PC-RCS-P036			Flow Path: 2A-PC-RCS-P036		
ID: CV1000			ID: CV1000		
DCD (Links):		Status: As Built	DCD (Links):		Status: As Built
DCD (SSData):		Status: As Built	DCD (SSData):		Status: As Built
System: RCS	Bus: MCCB61		System: RCS	Bus: MCCB61	
PRESSURIZER PORV BLOCK VALVE			PRESSURIZER PORV BLOCK VALVE		
Component in Area? No			Component in Area? No		
Cables in Area:			Cables in Area:		
PWR LOST 99-M	PWR LOST I		PWR LOST 99-M	PWR LOST I	

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 1B-PR-RCS-P042	Flow Path: 1B-PG-RCS-P042
ID: PT1042	ID: PT1041
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539	System: RCS Bus: C540/Y28
RCS LOOP A PRESSURE TO PR1042 OR SPDS-A VIA C539	RCS LOOP B PRESSURE TO PI1041 OR SPDS-B VIA C540
Component In Area? No	Component In Area? No
Cables In Area:	Cables In Area:
PWR LOST I	PWR LOST 99-M PWR LOST I
Flow Path: 1B-PR-RCS-P043	Flow Path: 1B-PG-RCS-P043
ID: PR1042	ID: PI1041
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539	System: RCS Bus: Y28/C540
RCS PRESSURE RECORDER FROM PT1042 VIA C539. Isolated at C539.	RCS PRESSURE INDICATOR FROM PT1041 VIA C540
Component In Area? No	Component In Area? No
Cables In Area:	Cables In Area:
PWR LOST I RJP0727C	PWR LOST 99-M PWR LOST I
Flow Path: 0A-SC-RHR-P010	Flow Path: 0A-SC-RHR-P010
ID: CV1404	ID: CV1404
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: DHR Bus: MCCB56	System: DHR Bus: MCCB56
DECAY HEAT COOLING RETURN ISOLATION VALVE	DECAY HEAT COOLING RETURN ISOLATION VALVE
Component In Area? No	Component In Area? No
Cables In Area:	Cables In Area:
B5651A B5651C B5651D	B5651A B5651C B5651D
PWR LOST 99-M PWR LOST I	PWR LOST 99-M PWR LOST I
ID: CV1410	ID: CV1410
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: DHR Bus: MCCB62	System: DHR Bus: MCCB62
DECAY HEAT COOLING RETURN HEADER ISOLATION VALVE	DECAY HEAT COOLING RETURN HEADER ISOLATION VALVE
Component In Area? No	Component In Area? No
Cables In Area:	Cables In Area:
PWR LOST 99-M PWR LOST I	PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0A-SG-RHR-P030

ID: CV1435
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B65
Component in Area? No
Cables in Area:
GCB6541C GCB6541D GCB6541E
GPB6541A

ID: CV1437
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B65
Component in Area? No
Cables in Area:
GCB6542C GCB6542D GPB6542A

Red Train	Green Train
Flow Path:	Flow Path: 0A-SG-RHR-P031

ID: CV1400
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: MCCB61
LP SAFETY INJECTION HEADER ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

ID: CV1429
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: DHR Bus: B63
DECAY HEAT COOLER E35B OUTLET CONTROL VALVE
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Red Train	Green Train
Flow Path:	Flow Path: 1A-SG-RHR-P032

ID: TIT1405
DCD (Links) : Status: As Built
DCD (SSData): LCP974044L101 Status: New
System: DHR Bus: Y28
DECAY HEAT REMOVAL PUMP P34B SUCTION TEMPERATURE
Component in Area? No
Cables in Area:
Y2802A Y2802B

Fire Zone: 99-M　Unit: 1　Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 0A-SG-RHR-P033 ID: PM34B DCD (Links): Status: As Built DCD (SSData): Status: As Built System: DHR Bus: SWGA4 DECAY HEAT REMOVAL PUMP Component in Area? No Cables in Area: GCA405C GCA405E GCA405F GPA405A PWR LOST 99-M PWR LOST I
Flow Path: 0A-SR-RHR-P050 ID: CV3840 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: RS1 SW TO DHR PUMP P34A COOLER E50A Component in Area? No Cables in Area: PWR LOST I	Flow Path: 0A-SG-RHR-P050 ID: CV3821 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCCB61 DECAY HEAT COOLER E35B SW INLET VALVE Component in Area? No Cables in Area: GCB6183E PWR LOST 99-M PWR LOST I ID: CV3841 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: RS2 SW TO DHR PUMP P34B COOLER E50B Component in Area? No Cables in Area: GCJ056C GCJ056D GCJ056E PWR LOST 99-M PWR LOST I
Flow Path: 2A-VR-SGS-P011 ID: TE1111 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: C539/RS1 RCS Loop A Hot Leg to TI1111 or SPDS. Component in Area? No Cables in Area: PWR LOST I ID: TI1111 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: C539/RS1 RCS Loop A Hot Leg. Requires TE1111 and C539. Isolated at C539. Component in Area? No Cables in Area: PWR LOST I RJR196E	Flow Path: 2A-VG-SGS-P011 ID: TE1112 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: Y28/C540 RCS LOOP A HOT LEG TO SPDS-B VIA C540 Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path: 1A-GR-SGS-P012

ID: CV2646
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: RA1
EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24A CONTROL VALVE
Component in Area? No
Cables in Area:
RJI423A1 RJI423D1

Green Train

Flow Path: 1A-GG-SGS-P012

ID: CV2627
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCD15
EMERGENCY FEEDWATER FROM P7A TO STEAM GENERATOR E24A ISOLATION VALVE
Component in Area? No
Cables in Area:
RCD1522D RCD1522E RCD1522F
RPD1522A1 RPD1522A2 RPD1522A3
RPD1522A4 RPD1522A5

ID: CV2645
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: RA2
EMERGENCY FEEEDWATER FROM P7A TO STEAM GENERATOR E24A CONTROL VALVE
Component in Area? No
Cables in Area:
PWR LOST I

ID: CV2670
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB61
EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24A ISOLATION VALVE
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Flow Path: 4A-VR-SGS-P012

ID: TE1117
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS1/C539
RCS LOOP A PUMP C COLD LEG TO SPDS-A VIA C539
Component in Area? No
Cables in Area:
PWR LOST I

Flow Path: 4A-VG-SGS-P012

ID: TE1115
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: Y28/C540
RCS LOOP A PUMP D COLD LEG TO TI1115 OR SPDS-B VIA C540
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 5A-VG-SGS-P012

ID: TI1115

DCD (Links): Status: As Built

DCD (SSData): Status: As Built

System: RCS Bus: Y28/C540

RCS LOOP A PP D CLD LEG TEMP. REQUIRES TE1115 AND C540. Isolated at C540.

Component in Area? No

Cables in Area:

PWR LOST 99-M   PWR LOST I

Red Train

Flow Path: 1A-GR-SGS-P013

ID: CV2648

DCD (Links): Status: As Built

DCD (SSData): Status: As Built

System: EFW Bus: RA1

EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24B CONTROL VALVE

Component in Area? No

Cables in Area:

RJI423B1   RJI423D2

Green Train

Flow Path: 1A-GG-SGS-P013

ID: CV2620

DCD (Links): Status: As Built

DCD (SSData): Status: As Built

System: EFW Bus: MCCD15

EMERGENCY FEEDWATER FROM P7A TO STEAM GENERATOR E24B ISOLATION VALVE

Component in Area? No

Cables in Area:

RCD1514D   RCD1514E   RCD1514F

ID: CV2626

DCD (Links): Status: As Built

DCD (SSData): Status: As Built

System: EFW Bus: MCCB63

EMERGENCY FEEDWATER FROM P7B TO STEAM GENERATOR E24B ISOLATION VALVE

Component in Area? No

Cables in Area:

GCB6335B   GPB6335A   PWR LOST 99-M

PWR LOST I

ID: CV2647

DCD (Links): Status: As Built

DCD (SSData): Status: As Built

System: EFW Bus: RA2

EMERGENCY FEEDWATER FROM P7A TO STEAM GENERATOR E24B CONTROL VALVE

Component in Area? No

Cables in Area:

PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path: 3A-VR-SGS-P013	Flow Path: 3A-VG-SGS-P013
ID: TE1012	ID: TE1013
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: RCS Bus: RS1	System: RCS Bus: RS2
RCS LOOP A HOT LEG TO BUF. A2-3-1 OR XI	RCS LOOP A HOT LEG TO BUF.B2-3-1 OR XI
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
PWR LOST I	PWR LOST 99-M PWR LOST I
Flow Path: 3A-GR-SGS-P014	Flow Path: 3A-GG-SGS-P014
ID: CV2869	ID: CV2870
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: EFW Bus: MCCB51	System: EFW Bus: D25
EFW FLOW TEST ISOLATION FOR P7B	EFW FLOW TEST ISOLATION FOR P7A
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
RCB5134C	PWR LOST I
Flow Path: 1A-VR-SGS-P015	Flow Path: 1A-VG-SGS-P015
ID: LI2618	ID: LI2622
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SGS Bus: RS1	System: SGS Bus: RS2
Steam Generator E24A Lower Range Level. Requires LT2618 and C539. Isolated at C539.	Steam Generator E24A Lower Range Level. Requires LT2622 and C540 via C37.
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
PWR LOST I RJI419A	PWR LOST 99-M PWR LOST I
ID: LT2618	ID: LT2622
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SGS Bus: RS1	System: SGS Bus: Y28/C540
STM GEN E24A LOW RANGE LEVEL EFIC CHAN A OR SPDS-A VIA C539	STM GEN E24A LOW RANGE LEVEL EFIC CHAN B OR SPDS-B
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
PWR LOST I	PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 1A-VR-SGS-P016	Flow Path: 1A-VG-SGS-P016
ID: LI2620 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: RS1 Steam Generator E24A Upper Range Level. Requires LT2620 and C539. Isolated at C539. Component In Area? No Cables In Area: PWR LOST I RJI419B	ID: LI2624 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: RS2 Steam Generator E24A Upper Range Level. Requires LT2624 and C540 via C37. Component In Area? No Cables In Area: PWR LOST 99-M PWR LOST I
ID: LT2620 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: RS1/C539 STM GEN E24A UPPER RANGE LEVEL EFIC CHAN A OR SPDS-A. Component In Area? No Cables In Area: PWR LOST I	ID: LT2624 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SGS Bus: Y28/C540 STM GEN E24A UPPER RANGE LEVEL EFIC CHAN A OR SPDS-B. Component In Area? No Cables In Area: PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 2B-VG-SGS-P021
	ID: TE1139 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: Y28/C540 RCS LOOP B HOT LEG TO SPDS-B VIA C539 Component In Area? No Cables In Area: PWR LOST 99-M PWR LOST I
	ID: TR1139 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: C540/Y28 RCS Loop B Hot Leg Temp. Requires TE1139 and C540. Isolated at C540. Component In Area? No Cables In Area: PWR LOST 99-M PWR LOST I
Flow Path: 4B-VR-SGS-P022	Flow Path: 4B-VG-SGS-P022
ID: TE1144 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: RS1/C539 RCS LOOP B PUMP B COLD LEG TO SPDS-A VIA C539 Component In Area? No Cables In Area: PWR LOST I	ID: TE1147 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: RCS Bus: Y28/C540 RCS LOOP B PUMP A COLD LEG TO TI1147 OR SPDS-B VIA C540 Component In Area? No Cables In Area: PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 5B-VG-SGS-P022

ID: TI1147
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: Y28/C540
RCS LOOP B PP A CLD LEG TEMP REQUIRES TE1147 AND C540 Isolated at C540.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Red Train

Flow Path: 3A-VR-SGS-P023

ID: TE1040
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS3
RCS LOOP B HOT LEG TO BUF C2-2-13 OR X1
Component in Area? No
Cables in Area:
PWR LOST I

Green Train

Flow Path: 3A-VG-SGS-P023

ID: TE1041
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: RCS Bus: RS4
RCS LOOP B HOT LEG TO BUF D2-3-1 OR XI
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Red Train

Flow Path: 1A-VR-SGS-P024

ID: PI2618A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: PNLRS1
STM GEN E24A PRESSURE REQUIRESPT2618A AND C539 ISOLATED AT C539.
Component in Area? No
Cables in Area:
PWR LOST I RJI419C

ID: PT2618A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539
STM GEN E24A PRESSURE EFIC CHAN A OR SPDS-A
Component in Area? No
Cables in Area:
PWR LOST I

Green Train

Flow Path: 1A-VG-SGS-P024

ID: PI2618B
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: PNLRS2
STM GEN E24A PRESSURE REQUIRESPT2618B AND C540 ISOLATED AT C540.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

ID: PT2618B
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: Y28/C540
STM GEN E24A PRESSURE EFIC CHAN B OR SPDS-B.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path: 1B-VR-SGS-P024

ID: PR2667A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1
Steam Generator E24B Pressure Requires PT2667A and C539. Isolated at C539.
Component in Area? No
Cables in Area:
PWR LOST I RJI419F

ID: PT2667A
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539
STM GEN E24B PRESSURE EFIC CHAN A OR SPDS-A.
Component in Area? No
Cables in Area:
PWR LOST I

Flow Path: 1B-VR-SGS-P025

ID: LI2667
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1
Steam Generator E24B Lower Range Level. Requires LT2667 and C539. Isolated at C539.
Component in Area? No
Cables in Area:
PWR LOST I RJI419D

ID: LT2667
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539
STM GEN E24B LOW RANGE LEVEL EFIC CHAN A OR SPDS-A.
Component in Area? No
Cables in Area:
PWR LOST I

Green Train

Flow Path: 1B-VG-SGS-P024

ID: PI2667B
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: PNLRS2
STM GEN E24B PRESSURE REQUIRESPT2667B AND C540 ISOLATED AT C540.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

ID: PT2667B
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: Y28/C540
STM GEN E24B PRESSURE EFIC CHAN B OR SPDS-B.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Flow Path: 1B-VG-SGS-P025

ID: LI2671
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: RS2
Steam Generator E24B Lower Range Level. Requires LT2671 and C540. Isolated at C540.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

ID: LT2671
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SGS Bus: Y28/C540
STM GEN E24B LOW RANGE LEVEL EFIC CHAN B OR SPDS-B.
Component in Area? No
Cables in Area:
PWR LOST 99-M PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path: 1B-VR-SGS-P026	Flow Path: 1B-VG-SGS-P026
ID: LI2669	ID: LI2673
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SGS Bus: RS1	System: SGS Bus: RS2
Steam Generator E24B Upper Range Level. Requires LT2669 and C539. Isolated at C539.	Steam Generator E24B Upper Range Level. Requires LT2673 and C540 via C37.
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
PWR LOST I RJI419E	PWR LOST 99-M PWR LOST I
ID: LT2669	ID: LT2673
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SGS Bus: RS1/C539	System: SGS Bus: Y28/C540
STM GEN E24B UPPER RANGE LEVEL EFIC CHAN A OR SPDS-A.	STM GEN E24B UPPER RANGE LEVEL EFIC CHAN B OR SPDS-B.
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
PWR LOST I	PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 0A-VG-SGS-P029
	ID: CV2619
	DCD (Links): Status: As Built
	DCD (SSData): Status: As Built
	System: SGS Bus: MCCB61
	STEAM GENERATOR E24B STEAM DUMP TO ATM (CV2618) BLOCK VALVE
	Component in Area? No
	Cables in Area:
	PWR LOST 99-M PWR LOST I
Flow Path: 0B-VR-SGS-P029	Flow Path: 0B-VG-SGS-P029
ID: CV2668	ID: CV2618
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SGS Bus: PNLRS1	System: SGS Bus: PNL RS2
ATMOSPHERIC DUMP VALVE STM GEN E24A	ATMOSPHERIC DUMP VALVE STM GEN E24B (E/P - 2618)
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
I443A PWR LOST I RJI423C	I442A PWR LOST 99-M PWR LOST I

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path: 2A-GR-SGS-P039	Flow Path: 2A-GG-SGS-P039
ID: PM7B	ID: PM7A
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: EFW Bus: A3	System: EFW Bus: NONE
EMERGENCY FEEDWATER PUMP MOTOR DRIVEN	EMERGENCY FEEDWATER PUMP TURBINE DRIVEN
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
RCA311H	GCI428L
Flow Path: 1A-GR-SGS-P041	Flow Path: 1A-GG-SGS-P041
ID: CV2663	ID: CV2613
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: EFW Bus: D15	System: EFW Bus: D25
P7A STM ADMISSION VALVE EFIC CHANNEL A	P7A STEAM ADMISSION VALVE EFIC CHANNEL B
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
RCD1512C RCD1512F	PWR LOST I
	ID: SV2613
	DCD (Links): Status: As Built
	DCD (SSData): Status: As Built
	System: EFW Bus: D25
	PM7A Steam Admin Bypass Valve EFIC Channel B.
	Component in Area? No
	Cables in Area:
	PWR LOST I
Flow Path: 2A-GR-SGS-P041	Flow Path: 2A-GG-SGS-P041
ID: CV2667	ID: CV2617
DCD (Links): Status: As Built	DCD (Links): Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SGS Bus: MCCB52	System: SGS Bus: MCCB62
EMERGENCY FEED PUMP P7A TURBINE STEAM SUPPLY FROM E24A ISOLATION VALVE	EMERGENCY FEED PUMP P7A TURBINE STEAM SUPPLY FROM E24B STOP VALVE
Component in Area? No	Component in Area? No
Cables in Area:	Cables in Area:
RCB5241H RCB5241J	GCB6241C PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path: 2A-GR-SGS-P043

ID: CV2803
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB51
EMERG FEEDWATER PUMP P7B SERVICE WATER SUCTION VALVE
Component in Area? No
Cables in Area:
RCB5193E

ID: CV3850
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB51
SERVICE WATER HEADER TO EMERG FP P7B ISOLATION VALVE
Component in Area? No
Cables in Area:
RCB5194E

Green Train

Flow Path: 2A-GG-SGS-P043

ID: CV2806
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB61
EMERG FEEDWATER PUMP P7A SERVICE WATER SUCTION VALVE
Component in Area? No
Cables in Area:
GCB6181C GPB6181A PWR LOST 99-M
PWR LOST I

ID: CV3851
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB61
SERVICE WATER HEADER TO EMERG FP P7A ISOLATION VALVE
Component in Area? No
Cables in Area:
GCB6185C GPB6185A PWR LOST 99-M
PWR LOST I

Flow Path: 1A-GR-SGS-P044

ID: CV2800
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB51
EMERG FEEDWATER PUMP P7B CONDENSATE SUCTION VLV
Component in Area? No
Cables in Area:
RCB5173E

Flow Path: 1A-GG-SGS-P044

ID: CV2802
DCD (Links): Status: As Built
DCD (SSData): Status: As Built
System: EFW Bus: MCCB61
EMERG FEEDWATER PUMP P7A CONDENSATE SUCTION VLV
Component in Area? No
Cables in Area:
GCB6175C GPB6175A PWR LOST 99-M
PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path: 0C-GR-SGS-P045	Flow Path: 0C-GG-SGS-P045
ID: LRS4204 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: CFW Bus: C539/RS1 Requires LT4204 and C539. Isolated at C539. Component in Area? No Cables in Area: PWR LOST I RJI452B	ID: LIS4205 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: CFW Bus: C540/Y28 Requires LT4205 and C540. Isolated at C540. Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I
ID: LT4204 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: CFW Bus: C539/RS1 Cond. Storage TK T41B Level to LRS4204 or SPDS. Component in Area? No Cables in Area: PWR LOST I	ID: LT4205 DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: CFW Bus: C540/Y28 Cond. Storage TK T41B Level to LIS4205 or SPDS. Component in Area? No Cables in Area: PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 0A-GG-SGS-P050
	ID: MSIV-B DCD (Links) : Status: As Built DCD (SSData): Status: As Built System: SGS Bus: D21 MAIN STEAM ISOLATION VALVE CONTROL CIRCUIT CHANNEL B (SV711,SV621) Component in Area? No Cables in Area: GCM022J GCM022K GCM022Y1 PWR LOST I
Flow Path: 0A-GR-SGS-P051	Flow Path: 0A-GG-SGS-P051
ID: CV2680 DCD (Links) : PC 985000B201 Status: New DCD (SSData): Status: As Built System: CFW Bus: MCCB51 MAIN FEEDWATER TO E24A CONTAINMENT ISOLATION (NOT COI) Component in Area? No Cables in Area: RCB5124F RCB5124G	ID: CV2630 DCD (Links) : PC 985000B201 Status: New DCD (SSData): Status: As Built System: CFW Bus: MCCB61 MAIN FEEDWATER TO E24B CONTAINMENT ISOLATION (NOT A COI) Component in Area? No Cables in Area: GCB6124D GCB6124E GCB6124H GCB6124K PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train

Flow Path:

Green Train

Flow Path: 0A-WG-SWS-P001

ID: CV3643
DCD (Links) : PC 985000B201 Status: New
DCD (SSData): Status: As Built
System: SW Bus: MCCB56
AUX COOLING WATER SYSTEM SERVICE WATER VALVE NORMALLY OPEN
Component in Area? No

Cables in Area:

GCB5653C	GCB5653G	GCB5653J
GPB5653A	PWR LOST 99-M	PWR LOST I
RCB5653D	RCB5653H	

Red Train

Flow Path:

Green Train

Flow Path: 0A-WG-SWS-P014

ID: CV3642
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB62
SERVICE WATER PUMP DISCHARGE CROSSCONNECT VALVE P4B-P4C
Component in Area? No

Cables in Area:

GCB6224C	GCB6224D	GCB6224E
GCB6224G	GCB6224H	GPB6224A
PWR LOST 99-M	PWR LOST I	

ID: CV3644
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: MCCB62
SERVICE WATER PUMP DISCHARGE CROSSCONNECT VALVE P4A-P4B
Component in Area? No

Cables in Area:

GCB6223C	GCB6223D	GCB6223E
GPB6223A		

Red Train

Flow Path: 1A-WR-SWS-P020

ID: PM4A
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: SWGA3
SERVICE WATER PUMP A
Component in Area? No

Cables in Area:

RCA302J	RCA302K

Green Train

Flow Path: 1A-WG-SWS-P020

ID: PM4C
DCD (Links) : Status: As Built
DCD (SSData): Status: As Built
System: SW Bus: SWGA4
SERVICE WATER PUMP C
Component in Area? No

Cables in Area:

GCA402C	GCA402D	GCA402E
GCA402J	GCA402K	GCA402L
PWR LOST 99-M	PWR LOST I	GPA402C1
GPA402B1	GPA402D1	

Fire Zone: 99-M   Unit: 1   Status: As Built

Red Train	Green Train
Flow Path: 1A-WR-SWS-P021 ID: PM4B(R) DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: A3 Service Water Pump B Component in Area? No Cables in Area: GCA303K RCA303M	Flow Path: 1A-WG-SWS-P021 ID: PM4B(G) DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: A4 Service Water Pump B Component in Area? No Cables in Area: GCA403D GCA403E GCA403F GCA403H GCA403J GCA403L GCA403M GPA403A PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 1A-WG-SWS-P022 ID: PM4B(G)DS DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: RA2 Disconnect Switch for PM4B(G) Green Power Supply Component in Area? No Cables in Area: PWR LOST I
Flow Path:	Flow Path: 1A-WG-SWS-P031 ID: SG2 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCCB61 SLUICE GATE DARDANELLE TO BAY C Component in Area? No Cables in Area: GPB6253A PWR LOST 99-M PWR LOST I
Flow Path:	Flow Path: 2A-WG-SWS-P031 ID: SG7 DCD (Links): Status: As Built DCD (SSData): Status: As Built System: SW Bus: MCCB62 SLUICE GATE EMERGENCY POND TO BAY C Component in Area? No Cables in Area: GPB6251A PWR LOST 99-M PWR LOST I

Fire Zone: 99-M Unit: 1 Status: As Built

Red Train	Green Train
Flow Path:	Flow Path: 1A-WG-SWS-P033
	ID: SG4
	DCD (Links) : Status: As Built
	DCD (SSData): Status: As Built
	System: SW Bus: MCCB61
	SLUICE GATE BAY C TO BAY B
	Component In Area? No
	Cables In Area:
	GPB6334A PWR LOST 99-M PWR LOST I
Flow Path: 2A-WC-SWS-P033	Flow Path: 2A-WC-SWS-P033
ID: SG6	ID: SG6
DCD (Links) : Status: As Built	DCD (Links) : Status: As Built
DCD (SSData): Status: As Built	DCD (SSData): Status: As Built
System: SW Bus: MCCB62	System: SW Bus: MCCB62
SLUICE GATE EMERGENCY POND TO BAY B	SLUICE GATE EMERGENCY POND TO BAY B
Component In Area? No	Component In Area? No
Cables In Area:	Cables In Area:
GPB6242A PWR LOST 99-M PWR LOST I	GPB6242A PWR LOST 99-M PWR LOST I

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NUCLEAR ENGINEERING DEPARTMENT
DOCUMENT REVIEW AND APPROVAL PAGE

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Preparer: G. B. Spikes / G. Spikes — Date: 11/11/92 — Phone: *9453

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- X ANO-1
- ___ ANO-2
- ___ GGNS-1
- ___ GGNS-2
- ___ WSES-3
- ___ System
- ___ Other

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DOCUMENT REVIEW AND APPROVAL
CONTINUATION PAGE

Document Number: NEAD-NE-92/004.R0

Comments By: SR

I reviewed the package against the purpose and controlling procedure. The calculations supporting MAAP input parameters were reviewed for appropriateness and completeness. All calculations were checked. I reviewed the entire package for readability and completeness. I reviewed all inputs and output plots for consistency and appropriateness. I recommend this package for approval.

Comments By:

Comments By:

ANO-1 MAAP ANALYSES TO SUPPORT PRA LEVEL 1 AND 2

ASSUMPTIONS AND SEVERE ACCIDENT MANAGEMENT

Revision 0

Document No. NEAD-NS-92/015.R0

Calculational Package File 178-12

Prepared by: G. B. Spikes
Contributor: M. Aboul-Fetouh

Technical Review by S. Ranatza

This calculational package conforms to the requirements of NEDI-NS.01, Revision 0.

TABLE OF CONTENTS

There are a total of 766 pages in this package.

0. INDEX AND CODES LIST

0.1 Index

This calculational package is complete and self contained.

0.2 Codes List

MAAP 3.0B Revision 18.0 is the only code used. Code verification is documented in this package. The executable load module is RS/6000 workstation file p3/maap/Pmaap.

1. PURPOSE

To perform MAAP analyses of representative ANO-1 sequences to support verification of PRA Level 1 and 2 assumptions and to provide data for Severe Accident Management (SAM) Guideline development.

2. PROCEDURE

ANO Design Engineering (ANO-DE) defined eight severe accident scenarios for ANO Unit 1 and requested that MAAP analyses of the scenarios be performed [8]*. The procedure for performing the analyses is as follows:

1. Install and verify the MAAP 3.0B Revision 18.0 code on the Nuclear Engineering Analysis Department's (NEAD's) IBM RS/6000 workstation. This code will be used to analyze the accident sequences.

2. Develop a task plan describing the scenarios and branch cases to be run, modeling assumptions, and project schedule. The task plan will be the defining document for this project. (This task plan is included in Reference 8, with clarifications in Reference 22).

3. Define the accident scenarios, or sequences, to be analyzed and operator recovery actions for sequence branch cases. (Sequence definitions and modeling assumptions will be specified in the task

* Numbers in brackets refer to references in Section 5.

plan.)

4. Develop the MAAP input parameter files to be used for the analyses per the guidelines set forth in the task plan [8]. The basis for the parameter file is the ANO-1 MAAP 3.0B Rev. 16 parameter file documented in NEAD Calculational Package 178-10 [1].

5. Perform sensitivity studies to assess the impact of values of selected parameters on results and to determine the best values to use in the analyses.

6. Develop MAAP input files for each accident sequence and branch case.

7. Perform the analyses and document results.

3. RESULTS

The accident scenarios and analysis results are summarized in Tables 3.1 and 3.2. Table 3.1 lists the sequences analyzed and the available systems for each sequence. Table 3.2 summarizes the analysis results from each sequence and the associated branch cases. This table also shows the operator recovery actions used in each branch case. The sequence end times are 2 hours after containment failure for sequences that predict containment failure or some time after vessel failure for sequences with no containment failure (i.e., SU, RX, RU, and AU). Branch cases are run just long enough to demonstrate the effectiveness of the operator recovery action.

Appendix 3 contains listings of all sequence input files. Microfiche of output files from each analysis are provided in Section 6. Plots of selected parameters from each sequence are included in Appendix 4.

3.1. Branch Cases

Branch cases were analyzed for all but one sequence to demonstrate the effectiveness of operator actions in mitigating three plant damage states: containment failure (CF) (for cases involving containment failures), reactor vessel failure (VF), and core damage (CD). Core damage is defined here to occur when the temperature of the hottest core node reaches 2500 K (4038.7 F), which is the normal melting temperature of the zircaloy fuel cladding. Mitigating actions for the SGTR RX sequence could not be implemented due to the sequence progression. Branch cases for this sequence were therefore not analyzed (per Ref. 22).

The operator intervening actions are shown in Table 3.3. These interventions, or recovery actions, are based on the assumption that previously unavailable systems are returned to service and are started by the control room operator. Recovery actions to avoid containment failure include initiation of one train of reactor building spray (RBS) and fan coolers (RBFC). Recovery actions to avoid core damage and vessel failure include initiation of feed and bleed (F&B)

operations and recovery of ECCS injection (one LPI, one HPI, or both).

In addition to demonstrating the effectiveness of the recovery actions, the branch case analyses also determine the approximate time that the recovery action can be initiated to avoid the plant damage state. The timing of the recovery actions in each branch case were iteratively determined based on observations of critical parameters (TCRHOT, containment pressure, etc.) from the base case results. Recovery action times for each branch case are included in Table 3.2.

3.2. Results Summary

Overall, calculated results for all sequences analyzed are consistent with expected plant response. Plant response to operator actions in the branch cases is also as expected. Some observations from specific sequences are provided below.

- The TBF2P sequence is the TBF2 (loss of AC and DC power) sequence but with RCPs running. The RCPs trip after 43 min. due to voiding in the RCS. The

effect of the pumps on sequence progression is to decrease the timing of all key events except containment failure, which is unaffected. TBF3P is the no core damage branch case for the TBF2P sequence. The mitigating action (F&B) is initiated at 55 min., 10 min. before core damage. This is after the 40 min. minimum time limit specified in Table 3.3 (Note 2). The mitigating action in the no CD branch of the base (RCPs tripped) case (TBF6) is initiated at 59 min. This also satisfies the minimum time limit for the mitigating action for this sequence as specified in Table 3.3.

- TBX: The TBX sequence initiating event is a reactor scram and stuck open pressurizer ERV. The ERV remains open until ECCS recirculation is initiated, at which time the valve is closed. This sequence was found to be very responsive to the operator recovery actions (F&B) for the no core damage and no vessel failure branch cases. Initiating F&B as late as 5 min. before core damage (TBX3) and before vessel failure (VF) (TBX7) was sufficient to avoid the relevant plant damage

state. This sequence also predicts the latest containment failure time (56 hr.) of all sequences analyzed.

- SX: The small LOCA sequence uses a break area based on a 4" diameter hole as specified in the project task plan [8]. However, the resulting break flow is more typical of that expected for a medium break LOCA. In addition, the decay heat removal criterion for small breaks defined in the task plan [8] is not satisfied. (See Section 4.2.2 for a detailed discussion of break sizes.)

- RX: The first Steam Generator Tube Rupture (SGTR) sequence (RX1) is initiated by a double ended break of one SG tube. No operator actions to cooldown the RCS or isolate the affected SG are credited. One HPI pump is started 30 minutes after the initiating event and runs until recirculation conditions (i.e., depletion of BWST inventory) at 14.4 hours (c.f. Table 3.2). At this time, all ECCS injection and RB Spray fails due to insufficient water in the reactor building sump. Note that no operator recovery actions (e.g.,

start one HPI pump) can be initiated after recirculation due to the dry RB sump. Therefore, no branch cases are run for the RX sequence (per Reference 22). Containment failure will eventually occur due to failure of RB Sprays and Fan Coolers at recirculation. However, the SGTR sequences are terminated prior to containment failure. The RX1 sequence is terminated at 40 hours, when containment pressure (PD) is < 60 psia, well below the 153.4 psia failure limit.

The second SGTR sequence (RX0) is identical to RX1 with the exception of the break size, which is equal to 50% of that used in RX1 (see Section 4.4.3 for a discussion of SGTR break sizes). The progression of this sequence is similar to RX1. However, the smaller break size and subsequent lower break flow results in a slower rate of RCS depressurization, lower HPI pump flow rate (due to the higher RCS pressure), and thus a later recirculation time (19.8 hours versus 14.4 hours in the RX1 sequence). Vessel failure occurs approximately 6 hours after recirculation (30.3 hours versus 24.6 hours in RX1). The RX0 sequence is

terminated two hours after RV failure.

Results from both the RX1 and RX0 sequences show significant oscillations in broken steam generator secondary pressure (PBS) after the SG fills. These oscillations are also reflected in the secondary temperature (TGBS) and level (ZWBS) response and are due to a limitation in the MAAP 3.0B Revision 18.0 SG model. A revision to the model is being incorporated into the Revision 18.1 code to address this limitation.

- AX: This large LOCA sequence uses a 12" diameter break and is the only sequence analyzed that does not credit the core flood tanks (CFTs). As a result, core uncovery occurs very early in the sequence (126 sec.). However, early core damage is avoided due to ECCS injection initiated at 4.3 sec. A sensitivity calculation was run with CFTs credited. The effect was to increase the core uncovery time to 6493 sec. However, core damage (2.3 hr) and vessel failure (3.6 hr.) times were not significantly affected.

- Sensitivity calculations involving containment geometry and corium entrainment options show that the timing of the containment failure can be impacted as much as 30% by changes in some input parameters. A detailed discussion of the results of several containment sensitivity studies is provided in Section 4.3. Output files from the sensitivity calculations are NOT included in this package.

TABLE 3.1

ANO-1 MAAP ANALYSES - ACCIDENT SEQUENCE DETAILS

Sequence Description	SEQ	EFW	HPI i/r	LPI i/r	RBS i/r	RBFC i/r Note 2	PRZR Spy	PRZR Htrs	Trip RCP's	CFTs Note 1	AC+DC	Rx Scram
Transient #1 Station Blackout	TBF	0	0/0	0/0	0/0	0/0	0	0	at 0.0 hr	1	0	at time 0.0 hr
Transient #2 Loss of SW	TBX	0	1/0	1/0	1/0	1/0	1	1	at 2 min after IE	1	1	at time 0.0 hr
Small LOCA + Recirc. Failure	SX	0	1/0	1/0	1/0	1/0	0	0	at 2 min after IE	1	1	auto
Small LOCA + Inject. Failure	SU	1 Note 3	0/0	0/0	1/1	1/1	0	0	at 1400 psia	1	1	auto
SGTR + Recirc. Failure	RX	0	1/0 Note 4	1/0	1/0	1/0	0	0	at 2 min after IE	1	1	auto
SGTR + Inject. Failure	RU	1 Note 3	0/0	0/0	1/1	1/1	0	0	at 1400 psia	1	1	auto
Large LOCA + Recirc. Failure	AX	0	1/0	1/0	1/0	1/0	0	0	at 2 min after IE	0	1	auto
Large LOCA + Inject. Failure	AU	0	0/0	0/0	1/1	1/1	0	0	at 2 min after IE	1	1	auto

Legend:
- 1 - Denotes system/component available.
- 0 - Denotes system/component unavailable.
- HPI - High Pressure Safety Injection System.
- LPI - Low Pressure Safety Injection System.
- RBS - Reactor Building Spray.
- RBFC - Reactor Building Fan Coolers.
- CFT - Core Flood Tanks (MAAP Accumulators).
- i/r - injection mode/recirculation mode.
- IE - initiating event.

Notes:
1. Credit 1 of 2 Core Flood Tanks (CFTs) (if available).
2. Credit 1 of 4 reactor building fan coolers (RBFC) in all sequences (when available).
3. EFW automatically actuated on reactor scram and controls OTSG levels at the ZWCTLB/ZWCTLU setpoints (17.6 ft per C-13.29, 13.30 of CP 178-10, Rev. 0 [1]).
4. Start HPI pump 30 minutes after initiating event.

TABLE 3.2
ANO-1 MAAP ANALYSES - RESULTS SUMMARY

		TIMING OF KEY EVENTS (HR)									OPERATOR RECOVERY ACTIONS (HR)				
Sequence	SEQ/RUN ID	RX SRAM	RCPS TRIP	HPI	LPI	RECIRC. (Note 2)	CORE UNCOVERY	CORE TEMP. > 2500 K	RV FAILURE	CONTMT FAILURE	INITIATE F&B(1)	START ECCS(3)	START RBS	START RBFC	TIME BEFORE DAMAGE STATE
SBO Base Case	TBF2	0.0	0.0	N/S	N/S	N/S	1.1	1.5	2.05	43.5	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	TBF6	0.0	0.0	N/S	N/S	Note 4	N/A	N/A	N/A	N/A	0.98	N/S	N/S	0.98*	0.5 hr
No Vessel Failure (VF)	TBF5	0.0	0.0	N/S	N/S	6.2	1.1	1.5	N/A	N/A	1.56	N/S	N/S	1.56*	0.5 hr
No Contmt Failure (CF)	TBF4	0.0	0.0	N/S	N/S	Note 4	1.1	1.5	2.05	N/A	N/S	N/S	43.04	43.04	0.5 hr
SBO W/RCPs Base Case	TBF2P	0.0	43 min	N/S	N/S	N/S	0.77	1.1	1.6	43.9	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	TBF3P	0.0	43 min	N/S	N/S	6.04	0.77	N/A	N/A	N/A	0.92	0.92*	0.92*	0.92*	10 min
Loss of SW Base Case	TBX1	0.0	2 min	3.6 min	3.6 min	8.56	11.4	12.2	13.2	56.0	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	TBX3	0.0	2 min	3.6 min	3.6 min	8.56	11.4	N/A	N/A	N/A	12.1	N/S	12.1*	N/S	5 min
No Vessel Failure (VF)	TBX7	0.0	2 min	3.6 min	3.6 min	8.56	11.4	12.2	N/A	N/A	13.1	N/S	13.1*	13.1*	5 min
No Contmt Failure (CF)	TBX8	0.0	2 min	3.6 min	3.6 min	8.56	11.4	12.2	13.2	N/A	N/S	N/S	55.5	55.5	0.5 hr
SBLOCA+Recirc Failure-Base	SX6	19 sec	2 min	32 sec	32 sec	3.7	4.9	5.7	7.1	28.5	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	SX9	19 sec	2 min	32 sec	32 sec	3.7	4.9	N/A	N/A	N/A	N/S	5.24	N/S	5.24	30 min
No Vessel Failure (VF)	SX8	19 sec	2 min	32 sec	32 sec	3.7	4.9	5.7	N/A	N/A	N/S	6.6	N/S	6.6	27 min
No Contmt Failure (CF)	SX7	19 sec	2 min	32 sec	32 sec	3.7	4.9	5.7	7.1	N/A	N/S	N/S	28.0	28.0	30 min

Notes:
1. Feed and Bleed (F&B) initiation consists of opening the Pressurizer ERV and starting one HPI pump.
2. Manual transfer to ECCS recirculation mode.
3. Start one HPI pump OR one HPI and one LPI pump if in recirculation.
4. Problem end time reached before initiation conditions obtained.

* Placed in automatic.
N/S - Not Started.
N/A - Not Applicable.

TABLE 3.2
ANO-1 MAAP ANALYSES - RESULTS SUMMARY

Sequence	SEQ/RUN ID	TIMING OF KEY EVENTS (HR)									OPERATOR RECOVERY ACTIONS (HR)				
		RX SRAM	RCPs TRIP	HPI	LPI	RECIRC (Note 2)	CORE UNCOVERY	CORE TEMP. > 2500 K	RV FAILURE	CONTMT FAILURE	INITIATE F&B(1)	START ECCS(3)	START RBS	START RBFC	TIME BEFORE DAMAGE STATE
SBLOCA+Inject Failure-Base	SU01	19 sec	33 sec	N/S	N/S	5.0	0.44	1.0	2.4	N/A	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	SU21	19 sec	33 sec	0.83	3.8	3.8	0.45	N/A	N/A	N/A	N/S	0.83	N/S	N/S	10 min
No Vessel Failure (VF)	SU11	19 sec	33 sec	2.26	4.2	4.2	0.45	1.0	N/A	N/A	N/S	2.26	N/S	N/S	10 min
SGTR+Recirc. (0.00338 f2)	RX1	2 min	2 min	0.5	0.2	14.4	22.0	23.2	26.6	Note 4	N/S	N/S	N/S	N/S	N/A
SGTR+Recirc. (0.00169 f2)	RX0	2 min	2 min	0.5	N/S	19.8	27.5	28.6	30.3	Note 4	N/S	N/S	N/S	N/S	N/A
SGTR+Inject. Failure-Base	RU02	19.3 sec	0.1	N/S	N/S	25.7	2.24	2.9	3.8	N/A	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	RU4	19.3 sec	0.1	2.4	N/S	Note 4	2.24	N/A	N/A	N/A	N/S	2.4	N/S	N/S	28 min
No Vessel Failure (VF)	RU3	19.3 sec	0.1	3.32	N/S	Note 4	2.24	2.9	N/A	N/A	N/S	3.32	N/S	N/S	0.5 hr
LBLOCA+Recirc Failure-Base	AX2	4.3 sec	48.8s **	4.3 sec	4.3 sec	1.55	125.7 sec	2.8	4.0	26.7	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	AX55	4.3 sec	48.8s **	4.3 sec	4.3 sec	1.55	125.7 sec	N/A	N/A	N/A	N/S	2.3	N/A	2.3*	0.5 hr
No Vessel Failure (VF)	AX4	4.3 sec	48.8s **	4.3 sec	4.3 sec	1.55	125.7 sec	2.8	N/A	N/A	N/S	3.51	N/S	3.51*	0.5 hr
No Contmt Failure (CF)	AX3	4.3 sec	48.8s **	4.3 sec	4.3 sec	1.55	125.7 sec	2.8	4.0	N/A	N/S	N/S	26.2	26.2	0.5 hr
LBLOCA+Inject Failue-Base	AU21	4.2 sec	48 s **	N/S	N/S	4.4	526.4 sec	0.43	1.0	N/A	N/S	N/S	N/S	N/S	N/A
No Core Damage (CD)	AU320	4.2 sec	48 s **	N/S	0.40	1.6	526.4 sec	N/A	N/A	N/A	N/S	0.40	N/S	N/S	2.4 min
No Vessel Failure (VF)	AU311	4.2 sec	48 s **	N/S	0.83	1.9	526.4 sec	0.43	N/A	N/A	N/S	0.83	N/S	N/S	10 min

Notes: See Page 1. ** RCPs trip early due to RCS vaporization. N/S Not Started. * Placed in automatic.
N/A Not Applicable.

TABLE 3.3

Operator Recovery Actions

Sequence	Branch Case	Recovery Action
TBF	No CD [2]	F&B [1]
	No VF	F&B [1]
	No CF	RBS, RBFC
TBX	No CD	F&B [1]
	No VF	F&B [1]
	No CF	RBS, RBFC
SX	No CD	Start HPI/LPI, RBFC [3]
	No VF	Start HPI/LPI, RBFC
	No CF	RBS, RBFC
SU	No CD	Start 1 HPI [4]
	No VF	Start 1 HPI [4]
RX	N/A	N/A
RU	No CD	Start 1 HPI
	No VF	Start 1 HPI
AX	No CD	Start LPI, RBFC [3]
	No VF	Start LPI, RBFC
	No CF	RBS, RBFC
AU	No CD	Start LPI
	No VF	Start LPI

1) Open ERV and start 1 HPI pump. Add LPI pump at recirculation.
2) Run two cases, one with RCPs running and the other with RCPs tripped. Initiate F&B (start 1 HPI pump) no earlier than 40 min. with RCPs running and no earlier than 55 min. with RCPs tripped.
3) Credit 1 RBFC and 1 HPI or LPI train with no DHR Cooler.
4) For all cases, add LPI pump at recirculation for long term core cooling (normal ECCS pump recirculation alignment).

Legend:
CD - Core Damage
VF - Vessel Failure
CF - Containment Failure
RBS - Reactor Bldg Spray
RBFC - Reactor Bldg Fan Cooler
HPI - High Pressure Injection
LPI - Low Pressure Injection
DHR - Decay Heat Removal

4. CALCULATIONS

4.1. MAAP Code Verification

The purpose of the MAAP code verification task is to validate the performance of the PWR MAAP 3.0B Revision 18 code installed on the Nuclear Engineering Analysis Department (NEAD) IBM RISC System/6000 workstation.

4.1.1. Code Installation

The PWR MAAP 3.0B Revision 18.0 source code was obtained by Entergy Operations from Fauske & Associates, Inc. through the MAAP Users Group (MUG) [2]. The code has been subjected to a design review and independent verification and validation by EPRI. MAAP 3.0B codes are maintained under the FAI Quality Assurance Program in conformance with 10CFR50 Appendix B. PWR MAAP 3.0B Rev. 18 was installed at NEAD by first loading the single-precision source code onto the RS/6000. The source code was then split into individual subroutines using the RS/6000 "fsplit" utility, and compiled and

linked using the xlf link editor to create an executable load module. The load module is /p3/pmaap/Pmaap.

4.1.2 Approach

The approach used to verify the MAAP code installation consisted of executing three standard sample problems and comparing the results to those provided by FAI. FAI transmitted with the MAAP source code a default parameter file for a Zion-like PWR Large Dry plant (ZION_R18.PAR) and input files for three sample problems; a station blackout with pump seal LOCA (TMLB), large break LOCA (AHF), and small break LOCA (S2HF). These sample problems were executed by FAI using several different computer systems and compilers and the results reported in Table 4.1-4.3 of the Transmittal Documentation [15].

To verify the MAAP installation at NEAD, these same sample problems were executed on the RS/6000 using the default ZION_R18.PAR parameter file and FAI's input files. The results, in the form of numerical figures-of-merit, were then compared to those reported

by FAI (Table 4.1 - 4.3 [15]).

Additional verification was obtained through qualitative comparisons of plotted results. Plot files from the TMLB sample problem were plotted using an in-house Fortran post-processor (MAAP.GRAPH2). The plots were compared to corresponding plots in Appendix V of the Transmittal Documentation [15].

Microfiche of the workstation input script files and all output files for the four sample problems is included in Section 6.

4.1.3 Acceptance Criteria

The acceptance criteria established by FAI to evaluate code performance is used to verify the performance of the MAAP code on the RS/6000. This criteria requires that results be:

- Within 3% of FAI's results for timing of these key events:

- core uncovery,
- vessel failure,
- containment failure.

- Generally within 10% to order of magnitude on masses.

- Within 5% of mean on absolute basis for fraction of clad reacted.

4.1.4 Results

Results of the code verification are summarized in Tables 4.1.1 - 4.1.3. The NEAD data is from the figures-of-merit summaries printed at the end of the log files from the RS/6000 sample problem results. The FAI results are the average of the four single-precision cases reported in Tables 4.1 - 4.3 of the MAAP 3.0B Revision 18 transmittal documentation [15].

Agreement between results from the Station Blackout (TMLB) problem (Table 4.1.1) and Large LOCA (AHF) problem (Table 4.1.3) are within the FAI acceptance criteria for fraction of clad reacted and timing of key events and generally within the 10% acceptance limit on masses. Exceptions (CsI mass in corium in

the TMLB case and SrO released in-vessel in the AHF case) involve small quantities (<.35 kg) and are not considered significant.

NEAD results from the Small LOCA (S2HF) problem (Table 4.1.2) satisfy the acceptance criteria for most parameters. Exceptions include timing of vessel failure and several mass distribution totals. The relatively large (7.52%) discrepancy in vessel failure timing is believed to be due to differences in maximum time step between two of the FAI cases (Vax and Avalon) and the RS/6000. FAI obtained similar large discrepancies between their Vax/Avalon cases and Lahey and NDP compilers (cf. Table 4.3 [15]). FAI attributed this difference to a smaller maximum time step used on the Lahey/NDP compilers (10 sec. versus 20 sec.) . Examination of the NEAD results show that the RS/6000 also uses a 10 sec. maximum time step, similar to the Lahey and NDP compilers. Comparison between the RS/6000 (NEAD) and Lahey/NDP failure times show only a 0.03% discrepancy (56,661.36 sec. Lahey/NDP average versus 56,678.48 sec. RS/6000), which is well within the 3% acceptance limit. This is believed to be the more valid comparison. Therefore, the NEAD result for this

parameter is considered acceptable.

Table 4.1.2 also shows a large discrepancy in the concrete aerosol mass (68.65%). FAI also obtained large differences in this parameter for the different compilers (cf. Table 4.3 [15]). The reason for this discrepancy is unknown. However, due to the relatively small quantities involved (<3.5 kg), this difference is not considered significant in terms of code validation. The remaining mass parameters that do not satisfy the 10% acceptance limit (i.e., selected UO_2, CsI, and SrO mass distributions) all involve small quantities and are therefore not considered significant.

Additional verification of the MAAP code is obtained by comparing plots of selected parameters. Parameters specified in the default parameter file group (PLTMAP) were plotted using the MAAP.GRAPH2 post-processor for the Station Blackout (TMLB) and Small LOCA (S2HF) sample problems. These plots were compared to corresponding plots in Appendix V of the PWR Rev. 18 transmittal documentation [15] (TMLB case) and to plots generated from the Lahey-S plot files provided

by FAI (S2HF case). The comparisons showed good agreement for all parameters for both problems. (Note: No verification plots are included in this package.)

4.1.5 Conclusion

Based on the results of the code validation program, it is concluded that the PWR MAAP 3.0B Revision 18 code as installed on the RS/60000 workstation at NEAD is running correctly and returning valid results.

TABLE 4.1.1

MAAP 3.0B Rev. 18 Verification: Station Blackout (TMLB)

EVENT TIMING	NEAD	FAI	% Difference (NEAD-FAI/FAI)
Core Uncovery (sec.)	8643.33	8866.58	-2.518
Vessel Failure (sec.)	14245.89	14668.48	-2.881
Containment Failure (sec.)	118693.09	119209.95	-0.434
CONSTITUENT MASSES AND CLAD REACTED			
Clad Reacted (FRAC)	0.4349	0.4395	0.0046(1)
Concrete Aerosol (KG)	0.0000	0.0000	0.0000
UO_2 Mass Distribution (KG)			
UO2 Mass In Cavity	13229.39	14032.57	-5.724
UO2 Mass In 'B' Compt.	85916.05	85112.85	0.944
CsI Mass Distribution (2)			
Initial Mass	1.0000	1.0000	0.00
In Core	0.0000	0.0000	0.00
In Corium	0.0182	0.0065	180.00
In Primary System	0.9281	0.9381	-1.066
In Steam Generator	0.0000	0.0000	0.00
In Containment	0.0523	0.0573	-8.726
Total In-Vessel Released	0.9818	0.9968	-1.505
Total Ex-Vessel Released	0.0000	0.0000	0.00
Released to Environment	0.0013	0.0013	0.00
SrO Mass Distribution (2)			
Initial Mass	1.0000	1.0000	0.00
In Core	0.0000	0.0000	0.00
In Corium	0.9998	0.9998	0.00
In Primary System	0.0002	0.0002	0.00
In Steam Generator	0.0000	0.0000	0.00
In Containment	0.00	0.00	0.00
Total In-Vessel Released	0.0002	0.0002	0.00
Total Ex-Vessel Released	0.0000	0.0000	0.00
Released to Environment	0.0000	0.0000	0.00

1. Absolute difference in fraction of clad reacted.
2. Avg. for CsI, SrO distribution are normalized to initial masses.

TABLE 4.1.2
MAAP 3.0B Rev. 18 Verification: Small LOCA (S2HF)

EVENT TIMING	NEAD	FAI	% Difference (NEAD-FAI/FAI)
Core Uncovery (sec.)	41709.33	41422.09	0.693
Vessel Failure (sec.)	56678.48	61287.77	-7.52
Containment Failure (sec.)	0.00	0.00	0.00
CONSTITUENT MASSES AND CLAD REACTED			
Clad Reacted (FRAC)	0.3909	0.4252	0.0343(1)
Concrete Aerosol (KG)	16.74	53.40	-68.65
UO_2 Mass Distribution (KG)			
UO2 Mass In Cavity	99142.29	90841.17	9.138
UO2 Mass In 'B' Compt.	2.50	3.22	-22.360
CsI Mass Distribution (2)			
Initial Mass	1.0000	1.0000	0.00
In Core	0.0000	0.0000(3)	0.00
In Corium	0.0000	0.0000	0.00
In Primary System	0.7529	0.6029	24.888
In Containment	0.2471	0.3954	-37.491
In Steam Generator	0.0000	0.0000	0.00
Total In-Vessel Released	1.0000	0.9983	0.1703
Total Ex-Vessel Released	0.0000	0.0000	0.00
Released to Environment	0.0000	0.0000	0.00
SrO Mass Distribution (2)			
Initial Mass	1.0000	1.0000	0.00
In Core	0.0000	0.1304	-
In Corium	0.9982	0.9320	7.1030
In Primary System	0.0003	0.0003	0.00
In Steam Generator	0.0000	0.0000	0.00
In Containment	0.0014	0.0025	-44.00
Total In-Vessel Released	0.0004	0.0005	-20.00
Total Ex-Vessel Released	0.0014	0.0023	-39.13
Released to Environment	0.0000	0.0000	0.00

1. Absolute difference in fraction of clad reacted.
2. Avg. for CsI, SrO distribution are normalized to initial masses.
3. FAI results =0.00 for all but one case.

TABLE 4.1.3

MAAP 3.0B Rev. 18 Verification: Large LOCA (AHF)

EVENT TIMING	NEAD	FAI	% Difference (NEAD-FAI/FAI)
Core Uncovery (sec.)	5090.64	5087.43	0.0631
Vessel Failure (sec.)	9921.57	9910.56	0.1111
Containment Failure (sec.)	71822.12	71807.20	0.0208
CONSTITUENT MASSES AND CLAD REACTED			
Clad Reacted (FRAC)	0.2962	0.2981	0.0019 (1)
Concrete Aerosol (KG)	46.12	48.90	-5.69
UO_2 Mass Distribution (KG)			
UO2 Mass In Cavity	99142.06	99141.97	0.00
UO2 Mass In 'B' Compt.	2.59	2.64	-1.894
CsI Mass Distribution (2)			
Initial Mass	1.0000	1.0000	0.00
In Core	0.0000	0.0000	0.00
In Corium	0.0000	0.0000 (3)	0.00
In Primary System	0.4797	0.4863	-1.357
In Steam Generator	0.0000	0.0000	0.00
In Containment	0.3981	0.3914	1.712
Total In-Vessel Released	1.0000	0.9995	0.050
Total Ex-Vessel Released	0.0000	0.0000	0.00
Released to Environment	0.1222	0.1219	0.246
SrO Mass Distribution (2)			
Initial Mass	1.0000	1.0000	0.00
In Core	0.0000	0.0000 (3)	0.00
In Corium	0.9973	0.9972	0.010
In Primary System	0.0003	0.0003	0.00
In Steam Generator	0.0000	0.0000	0.00
In Containment	0.0023	0.0025	-8.00
Total In-Vessel Released	0.0004	0.0005	-20.00
Total Ex-Vessel Released	0.0022	0.0023	-4.348
Released to Environment	0.0000	0.0000	0.00

1. Absolute difference in fraction of clad reacted.
2. Avg. for CsI, SrO distribution are normalized to initial masses.
3. FAI results ≈0.0 for all but one case.

4.2. Parameter File Development

This section documents changes made to the base ANO-1 MAAP 3.0B Rev. 16 parameter file [1] (A2_R17Q.PAR) to create the parameter file used in the ANO-1 analyses (A1SAM02). The base model is revised to:

- Reflect new, deleted, and redefined parameters for the Revision 18 code.
- Reflect the requirements of ANO as defined in the Project Task Plan [8].
- Incorporate the latest recommendations from EPRI/FAI, and Gabor, Kenton, & Associates (GKA).
- Incorporate SAIC's comments and recommendations from the ANO benchmark project [10].

Table 4.2.1 is a listing of the parameters that were evaluated. Consistent with previous MAAP documentation (e.g., [1]), the parameter numbers in the table conform to the convention "xx-yy," where xx is the MAAP input parameter group number and yy is the number of the parameter within that group. The "Original Value" in the table is the value of the parameter in

the base parameter file [1]. The "Revised Value" is the value used in this analysis. Calculation numbers for each parameter are referenced in the last column. The calculations are provided in Appendix 1. Note that the value of the accumulator pipe length (XLACUM) used in the parameter file and shown in Table 4.2.1 differs from the value calculated in Appendix 1 (see C-6.1). Note also from Table 4.2.1 that values of some parameters evaluated remained unchanged. These are parameters that were revisited during the development of the A1SAM02 file but determined to require no revision. A copy of the A1SAM02 parameter file is included on microfiche in Section 6.

TABLE 4.2.1 (1 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
1-16	MFCN(12)	0.0	DELETED	Not a user input for Rev. 18.	ZION_R18.PAR [2].	1.1
2-21	GRXVO	0.0	DELETED	Not a user input for Rev. 18.	ZION_R18.PAR [2].	2.1
2-51	PDCRO	44.66 psid	1000 psid	Revised definition for Rev. 18 T/H modifications.	Users Guide [3], Rev. 8/92	2.2
2-65	MCLTOT	106482.7 lb	160643.9 lb	Revised definition for Rev. 18.	Users Guide [3], Rev. 3/92.	2.3
2-78	HALFLP	N/A	0	Added to Rev. 17 for half-loop operations.	Users Guide [3], Rev. 4/91.	2.4
2-79	WRHRHI	N/A	0.0 lb/hr	Added to Rev. 17 for half-loop operations.	Users Guide [3], Rev. 4/91 & 8/92.	2.5
2-80	WRHRHO	N/A	0.0 lb/hr	See 2-79.	See 2-79.	2.5
2-81	TIHALF	N/A	24 hr	See 2-79.	See 2-79.	2.5
2-82 - 2-143		N/A	0.0 (#82-#143)	#82 - #143 added to Rev. 17 for half-loop operations.	See 2-79.	2.5
2-144	ZINOZ	N/A	3.5 ft	Added to Rev. 18 as T/H modificaitons.	Users Guide [3], Rev. 8/92.	2.6
2-145	ZOFFCL	N/A	3.5 ft	See 2-144.	See 2-144.	2.7
3-28	ZPZCT	N/A	N/U	Added to Rev. 18. Used only with Generalized ESF model.	ZION_R18.PAR [2].	3.1
3-29	ZWPZCL	N/A	N/U	See 3-28.	See 3-28.	3.1
3-30	ZWPZCH	N/A	N/U	See 3-28.	See 3-28.	3.1
5-01	ATNBP	5.68 ft2	5.68 ft2	Re-evaluated - no change.	SAIC CP 2220921 [10].	5.1
6-10	XLACUM	106.6 ft	558.4 ft	Recalculated per definition clarification.	Users Guide [3], Rev. 6/91.	6.1
6-17	NACUM	2	1	Credit 1 of 2 Core Flood Tanks (CFTs).	Project Task Plan [8].	6.2

TABLE 4.2.1 (2 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
6-18	NHPI	2	1	Credit one HPI train.	Project Task Plan [8].	6.3
6-19	NLPI	2	1	Credit one LPI train.	Project Task Plan [8].	6.4
6-13	NFN	2	1	Credit on train of RB Fan Coolers.	Project Task Plan [8].	6.5
6-57	NSPPT	5	2	Revised for new spray pump head-flow curve.	Project Task Plan [8].	6.6
6-58 6-59 6-60 6-61 6-62 6-63 6-64 6-65 6-66 6-67	ZHDSP(1) ZHDSP(2) ZHDSP(3) ZHDSP(4) ZHDSP(5) WVSP(1) WVSP(2) WVSP(3) WVSP(4) WVSP(5)	553.0 ft 533.0 ft 500.0 ft 457.0 ft 357.0 ft 0.0 gpm 500.0 gpm 1000.0 gpm 1500.0 gpm 2000.0 gpm	553.0 ft 552.9 ft N/U N/U N/U 0.0 GPM 1200.0 GPM N/U N/U N/U	Revised spray pump head-flow curve to deliver constant 1200 gpm.	Project Task Plan [8].	6.6
6-83 6-84 6-85 6-86 6-87	ZHDRSP(1) ZHDRSP(2) ZHDRSP(3) ZHDRSP(4) ZHDRSP(5)	9.3 ft 10.0 ft 11.4 ft 12.9 ft 14.3 ft	9.3 ft 12.0 ft N/U N/U N/U	Revised spray pump NPSH curve for consistency with revised head-flow curve.	Project Task Plan [8].	6.6
6-88	NSPA	2	1	Credit one train of Reactor Building spray.	Project Task Plan [8].	6.7
6-107	XDFNFC	0.143 ft	0.0448 ft	Recalculated per definition clarification in Users Guide.	Users Guide [3], Rev. 8/92.	6.8
6-134	XTCRH	0.01563 ft	0.0781 ft	Recalculated per revised description in default parameter file.	ZION_R18.PAR [2].	6.9
6-159 6-160 6-161 6-162 6-163	WVAFW(1) WVAFW(2) WVAFW(3) WVAFW(4) WVAFW(5)	0.0 gpm 300.0 gpm 400.0 gpm 600.0 gpm 1050.0 gpm	0.0 gpm 150.0 gpm 200.0 gpm 300.0 gpm 525.0 gpm	Credut one train (Train B) of EFW. (Train A turned off.)	Project Task Plan [8].	6.10
6-172 6-173 6-174 6-175	TDLP2 TDSPC WSPCX WLP2X	N/A N/A N/A N/A	1.E3 hr 1.E3 hr 1.E10 lb/hr 1.E10 lb/hr	Recalculated per revised description Added for Rev. 18. Used only with Generalized ESF model.	ZION_R18.PAR [2].	6.11

TABLE 4.2.1 (3 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
6-176	BYPASS	N/A	0	Added for Rev. 18.	ZION_R18.PAR [2].	6.12
7-08	XLOWA	0.0 ft	2.133E-3 ft	Added 1/4" steel liner with no liner/containment wall gap.	SAIC CP 2220921 [10].	7.1
7-09	RGOWA	0.0	0.0	See 7-08 (no wall gap).	See 7-08.	7.2
7-34	FSPA	0.16	0.25	Direct 1/4 of spray flow to cavity.	Project Task Plan [8].	7.3
7-35	FWRPB	1.0	0.0	See 7-34.	See 7-34.	7.3
7-36	PCF	0.0	154.3 psia	Use simple containment failure model with 154.3 psia failure pressure.	Project Task Plan [8].	7.4
7-37	FCFA	1.0	0.0	Failure location is in annular compt.	Project Task Plan [8].	7.5
7-53	ZSPA2	N/A	0.0	Added for Rev. 17.	Users Guide 4/91 [3].	7.6
8-08	XTGAP	0.0 ft	0.0 ft	See 7-08 (no wall gap).	See 7-08.	7.2
9-06	XLOWD	0.0 ft	2.133E-2 ft	See 7-08.	See 7-08.	9.1
9-07	RGOWD	0.0	0.0	See 7-09.	See 7-09.	9.2
9-19	ADGRAT	1797.65 ft2	1797.65 ft2	AGRATE renamed to ADGRAT for Rev. 17. Definition unchanged.	ZION_R18.PAR [2].	9.3
10-17	TSGOHL	N/A	71.3 F	Added to Rev. 17 for half-loop operation	ZION_R18.PAR [2].	10.1
10-18	MWSGHL	N/A	0.0	See 10-17.	See 10-17.	10.2
10-19	PSGOHL	N/A	14.5 psia	See 10-17.	See 10-17.	10.3
10-20	ZWPSHL	N/A	4.92 ft	See 10-17.	See 10-17.	10.4
10-21	MWPSHL	N/A	0.0	See 10-17	See 10-17.	10.5

TABLE 4.2.1 (4 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
11-03	IRUNG	N/A	1	Added for Rev. 18.	Users Guide 8/92 [3], ZION_R18.PAR [2].	11.1
11-07	IPLMAP	1	DELETED	Deleted as of Rev. 17.	ZION_R18.PAR [2].	11.2
11-10	IPLT1	1	1	Redefined for Rev. 17 (value not changed).	ZION_R18.PAR [2].	11.3
11-15	IRECIR	1	2	Reevaluated.	MAAP Users Manual [11]	11.4
11-31	IBALAN	N/A	0	Added for Rev. 18.	Users Guide 8/92 [3], ZION_R18.PAR [2].	11.5
11-32	IRSBAD	N/A	0	Added for Rev. 18.	Users Guide 8/92 [3], ZION_R18.PAR [2].	11.6
12-05	MFCHMX	0.05	0.025	Revised to FAI recommended value per default parameter file.	ZION_R18.PAR [2].	12.1
12-08	MFCHFP	0.1	0.025	Revised to FAI recommended value per default parameter file.	ZION_R18.PAR [2].	12.2
12-18	FPPSHL	N/A	0.01	Added to Rev. 18 for half-loop ops.	ZION_R18.PAR [2].	12.3
13-01	VSG	9765 ft3	4882.5 ft3	Recalculated - value for one OTSG.	SAIC CP Z220921 [10].	13.1
13-12	PSGRV	1.0E+10 psia	2.5E+3 psia	"Large" value exceeds steam table limits. Revised to avoid diagnostics.	SAIC CP Z220921 [10].	13.2
13-37	MSHEL	5.396E+5 lb	501,089 lb	Recalculated per expanded definition.	Users Guide 3/92 [3], ZION_R18.PAR [2].	13.3
13-45	NZPTS	N/A	7	Added OTSG secondary volume vs. height table per Rev. 18.	ZION_R18.PAR [2].	13.4
13-46	VOFZSG(1)	N/A	0.00 ft3	New volume vs. height table for Rev. 18.	ZION_R18.PAR [2].	13.4
13-47	VOFZSG(2)	N/A	11.90 ft3			
13-48	VOFZSG(3)	N/A	83.10 ft3			
13-49	VOFZSG(4)	N/A	201.85 ft3			
13-50	VOFZSG(5)	N/A	550.98 ft3			
13-51	VOFZSG(6)	N/A	757.60 ft3			
13-52	VOFZSG(7)	N/A	778.98 ft3			
13-53	N/U	N/A	N/U			
13-54	N/U	N/A	N/U			
13-55	N/U	N/A	N/U			

TABLE 4.2.1 (5 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
13-56	ZOFSG(1)	N/A	0.0 ft	New volume vs. height table for Rev. 18.	ZION_R18.PAR [2].	13.4
13-57	ZOFSG(2)	N/A	0.5 ft			
13-58	ZOFSG(3)	N/A	3.5 ft			
13-59	ZOFSG(4)	N/A	8.5 ft			
13-60	ZOFSG(5)	N/A	23.2 ft			
13-61	ZOFSG(6)	N/A	31.9 ft			
13-62	ZOFSG(7)	N/A	32.8 ft			
13-63	N/U	N/A	N/U			
13-64	N/U	N/A	N/U			
13-65	N/U	N/A	N/U			
14-65	MFFESS	N/A	0.78	Added for Rev. 18.	ZION_R18.PAR [2], Users Guide 8/91 [3].	14.1
14-66	MFCRSS	N/A	0.16	See 14-66.	See 14-66.	14.2
14-67	MFNISS	N/A	0.06	See 14-66.	See 14-66.	14.3
15-06	NQT	N/A	0.0	Added for Rev. 18.	Users Guide 8/91 [3].	15.1
17-31	FQP(1)	N/A	0.03	New FQP array added for Rev. 18.	Users Guide 8/92 [3], MAAP FLAASH #12 [13].	17.1
17-32	FQP(2)	N/A	0.17			
17-33	FQP(3)	N/A	0.02			
17-34	FQP(4)	N/A	0.04			
17-35	FQP(5)	N/A	0.02			
17-36	FQP(6)	N/A	0.01			
17-37	FQP(7)	N/A	0.02			
17-38	FQP(8)	N/A	0.27			
17-39	FQP(9)	N/A	0.03			
17-40	FQP(10)	N/A	0.006			
17-41	FQP(11)	N/A	0.02			
17-42	FQP(12)	N/A	0.16			
18-02	ACFSTR	0.0215 ft2	0.0 ft2	Recalculated per revised Users Guide definition.	Users Guide 6/92 [3], Project Task Plan [8].	18.1
18-04	ACFPR	7.1 ft2	0.0538 ft2	Recalculated to implement simple containment failure model.	GKA Sensitivity [14], Project Task Plan [8].	18.2
18-06	TDSTX	N/U	2.778E-5 hr	Added for Rev. 17.	Users Guide 4/91 [3].	18.3

TABLE 4.2.1 (6 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
18-10	FAOUT	0.2	0.3	Revised per FAI recommendation.	Users Guide 4/91 [3].	18.4
18-13	FCMDA	0.0	0.0	Re-evaluated per GKA, FAI data. Value not changed.	Users Guide 6/92 [3], GKA Sensitivity [14].	18.5
18-14	FCMDCH	0.0	0.03	Revised per GKA, SAIC recommendations.	GKA Sensitiviy [14], SAIC CP Z220921 [10].	18.6
18-15	FSSCL	N/A	0.0	Added for Rev. 18 SS clad mods.	ZION_R18.PAR [2].	18.7
18-16	TSSMP	N/A	2780.3 F	See 18-15.	See 18-15.	18.8
18-17	FFEOX	N/A	1.15	See 18-15.	See 18-15.	18.9
18-18	FGCSSR	N/A	0.6667	See 18-15.	See 18-15.	18.10
18-23	FVOL	1.0	2.0	Revised per FAI recommendations.	ZION_R18.PAR [2].	18.11
18-25 18-26 18-27 18-28 18-29	EW EWL EEQ ECM EG	0.95 0.85 0.85 0.85 0.6	0.90 0.85 0.85 0.85 0.6	Emissivities re-evaluated. Changed to recommended default values.	ZION_R18.PAR [2], Users Guide 4/91 [3], GKA Sensitivity [14].	18.12
18-31	FENTR	100.0	1.0	Revised per GKA recommendations.	GKA Sensitivity [14].	18.13
18-33	FCHF	0.14	0.02	Revised per GKA, SAIC recommendations.	GKA Sensitivity [14], SAIC CP Z220921 [10].	18.14
18-35	FCDBRK	1.0	0.75	Revised per FAI recommendations.	ZION_R18.PAR [2].	18.15
18-40	FAERDC	3.0	8.0	Revised per GKA, SAIC recommendations.	GKA Sensitivity [14], SAIC CP Z220921 [10].	18.16
18-46	TCLMAX	3320.0 F	1700.3 F	Revised per GKA, FAI recommendations.	GKA Sensitivity [14], ZION_R18.PAR [2].	18.17
18-45	FCDDC	0.0	0.75	Revised per GKA recommendations for B&W.	GKA Sensitivity [14].	18.18

TABLE 4.2.1 (7 of 7)

Parameter Number	Parameter Name	Original Value	Revised Value	Reason	Reference	Calc. No.
18-53	FFRICR	0.039	0.1	Revised per GKA, FAI, SAIC rec.	GKA [14], SAIC [10], Users Guide 4/91 [3].	18.19
18-54	FNCBP	0.0	1.0	Revised per SAIC recommendations.	SAIC CP Z220921 [10].	18.20
18-55	TCPFAL	N/A	N/U	Added for Rev. 18. Not Used in this model.	ZION_R18.PAR [2].	18.21
18-57	FFRICX	-0.25	+0.25	Revised for Rev. 18 per GKA recommendations.	GKA Sensitivity [14].	18.22
18-59	VFSEP	0.6	0.6	Re-evaluated per GKA recommendation. Not changed in base model.	GKA Sensitivity [14].	18.23
18-65	FCRDR	0.1	0.5	Revised per SAIC recommendations.	SAIC CP Z220921 [10].	18.24
18-67	FCRBLK	1.0	0.0	Revised for Rev. 17 per FAI recommendations.	ZION_R18.PAR [2].	18.25
18-76	FHTPRI	N/A	1.0	Added to Rev. 17 for half-loop ops.	Users Guide 4/91 [3].	18.26
18-77	FTENUR	N/A	0.9	Added for Rev. 17. Not used in this model. UG value specified.	Users Guide 4/91 [3].	18.27

4.3. Sensitivity Studies

Sensitivity studies were performed to evaluate the impact of containment modeling approaches and selected input parameters on code response and to provide a basis for selection of values of certain parameters used in the ANO-1 analyses.

4.3.1. Time Step

The time step sensitivity was motivated by results from the Revision 18 code verification procedure in which the maximum time step size was found to significantly influence results of the SBLOCA sample problem (S2HF) (recall Section 4.1.4). The parameters of interest are the maximum time step size, TDMAX (parameter 12-03), and the minimum time step size, TDMIN (parameter 12-04).

Sensitivity cases were run for representative small and large break LOCA sequences (SX and AX). The results, summarized in Table 4.3.1, show that the maximum time step (TDMAX) has a negligible influence on timing of key events. The results also show an

insensitivity to reductions in the minimum time step (TDMIN) in the SX sequences (compare SX22 and SX213, SX211 and SX213). Note that no TDMIN sensitivity studies were performed for the large break LOCA sequence (AX). This sequence would not execute with a minimum time step greater than 0.00005 sec. and sensitivities to even smaller time steps were not investigated.

In conclusion, the small and large LOCA time step sensitivity calculations show that code results are relatively insensitive to time step size. All sequences (excluding the LBLOCAs, AX and AU) use values of TDMAX=5.0 sec. and TDMIN=0.005 sec. The smaller value of TDMAX was selected (20 sec. is the default value) because it provides greater plot data and tabular output frequencies (i.e., more detail about the sequence) with minimal cost in code execution time. The LBLOCAs (AX, AU) use values of TDMAX=5.0 sec. and TDMIN = 0.00005 sec. 0.005 and 20.0 are the default values of TDMIN and TDMAX and are the values in the parameter file [1]. New TDMAX (and TDMIN for LBLOCA sequences) values are therefore input via local parameter change cards in the sequence input files.

TABLE 4.3.1

ANO-1 MAAP Analyses - Time Step Sensitivities

Case	TDMAX	TDMIN	Timing of Key Events (sec) Core Uncovery	Vessel Failure	Contmt Failure	Core Unc. %DIFF
AX211*	5.0	0.00005	6492.9	12,802.6	96,943.7	-
AX212	10.0	0.00005	6488.56	12,657.8	96,848.0	-0.07
AX213	20.0	0.00005	6421.15	12,620.8	96,773.1	-1.11
SX22*	5.0	0.005	17,709.95	25,509.4	102,470.5	-
SX211	10.0	0.005	17,698.2	25,622.5	102,806.9	-0.07
SX212	20.0	0.005	17,844.57	25,560.2	101,936.2	0.76
SX213	5.0	0.00005	17,672.5	25,585.4	102,732.7	-0.21
SX214	10.0	0.00005	17,916.39	25,841.3	102,368.6	1.17

* Base Case

%DIFF = (TCU - TCUB)/TCUB,

where TCU = Time to Core Uncovery
TCUB = Time to Core Uncovery - Base Case

4.3.2. Break Elevation

Two break elevation sensitivity cases were evaluated with the small break LOCA sequences with ECCS recirculation failure (SX).

In the first case (SX1), break elevation (ZBB, parameter 2-15) is equal to 2" above the bottom of the horizontal cold leg, which places the bottom of this 4" diameter break at the lower elevation of the cold leg. The elevation is given by:

ZBB = ZNOZ + 2"/12 = 23.418 + 2/12,

<u>ZBB = 23.5847 ft.</u>

where ZNOZ = 23.418 ft is from C-2.47 of Ref. 1, (see also Fig. 2-6, pg. 2-54, Ref.1).

The second case (SX2) uses a break elevation corresponding to the centerline of the cold leg. In this case,

<u>ZBB = 24.5845 ft</u>,

(Ref. C-2.15, Reference 1).

Results from the two cases are shown in Table 4.3.2 and Figures 4.3.1 - 4.3.3. The lower break elevation

case (SX1) results in a larger liquid flow rate (WWBB, Figure 4.3.3) and lower vapor flow rate (WGBB, Figure 4.3.2) during RCS blowdown. This result is consistent with expectations and results in the faster RCS depressurization shown in Figure 4.3.1 (PPS). The effect on sequence progression is earlier uncovery of the core and earlier vessel failure. The lower elevation case (SX1) predicts a core uncovery time 17.8% earlier than the centerline elevation case (SX2) and a vessel failure time 14.4% earlier. Containment failure times are not affected.

The above results suggest using a break elevation near the bottom of the cold leg as this returns earlier core uncovery and vessel failure times, which for most sequences is conservative. However, FAI recently identified an error in the Revision 18 MAAP code which will result in incorrect break flow calculations if the break entrainment area (equal to twice the break radius) is below the bottom of the pipe [16]. This is the case for the break elevation specified in the SX1 sequence. Therefore, to avoid this code limitation, the centerline break elevation (24.5845 ft) was selected for use in all ANO-1 LOCA calculations (small

and large breaks). This elevation is input using local parameter change cards in the LOCA sequence input files.

TABLE 4.3.2

ANO-1 MAAP Analyses - Break Elevation Sensitivities

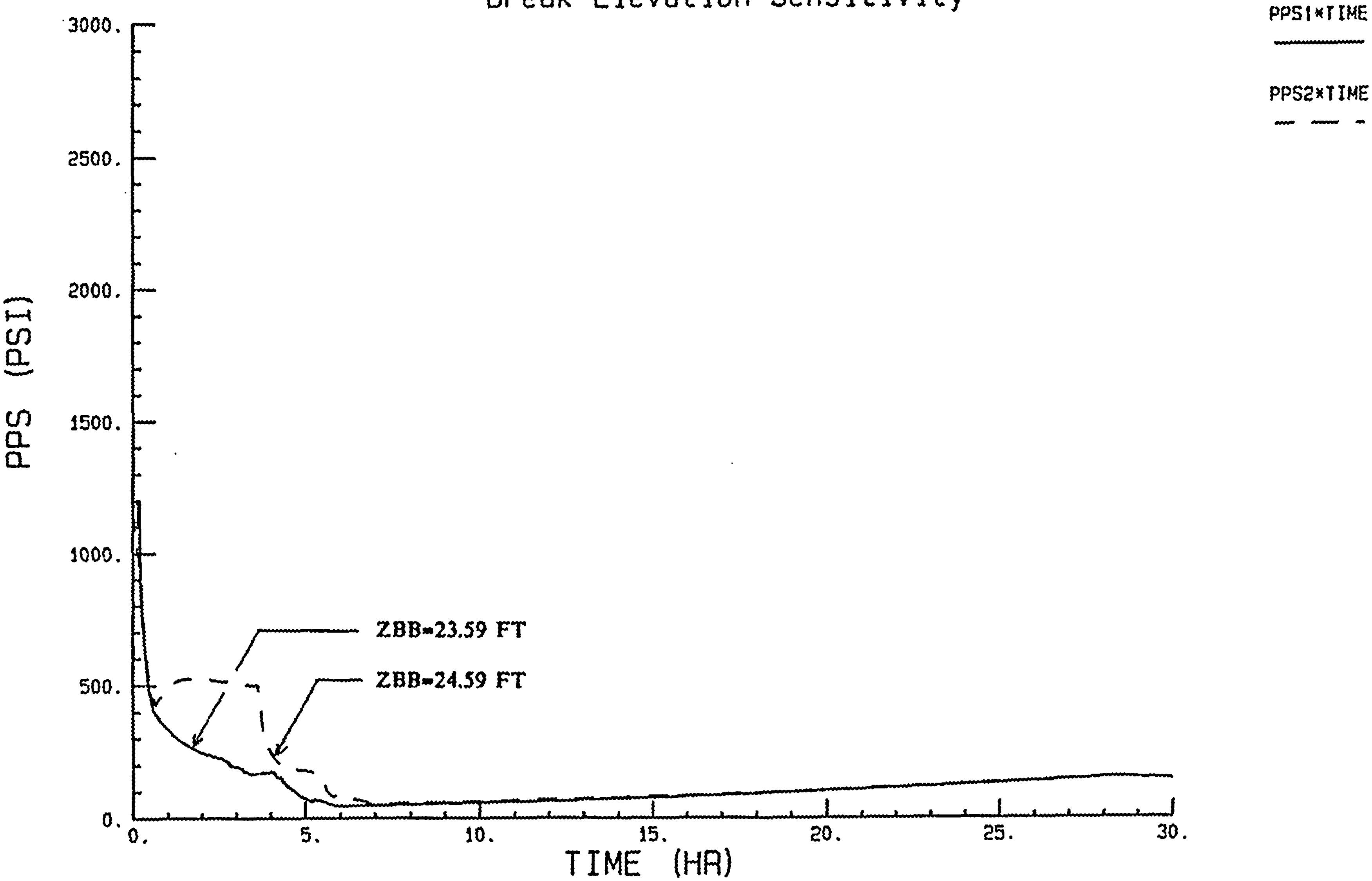
Case	ELEV. (FT) (ZBB)	Timing of Key Events (sec) Core Uncovery	Vessel Failure	Contmt Failure
SX1	23.5847	14,553.5	21,838.3	102,586.3
SX2	24.5845	17,709.95	25,509.4	102,470.5
%DIFF	-	17.8	14.4	0.1

%DIFF = (SX1 - SX2)/SX2,

where SX1 = Time from case SX1,
SX2 = Time from case SX2.

FIGURE 4.3.1

ANO-1 SBLOCA + RECIRC FAILURE
Break Elevation Sensitivity



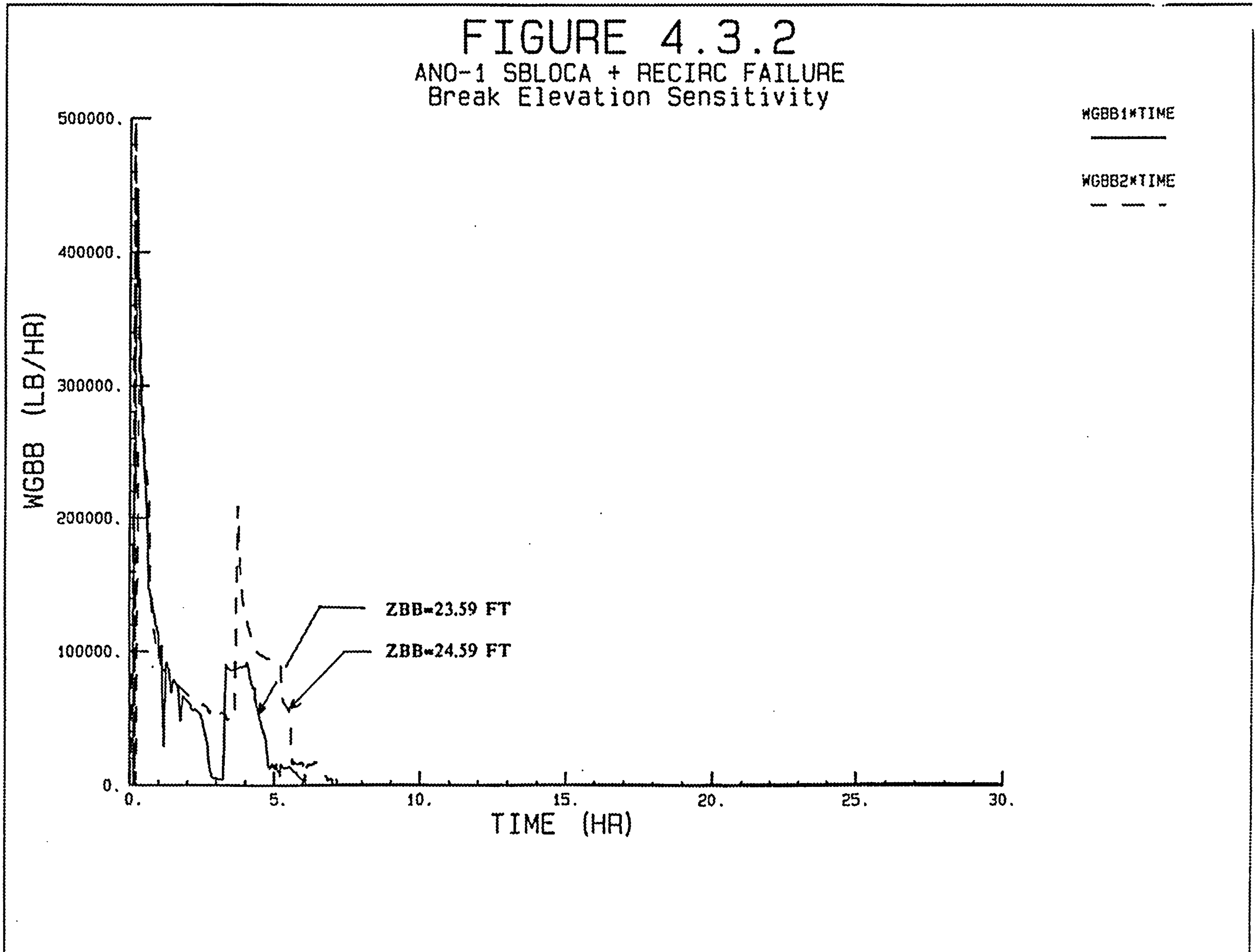
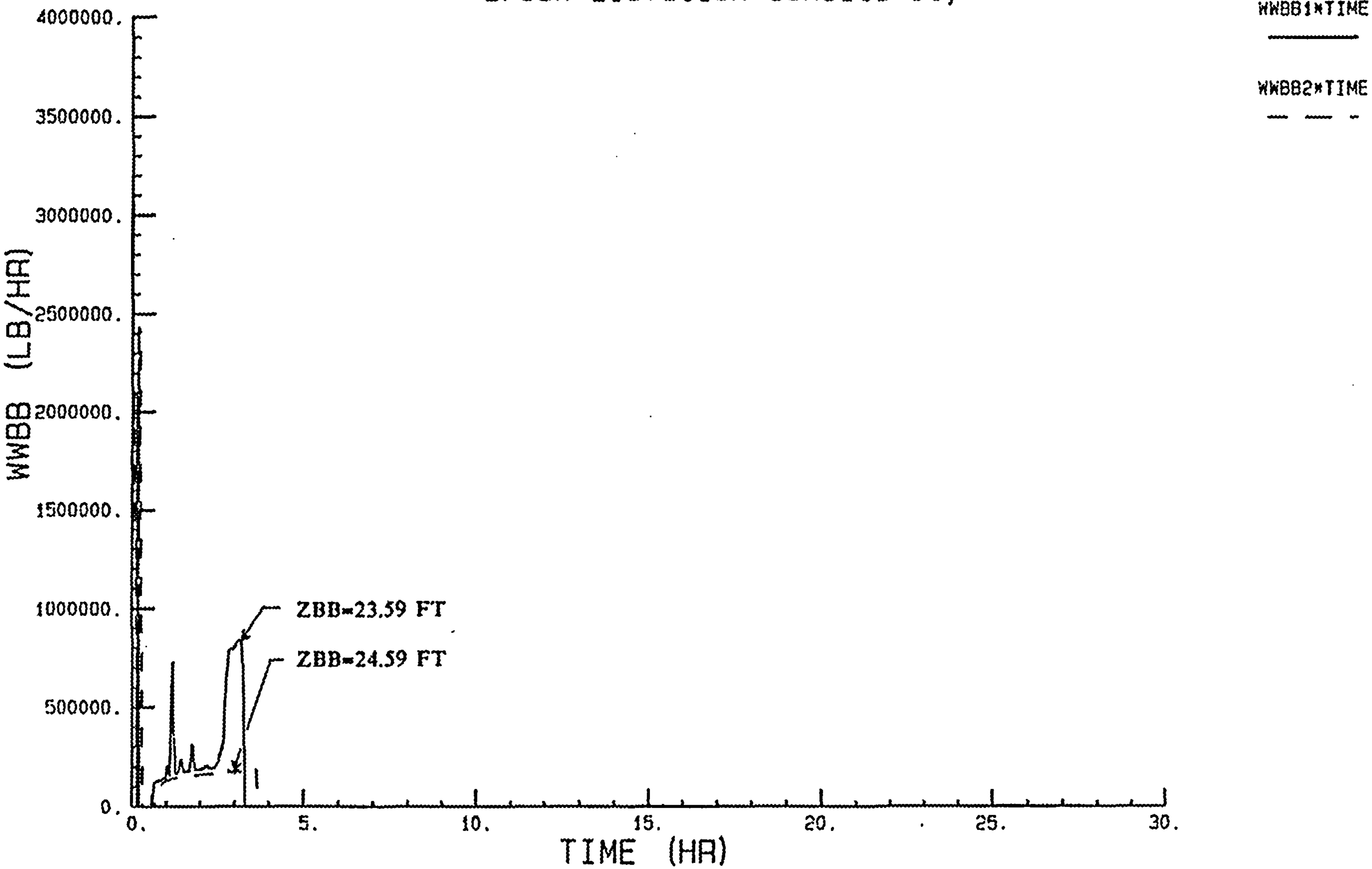


FIGURE 4.3.2
ANO-1 SBLOCA + RECIRC FAILURE
Break Elevation Sensitivity
WGBB1*TIME
WGBB2*TIME
500000.
400000.
300000.
200000.
100000.
0.
WGBB (LB/HR)
ZBB=23.59 FT
ZBB=24.59 FT
0.
5.
10.
15.
20.
25.
30.
TIME (HR)

FIGURE 4.3.3

ANO-1 SBLOCA + RECIRC FAILURE
Break Elevation Sensitivity



4.3.3. LOCA Model Parameters

Aside from break location, elevation, and area, large and small break LOCA sequence results can be affected by three model parameters [27]; the primary system void fraction at separation limit (VFSEP, Parameter 18-59), break discharge coefficient (FCDBRK, 18-35), and ECCS water maximum condensation efficiency (FCDDC, 18-45). Several sensitivity calculations were performed for ANO-1 large and small break LOCA sequences AX and SX to evaluate the impact of these parameters and to determine suitable values to use in the ANO-1 analyses. Results are discussed below.

FCDBRK: FAI recommends using a value of FCDBRK of 0.75 [2]. However, the GKA/EPRI sensitivity analyses [14] recommends a value of 0.70. FAI has reported a significant impact on results from the small LOCA sample problem in changing FCDBRK from 0.75 to 0.70 [23]. Therefore, several SX sequences were run with values of FCDBRK between 0.60 and 1.00. The results, however, summarized in Table 4.3.3, show that the ANO-1 model has only a small sensitivity to FCDBRK values. The key figure of merit is time to core

uncovery. The table shows that core uncovery times are within about ± 4% of the base case for all values of FCDBRK evaluated. Smaller values of FCDBRK result in generally later core uncovery and vessel failure times. The reason for this is apparent from Figure 4.3.4, which shows primary system depressurization for the 0.6, 0.75 (base), and 1.00 cases. The depressurization rate decreases with smaller values of FCDBRK, indicating a slower sequence progression and thus later vessel failure and core uncovery times. Due to the relative insensitivity of results to the value of FCDBRK, the default value of 0.75 was selected for use in all ANO-1 analyses.

VFSEP: VFSEP sensitivity calculations were performed for both small (SX) and large (AX) LOCA sequences. Results are summarized in Table 4.3.4. FAI recommends a value of VFSEP equal to 0.60 for Westinghouse and CE plants [3]. However, for B&W plants, a value of 0.02 has been recommended [14]. The VFSEP sensitivity calculations were performed to evaluate the impact of the larger VFSEP value. Two values of FCDBRK were considered. As shown in Table 4.3.4, the 0.60 value results in earlier key event timings (core uncovery

and vessel failure) for both small and large LOCAs for both values of FCDBRK. The reason for this is apparent from Figure 4.3.5, which compares the initial RCS depressurization rate for the 0.75 FCDBRK small LOCA cases (typical of all cases). The larger value of VFSEP results in a slightly faster depressurization rate and this results in earlier core uncovery. These results indicate that VFSEP does affect the results of LOCA sequences. However, because 0.02 is the recommended value for B&W plants and the Revision 18 code runs smoothly for both large and small LOCAs with VFSEP=0.02, 0.02 is the value selected for use in the ANO-1 analyses.

FCDDC: FAI recommends a value of 1.0 for this parameter [2]. THe EPRI/GKA sensitivity analyses, however, recommends a value of 0.75 for most sequences [14]. The impact of FCDDC on ANO-1 small and large LOCAs is shown in Table 4.3.5. These results show that the code is relatively insensitive to changes in FCDDC for small LOCAs. Therefore, the GKA recommended value of 0.75 was selected for use in ANO-1 small LOCA analyses. For large LOCAs, FCDDC can impact the time to core uncovery by up to 10%. The 0.75 value was used

in all ANO-1 large and small LOCA analyses. However, it should be noted that large LOCA results are sensitive to this parameter.

TABLE 4.3.3

ANO-1 MAAP Analyses - FCDBRK Sensitivities

Case	FCDBRK	Timing of Key Events (sec) Core Uncovery	Vessel Failure	Contmt Failure	Core Unc. %DIFF
SX2	0.75	17,709.9	25,509.4	102,470.5	-
SX3	0.70	17,635.1	26,050.0	101,990.4	-0.42
SX31	0.65	17,831.8	26,693.6	102,112.9	1.25
SX32	0.60	18,383.4	27,565.8	102,630.3	3.80
SX33	0.80	17,705.9	25,095.3	102,070.2	-0.02
SX34	0.85	17,647.2	24,660.1	103,415.4	-0.35
SX35	0.90	17,405.6	24,797.3	102,232.7	-1.72
SX36	1.00	16,944.5	24,327.3	102,373.0	-4.32

VFSEP = 0.02 for all cases.

%DIFF = (TCU - TCUB)/TCUB,

where TCU = time to core uncovery,
TCUB = time to core uncovery - base case (SX2).

TABLE 4.3.4

ANO-1 MAAP Analyses - FCDBRK and VFSEP Sensitivities

Case	VFSEP	FCDBRK	Timing of Key Events (sec) Core Uncovery	Vessel Failure	Contmt Failure	Core Unc. %DIFF
Small Break LOCAs						
SX2*	0.02	0.75	17,709.9	25,509.4	102,470.5	-
SX4	0.60	0.75	16,210.9	24,213.9	102,412.9	-8.46
SX3*	0.02	0.70	17,635.1	26,050.0	101,990.4	-
SX5	0.60	0.70	16,163.4	24,575.4	102,481.8	-8.35
Large Break LOCAs						
AX2*	0.02	0.75	126.61	12,414.9	98,164.3	-
AX3	0.60	0.75	112.29	14,104.0	97,522.9	-11.3
AX4*	0.02	0.70	126.61	12,414.9	98,164.3	-
AX5	0.60	0.70	116.85	14,253.8	97,222.1	-7.7

* Base case.

%DIFF = (TCU - TCUB)/TCUB,

where TCU = time to core uncovery,
TCUB = time to core uncovery - base case.

TABLE 4.3.5

ANO-1 MAAP Analyses - FCDDC Sensitivities

Case	FCDDC	Timing Key Events (sec) Core Uncovery	Vessel Failure	Core Unc. %DIFF
Small Break LOCAs				
SX6*	0.75	17,673.0	25,392.0	-
SX61	0.60	17,557.5	25,466.5	-0.65
SX62	0.85	17,682.1	25,448.2	0.05
SX63	1.00	17,693.0	25,345.3	0.11
Large Break LOCAs				
AX80*	0.75	125.8	14,428.9	-
AX81	0.60	112.7	12,287.1	-10.4
AX82	0.85	124.9	14,405.2	-0.69
AX83	1.00	112.7	12,534.6	-10.4

* Base case

For all cases, VFSEP = 0.02, FCDBRK=0.75.

%DIFF = (TCU - TCUB)/TCUB,

where TCU = time to core uncovery,
TCUB = time to core uncovery - base case (SX2).

FIGURE 4.3.4

ANO-1 SBLOCA + RECIRC FAILURE
Break Discharge Coefficient Sensitivity With VFSEP=0.02

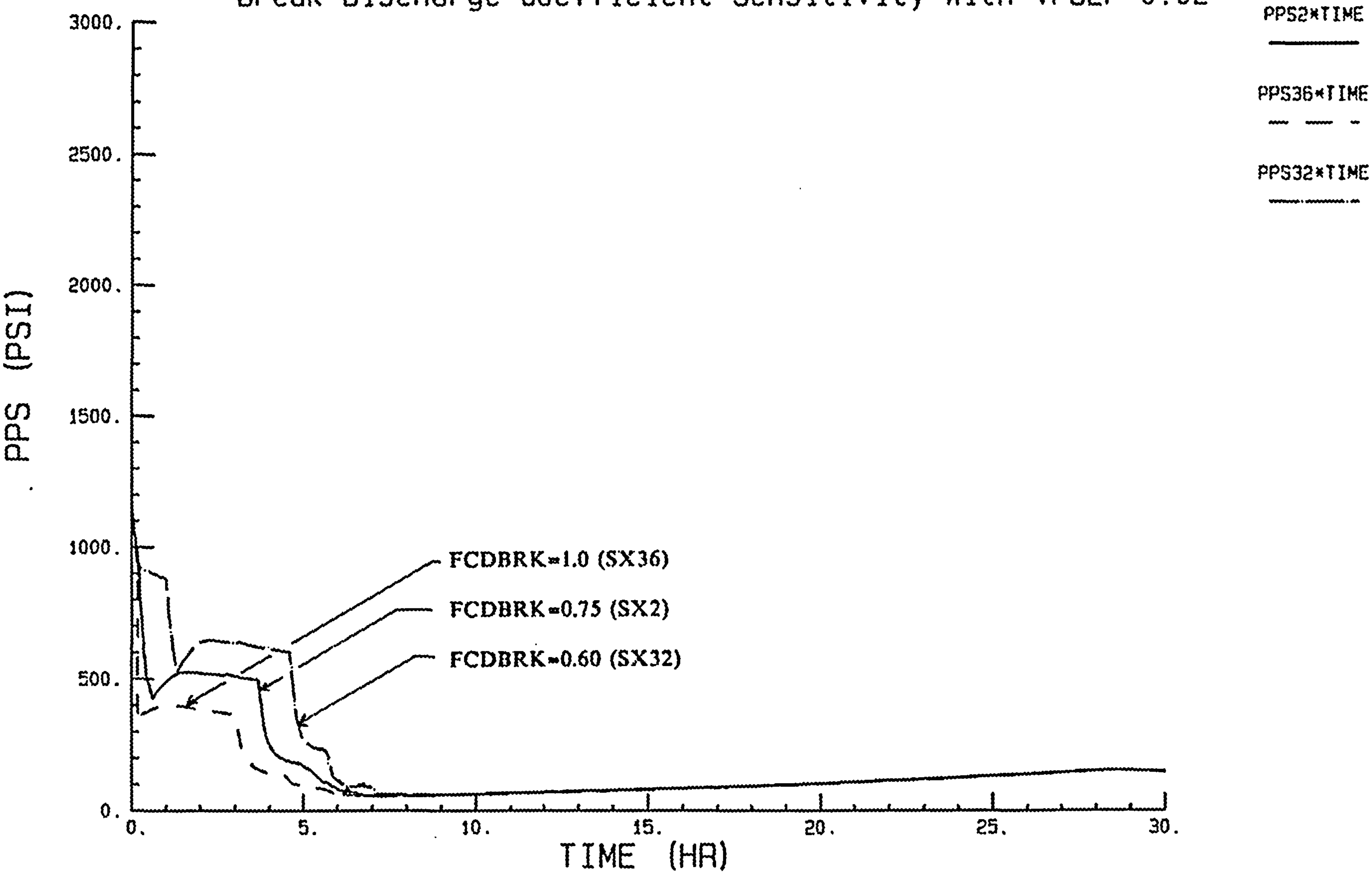
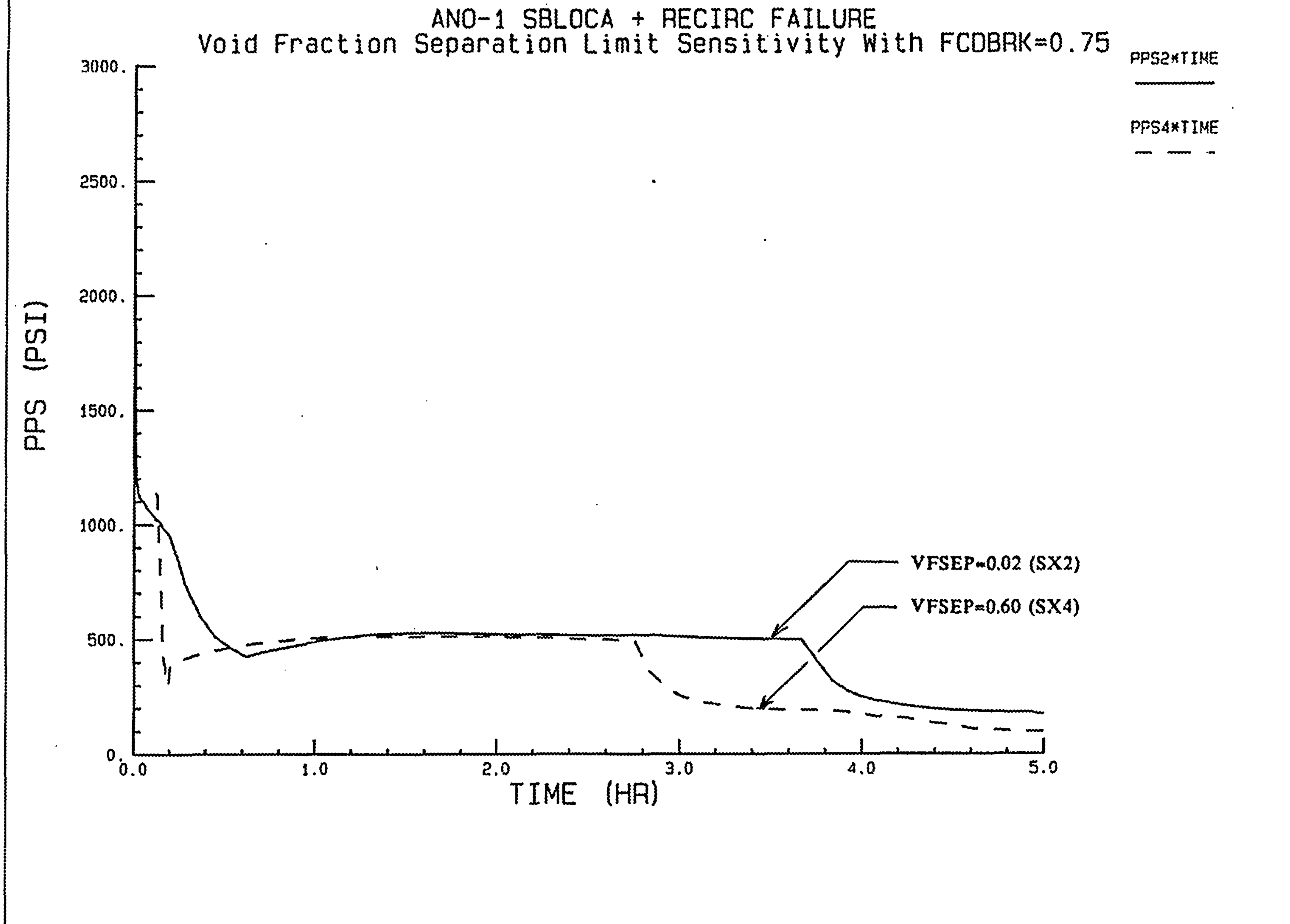


FIGURE 4.3.5


ANO-1 SBLOCA + RECIRC FAILURE
Void Fraction Separation Limit Sensitivity With FCDBRK=0.75
PPS2*TIME
PPS4*TIME
PPS (PSI)
3000.
2500.
2000.
1500.
1000.
500.
0.
0.0
1.0
2.0
3.0
4.0
5.0
TIME (HR)
VFSEP=0.02 (SX2)
VFSEP=0.60 (SX4)

4.3.4. Containment Modeling

The containment model developed for the ANO-1 Revision 16 parameter file [1] is based on the assumption that migration of molten corium from the cavity to the lower compartment after vessel failure is via the 30" diameter hatch located in the wall of the incore instrument (ICI) tunnel. No corium dispersal through the tunnel to the ICI room is accounted for (Figure A.2.1 in Appendix 2 shows the cavity/tunnel geometry). This model represents a compromise between ANO-1 containment geometry and the rigid compartmentalization requirements of the MAAP code. However, the model is expected to provide a reasonable approximation of post-vessel-failure containment behavior, especially during low pressure melt ejection (LPME) sequences.

To evaluate the impact on containment response of the containment model, an alternate containment model has been developed. This model accounts for corium dispersal from the cavity to the ICI room via the tunnel by including the entire ICI tunnel volume in the cavity compartment and the ICI room and ICI cavity volume

(which extends upward to the bottom of the upper compartment) in the lower compartment. (The tunnel volume downstream of the hatch and the ICI room and cavity are part of the annular compartment region of the base model). The alternate model is developed in detail in Appendix 2. Table A.2.1 in Appendix 2 summarizes the changes made to the base model to create the alternate model.

Sensitivity calculations were performed to evaluated the impact of this alternate containment model on containment response. The key figure of merit is containment failure time. Three sequences were considered: the small LOCA (SX) sequence (typical for LPME sequences), and the TBF (blackout) and TBX sequences (typical for high pressure melt ejection (HPME) sequences). The results are summarized in Table 4.3.6. The table shows that the effect of the alternate model is to decrease the time to containment failure. As expected, the greatest impact is seen in HPME sequences (i.e., TBF and TBX).

The earlier containment failure times for the alternate model cases are attributed to the less restric-

cavity-lower compartment corium migration path (which results in more corium migration to the lower compartment) and the large lower compartment corium pool area (ACMPLB) (results in less concrete ablation in the lower compartment).

Results from the small LOCA (SX) sequence are shown in Table 4.3.7 and Figures 4.3.6 - 4.3.20. The alternate model predicts 15,270 lb more UO_2 migration to the lower compartment and 53,500 lb more corium debris (MCMTB) in the lower compartment than does the base model (cf. Figure 4.3.7). (MCMTB includes UO_2 plus Zr, ZrO_2, and concrete, rebar, etc. due to ablation)

The results also show that:

- The water inventory in all compartments is nearly equal (cf. Figures 4.3.9 - 4.3.13).
- Both cases calculate some ablation in the cavity and lower compartments. However, ablation in the lower compartment stops in less than two hours in both models (cf. Figure 4.3.14, 4.3.16).

- The base model predicts more concrete ablation in the cavity and lower compartments (cf. Figures 4.3.14, 4.3.16). This is true despite the smaller corium mass in the base model lower compartment (MCMTB, Figure 4.3.7) and cavity (MCMTC, Figure 4.3.8). The greater ablation in the lower compartment is attributed to the smaller corium pool area (ACMPLB) in the base model (78.5 ft^2 versus 246 ft^2 per Table A.2.1). This smaller area results in greater corium depth which, together with the equal water levels between the two models, results in less cooling of the debris bed and thus more ablation in the base case.

- The rate of containment pressurization is faster in the alternate model case and results in the earlier containment failure time reported in Table 4.3.7 (cf. Figures 4.3.17 4.3.20). This is attributed to the greater total mass of corium deposited in the lower compartment of the alternate model (MCMTB) combined with the early discontinuation of concrete ablation (cf. Figure 4.3.16).

- No entrainment of corium from the cavity to the upper compartment is predicted in either case (cf. MCMTA, Figure 4.3.6).

Comparison of results from the TBF and TBX sequences are also provided in Table 4.3.6. Figures 4.3.21 - 4.3.36 compare results from the TBX sequences. As in the SX sequence, an earlier containment failure time is predicted in the alternate model case. This is attributed to more corium migration to the lower compartment of the alternate model together with less concrete ablation in the lower compartment. The greater corium migration is evident in the UO_2 mass distribution, as shown below:

	TBX1 (Base)	TBX1A (Alt.)
Lower Compt (lb)	71,938.9	82,669.6
Cavity Compt (lb)	21,947.5	11,215.7

Note from Figures 4.3.21 - 4.3.36 that:

- No ablation occurs in the cavity or upper compartments in either sequence (cf. Figure 4.3.29, 4.3.30).

- The total mass of debris in the cavity (MCMTC) is less in the alternate model case (cf. Figure 4.3.23).

- Both cases predict concrete ablation in the lower compartment (cf. Figures 4.3.22, 4.3.31). The base model, however, predicts much more ablation and so the total mass of debris (MCMTB) is much greater in the base case. This observation is in contrast to the SX sequence, in which a much larger mass of debris was calculated in the lower compartment of the alternate model and very little ablation occurred (recall Figure 4.3.7, 4.3.17).

- The rate of containment pressurization is much higher in the alternate model case (e.g., PD, Figure 4.3.32), resulting in the earlier containment failure time shown in Table 4.3.6. This despite the greater mass of debris generated in the lower compartment of the base model. The lower pressure increase in the base model is attributed to the ablation process, which tends to remove heat from the containment volume and, therefore, lower the temperature and pressure. This is evi-

dent in the temperature comparison shown in Figures 4.3.33 - 4.3.36. The base model compartment temperatures are less than in the alternate model.

Results similar to those discussed above for the TBX sequence are calculated in the TBF sequences. As in the TBX sequence, the alternate model predicts more corium migration to the lower compartment while the base model predicts more ablation and more total debris (MCMTB) in the lower compartment (cf. Figures 4.3.37 and 4.3.38). The result is a lower temperature and rate of pressurization in the base model (cf. Figures 4.3.39, 4.3.40) and, therefore, a later containment failure time.

The results from the containment model sensitivity calculations show that the containment modeling approach significantly impacts containment failure times, especially in high pressure sequences. The important phenomena are the mass of corium that migrates to the lower compartment and the coolability of the debris, which directly affects the amount of concrete ablation. The alternate containment model caused failure times 10-15% earlier in LPME sequences

and 30-40% earlier in HPME sequences. All ANO-1 analyses documented in this calculation use the base containment model. However, results from these calculations may be biased by the above percentages to estimate the impact of the alternate containment model.

TABLE 4.3.6

ANO-1 MAAP Analyses - Containment Model Sensitivities

Case	Contmt. Model	Contmt Failure Time (HR)	%DIFF	PS Pressure at Vessel Fail.
SX22	Base	28.5	-	58.3 psia
SX21	Alt.	24.7	-12.6	57.2 psia
TBX1	Base	56.0	-	2392.6 psia
TBX1A	Alt.	34.5	-38.4	
TBF2	Base	43.5	-	2452.8 psia
TBF1	Alt.	30.5	-29.9	2447.9 psia

* Base case.

%DIFF = (TCF - TCFB)/TCFB,

where TCF = time of containment failure,
TCFB = time of containment failure - base case.

TABLE 4.3.7

ANO-1 MAAP Analyses - Containment Model Sensitivities

Small LOCA (SX) Sequence

Parameter	Base Model (SX22)	Alt. Model (SX21)
Time of Contmt. Failure (HR)	28.5	24.9
Corium Dist. at CF (lb)		
Upper (A) Compt. (MCMTA)	0.0	0.0
Lower (B) Compt. (MCMTB)	41,000	94,500
Cavity (C) Compt. (MCMTC)	446,000	298,000
Final UO2 Mass Distr. (lb)		
Lower Compt.	11,296.5	27,017.4
Cavity Compt.	82,589.2	66,870.0
Ablation Depth (ft) at CF		
Upper (A) Compt. (XCNA1)	0.0	0.0
Lower (B) Compt. (XCNB1)	0.26	0.17
Cavity (C) Compt. (XCNC1)	2.2	1.2
Water Level (ft) at CF		
Upper (A) Compt. (ZWA)	0.024	0.026
Lower (B) Compt. (ZWB)	5.5	5.6
Cavity (C) Compt. (ZWC)	6.2	6.3
Annular (D) Compt. (ZWD)	5.5	5.6
Mass of Water (lb) in Cavity at CF (MWC1)	57,000	58,000

CF- Containment Failure.

FIGURE 4.3.6
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

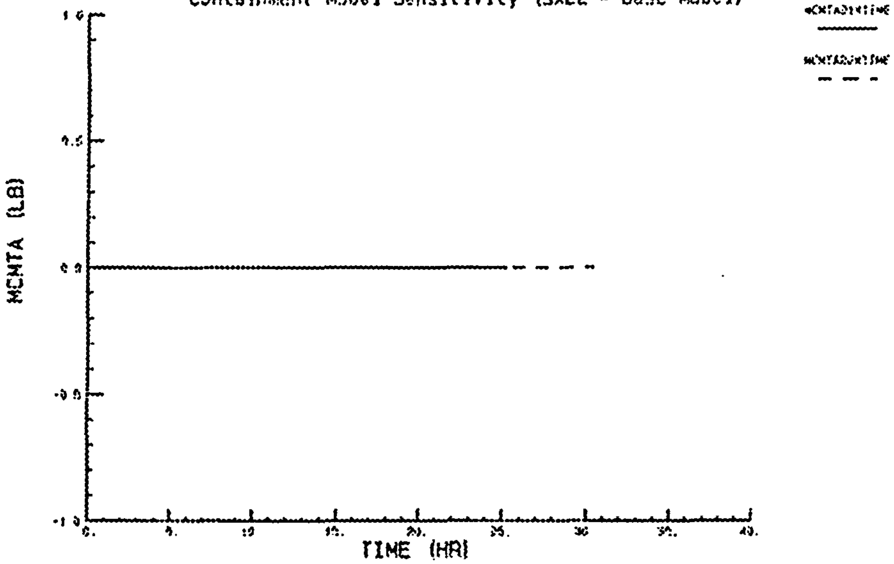


FIGURE 4.3.7
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

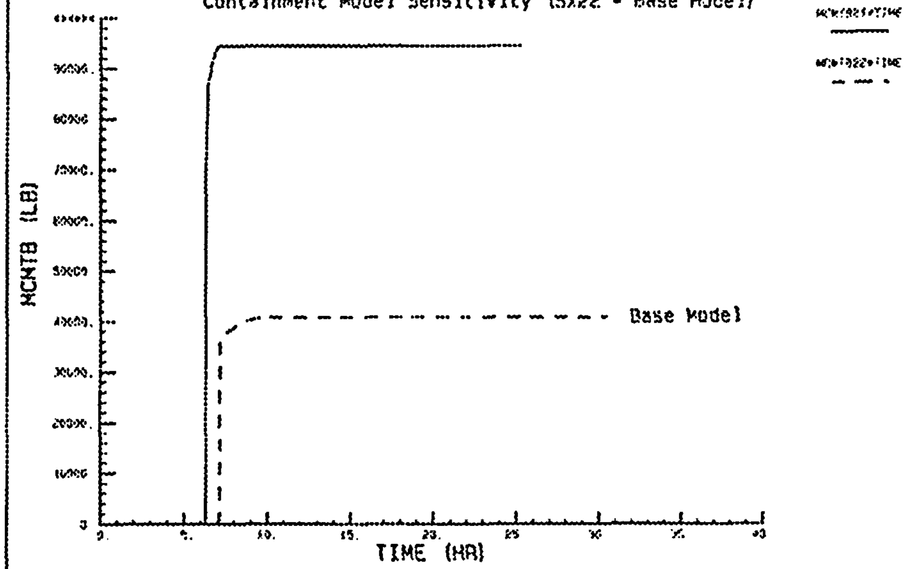


FIGURE 4.3.8
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

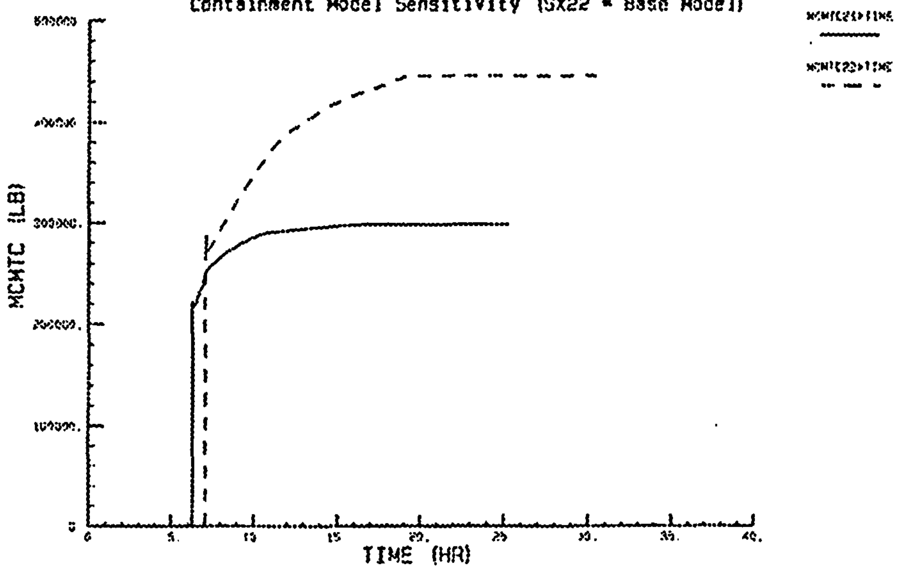


FIGURE 4.3.9
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

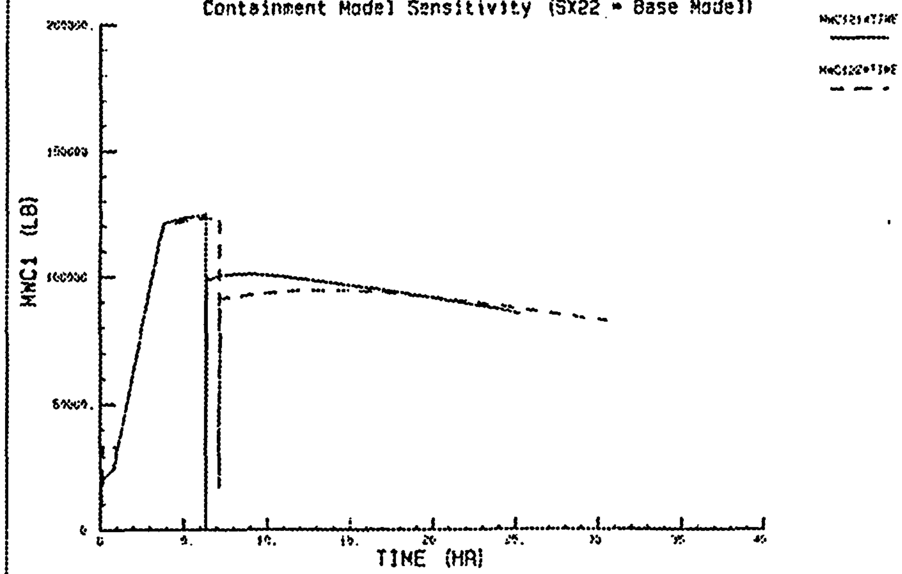


FIGURE 4.3.10
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

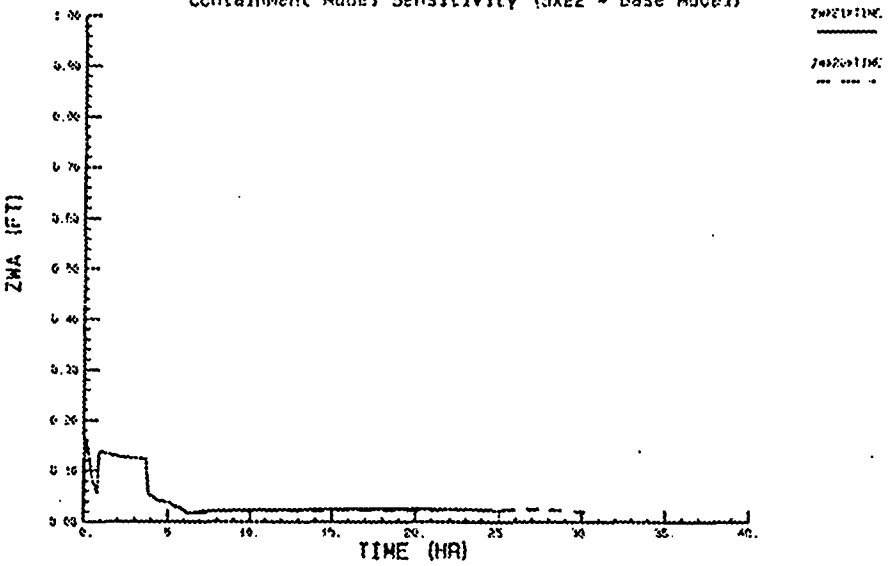


FIGURE 4.3.11
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

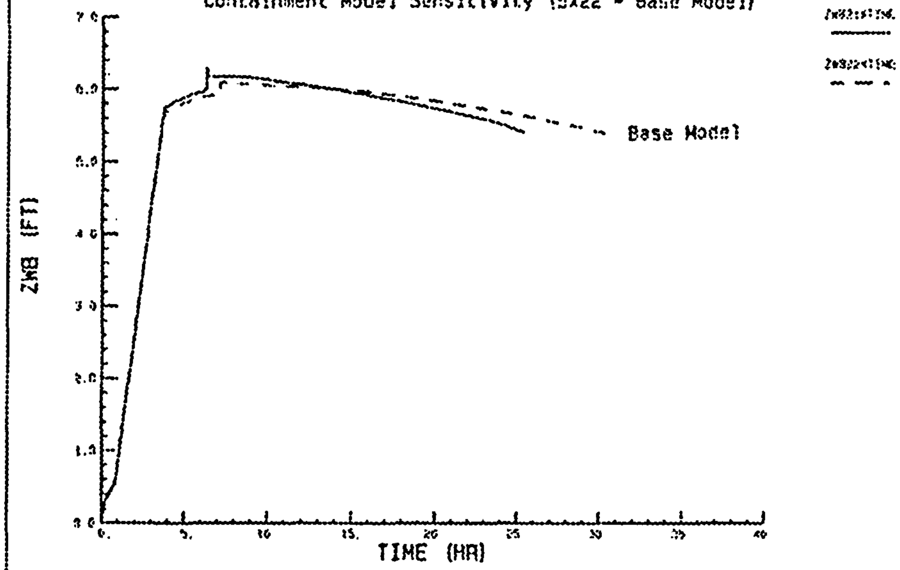


FIGURE 4.3.12
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

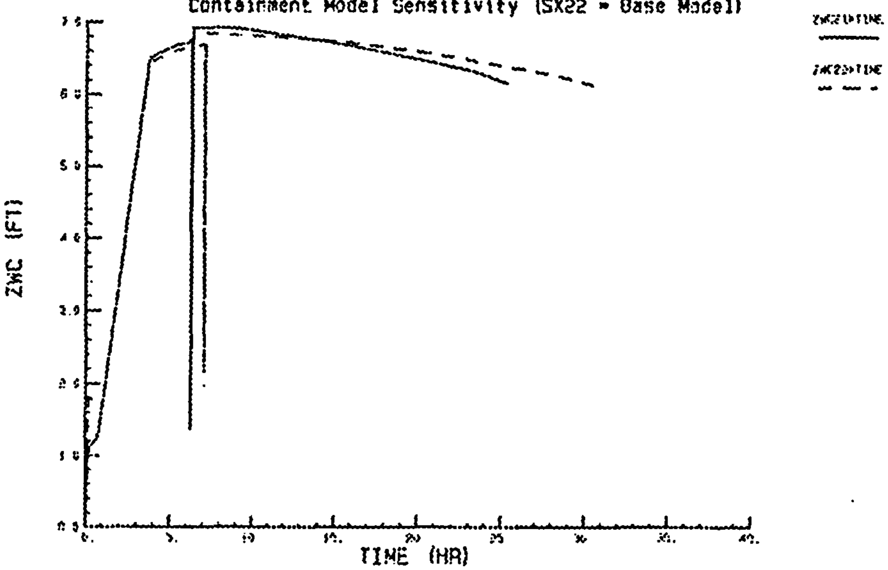


FIGURE 4.3.13
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

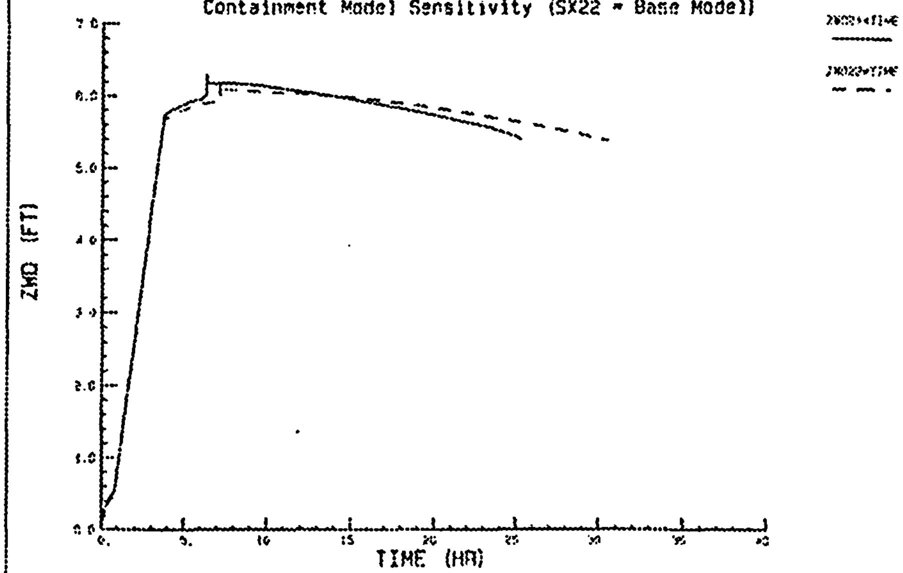


FIGURE 4.3.14
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

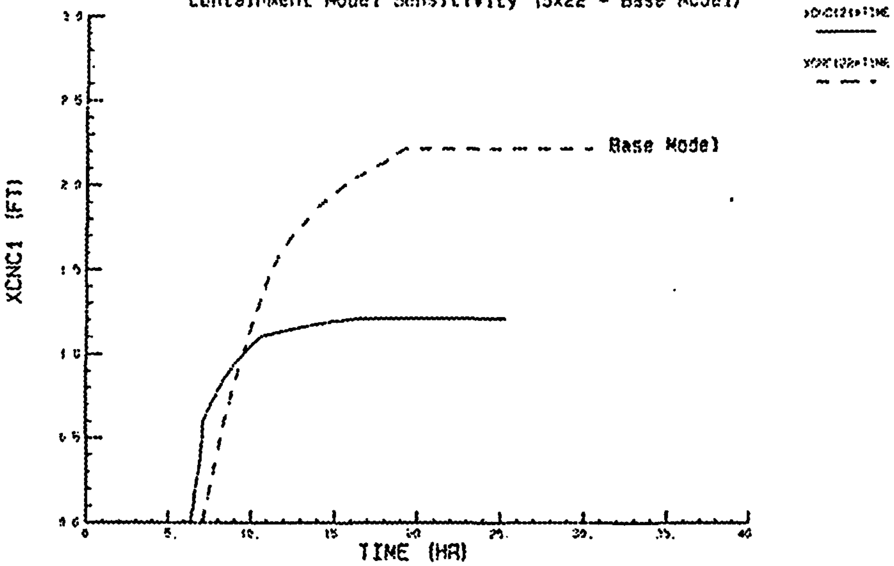


FIGURE 4.3.15
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

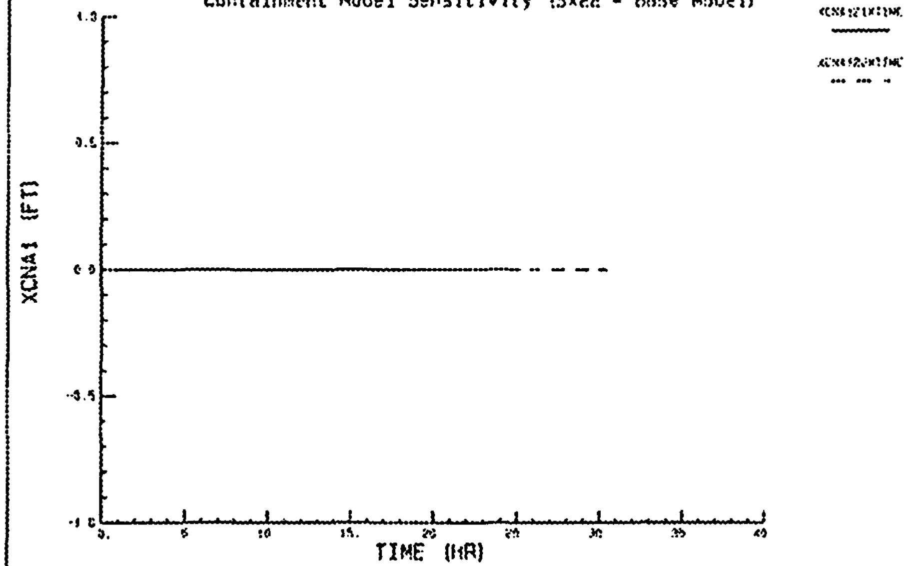


FIGURE 4.3.16
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

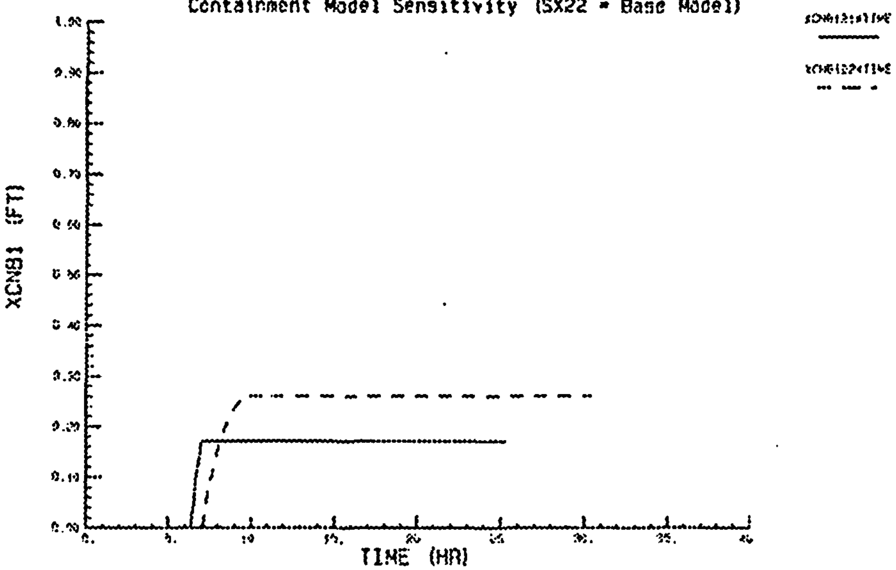


FIGURE 4.3.17
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

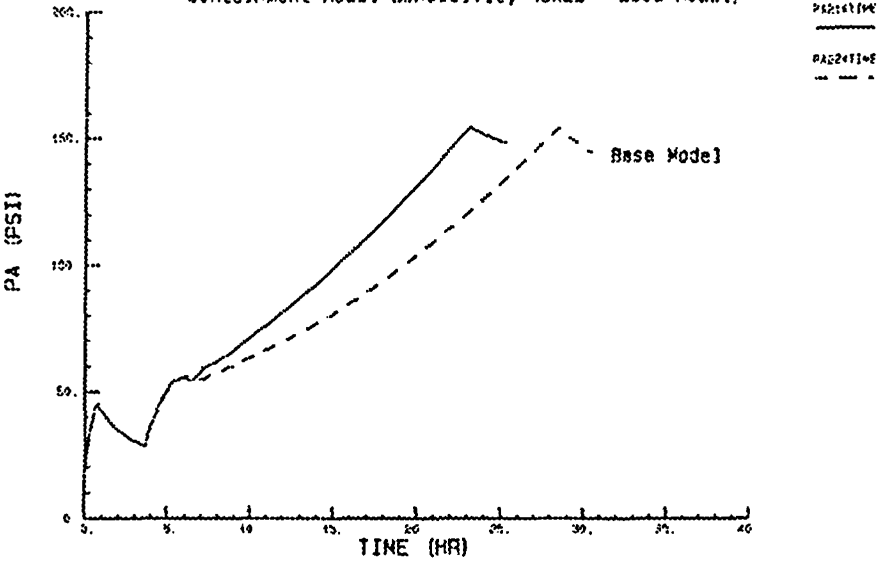


FIGURE 4.3.18
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

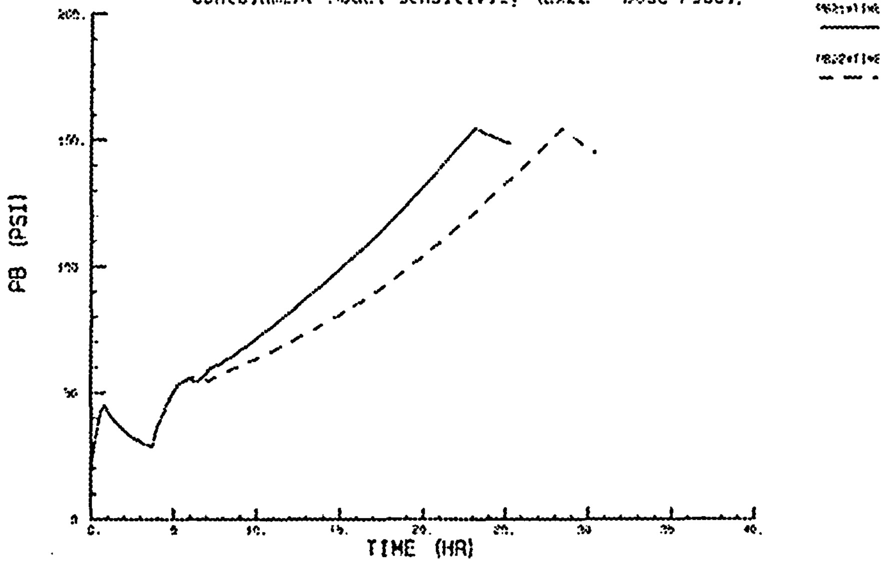


FIGURE 4.3.19
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

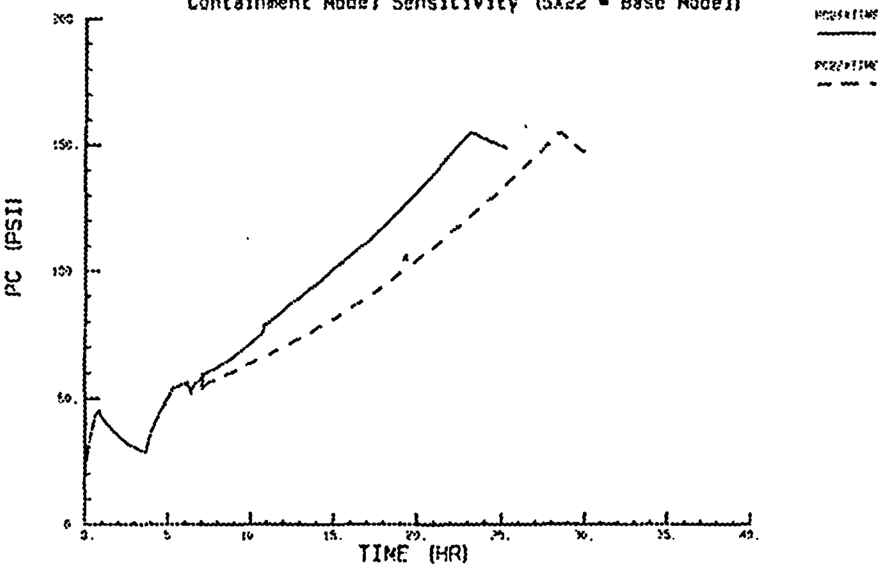


FIGURE 4.3.20
ANO-1 SBLOCA (SX21/22)
Containment Model Sensitivity (SX22 = Base Model)

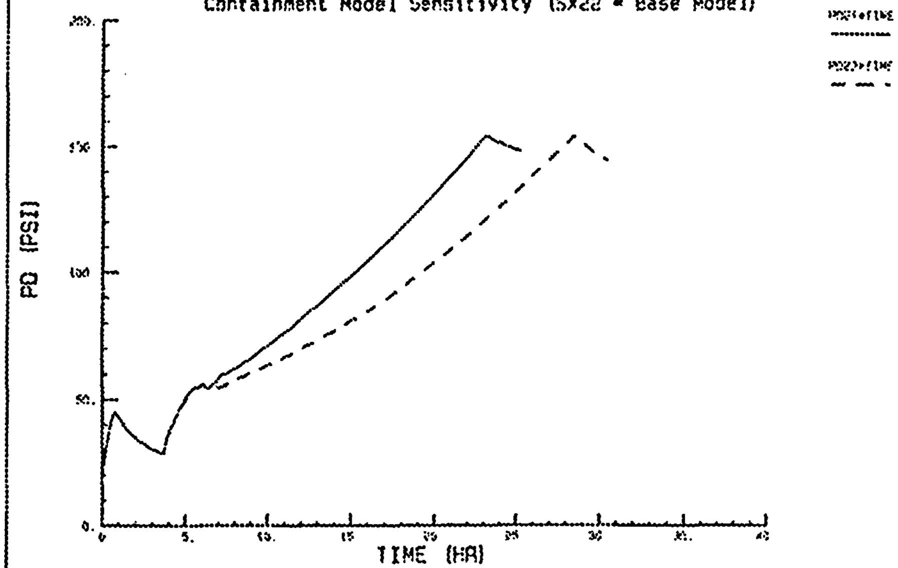


FIGURE 4.3.21
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

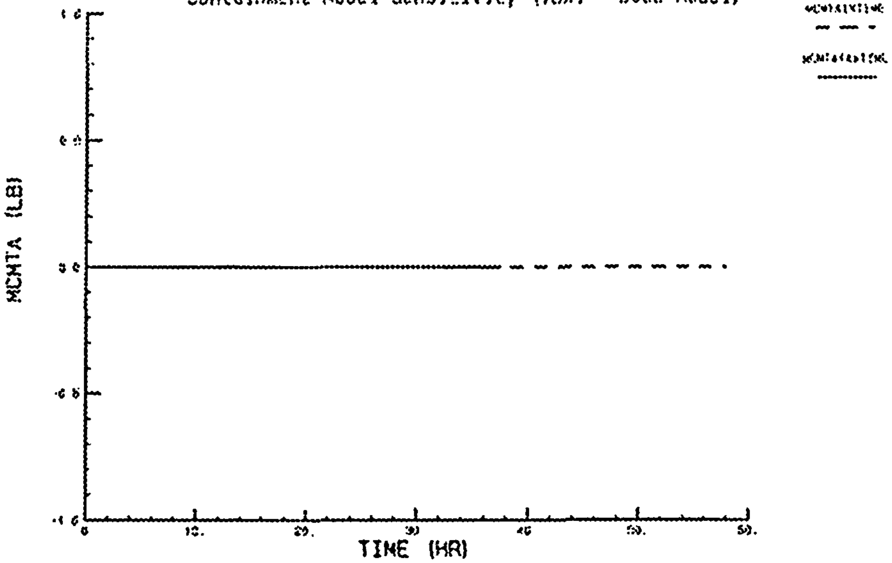


FIGURE 4.3.22
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

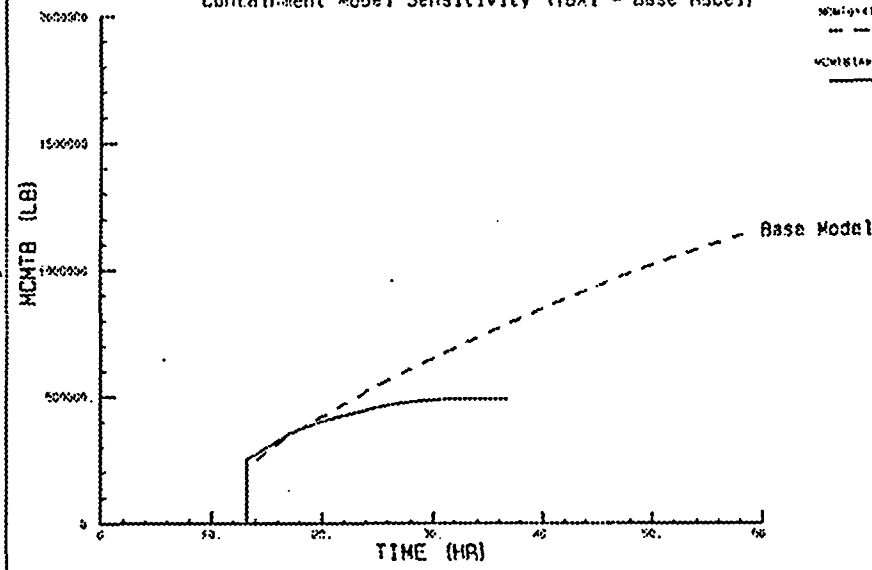


FIGURE 4.3.23
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

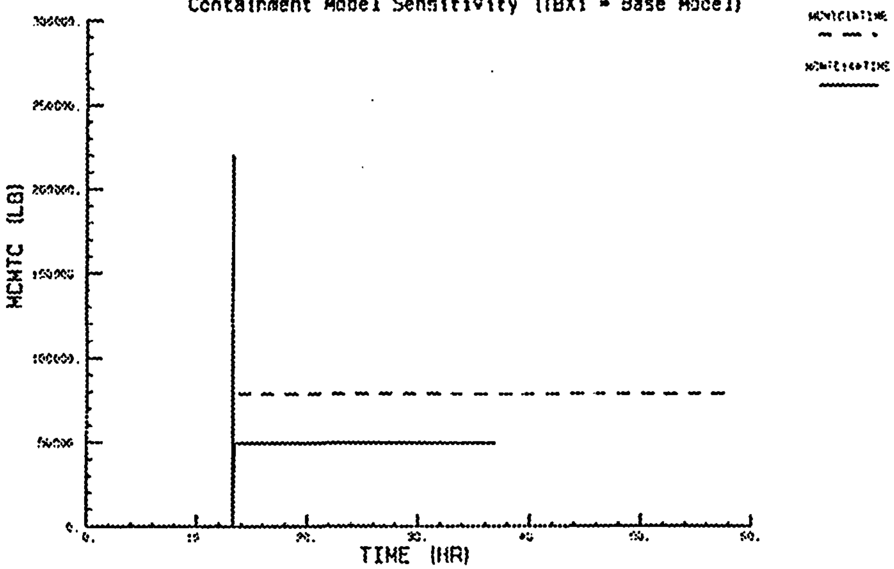


FIGURE 4.3.24
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

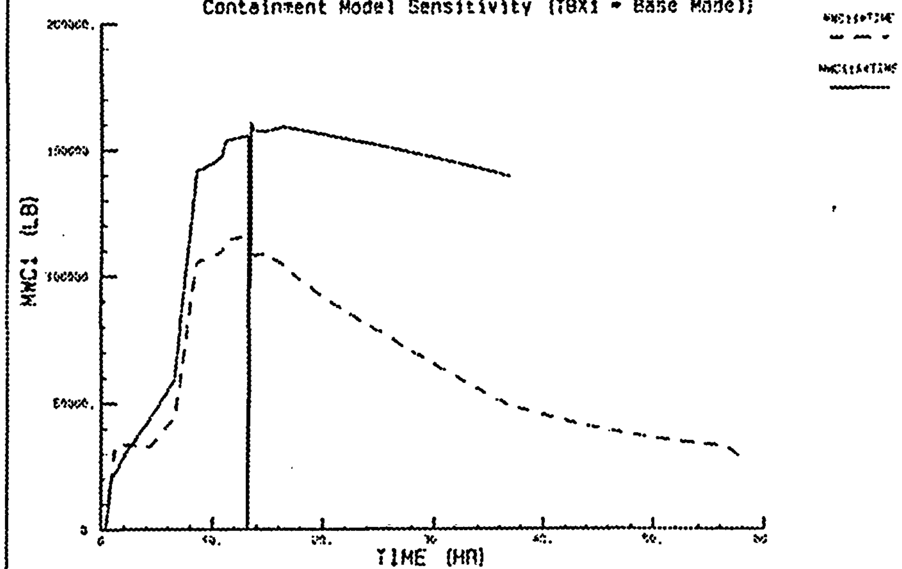


FIGURE 4.3.25
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

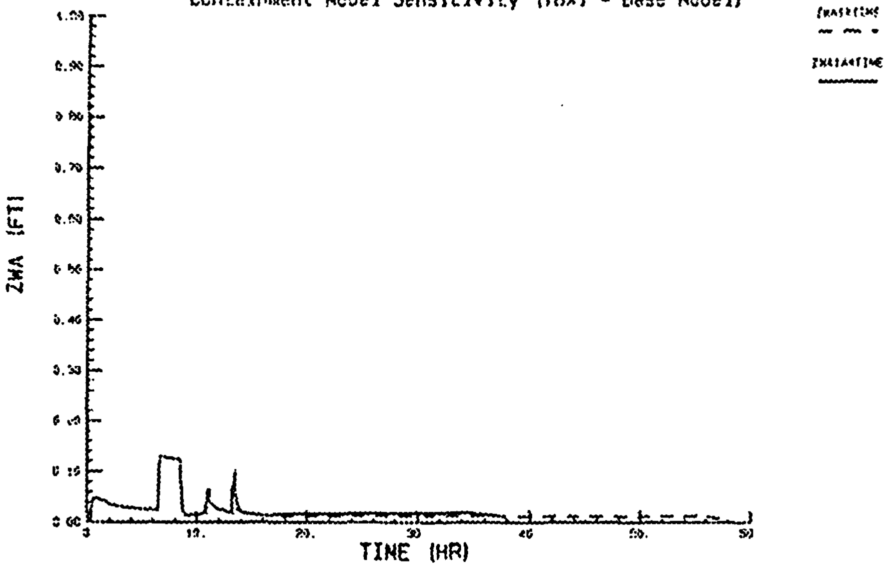


FIGURE 4.3.26
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

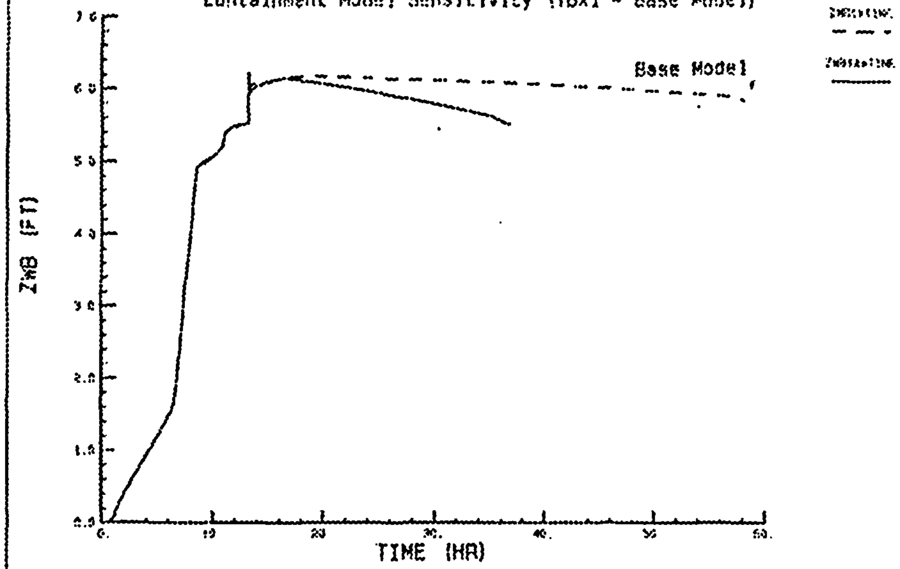


FIGURE 4.3.27
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

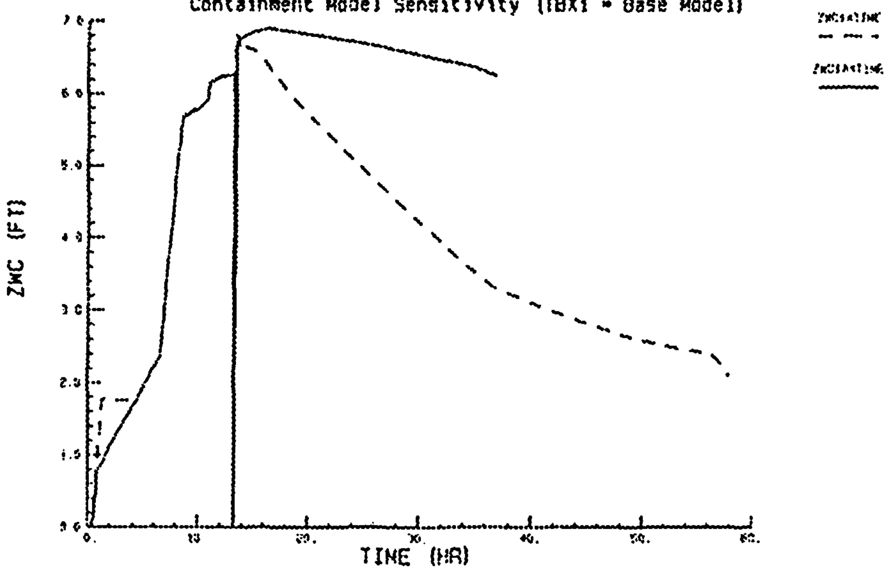


FIGURE 4.3.28
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

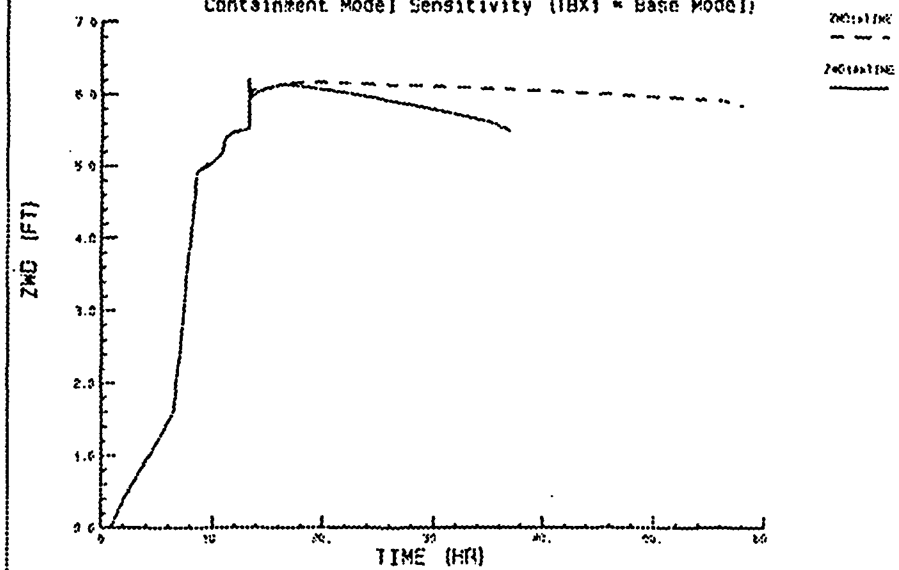


FIGURE 4.3.29
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

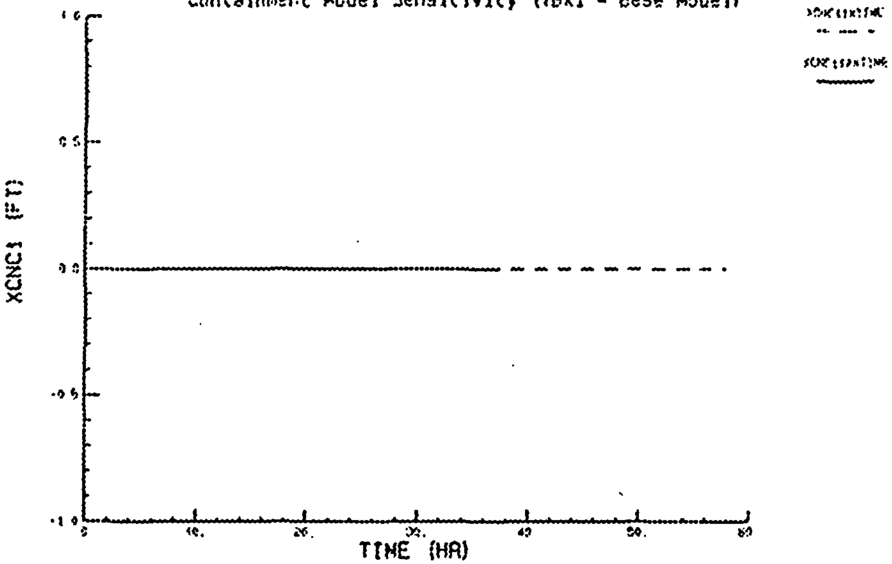


FIGURE 4.3.30
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

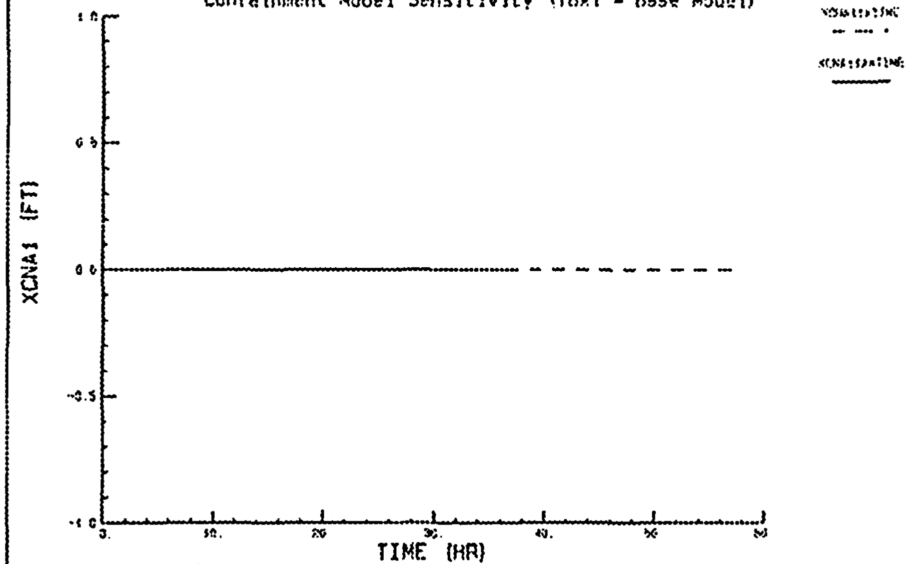


FIGURE 4.3.31
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

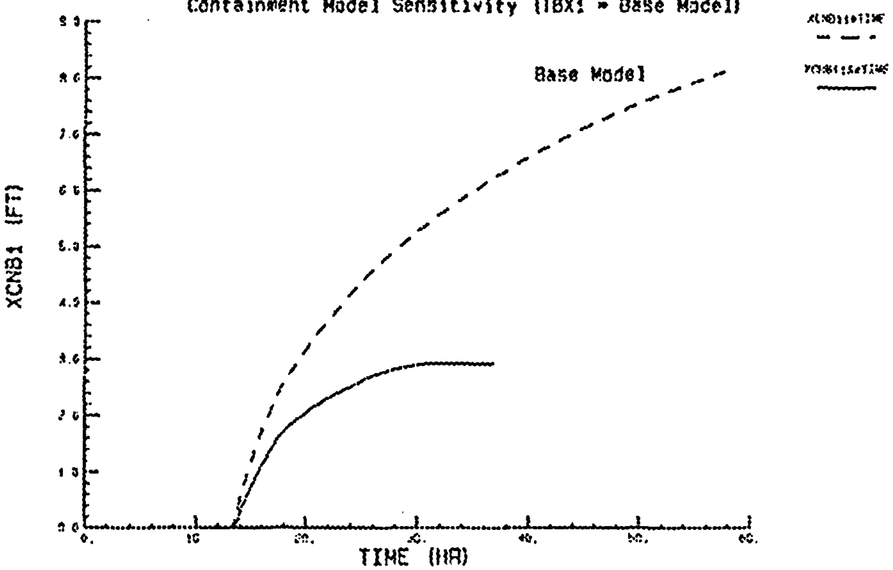


FIGURE 4.3.32
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

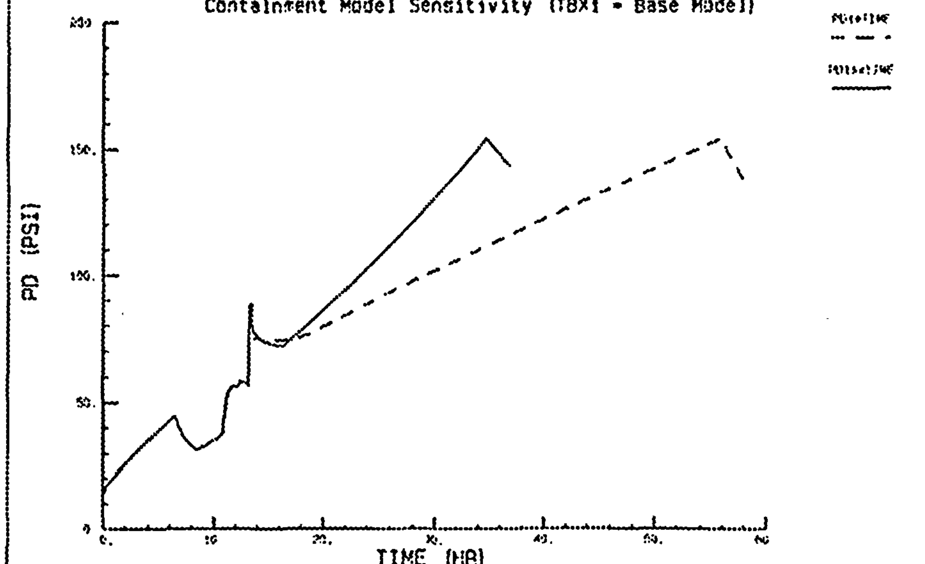


FIGURE 4.3.33
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

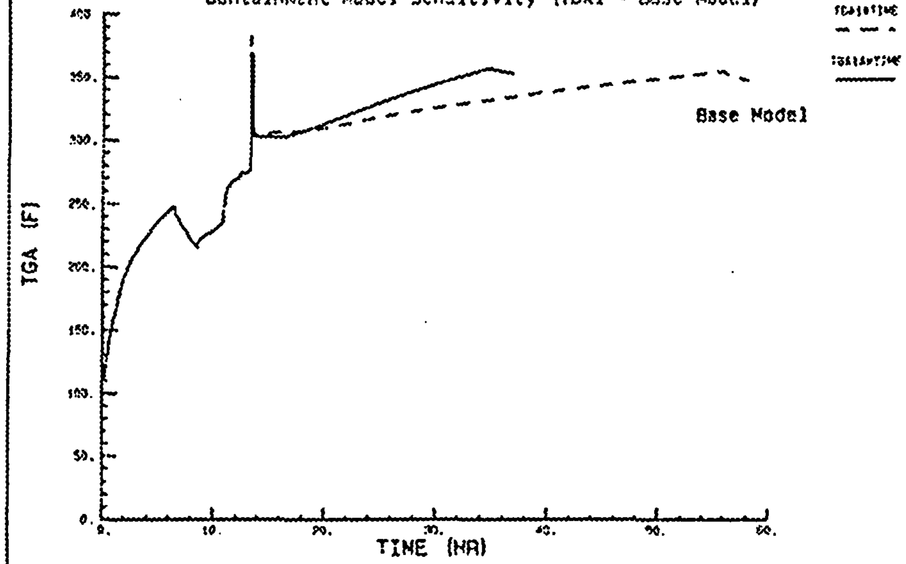


FIGURE 4.3.34
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

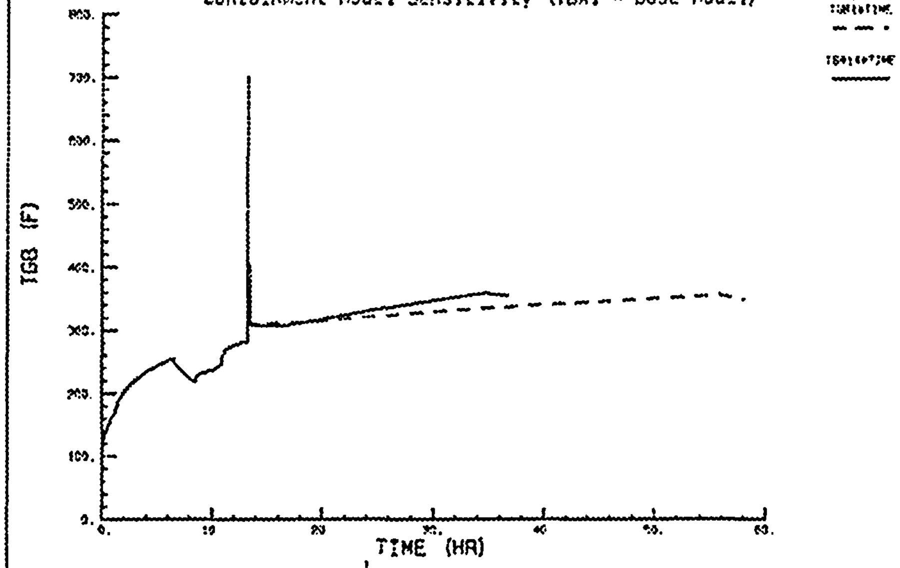


FIGURE 4.3.35
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

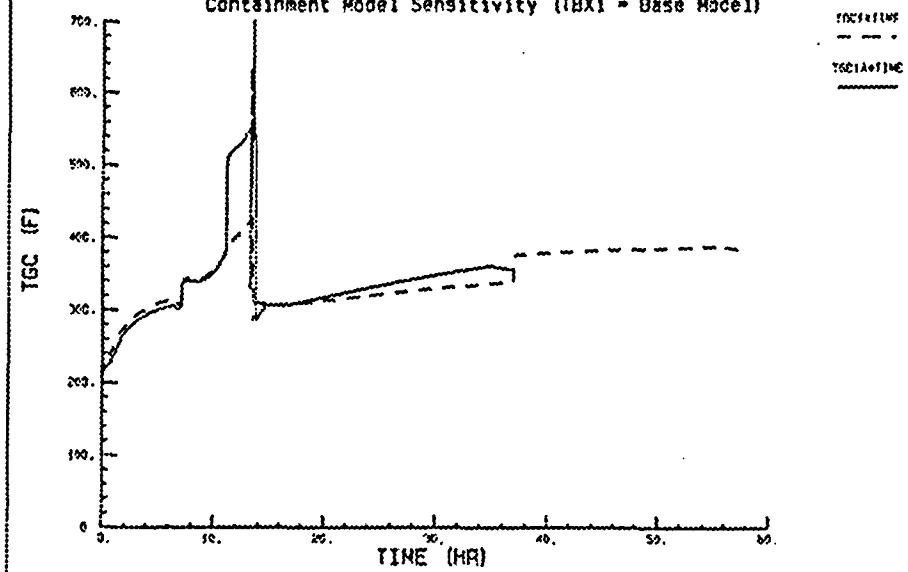


FIGURE 4.3.36
ANO-1 TRANSIENT 2 (TBX1/1A)
Containment Model Sensitivity (TBX1 = Base Model)

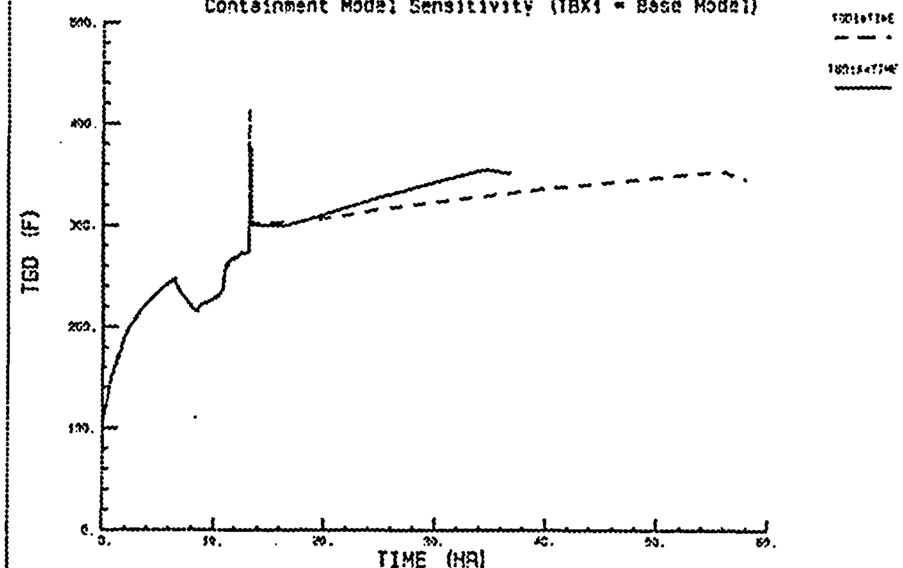


FIGURE 4.3.37
ANO-1 TRANSIENT 1 (TBF1/2)
Containment Model Sensitivity (TBF2 = Base Model)

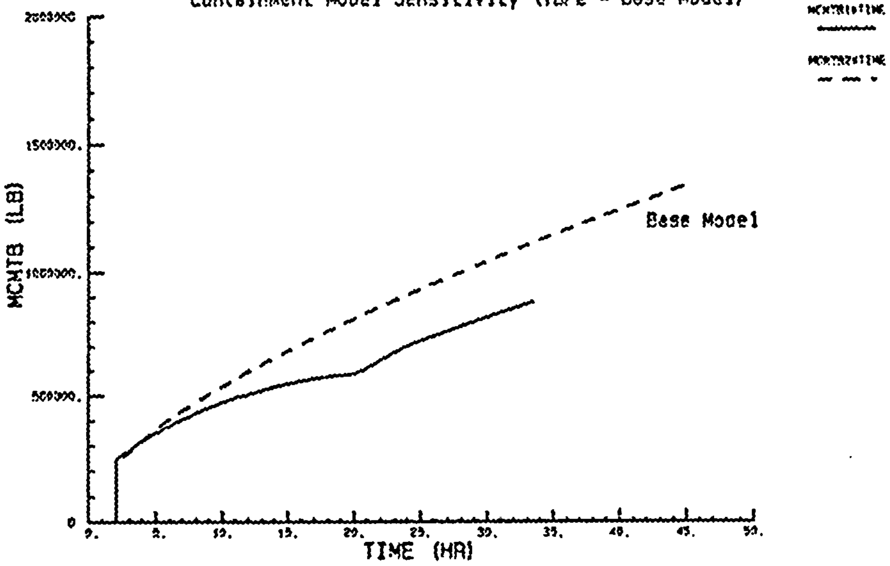


FIGURE 4.3.38
ANO-1 TRANSIENT 1 (TBF1/2)
Containment Model Sensitivity (TBF2 = Base Model)

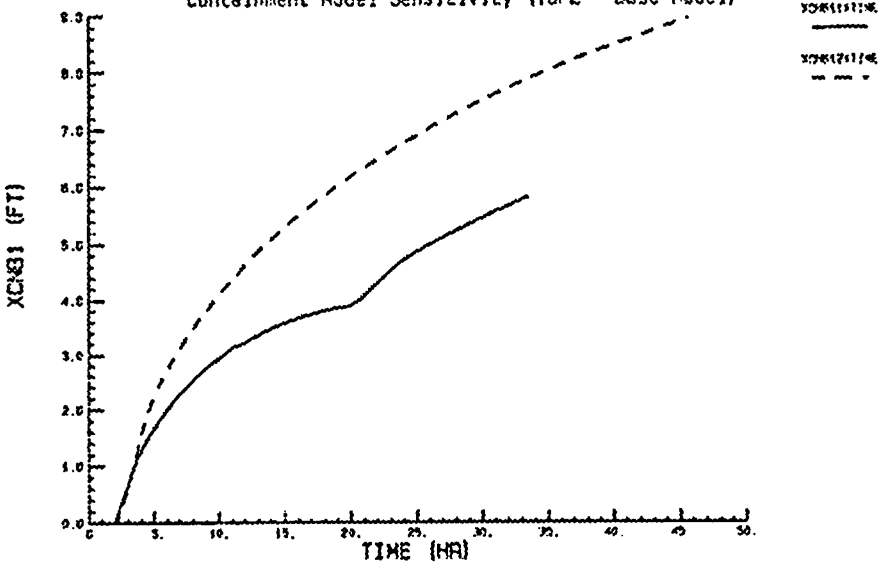


FIGURE 4.3.39
ANO-1 TRANSIENT 1 (TBF1/2)
Containment Model Sensitivity (TBF2 = Base Model)

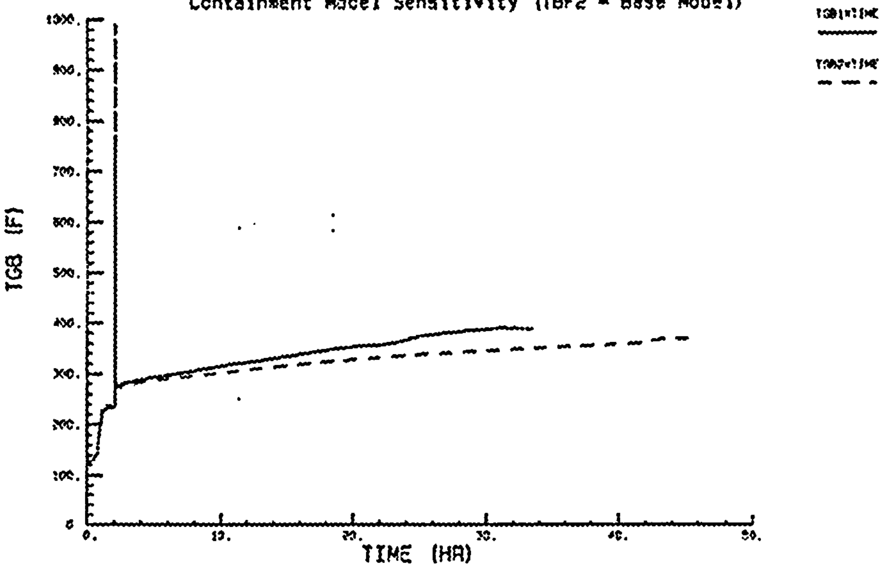
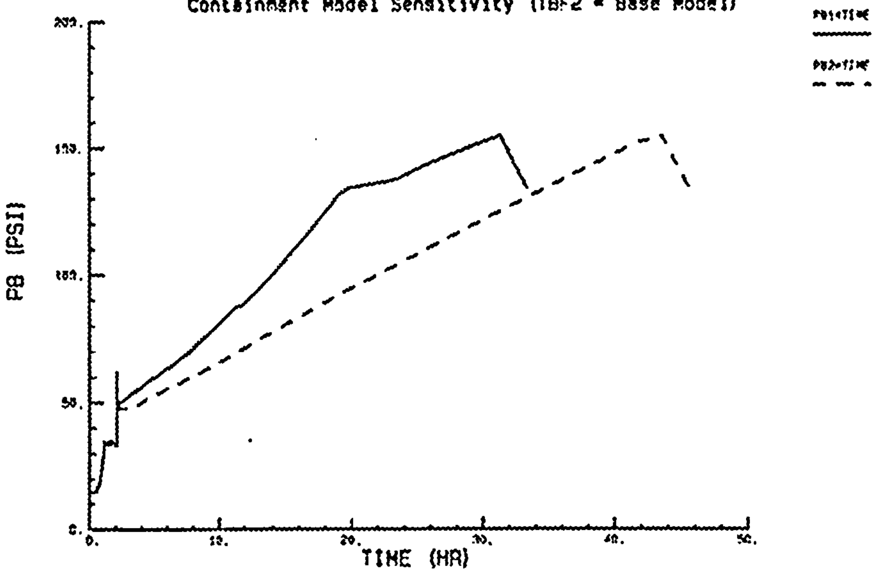


FIGURE 4.3.40
ANO-1 TRANSIENT 1 (TBF1/2)
Containment Model Sensitivity (TBF2 = Base Model)



4.3.5. Corium Entrainment

Corium entrainment sensitivity calculations evaluate the impact of changes in parameters that affect entrainment of corium from the cavity to the lower or upper compartment following vessel failure. Entrainment is expected to be significant only for HPME sequences in which high local gas velocities can occur immediately after failure of the reactor pressure vessel. The entrainment sensitivity calculations are therefore performed using the ANO-1 station blackout (TBF/U) sequence.

Entrainment parameters considered in these calculations are:

- FCMDA (18-13): Fractional corium split between the lower (B) and upper (A) compartment. (0 = entrainment to B, 1 = entrainment to A.)
- FENTR (18-31): Entrainment velocity multiplier. (Represents the difficulty (FENTR>1.0) or ease (FENTR<1.0) for entrainment.)
- FCMDCH (18-14): Entrained corium mass fraction assumed to be finely fragmented (this is a DCH parameter).

ATNBP (5-01): Bypass flow area coupling the cavity to the upper or lower compartments.

All cases were run using the base containment model (i.e., the alternate model discussed in Section 4.3.4 was not considered). The key figure of merit in these studies is containment failure time. The first sensitivity cases (TBF31 - TBF35) evaluate containment sensitivity to the bypass flow area (ATNBP). In these cases, the entrainment velocity multiplier is reduced from 1.0 in the base case (TBF2) to 0.5 to promote entrainment and FCMDA is set equal to 1.0 to direct all entrained material from the cavity to the upper (A) compartment. Therefore, ATNBP in these calculations represents the entrainment flow area between the cavity and upper compartment (see ATNBP description in Reference 3).

In the first ATNBP sensitivity case (TBF31), FENTR is decreased from 1.0 to 0.5 and ATNBP is unchanged. In the second case (TBF32), the flow area (ATNBP) is set equal to the area between the reactor vessel nozzles and the cavity wall (194.1 ft^2 per C-5.1, Appendix 1). In the third case (TBF33), ATNBP is set equal to the flow area of the ICI cavity (i.e., equal to ACMPLB per

C-2.5, Appendix 2). This latter case simulates corium entrainment down the ICI tunnel and upward to the upper compartment through the ICI cavity. The TBF34 and TBF35 cases use arbitrary values of ATNBP and are included to evaluate the effect of ATNBP values between 5.68 ft^2 and 194.1 ft^2. The TBU8 case uses the same entrainment area as TBF32 (194.1 ft^2), but entrainment is directed to the lower compartment (i.e., FCMDA < 0.5). The remaining cases (TBU4 - TBU7) show the effect of FCMDA, FENTR, and FCMDCH. In these cases, ATNBP is equal to the base parameter file value (5.68 ft^2 [1]).

The results of the entrainment sensitivity calculations are summarized in Table 4.3.8. These results prompt the following observations:

- Lowering FENTR from 1.0 to 0.5 with FCMDA=0.5 results in entrainment of all corium to the upper compartment. Corium migration to the lower compartment is eliminated (TBF31 - TBF35).

- Increasing the flow area (ATNBP) causes more corium to be entrained from the cavity (TBF31 - TBF35).

- Increasing the mass of corium entrained to the upper compartment does not necessarily result in an increase in the containment failure time. For example, in TBF32, more corium is entrained to the upper compartment than in TBF31, as evidenced by the larger value of corium debris in the upper compartment (MCMTA). However, the containment failure in TBF32 occurs 10% earlier than in the base case, whereas containment failure occurs 14% later in the TBF31 sequence.

- Increasing the value of FCMDA causes more corium entrainment to the upper compartment, as evidenced by the decreased time to contaniment failure (cf. TBF2, TBU6, TBU7).

- Increasing the value of FCMDCH results in an increase in direct containment heating (DCH) and, therefore, a 5.5% reduction in the containment failure time (cf. TBU5).

- The TBU8 case demonstrates the difficulty in predicting the impact on containment failure time of the entrainment parameters. This cases uses an entrainment area (ATNBP) equal to that used in the

TBF32 case but directs entrainment to the lower compartment (i.e., FCMDA < 0.5). The result is a 31% reduction in the time to containment failure. This compares to the 10% reduction calculated in TBF32 case.

Based on the results of these sensitivity studies, it is concluded that the entrainment parameters (other than the ATNBP geometric parameter) influence containment failure times by no more than 15%. The entrainment flow area (ATNBP) can impact results by as much as 30%. However, it is difficult to predict the impact on containment failure time for a given sequence of changes to this parameter. The entrainment parameter values used in the base parameter file are the values that are believed to best represent the ANO-1 containment geometry. These values are:

FCMDA = 0.0
FENTR = 1.0
FCMDCH = 0.03
ATNBP = 5.68 ft^2

TABLE 4.3.8

ANO-1 MAAP Analyses - Corium Entrainment Sensitivities

Case	FCMDA	FENTR	FCMDCH	ATNBP(ft2)	CF Time (hr)	% DIF	UO2 Mass (lb) Cavity	LC	UC** MCMTA
TBF2*	0.0	1.0	0.03	5.68	43.5	-	15,816.3	78,065	155,000
TBF31	1.0	0.5	0.03	5.68	49.5	13.8	46,322.4	0.0	268,000
TBF32	1.0	0.5	0.03	194.1	39.3	-9.7	14,474.1	0.0	275,100
TBF33	1.0	0.5	0.03	246.0	47.9	10.0	7,774.7	0.0	-
TBF34	1.0	0.5	0.03	75.0	39.5	-9.2	15,413.8	0.0	-
TBF35	1.0	0.5	0.03	150.0	39.3	-9.7	15,767.9	0.0	-
TBU8	0.3	1.0	0.0	194.1	30.1	-30.8	-	-	-
TBU4	0.0	99.0	0.0	5.68	40.9	-6.0	-	-	-
TBU5	0.0	1.0	1.0	5.68	41.1	-5.5	-	-	-
TBU6	0.30	1.0	0.0	5.68	41.4	-4.8	-	-	-
TBU7	0.80	1.0	0.0	5.68	37.0	-14.9	-	-	-

* Base case.

** MCMTA represents the total mass (LB) of corium debris in the Upper (A) Compt (UC).

CF = Containment Failure
LC = Lower (B) Compt.
UC = Upper (A) Compt.

%DIFF = (TCF - TCFB)/TCFB,

where TCF = time to containment failure,
TCFB = time to containment failure - base case.

4.4. Input File Development

MAAP input files for each accident sequence analysis are included in Appendix 3. Input file local parameter changes and operator intervention setpoint for ECCS recirculation are discussed below.

4.4.1. Recirculation Actuation

The ECCS recirculation mode is initiated by transferring suction of the reactor building spray (RBS) and LPI pumps from the Borated Water Storage Tank (BWST) to the containment sump and piggy-backing the HPI pumps onto the LPI pumps (i.e., HPI suction is realigned from the BWST to the discharge of the LPI pumps) [20]. Recirculation is initiated by the operator when the water level in the BWST decreases to 6 ft [21]. In the MAAP code, recirculation actuation is modeled with a user defined event code defined in the input file. When the BWST level, ZWRWST, decreases to 6.0 ft (1.829 M), recirculation is activated. The LPI, HPI, and RBS pumps are automatically realigned per the MAAP ESF pump lineup flag (see C-11.4, Appen-

dix 1).

4.4.2. Break Sizes, Locations, and Elevations

All breaks are located in the horizontal part of the MAAP "broken loop" cold leg between the RCP and reactor vessel. Break elevation (ZBB, parameter 2-15), location (FBB, 2-13), and area (ABB, 2-14) are specified via local parameter changes in the appropriate input files.

Break size: LOCA break sizes are calculated below.

Large Break: The large break is defined in the project task plan [8] as a 12" diameter hole. Results from the large break LOCA sequences indicate that this break depressurizes the RCS below the LPI shutoff head, thereby satisfying the large break pressure criterion [8]. The other defined criteria for the large break is that all core decay heat is removed from the RCS through the break. LBLOCA results show depressurization of the secondary side of the S/Gs, indicating that no heat is transferred from the RCS to the secondary system. Therefore, it is concluded that

all decay heat is carried out the large break and the large break decay heat removal criterion [8] is satisfied. The 12" diameter break corresponds to a break area (ABB) of 0.7854 ft^2.

Small Break: The small break is defined in the project task plan [8] as a 4" diameter hole. However, results from the small break LOCA sequences show that this break size causes RCS depressurization at a rate more typical of a medium break LOCA. In addition, depressurization on the secondary side of the S/Gs is observed, which indicates that the break size is large enough to remove all decay heat, thereby violating the small break decay heat removal criterion. Despite these observations, the 4" break size is used in the SBLOCA sequences as it is the size specified in the task plan. The corresponding break area (ABB) is 0.0873 ft^2.

Break elevation: See break elevation sensitivity studies, Section 4.3.2.

Break location: The break location key (FBB) for the horizontal cold leg is 7 per C-2.13 [1]. Therefore, for all LOCA sequences, set

FBB = 7.

4.4.3 Steam Generator Tube Rupture Input

The Steam Generator Tube Rupture (SGTR) sequences use local parameter changes to define the break area (ASB, parameter 13-40) and elevation (ZSB, parameter 13-41). Break elevation was selected based on results from sensitivity calculations in which a SGTR sequence was analyzed for a double ended rupture of one tube at three elevations above the OTSG lower tube sheet equal to 80%, 20%, and 5% of the total tube length. The 20% case resulted in key event times (core uncovery and vessel failure) of approximately 50% of those obtained in the 80% case. The 5% case resulted in key event times slightly earlier than the 20% case. Based on these results, it was concluded that a break elevation in the lower tube sheet region will result in the most conservative (earliest) key event timings. The 5%

elevation was thus selected. This corresponds to a break elevation (ZSB) of 2.6 ft, as shown below:

$$ZSB = 0.05*52.1 \text{ ft},$$

$$\underline{ZSB = 2.6 \text{ ft}},$$

where 52.1 ft is the distance between the lower and upper OTSG tube sheet (see C-13.37, Ref. 1).

Tube rupture size: The initial tube rupture size considered was based on a double ended guillotine break of one tube. The corresponding break area (ASB) is given by

$$ASB = 2*[(PI/4)*(XIDSG)^2],$$

where XIDSG, the inside diameter of one S/G tube, is

$$XIDSG = 0.0464 \text{ ft} \quad ([1], \text{Calc. } 13\text{-}24).$$

Therefore,

$$ASB = 2*[(PI/4)*(0.0464)^2],$$

$$\underline{ASB = 0.00338 \text{ ft}^2}.$$

Results from the RX SGTR sequence showed that this area results in a large break flow rate, as evidenced

by a rapid decrease in primary system pressure and water inventory during the first 30 min. of the sequence (prior to start-up of the HPI pump. See results in Appendix 3). The RX sequence was repeated with break area equal to 50% of the above area in an effort to obtain a sequence more consistent with typical tube rupture transients. This area is:

$$ASB = 0.50*0.00338 = 0.00169\ ft^2$$

The effect of the smaller area is shown in Section 3.

4.4.4 Main Feedwater Temperature

During checkout of the base Revision 16 input parameter file, it was found that the Main Feedwater (MFW) temperature (TFW, parameter 13-07) must be lowered from the 427°F design value to 400°F to maintain correct OTSG downcomer water levels. This result was also obtained during a steady-state run of the Revision 18 code using the A1SAM02 parameter file. Thus, for sequences in which the initial OTSG level may be important, TFW is set equal to 400°F via input parameter file local parameter change cards. Affected sequences are Transient #2 (TBX) and the SGTR sequences (RX and RU).

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2. Memo, B. J. Schlenger to MAAP Code Users, PWR MAAP 3.0B Revision 18 Software Transmittal, 4/30/92.

3. MAAP 3.0B Users Guide, PWR Babcock & Wilcox, FAI.

4. ANO-1 SAR, Vol. 3, Chapter 4, Amend. No. 10.

5. MAAP 3.0B Users Manual, Vol. 2, FAI, Rev. 3/16/90.

6. Crane Co. Tech. Paper 410, Flow of Fluids Through Valves, Fittings, and Pipe, Crane Co., 1978.

7. 6-CF-1, Rev. 9, "#6 Core Flooding Large Pipe Isometric."

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9. TM W180-0010, "Technical Manual For Whitlock Sample Cooler," Sec. 3, TD W180-0040, Rev. 0, "Decay Heat Coolers," 6/6/86.

10. Calc. No. Z220921, Rev. 0, MAAP 3.0B Baseline Calculations for ANO Units 1 & 2, Z. T. Mendoza, SAIC. (Transmittal: Z308921, dated 3/8/92.)

11. MAAP 3.0B Users Manual, Vol. 2, Part 1, App. 2P, Rev. 18.

12. CP 178-02, Rev. 0, ANO-1 CEPAC Data Base, (NDCC File 178-02). (Transmittal: PSA-88-602 dated 12/29/88.)

13. MAAP FLAASH, Issue No. 12, July 10, 1992.

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19. C-148, Rev. 12, "Reactor Building Reinforced Concrete Basement Floor El. 336'-6"."

20. ANO-1 SAR, Vol. 4, Chapter 6, Amend. No. 10.

21. EOP-1202.001, Sec. 13, ESAS, pg. 289, 11/23/90.

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25. C-154, Rev. 10, "Reactor Building Reinforced Concrete Wall Sections & Details - Sh. 1."

26. Diamond Power Corp. Dwg. 500996-001C, Rev. B (ANO Dwg. 6600-M1B-85-4), "Mirror Insulation."

27. EPRI TR-100743, MAAP PWR Application Guidelines for Westinghouse and Combustion Engineering Plants, June, 1992.

6. MICROFICHE

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A1SAM02 - ANO-1 Rev. 18 Input Parameter File.
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APPENDIX 1

PARAMETER FILE CALCULATIONS

There are a total of 74 pages in this appendix.

ENTERGY

Calculation No. ______ Rev ______ Sheet 1 Of ______

Calculation Title ______ Author GBS Date ______

Reviewer ______ Date ______

The calculations in this appendix document changes to the base ANO-1 MAAP Rev. 16 parameter file. The base parameter file is revised in order to:

- Reflect new, deleted, and redefined parameters for compatibility with MAAP 3.0B Rev. 18.
- Incorporate the latest recommendations for selected parameter values provided by EPRI, FAI, and GKA (Gabor, Kenton, and Associates).
- Incorporate SAIC recommendations from the ANO benchmark project.

Parameter numbers in this appendix are consistent in format to the base parameter file calculations [1]*.

*Numbers in brackets refer to references in Section 5.0.

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Calculation No. ______ Rev ______ Sheet 2 Of ______

Calculation Title ______ Author GS Date ______

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Abbreviations:

x-yy: Parameter number; x = Group number, yy = parameter number. (also corresponds to calculation number in Ref. 1.).

R16: PWR MAAP 3.0B Revision 16.

R17: PWR MAAP 3.0B Revision 17

R18: PWR MAAP 3.0B Revision 18.

FAI: Fauske & Associates, Inc.

GKA: Gabor, Kenton, and Associates.

UG: PWR MAAP Users Guide, Babcock & Wilcox.

C-x.y: Calculation number.

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Calculation No. ______ Rev ______ Sheet 3 Of ______

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1. Concrete and Containment Shell (Group #1)

1.1. 1-16: MFCN (12): Mass Fraction of concrete that is O_2

MFCN(12) not a user input for Rev. 18

(Ref. Default parameter file listing [2])

2. Primary System

2.1 2-21: GRXVØ: Gas flow rate of reactor high points vents, if any.

GRXVØ Not a user input for Rev. 18

(Ref ZION-R18.PAR [2])

2.2 2-51 PDCRO Pressure drop across RCP's during normal operations.

Revised per UG Rev. 8/92 [3]

PDCRO = 1000 psid

ENTERGY

Calculation No. ______ Rev. ______ Sheet 4 Of ______

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2.3 2-65 / MCLTOT: Total Mass of one Cold Leg.

MCLTOT revised definition: Does not include one-half the mass of the S/G outlet tube sheet and lower plenum (included in original value, C-2-65, Ref. 1). Also, add mass of the RCP in contact with the RCS fluid.

MCLTOT = MCL + MRCP

MCL = 56,443.9 ([1], Calc. 2-65)

MRCP = 104,200 (Dry weight w/o motor [4])

MCLTOT = 56,443.9 + 104,200

$\boxed{\text{MCLTOT} = 160{,}643.9 \text{ lb}}$

2.4. 2-78 HALFLP: Half-loop operation flag.

Parameters 78-143 added to R17 for half loop operations. Setting this flag to zero

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selects normal operations and half-loop parameters are not used. For the ANO-1 SAM model, normal operations is selected. Therefore,

$\boxed{\text{THALFLP} = 0.0}$ (Ref. UG [3], Rev. 4/91)

$\boxed{2.5}$ 2-79 - 2-443 Parameters not used (see C-2.4). All values therefore set equal to zero, with the exception of TIHALF (2-81), which is set equal to the UG value of 86,400 sec, or 24 hr ([3], Rev. 4/91).

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2.6

2-144: ZSINOZ: Height of the SI Nozzle above the elevation of the bottom of the cold leg nozzle at the RPV

This parameter is new for PWR Rev 18.

As defined in the UG [3], Rev. 8/92,

ZSINOZ = ZOFFCL for a B&W plant. (See 2.7)

$\boxed{ZSINOZ = 3.5 \text{ ft}}$

2.7

2-145 ZOFFCL: Difference in elevations of the bottom of cold leg measured at the RCP discharge and at the RPV nozzle.

Assume reference inside bottom of cold leg.

Elev. of Cold leg at RCP = 373'-0" = 373.0' [7]
Elev. of cold leg at RPV nozzle = 369'-6" = 369.5' [7]
Cold Leg ID constant.

∴ ZOFFCL = 373.0 - 369.5

$\boxed{ZOFFCL = 3.5 \text{ ft}}$ (= 1.067m)

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3. GROUP 3. Pressurizer.

3.1

3-28 - NPZCT
3-29 ZWPZCL
3-30 ZWPZCH

3-28 - 3-29 added for R18 apply only when generalized ESF Model is used. Not used for ANO-1 SAM model (Ref. ZION_R18.PAR [2])

5. CAVITY COMPARTMENT

C-5.1 5.01: ATNBP By pass (non-tunnel) flow area coupling the cavity - to the lower compartment.

ATNBP is the minimum of:

1- Total area of cavity wall openings around the vessel hot/cold leg nozzels.

2- Annular area between the vessel and cavity wall.

Notes: 1) ATNBP calculated in Ref 4 (C-5-01) is revised based on the assumption from Ref. 10 that vessel and hot/cold leg insulation is blown away onn vessel failure.

2) All equations used in the calculations below are from the Users Guide [3].

$$ATNBP = MIN\,[\,AEQRUA,\ AEQNZT\,] \quad (1)$$

AEQRUA: Equivalent Flow area - RV annular path.

AEQNZT: Equivalent flow area - all hot/cold leg nozzle paths.

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$$AEQNZT = (NHL)(AEQHLN) + (NCL)(AEQCLN) \quad (2)$$

$$AEQHLN = (CDHLN)(AAHLN) \quad (3)$$

$$AEQCLN = (CDCLN)(AACLN) \quad (4)$$

and $AEQRVA = (CDRVA)(AARVA).$ (5)

Consider AEQNZT:

Hot Leg:

$$CDHLN = \frac{1.0}{CD\,(KCE + KF[HLN])^{0.5}}$$

$KCE = 1.5,$

$CD = \frac{1}{\sqrt{KCE}} = 0.816$ [3]

$K90 = 0.5$ [5]

$$KF(HLN) = F\left(\frac{HLTBP}{HDHTBP}\right)$$

$F \approx 0.02$ [3]

HLTBP = 6.25 ft. ([18], Scaled).

HDHTBP = Hyd. Diameter of hot leg nozzle flow path.

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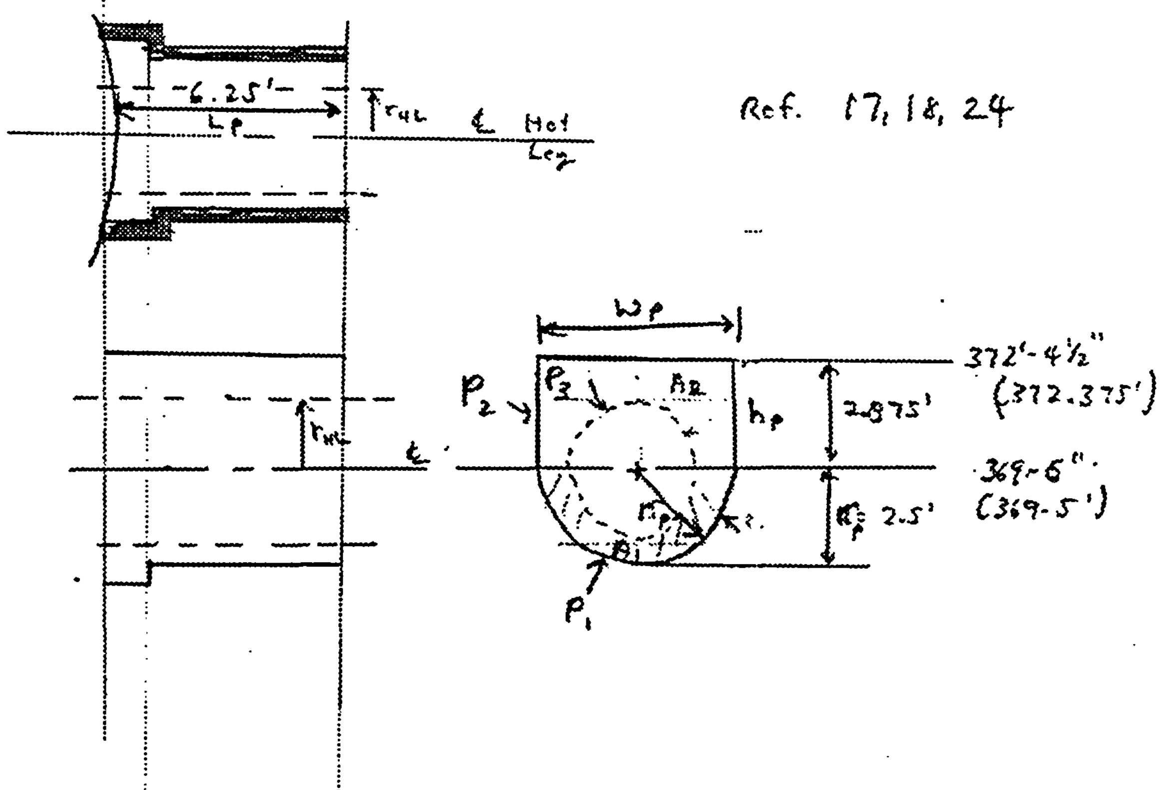
5.01

Hot leg nozzle flow path is shown below:



Ref. 17, 18, 24

$$HDHTBP = \frac{4A}{P_w}$$

$$A = A_1 + A_2$$

$$A_1 = \tfrac{1}{2}(\pi r_p^2) - \tfrac{1}{2}(\pi r_{HL}^2)$$

where $r_p = 2.5'$

$$r_{HL} = \left[\tfrac{1}{2}(36") + 2\,5/8"\right] / 12 \quad [4]$$

$$r_{HL} = 1.719 \text{ ft}$$

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C-5501 (cont.)

$$A_1 = \pi/2\,(r_p^2 - r_{HL}^2)$$

$$A_2 = 2\,\omega_p h_p - 1/2\,(\pi r_{HL}^2)$$

$$h_p = 2.875'$$
$$\omega_p = 2 r_p = 5.0'$$

$$A_2 = 2\cdot 2 r_p h_p - \pi/2\, r_{HL}^2$$

$$\therefore\ A = \pi/2\,(r_p^2 - r_{HL}^2 - r_{HL}^2) + 2 r_p h_p$$

P_w = Wetted perimeter $= P_1 + P_2 - P_3$

where $P_1 = \frac{1}{2}(2\pi r_p) = \pi r_p$

$$P_2 = 2h_p + \omega_p$$

$$P_3 = 2\pi r_{HL}$$

$$P_w = \pi r_p + 2h_p + \omega_p + 2\pi r_{HL}$$

Then $$HDHTBP = \frac{2\pi\,(r_p^2 - 2r_{HL}^2) + 8 r_p h_p}{\pi r_p + 2h_p + \omega_p + 2\pi r_{HL}}$$

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C-5;01 (cont.)

$$HDHTBP = \frac{2\pi\left[(2.5)^2 - 2(1.719)^2\right] + 8(2.5)(2.875)}{2.5\pi + 2(2.875) + 5.0 + 2\pi(1.719)}$$

$$HDHTBP = \frac{59.637}{29.405} = 2.028\ ft$$

$HLTBP = 6.25\ ft = L_p$ (see sketch)

$$\therefore\quad KF[HLN] = 0.02\left(\frac{6.25}{2.028}\right)$$

$$KF[HLN] = 0.0616$$

$$CDHLN = \frac{1.0}{0.816\left[1.5 + 0.0616\right]^{0.5}}$$

$$\underline{CDHLN = 0.98}$$

$$AAHLN = w_p h_p + \tfrac{1}{2}\pi r_p^2 - \pi r_{HL}^2$$

$$AAHLN = (5.0)(2.875) + \pi/2\,(2.5)^2 - \pi(1.719)^2$$

$$\underline{AAHLN = 14.909\ ft^2}$$

5.01 (cont.)

Cold Leg:

$$CDCLN = \frac{1.0}{CD\,(KCE + KF[CLN])^{0.5}},$$

where $KCE = 1.5$

$CD = 0.916$

(see pg. 2).

$$KF[CLN] = F\left(\frac{CLTBP}{CDHTBP}\right)$$

$CLTBP = 5.0$ ft ([18], scaled)

CDHTBP = Hyd. Diameter of Flow Path.

Cold Leg Nozzle flow path is sketched on the following page.

FROM the sketch

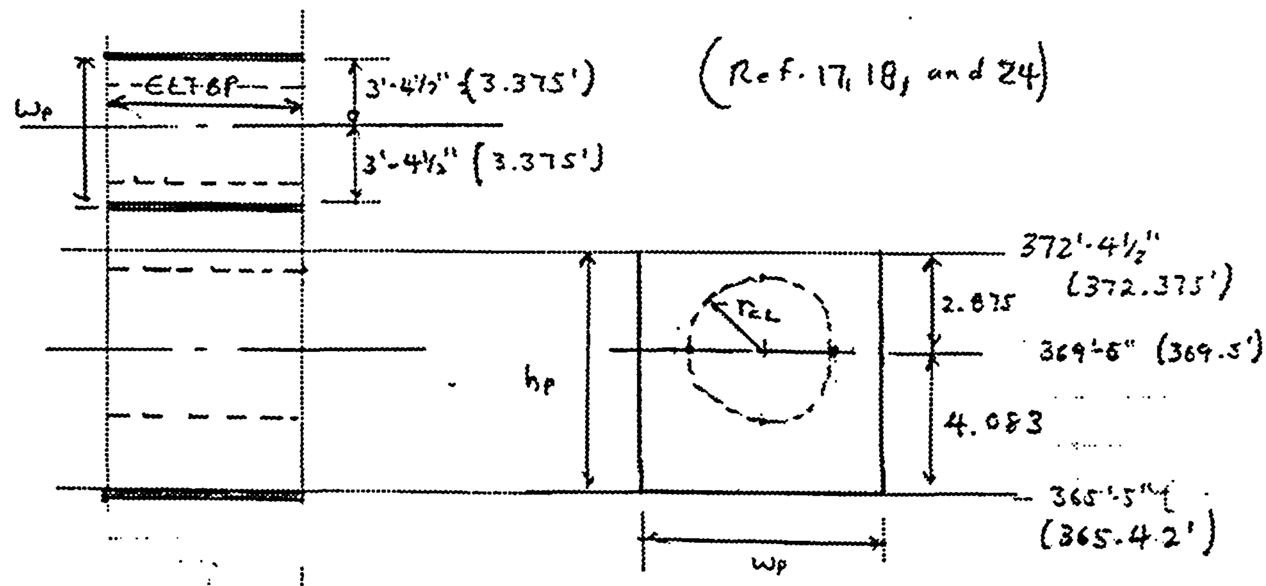
$$CDHTBP = \frac{4A}{P_w};$$

$$A = h_p w_p - \pi r_{CL}^2$$

$$P_w = 2h_p + 2w_p - 2\pi r_{CL}$$

C-5901 (cont.)

(Ref. 17, 18, and 24)



$w_p = 2(3.375) = 6.75 \text{ ft}$

$h_p = 2.875 + 4.083 = 6.958 \text{ ft}$

$r_{CL} = \left(\frac{28}{2} + 2\frac{1}{16}''\right)\frac{1}{12} = 1.339 \text{ ft}$ [4]

Then $CDHTBP = \dfrac{2\,(h_p w_p - \pi r_{CL}^2)}{h_p + w_p - \pi r_{CL}}$

$CDHTBP = \dfrac{2\left[(6.958)(6.75) - \pi(1.339)^2\right]}{6.958 + 6.75 - \pi(1.339)}$

$CDHTBP = \dfrac{82.668}{9.5014}$

$CDHTBP = 8.7006$

5.01 (cont) Pg 8 of 12

$$KFECLN = 0.02\left(\frac{5.0}{8.70}\right) = 0.0115$$

$$CDCLN = \frac{1.0}{0.816\,(1.5 + 0.0115)^{0.5}}$$

$$\underline{CDCLN = 0.997}$$

$$AACLN = w_p h_p - \pi r_{cL}^2$$

$$= (6.75)(6.958) - \pi(1.339)^2$$

$$\underline{AACLN = 41.334\ ft^2}$$

From Eqt. 3:

$$AEQHLN = CDHLN * AAHLN = 0.98(14.909)$$

$$\underline{AEQHLN = 14.61\ ft^2}$$

From Eqt. 4:

$$AEQCLN = CDCLN * AACLN = (0.997)(41.334)$$

$$\underline{AEQCLN = 41.21\ ft^2}$$

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S.01 (cont.)

Now, substitute AEQHLN, AEQCLN into Eqt. 2 with NCL = 4, NHL = 2:

$$AEQNZT = 2(44.61) + 4(41.21)$$

$$\underline{AEQNZT = 194.1 \; ft^2}$$

Now, Consider <u>AEQRVA</u>. (RV annulus path)

$$AEQRVA = CDRVA * AARVA \qquad (6)$$

$$CDRVA = \frac{1.0}{CD\,(KCE + KF[RVA])^{0.5}}$$

Similar to Hot/cold leg nozzles:

$$CD = 0.816, \quad KCE = 1.5.$$

$$KF[RVA] = F\left(\frac{RLTOP}{RDHTOP}\right)$$

RLTOP = Flow path length.

RDHTOP = Hyd. Diameter.

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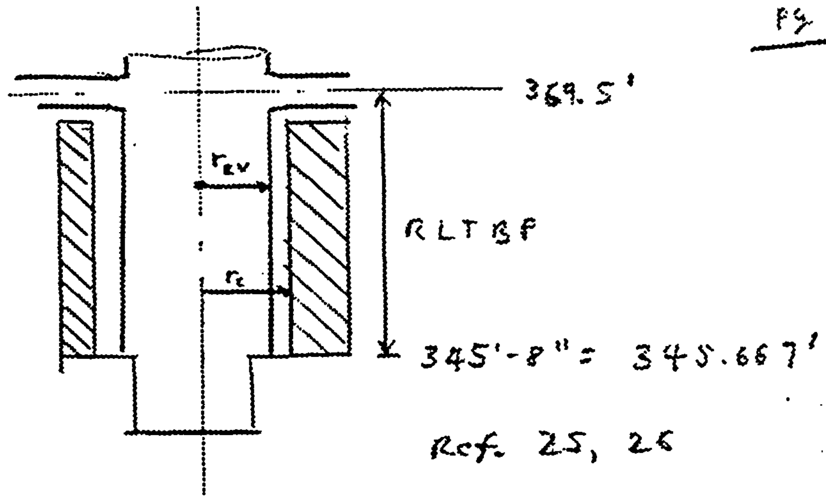
Soil (cont.)



Ref. 25, 26

$r_{RV} = \frac{1}{2}\left(\frac{187\ 7/8}{12}\right) = 7.828\ ft$ [26]

$r_c = 138'' = 11.5\ ft$ [26]

$RDHTBP = 4A/P_w$

$A = \pi(r_c^2 - r_{RV}^2) = \pi\left[(11.5)^2 - (7.828)^2\right]$

$A = 222.966\ ft^2$

$P_w = 2\pi(r_c - r_{RV}) = 2\pi(11.5 - 7.828) = 23.072$

$RDHTBP = \frac{4(222.966)}{23.072} = 38.656$

$RLTBP = 369.5 - 345.667 = 23.833\ ft$

5.01 (cont) Pg 11 of 12

$$KF[RVA] = \frac{0.02(23.833)}{38.656}$$

$$KF[RVA] = 0.0123$$

$$CDRVA = \frac{1.0}{0.816(1.5 + 0.0123)^{0.5}}$$

$$\underline{CDRVA = 0.997}$$

$$AARVA = \pi(r_c^2 - r_{ov}^2) = \pi[(11.5)^2 - (7.828)^2]$$

$$\underline{AARVA = 222.966\ ft^2}$$

Substitution into Eqt. 6 gives

$$AEQRVA = CDRVA * AARVA = 0.997(222.966)$$

$$\underline{AEQRVA = 222.3\ ft^2}$$

5-01 (Cont.)

From Eqt. 1

ATNBP = MIN [[222.3, 194.1]]

ATNBP = 194.1 ft^2

(= 18.03 m^2)

(Flow area of nozzle paths).

Note: Per C-5-01 of Ref. 1, the minimum flow area is actually the area of the openings in the RV support skirt. (= 5.68 ft^2) Therefore, for most sequences, ATNBP = 5.68 ft^2 and is unchanged from the base model.

$\boxed{ATNBP = 5.68\ ft^2}$

6. ENGINEERED SAFEGUARDS.

61 6-10: XLACUM: Length of one accumulator pipe.

XLACUM is recalculated per revised definition in the Users Guide([3], Rev. 6/91). (i.e., account for friction losses).

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C-6.1 (Cont.)

Per the Users Manual description ([5], Subroutine ACCUM), MAAP accumulator does not account for geometric (k) losses in the injection lines. This calculation derives a value of XLACUM that accounts for friction and k-losses.

Per subroutine ACCUM description [5], CFT discharge flow (accumulator flow) is given by

$$W = C\sqrt{\Delta P}\ , \text{ where} \qquad (i)$$

$$\Delta P = P_{CFT} - P_{RCS}\ ,$$

$$C = A\sqrt{\frac{2}{V_a\,(1+fL/D)}}\ ,$$

A = CFT line area ($= \pi\,(XOACUM)^2/4$),

V_a = CFT liquid sp. volume.

f = FFRIC = 0.02 (Ref. Rev. 18 source code, subroutine ACCUM).

D = XOACUM

6.1 (cont.)

Replacing C in (i) and rearranging gives

$$\Delta P = \frac{1 + f\,L/D}{2\rho_x A^2} W^2, \quad \text{where} \qquad (ii)$$

$$\rho_x = \frac{1}{v_x} \quad \text{(CFT liquid density).}$$

By definition, unrecoverable pressure drop in a pipe (in British units) is given by

$$\Delta P_u = \left[\frac{K}{2(144 g_c)\rho A^2} + \frac{f\,L/D}{2(144 g_c)\rho A^2}\right] W^2,$$

or

$$\Delta P_u = \left(K + f\,L/D\right)\frac{1}{2(144 g_c)\rho A^2} W^2 \qquad (iii)$$

Comparing (ii) and (iii), shows that MAAP assumes K = 1.0 to calculate geometric losses in the CFT injection lines.

An expression for L(XLACUM) that includes the actual geometric losses, is derived by equation (ii) and (iii):

$$\left(1 + f\tfrac{L}{D}\right)_{MAAP} = \left(K + f\tfrac{L}{D}\right)_{ACT}. \qquad (iv).$$

Let L_{eq} = XLACUM be the equivalent pipe length (i.e. the pipe length to account for K-losses) for MAAP. Then,

$$1 + f\frac{L_{eq}}{D} = K + \frac{f L_{act}}{D}.$$

Solving for L_{eq}:

$$\underline{L_{eq} = \frac{D}{f}\left(K-1\right) + L_{act}} \qquad (v)$$

$f = 0.02$ = FFRIC,

$D =$ XDACUM. $= 1.09367$ ft ([1], C-6-01).

Table 6.1.1 shows the actual line lengths and K factors for the "A" CFT (T-2A, typical for T-2B) injection line. From this table,

$$K = \sum k_i = 8.450$$

$$L_{act} = \sum L_i = 96.36 \text{ ft.}$$

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6.1 (cont.)

Note that these values of k are based on a 0.013 friction factor, whereas the friction factor used by MAAP is 0.02. To adjust k above for this difference, note from Table 6.1.1 that, for any k,

$$k_i = A_i f_T \; ; \quad \text{where}$$

$$A_i = \text{constant}$$

Thus $$k_i' \text{ (adjusted)} = (A_i f_T)(f/f_T) = A_i f$$

$$f/f_T = \frac{0.02}{0.013} = 1.538$$

Therefore, $$k' = (\Sigma k_i)\, f/f_T = (8.450)(1.538) = 13.0.$$

Substitution into (V) gives

$$L_{eq} = XLACUM = \left(\frac{1.09317}{0.02}\right)(13-1.0) + 96.36$$

$$\underline{XLACUM = 752.6 \text{ ft}}$$

NOTE: The actual value used in the MAAP Parameter file is 558.4 ft. The error introduced by this discrepancy (752.6 − 558.4 = 194.2 ft) is not expected to significantly impact the results of any calculations.

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C-6.1 (cont.)

TABLE 6.1.1.

CFT T-2A INJECTION LINE LENGTHS, K-FACTORS

Segment (Fig. 6.1.1)	Description	L or K
1	Straight Pipe	$L_1 = 6.693$ ft
2	90° Elbow	$K_2 = 30 f_T = 0.390$ [1]
3	CV-2415	$K_3 = 340 f_T = 4.420$ [2]
4	St. Pipe	$L_4 = 7.0 - 3.25 = 3.75$
5	90° Elbow	$K_5 = 0.390$
6	St. Pipe	$L_6 = 11.5$
7	90° Elbow	$K_7 = 0.390$
8	St. Pipe	$L_8 = 4.667$
9	90° Elbow	$K_9 = 0.390$
10	St. Pipe	$L_{10} = 27.5 - 3.5 = 24.0$
11	Swing Check Vlv.	$K_{11} = 50 f_T = 0.65$
12	90° Elbow	$K_{12} = 0.390$
13	St. Pipe	$L_{13} = 18.0 - 3.5 = 14.5'$
14	Swing Check Vlv.	$K_{14} = 0.65$
15	90° Elbow	$K_{15} = 0.390$
16	St. Pipe	$L_{16} = 21.5$
17	90° Elbow	$K_{17} = 0.390$
18	St. Pipe	$L_{18} = 9.75$

Notes:

1. All K values from App. A of Ref. 6 with $f_T = 0.013$ for 14" pipe per pg A-26 of [6].
2. Assumed globe valve with $\beta = 1$.

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C-6.1 (cont.)

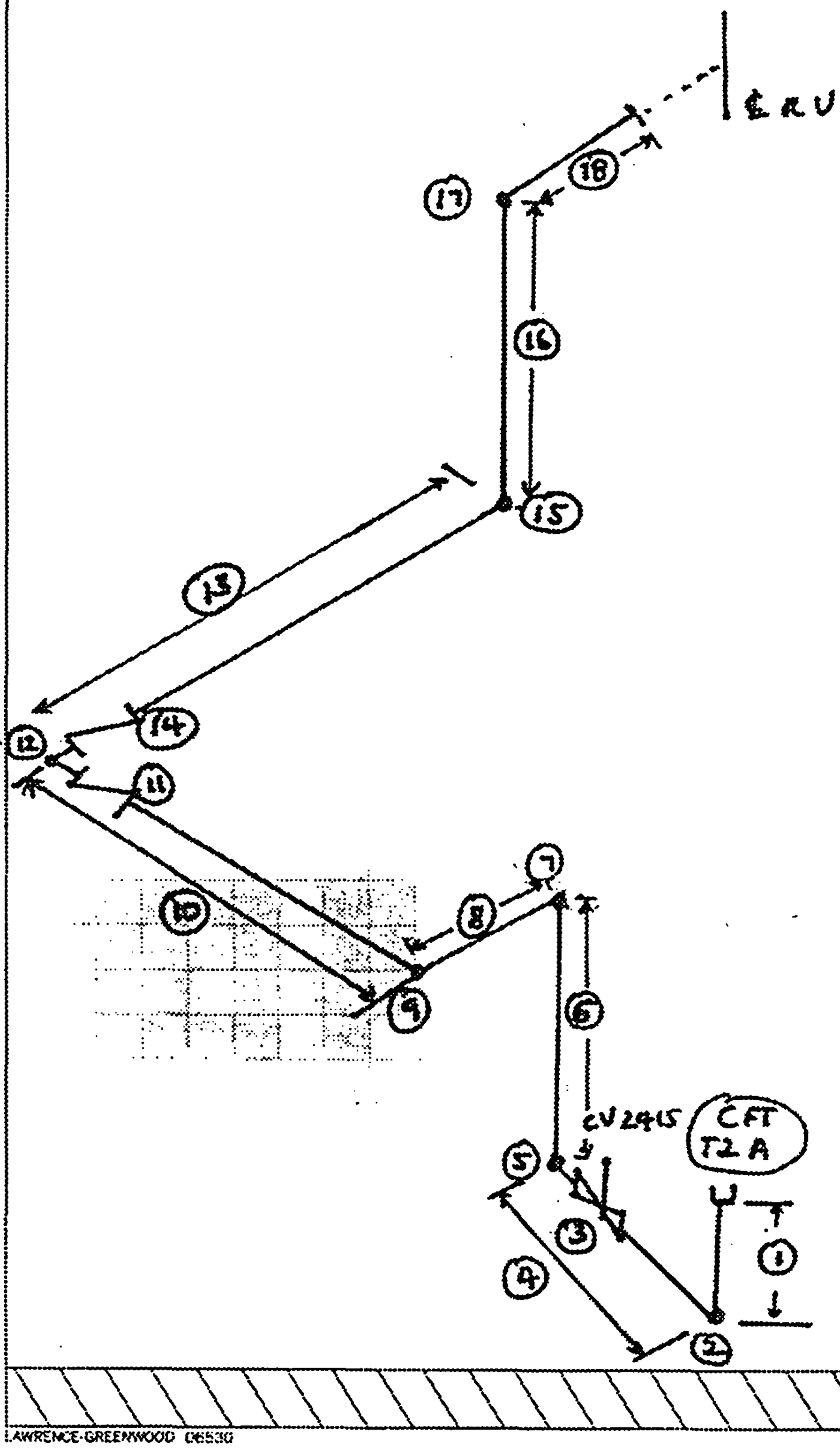

FIGURE 6.1.1

Ref: Dwg. 6-CF-1 [7]
All Pipe 14" SCH 40.

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6.2 6-17 : NAcum: Number of Operational cold Leg Accumulators.

Credit One Core Flood Tank (Accumulator)

for all sequences per Project Task Plan [8].

$\boxed{NAcum = 1}$

6.3 6-18 : NHPI : Number of Operational HPI Pumps

Credit one train of HPI (Ref. Project Task Plan [8])

$\boxed{NHPI = 1}$

6.4 6-19 NLPI : Number of operational LPI Pumps.

Credit one train of LPI (Ref. Project Task Plan [8]).

$\boxed{NLPI = 1}$

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6.5 6-13 NFN: Number of Operating Fan Coolers

Credit One train of Reactor Building Fan Coolers (RBFC) (Ref. Project Task Plan [8]).

$\boxed{NFN=1}$

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6.6

6-55 – 6-67; 6-83 – 6-87

NSPPT
ZHDSP(I)
WVSP(I)
ZHDRSP(I)

SPRAY PUMP CURVE

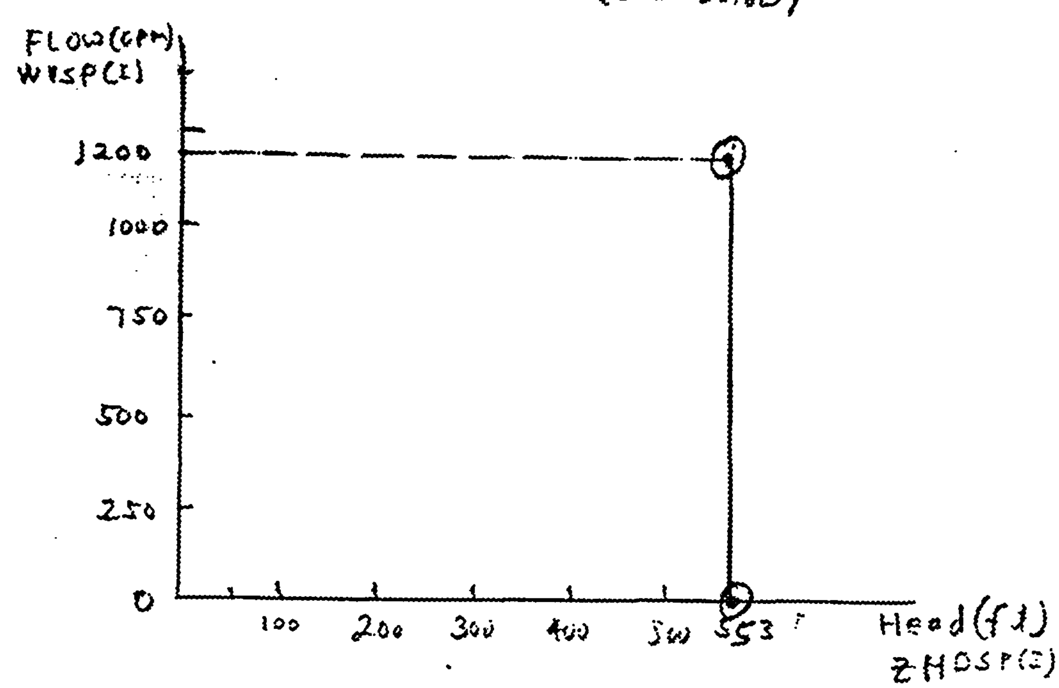
The spray pump curve developed for the base model [1] is replaced by a constant flow rate curve equal to 1200 GPM per the project task plan [8]. The shutoff head from the original curve is retained.

The revised curve is sketched below:

6-57

NSPPT = 2

(see below)



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6.6 (Cont.)

6-58-6-62 ZHDSP(I): Spray Pump Head.

Only two points are required to define the constant-flow spray pump curve. When the actual system head exceeds the shutoff head, the value of flow corresponding to the shutoff head (i.e., 0.0) is assigned to the flow. Similarly, when the system head is less than the smallest ZHDSP(I), the value of flow corresponding to the smallest ZHDSP is calculated. Therefore, only two head-flow values are required.

6-58 ZHDSP (1) = 553 ft

6-59 ZHDSP (2) = 552.9 ft

6-60 - 6-62 ZHDSP (3,4,5): Not Used

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6.6 (cont)

6-63-6-67 WUSP(I) Volumetric flow rate in spray pump head-flow curve.

$\boxed{6\text{-}63}$ $\boxed{WUSP(1) = 0.0 \text{ gpm}}$

$\boxed{6\text{-}64}$ $\boxed{WUSP(2) = 1200 \text{ gpm}}$

$\boxed{6\text{-}65 - 6\text{-}67}$ WUSP(3,4,5): Not Used.

$\boxed{6\text{-}83 - 6\text{-}87}$ ZHORSP(I) NPSH required for spray pump

This table must be revised for consistency with the revised spray pump head-flow curve. Interpolation in the original head-flow-NPSHR tables [1] results in an NPSHR of 12.0 ft at 1200 gpm. This is the value used here for the required NPSH. At the shut-off head (553 ft, 0.0 gpm flow), the corresponding NPSHR from the base deck [1] is used (i.e. ZHONSP(1)).

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C-6.6 (cont.)

Therefore,

6-83 $\boxed{ZHDRSP(1) = 9.3\ ft}$ [1]

6-84 $\boxed{ZHDRSP(2) = 12.0\ ft}$

(Corresponds to 1200 gpm)

6-85 - 6-87 ZHDRSP(3, 4, 5): Not Used.

6.7 6-88 NSPA: No. Operating Spray Pumps

Credit one spray pump train (Ref. Project Task Plan [8]):

$\boxed{NSPA = 1}$

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6.8 6-107: XDFNFC: Fan Cooler Fin Diameter.

Recalculated per clarified definition in UG ([3], Rev. 8/92).

$$XDFNFC = r_{f_{eff}} - r_T,$$

where $r_{f_{eff}}$ = effective radius of fin.
r_T = radius (outside) of tube

$$r_{f_{eff}} = \frac{XDFNFC}{2} = \frac{0.143}{2} = \underline{0.0715\,ft}$$

([1], C-6-107)

$$r_T = \tfrac{1}{2}(XIDTFC + 2 * XTTFC),$$

XIDTFC = Tube ID = 0.0454 ft
([1], C-6-111)

XTTFC = Tube Thickness = 0.0040 ft
([1], C-6-108)

$$r_T = \tfrac{1}{2}(0.0454 + 2 * 0.0040)$$

$$r_T = \underline{0.0267\,ft}$$

$$XDFNFC = 0.0715 - 0.0267$$

$$\boxed{XDFNFC = 0.0448\,ft}$$

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6.9

6-134 XTCRH. Tube-to-Tube pitch in RHR HXS

Per ZION-RIB.PAR [2], definition of XTCRH is changed to tube pitch, not separation, as used in Ref. 1. From C-6-B4 [1.], or Ref. 8,

$$\boxed{XTCRH = 15/16'' = 0.0781\ ft}$$

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6.10

6-159 - 6-163 WVAFW (I), I = 1, 2, 3, 4, 5
Volumetric flowrate in AFW pump curve.

Per User Guide [3], 6/92 Update, MAAP assumes one AFW pump per SG. Therefore, the WVAFW (I) values represent flow PER STEAM GENERATOR. The ANO-1 SAM AFW Head-Flow curve is based on P-7B supplying EFW flow to to both OTSG's. (i.e. credit from B EFW only) per Task Plan [8]. WVAFW (I) values from [7] are multiplied by 0.5 to convert these total flows to flow per SG.

6-159 WVAFW(1) = ½ (0.0) = 0.0 GPM

6-160 WVAFW (2) = ½ (300) = 150 GPM

6-161 WVAFW (3) = ½ (400) = 200 GPM

6-162 WVAFW (4) = ½ (600) = 300 GPM

6-163 WVAFW (5) = ½ (1050) = 525 GPM

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6.11

7-172 - 7-175: These parameters are new for R18 but are used only with Generalized ESF model [2]. This model does not use Generalized ESF. Therefore, the default values from the ZION_R18.PAR [2] parameter file are retained.

7-172: TDLP2 = 1.E3 HR

7-173 TDSPC = 1.E3 HR

7-174 WSPCX = 1.E10 lb/hr

7-175 WLP2X = 1.E10 lb/hr

6.12

7-176: BYPASS: Flag to direct excess LPI flow during piggybacking.

This parameter new for R18 (cf. UG [3], Rev. 8/92) In this model, bypass flow is not accounted for.

$\boxed{\text{BYPASS} = 0}$

7. Upper (A) Compartment (Group #7)

7.1 7-08 XLOWA: Outer Wall Liner Thickness.

A separate outer containment wall steel liner is added per SAIC recommendations, with, no liner/containment gap assumed (Ref. 10, Table 2).

Affected Parameters: XLOWA (7-08),
RGOWA (7-09)
XTGAP (8-08)
XLOWD (9-06)
RGOWD (9-07)

$\boxed{XLOWA = 2.133E\text{-}2\ ft^2}$

(Ref. Table 2, Ref. 10)

7.2 7-09: RGOWA: Outer wall/liner gap resistance
8-08: XTGAP: Distance (gap) between Contmt. liner and concrete wall.

As noted in 7.1, no liner-contmt gap is modeled. Therefore, set

$\boxed{RGOWA = 0.0}$

$\boxed{XTGAP = 0.0\ ft}$

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7.3

7-34 FSPA: Fraction of upper compartment spray water that runs into the refueling pool.

Per Project Task Plan (ANO request), [8], 1/4 of spray flow should run into the cavity from the refueling pool. Therefore, set FSPA = 0.25 to force 25% of spray flow into the refueling pool, and set FWRPB to 0.0 to force this 25% flow from the refueling pool into the cavity.

$$\boxed{FSPA = 0.25}$$

7-35 FWRPB: Fraction of refueling water draining out of the refueling pool that flows into the lower compartment -: remaining fraction flows into the cavity.

$\boxed{FWRPB = 0.0}$

(see FSPA descussion, above).

7.4

7-36 PCF: Failure pressure of Containment.

The ANO-1 Model uses the simple Containment failure model with a failure pressure of 154.3 psia. [2].

$\boxed{PCF = 154.3 \text{ psia}}$

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7.5

7-37: FCFA: Containment failure Location Flag.

Per Ref. 8, failure is assumed to occur at the personnel hatch. Per Dwg C-102, [11] hatch elevation center line is at 394'-0". This places the hatch in the Annular Compartment. Thus

$\boxed{FCFA = 0}$

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7.6 7-53 : ZSPA2 : Elevation of Upper Compartment Spray header #2.

This parameter added for R17. Set equal to zero consistent with the UA ([3], Rev.4/91).

$\boxed{ZSPA2 = 0.0}$

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Group 9: Annular (D) Compartment

9.1 9-06: XLOWD: Wall Liner Thickness

$\boxed{XLOWD = 2.133 E\text{-}2 \text{ ft}}$

(See XLOWA, #7-08, C-7.1)

9.2. 9-07 RGOWD: Outer Wall-liner gap resistance.

$\boxed{RGOWD = 0.0}$

(See RGOWA, #7-09 C-7.2)

9.3 9-19 ADGRAT: Total Upward Gas flow Area in the compt. at the grating elevation.

AGRATE renamed to ADGRAT for R17. [2].

Value has not changed from base model (Ref. 1).

$\boxed{ADGRAT = 1797.65 \text{ ft}^2}$

([1], C-9-19)

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GROUP 10. INITIAL CONDITIONS

10.1 10-17: TSGOHL - Initial temperature of water and gas in SG for half loop operation.

10-17 – 10-21 added to R17 for half-loop operation. In this model, half-loop operation parameters are not used (see C-2.4).

Therefore, values from the default parameter file (7ION-R18.PAR [2]) are retained. (Converted to British Units):

$\boxed{TSGOHL = 295\,K = 71.3F}$ [2]

10.2 10-18 MWSGHL: Initial S/G water mass

$\boxed{MWSGHL = 0.0\ lb}$

(See C-10.1)

10.3 10-19: PSGOHL: Initial Pressure in S/G

$\boxed{PSGOHL = 14.5\,psia}$ (1.E5 Pa).

(see C-10.1)

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$\boxed{10.4}$ 10-20: ZWPSHL: Initial water level above top of core

$\boxed{\text{ZWPSHL} = 1.5\ \text{m} = 4.92\ \text{ft}}$

(Ref C-10.1)

$\boxed{10.5}$ 10-21 MWPSHL: Initial water mass of Primary System

$\boxed{\text{MWPSHL} = 0.0\ \text{lb}}$

(See C-10.1)

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Group 11: Control Cards

11.1 11-03 IRUNG: Integration Method - Runge-Kutta order 1 or 2.

IRUNG added for R18. Use first order

(IRUNG=1) per FAI recommendations

(See ZION-R18.PAR [2] and UG Rev. 8/92 [3])

$\boxed{IRUNG=1}$

11.2 11-07: IPLMAP: Plotting routine flag.

IPLMAP Obsolete beginning with R17

(Ref. ZION-R18.PAR [2])

11.3 11-10: IPLTI: Option flag for PLTMAP variable label length in plot files.
=1; A8 format
=2; A15 format

Per ZION-R18.PAR [2], IPLTI was redefined

for R17. Option 1 is selected for the ANO1

Model: $\boxed{IPLTI=1}$

11.4 11-15 IRECIR : ESF Pump Lineup Flag in Recirculation.

Figure 6.4, pg. 6.84 of Ref 1 shows the ANO-1 ESF line-up. In recirculation, Sprays continue to operate, and LPI takes suction from the sump and discharges via DHR coolers, to the suction of the HPI pumps. This alignment is consistent with type #2 . shown in Figure 3 of the ENGSAF subroutine description in the MAAP Users Manual [11]. Note that ANO-1 does not have a spray heat exchanger. This is modeled by deactivating the spray heatexchanger in the parameter file.

IRECIR = 2

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11.5 11-31: IBALAN - Flag to perform mass and energy balances.

IBALAN new for R18. Per UG [3], IBALAN set equal to zero to avoid writing mass/energy balances.

$\boxed{IBALAN = 0}$

(Ref. ZION.R18.PAR [2], UG, Rev. 8/92 [3])

11.6 11-32 IRSBAD: Flag to control restart file write option.

New for R18. Set to zero to avoid writing restart files (see description in UG [3], Rev. 8/92).

$\boxed{IRSBAD = 0}$

(See also ZION.R18.PAR [2]).

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GROUP 12: TIMING DATA

12.1 12-05: MFCHMX : Relative mass change to select time step.

This parameter reduced from 0.05 = value from the base model ([1], C-12-1) to the recommended value from the default parameter file (ZION_R18.PAR [2]).

$\boxed{MFCHMX = 0.025}$

12.2 12-08: MFCHFP: Relative mass change in fission products used to select time step.

Recommended value of MFCHFP Reduced to 0.025 for R17 per the default parameter file (ZION_R18.PAR [2]).

$\boxed{MFCHFP = 0.025}$

Note: Above values not reflected in the UG ([3], Rev. 414).

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12.3 12-18 FPPSHL: Rate of Primary System pressure change controlling time step [during half loop operations].

FPPSHL added for R17. Half loop operations is not modeled in the ANO-1 SAM model (recall C-2.4) and FPPSHL is not used. Thus, the value from the default parameter file (ZION-R10.PAR [2]) is retained.

$\boxed{FPPSHL = 0.01}$

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GROUP 13: Steam Generator

13.1 13-01: VSG: Secondary side free volume

Recalculated per SAIC comments [10].

VSG should be volume per OTSG. In the base model, V.SG was calculated for both OTSGs to be 9765 ft³.

(Ref C-13-01, Ref. 1).

$\therefore$ VSG = ½ (9765)

$$\boxed{VSG = 4882.5\ ft^3}$$

13.2 13-12: PSGRV: Opening (set) pressure of a main steam relief valve.

"Large" value of PSGRV used in Ref 1 (C-13-12) reduced to avoid diagnostics on exceeding steam table limits (cf. SAIC Calculations, Att 1 [10])

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$$\boxed{PSGRV = 2.5E3 \text{ psia}}$$

13.3 13-37 MSHEL: Total Mass of S/G Shell.

Recalculated per expanded definition in the User Guide ([3], Rev. 3/92). and ZION-INIG. PAR [2]. MSHEL should not include 50% of the tube sheet masses as in the original calculation [1].

Thus,

$$\boxed{MSHEL = M_s = 501,089 \text{ lb}}$$

(Ref C-13-37, [1]).

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13.4 13-45 – 13-52 Table of water volume vs. height for Secondary side of OTSG.

This table added for R18 and is described in ZION-R18.PAR [2]. The table entered here is the height vs. volume table calculated for the ANO-1 CEPAC data base (Calcs 9.1-9.14, Ref. 12). (The CEPAC table contains downcomer volume vs. height above tube sheet data, which is equivalent to this table).

13-45 NZPTS: No. of points in volume vs. height table

$\boxed{NZPTS = 7}$ [12]

The volume vs. height table is Table 13.1 on the following page.

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TABLE 13.1

MAAP Secondary OTSG Volume Vs. Height Table

Parameter #	Volume Param. Name	Value (ft³)	Parm. #	Height Parm Name	Value (ft)
13-46	VOFZSG(1)	0.0	13-56	ZOFSG(1)	0.0
13-47	VOFZSG(2)	11.9	13-57	ZOFSG(2)	0.5
13-48	VOFZSG(3)	83.1	13-58	ZOFSG(3)	3.5
13-49	VOFZSG(4)	201.85	13-59	ZOFSG(4)	8.5
13-50	VOFZSG(5)	550.98	13-60	ZOFSG(5)	23.2
13-51	VOFZSG(6)	757.6	13-61	ZOFSG(6)	31.9
13-52	VOFZSG(7)	778.98	13-62	ZOFSG(7)	32.8
13-53 - 13-55	Not Used		13-63 - 13-65	Not Used	

(Ref. CEPAC Data Base Calcs 9.1-9.44 [12])

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Group 14: Core

14.1 14-65: MFFESS: Mass fraction of Fe in Stainless Steel.

Parameters 14-65 - 14-67 new for Rev. 18.

Default values from ZION_N18.PAR [2]

are used in this model (see also UG [3], Rev. 8/91)

$\boxed{MFFESS = 0.78}$

14.2 14-66: Mass fraction of Cr in Stainless Steel

$\boxed{MFCRSS = 0.16}$ [2], [3]

(see C-14.1)

14.3 14-67: MFNISS: Mass fraction of Ni in Stainless Steel.

$\boxed{MFNISS = 0.06}$ [2], [3]

(see C-14.1)

Group 15: Quench Tank

$\boxed{15.1}$ 15-06: NQT: Quench Tank Location selection flag.

NQT added for R18 (Ref UG[3], Rev. 8/91).

Per Calc. 15.04 of [1], the Quench Tank is located on the floor of the Lower Compartment. Therefore,

$$\boxed{NQT = 0}$$

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GROUP 17: FISSION PRODUCTS

17.1 17-31 – 17-42
Fission Product Group Decay Heat Array
(FQP array).

The FQP array is new for MAAP Rev. 18.

No ANO-1 specific values are calculated.

Instead, the latest default values recommended

by FAI are entered (see discussion in UG [3],

Rev. 8/92 or MAAP FLASH Issue No. 12 [13]).

17-31: FQP(1) = 0.03
17-32: FQP(2) = 0.17
17-33 FQP(3) = 0.02
17-34 FQP(4) = 0.04
17-35: FQP(5) = 0.02
17-36: FQP(6) = 0.01
17-37: FQP(7) = 0.02
17-38: FQP(8) = 0.27
17-39: FQP(9) = 0.03
17-40: FQP(10) = 0.006
17-41: FQP(11) = 0.02
17-42: FQP(12) = 0.16

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GROUP 18: MODEL PARAMETERS

18.1 18.02: ACFSTR: Leak-before-break containment leakage area.

ACFSTR is not used for the simple containment failure model used here (cf. PCF, Upper Compt. Variable # 36) (Ref. Users Guide update 6/11/92 [3]).

Therefore, ACFSTR is set equal to the User Guide default value:

$\boxed{ACFSTR = 0.0\ ft^2}$

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18.2

18-04: ACFPR: Failure area used by simple containment failure model.

(Recalculate to implement simple failure model per [8])

For C-7.5, failure is assumed to occur at the personnel hatch (the ANO-1 SAM model uses the simple containment failure model). MAAP experience has shown:

(1) For most cases, slow containment pressurization and a leak-before-break failure mode is expected. Failure areas of $\sim 0.005 m^2$ ($0.0538 ft^2$) are recommended [14].

2) For cases in which failure is due to rapid pressurization (e.g. H_2 burns, DCH), a large failure area of $\sim 0.1 m^2$ ($1.076 ft^2$) is recommended [1].

The recommended small failure area is selected

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this model as this is believed to be most consistent with the most probable containment failure mode.

$$\boxed{ACFPR = 0.00538 ft^2}$$ [14]

$(= 0.005 m^2)$

18.3 18-06/TDSTX: Time Delay after corium contacts floor to trigger steam explosion.

TDSTX New for the Rev. 17 code. Nominal value recommended in the Users Guide [3] is selected.

$$TDSTX = (0.1 sec)(1/3600)$$

$$\boxed{TDSTX = 2.778 E-5 \text{ Hr}}$$

$(= 0.1 sec)$.

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19.4

18-10/FAOUT: Fraction of S/G tubes carrying out flows in the hot leg natural circulation model.

FAOUT changed from 0.2 to 0.3 per User Guide recommendation ([3], Rev. 4/91)

$\boxed{FAOUT = 0.3}$

19.5

18-13 FCMDA: Corium Entrainment Flag.

(Revisited for ANO-1 SAM model).

Corium entrainment is expected to take place between cavity and lower compartment via the instrument tunnel.

Therefore, FCMDA is set to zero per Users Guide [3]: (and GKA recommendation [14])

$\boxed{FCMDA = 0}$

Note: May be revised as a result of sensitivity calculations.

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18.6 18-14/FCMOCH: Fraction of entrained corium mass assumed to be finely fragmented and to interact completely with the gas of the compartment to which it is entrained.

A best-estimate value of 0.03 is recommended by GKA [14]. This is also the value selected by SAIC for the benchmark studies [10]:

$\boxed{FCMOCH = 0.03}$

Note: May revise based on sensitivity studies.

18.7 18-15/FSSCL: Stainless Steel Clad Flag. (New for Rev. 18 Stainless Steel Clad Option).

Per description in the default parameter file [2]:

$\boxed{FSSCL = 0.0}$

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18.8

18-16 TSSMP: Melting Point for Stainless Steel and Oxide
(New for Rev. 18 SS Clad Option).

N/A for ANO-1 (FSSCL = 0) Value from default parameter file [2] will be used.

$\boxed{TSSMP = 2780.3\,^\circ F}$

(= 1800 K)

18.9 18-17: FFEOX: Moles O_2 Per Mole Fe in Iron Oxide
(New For Rev. 18 SS Clad Option).

N/A for ANO-1 (FSSCL = 0). Value from default parameter file [2] entered here.

$\boxed{FFEOX = 1.15}$

18.10 18-18 / FGCSSR: Mole Fraction of H_2 for iron/iron oxide equilibrium.
(New for Rev. 18 SS Clad option)

$\boxed{FGCSSR = 0.6667}$ [2]

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18.11 18-23 FVOL : Volumetric Steam Generation void fraction coefficient.

Revised per latest recommended value from the default parameter file (ZION.R18.PAR [2]).

$\boxed{FVOL = 2.0}$

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18.12 Emissivities (#25 - #29) changed to FAI/GKA recommended values (Refs. 2, 3, 14). Were based on empirical calculations (see Ref. 1).

18-25 EW : Emissivity of Water

$\boxed{EW = 0.90}$

18-26 EWL: Emissivity of Walls

$\boxed{EWL = 0.85}$ (Unchanged)

18-27 EEQ: Emissivity of equipment

$\boxed{EEQ = 0.85}$ (Unchanged

18-28 ECM: Emissivity of corium surface

$\boxed{ECM = 0.85}$ (Unchanged)

18-29 EG: Emissivity of Gas

$\boxed{EG = 0.6}$ (Unchanged).

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$\boxed{18.13}$ 18-31 FENTR: Critical Superficial Gas Velocity multiplier for debris entrainment.

FENTR is used as a multiplier on the minimum superficial gas velocity for entrainment (UCMFL). When the cavity gas velocity (UTN) is less than UCMFL, no entrainment occurs. When UTN > UCMFL, entrainment is predicted. The equations are

No entrainment: $UTN \leq UCMFL * FENTR$

Entrainment: $UTN > UCMFL * FENTR$.

So, $FENTR \geq 1$ limits entrainment, i
$0.0 < FENTR < 1$ eases requirement for entrainment. For the SAM model, a value of 1.0 per GKA recommendations [14] is used.

$\boxed{FENTR = 1.0}$

Note: See also Sensitivity calcs., Sec. 4.35.

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18.14 18-33/ FCHF : Flat plate critical heat flux critical velocity coefficient.

Per GKA Sensitivity Studies [14], FCHF should be between 0.10 and 0.02, 0.02 applicable for debris thickness ≥ 25 cm. SAIC used 0.02 for all benchmark runs (Table 3, Ref. 10). Therefore, FCHF is set equal to 0.02 in the MAAP SAM model:

$\boxed{FCHF = 0.02}$

18.15 18-35/ FCOBRK: LOCA pipe break discharge coefficient

Revised recommended value from 1.0 to 0.75 per FAI (Ref. ZION-RIB.PAR [2])

$\boxed{FCOBRK: 0.75}$

See also sensitivity calculations, sec. 4.3.3.

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18.16 18-40/FAEROC: Multiplier to determine when steady-state aerosol correlations should be utilized.

Revised per GKA Recommendation [14]. SAIC also uses the revised value for their benchmark calculations (cf. Table 3 [10]).

FERDC = 8.0

18.17 18-46/TCLMAX: Cladding failure temperature provided it has not previously ruptured.

TCLMAX changed from 2100K to 1200K per GKA recommendations [14] and FAI default parameter file [2].

TCLMAX = 1700.3°F

(= 1200K)

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18.18 18-45 FCDDC: Fraction of perfect condensation of steam entering downcomer through flapper valves (B&W units only).

Default value of FCDDC (0.0) was revised for Rev. 18 to 1.0. This is considered the "best estimate" value [2]. However, The GKA Sensitivity Analyses recommend a value of 0.75 for B&W plants. [14].

Therefore, set

$$\boxed{FCDDC = 0.75}$$ [14]

See also Sensitivity calculations, Sec. 4.3.3.

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19.19 18-53/FFRICR: Friction Coefficent for axial flow.

ANO-1 Rev. 16 base model [1] calculates a FFRICR value of 0.039 (See C-18.53). FAI recommends a value of 0.1 ([2], [3]). The EPRI Sensitivity Study (GKA) recommends a value of ~0.1. [14]. SAIC benchmark calculations also specify 0.1 (Table 3, [10]). FFRICR is thus revised to 0.1 for this model.

$\boxed{FFRICR = 0.1}$

18.20 18-54/FNCBP: RV Natural circulation path selection Flag.

Value changed to 1.0 for B&W plant due to large bypass flow area (See SAIC discussion, sh. 3, Ref. 10)

$\boxed{FNCBP = 1}$

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18.21 18-55/TCPFAL: Temperature of core node that defines Core plate failure.

Model parameter #55 was VFCRBL in the Rev. 16 model [cf. C-18-55 [1]]. TCPFL was introduced for Rev. 18 of MAAP.

TCPFL should be set 1°K higher than TEU [15]

Or, if the default core support plate model is used, TCPFL should be commented out. [2].

In the ANO-1 SAM model, the default model is used and TCPFL is not calculated.

$\boxed{\text{TCPFL = Not Used}}$

18.22 18-57/FFRICX: Cross-flow friction coefficient in Natural Circulation model.

FFRICX revised from -0.25 to +0.25 per EPRI Sensitivity Analyses (GKA) [14].

$\boxed{\text{FFRIX = 0.25}}$

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18.23

18-59/VFSEP: Void fraction in primary system above which phases separate and two-phase natural circulation stops.

Default value of 0.6 [2] is good for W, CE plants. A low value (~0.02) is recommended in the EPRI Sensitivity Analyses report [14] for B&W plants. It is not clear, however, that the MAAP models have been upgraded to allow use of small values of VFSEP. Therefore, 0.6 is retained in the base ANO-1 SAM model. Sensitivity calculations will be performed (cf. Sec. 4.3.3) to determine whether or not the 0.02 value recommended for B&W plants [14] should be used.

$\boxed{VFSEP = 0.60}$

18.24 18-65/ FCRDR : Fraction of original core mass below which remaining core is dumped into reactor cavity after vessel failure.

FAI recommends a value of 0.1, or 0.5-0.6 for special cases (See discussion in Ref. 3.). SAIC benchmark calculations [10] used a value of 0.5 for all sequences. (i.e. model core hang-up in vessel). This is the value specified here for the ANO-1 SAM analyses.

$\boxed{FCRDR = 0.5}$

18.25 18-68/ FCRBLK : Flag to describe core melt/local node blockage.

A value of zero (no blockage) is recommended by FAI [2]. (revised for PWR Rev. 17).

$\boxed{FCRBLK = 0.0}$

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18.26 18-76 / FHTPRI: Multiplier for a primary side condensation heat transfer coefficient during reflux cooling.

FHTPRI added to PWR Rev. 17 for half-loop operation. Half-loop operation is not included in this model (See C-2.4). Thus, the UG [3] value is entered here.

$\boxed{FHTPRI = 1.0}$

18.27 18-77 / FTENUR: Oxidized Zr mass fraction limit.

FTENUR is new for PWR Rev. 17 code.

Applies only to NUREG-0772/Kelly fission product release model. In this model, the EPRI/IDCOR Steam oxidation model is specified (FPRAT, C-18-50 [17]. Therefore, FTENUR is not used.

The default value from the Users Guide [3] is entered here.

$\boxed{FTENUR = 0.9}$

APPENDIX 2

ALTERNATE CONTAINMENT MODEL

There are a total of 23 pages in this appendix.

APPENDIX 2

Alternate Containment Lower Compartment/ Cavity Compartment Model

Purpose:

Purpose of the revised lower/cavity containment compartment model is to model corium/water migration from the cavity to the Incore Instrument (ICI) room, located at azimuthal angle 54° between the secondary shield wall and the containment outer wall (cf. Figure A2.1). The base ANO-1 containment model [1] assumes that the corium migration path from the cavity to the lower compartment is via the 30" dia. hatch located in the tunnel wall at EL. 338'9", 24 ft down the tunnel from the cavity centerline. The cavity volume for this

model includes the cavity region below the reactor pressure vessel (RV) and the portion of the instrument tunnel out to the hatch. The remaining length of the tunnel and the ICI room adjacent to the containment wall are included in the annular compartment, as is the ICI cavity above the ICI room. (cf Figure A.2.1).

The alternate containment model developed below redistributes the compartment volumes as follows:

- Tunnel volume out to the ICI room is included in the cavity compartment.
- ICI room and cavity are included in the lower compartment. The upper boundary of the ICI cavity is the lower boundary of the upper compartment.
- The ICI room and cavity volume is excluded from the annular compartment volume.

The purpose of the alternate model is to

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allow corium migration down the tunnel and into the ICI room. This path is not modeled by the base model developed in Reference 1, because MAAP does not calculate corium disperal from the cavity to the annular compartment. The alternate model is developed in the following calculations. Note that this model is intended only to provide an approximation to the ANO-1 containment by revising only the values of MAAP containment parameters considered to have the greatest affect on containment compartment temperatures and pressure and, ultimately, on containment failure timing. Other parameters (e.g., cavity fission product sedimentation area), whose value is affected by the alternate model, are not revised. The results of the calculations are summarized in Table A.2.1.

Group 5: Cavity Compartment

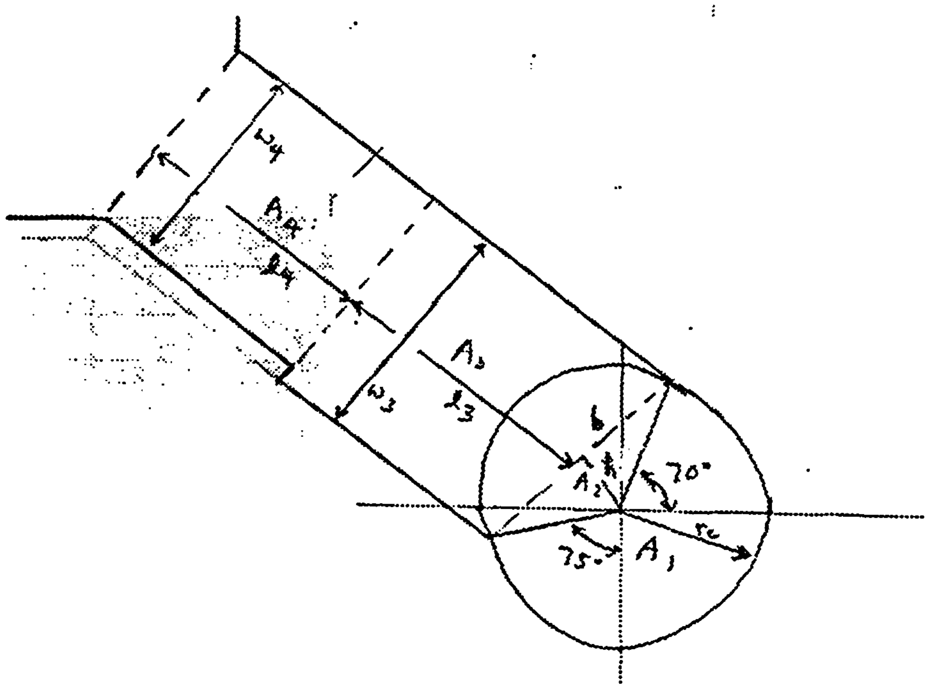
$\boxed{2.1}$ 5-02) APLC: Area of cavity debris and/or water pool.

The tunnel floor has negligible slope [7] and is therefore treated as a flat surface.

APLC is therefore given by

$$APLC = A_1 + A_2 + A_3 + A_4,$$

where the areas are shown in the sketch below.



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2.1 (cont.)

$$A_1 = \pi r_c^2 - \tfrac{1}{2} r_c^2 \alpha = r_c^2 (\pi - \alpha/2)$$

$r_c = 6.0$ ft. [18]

$\alpha = 360° - 90 - 70 - 75 = 125° = 2.18166$ rad

(Scaled from [18]. See C-5-02, Ref. 1)

$$A_1 = 36 [\pi - \tfrac{1}{2}(2.18166)] = \underline{73.827 \text{ ft}^2}$$

$$A_2 = \tfrac{1}{2} b h;$$

$$b = 2 r_c \sin(\alpha/2) = 2(6)\sin(2.18166/2) = 10.644'$$

$$h = r_c \cos \alpha/2 = 6 \cos(2.18166/2) = 2.771 \text{ ft.}$$

$$A_2 = \tfrac{1}{2} (10.644)(2.771) = \underline{14.747 \text{ ft.}}$$

$$A_3 + A_4 = w_3 l_3 + w_4 l_4$$

$w_3 = 11.0$ ft $\quad w_4 = 10.0$ ft. [18]

$l_3 = 13.0 \text{ ft} - h = 13.0 - 2.771 = 10.229$ ft [18].

$l_4 = 24.0 - h + \tfrac{1}{2}(3.333 \text{ ft}) + 9.0 \text{ ft}_a - l_3$

where 9.0 ft is scaled from Dwg C-167 [18].

$l_4 = 21.67$

$\therefore A_3 + A_4 = (11.0)(10.229) + (10.0)(21.675)$

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2.1: (cont.)

$A_3 + A_4 = \underline{329.21\ ft^2}$

$APLC = 73.82 + 14.74 + 329.2$

$$\boxed{APLC = 417.76\ ft^2}$$

2.2 5-07 | VC4: Cavity free volume.

VC4 is revised to include the volume of the tunnel downstream of the equipment hatch center line.

V_1: Volume of RV annulus:

$\underline{V_1 = 2783.7}$ ([1], C-5-07)

V_2: Volume below RPV:

$\underline{V_2 = 664.4\ ft^3}$ ([1], C-5-07).

V_3 ; V_4: Tunnel & keyway Volume.

$V_3 = (ATN4)\ L_T$

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2.2 (cont.)

$A_{TN\phi} = 41.25\ ft^2$ ([1], C-5-05)

$L_T = l_s = 10.229\ ft$ (C-2.1)

$V_3 = (41.25)(10.229) = \underline{421.95\ ft^3}$

$V_4 = (A_{KEY})\,L_4 = \underbrace{(58.33)}_{([1],\ C\text{-}5\text{-}06)}\underbrace{(21.67)}_{C\text{-}2.1}$

$V_4 = \underline{1264.01}$

$\therefore\ V_{C\phi} = 2783.7 + 664.4 + 421.95 + 1264.01$

$\boxed{V_{C\phi} = 5134.1\ ft^3}$

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2.3

5-19) ATNEX: Minimum flow area connecting cavity to the lower compartment through the tunnel.

ATNEX in the alternate model is equal to the tunnel cross-sectional area; ATNO from C-5-05 of Ref. 1,

$\boxed{ATNEX = 41.25\,ft^2}$

ENTERGY

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2.4 S-20: XRBRC - Cavity characteristic radius for H_2 Burns

Using methodology from C-5.20 of [1]:

$$XRBRC = \sqrt{\frac{APLC}{\pi}}$$

From C-2.1: APLC = 417.76 ft^2

$$\therefore \quad \boxed{XRBRC = 11.53\ ft}$$

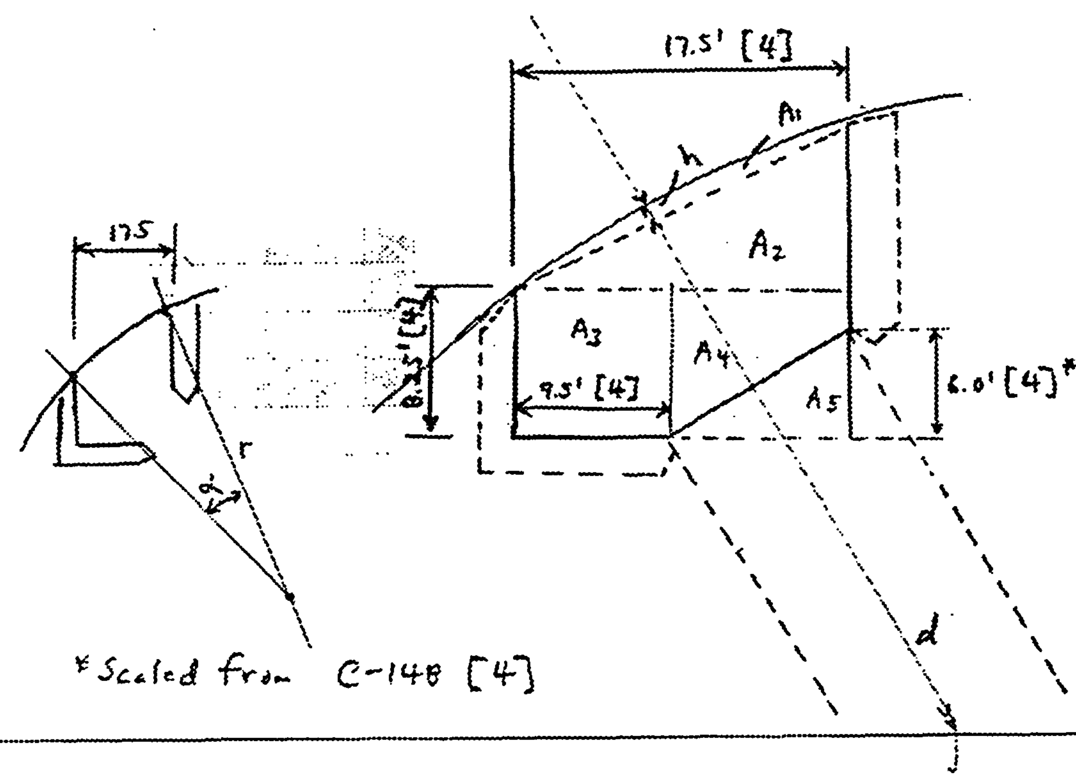
GROUP 8: LOWER COMPARTMENT

2.5 8-02 ACMPLB: Area of corium pool.

Per Users Guide [3], ACMPLB is equal to the floor section outside the tunnel accessway. In this model, this area is equal to the ICI room floor area (see sketch below). The total area is

$$ACMPLB = A_1 + A_2 + A_3 + A_4 + A_5$$

(Note that A_5 is included in ACMPLB. Although this region is in the Cavity (see C-2.1), it is also credited in ACMPLB)



*Scaled from C-148 [4]

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2.5: (cont.)

$$d = \frac{1}{2}\sqrt{4r_{CT}^2 - 17.5^2} = \frac{1}{2}\sqrt{4(58)^2 - 17.5^2} = 57.3362$$

$$h = r_{CT} - d = 58 - 57.3362 = 0.6638$$

$$\alpha = 2\cos^{-1} d/r_{CT} = 2\cos^{-1}\left(\frac{57.3362}{58.0}\right) = 0.3029 \text{ rad}$$

$$A_1 = \frac{1}{2} r_{CT}^2 \alpha - \frac{1}{2}(17.5)(d)$$

$$A_1 = \tfrac{1}{2}(58)^2(0.3029) - \tfrac{1}{2}(17.5)(57.3362)$$

$$\underline{A_1 = 7.786 \text{ ft}^2}$$

$$A_2 = \tfrac{1}{2}(17.5)(17.75-6) = \underline{102.813 \text{ ft}^2}$$

$$A_3 = (9.5)(8.25) = \underline{78.375 \text{ ft}^2}$$

$$A_4 = \frac{1}{2}(17.5-9.5)(8.25) = \underline{33.0 \text{ ft}^2}$$

$$A_5 = \frac{1}{2}(17.5-9.5)(6.0) = \underline{24.0 \text{ ft}^2}$$

ACMPLB = 7.786 + 102.813 + 78.375 + 33.0 + 24.0

$\boxed{\text{ACMPLB} = 245.97 \text{ ft}^2}$ $(= 22.85 \text{ m}^2)$

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2.6 8-03) ZCURBB: Height of curb over which water flows to the cavity compartment.

No curb separating lower and cavity compartments is modeled. The value of ZCURBB is therefore unchanged from the base model (=0.0, C-8-03 [1]).

$\boxed{ZCURBB = 0.0}$

2.7 VBØ: Lower Compartment free Volume. (8-05)

VBØ is equal to VBØ from the base model, plus the portion of the base model annular volume that defines the ICI cavity. (V_4)

Refering to C-8-05 [1]:

$$VB\phi = f \sum V_i = f(V_1 + V_2 + V_3 + V_4)$$

$$V_4 = (ACMPLB)H = (246)(357'\text{-}0'' - 336'\text{-}6'')$$

$$V_4 = (246)(20.5) = 5043.0 \text{ ft}^3$$

$$\sum V_i = 65{,}343.9 + 109{,}487.051 + 10{,}233.712 + 5043.0$$

$$\sum V_i = 190{,}107.66 \text{ and } f = 0.85 \ ([1], \text{C-8-05})$$

$$VB0 = (0.85)(190{,}107.66)$$

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		Reviewer	Date

C-2.7 (cont.)

$$\boxed{VB\phi = 161,591\ ft^3}$$

2.8 8-09 A¢WB: Half of total lower compartment outer wall surface area.

1) A¢WB in this alternate model will equal A¢WB from the base model plus the surface area of the ICS room wall separating the lower compartment from the annular compartment between 401.5' and 336.5' elevations.

2) A¢WB is not revised for this model. because a revised value would not significantly impact key results (i.e. time to containment failure).

$$\boxed{A\phi WB = 14,759\ ft^2}$$

(Ref. C-8-09 [1])

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2.9 8-17: AIWB: Half of lower compartment interior wall surface area.

Value from base model [1] is used. See Item (2), C-2.8.

$\boxed{AIWB = 887\ ft^2}$ (C-8-17 [1]).

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2.10

(8-24) AFB: Lower Compartment floor area.

AFB is equal to the value of AFB from [1] (AFB_0) plus the area of the floor outside the tunnel (ACMPLB) (C-2.5)

$AFB = AFB_0 + ACMPLB = 2811 + 245.97$

$$\boxed{AFB = 3057\ ft^2}$$

2.11

8-42: ASEDB: Sedimentation area for fission product settling on lower compt. Floor.

$ASEDB = ASEDB_0^* + ACMPLB$

$= 5622.0 + 246$

$$\boxed{ASEDB = 5868\ ft^2}$$

*(Ref C-8-42, [1])

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2.12

8-37 ABD Flow area of lower compartment into annular compartment.

ABD is equal to the original flow area (ABDo, [1], C-8-37) plus ACMPLB, which is the floor area of the ICI room. From C-2.5:

$ACMPLB = 245.97 \; ft^2$

$ABD_o = 1147 \; ft^2$ ([1], C-08-37)

$\therefore \; ABD = 1147 + 246$

$\boxed{ABD = 1393.0 \; ft^2}$

8-38 ABA Flow area of lower compartment into upper compartment.

ABA is unchanged from base model. Thus

$\boxed{ABA = 937.9 f^2}$ ([1], C-8-38)

Note: The effect of the increased value of ABD is negligible. Both ABD and ABA values ensure negligible ΔP between the annular, lower, and upper Compt.

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2-13 8-44: XRBRB: Characteristic radius of lower compartment for H_2 burns.

$$XRBRB = \sqrt{\frac{AFB}{\pi}} \quad (\text{cf. C-8-44, [1]})$$

$$= \sqrt{\frac{3057}{\pi}} \quad (\text{Ref C-2.10})$$

$$\boxed{= 31.2 \text{ ft}}$$

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Annular Compartment

2.14 9-01 : VD: Annular compartment free volume.

VD is equal to the annular compt. volume from the base model [1] (VD_o) less the volume of the ICI room included in the lower compartment (V_{LC}) less the additional tunnel volume (i.e. volume downstream of the center line of the equipment hatch) that was added to the cavity compt. (V_c).

$\therefore$ $VD = VD_o - V_{LC} - V_c$

$VD_o = \underline{301,672\ ft^3}$ (C-9-01 [1]).

$V_{LC} = 0.85\ V_{⑭} = 0.85\ (5043)$

$\underline{V_{LC} = 4286\ ft^3}$ (Ref C-2.7)

$V_c = AKEY * L,$

L = tunnel length from hatch centerline to ICI room.

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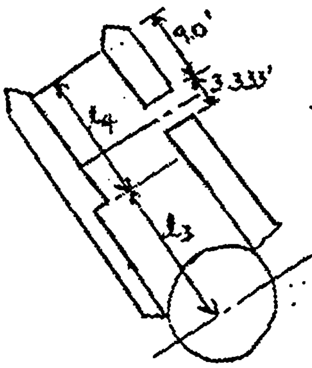
2.14 (cont.)

$$\underline{AKEY = 58.33\ ft^2} \quad (C\text{-}5\text{-}06\ [1]).$$
$$\underline{L = 9.0\ ft}$$

Note: L should include the region from the centerline to the outside radius of the equipment hatch. From C-2.1 (l_4 calculation), L should be $L = 9.0\,ft + \frac{1}{2}(3.333) = 10.667\,ft$. With this value of L, $VD = 296{,}764\,ft^3$. Thus the error introduced by L=9.0 is not significant.



$$V_c = (58.33)(9) = 524.97\,f^2$$

$$VD = 301{,}672 - 4286 - 525,$$

$$\boxed{VD = 296{,}861.\ ft^3}$$

2.15 9-02 ADPL: Area of annular compartment floor.

$$ADPL = ADPL_o - A_T - A_{ICI},$$

where $ADPL_o$ = base model annular floor area,
A_T = tunnel floor area past equip. hatch CL.
A_{ICI} = ICI room floor area.

$$ADPL_o = 4750 \quad (C\text{-}9\text{-}02\ [1])$$

$$A_T = (9.0)^*(10.0) = 90\,ft^2 \quad (\text{ref. } C\text{-}2.1,\ 2.14)$$

$$A_{ICI} = ACMPLB = 246\,ft^2 \quad (C\text{-}2.5)$$

* Should be 10.667 ft (C-2.14). Error is not significant

C-2.15 (cont.)

$$ADPL = 4958 - 90 - 246$$

$$\boxed{ADPL = 4622.0\ ft^2}$$

2.16 9-16: ASEDD: Sedimentation area for aerosol FP settling in annular compt.

$$ASEDD = ASEDD_0 - A_T - A_{ICE}$$

$$ASEDD_0 = 4958\ ft^2 \quad (C\text{-}9\text{-}16\ [1])$$

A_T, A_{ICE} given in C-2.15.

$$\therefore \quad ASEDD = 8633 - 90 - 246$$

$$\boxed{ASEDD = 8297.0\ ft^2}$$

2.17 9-28: XRBRD: Characteristic radius of annulare compt. for H_2 burns.

Using methodology from [1] (C-9-28):

$$XRBRD = \sqrt{\frac{ADPL}{\pi}} = \sqrt{\frac{4622}{\pi}} \quad (C\text{-}2.15)$$

$$\boxed{XRBRD = 38.36\ ft}$$

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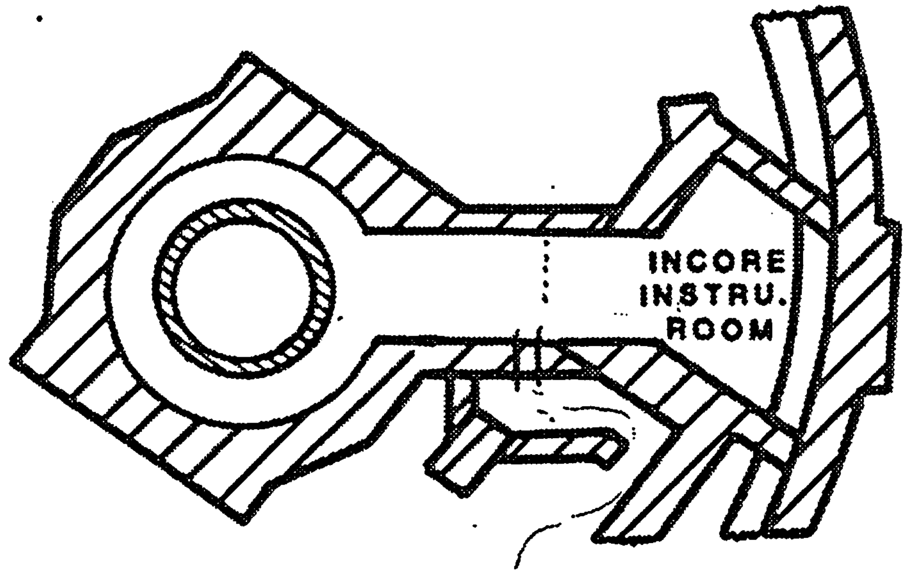
TABLE A.2.1

Summary of Changes to BWC Model to Create Alternate Containment Model.

Parameter No.	Name	BWC Model [1]	Alt. Model	% Δ
Cavity				
5-02	APLC	310 ft²	417.76 ft²	+ 35%
5-07	VCØ	4514.6 ft³	5134.1 ft³	+ 14%
5-19	ATNEX	4.91 ft²	41.25 ft²	+ 740%
5-20	XRBRC	9.93 ft	11.53 ft	+ 16%
Lower Compt.				
8-02	ACMPLB	78.517 f²	245.97 f²	+213%
8-03	ZCURBO	0.0 ft	0.0 ft	0.0%
8-05	VBØ	157,297 ft³	161,591 f³	+3%
8-09	AØWB	14,759 ft²	14,759 ft²	0.0%
8-17	AIWB	887 f²	887 ft²	0.0%
8-24	AFB	2811 f²	3057 ft²	+9.0%
8-42	ASEDB	5622 f²	5868 ft²	+4.4%
8-37	ABD	1147 f²	1393.0 ft²	+21%
8-38	ABA	937.9 f³	937.9 ft²	0.0 %
8-44	XRBRB	29.9 ft	31.2 ft	+ 4.35%
Annular Compt.				
9-01	VD	301,672 ft³	296,861 ft³	− 1.6%
9-02	ADPL	4959 ft²	4622 ft²	− 6.78%
9-16	ASEDD	8633 ft²	8297 ft²	− 3.9%
9-28	XRBRD	39.7 ft	38.36 ft	− 3.38%

fig 22



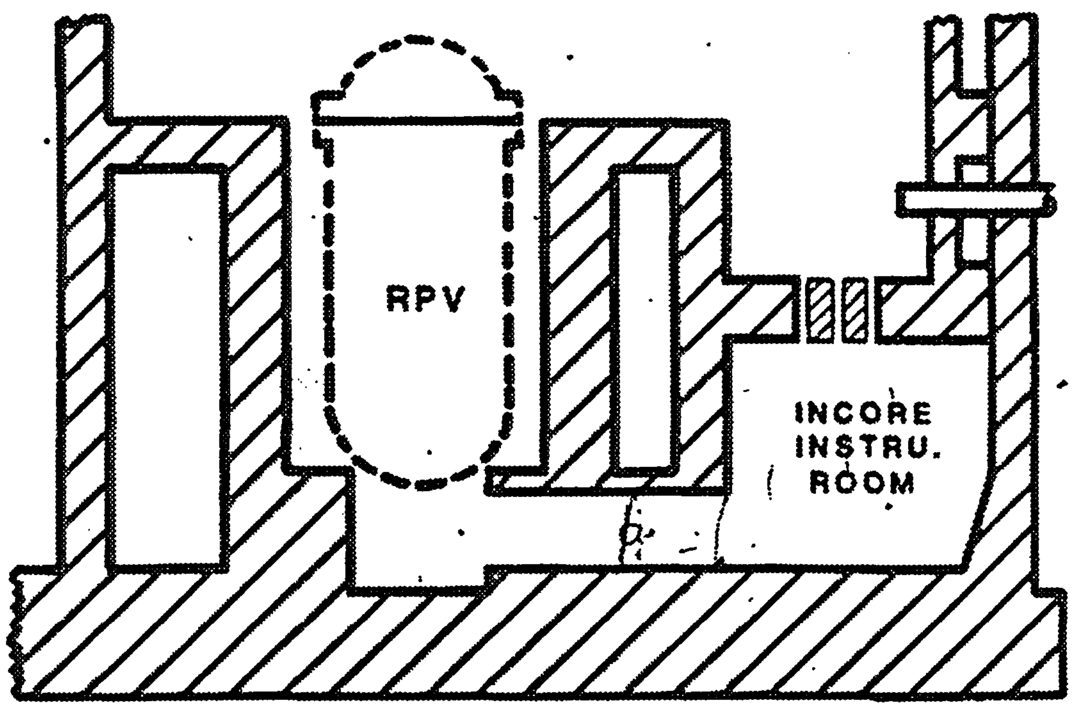


Fig. A.11 Type K cavity configuration.

FIGURE A.2.1

APPENDIX 3

SEQUENCE INPUT FILES

There are a total of 110 pages in this appendix.

Appendix 3.1

TBF Base Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBO + INJECT FAILURE (TBF2)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** GO TO RECIRC MODE WHEN BWST <= 6 FT  *****************************

410 ZWRWST <= 1.829 M
410 ACTION 1 6
410 TRUE  Initiate Recirculation

  ACTION 1
      220 TRUE    ! RECIRC FORCED ON
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 1
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 1 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure
```

```
 ACTION 3
      TILAST=TIM   .! SET THE END TIME TO CURRENT PROBLEM TIME
END

***********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
***********************************************************************

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
```

```
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
50.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
205            / AC AND DC POWER SHUT OFF?
1              / YES
226            / PRZR HEATERS FORCED OFF
1              / YES
223            / PRZR SPRAYS FORCED OFF
1              / YES
224            / EFW FORCED OFF
1              / YES
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.2

TBF No CD Case

```
2              / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
1              / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25             / PARAMETER FILE I/O UNIT NUMBER
0              / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1              / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
ATNBP=5.68
FCMDA=0.0
FENIR=1.0
FCMDCH=0.03

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** GO TO RECIRC MODE WHEN EWST <= 6 FT  *****************************

410 ZWRWST <= 1.829 M
410 ACTION 1 6
410 TRUE  Initiate Recirculation

  ACTION 1
      220 TRUE   ! RECIRC FORCED ON
      213 TRUE   ! LPI FORCED ON
      217 FALSE
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 1
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 1 >= 2 HR
409 ACTION 3 6
```

```
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

 ** OPERATOR INTERVENTION *********************************************

417 TIM >= 0.9839 HR ! INTERVENE WHEN PROBLEM TIME IS 0.5 HR BEFORE CD
417 ACTION 4 6       ! INITIATED MITIGATING ACTION
417 TRUE    Initiate Feed & Bleed

  ACTION 4
       221 FALSE     ! RBFC IN AUTO
       222 FALSE     ! RBS IN AUTO
       212 TRUE      ! HPI STARTED
       216 FALSE     !
       210 TRUE      ! OPEN PRZR ERV
  END

   ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
  END


**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************


** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered


** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
```

```
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS ********************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
7.0            / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
227            / RX SCRAM
1              / TRUE
215            / RCP TRIP
1              / TRUE
216            / HPI FORCED OFF
1
217            / LPI FORCED OFF
1
221            / RBFC FORCED OFF
1
222            / RBS FORCED OFF
1
226            / PRZR HEATERS FORCED OFF
1
223            / PRZR SPRAYS FORCED OFF
1
```

```
224          / EFW FORCED OFF
1
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.3

TBF No VF Case

```
2            / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
1            / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25           / PARAMETER FILE I/O UNIT NUMBER
0            / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1            / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** GO TO RECIRC MODE WHEN BWST <= 6 FT  *****************************

410 ZWRWST <= 1.829 M
410 ACTION 1 6
410 TRUE  Initiate Recirculation

  ACTION 1
      220 TRUE   ! RECIRC FORCED ON
      213 TRUE   ! LPI FORCED ON
      217 FALSE
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE   ! CONTAINMENT FAILED
408 SET TIMER 1
408 TRUE             ! Timer #1 Initiated on Containment Failure

409 TIMER 1 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure
```

```
** OPERATOR INTERVENTION *********************************************

417 TIM >= 1.5566 HR ! INTERVENE WHEN PROBLEM TIME IS 0.5 HR BEFORE VF
417 ACTION 4 6       ! INITIATED MITIGATING ACTION
417 TRUE    Initiate Feed & Bleed

 ACTION 4
      221 FALSE      ! RBFC IN AUTO
      222 FALSE      ! RBS IN AUTO
      212 TRUE       ! HPI STARTED
      216 FALSE      !
      210 TRUE       ! OPEN PRZR ERV
 END

  ACTION 3
      TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
 END


**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************


** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered


** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed
```

```
** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
7.0           / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
227           / RX SCRAM
1             / TRUE
215           / RCP TRIP
1             / TRUE
216           / HPI FORCED OFF
1
217           / LPI FORCED OFF
1
221           / RBFC FORCED OFF
1
222           / RBS FORCED OFF
1
226           / PRZR HEATERS FORCED OFF
1
223           / PRZR SPRAYS FORCED OFF
1
224           / EFW FORCED OFF
```

```
1
0          / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0          / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.4

TBF No CF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBO + INJECT FAILURE - NO CF BRANCH (TBF4)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
AINBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** GO TO RECIRC MODE WHEN BWST <= 6 FT  *****************************

410 ZWRWST <= 1.829 M
410 ACTION 1 6
410 TRUE  Initiate Recirculation

  ACTION 1
      220 TRUE   ! RECIRC FORCED ON
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE   ! CONTAINMENT FAILED
408 SET TIMER 1
408 TRUE             ! Timer #1 Initiated on Containment Failure

409 TIMER 1 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure
```

```
417 TIM >= 43.0419 HR ! INTERVENE WHEN PROBLEM TIME IS 0.5 HR BEFORE CF
417 ACTION 4 6        ! INITIATE MITIGATING ACTION
417 TRUE    Start 1 RBFC and RBS

 ACTION 3
      TILAST=TIM      ! SET THE END TIME TO CURRENT PROBLEM TIME
END

 ACTION 4 6           ! CF MITIGATING ACTION
      221 FALSE       ! RBFC IN AUTO
      222 FALSE       ! RBS IN AUTO
 END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************


** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered


** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************
```

```
414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS *************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
45.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
227            / RX SCRAM
1              / TRUE
215            / RCP TRIP
1              / TRUE
216            / HPI FORCED OFF
1
217            / LPI FORCED OFF
1
221            / RBFC FORCED OFF
1
222            / RBS FORCED OFF
1
226            / PRZR HEATERS FORCED OFF
1
223            / PRZR SPRAYS FORCED OFF
1
224            / EFW FORCED OFF
1
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.5

TBFP Base Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** GO TO RECIRC MODE WHEN BWST <= 6 FT  ******************************

410 ZWRWST <= 1.829 M
410 ACTION 1 6
410 TRUE  Initiate Recirculation

  ACTION 1
      220 TRUE    ! RECIRC FORCED ON
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 1
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 1 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 3
```

```
     TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

************************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
************************************************************************

** INTERVENE WHEN CORE FIRST UNCOVERS *********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ****************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS ***********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS ********************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END
```

```
ACTION 7
  EVENT 320 TRUE   !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE   !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
50.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
227           / RX SCRAM
1             / TRUE
215           / RCP SWITCH
0             / ON-NO TRIP
216           / HPI FORCED OFF
1
217           / LPI FORCED OFF
1
221           / RBFC FORCED OFF
1
222           / RBS FORCED OFF
1
226           / PRZR HEATERS FORCED OFF
1
223           / PRZR SPRAYS FORCED OFF
1
224           / EFW FORCED OFF
1
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.6

TBFP No CD Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBO+INJECT FAILURE+RCPS NO CD (TBF3P)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** GO TO RECIRC MODE WHEN BWST <= 6 FT  ******************************

410 ZWRWST <= 1.829 M
410 ACTION 1 6
410 TRUE  Initiate Recirculation

  ACTION 1
      220 TRUE   ! RECIRC FORCED ON
      213 TRUE   ! LPI FORCED ON
      217 FALSE
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE   ! CONTAINMENT FAILED
408 SET TIMER 1
408 TRUE             ! Timer #1 Initiated on Containment Failure

409 TIMER 1 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure
```

```
 ** OPERATOR INTERVENTION *********************************************

417 TIM >= 0.9233 HR ! INTERVENE WHEN PROBLEM TIME IS 10 MIN BEFORE CD
417 ACTION 4 6       ! INITIATED MITIGATING ACTION
417 TRUE    Initiate Feed & Bleed

  ACTION 4
       221 FALSE     ! RBFC IN AUTO
       222 FALSE     ! RBS IN AUTO
       212 TRUE      ! HPI STARTED
       216 FALSE     !
       210 TRUE      ! OPEN PRZR ERV
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END


**********************************************************************
 ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************


** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered


** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed
```

```
** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ***************************************
0,0,0        / NO MORE LOCAL PARAMETER CHANGE(S)
0            / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.           / PROBLEM START TIME (SEC)
7.00         / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
227          / RX SCRAM
1            / TRUE
215          / RCP SWITCH
0            / ON-NO TRIP
216          / HPI FORCED OFF
1
217          / LPI FORCED OFF
1
221          / RBFC FORCED OFF
1
222          / RBS FORCED OFF
1
226          / PRZR HEATERS FORCED OFF
1
223          / PRZR SPRAYS FORCED OFF
1
224          / EFW FORCED OFF
1
```

```
0          / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0          / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.7

TBX Base Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 TRANSIENT 2 (TBX1)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TFW=400
TDMAX=5.0
VFSEP=0.02
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

***********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE TRANSIENT #2

401 TIM > 0.0 HR
401 ACTION 1 6
401 TRUE   Initiate Transient #2

** TRIP RCPS 2 MINUTES AFTER IE

402 TIM >= 0.0333 HR
402 ACTION 2 6
402 TRUE   RCPs Tripped

** GO TO RECIRC MODE WHEN BWST <= 6 FT  ******************************

403 ZWBWST <= 1.829 M
403 ACTION 3 6
403 TRUE  Initiate Recirculation
```

```
  ACTION 1
      211 TRUE    ! OPEN PRZR PORV
      224 TRUE    ! EFW FORCED OFF
      227 TRUE    ! RX SCRAM
  END

  ACTION 2
      215 TRUE    ! RCPS TRIPPED
  END

  ACTION 3
      220 TRUE    ! RECIRC FORCED ON
      216 TRUE    ! HPI FAILURE
      217 TRUE    ! LPI FAILURE
      221 TRUE    ! REFC FORCED OFF
      222 TRUE    ! RES FORCED OFF
      211 FALSE . ! CLOSE PRZR ERV
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

404 EVENT 104 TRUE   ! CONTAINMENT FAILED
404 SET TIMER 1
404 TRUE             ! Timer #1 Initiated on Containment Failure

405 TIMER 1 >= 2 HR
405 ACTION 4 6
405 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 4
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

***********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
***********************************************************************


** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered
```

```
** INTERVENE WHEN CORE SUPPORT PLATE FAILS **************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS *********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS ******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
80.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.8

TBX No CD Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 TRANSIENT 2 NO CD (TBX3)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TFW=400
TIMAX=5.0
VFSEP=0.02
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

***********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE TRANSIENT #2

401 TIM > 0.0 HR
401 ACTION 1 6
401 TRUE   Initiate Transient #2

** TRIP RCPS 2 MINUTES AFTER IE

402 TIM >= 0.0333 HR
402 ACTION 2 6
402 TRUE   RCPs Tripped

** GO TO RECIRC MODE WHEN BWST <= 6 FT  ******************************

403 ZWRWST <= 1.829 M
403 ACTION 3 6
403 TRUE  Initiate Recirculation
```

```
** OPERATOR INTERVENTION *********************************************

417 TIM >= 12.1317 HR ! INTERVENE WHEN PROBLEM TIME IS 5 MIN BEFORE CD
417 ACTION 5 6        ! INITIATED MITIGATING ACTION
417 TRUE    Initiate Feed & Bleed

 ACTION 1
     211 TRUE    ! OPEN PRZR PORV
     224 TRUE    ! EFW FORCED OFF
     227 TRUE    ! RX SCRAM
 END

 ACTION 2
     215 TRUE    ! RCPS TRIPPED
 END

 ACTION 3
     220 TRUE    ! RECIRC FORCED ON
     216 TRUE    ! HPI FAILURE
     217 TRUE    ! LPI FAILURE
     221 TRUE    ! RBFC FORCED OFF
     222 TRUE    ! RBS FORCED OFF
     211 FALSE   ! CLOSE PRZR ERV
 END


 ACTION 5
      221 FALSE      ! RBFC IN AUTO
      222 FALSE      ! RBS IN AUTO
      213 TRUE       ! LPI MAN ON
      217 FALSE      ! LPI NOT FORCED OFF
      212 TRUE       ! HPI MAN ON
      216 FALSE      ! HPI NOT FORCED OFF
      210 TRUE       ! OPEN PRZR ERV
 END
** NOTE:  LPI REQUIRED FOR F&B DUE TO POST-RECIRC REQUIREMENTS

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

404 EVENT 104 TRUE   ! CONTAINMENT FAILED
404 SET TIMER 1
404 TRUE             ! Timer #1 Initiated on Containment Failure

405 TIMER 1 >= 2 HR
405 ACTION 4 6
405 TRUE    MAAP Run Stops 2 hr after Contmt Failure
```

```
  ACTION 4
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

*********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*********************************************************************


** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered


** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
```

```
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS *************************************
0,0,0        / NO MORE LOCAL PARAMETER CHANGE(S)
0            / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.           / PROBLEM START TIME (SEC)
20.0         / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.9

TBX No VF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 TRANSIENT 2 NO VF (TBX7)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TFW=400
TIMAX=5.0
VFSEP=0.02
AINBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

*************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE TRANSIENT #2

401 TIM > 0.0 HR
401 ACTION 1 6
401 TRUE   Initiate Transient #2

** TRIP RCPS 2 MINUTES AFTER IE

402 TIM >= 0.0333 HR
402 ACTION 2 6
402 TRUE   RCPs Tripped

** GO TO RECIRC MODE WHEN BWST <= 6 FT   *****************************

403 ZWRWST <= 1.829 M
403 ACTION 3 6
403 TRUE  Initiate Recirculation
```

```
** OPERATOR INTERVENTION *********************************************

417 TIM >= 13.0997 HR ! INTERVENE WHEN PROBLEM TIME IS 5 MIN BEFORE VF
417 ACTION 5 6        ! INITIATED MITIGATING ACTION
417 TRUE    Initiate Feed & Bleed

  ACTION 1
      211 TRUE   ! OPEN PRZR PORV
      224 TRUE   ! EFW FORCED OFF
      227 TRUE   ! RX SCRAM
  END

  ACTION 2
      215 TRUE   ! RCPS TRIPPED
  END

  ACTION 3
      220 TRUE   ! RECIRC FORCED ON
      216 TRUE   ! HPI FAILURE
      217 TRUE   ! LPI FAILURE
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
      211 FALSE  ! CLOSE PRZR ERV
  END


  ACTION 5
       221 FALSE    ! RBFC IN AUTO
       222 FALSE    ! RBS IN AUTO
       213 TRUE     ! LPI MAN ON
       217 FALSE    ! LPI NOT FORCED OFF
       212 TRUE     ! HPI MAN ON
       216 FALSE    ! HPI NOT FORCED OFF
       210 TRUE     ! OPEN PRZR ERV
  END
** NOTE:  LPI REQUIRED FOR F&B DUE TO POST-RECIRC REQUIREMENTS

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************

404 EVENT 104 TRUE   ! CONTAINMENT FAILED
404 SET TIMER 1
404 TRUE             ! Timer #1 Initiated on Containment Failure

405 TIMER 1 >= 2 HR
405 ACTION 4 6
405 TRUE    MAAP Run Stops 2 hr after Contmt Failure
```

```
 ACTION 4
      TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

*************************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*************************************************************************

** INTERVENE WHEN CORE FIRST UNCOVERS *********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ****************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS ***********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS ********************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
```

```
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS *************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
20.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.10

TBX No CF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 TRANSIENT 2 NO CF (TBX8)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TFW=400
TDMAX=5.0
VFSEP=0.02
ATNBP=5.68
FCMDA=0.0
FENTR=1.0
FCMDCH=0.03

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE TRANSIENT #2

401 TIM > 0.0 HR
401 ACTION 1 6
401 TRUE   Initiate Transient #2

** TRIP RCPS 2 MINUTES AFTER IE

402 TIM >= 0.0333 HR
402 ACTION 2 6
402 TRUE   RCPs Tripped

** GO TO RECIRC MODE WHEN BWST <= 6 FT  ******************************

403 ZWRWST <= 1.829 M
403 ACTION 3 6
403 TRUE  Initiate Recirculation

 ** OPERATOR INTERVENTION  *******************************************
```

```
417 TIM >= 55.5133 HR ! INTERVENE WHEN PROBLEM TIME IS .5 HR BEFORE CF
417 ACTION 5 6         ! INITIATED MITIGATING ACTION
417 TRUE    Start RBFC and RBS

  ACTION 1
      211 TRUE    ! OPEN PRZR PORV
      224 TRUE    ! EFW FORCED OFF
      227 TRUE    ! RX SCRAM
  END

  ACTION 2
      215 TRUE    ! RCPS TRIPPED
  END

  ACTION 3
      220 TRUE    ! RECIRC FORCED ON
      216 TRUE    ! HPI FAILURE
      217 TRUE    ! LPI FAILURE
      221 TRUE    ! RBFC FORCED OFF
      222 TRUE    ! RBS FORCED OFF
      211 FALSE   ! CLOSE PRZR ERV
  END


  ACTION 5
        221 FALSE     ! RBFC IN AUTO
        222 FALSE     ! RBS IN AUTO
  END

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

404 EVENT 104 TRUE   ! CONTAINMENT FAILED
404 SET TIMER 1
404 TRUE             ! Timer #1 Initiated on Containment Failure

405 TIMER 1 >= 2 HR
405 ACTION 4 6
405 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 4
        TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
```

```
| RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
| THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered


** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

416 TCRHOT > 2499.0 K  LOCK
416 ACTION #6 7
416 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END
```

```
END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
58.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.11

SX Base Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA + RECIRC FAILURE (SX6)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02
FCDBRK=0.75
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873    / BREAK AREA EQUAL TO 4 " DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTER LINE OF COLD LEG

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE LOCA ******************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT *******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

*********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F
```

```
** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ***************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
40.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.12

SX No CD Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA + RECIRC FAILURE - NO CD (SX9)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873    / BREAK AREA EQUAL TO  4" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTER LINE OF COLD LEG

*********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWBWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

416 TIM >=  5.24 HR  !  INTERVENE 30 MIN. BEFORE CORE DAMAGE
416 ACTION 5 6
416 TRUE    HALF HOUR BEFORE CD

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

  ACTION 5
      212 TRUE   ! HPI MANUAL ON
      216 FALSE  ! HPI NOT MAN OFF
      213 TRUE   ! LPI MANUAL ON
      217 FALSE  ! LPI NOT MAN OFF
      218 TRUE   ! RBFC MANUAL ON
```

```
    221 FALSE  ! RBFC NOT FORCED OFF
    1000
    FHXRH = 0
  END

*********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END
```

```
ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS *************************************
0,0,0        / NO MORE LOCAL PARAMETER CHANGE(S)
0            / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.           / PROBLEM START TIME (SEC)
10.0         / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.13

SX No VF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA + RECIRC FAILURE - NO VF (SX8)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873    / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTER LINE OF COLD LEG

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA *****************

407 TIM > 0.0 HR     ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

416 TIM >=  6.6  HR  !  INTERVENE 30 MIN. BEFORE VESSEL FAILURE
416 ACTION 5 6
416 TRUE    HALF HOUR BEFORE VF

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE   ! RBCIRC FORCED ON
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
  END


  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

  ACTION 5
      212 TRUE   ! HPI MANUAL ON
      216 FALSE  ! HPI NOT MAN OFF
      213 TRUE   ! LPI MANUAL ON
      217 FALSE  ! LPI NOT MAN OFF
      218 TRUE   ! RBFC MANUAL ON
```

```
    221 FALSE  ! RBFC NOT FORCED OFF
  END

*************************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*************************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
```

```
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
10.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.14

SX No CF Case

```
2            / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA + RECIRC FAILURE - NO CF (SX7)
1            / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25           / PARAMETER FILE I/O UNIT NUMBER
0            / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1            / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02   / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75  / FCDBRK IS DEFAULT FAI VALUE
FBB=7        / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873   / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845  / BREAK ELEVATION AT CENTER LINE OF COLD LEG

*********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR       ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  *******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ********************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************

408 EVENT 104 TRUE   ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE             ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

416 TIM >= 27.96 HR  !  INTERVENE 30 MIN. BEFORE CONTAINMENT FAILURE
416 ACTION 5 6
416 TRUE    HALF HOUR BEFORE CF

  ACTION 1
     209 TRUE        ! OPEN BREAK
     223 TRUE        ! PRZR SPRAYS FORCED OFF
     226 TRUE        ! PZRR HEATERS FORCED OFF
     215 FALSE       ! RCPS ON/NO TRIP
     224 TRUE        ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE   ! RCPS FORCED OFF
  END

  ACTION 5
      219 TRUE   ! RBS MANUAL ON
      222 FALSE  ! RBS NOT MAN OFF
      218 TRUE   ! RBFC MANUAL ON
      221 FALSE  ! RBFC NOT FORCED OFF
  END
```

```
**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END
```

```
END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0        / NO MORE LOCAL PARAMETER CHANGE(S)
0            / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.           / PROBLEM START TIME (SEC)
32.0         / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.15

SU Base Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA                 (SU01)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873    / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTER LINE OF COLD LEG
**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR       ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG


** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation


** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure
```

```
409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 1
     209 TRUE          ! OPEN BREAK
     223 TRUE          ! PRZR SPRAYS FORCED OFF
     226 TRUE          ! PZRR HEATERS FORCED OFF
     215 FALSE         ! RCPS ON/NO TRIP
     216 TRUE          ! HPI NOT AVAILABLE
     217 TRUE          ! LPI NOT AVAILABLE
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE   ! RCPS FORCED OFF
  END

** TRIP RCPS AT PPS < 1400 PSIA ***************************************

406 PPS < 9.653E6 PA  LOCK
406 ACTION 4
406 TRUE   RCPS FORCED OFF

*************************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
|  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*************************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS **********************************
```

```
411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS ******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** INTERVENE WHEN ECCS ACTUATED (PPS <= 1526 PSIG)  ******************

416 PPS <= 1.062E+7  LOCK
416 ACTION #6 7
416 TRUE ESAS Actuated

** INTERVENE WHEN RBFC ACTUATED (PA  >= 4.0  PSIG)  ******************

417 PA  >= 1.289E+5  LOCK
417 ACTION #6 7
417 TRUE RBFC Auto Start

** INTERVENE WHEN RBS ACTUATED (PA  >= 30   PSIG)  ******************

418 PA  >= 3.082E+5  LOCK
418 ACTION #6 7
418 TRUE RBS Auto Start

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END
```

```
ACTION 7
  EVENT 323 TRUE   !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ***************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
32.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.16

SU No CD Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA + INJEC. FAILURE - NO CD (SU21)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873    / BREAK AREA EQUAL TO 4" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTER LINE OF COLD LEG

************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ********************************************

** TRIP RCPS AT PPS < 1400 PSIA ***************************************

406 PPS < 9.653E6 PA  LOCK
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ********************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
```

```
410 TRUE  Initiate Recirculation

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

419 TIM >= 0.83 HR  !  INTERVENE 10 MIN. BEFORE CORE FAILURE
419 ACTION 5 6
419 TRUE    HALF HOUR BEFORE CF

  ACTION 1
     209 TRUE          ! OPEN BREAK
     223 TRUE          ! PRZR SPRAYS FORCED OFF
     226 TRUE          ! PZRR HEATERS FORCED OFF
     217 TRUE          ! LPI FORCED OFF
     216 TRUE          ! HPI FORCED OFF
END

  ACTION 2
    220 TRUE          ! RECIRC FORCED ON
    217 FALSE         ! LPI NOT MAN ON
    213 TRUE          ! LPI MAN ON
  END

  ACTION 3
      TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
      215 TRUE    ! RCPS FORCED OFF
  END

  ACTION 5
     216 FALSE  ! HPI NOT MANUAL OFF
     212 TRUE   ! HP1 MAN ON
  END

***********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
```

```
| RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
| THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
***********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

** INTERVENE WHEN ECCS ACTUATED (PPS <= 1526 PSIG)   ******************

416 PPS <= 1.062E+7  LOCK
416 ACTION #6 7
416 TRUE ESAS Actuated

** INTERVENE WHEN RBFC ACTUATED (PA  >= 4.0  PSIG)   ******************
```

```
417 PA  >= 1.289E+5  LOCK
417 ACTION #6 7
417 TRUE RBFC Auto Start

** INTERVENE WHEN RBS ACTUATED (PA  >= 30   PSIG)  ******************

418 PA  >= 3.082E+5  LOCK
418 ACTION #6 7
418 TRUE RBS Auto Start

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 323 TRUE  !  FORCE PLOT POINT
END


END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
10.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.17

SU No VF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SBLOCA + INJEC. FAILURE - NO VF (SU11)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.0873    / BREAK AREA EQUAL TO 4" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTER LINE OF COLD LEG

************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR       ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  *******************************************

** TRIP RCPS AT PPS < 1400 PSIA ***************************************

406 PPS < 9.653E6 PA  LOCK
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ********************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
```

```
410 TRUE  Initiate Recirculation

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

419 TIM >= 2.26  HR  !  INTERVENE 10 MIN. BEFORE VESSEL FAILURE
419 ACTION 5 6
419 TRUE

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     217 TRUE         ! LPI FORCED OFF
     216 TRUE         ! HPI FORCED OFF
END

  ACTION 2
    220 TRUE         ! RECIRC FORCED ON
    213 TRUE         ! LPI MAN ON
    217 FALSE        ! LPI NOT FORCED OFF
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

  ACTION 5
      216 FALSE  ! HPI NOT MANUAL OFF
      212 TRUE   ! HP1 MAN ON
  END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
```

```
| RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
| THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

** INTERVENE WHEN ECCS ACTUATED (PPS <= 1526 PSIG)   *****************

416 PPS <= 1.062E+7  LOCK
416 ACTION #6 7
416 TRUE ESAS Actuated

** INTERVENE WHEN RBFC ACTUATED (PA  >= 4.0  PSIG)   *****************
```

```
417 PA  >= 1.289E+5  LOCK
417 ACTION #6 7
417 TRUE RBFC Auto Start

** INTERVENE WHEN RBS ACTUATED (PA  >= 30   PSIG)  ******************

418 PA  >= 3.082E+5  LOCK
418 ACTION #6 7
418 TRUE RBS Auto Start

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ***************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
10.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.19

RX Base Case (0.00338 ft2 break area)

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SGTR + RECIRC. MODE FAILURE (RX1)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75
ASB=0.00338   / BREAK AREA EQUAL TO 2 x TUBE I.D.
ZSB=3.6       / BREAK ELEVATION AT % % of OTSG H
TFW =400      / FEEDWATER TEMPERATURE
*********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE LOCA *****************

407 TIM > 0.0 HR      ! INITIATE SGTR AT TIME ZERO
407 ACTION 1 6
407 TRUE   SGTR

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR   ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** START HPI 30 MIN AFTER INITIATING EVENT

417 TIM > 0.5 HR
417 ACTION 8
417 TRUE  HPI FORCED ON

410 ZWRWST <= 1.829 M
```

```
410 ACTION 2 6
410 TRUE  INITIATE RECIRCULATION


** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
     216 TRUE         ! HPI FORCED OFF
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE   ! RCPS FORCED OFF
  END

  ACTION 8
      212 TRUE   ! HPI MAN ON
      216 FALSE  ! HPI NOT MAN OFF
  END

*************************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
```

```
! RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
| THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS *******************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS **************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS *********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS ******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
```

```
0          / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.         / PROBLEM START TIME (SEC)
40.0       / PROBLEM END TIME (HR)
1.0        / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0          / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0          / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.20

RX Base Case (0.00169 ft2 break area)

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SGTR + RECIRC. FAILURE -        (RX0)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75
ASB=0.00169  /ONE HALF OF BREAK AREA EQUAL TO 2 x TUBE I.D.
ZSB=3.6       / BREAK ELEVATION AT 5 % of OTSG H
TFW =400      / FEEDWATER TEMPERATURE
**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR      ! INITIATE SGTR AT TIME ZERO
407 ACTION 1 6
407 TRUE   SGTR

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** START HPI 30 MIN AFTER INITIATING EVENT

417 TIM > 0.5 HR
417 ACTION 8  6
417 TRUE  HPI FORCED ON

410 ZWRWST <= 1.829 M
```

```
410 ACTION 2 6
410 TRUE  INITIATE RECIRCULATION


** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 3  TRUE   ! VESSEL FAILED
408 SET TIMER 2
408 TRUE             ! Timer #2 Initiated on Vessel Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Vessel Failure

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
     216 TRUE         ! HPI FORCED OFF
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE   ! RCPS FORCED OFF
  END

  ACTION 8
      212 TRUE   ! HPI MAN ON
      216 FALSE  ! HPI NOT MAN OFF
  END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
```

```
! RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
| THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
```

```
0          / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.         / PROBLEM START TIME (SEC)
80.0       / PROBLEM END TIME (HR)
1.0        / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0          / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0          / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.21

RU Base Case

```
2          / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SGTR + INJECT. FAILURE    (RU02)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75
ASB=0.00338   / BREAK AREA EQUAL TO 2 x TUBE I.D.
ZSB=3.6       / BREAK ELEVATION AT 80 %
TFW=400       / FEEDWATER TEMPERATURE

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE EVENT *****************

407 TIM > 0.0 HR      ! INITIATE SGTR AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN BROKEN OTSG

** TRIP RCPS AT PPS < 1400 PSIA ***************************************

406 PPS < 9.653E6 PA  LOCK
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT *******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

** INITIATING EVENT *********************
  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAY FORCED OFF
     226 TRUE         ! PRZR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     216 TRUE         ! HPI NOT AVAILABLE
     217 TRUE         ! LPI FORCED OFF
END

  ACTION 2
      220 TRUE    ! RECIRC FORCED ON
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

***********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
***********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************
```

```
411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** INTERVENE WHEN ECCS ACTUATED (PPS <= 1526 PSIG)  ******************

416 PPS <= 1.062E+7  LOCK
416 ACTION #6 7
416 TRUE ESAS Actuated

** INTERVENE WHEN RBFC ACTUATED (PA  >= 4.0  PSIG)  ******************

417 PA  >= 1.289E+5  LOCK
417 ACTION #6 7
417 TRUE RBFC Auto Start

** INTERVENE WHEN RBS ACTUATED (PA  >= 30   PSIG)  ******************

418 PA  >= 3.082E+5  LOCK
418 ACTION #6 7
418 TRUE RBS Auto Start

** INTERVENE WHEN ADVs ACTUATED (PBS/PUS >= 900 PSIA)  ******************

419 PBS >= 6.206E+6  LOCK
419 ACTION #6 7
419 TRUE Broken SG Secondary Pressure Above 900 PSIA
```

```
** INTERVENE WHEN ADVs ACTUATED (PBS/PUS >= 900 PSIA)  ******************

420 PUS >= 6.206E+6  LOCK
420 ACTION #6 7
420 TRUE Unbroken SG Secondary Pressure Above 900 PSIA

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
40.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.22

RU No CD Case

```
2               / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SGTR + INJECT. FAILURE NO CU (RU4)
1               / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25              / PARAMETER FILE I/O UNIT NUMBER
0               / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1               / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
VFSEP=0.02      / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75
ASB=0.00338     / BREAK AREA EQUAL TO 2 x TUBE I.D.
ZSB=3.6         / BREAK ELEVATION AT  5 %
TFW=400.        / T FEEDWATER

*********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE EVENT *****************

407 TIM > 0.0 HR       ! INITIATE SGTR AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN BROKEN OTSG

** TRIP RCPS AT PPS < 1400 PSIA ****************************************

406 PPS < 9.653E6 PA  LOCK
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT *******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************
```

```
408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure


419 TIM >= 2.4  HR  !  INTERVENE 30 MIN. BEFORE CORE UNCOVERY
419 ACTION 5 6
419 TRUE    HALF HOUR BEFORE VF

** INITIATING EVENT ********************
  ACTION 1
     209 TRUE          ! OPEN BREAK
     223 TRUE          ! PRZR SPRAY FORCED OFF
     226 TRUE          ! PRZR HEATERS FORCED OFF
     215 FALSE         ! RCPS ON/NO TRIP
     216 TRUE        . ! HPI NOT AVAILABLE
     217 TRUE          ! LPI FORCED OFF
END

  ACTION 2
      220 TRUE    ! RECIRC FORCED ON
  END

  ACTION 5
      216 FALSE   ! HPI not MAN off
      212 TRUE    ! HPI MAN ON
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

***********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
***********************************************************************
```

```
** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** INTERVENE WHEN ECCS ACTUATED (PPS <= 1526 PSIG)   ******************

416 PPS <= 1.062E+7  LOCK
416 ACTION #6 7
416 TRUE ESAS Actuated

** INTERVENE WHEN RBFC ACTUATED (PA  >= 4.0  PSIG)   ******************

417 PA  >= 1.289E+5  LOCK
417 ACTION #6 7
417 TRUE RBFC Auto Start

** INTERVENE WHEN RBS ACTUATED (PA  >= 30   PSIG)  ******************

418 PA  >= 3.082E+5  LOCK
418 ACTION #6 7
```

```
418 TRUE RBS Auto Start

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS *************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
10.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.23

RU No VF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 SGTR + INJECT. FAILURE NO VF (RU3)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TIMAX=5.0
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDERK=0.75
ASB=0.00338   / BREAK AREA EQUAL TO 2 x TUBE I.D.
ZSB=3.7       / BREAK ELEVATION AT CENTER OF OTSG
TFW=400.      / T FEEDWATER

*****************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE EVENT *****************

407 TIM > 0.0 HR      ! INITIATE SGTR AT TIME ZERO
407 ACTION 1 6
407 TRUE   OPEN BREAK IN BROKEN OTSG

** TRIP RCPS AT PPS < 1400 PSIA ***************************************

406 PPS < 9.653E6 PA  LOCK
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ********************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation

** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************
```

```
408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure


419 TIM >= 3.32 HR  !  INTERVENE 30 MIN. BEFORE VESSEL FAILURE
419 ACTION 5 6
419 TRUE    HALF HOUR BEFORE VF

** INITIATING EVENT *********************
  ACTION 1
     209 TRUE          ! OPEN BREAK
     223 TRUE          ! PRZR SPRAY FORCED OFF
     226 TRUE          ! PRZR HEATERS FORCED OFF
     215 FALSE         ! RCPS ON/NO TRIP
     216 TRUE          ! HPI NOT AVAILABLE
     217 TRUE          ! LPI FORCED OFF
END

  ACTION 2
      220 TRUE    ! RECIRC FORCED ON
  END

  ACTION 5
      216 FALSE   ! HPI NOT MAN off
      212 TRUE    ! HPI MAN on
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE   ! RCPS FORCED OFF
  END

*******************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*******************************************************************
```

```
** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** INTERVENE WHEN ECCS ACTUATED (PPS <= 1526 PSIG)   ******************

416 PPS <= 1.062E+7  LOCK
416 ACTION #6 7
416 TRUE ESAS Actuated

** INTERVENE WHEN RBFC ACTUATED (PA  >= 4.0  PSIG)   ******************

417 PA  >= 1.289E+5  LOCK
417 ACTION #6 7
417 TRUE RBFC Auto Start

** INTERVENE WHEN RBS ACTUATED (PA  >= 30   PSIG)   ******************

418 PA  >= 3.082E+5  LOCK
418 ACTION #6 7
```

```
418 TRUE RBS Auto Start

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
10.0          / PROBLEM END TIME (HR)
1.0           / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0             / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0             / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.24

AX Base Case

```
2              / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA + RECIRC FAILURE (AX2)
1              / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25             / PARAMETER FILE I/O UNIT NUMBER
0              / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1              / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00005
VFSEP=0.02     / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75    / FCDBRK IS DEFAULT FAI VALUE
FBB=7          / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854     / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845    / BREAK ELEVATION AT CENTERLINE OF COLD LEG

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA *****************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  *******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 1
     209 TRUE         ! OPEN BREAK
     214 TRUE         ! CFT BLOCK VALVE CLOSED
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE    ! RECIRC FORCED ON
      216 TRUE    ! HPI FORCED OFF
      217 TRUE    ! LPI FORCED OFF
      221 TRUE    ! RBFC FORCED OFF
      222 TRUE    ! RBS FORCED OFF
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
  END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
```

```
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS *********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS ***********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS ********************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ***************************************
0,0,0        / NO MORE LOCAL PARAMETER CHANGE(S)
0            / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.           / PROBLEM START TIME (SEC)
40.0         / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.25

AX No CD Case

```
2              / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA + RECIRC FAILURE - NO CD (AX55)
1              / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25             / PARAMETER FILE I/O UNIT NUMBER
0              / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1              / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00005
VFSEP=0.02     / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75    / FCDBRK IS DEFAULT FAI VALUE
FBB=7          / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854     / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845    / BREAK ELEVATION AT CENTERLINE OF COLD LEG

**************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA ******************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ********************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE     MAAP Run Stops 2 hr after Contmt Failure

416 TIM >= 2.29 HR    ! INTERVENE 30 MIN. BEFORE CORE DAMAGE
416 ACTION 5 6
416 TRUE     HALF HOUR BEFORE CD

  ACTION 1
     209 TRUE         ! OPEN BREAK
     214 TRUE         ! CFT BLOCK VALVE CLOSED
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE   ! RECIRC FORCED ON
      216 TRUE   ! HPI FORCED OFF
      217 TRUE   ! LPI FORCED OFF
      221 TRUE   ! RBFC FORCED OFF
      222 TRUE   ! RBS FORCED OFF
  END

  ACTION 5
      213 TRUE   ! LPI  MANUAL ON
      217 FALSE  ! LPI  NOT MANUAL OFF
      218 TRUE   ! RBFC MANUAL ON
      221 FALSE  ! RBFC NOT FORCED OFF
      1000
      FHXRH = 0
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END
```

```
 ACTION 4
     215 TRUE    ! RCPS FORCED OFF
 END

*********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
*********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
```

```
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ***************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
6.0            / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.26

AX No VF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA + RECIRC FAILURE - NO VF (AX4)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00005
VFSEP=0.02    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854    / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTERLINE OF COLD LEG

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE LOCA *****************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  *******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT *******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************

408 EVENT 104 TRUE     ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE               ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE     MAAP Run Stops 2 hr after Contmt Failure

416 TIM >= 3.51 HR     ! INTERVENE 30 MIN. BEFORE VESSEL FAILURE
416 ACTION 5 6
416 TRUE     HALF HOUR BEFORE CF

  ACTION 1
     209 TRUE          ! OPEN BREAK
     214 TRUE          ! CFT BLOCK VALVE CLOSED
     223 TRUE          ! PRZR SPRAYS FORCED OFF
     226 TRUE          ! PZRR HEATERS FORCED OFF
     215 FALSE         ! RCPS ON/NO TRIP
     224 TRUE          ! EFW NOT AVAILABLE
END

  ACTION 2
       220 TRUE    ! RECIRC FORCED ON
       216 TRUE    ! HPI FORCED OFF
       217 TRUE    ! LPI FORCED OFF
       221 TRUE    ! RBFC FORCED OFF
       222 TRUE    ! RBS FORCED OFF
  END

  ACTION 5
       213 TRUE    ! LPI  MANUAL ON
       217 FALSE   ! LPI  NOT MANUAL OFF
       218 TRUE    ! RBFC MANUAL ON
       221 FALSE   ! RBFC NOT FORCED OFF
  END

  ACTION 3
        TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
        215 TRUE    ! RCPS FORCED OFF
```

```
 END

***********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
***********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS *******************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS **************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS *********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS ******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE   !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE   !  FORCE PLOT POINT
```

```
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0        / NO MORE LOCAL PARAMETER CHANGE(S)
0            / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.           / PROBLEM START TIME (SEC)
8.0         / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.27

AX No CF Case

```
2            / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA + RECIRC FAILURE - NO CF (AX3)
1            / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25           / PARAMETER FILE I/O UNIT NUMBER
0            / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1            / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00005
VFSEP=0.02   / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75  / FCDBRK IS DEFAULT FAI VALUE
FBB=7        / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854   / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845  / BREAK ELEVATION AT CENTERLINE OF COLD LEG

************************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA *****************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ********************************

410 ZWBWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS *****************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #1 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE     MAAP Run Stops 2 hr after Contmt Failure

416 TIM >= 26.22 HR   ! INTERVENE 30 MIN. BEFORE CONTAINMENT FAILURE
416 ACTION 5 6
416 TRUE     HALF HOUR BEFORE CF

  ACTION 1
     209 TRUE          ! OPEN BREAK
     214 TRUE          ! CFT BLOCK VALVE CLOSED
     223 TRUE          ! PRZR SPRAYS FORCED OFF
     226 TRUE          ! PZRR HEATERS FORCED OFF
     215 FALSE         ! RCPS ON/NO TRIP
     224 TRUE          ! EFW NOT AVAILABLE
END

  ACTION 2
      220 TRUE    ! RECIRC FORCED ON
      216 TRUE    ! HPI FORCED OFF
      217 TRUE    ! LPI FORCED OFF
      221 TRUE    ! RBFC FORCED OFF
      222 TRUE    ! RBS FORCED OFF
  END

  ACTION 5
      218 TRUE    ! RBFC MANUAL ON
      221 FALSE   ! RBFC NOT FORCED OFF
      219 TRUE    ! RBS MANUAL ON
      222 FALSE   ! RBS NOT MAN OFF
  END

  ACTION 3
       TILAST=TIM    ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE    ! RCPS FORCED OFF
```

```
END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE   !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE   !  FORCE PLOT POINT
```

```
END

END OF INTERVENTIONS AND ACTIONS ************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
30.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.28

AU Base Case

```
2              / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA  (AU21)
1              / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25             / PARAMETER FILE I/O UNIT NUMBER
0              / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1              / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00005
VFSEP=0.02     / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75    / FCDBRK IS DEFAULT FAI VALUE
FBB=7          / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854     / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845    / BREAK ELEVATION AT CENTERLINE OF COLD LEG

*******************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA *****************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  *****************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE        ! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
     216 TRUE         ! HPI FORCED OFF
     217 TRUE         ! LPI FORCED OFF
END

  ACTION 2
      220 TRUE        ! RECIRC FORCED ON
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE       ! RCPS FORCED OFF
  END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************
```

```
411 EVENT 49 TRUE LOCK    ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE          ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS ***********************************

415 EVENT 104 TRUE        ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE          ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE   !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE   !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS **************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
40.0           / PROBLEM END TIME (HR)
1.0            / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0              / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0              / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.29

AU No CD Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA  NO CD (AU320)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00001
VFSEP=0.05    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854    / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTERLINE OF COLD LEG

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS

LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE

** INITIATE LOCA ******************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  ******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE     ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE               ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6                 357
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

416 TIM >=  0.4   HR   ! INTERVENE 5  MIN BEFORE CORE D
416 ACTION 5 6
416 TRUE  !

  ACTION 1
     209 TRUE          ! OPEN BREAK
     223 TRUE          ! PRZR SPRAYS FORCED OFF
     226 TRUE          ! PZRR HEATERS FORCED OFF
     215 FALSE         ! RCPS ON/NO TRIP
     224 TRUE          ! EFW NOT AVAILABLE
     216 TRUE          ! HPI FORCED OFF
     217 TRUE          ! LPI FORCED OFF
END

  ACTION 2
      220 TRUE         ! RECIRC FORCED ON
  END

  ACTION 3
       TILAST=TIM      ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE        ! RCPS FORCED OFF
  END

  ACTION 5
     217 FALSE         ! LPI NOT MAN ON
     213 TRUE          ! LPI MAN ON
END

**********************************************************************
| ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
|  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
```

```
**********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS *************************************
0,0,0         / NO MORE LOCAL PARAMETER CHANGE(S)
0             / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.            / PROBLEM START TIME (SEC)
```

```
10.        / PROBLEM END TIME (HR)
1.0        / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0          / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0          / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

Appendix 3.30

AU No VF Case

```
2             / 0=INTERACTIVE, 1=BATCH, 2=BATCH WITH SENSITIVITY OPTION
ANO-1 LBLOCA  NO VF (AU311)
1             / 0=USE PARAMETER DEFAULTS, 1= USE SUPPLIED PARAMETER FILE
25            / PARAMETER FILE I/O UNIT NUMBER
0             / 0=NO PARAMETER FILE LISTING, 1=LIST PARAMETER FILE
1             / 0=NO LOCAL PARAMETER CHANGE, 1=LOCAL PARAMETER CHANGE
TDMAX=5.0
TDMIN=0.00001
VFSEP=0.05    / VFSEP FOR B&W PLANTS PER GKA RECOMMENDATION
FCDBRK=0.75   / FCDBRK IS DEFAULT FAI VALUE
FBB=7         / BREAK IS IN HORIZONTAL COLD LEG
ABB=0.7854    / BREAK AREA EQUAL TO 12" DIA BREAK
ZBB=24.5845   / BREAK ELEVATION AT CENTERLINE OF COLD LEG

**********************************************************************

28 / USEREVT SECTION - USER DEFINED EVENT CODE CONDITIONS AND ACTIONS


LOG ON ALL  / SEND MESSAGES TO THE LOG FILE WHEN USER DEFINED
            / EVENT CODE STATUS CHANGES STATE


** INITIATE LOCA *****************

407 TIM > 0.0 HR      ! INITIATE LOCA AT TIME ZERO
407 ACTION 1 6
407 TRUE   LBLOCA IN COLD LEG

** TRIP RCPS AFTER 2 MIN.  *******************************************

406 TIM > 0.0333 HR  ! TRIP RCPS 2 MIN AFTER IE
406 ACTION 4
406 TRUE   RCPS FORCED OFF

** GO TO RECIRC MODE WHEN BWST <= 6 FT ******************************

410 ZWRWST <= 1.829 M
410 ACTION 2 6
410 TRUE  Initiate Recirculation
```

```
** STOP CODE EXECUTION 2 HR AFTER CONTAINMENT FAILS ******************

408 EVENT 104 TRUE    ! CONTAINMENT FAILED
408 SET TIMER 2
408 TRUE              ! Timer #2 Initiated on Containment Failure

409 TIMER 2 >= 2 HR
409 ACTION 3 6
409 TRUE    MAAP Run Stops 2 hr after Contmt Failure

416 TIM >=  0.83 HR   ! INTERVENE 10 MIN BEFORE VESSEL F
416 ACTION 5 6
416 TRUE  !  1/6 HOUR BEFORE VF

  ACTION 1
     209 TRUE         ! OPEN BREAK
     223 TRUE         ! PRZR SPRAYS FORCED OFF
     226 TRUE         ! PZRR HEATERS FORCED OFF
     215 FALSE       .! RCPS ON/NO TRIP
     224 TRUE         ! EFW NOT AVAILABLE
     216 TRUE         ! HPI FORCED OFF
     217 TRUE         ! LPI FORCED OFF
END

  ACTION 2
      220 TRUE        ! RECIRC FORCED ON
  END

  ACTION 3
       TILAST=TIM     ! SET THE END TIME TO CURRENT PROBLEM TIME
END

  ACTION 4
       215 TRUE       ! RCPS FORCED OFF
  END

  ACTION 5
     217 FALSE        ! LPI NOT MAN ON
     213 TRUE         ! LPI MAN ON
END

*************************************************************************
! ALL THE FOLLOWING INTERVENTIONS ARE SIMPLY TO FORCE TABULAR OUTPUT,
!  RESTART, AND PLOT FILES AT KEY TIMES IN THE ACCIDENT PROGRESSION.
!  THE ORDER OF THE INTERVENTIONS DOES NOT MATTER
```

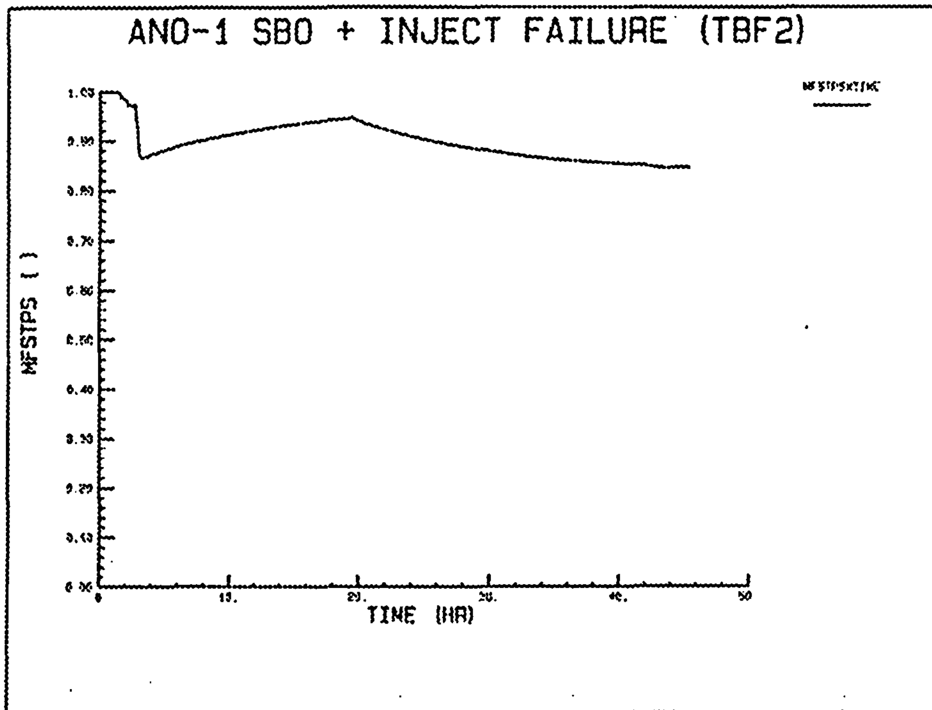
```
***********************************************************************

** INTERVENE WHEN ANY CORE NODE TEMPERATURE REACHES 4038.5 F (2499 K) *

412 TCRHOT > 2499.0 K  LOCK
412 ACTION #6 7
412 TRUE Maximum Core Temp Exceeded 4038.5 F

** INTERVENE WHEN CORE FIRST UNCOVERS ********************************

411 EVENT 49 TRUE LOCK   ! CORE HAS UNCOVERED
411 ACTION #6 7
411 TRUE Core has Uncovered

** INTERVENE WHEN CORE SUPPORT PLATE FAILS ***************************

413 EVENT 2 TRUE         ! SUPPORT PLATE FAILED
413 ACTION #6 7
413 TRUE Core Support Plate has Failed

** INTERVENE WHEN CONTAINMENT FAILS **********************************

415 EVENT 104 TRUE       ! CONTAINMENT FAILED
415 ACTION #6 7
415 TRUE Containment has Failed

** INTERVENE WHEN REACTOR VESSEL FAILS *******************************

414 EVENT 3 TRUE         ! REACTOR VESSEL FAILED
414 ACTION #6 7
414 TRUE Reactor Vessel has Failed

** PRINT LIST OF DEBRIS IN LOWER PLENUM AND PS CONDITIONS ***************
ACTION 6
   PRINT LIST #1 TO UNIT 6
END

ACTION 7
  EVENT 320 TRUE  !  PRINT TABULAR OUTPUT AND WRITE RESTART FILES
  EVENT 323 TRUE  !  FORCE PLOT POINT
END

END OF INTERVENTIONS AND ACTIONS ************************************
0,0,0          / NO MORE LOCAL PARAMETER CHANGE(S)
0              / 0=INITIAL MAAP RUN, 1=RESTART MAAP RUN
0.             / PROBLEM START TIME (SEC)
```

```
10.          / PROBLEM END TIME (HR)
1.0          / OUTPUT-RESTART FILE PRINT INTERVAL (HR), INITIATOR(S) FOLLOWS
0            / NO (MORE) INITIATOR(S), INTERVENTION CONDITION(S) FOLLOW
0            / NO (MORE) INTERVENTION(S), MAAP EXECUTION ENDS
```

APPENDIX 4

PLOTS OF KEY PARAMETERS

There are a total of 465 pages in this appendix.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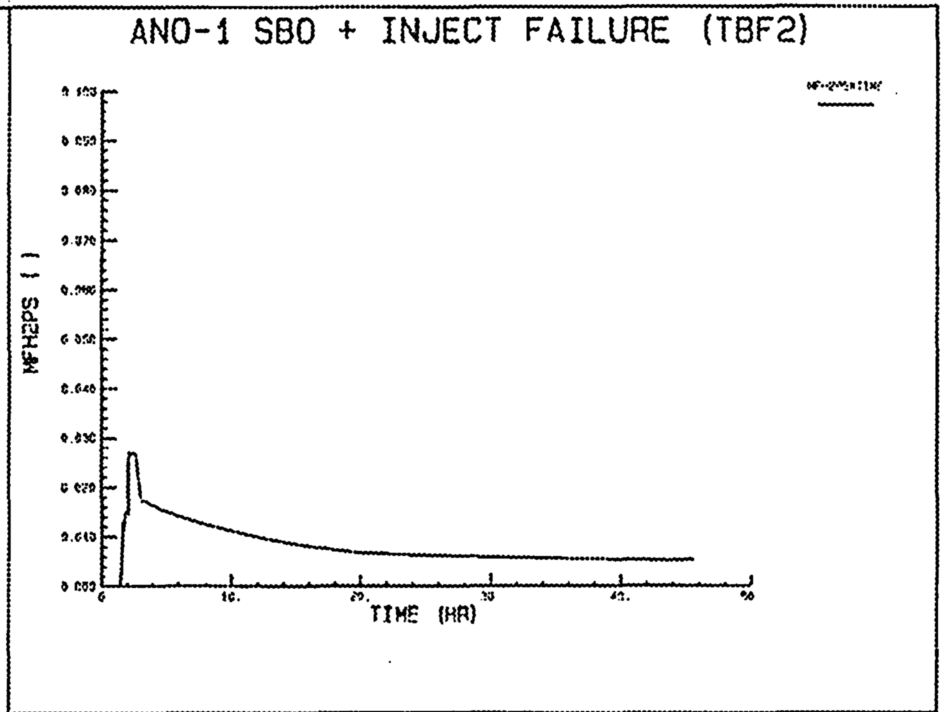
MFSTPS ( )
TIME (HR)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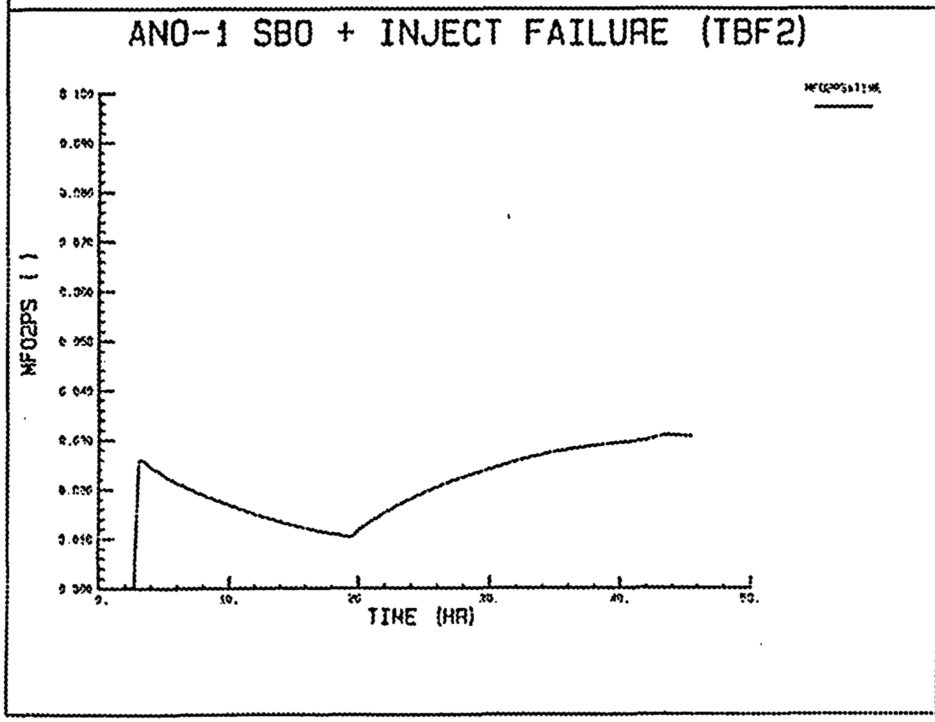
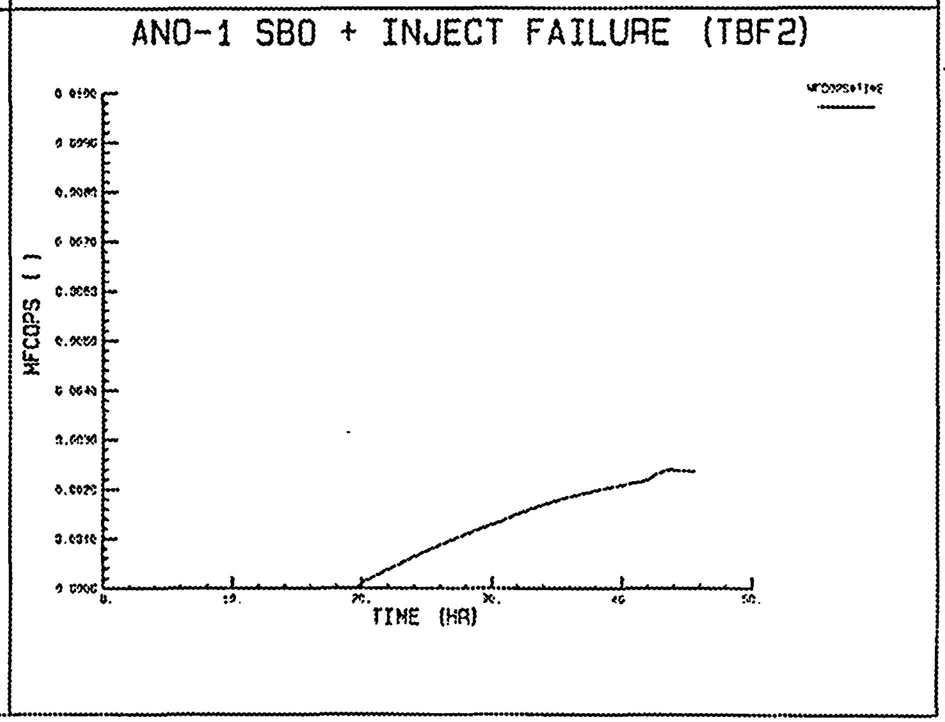
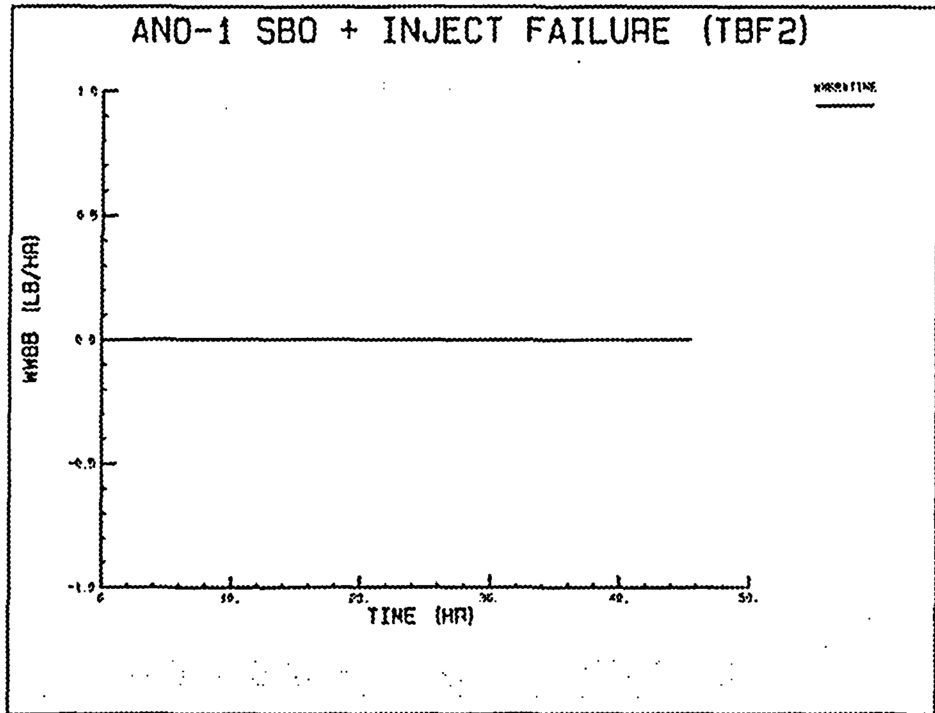
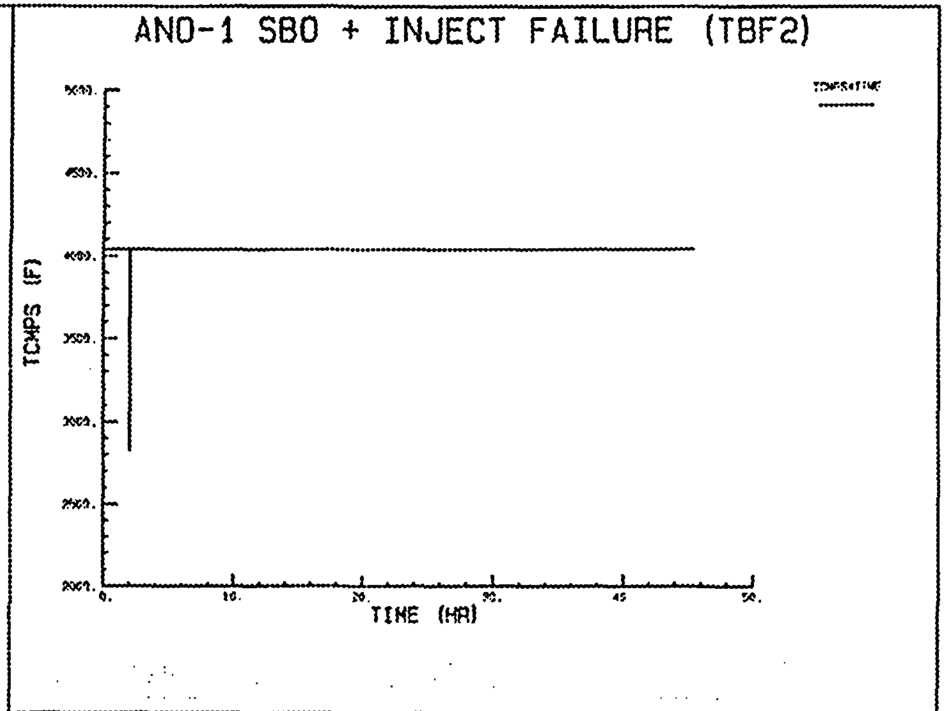
MFH2PS ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
MFO2PS ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
MFCOPS ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
WWBB (LB/HR)
TIME (HR)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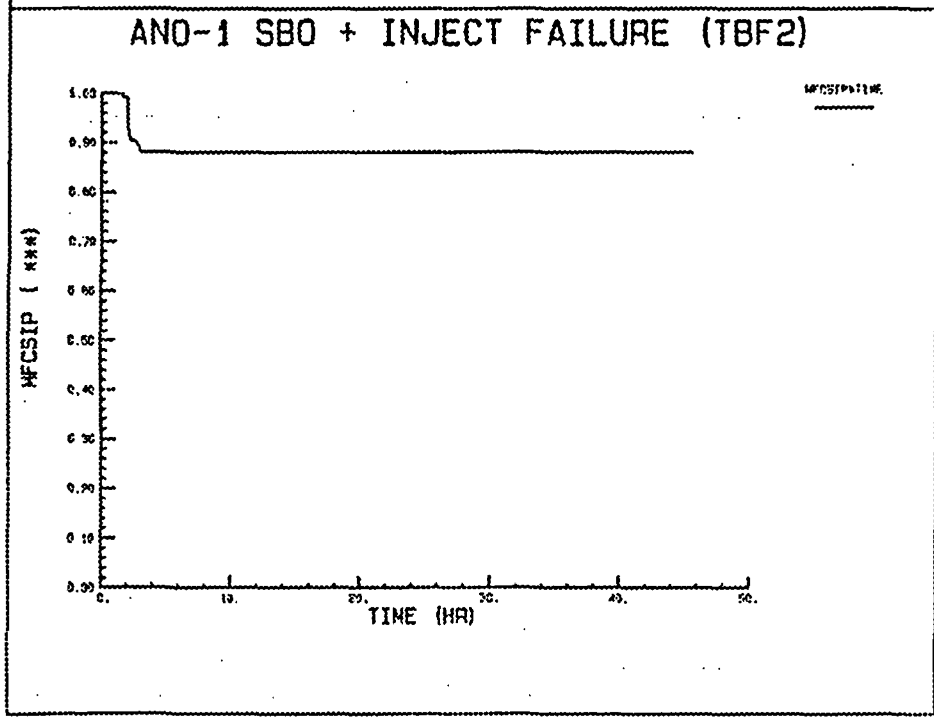
TCMPS (F)
TIME (HR)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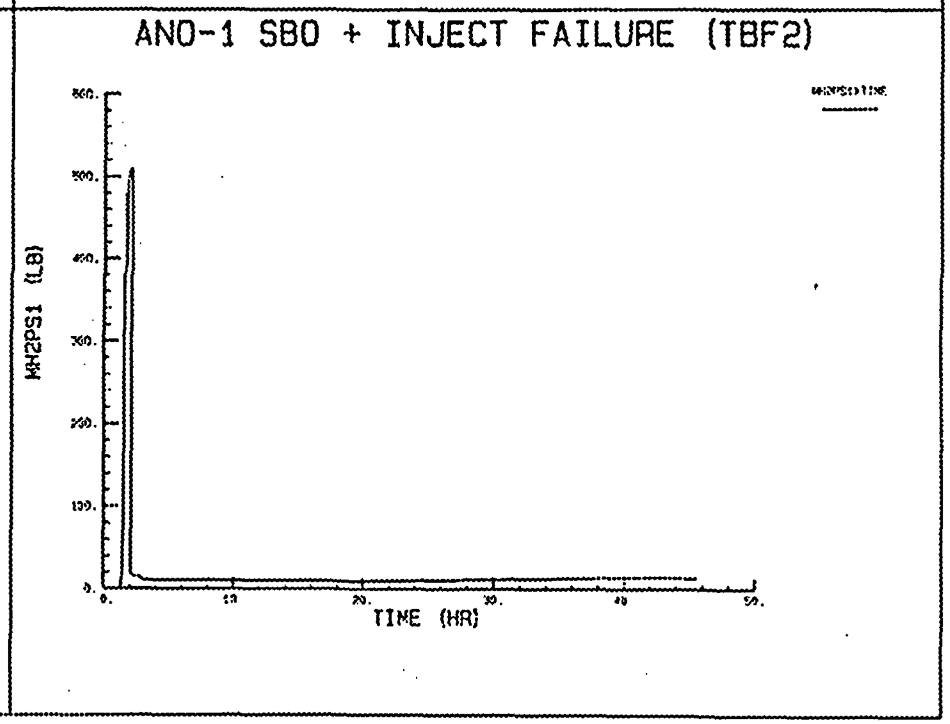
MFCSIP (***)
TIME (HR)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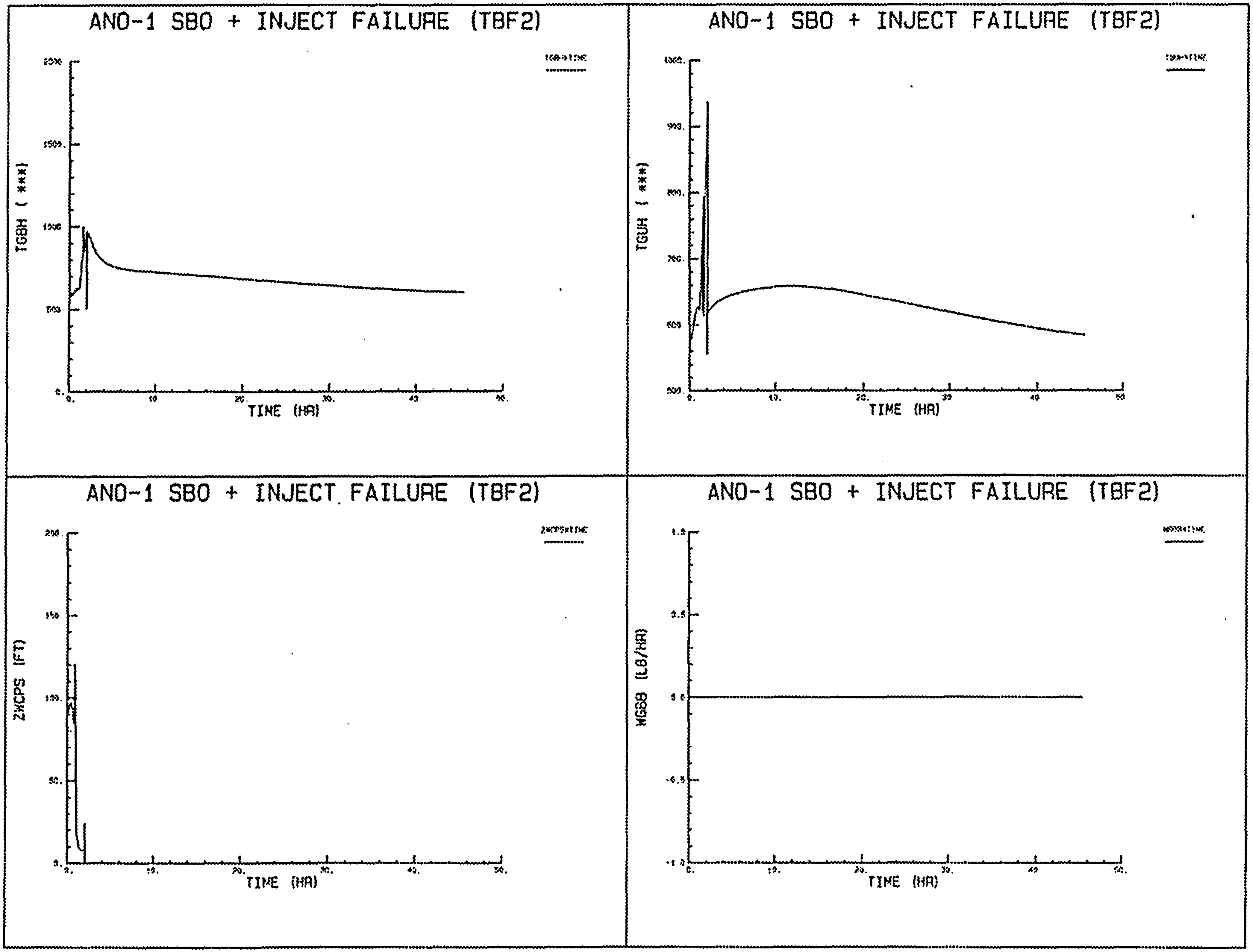
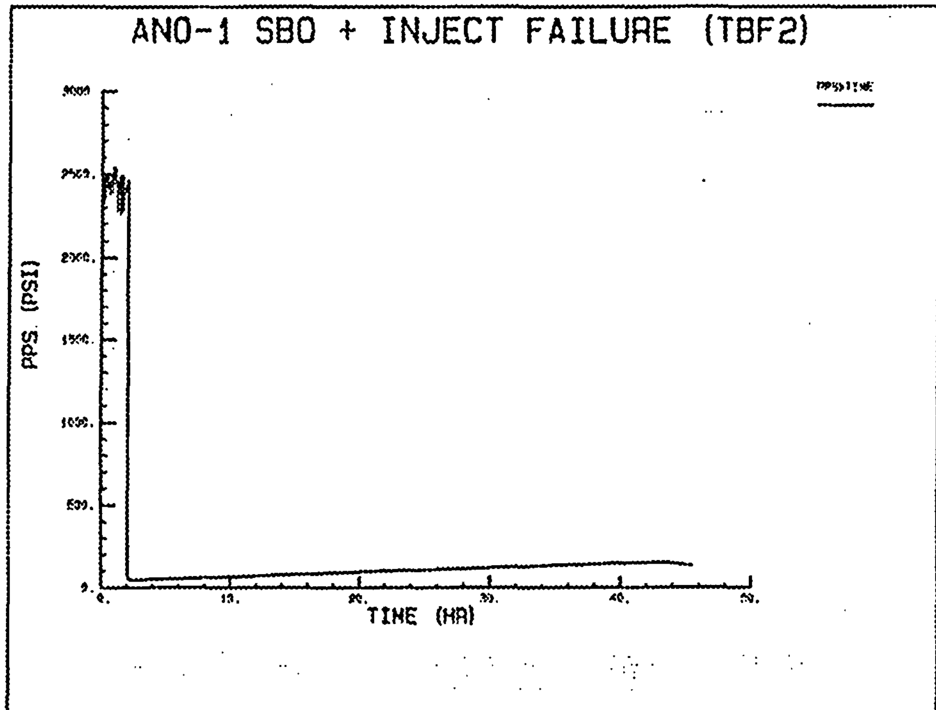
MH2PS1 (LB)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
TGBH (***)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
TGUH (***)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
ZWCPS (FT)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
WGBB (LB/HR)
TIME (HR)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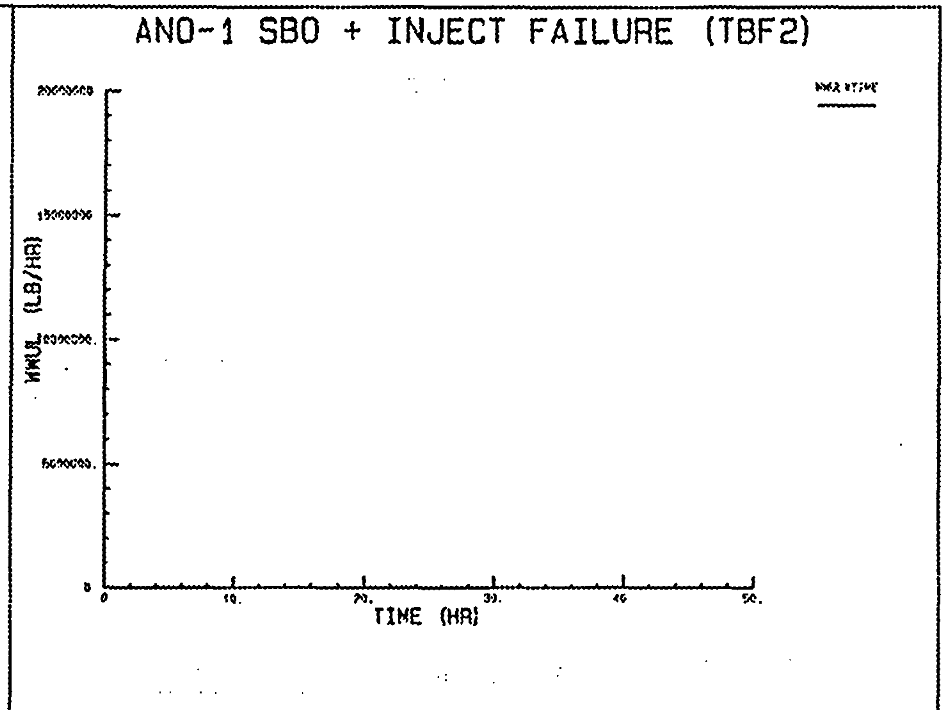
PPS (PSI)
TIME (HR)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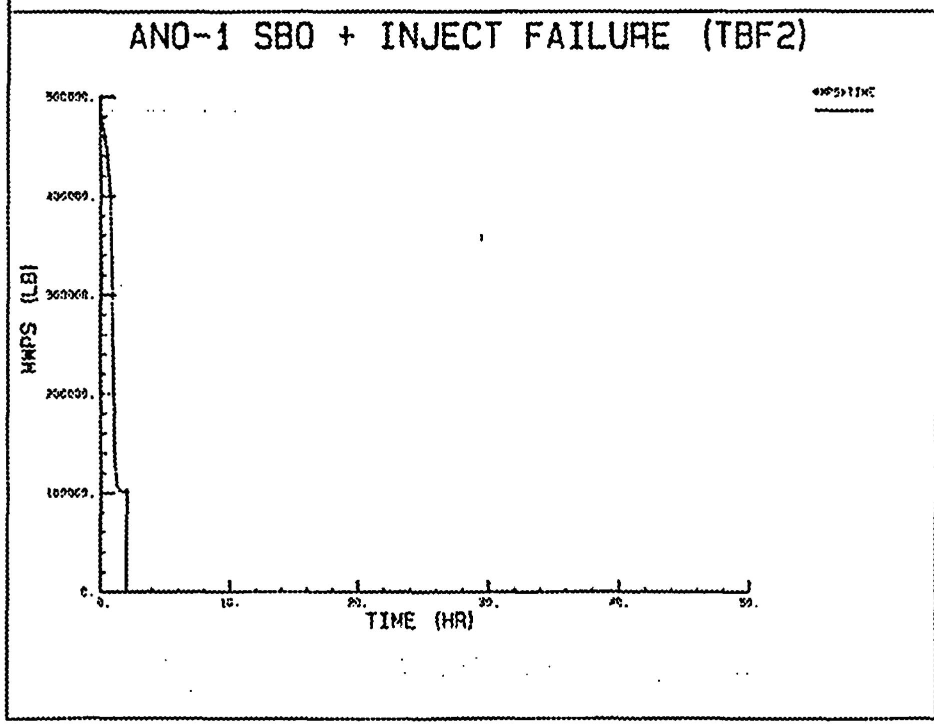
WWUL (LB/HR)
TIME (HR)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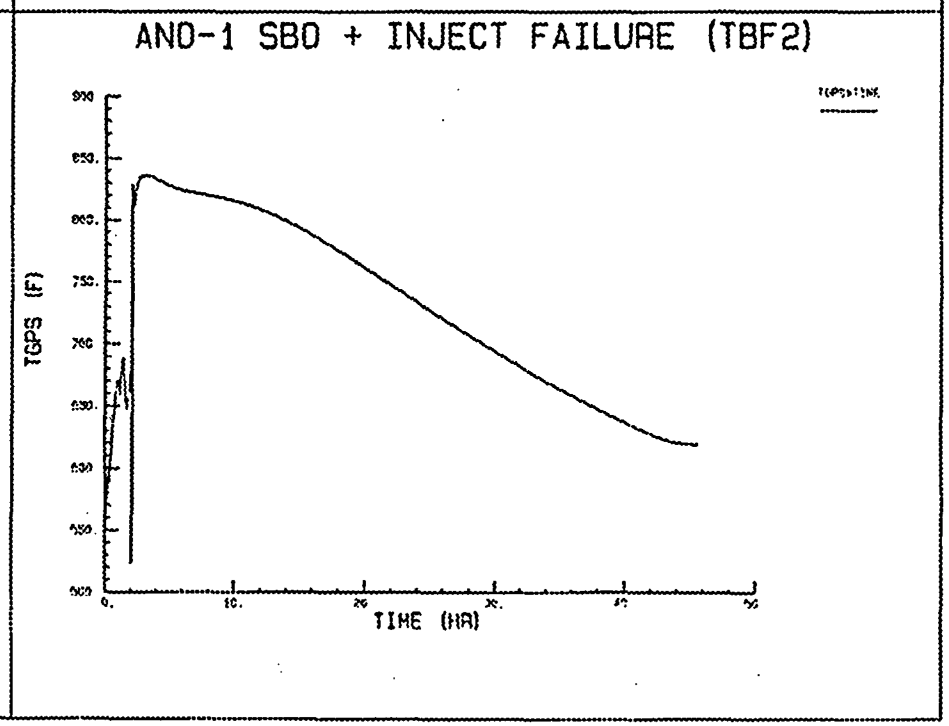
WWPS (LB)
TIME (HR)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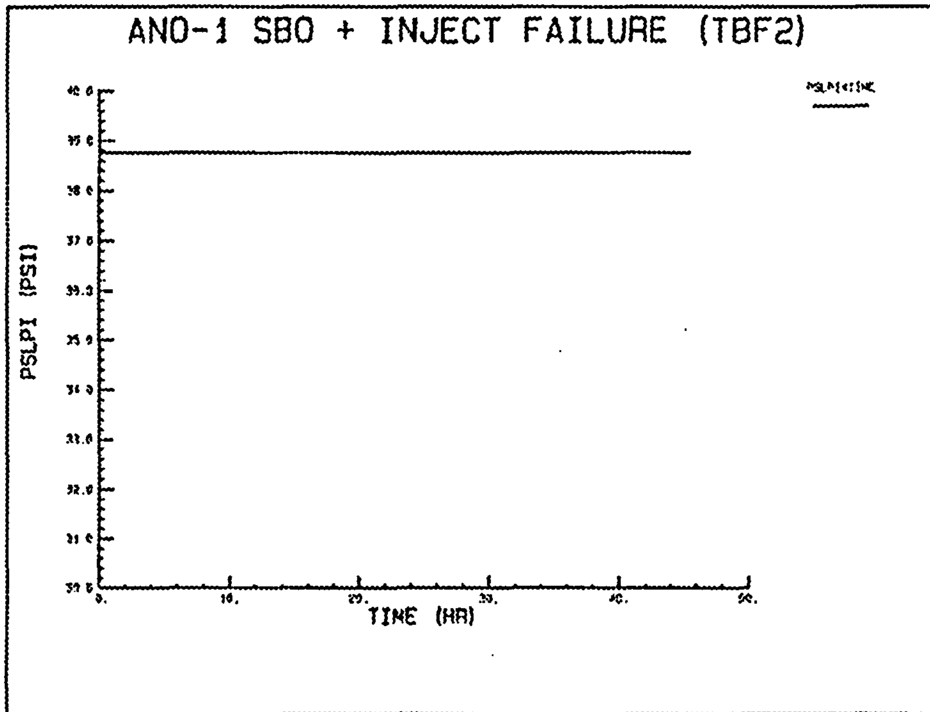
TGPS (F)
TIME (HR)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PSLPI (PSI)
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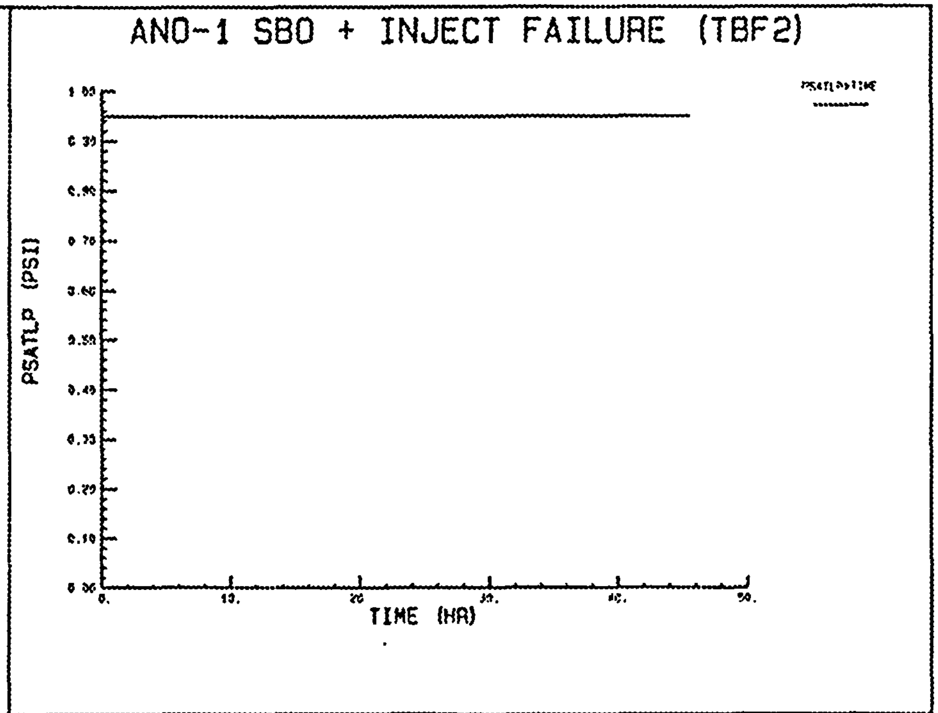
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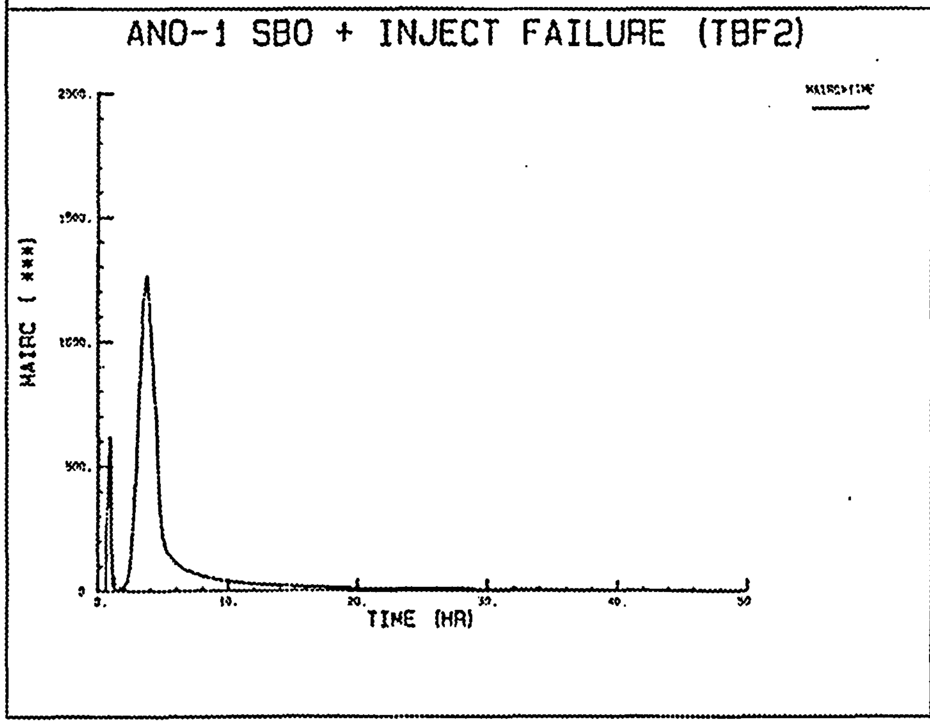
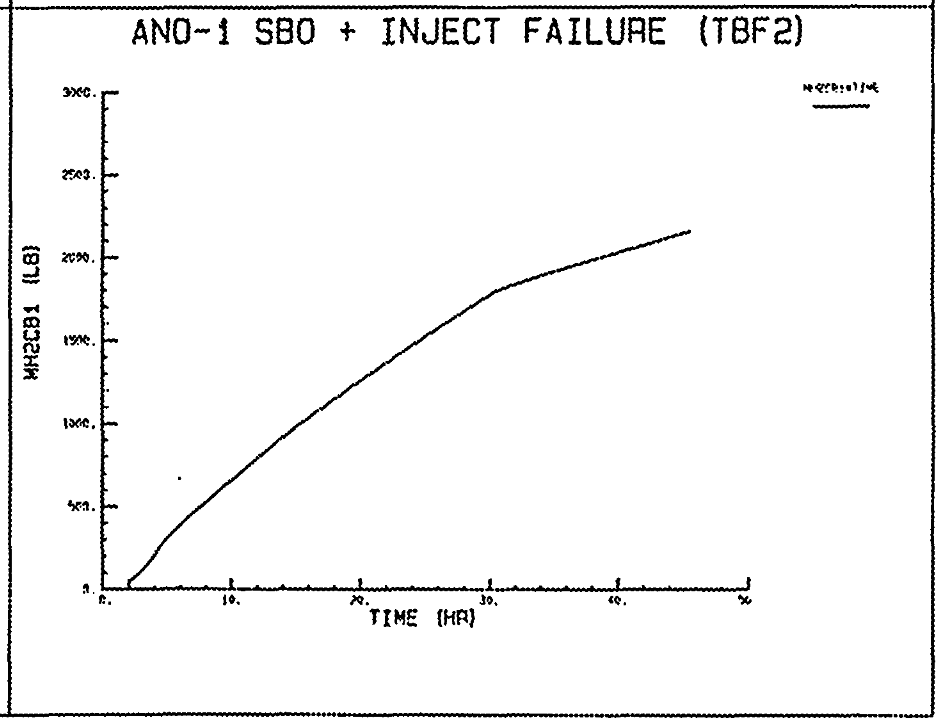
PSATLP (PSI)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
MAIRC (***)
TIME (HR)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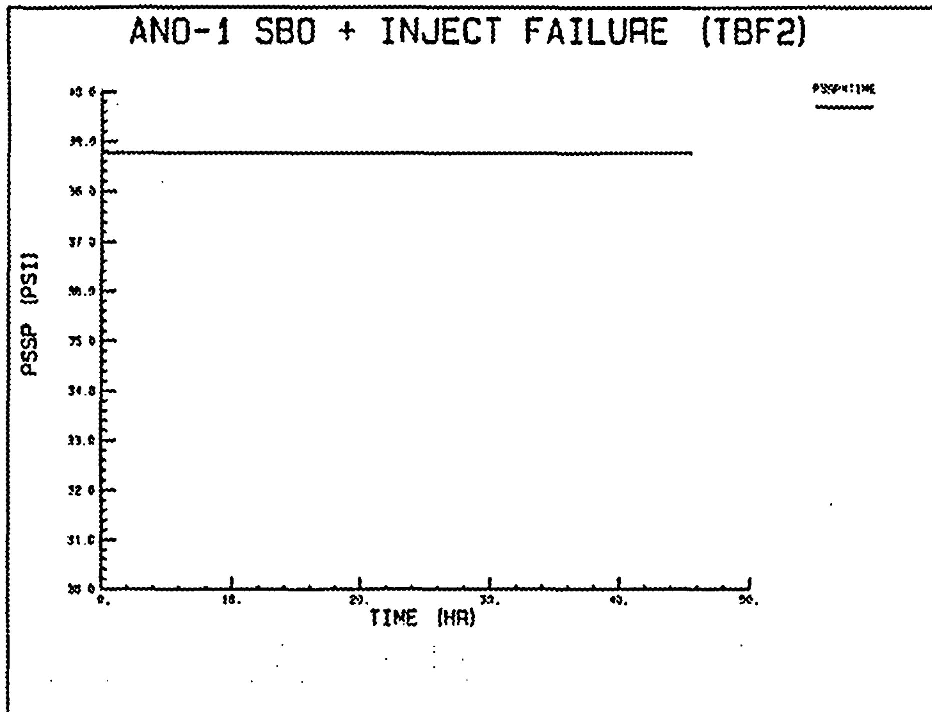
MH2CB1 (LB)
TIME (HR)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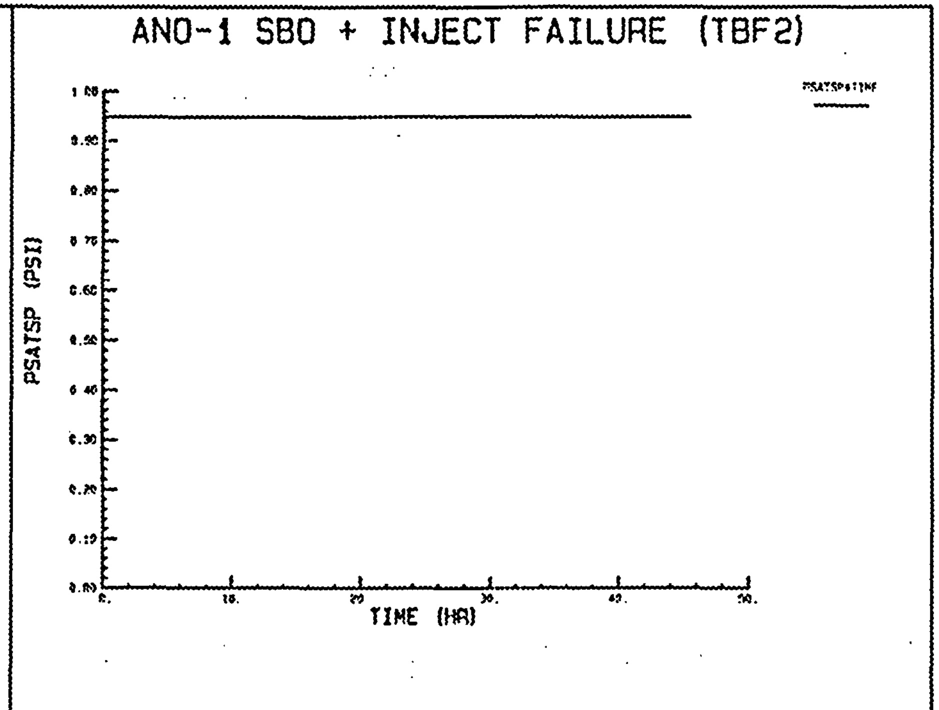
PSSP (PSI)
TIME (HR)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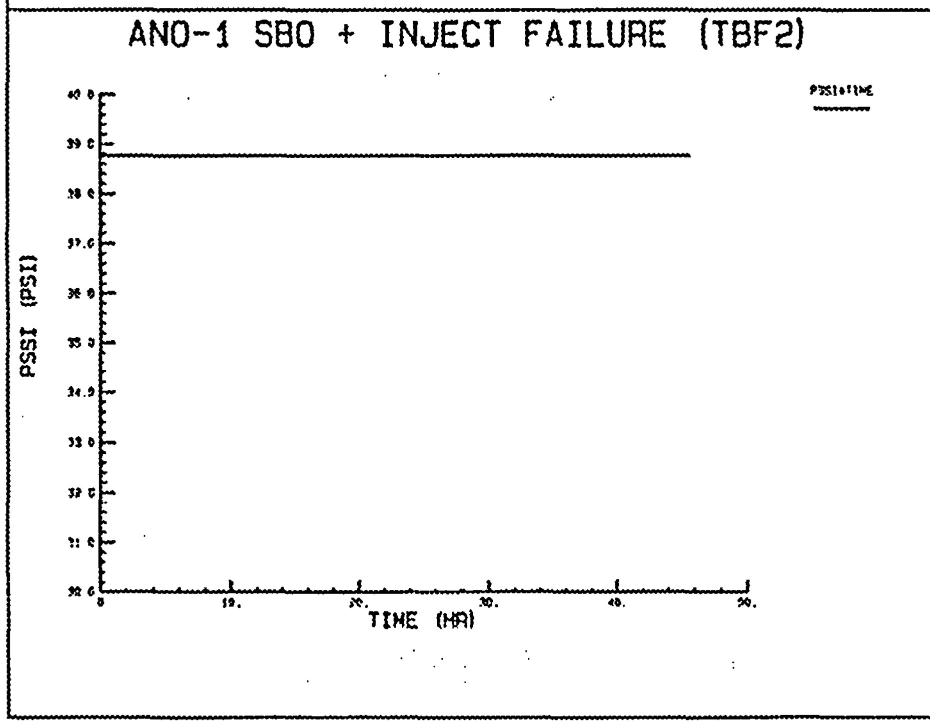
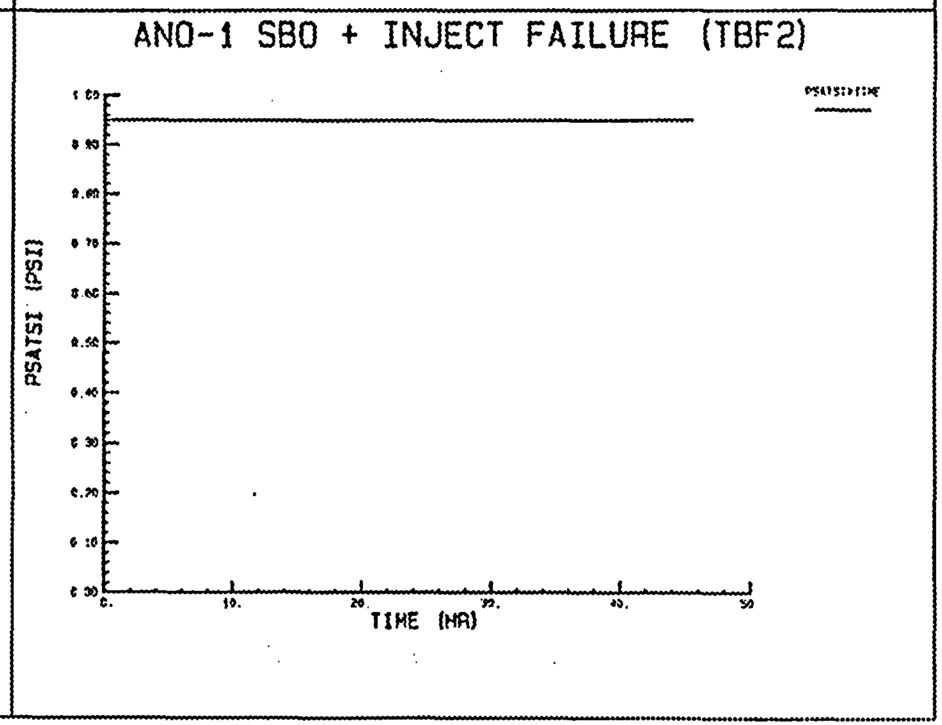
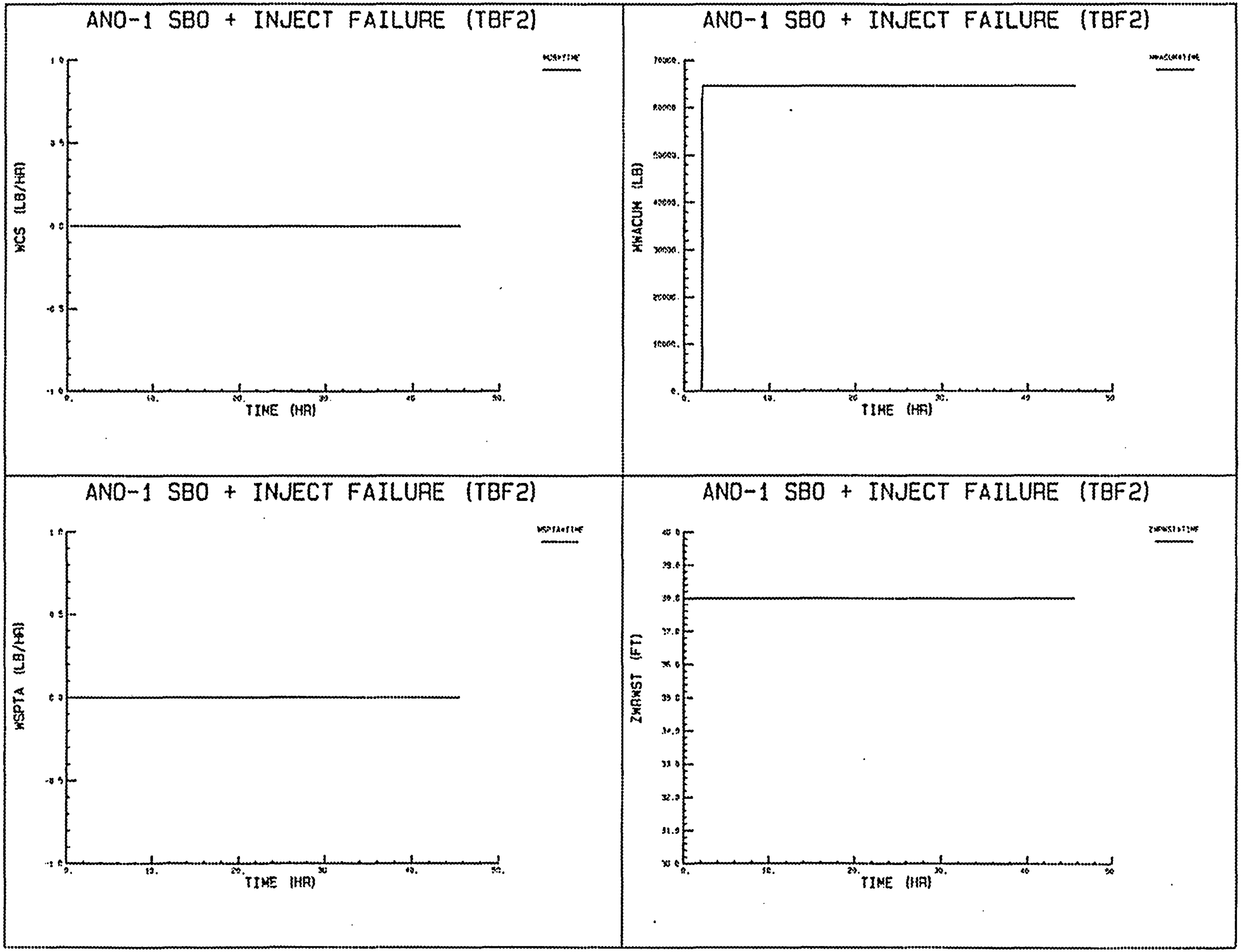
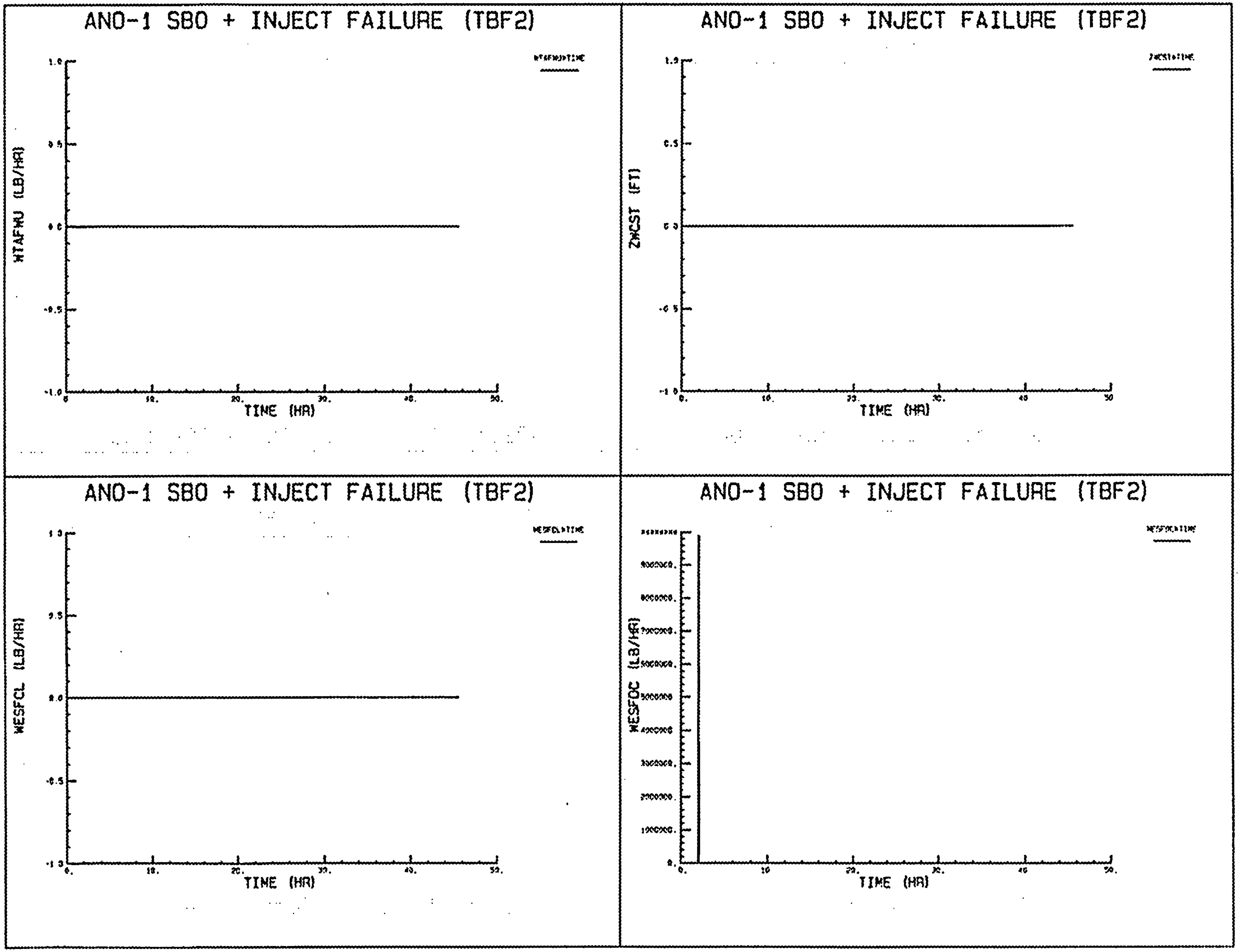
PSATSP (PSI)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
PSSI (PSI)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
PSATSI (PSI)
TIME (HR)



ANO-1 SBO + INJECT FAILURE (TBF2)
WCS (LB/HR)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
MWACUM (LB)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
WSPTA (LB/HR)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
ZWRWST (FT)
TIME (HR)



ANO-1 SBO + INJECT FAILURE (TBF2)
WTAFWU (LB/HR)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
ZWCST (FT)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
WESFCL (LB/HR)
TIME (HR)
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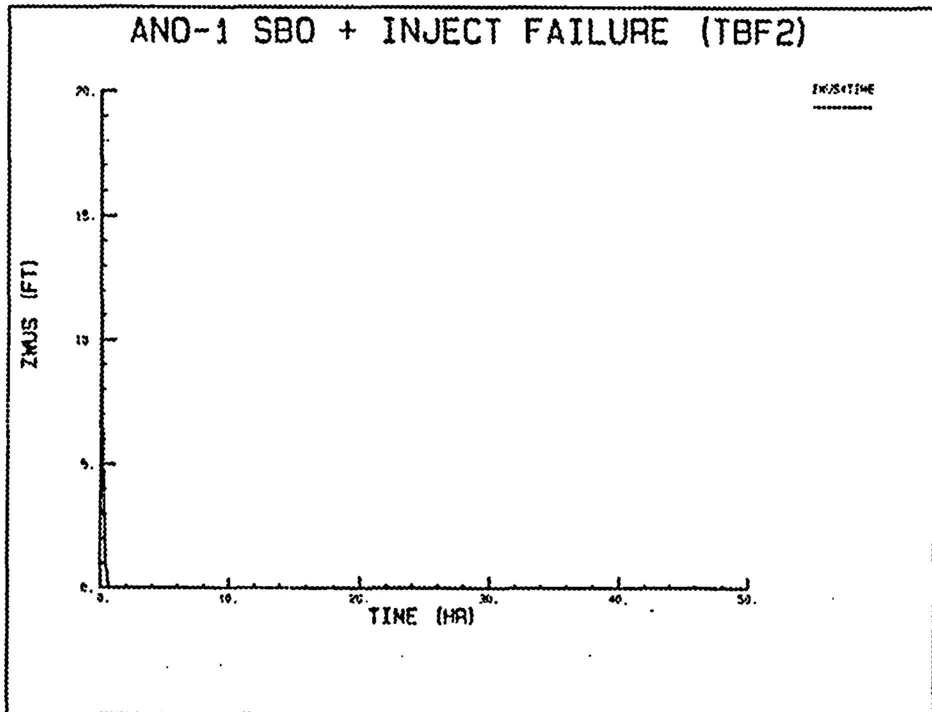
WESFOC (LB/HR)
TIME (HR)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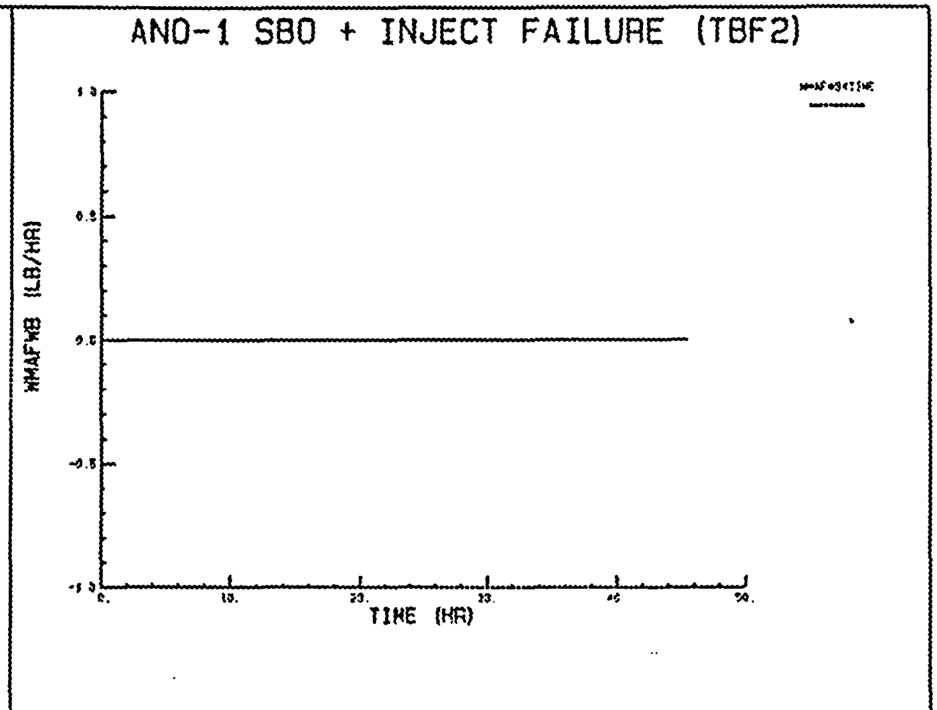
ZWUS (FT)
TIME (HR)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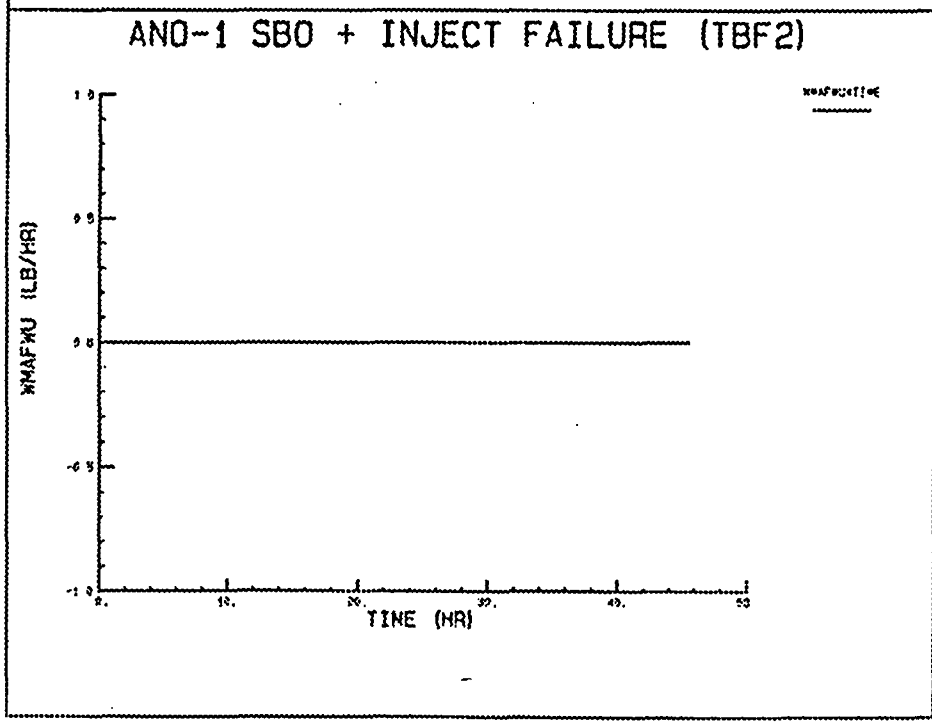
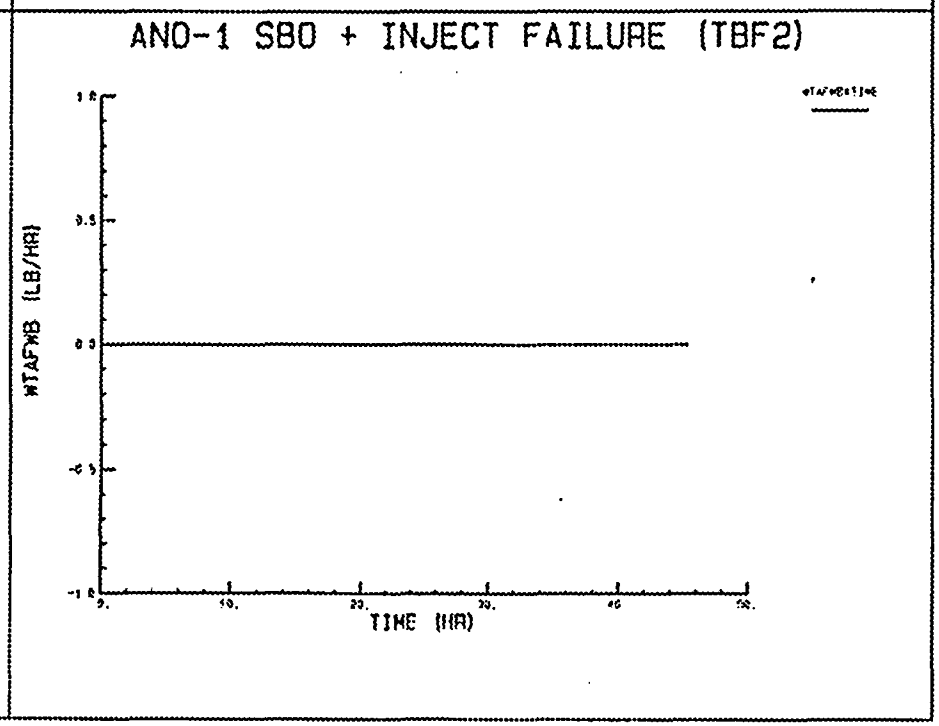
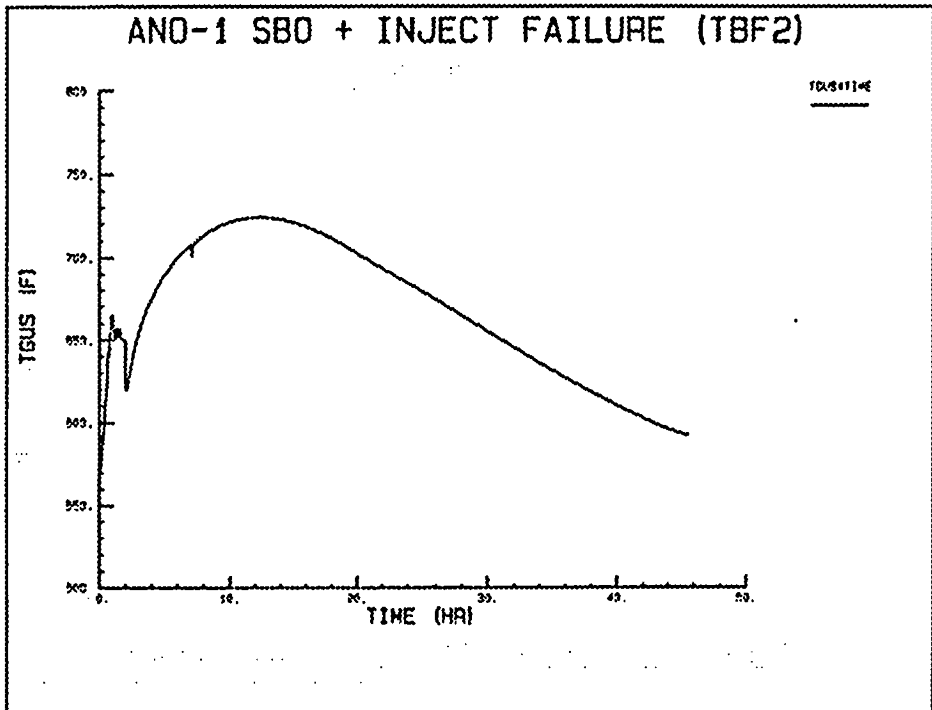
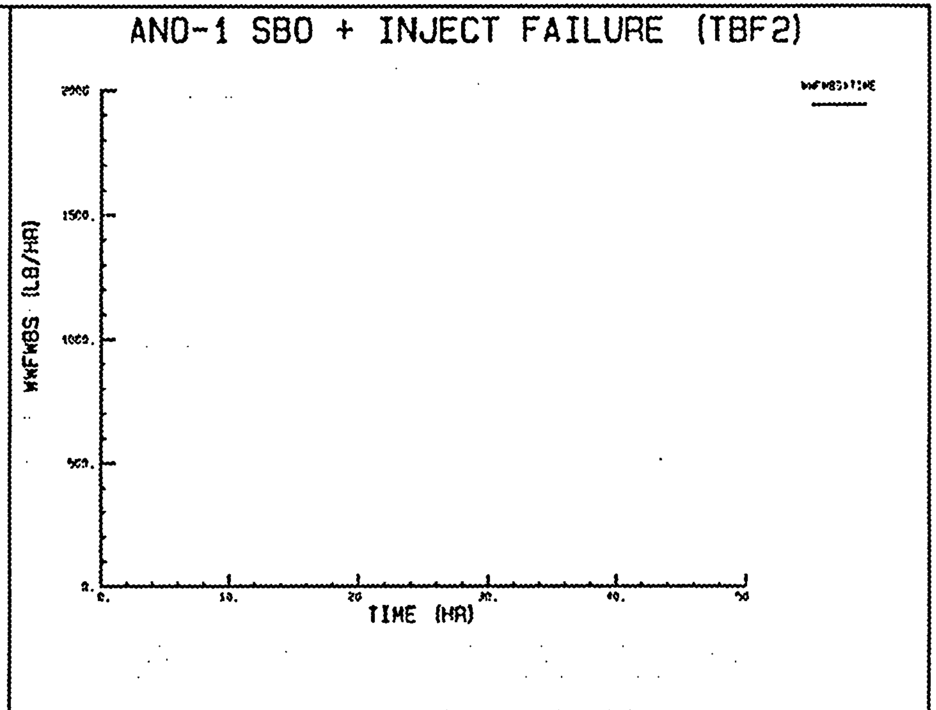
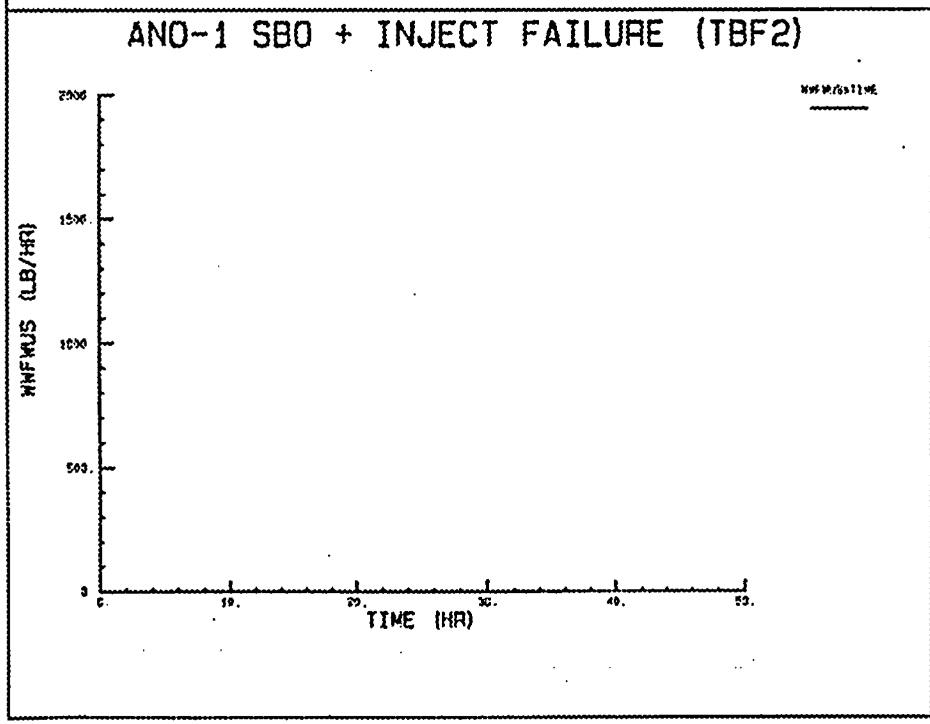
WMAFWB (LB/HR)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
WMAFWU (LB/HR)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
WTAFWB (LB/HR)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
TGUS (F)
800.
750.
700.
650.
600.
550.
500
0.
10.
20.
30.
40.
50.
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
WWFWBS (LB/HR)
2000
1500.
1000.
500.
0.
0.
10.
20
30.
40.
50
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
WWFWUS (LB/HR)
2000
1500
1000
500.
0
0.
10.
20.
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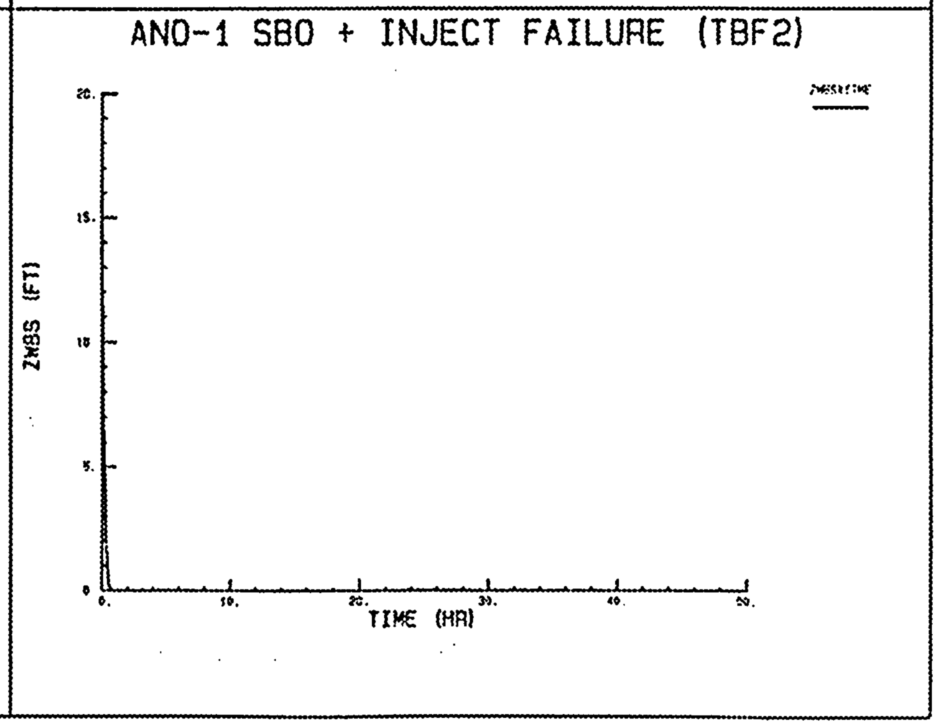
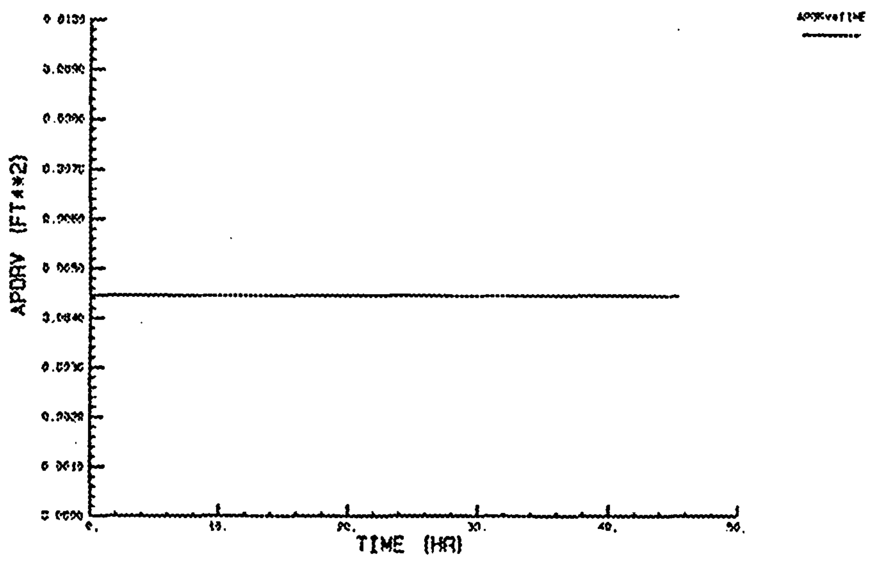
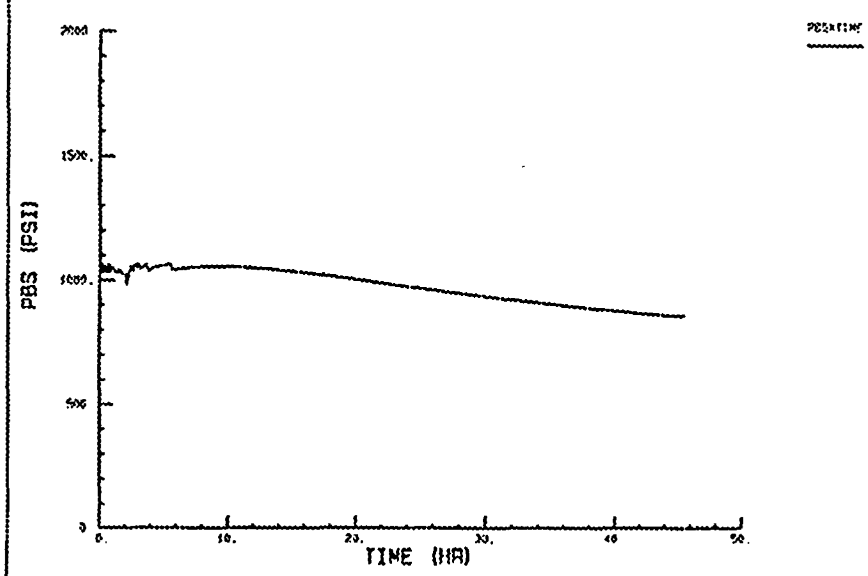
40.
50.
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
ZWBS (FT)
20.
15.
10
5.
0
0.
10.
20.
30.
40.
50.
TIME (HR)

ANO-1 SBO + INJECT FAILURE (TBF2)



ANO-1 SBO + INJECT FAILURE (TBF2)



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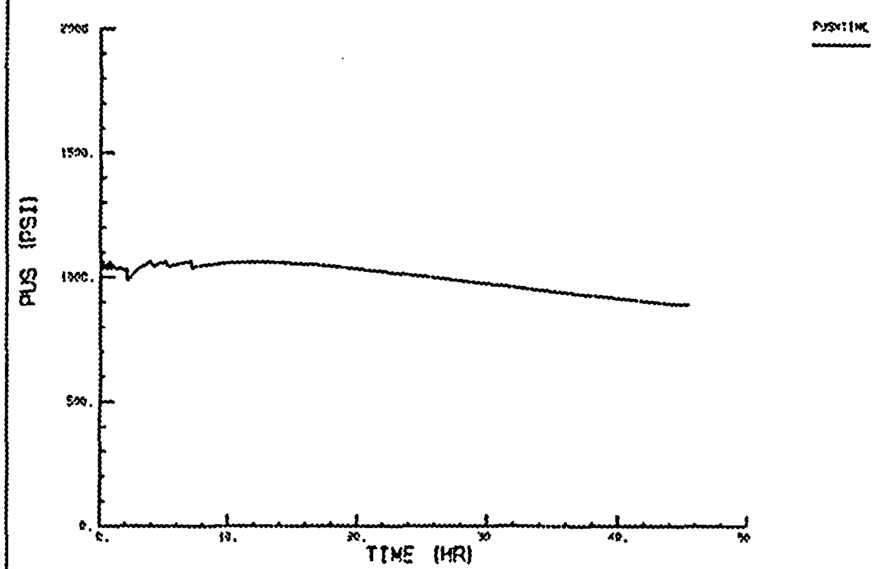

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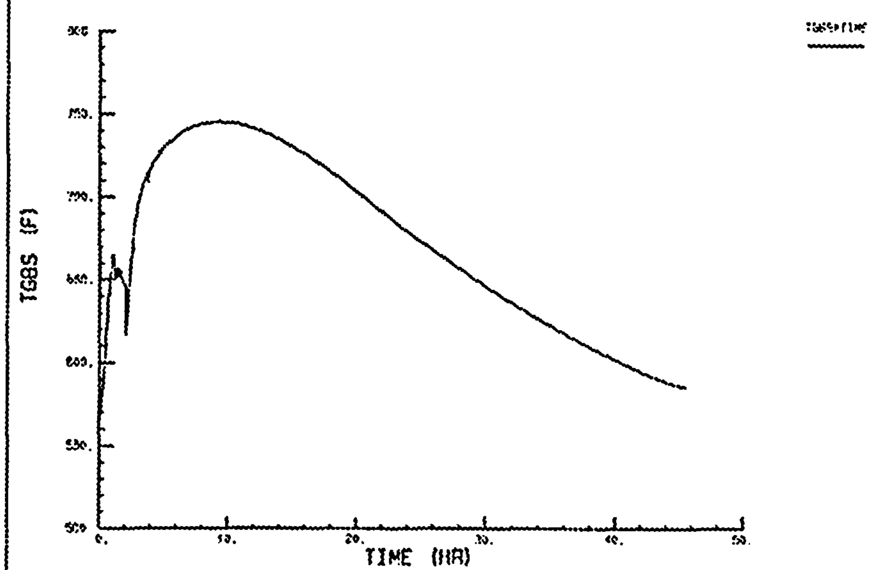

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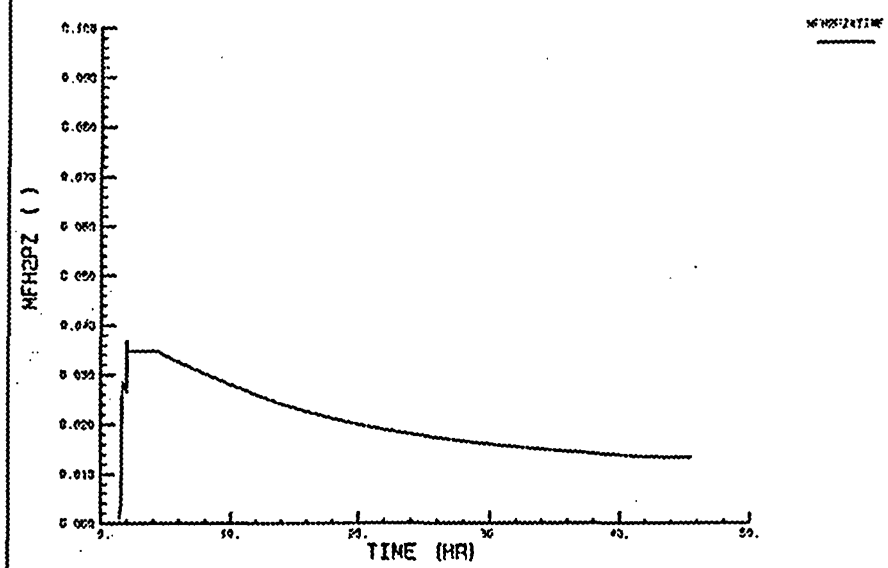

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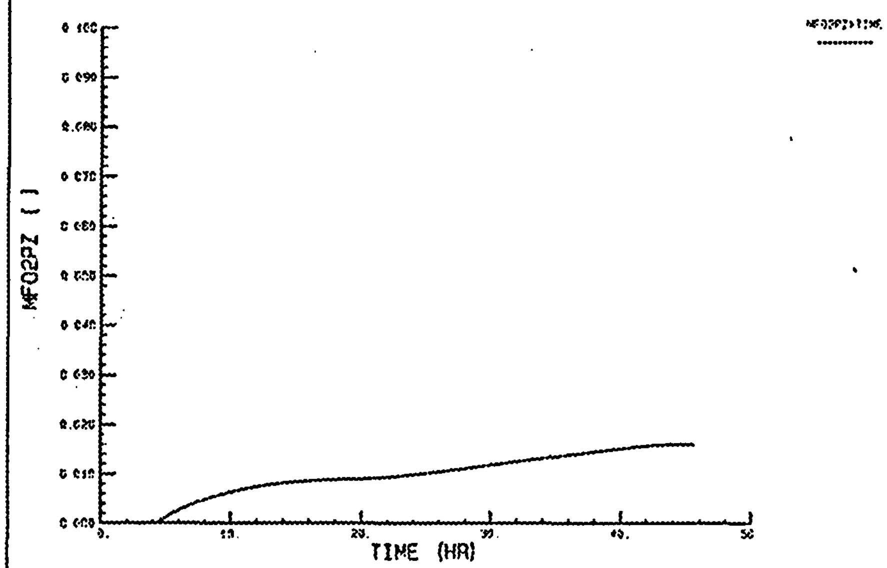
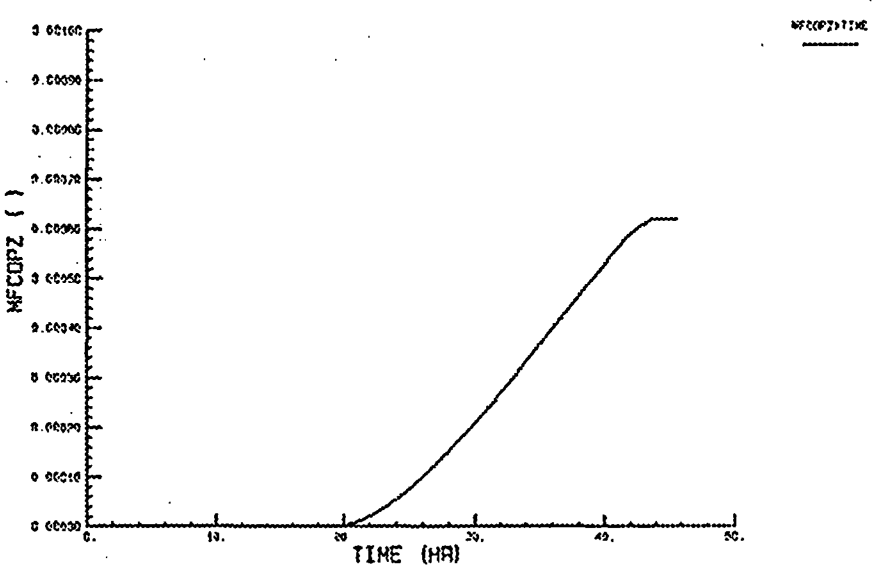


ANO-1 SBO + INJECT FAILURE (TBF2)



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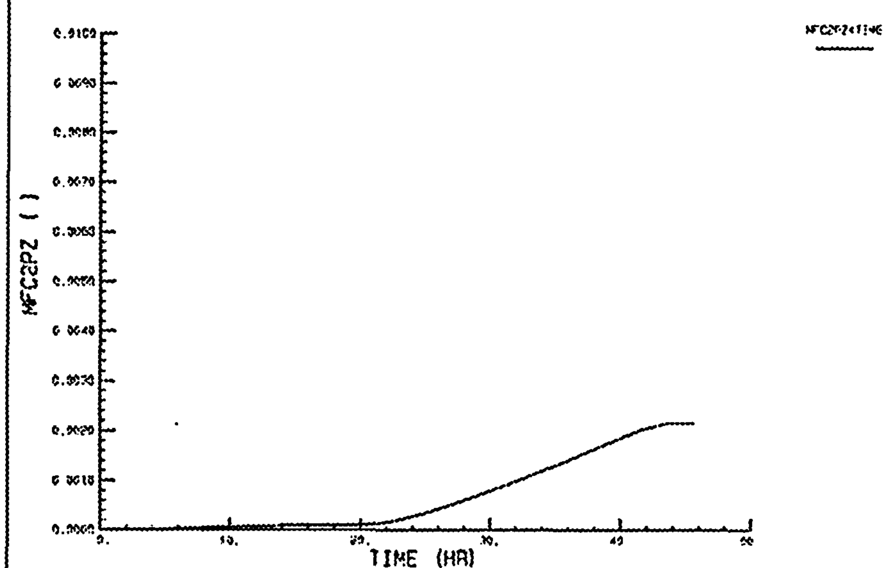

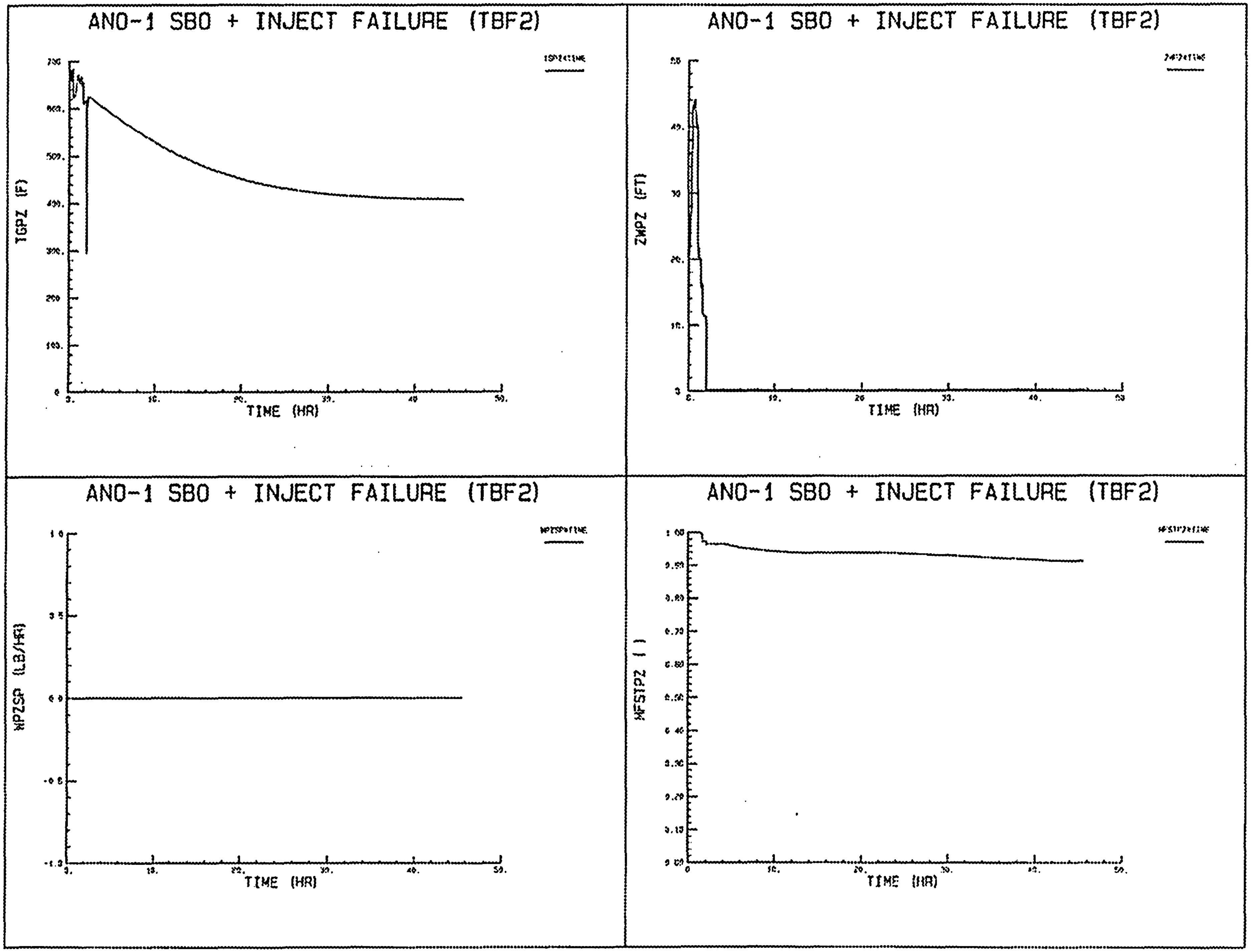

ANO-1 SBO + INJECT FAILURE (TBF2)
TGPZ (F)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
ZWPZ (FT)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
WPZSP (LB/HR)
TIME (HR)
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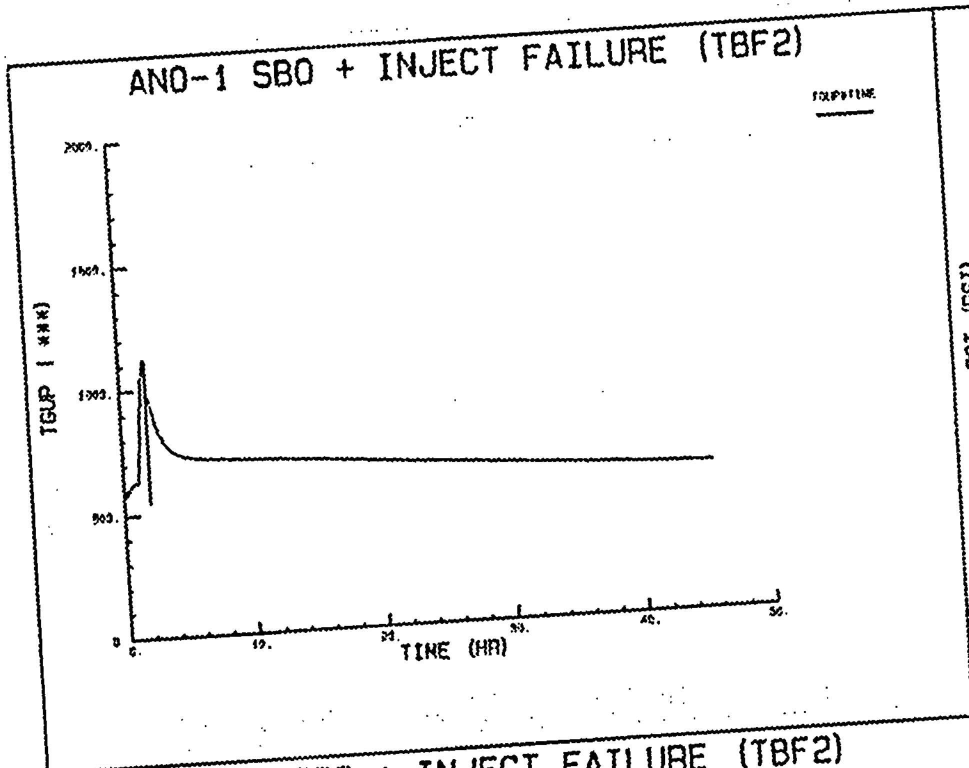
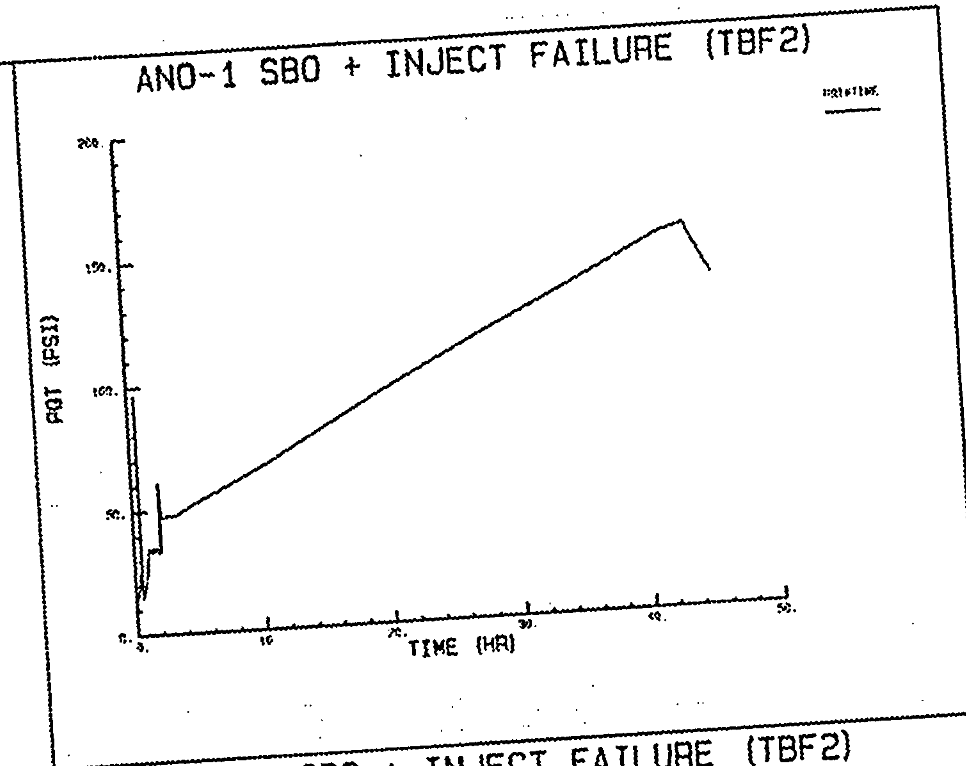
WFSTPZ ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
TIME (HR)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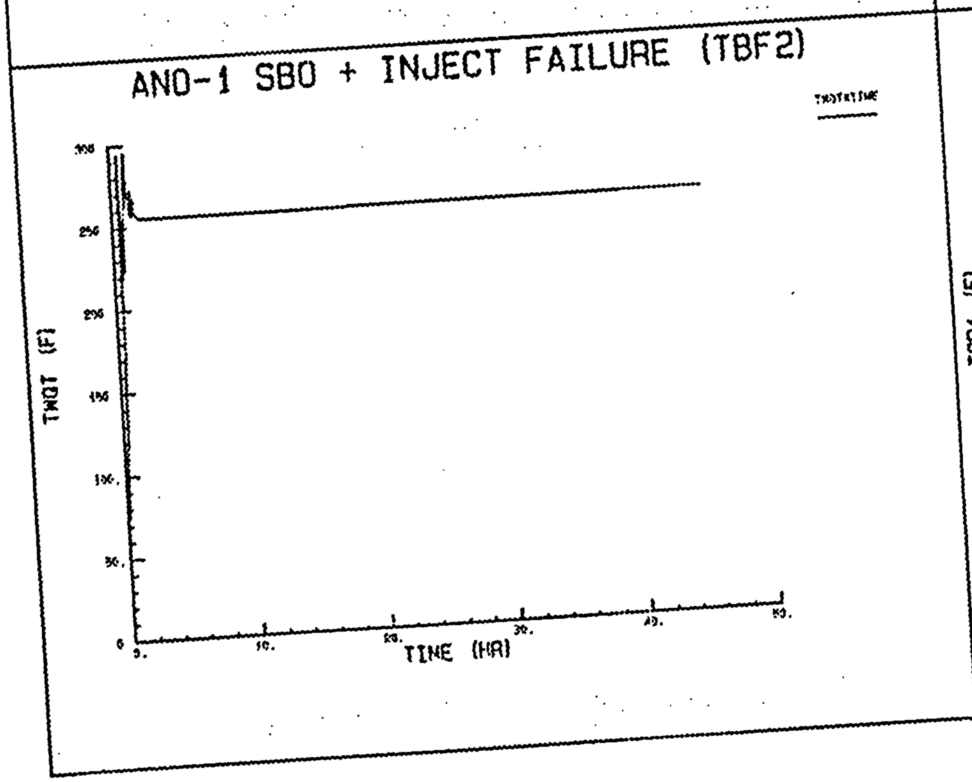
TIME (HR)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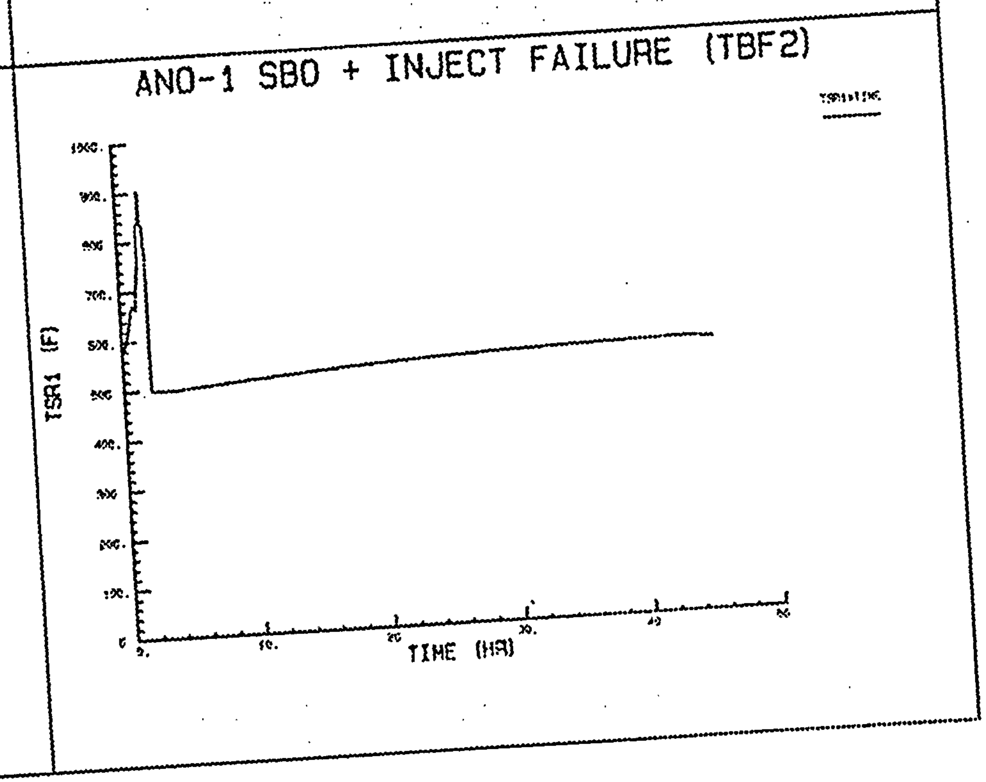
TIME (HR)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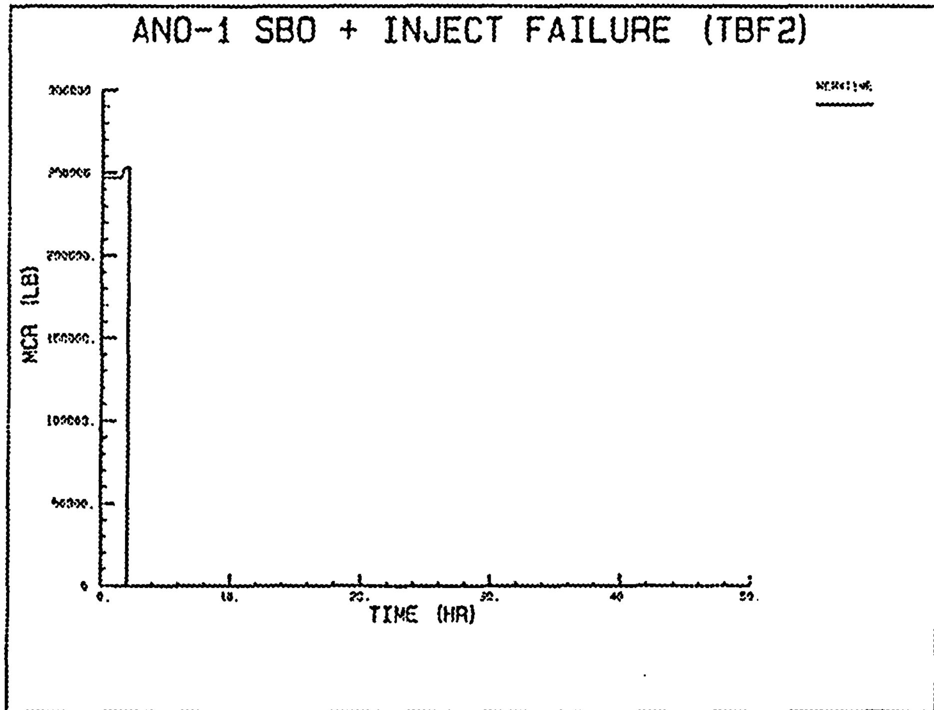
TSR1 (F)
TIME (HR)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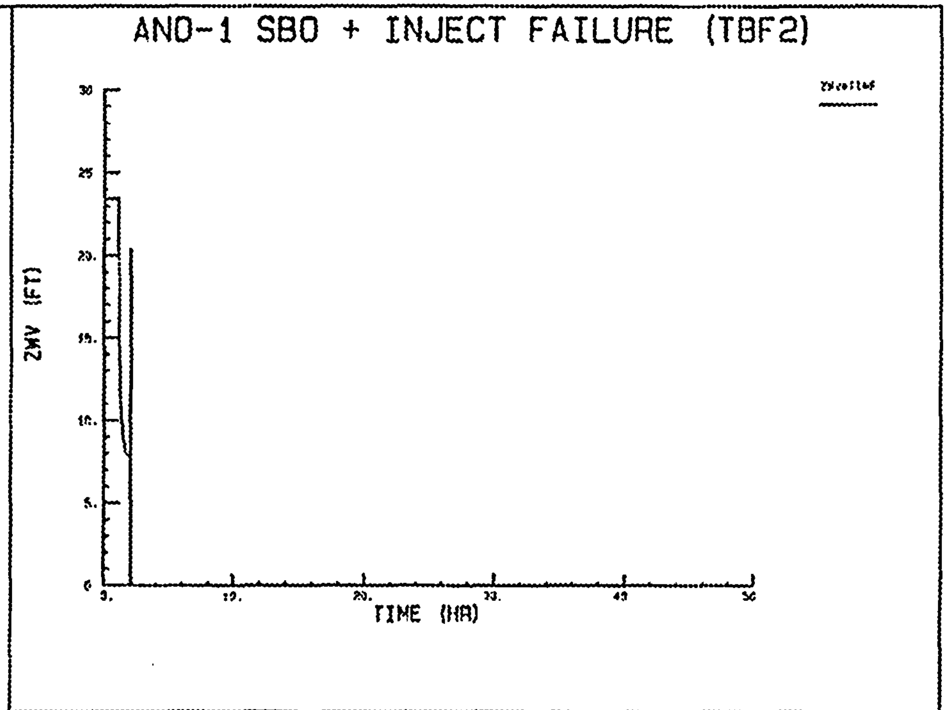
MCR (LB)
TIME (HR)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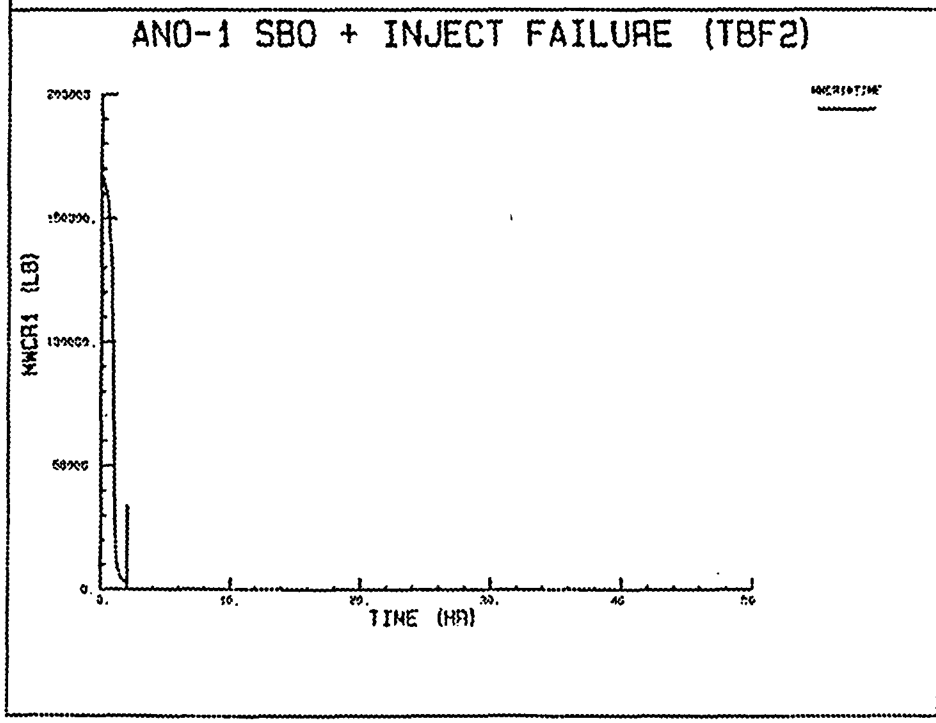
ZWV (FT)
TIME (HR)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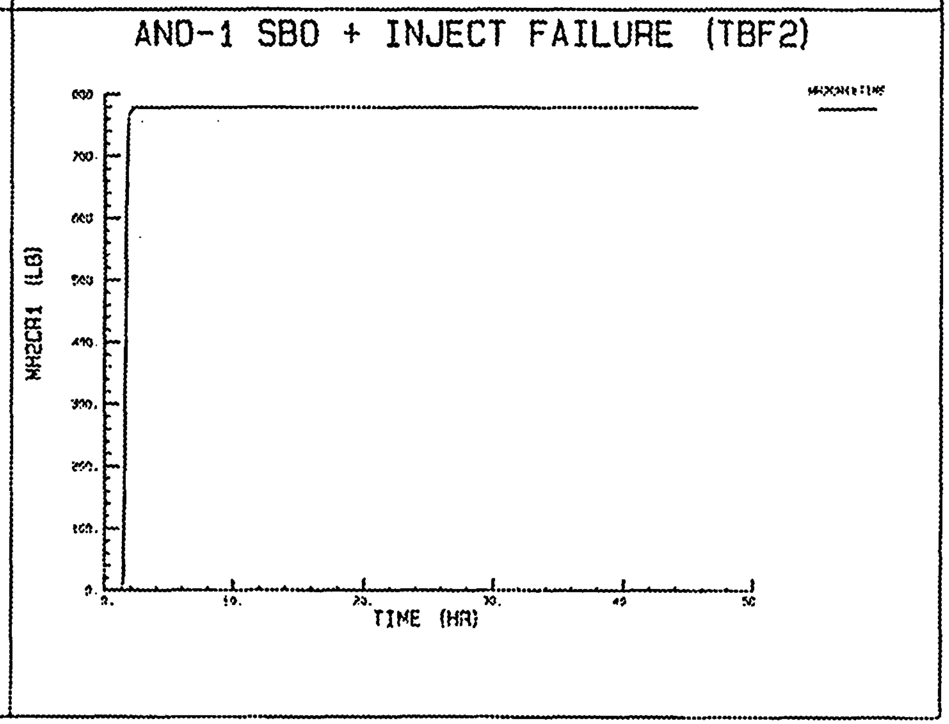
MWCR1 (LB)
TIME (HR)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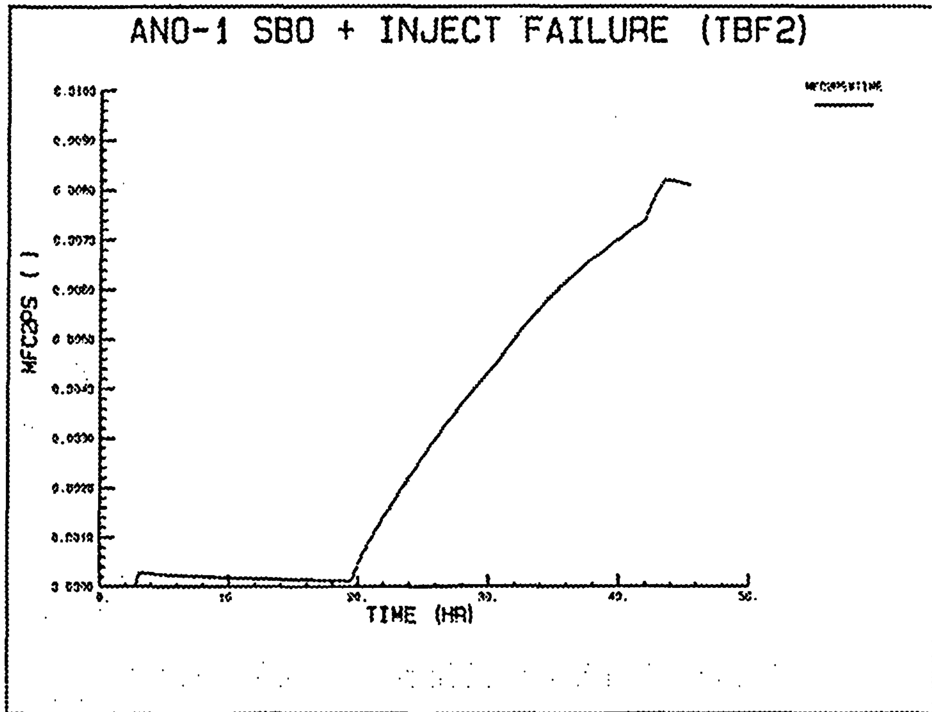
MH2CR1 (LB)
TIME (HR)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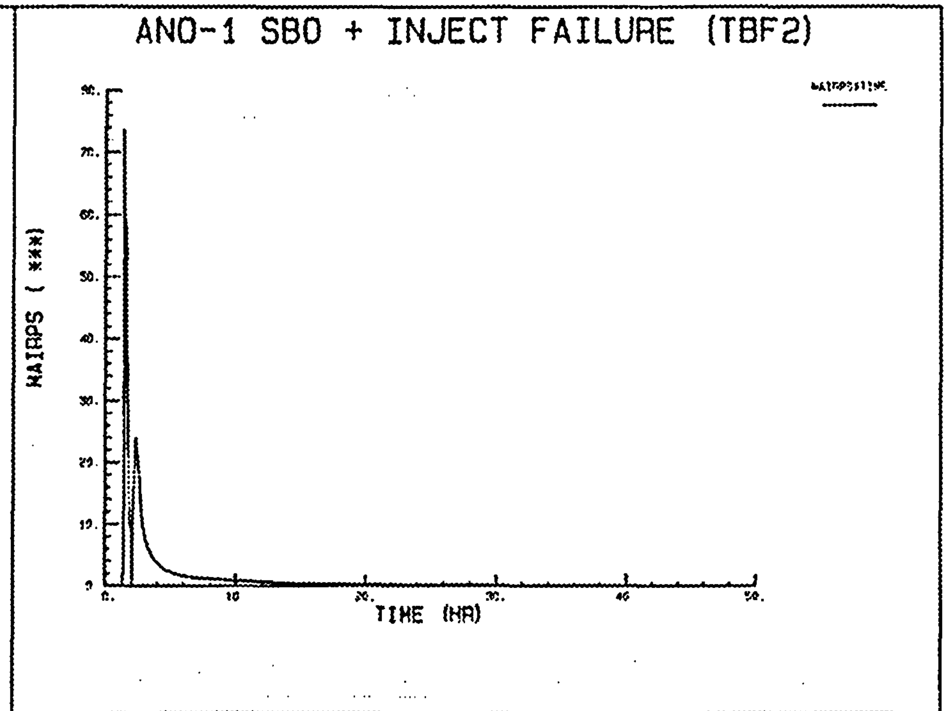
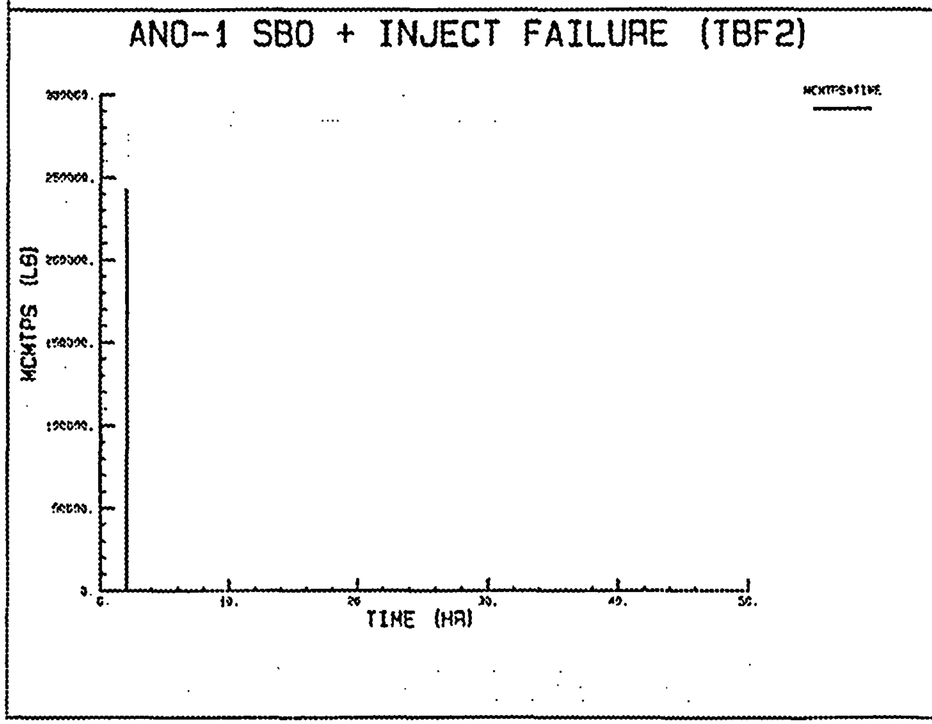
MFC3PS ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
MAIRPS (***)
TIME (HR)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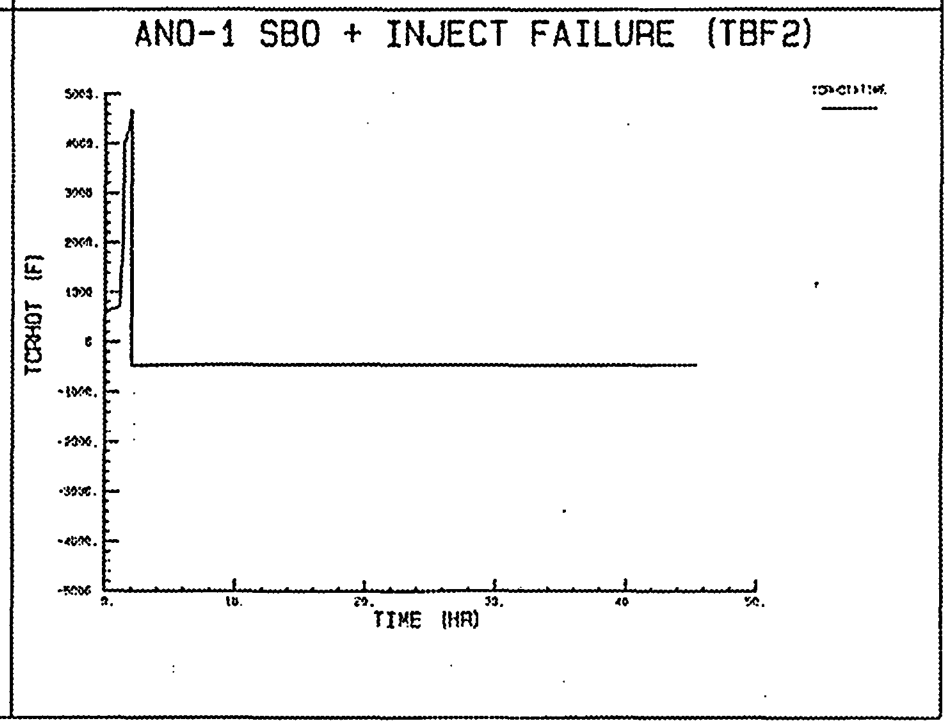
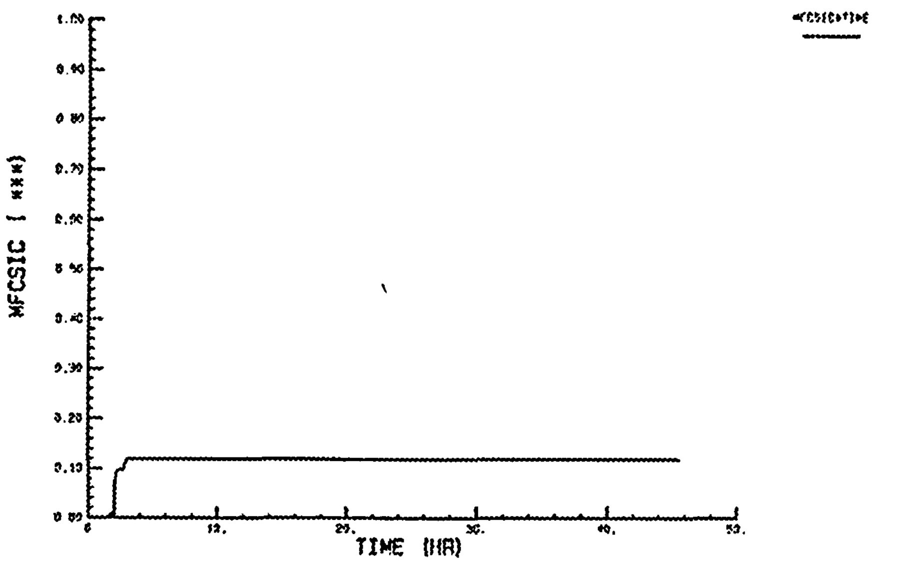
MCMTPS (LB)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
TCRHOT (F)
TIME (HR)

ANO-1 SBO + INJECT FAILURE (TBF2)



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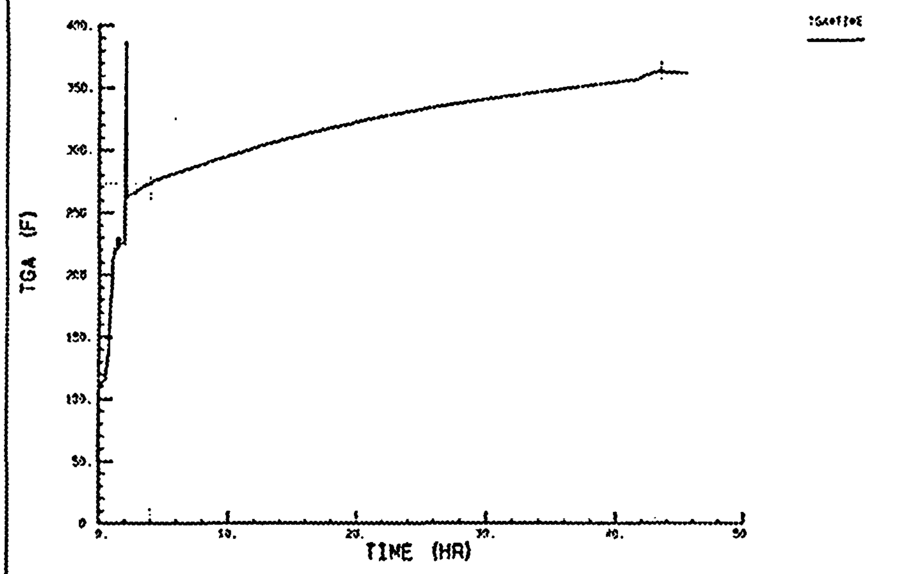
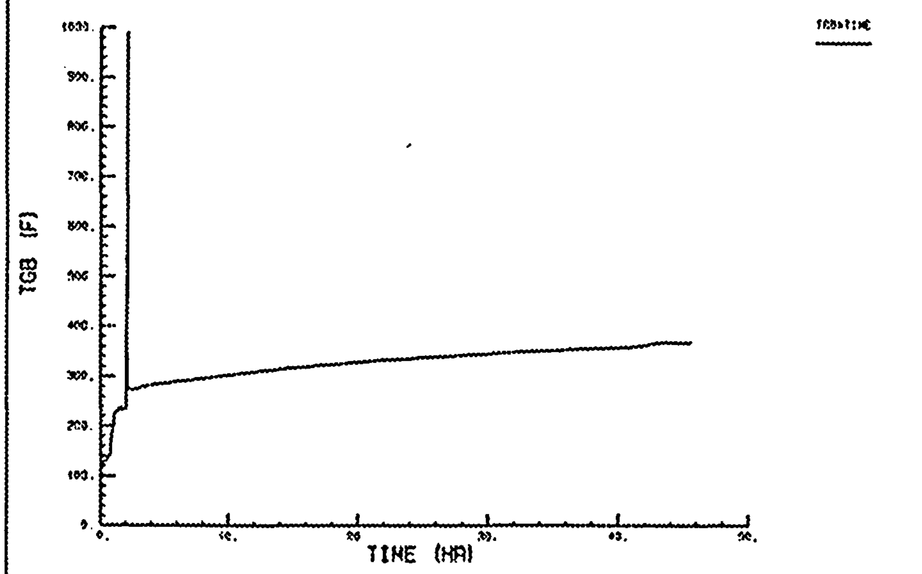
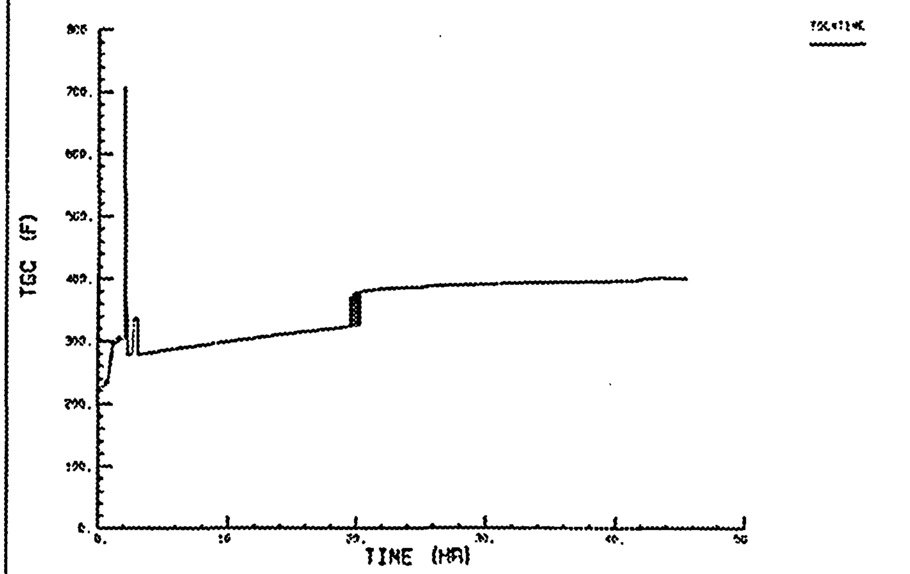
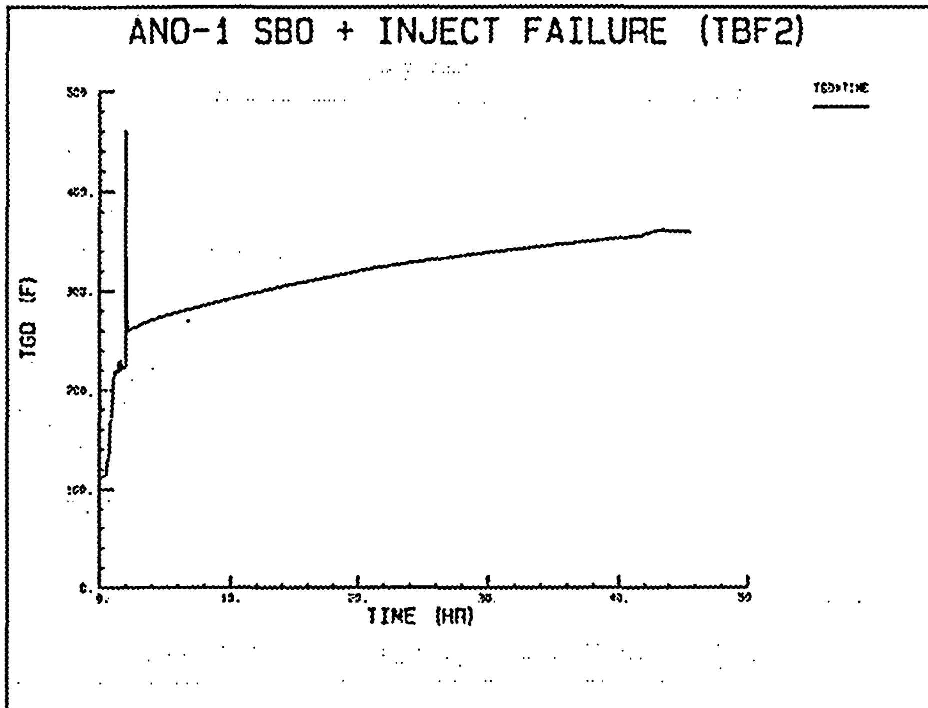


ANO-1 SBO + INJECT FAILURE (TBF2)



ANO-1 SBO + INJECT FAILURE (TBF2)

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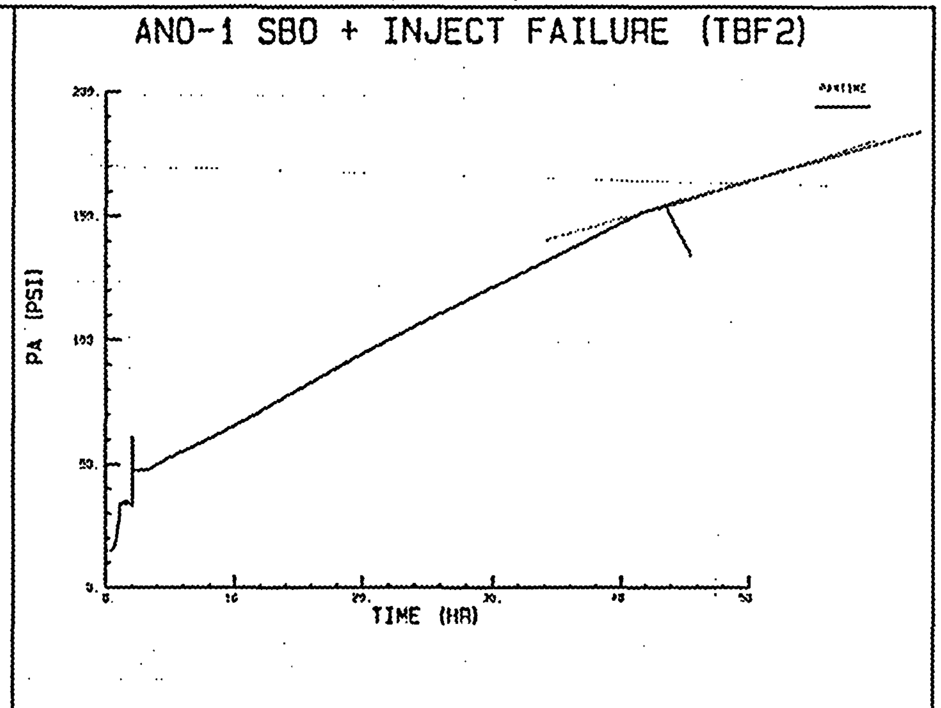
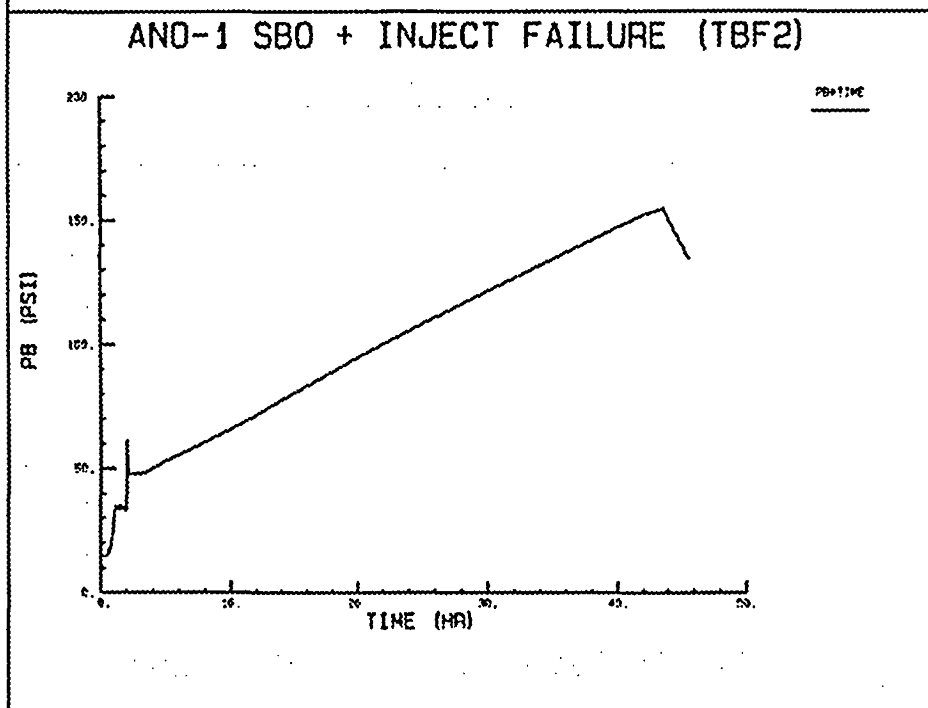
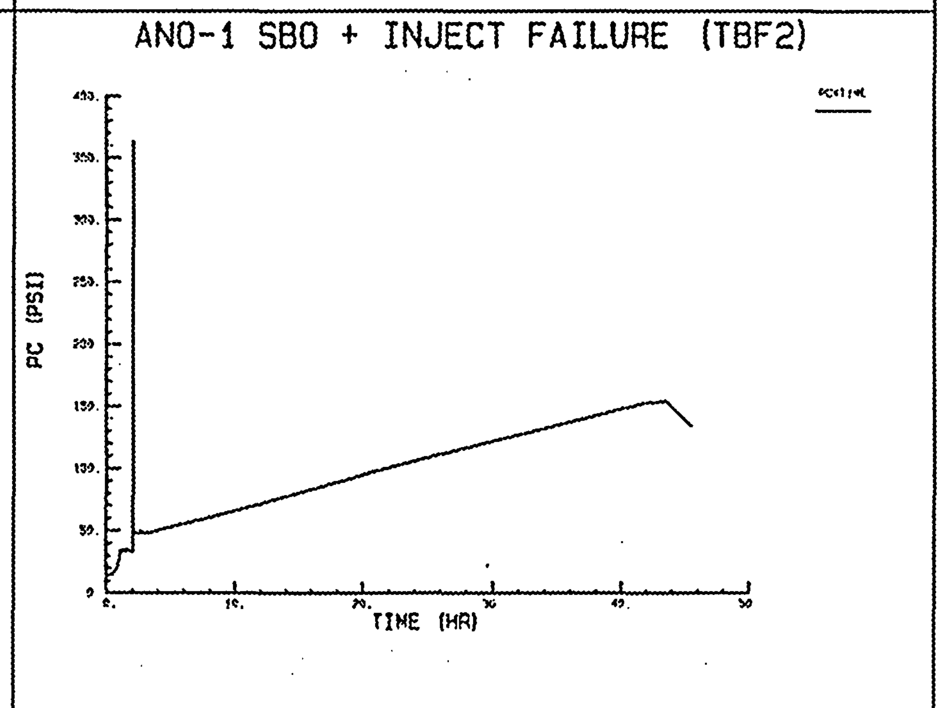
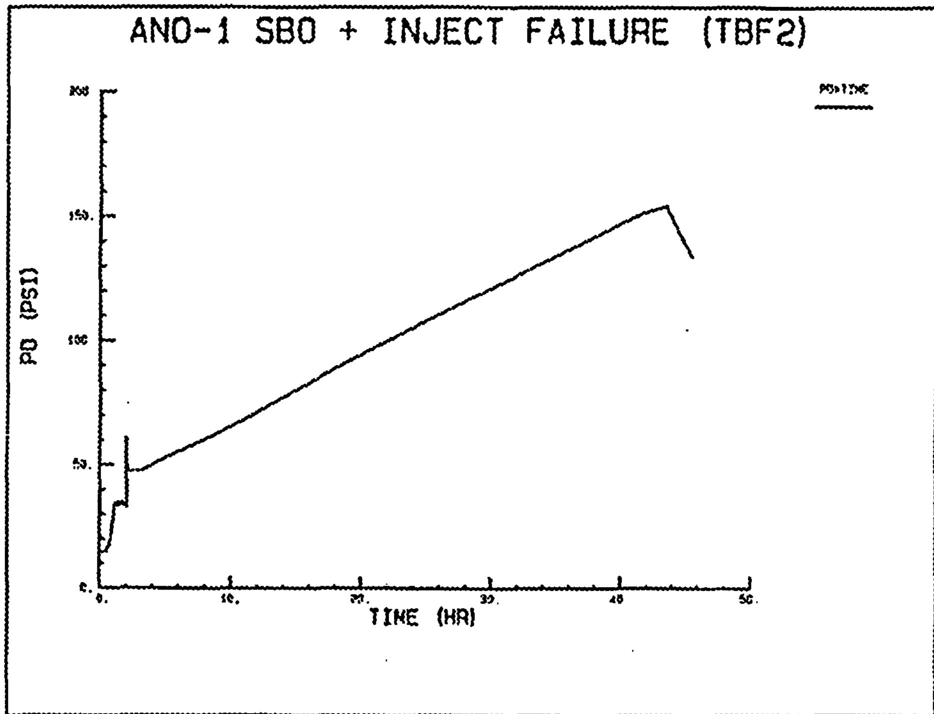
TGD (F)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
PA (PSI)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
PB (PSI)
TIME (HR)


ANO-1 SBO + INJECT FAILURE (TBF2)
PC (PSI)
TIME (HR)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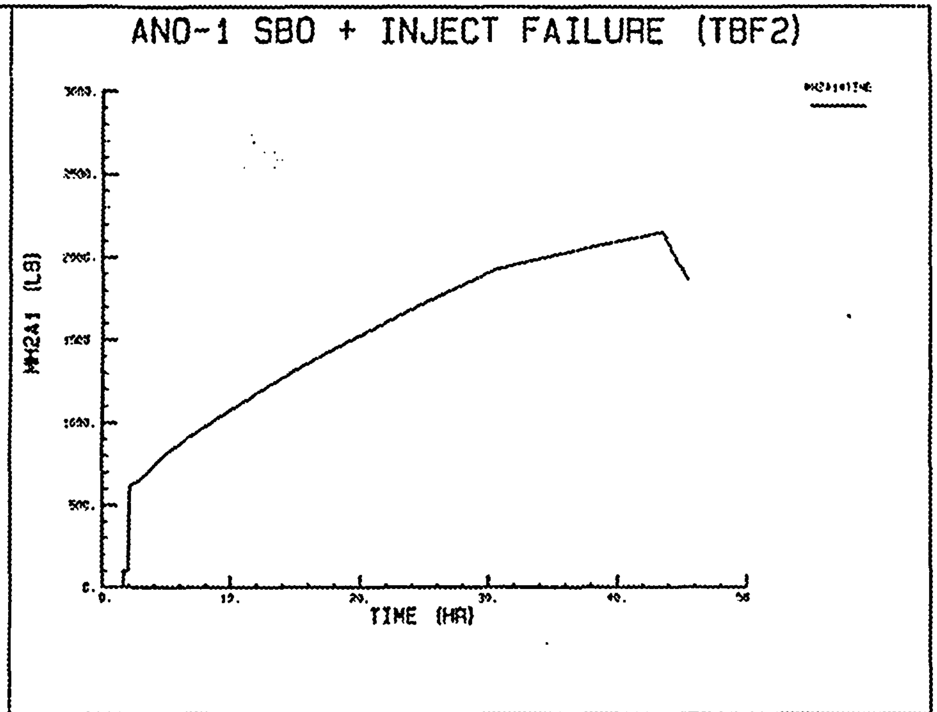
PD (PSI)
TIME (HR)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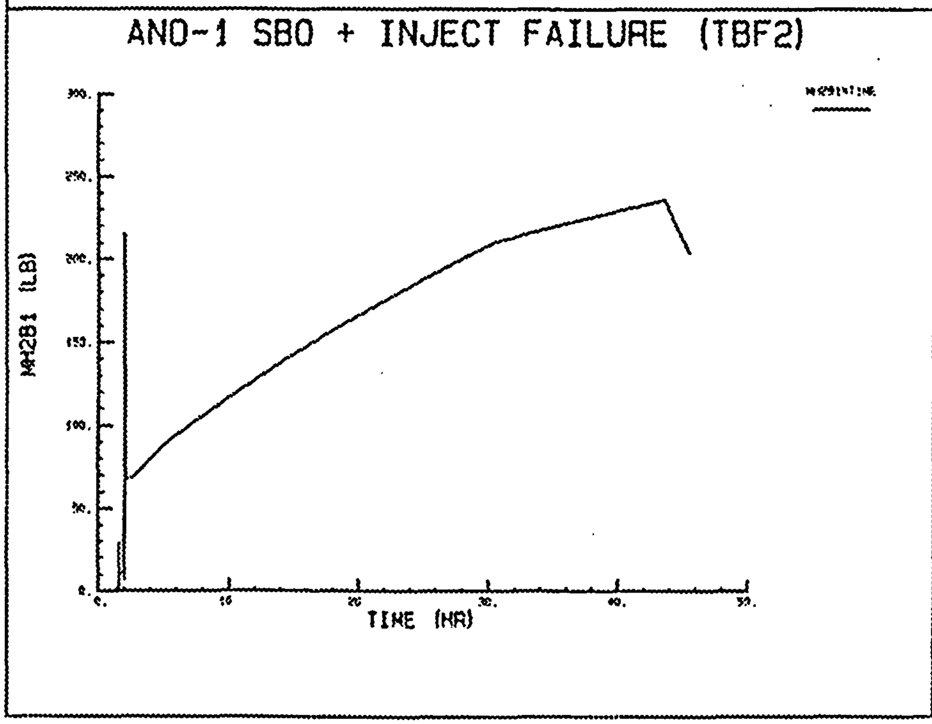
MH2A1 (LB)
TIME (HR)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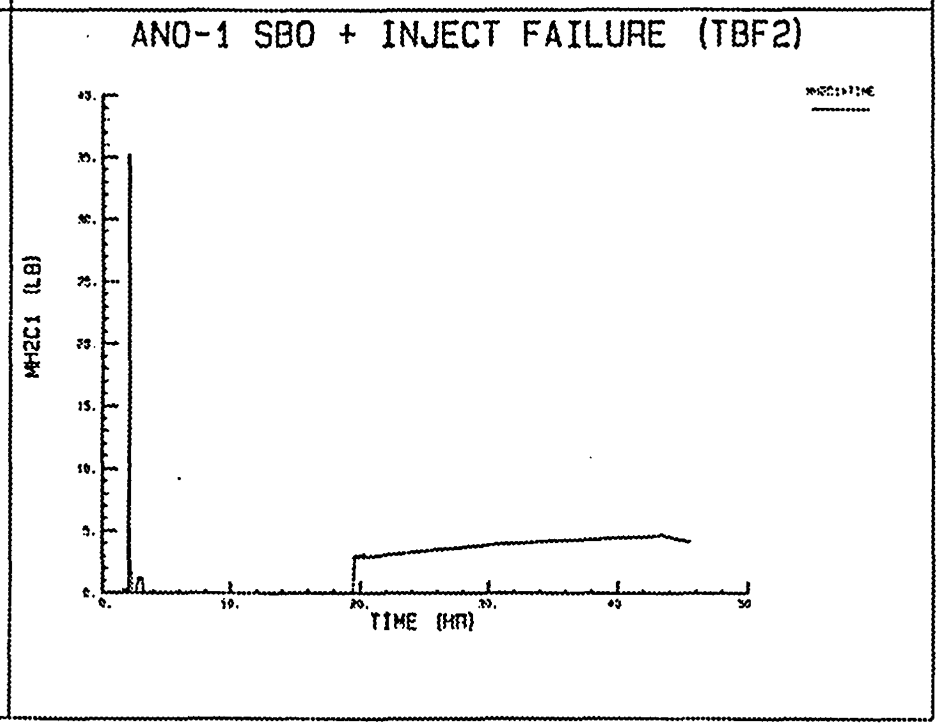
TIME (HR)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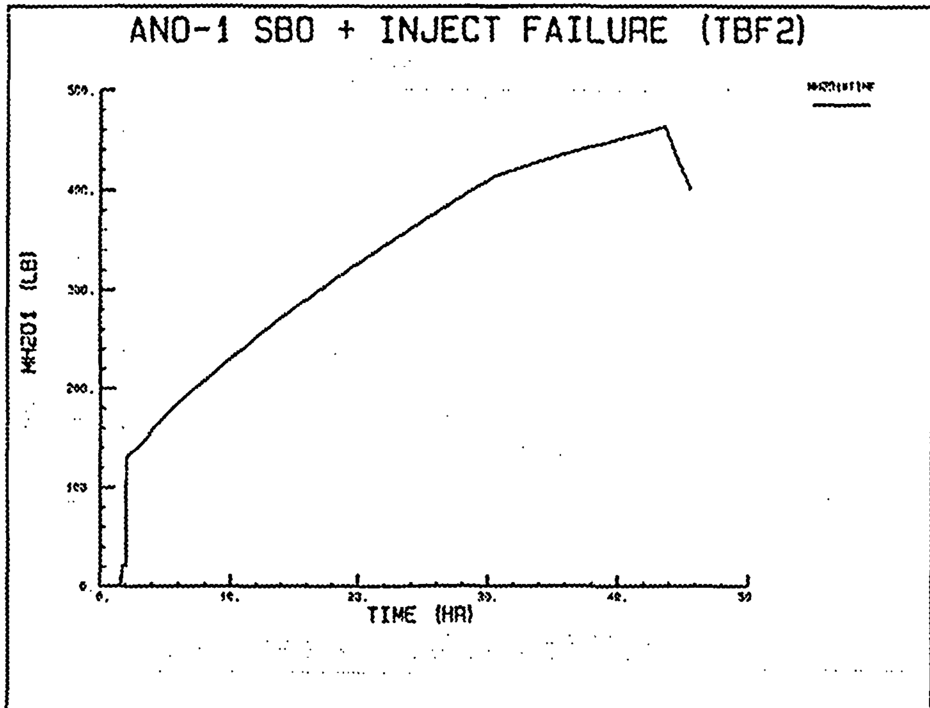
MH2C1 (LB)
TIME (HR)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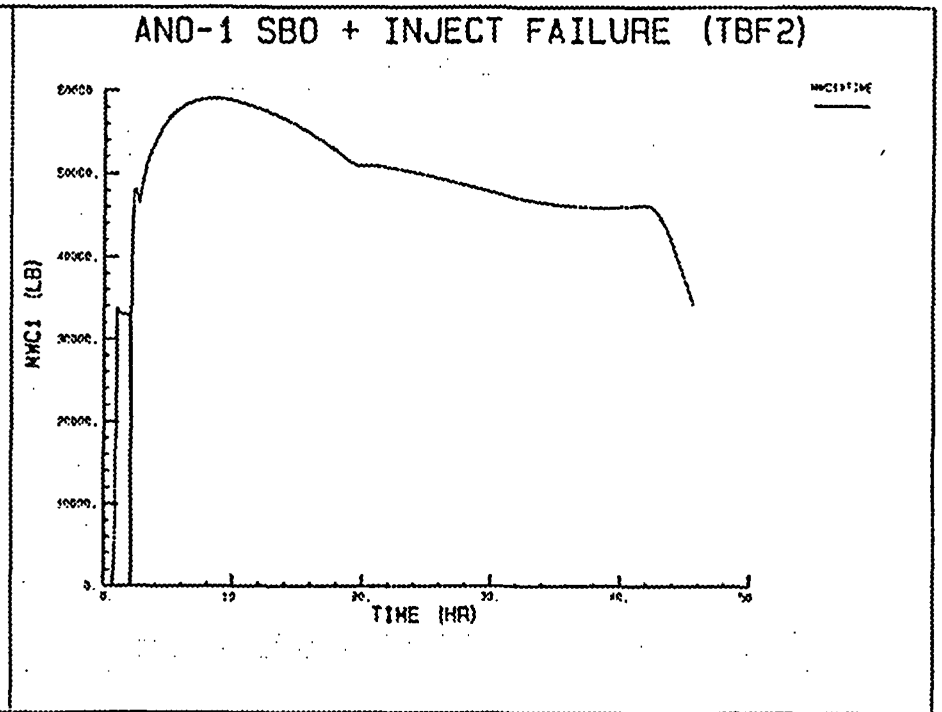
TIME (HR)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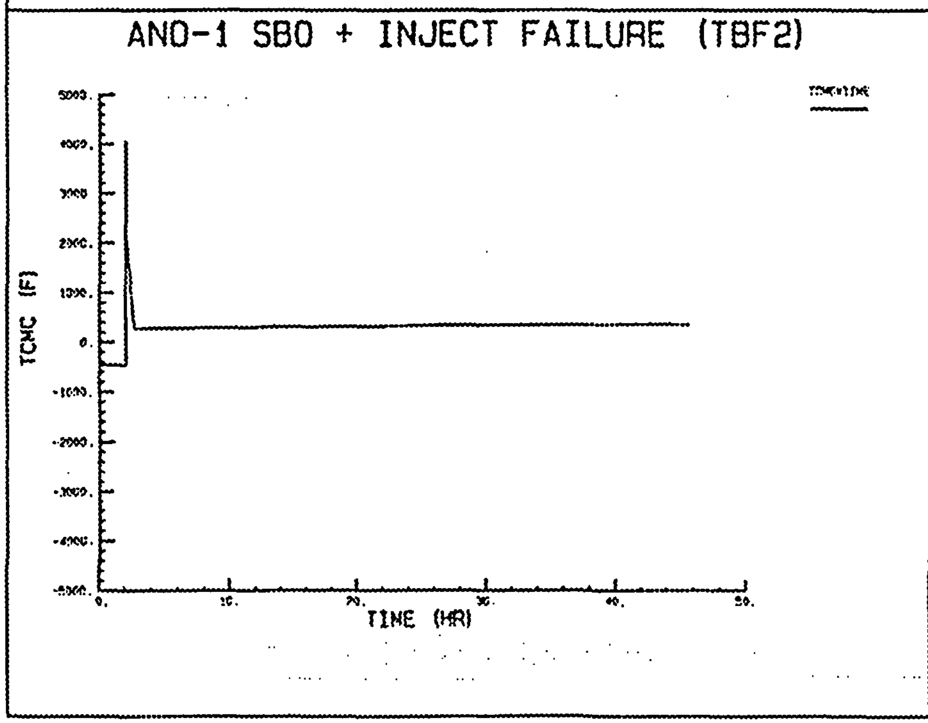
TIME (HR)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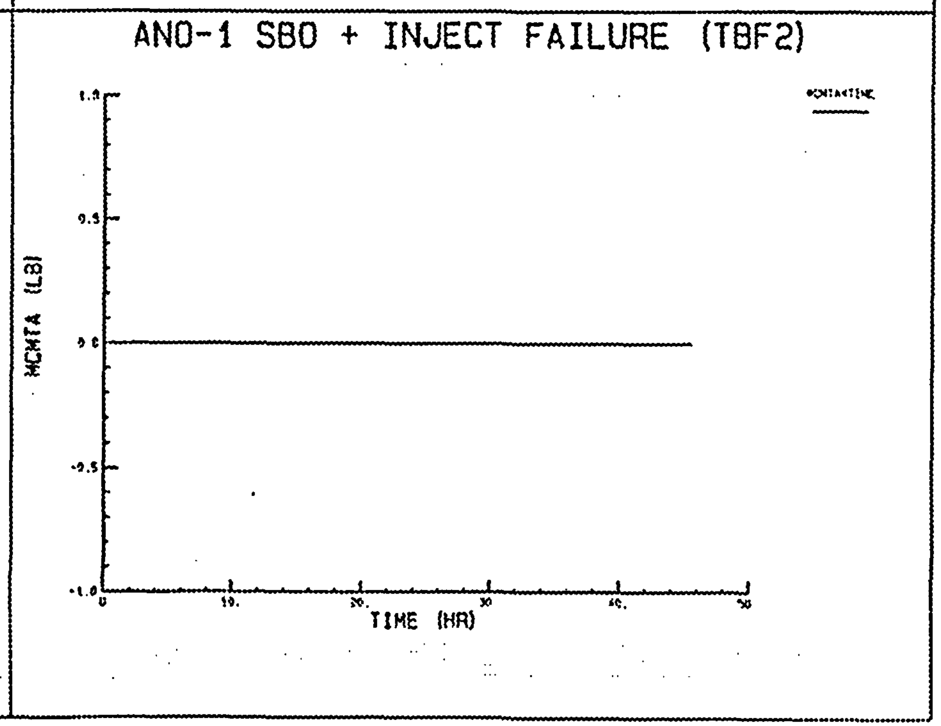
TCMC (F)
TIME (HR)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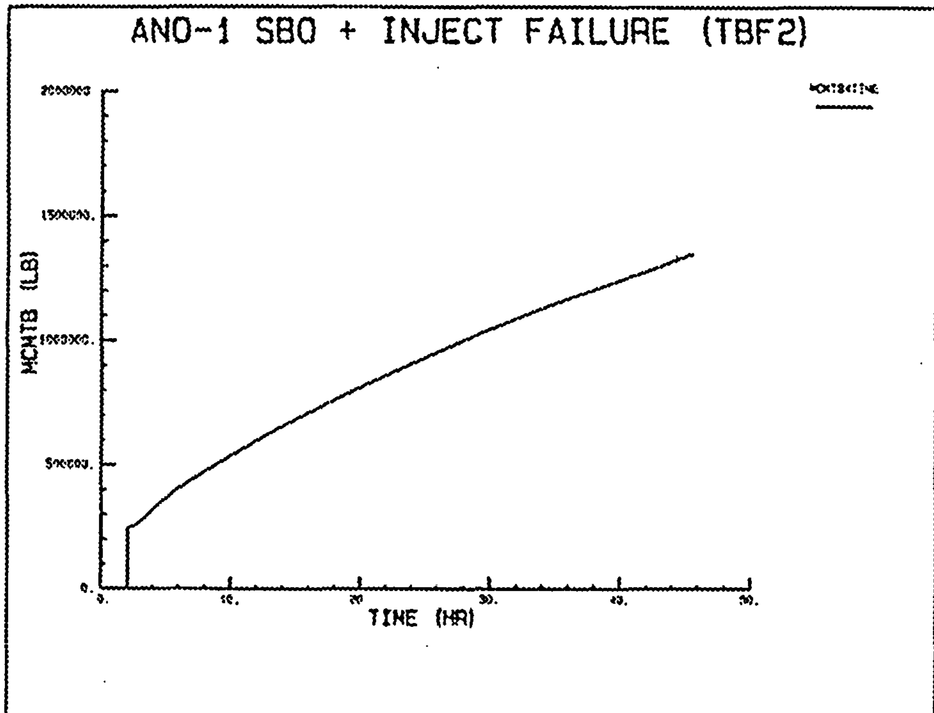
TIME (HR)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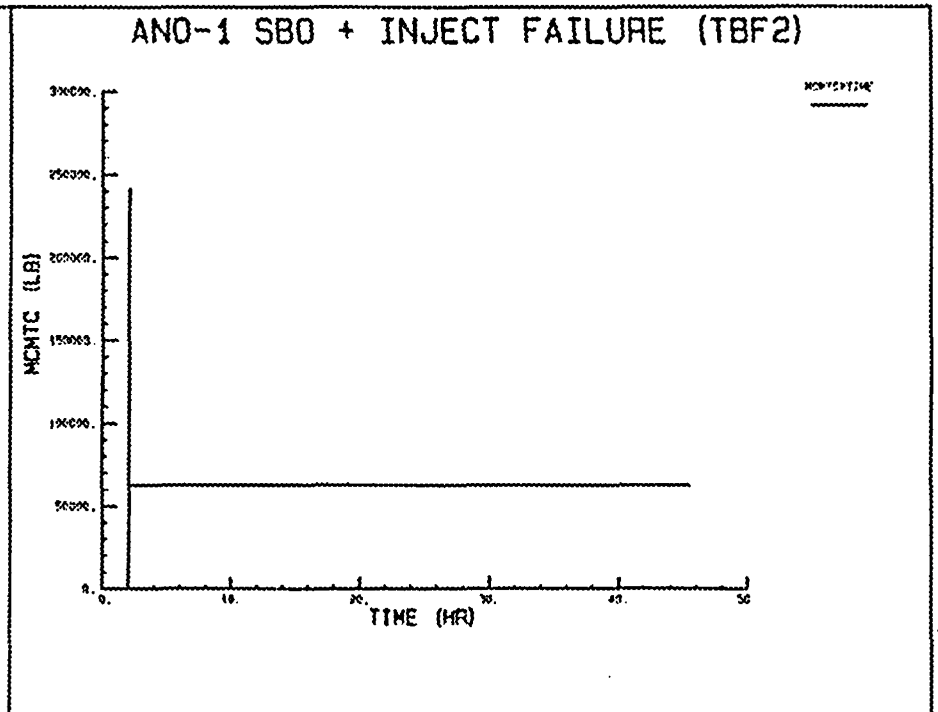
TIME (HR)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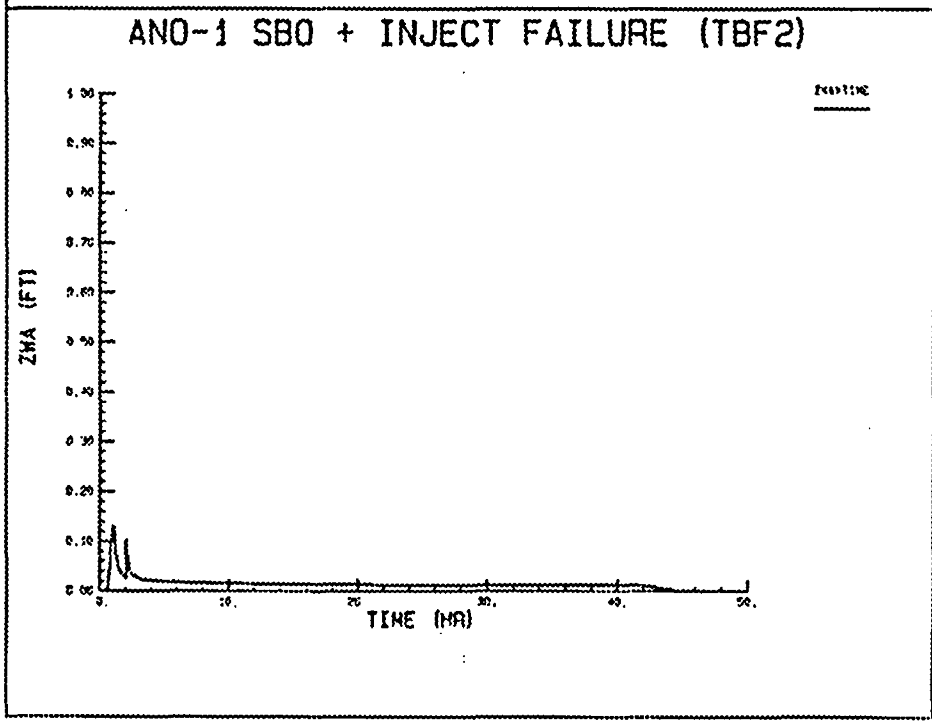
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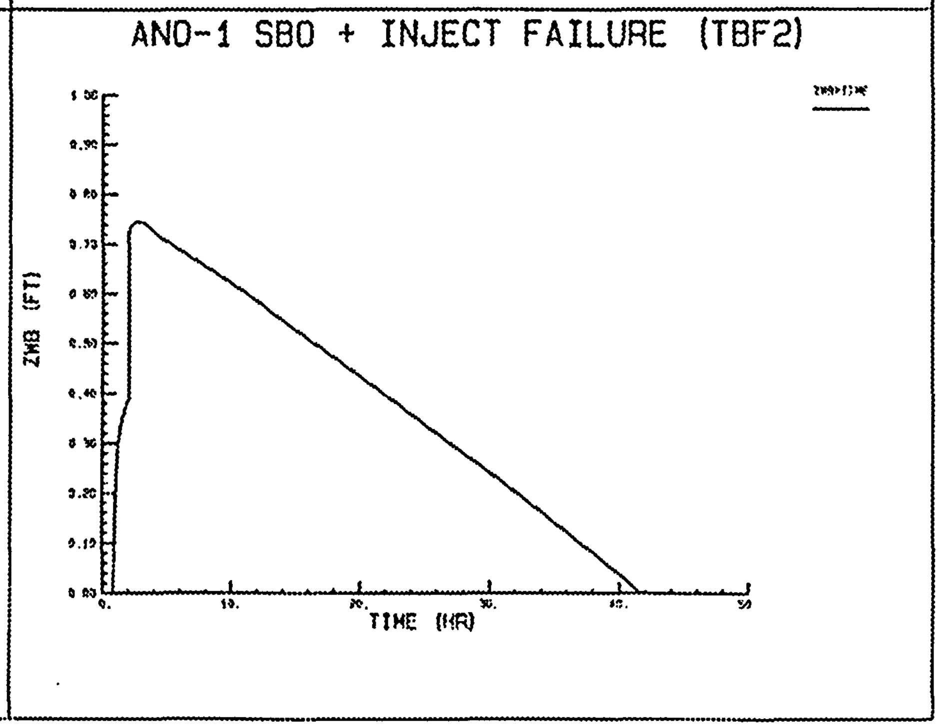
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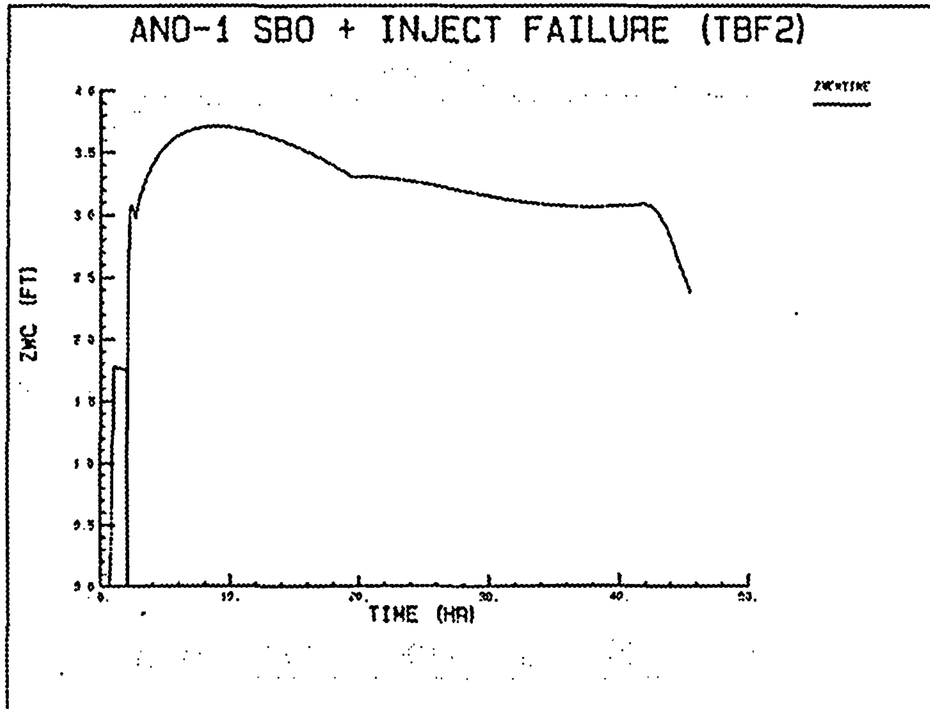
TIME (HR)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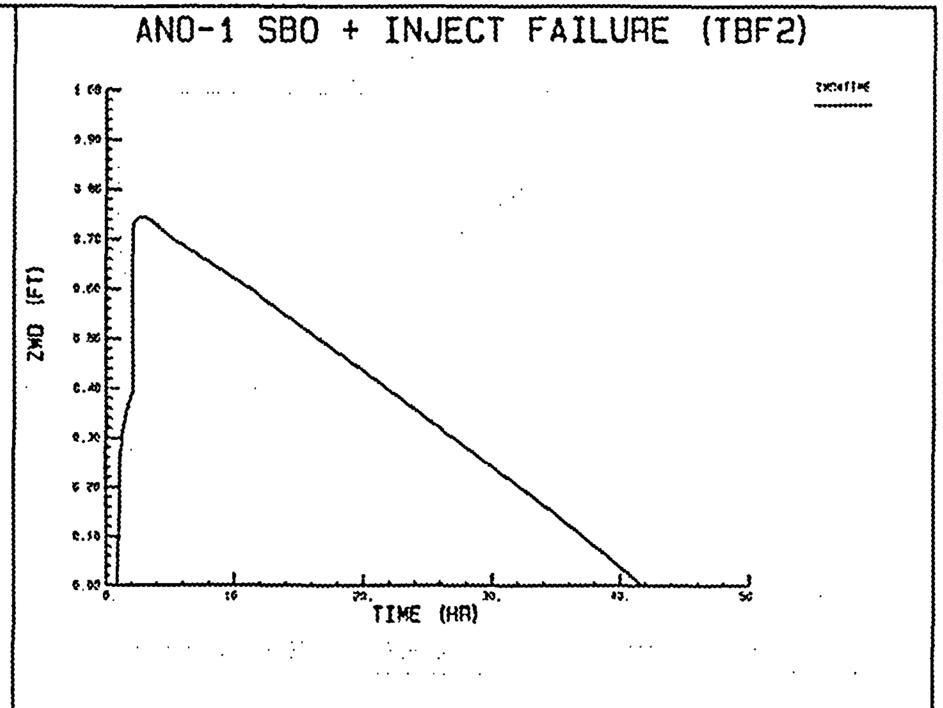
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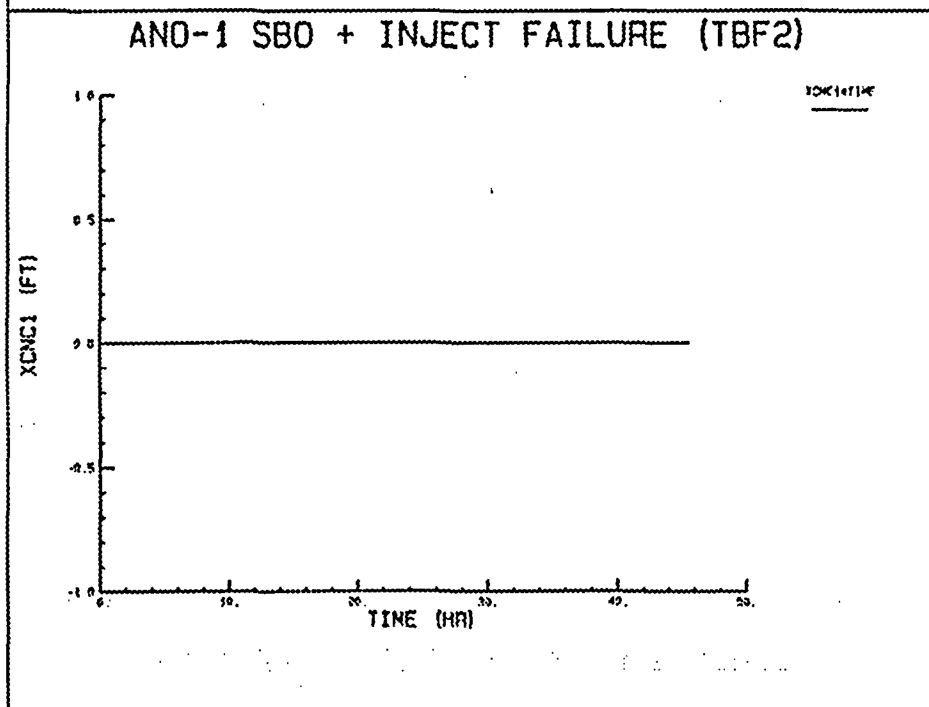
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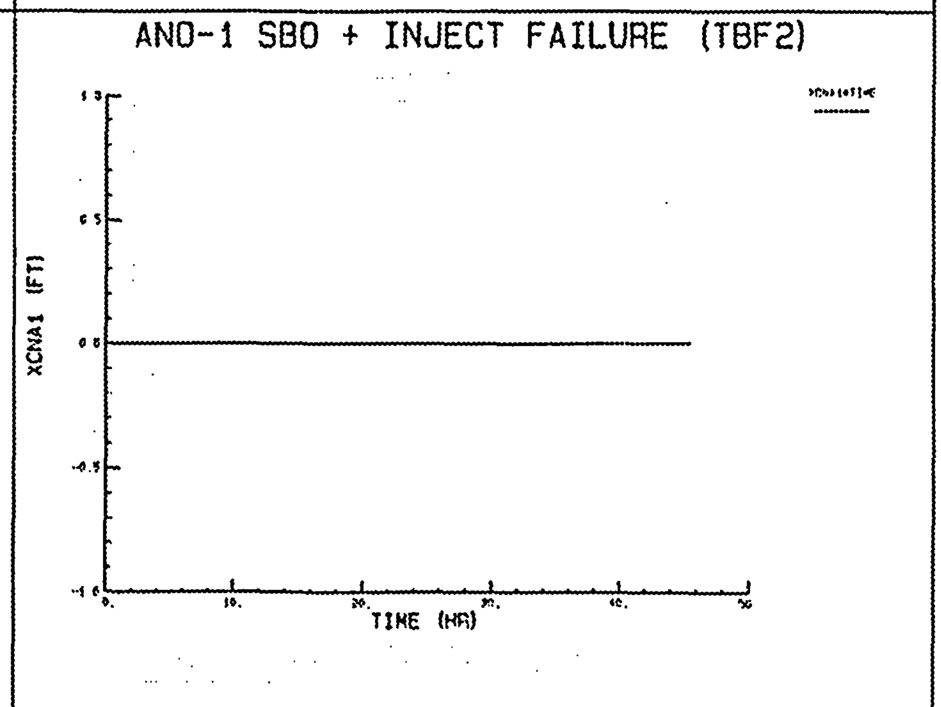
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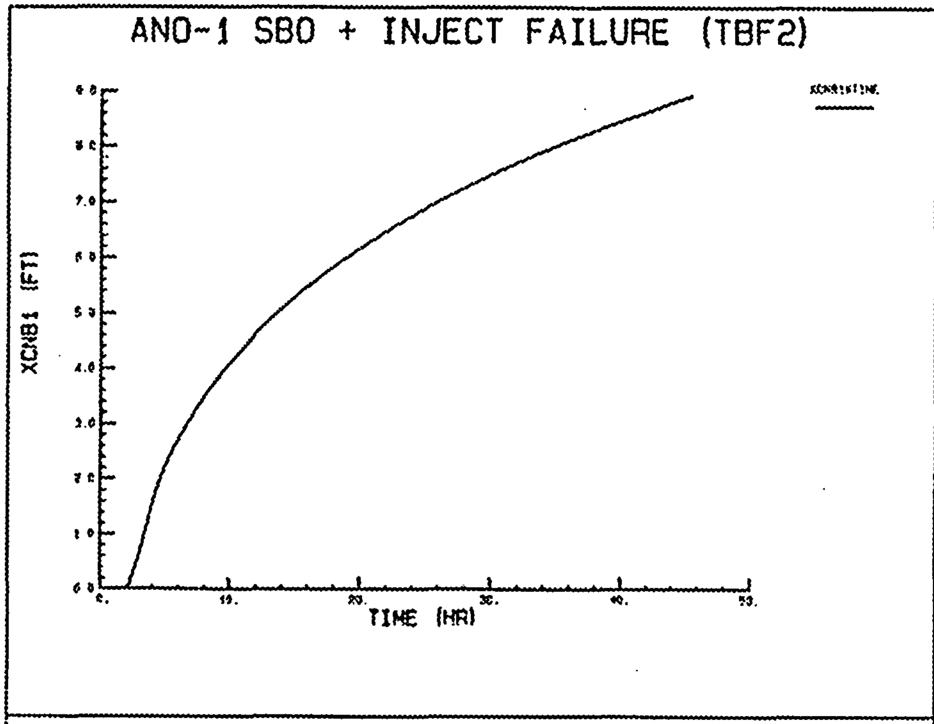
TIME (HR)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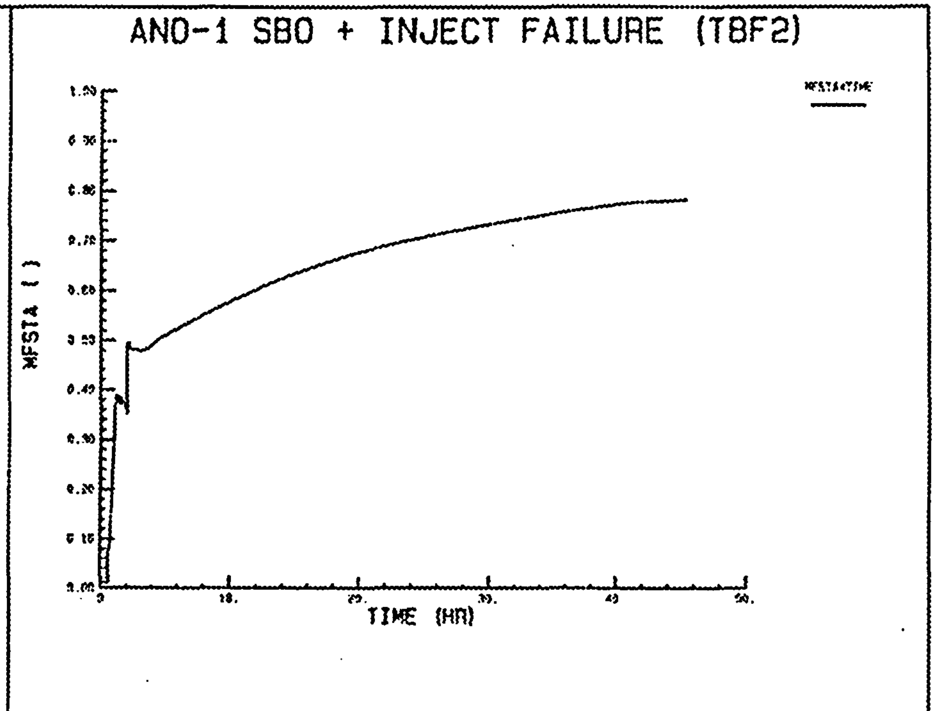
TIME (HR)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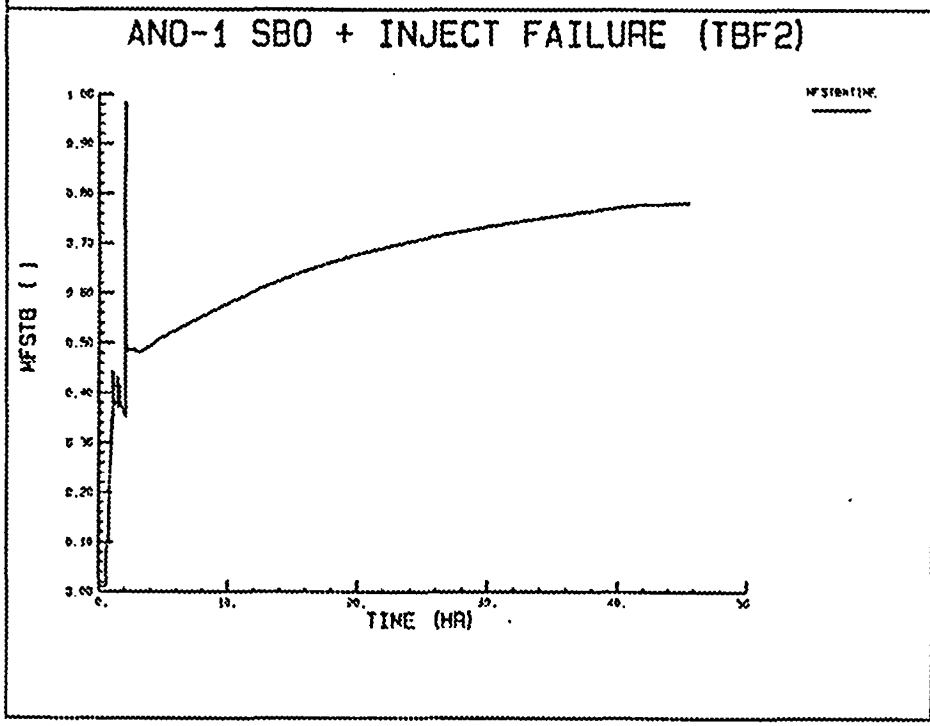
TIME (HR)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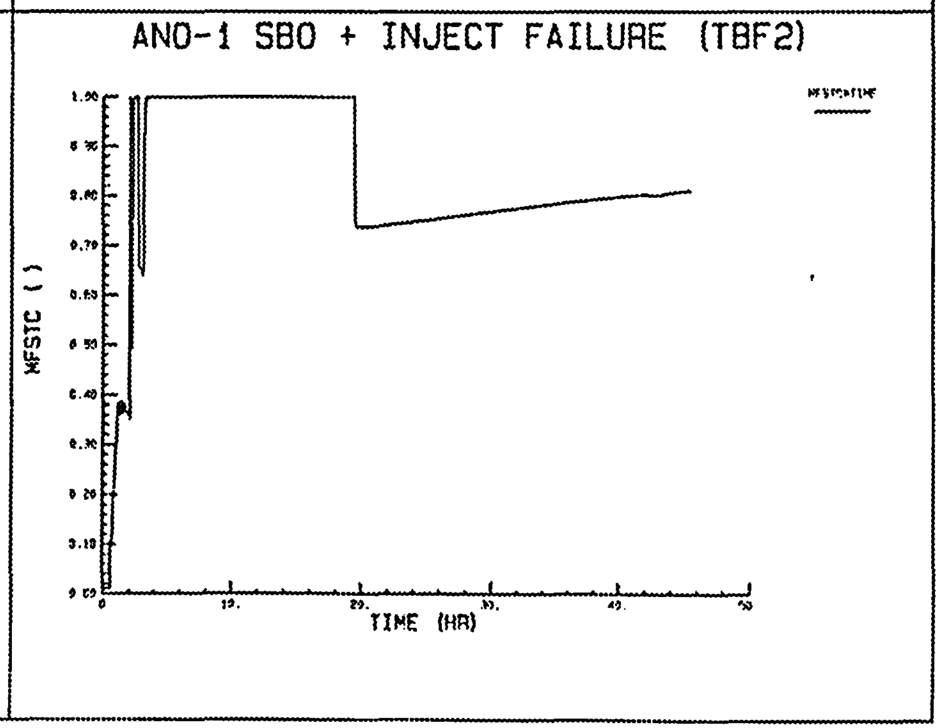
TIME (HR)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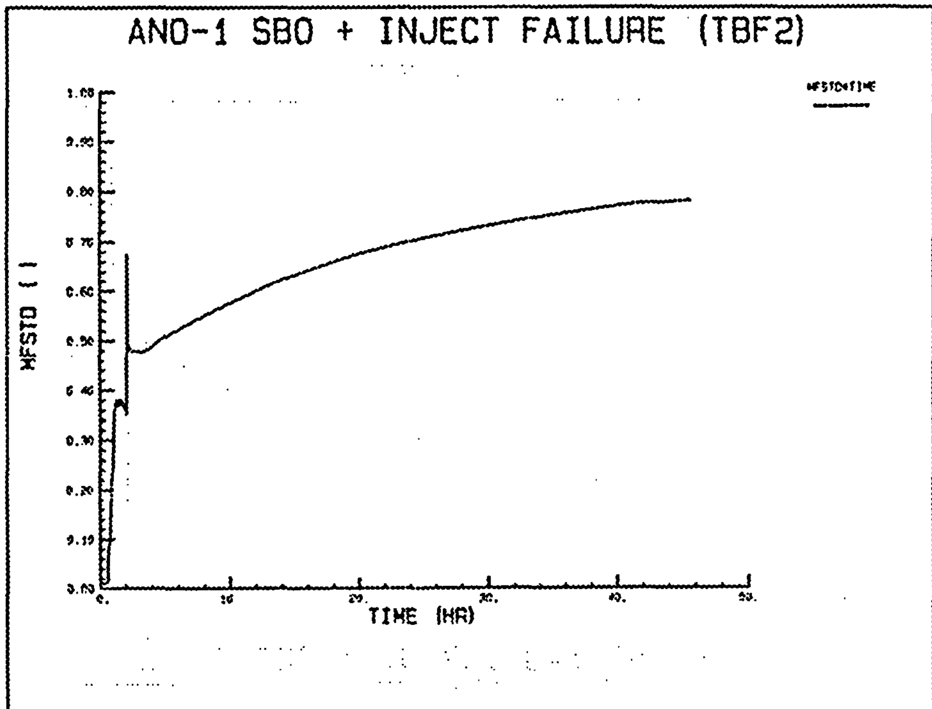
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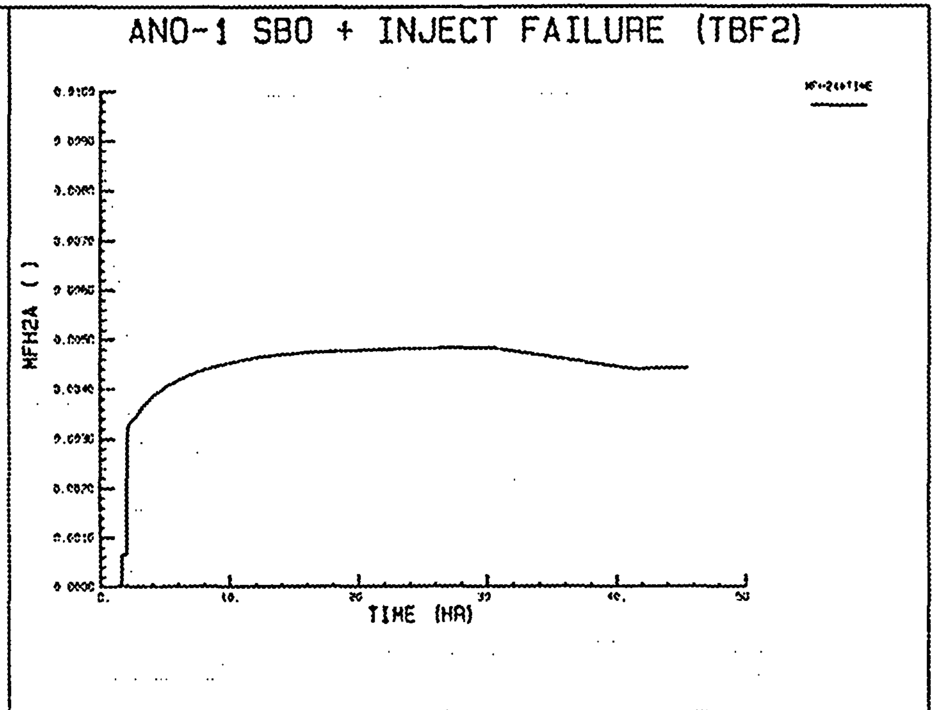
TIME (HR)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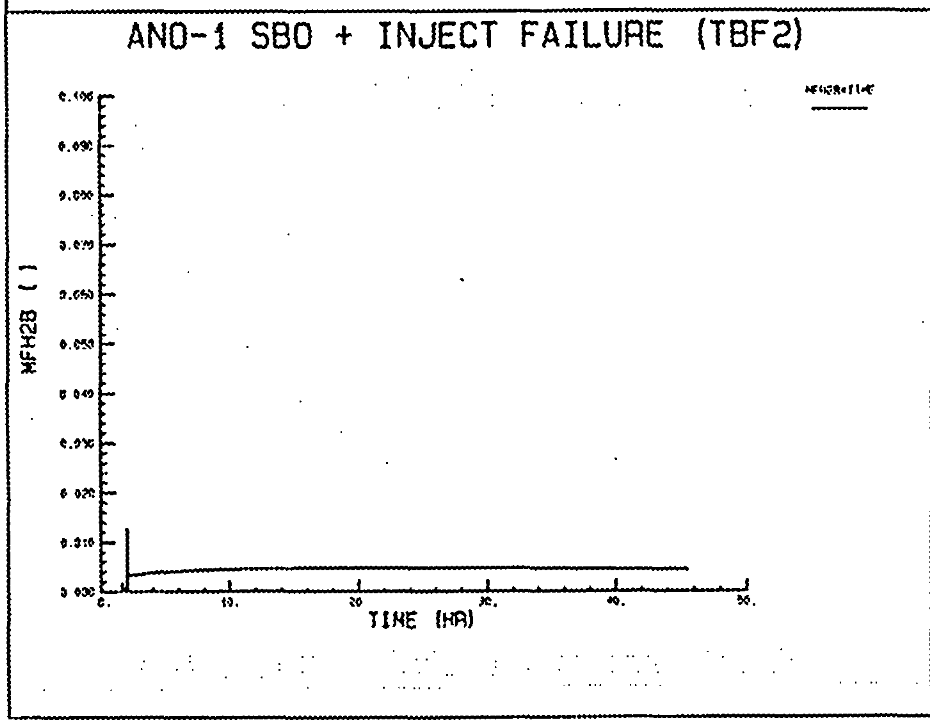
TIME (HR)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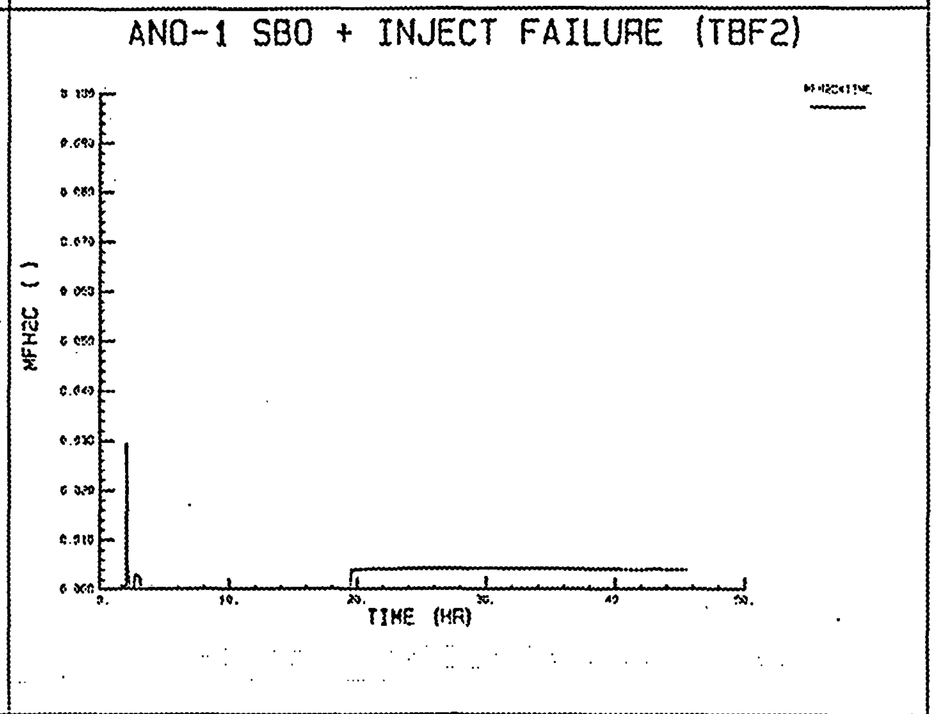
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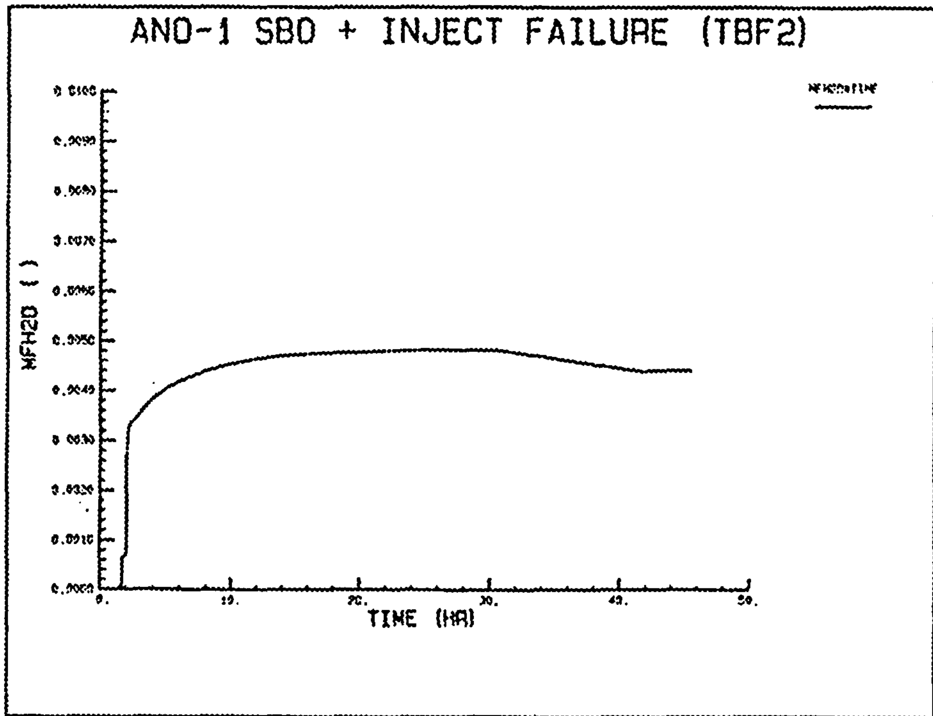
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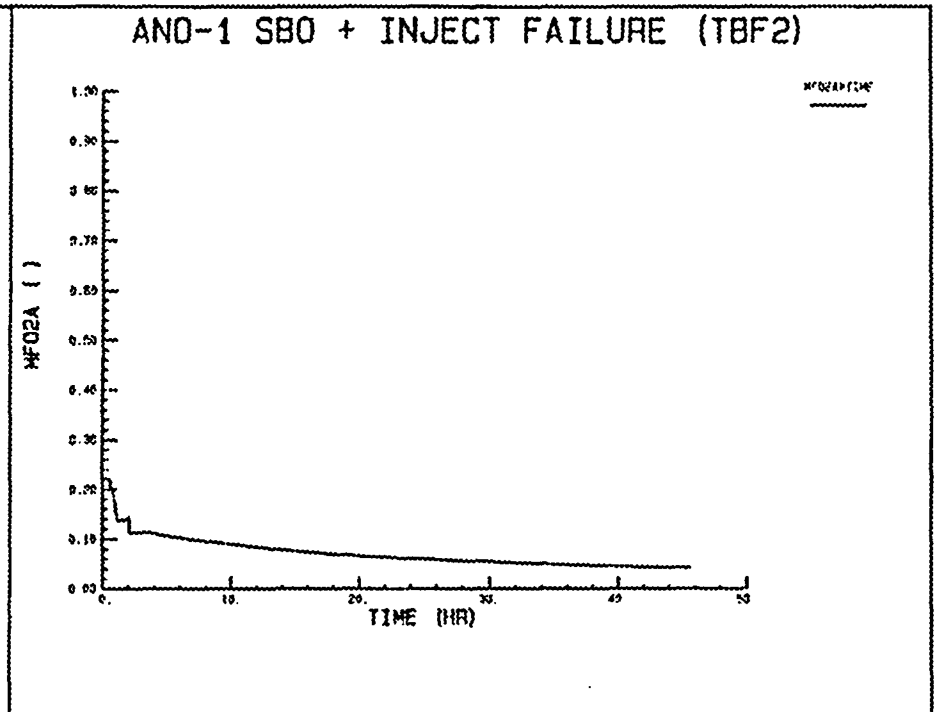
TIME (HR)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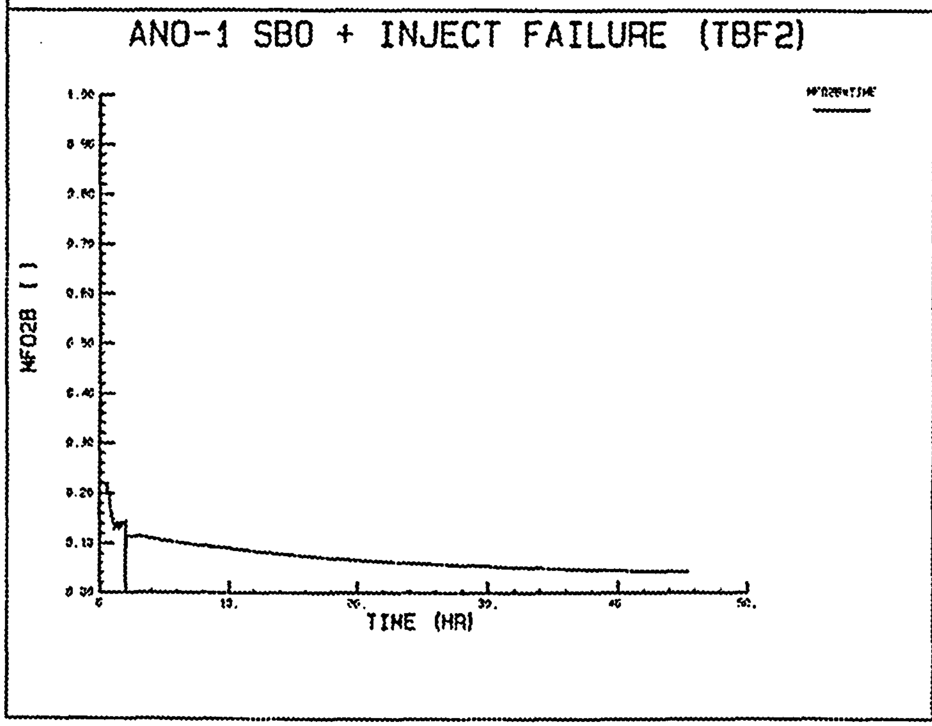
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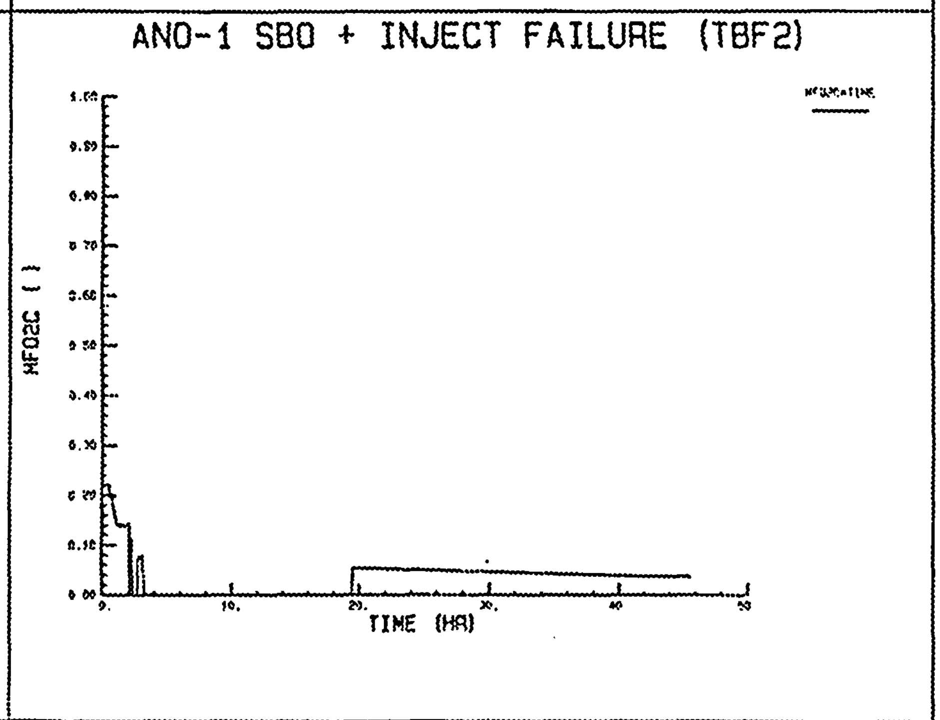
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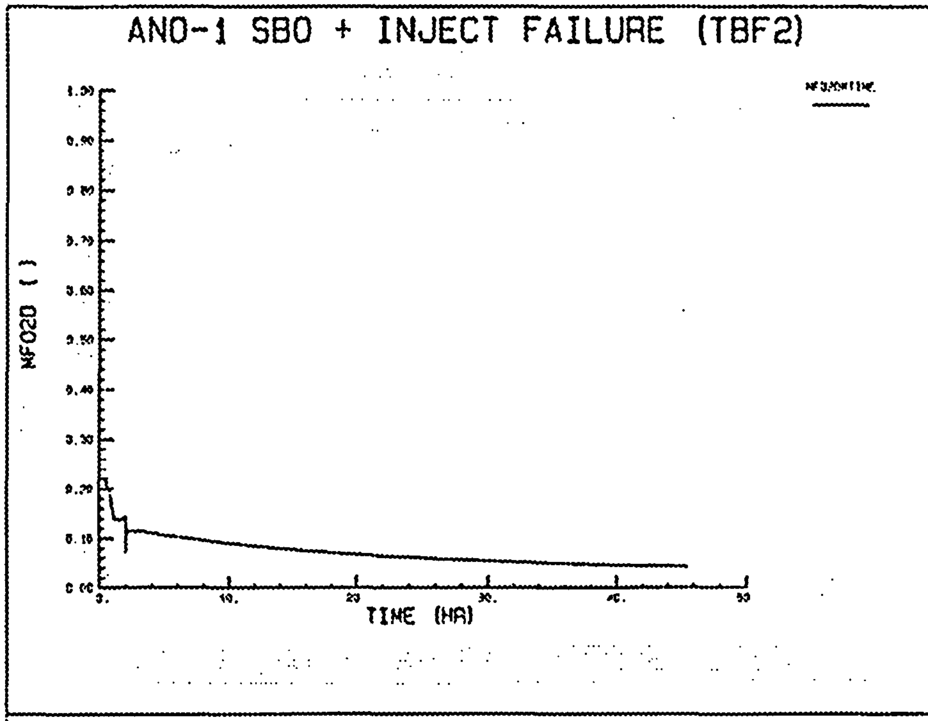
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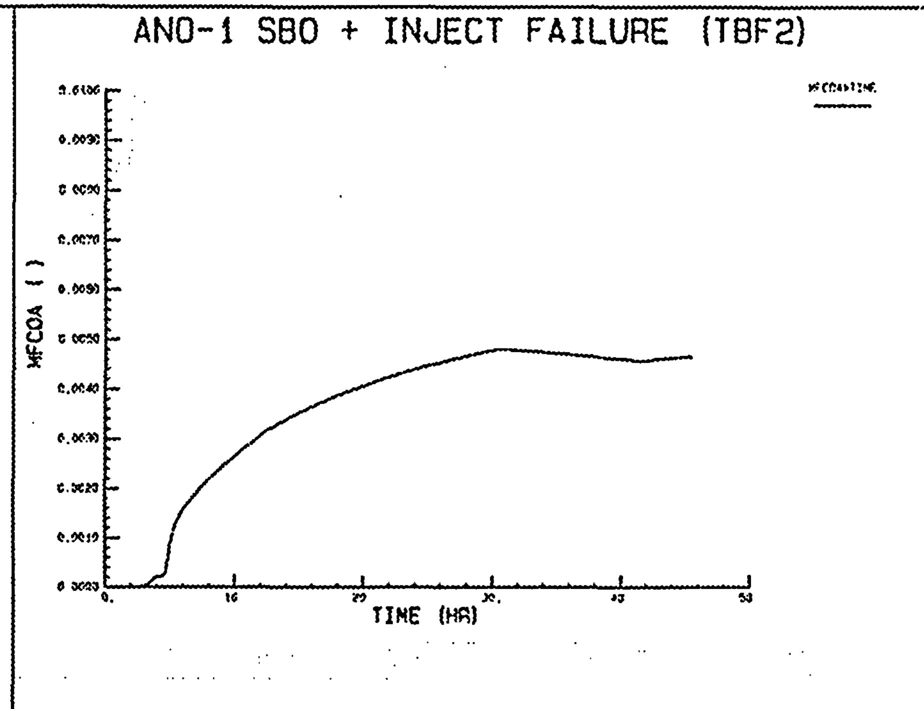
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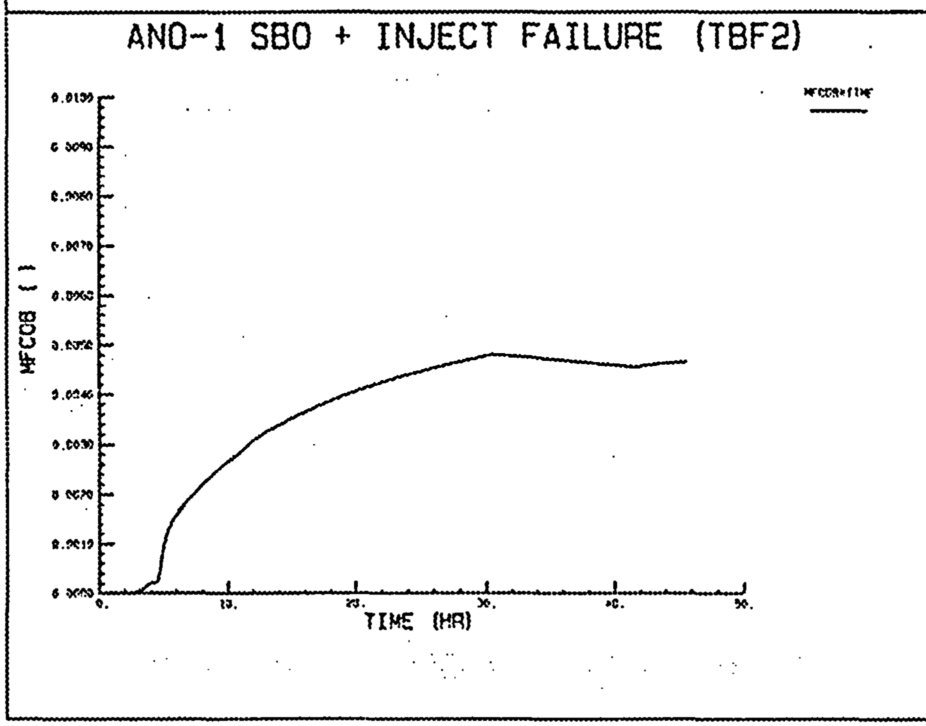
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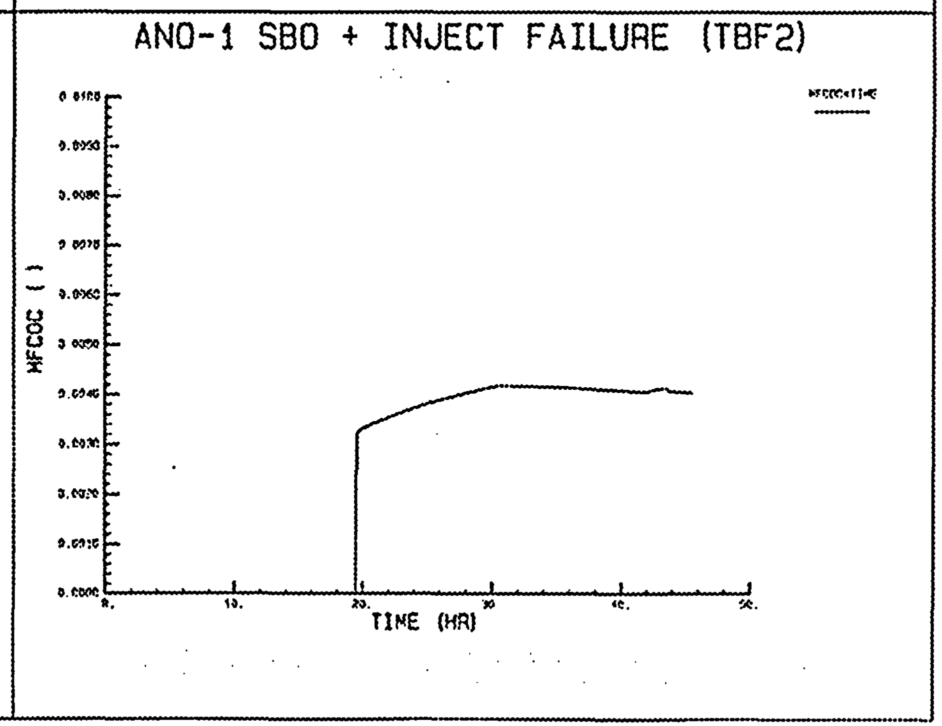
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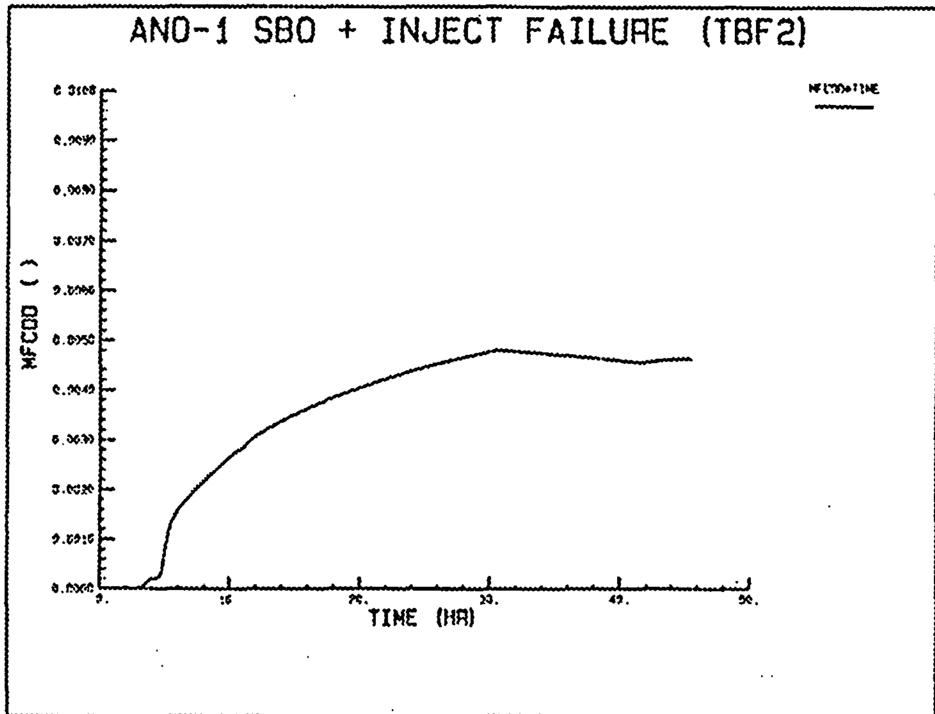
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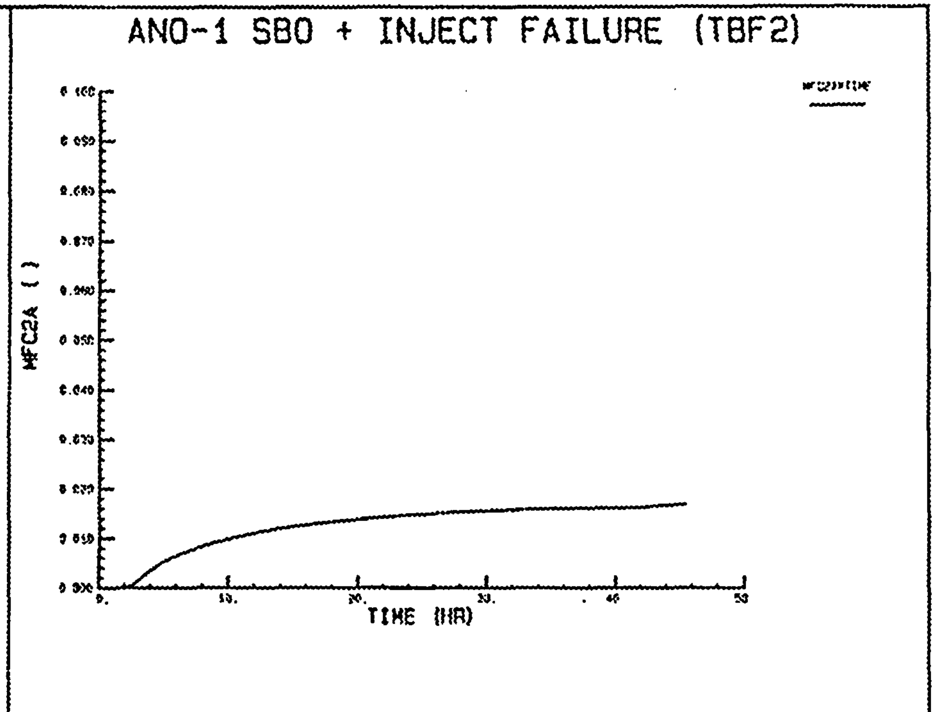
TIME (HR)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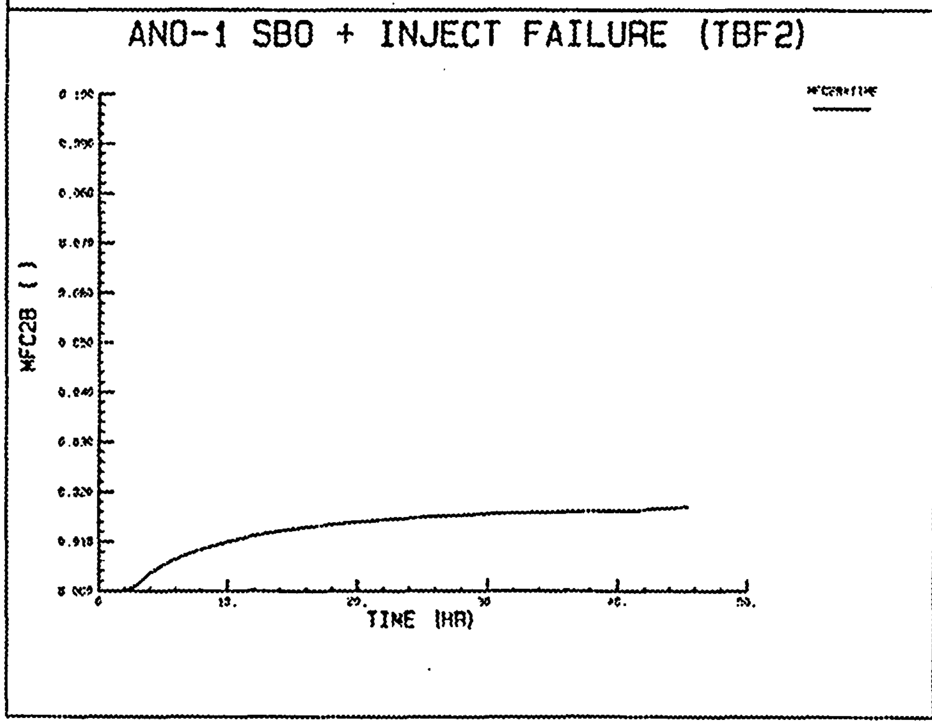
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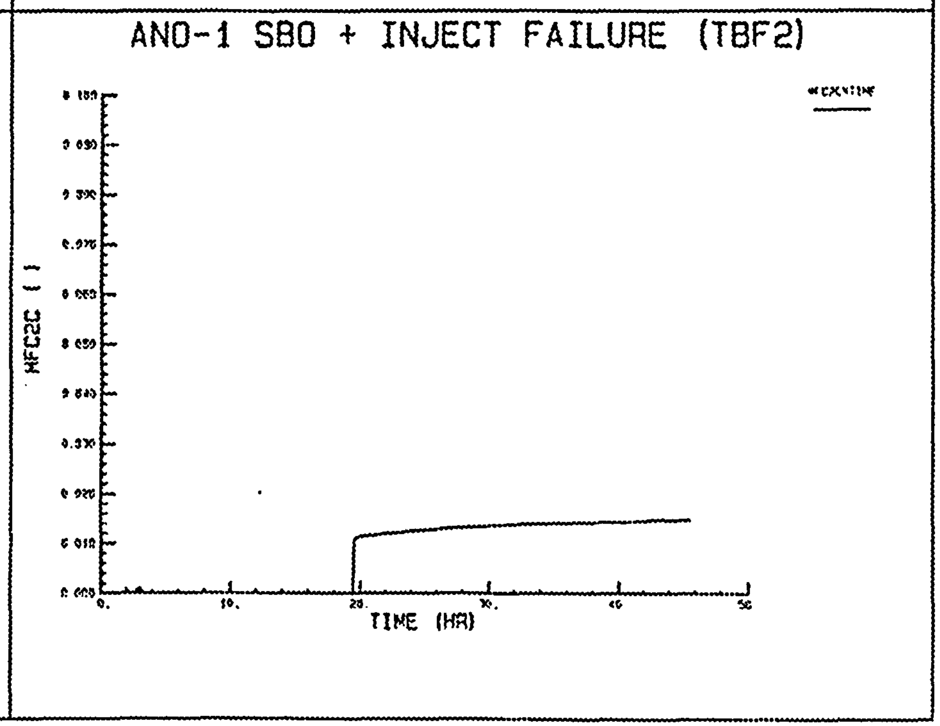
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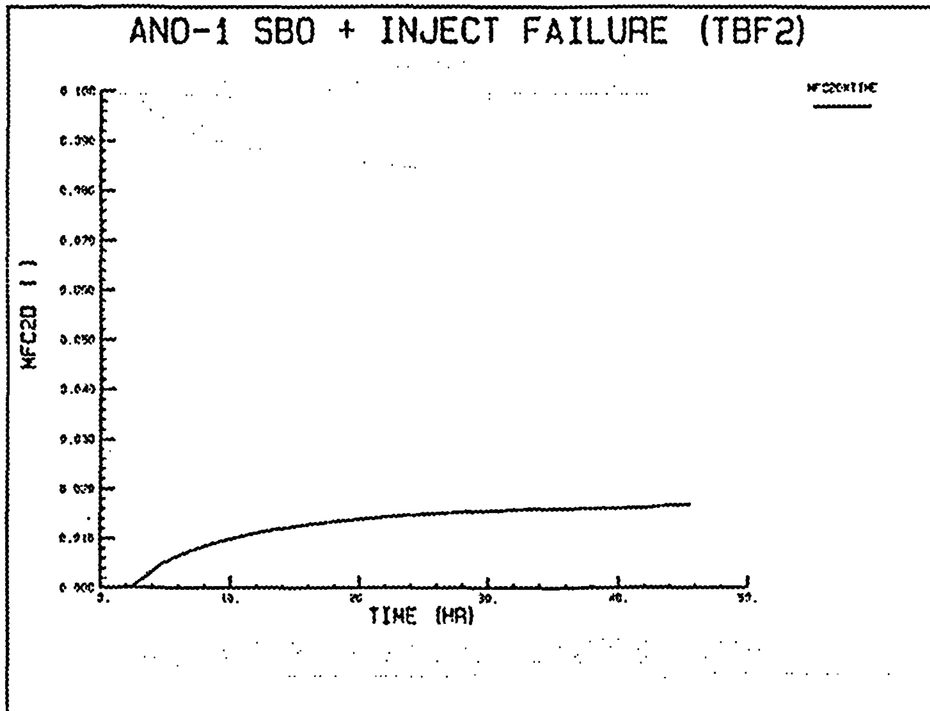
TIME (HR)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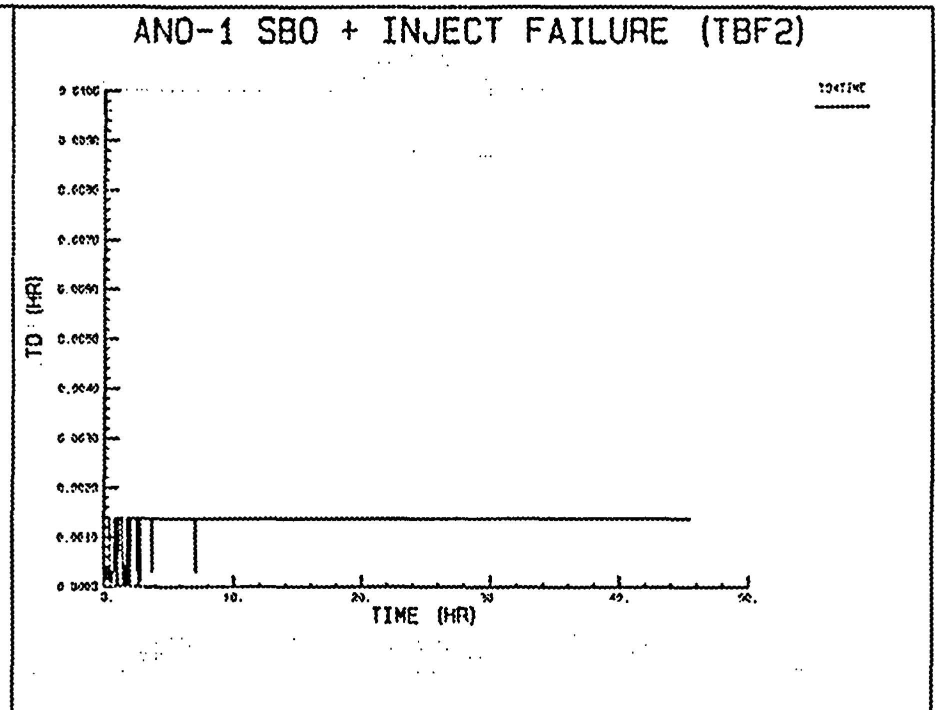
TIME (HR)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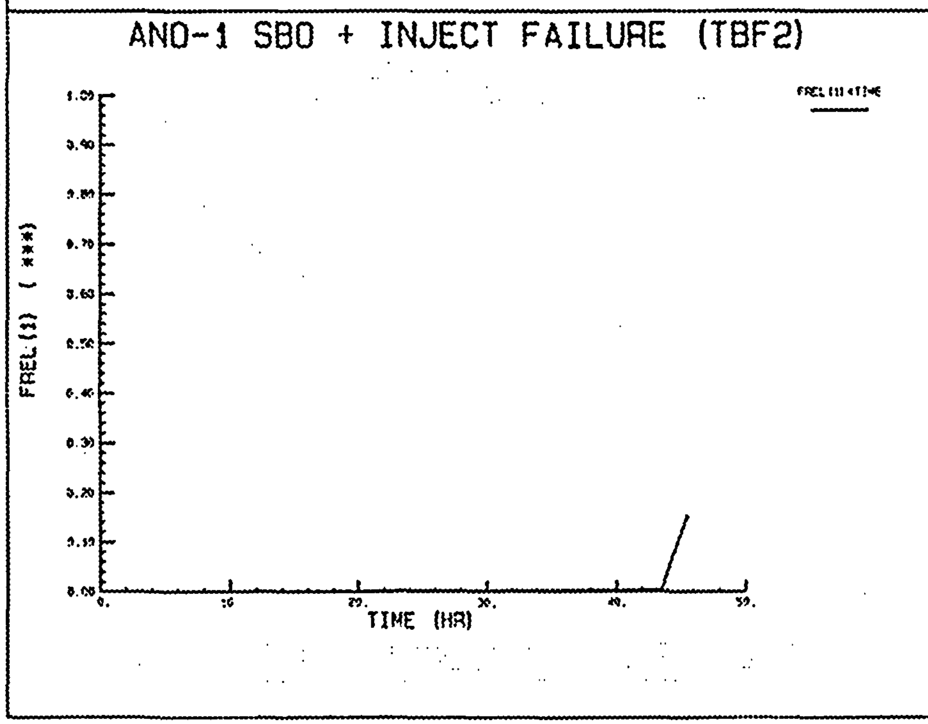
TD (HR)
TIME (HR)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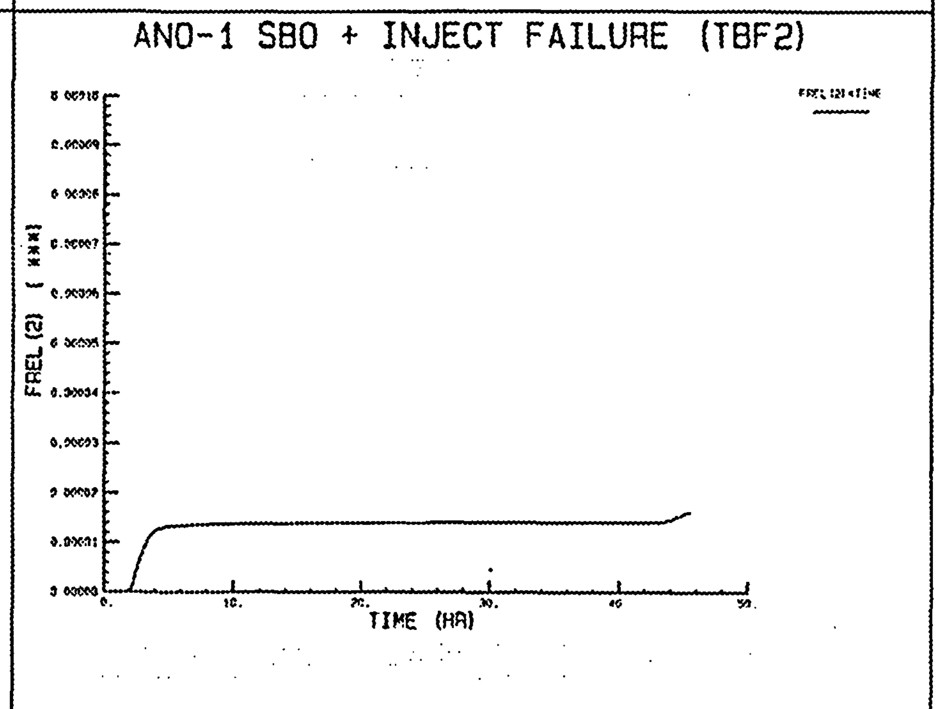
TIME (HR)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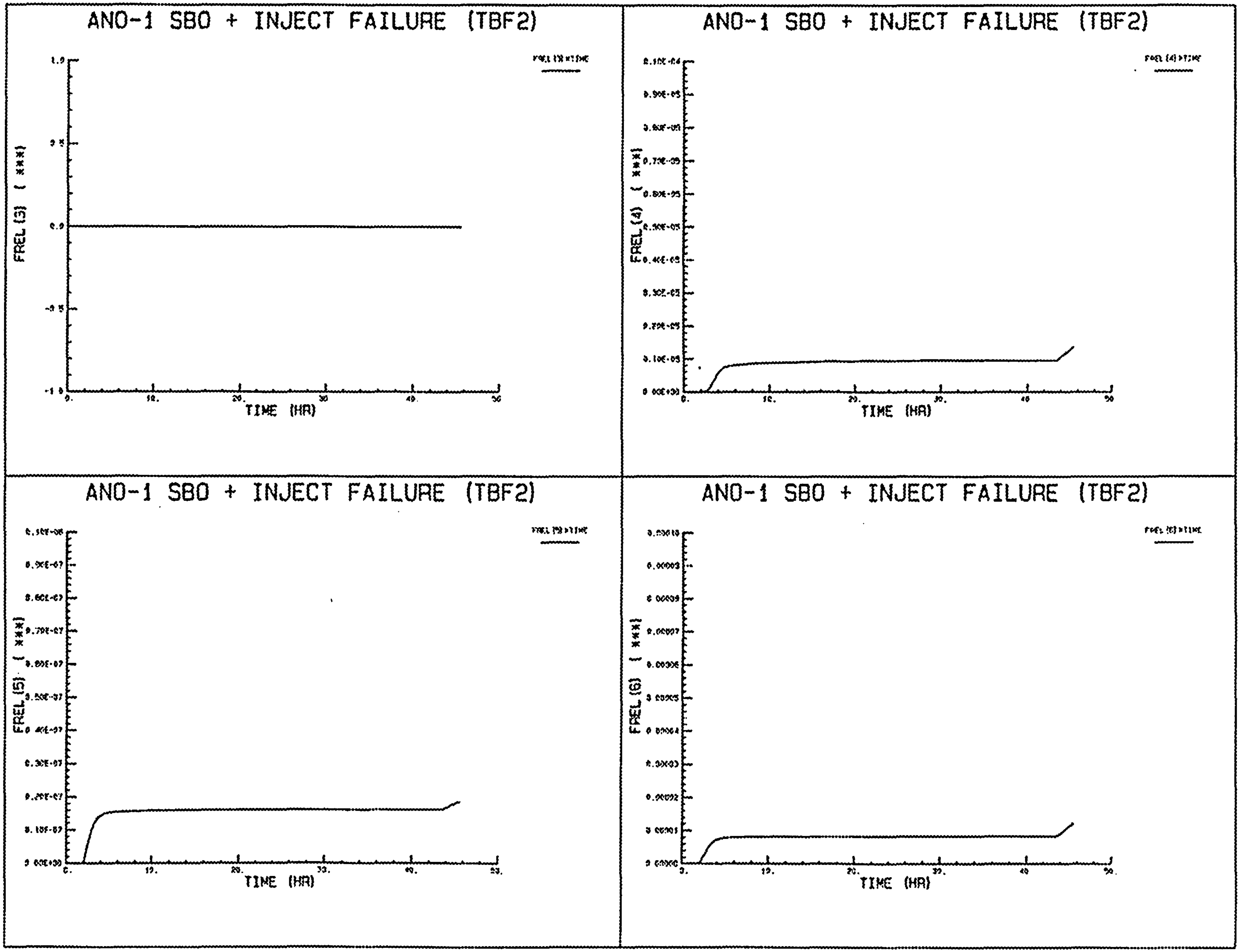
TIME (HR)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FREL (3) (***)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
FREL (4) (***)
TIME (HR)
ANO-1 SBO + INJECT FAILURE (TBF2)
FREL (5) (***)
TIME (HR)
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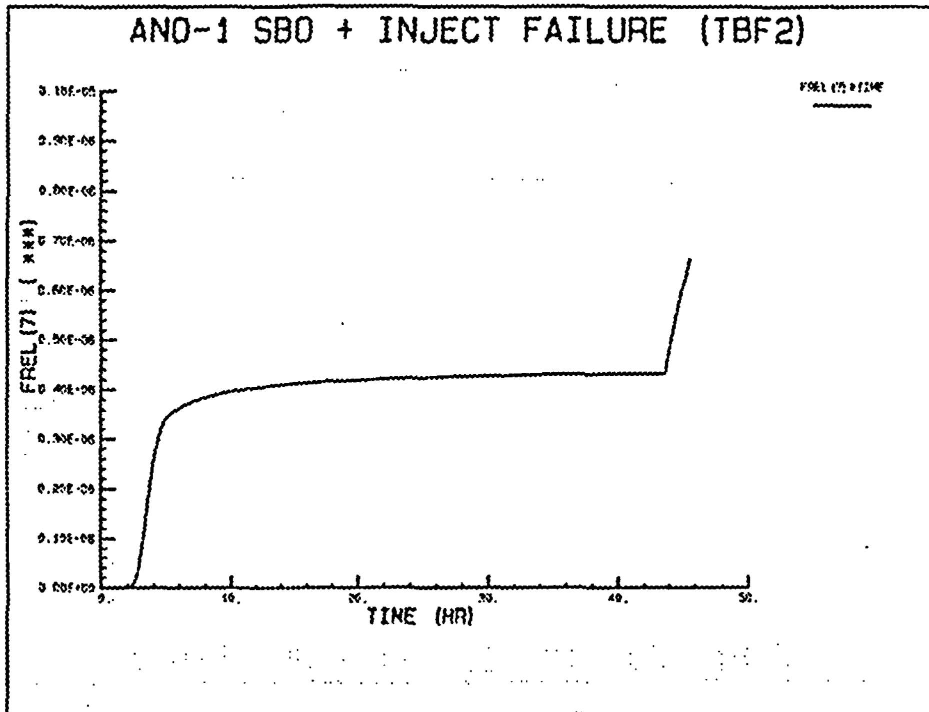
FREL (6) (***)
TIME (HR)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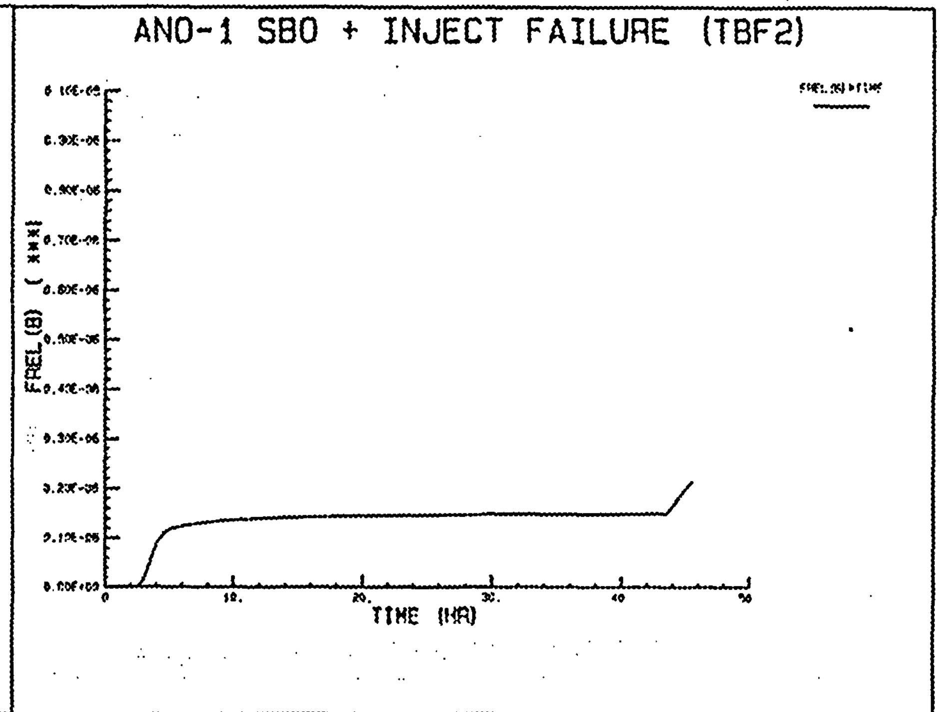
FREL (7) (***)
TIME (HR)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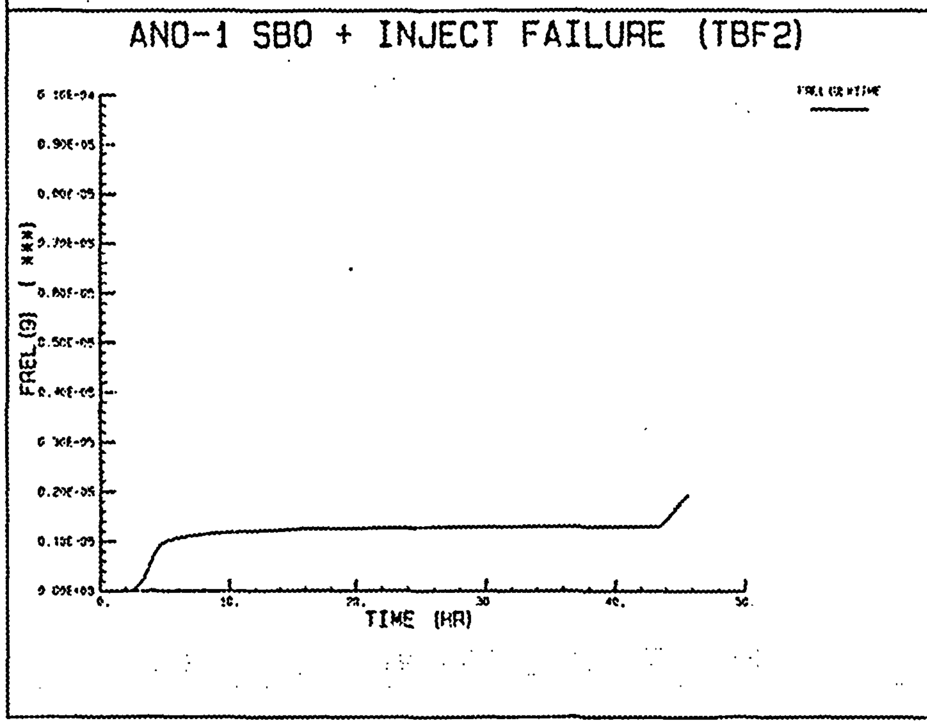
TIME (HR)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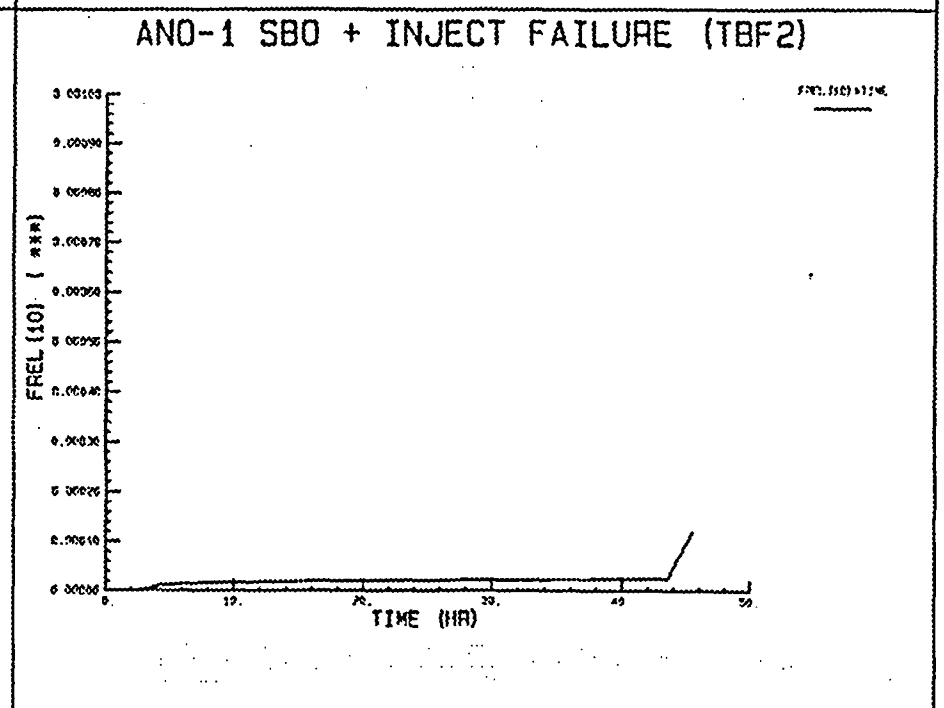
FREL (9) (***)
TIME (HR)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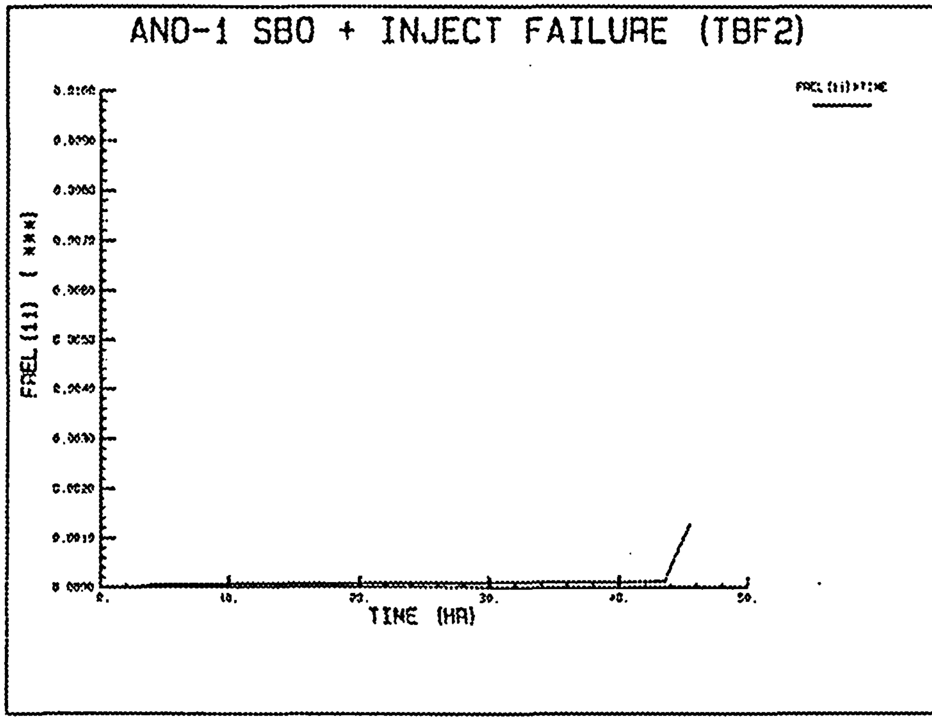
FREL (10) (***)
TIME (HR)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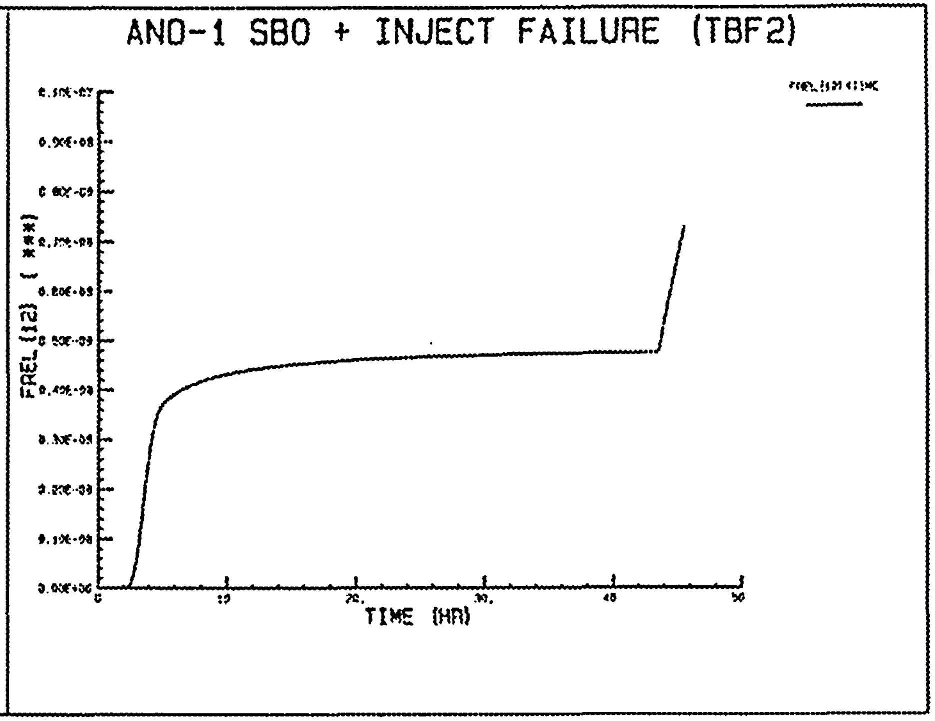
FREL (11) (***)
TIME (HR)
0.
10.
20.
30.
40.
50.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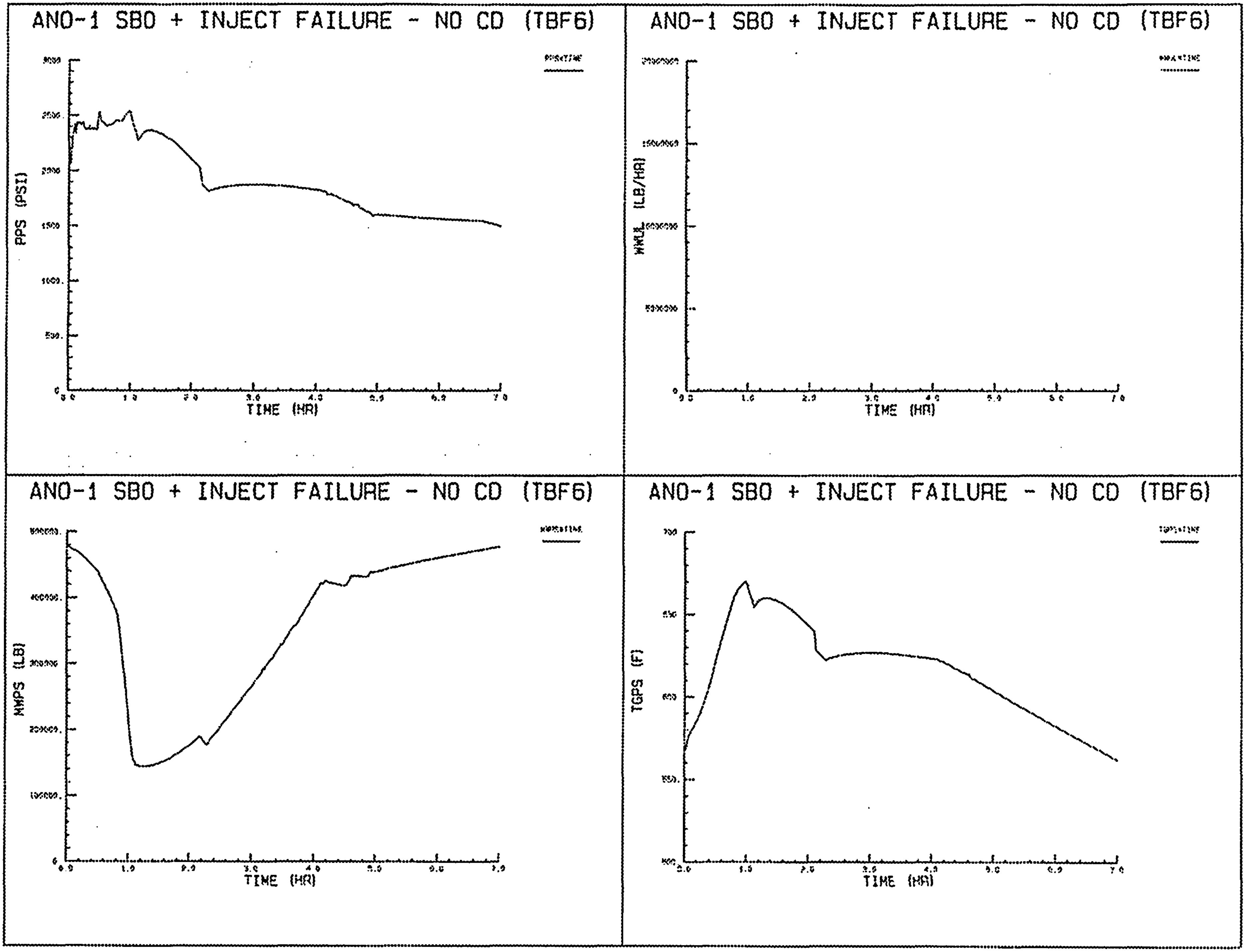
FREL (12) (***)
TIME (HR)
0
10
20.
30.
40
50


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
PPS (PSI)
TIME (HR)
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WKLL (LB/HR)
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MMPS (LB)
TIME (HR)
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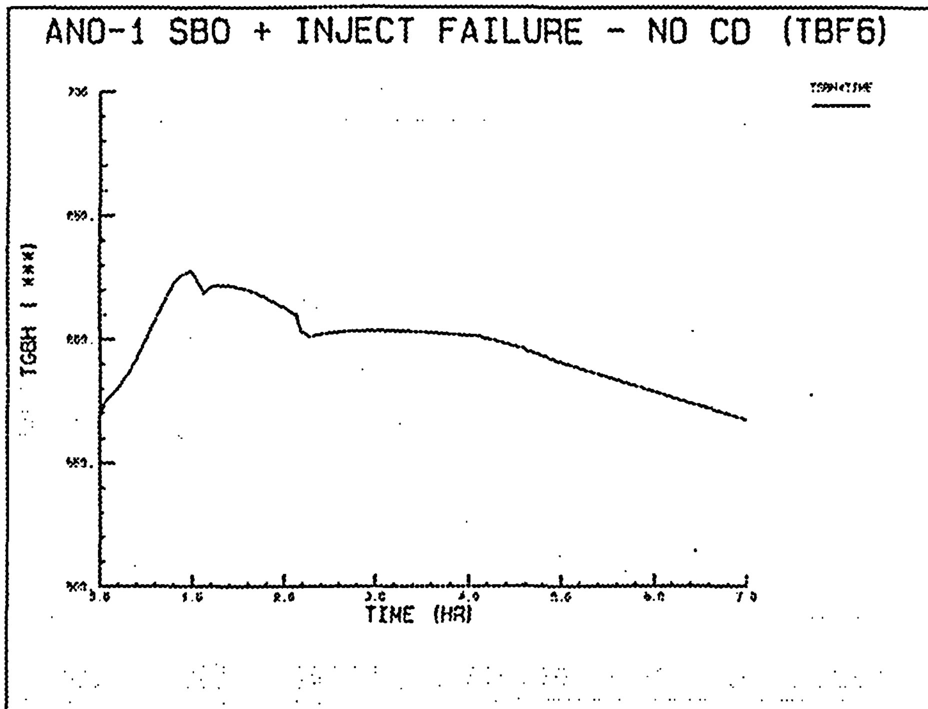
TGPS (F)
TIME (HR)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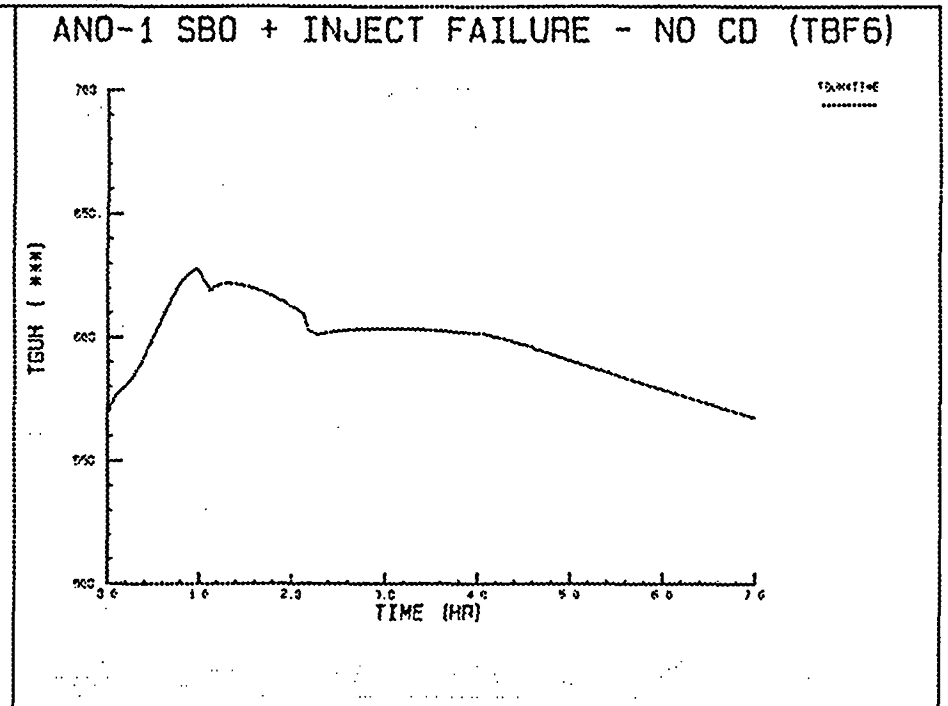
TIME (HR)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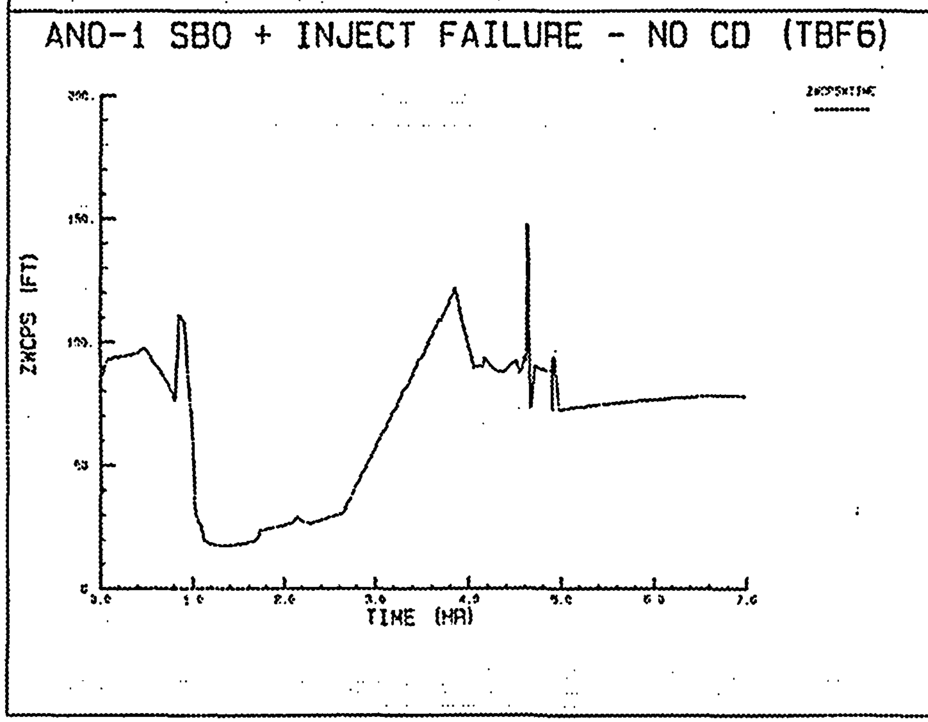
TGUH (***)
TIME (HR)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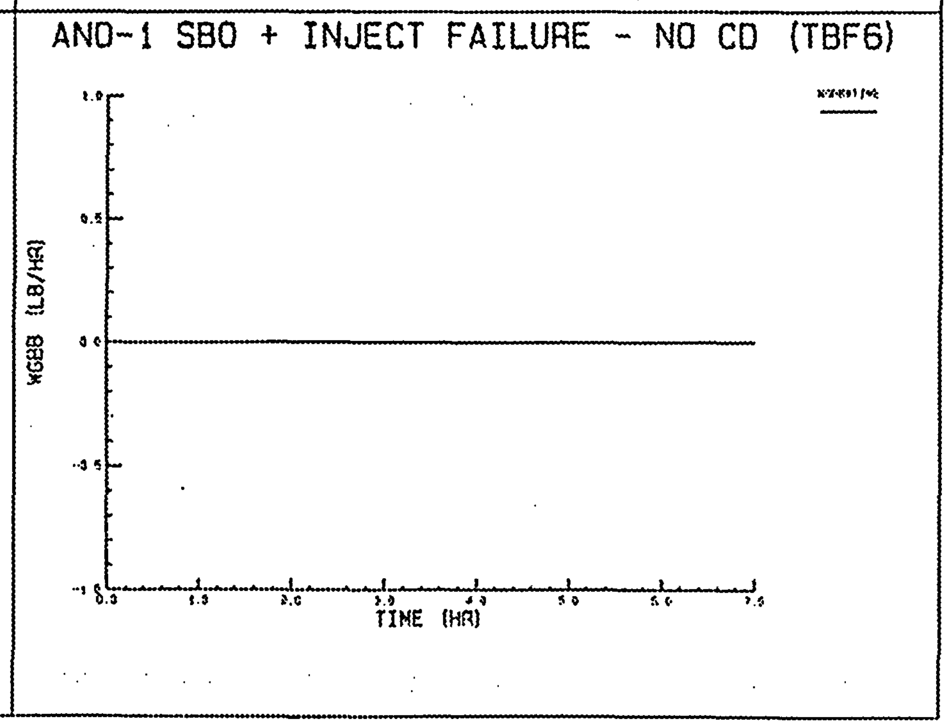
ZWCPS (FT)
TIME (HR)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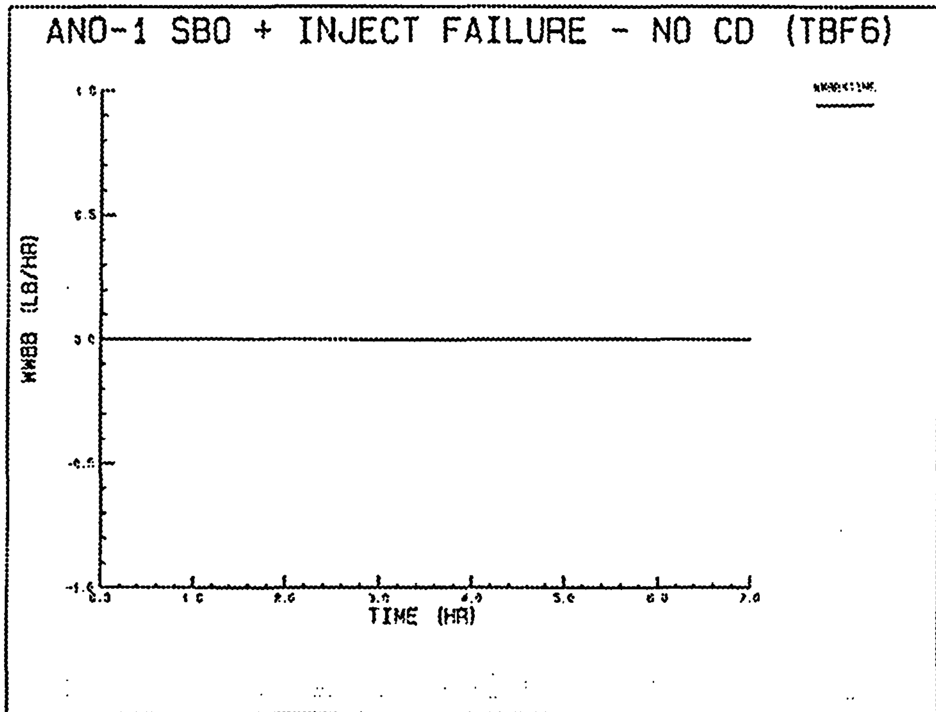
WGBB (LB/HR)
TIME (HR)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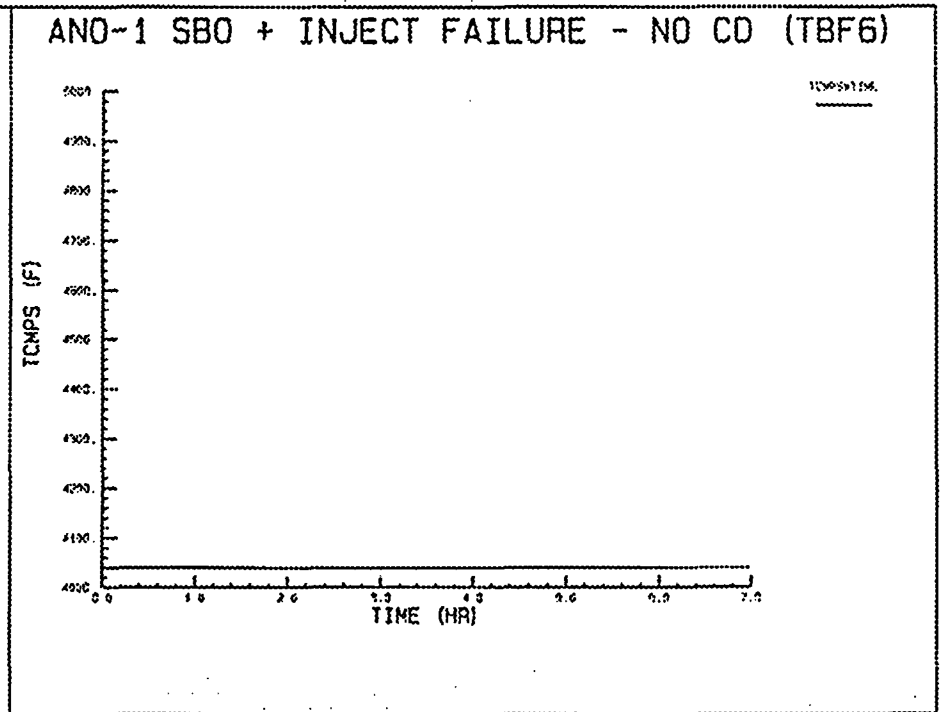
TIME (HR)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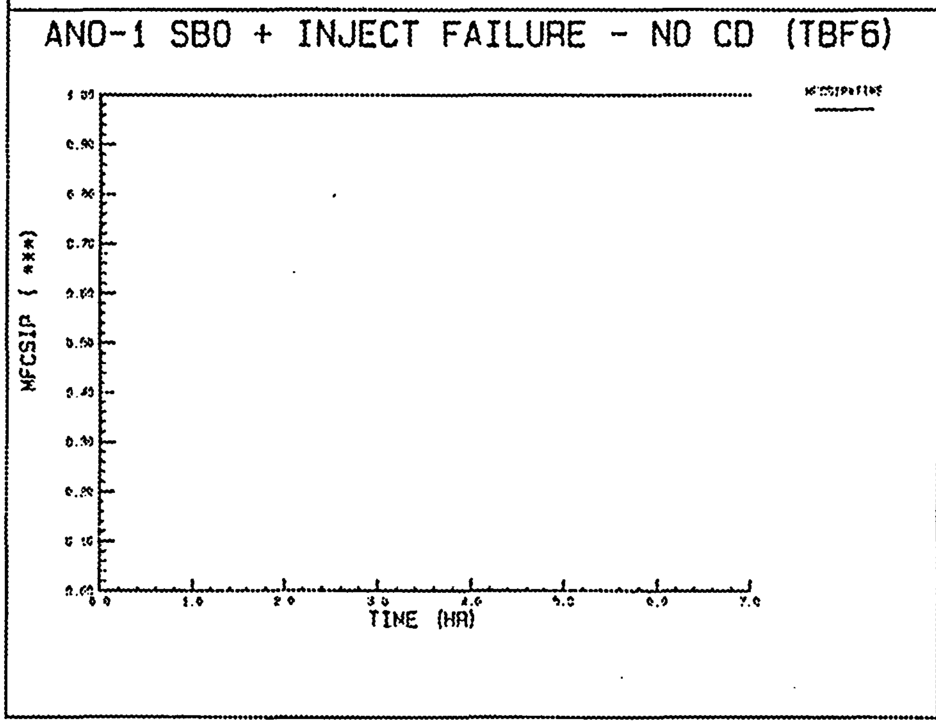
TIME (HR)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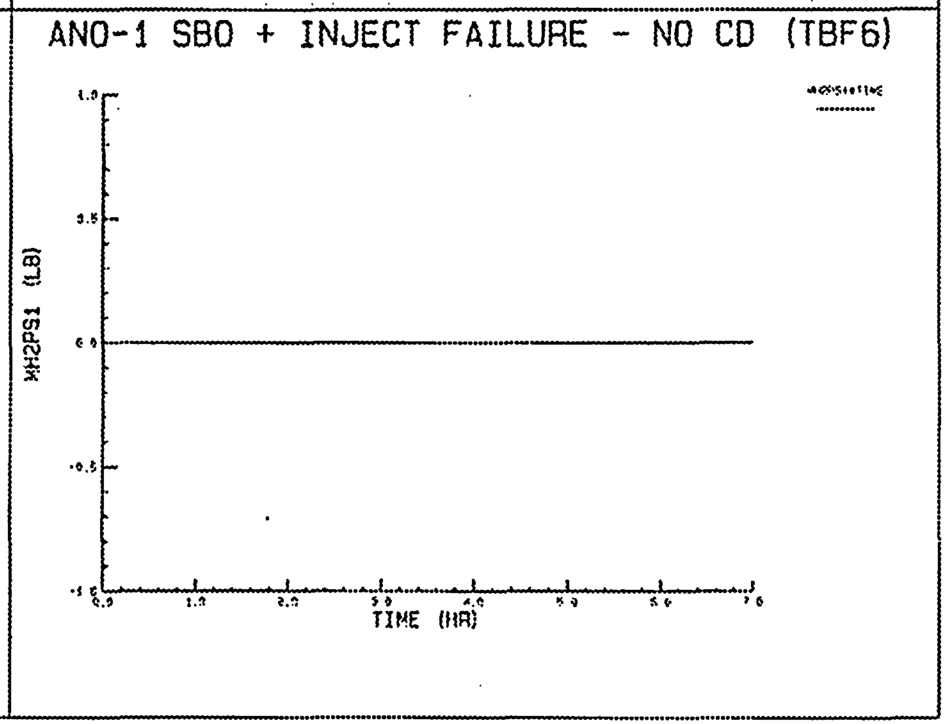
MFCSIP (***)
TIME (HR)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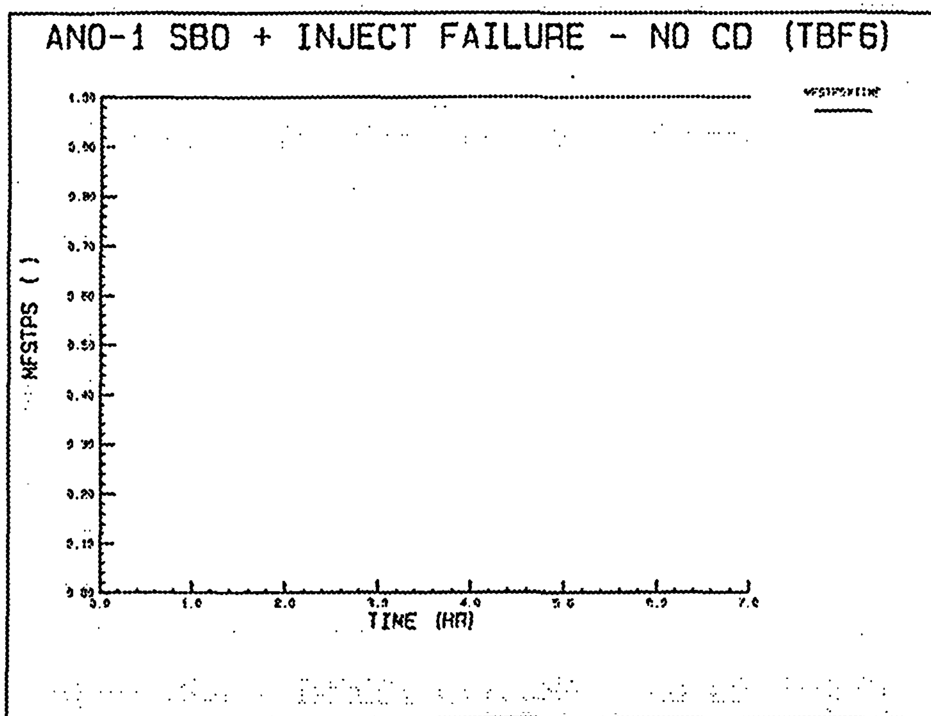
MH2PS1 (LB)
TIME (HR)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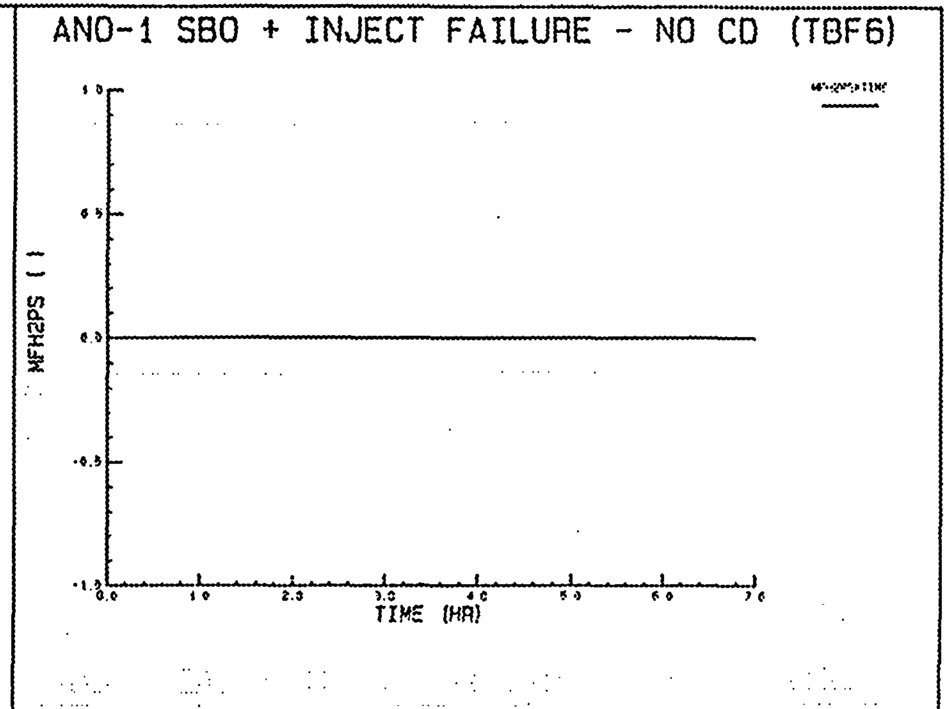
TIME (HR)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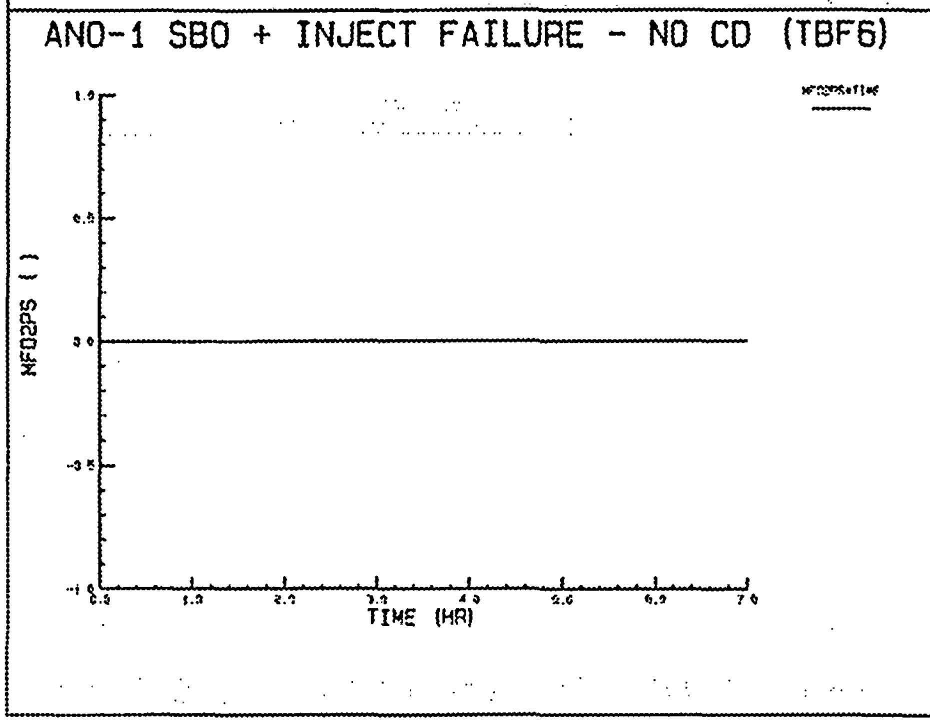
MFH2PS ( )
TIME (HR)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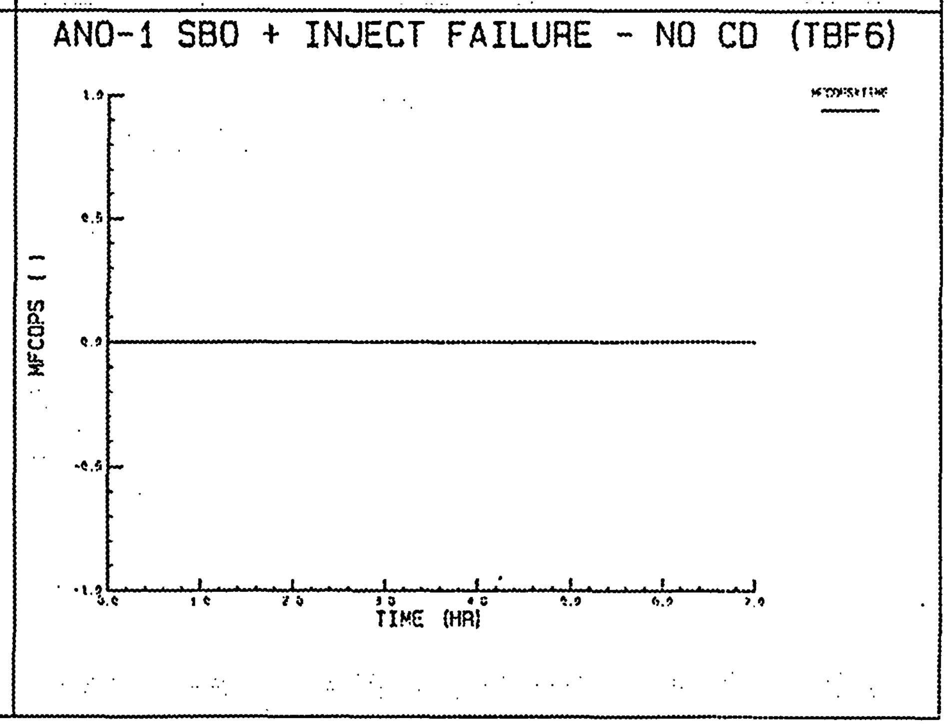
TIME (HR)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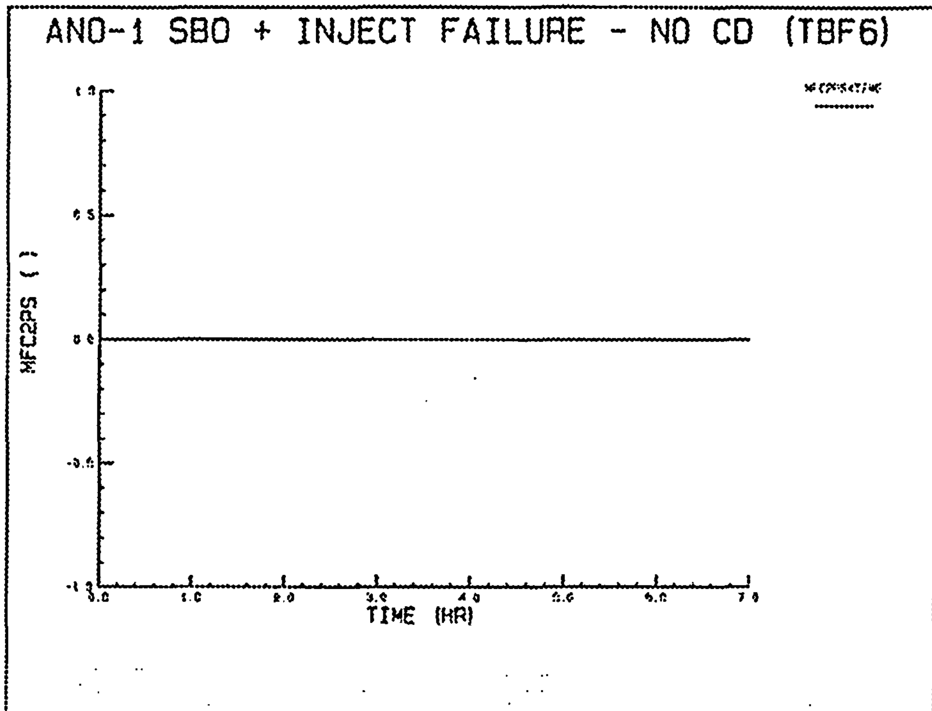
TIME (HR)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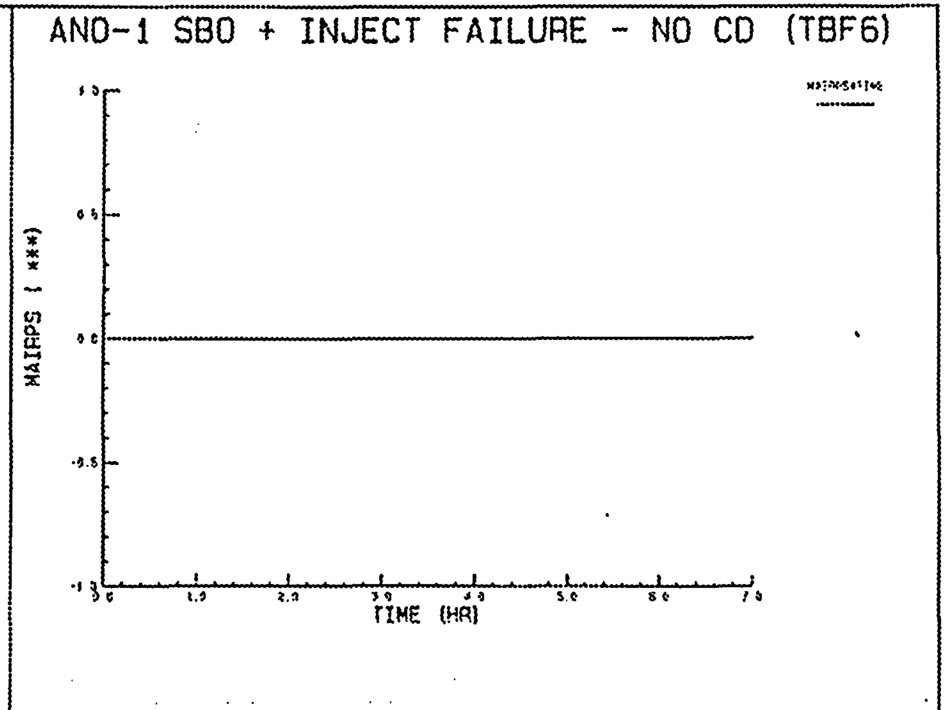
TIME (HR)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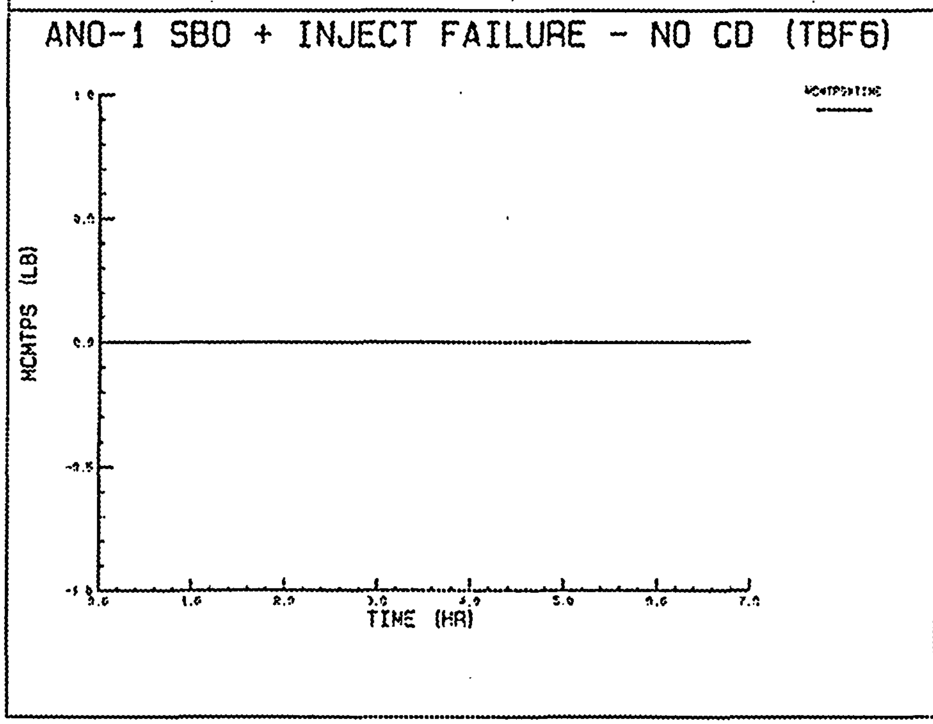
TIME (HR)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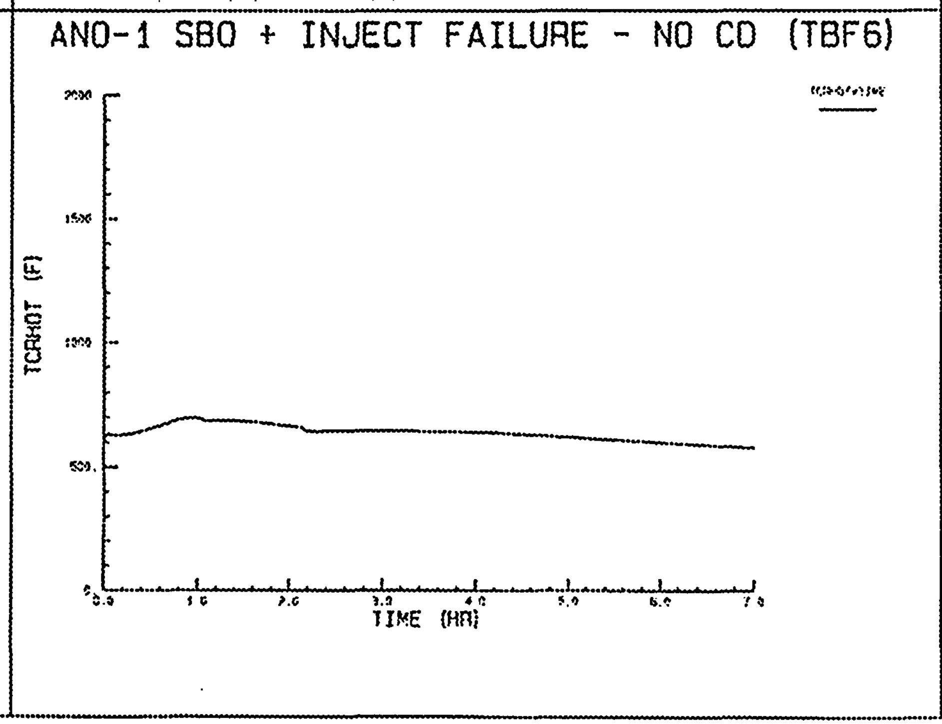
TIME (HR)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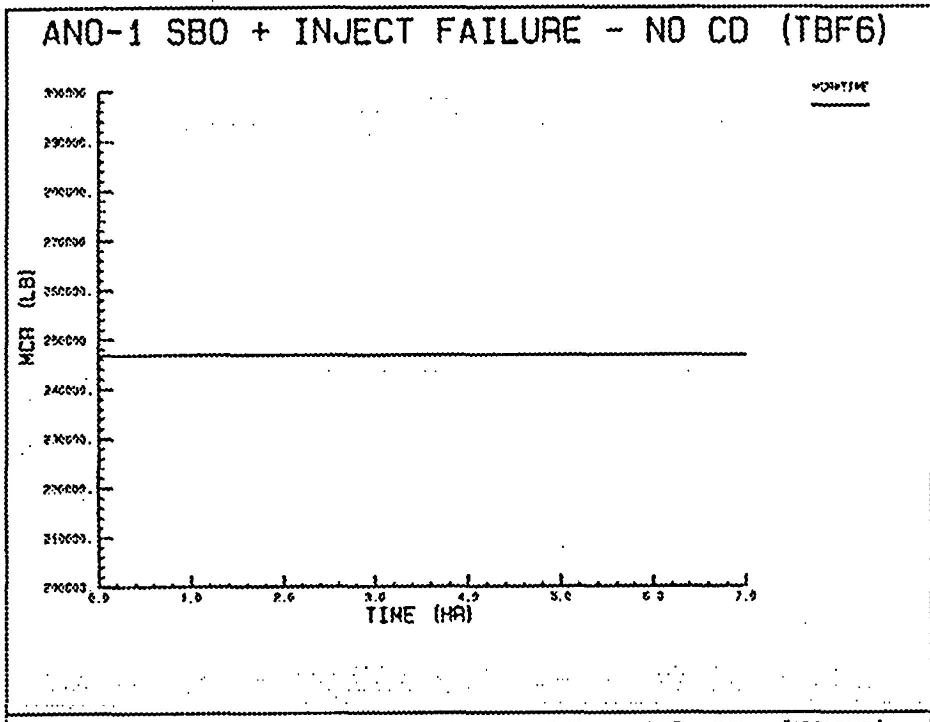
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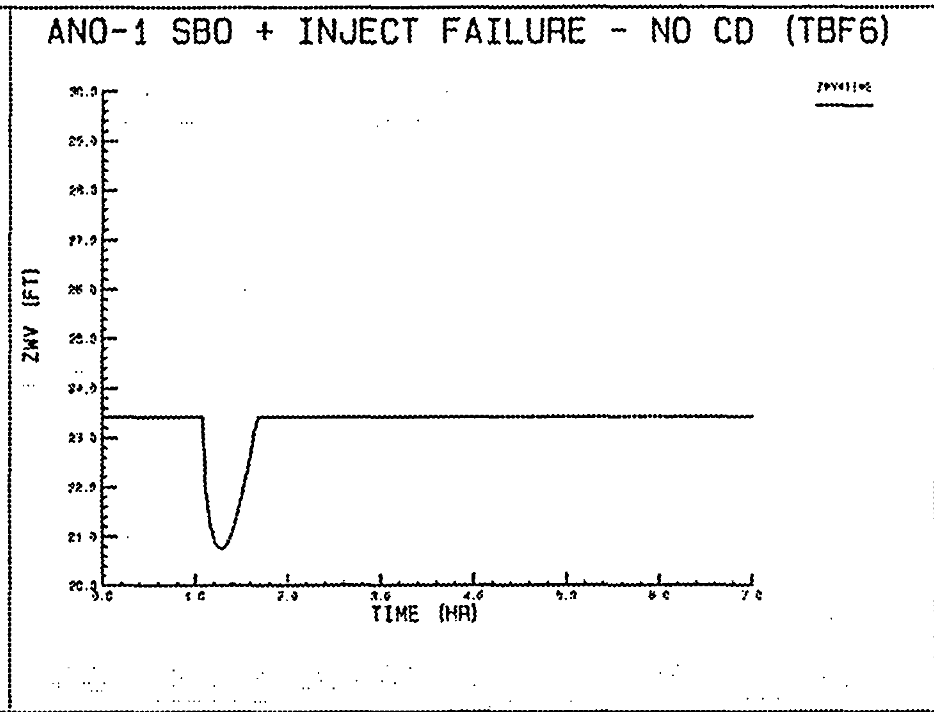
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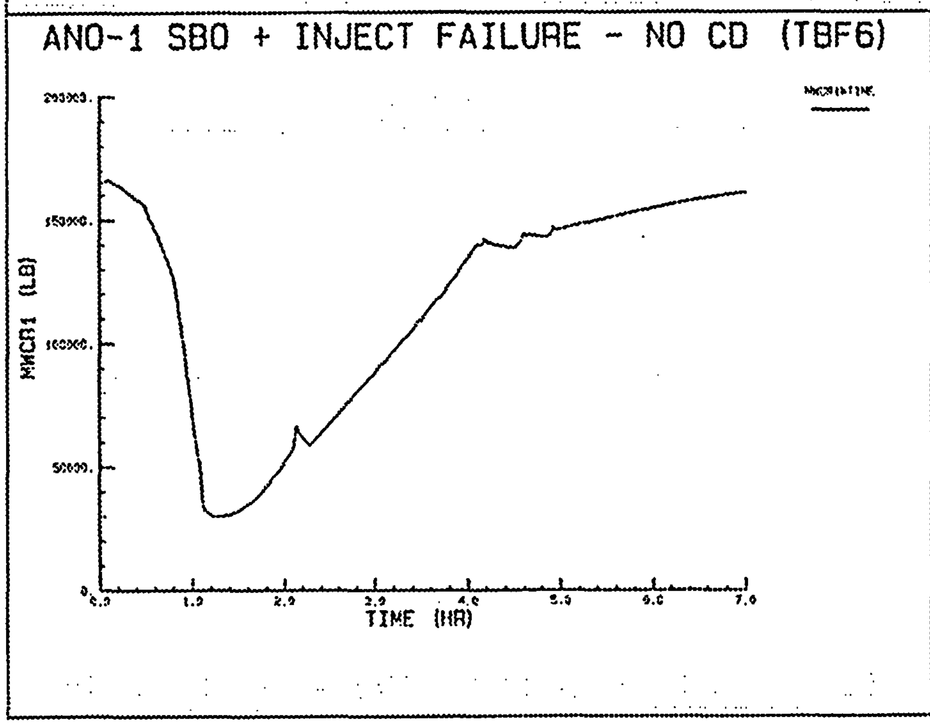
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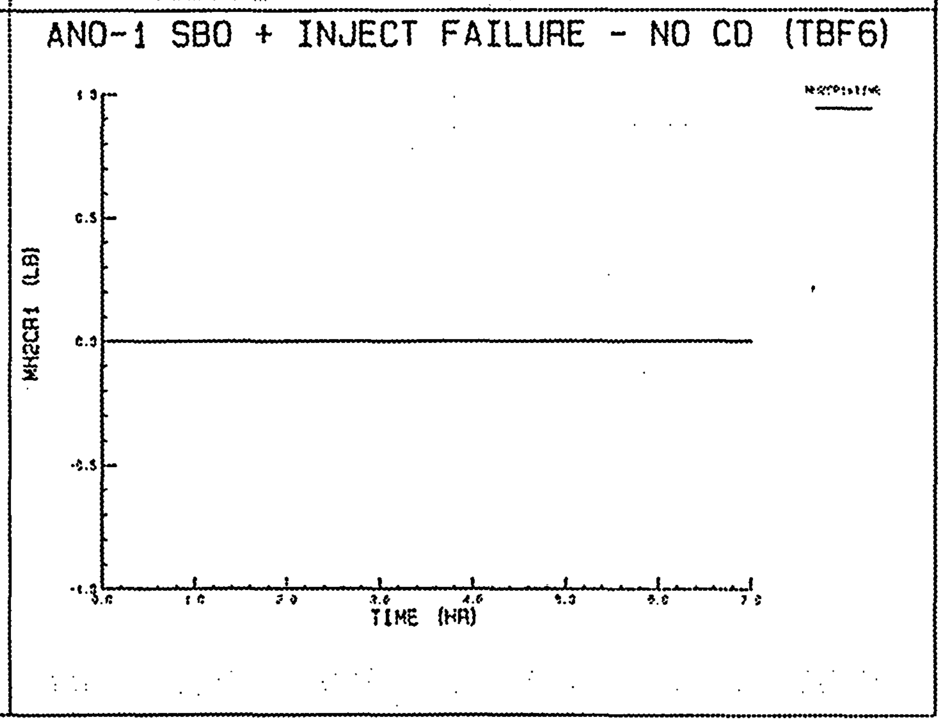
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TIME (HR)

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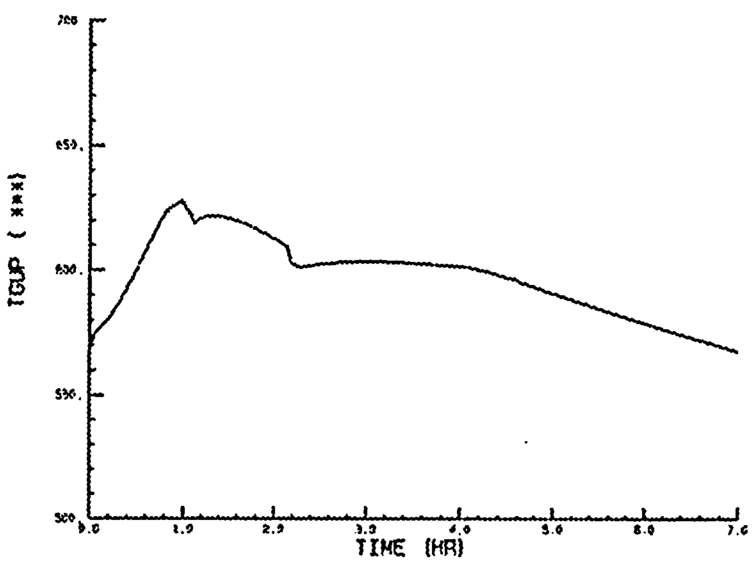

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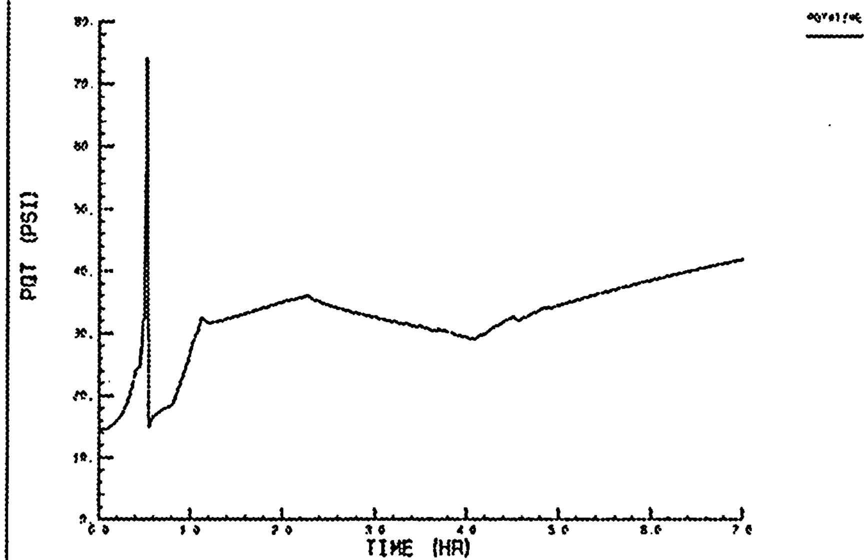

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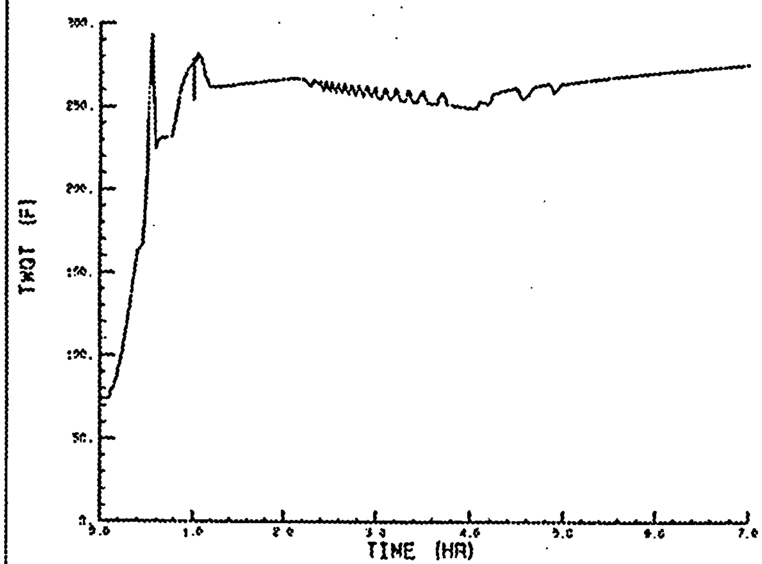

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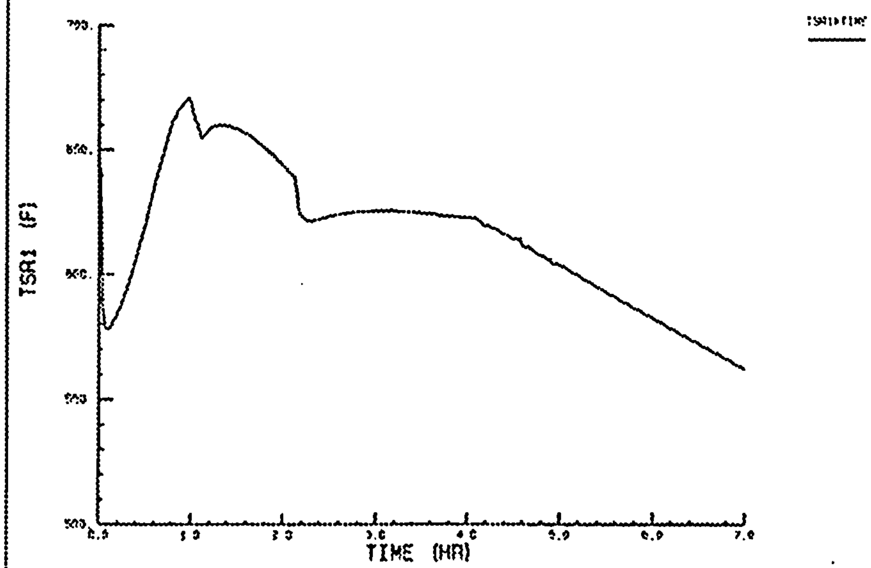

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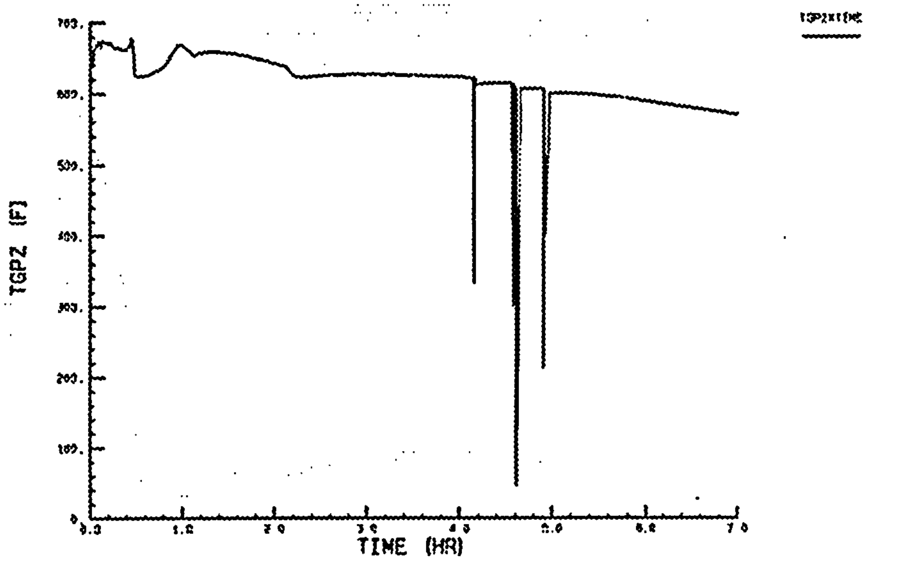

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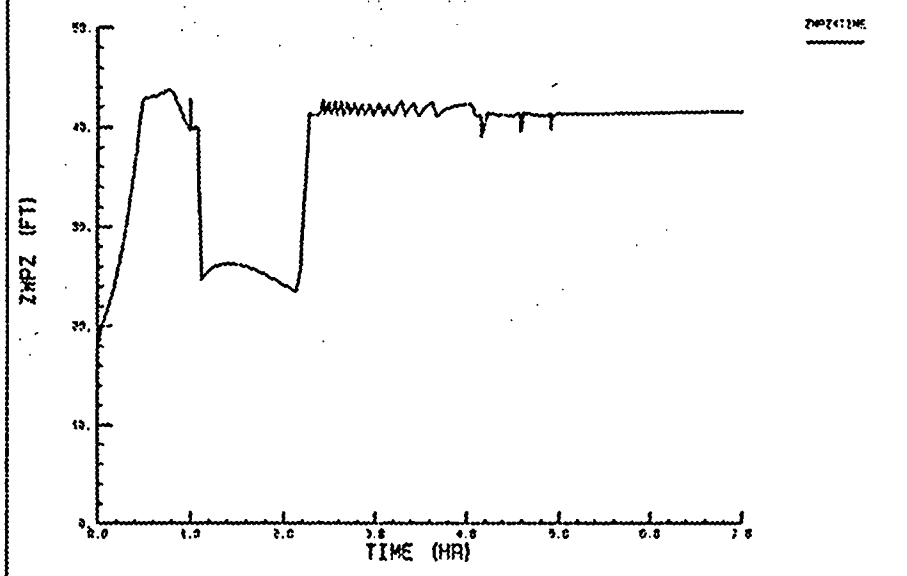

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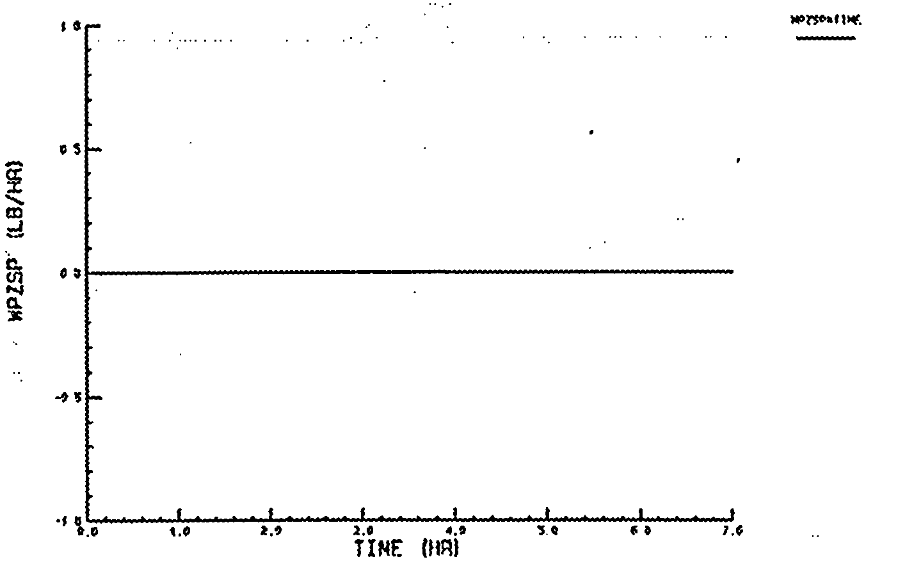

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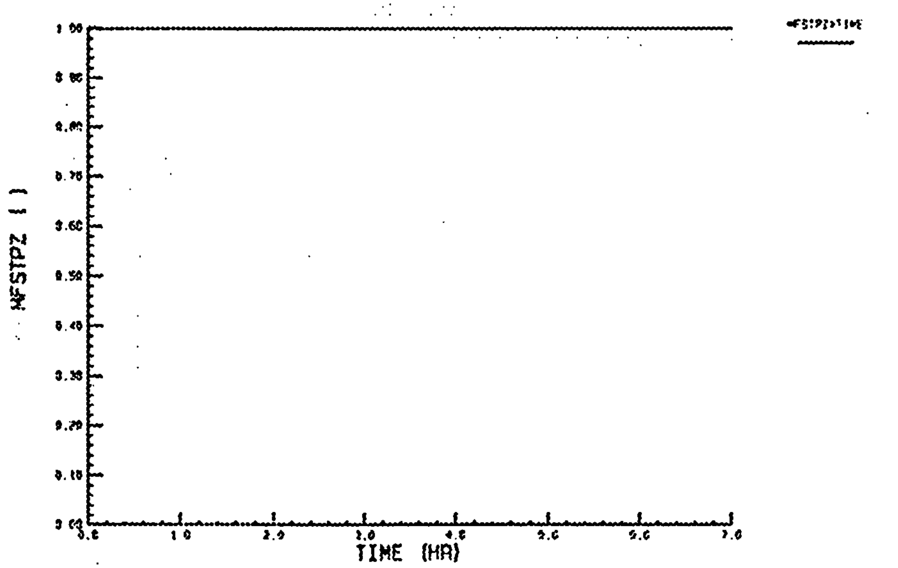

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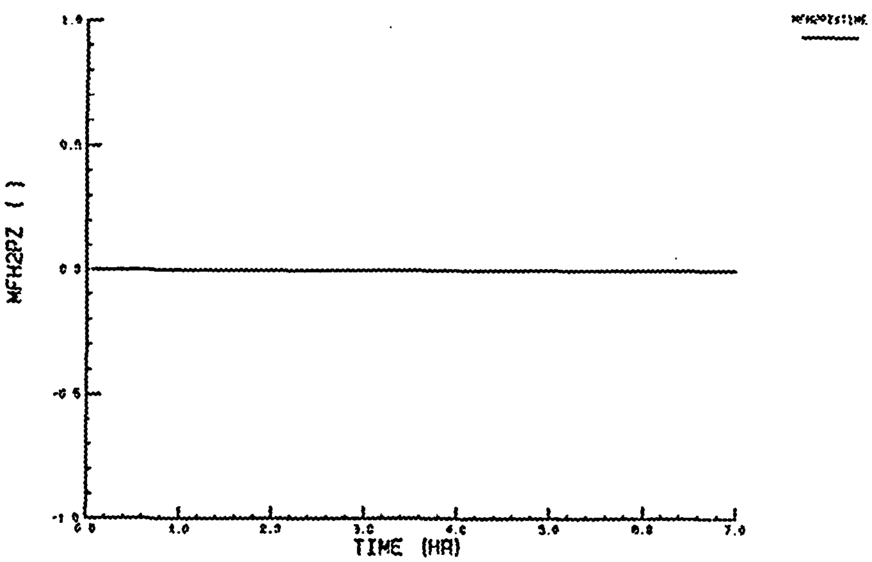

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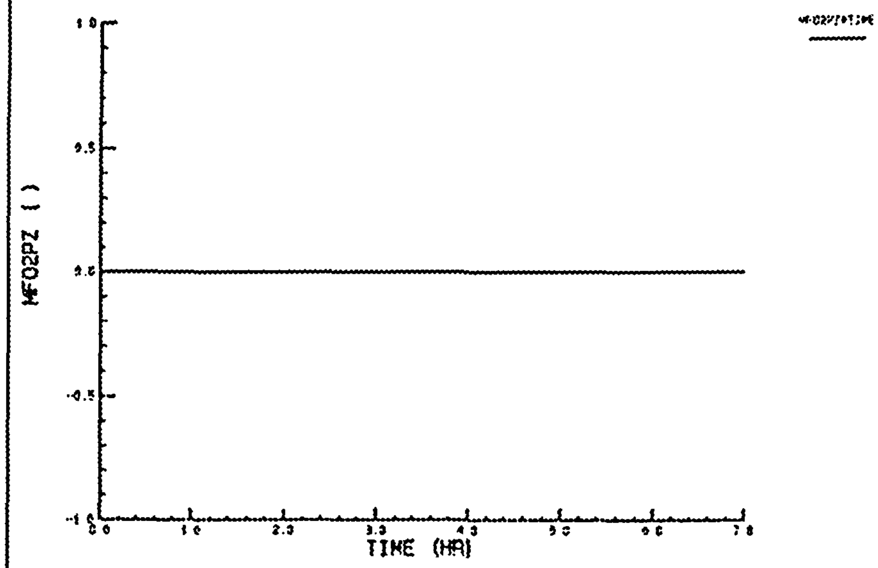

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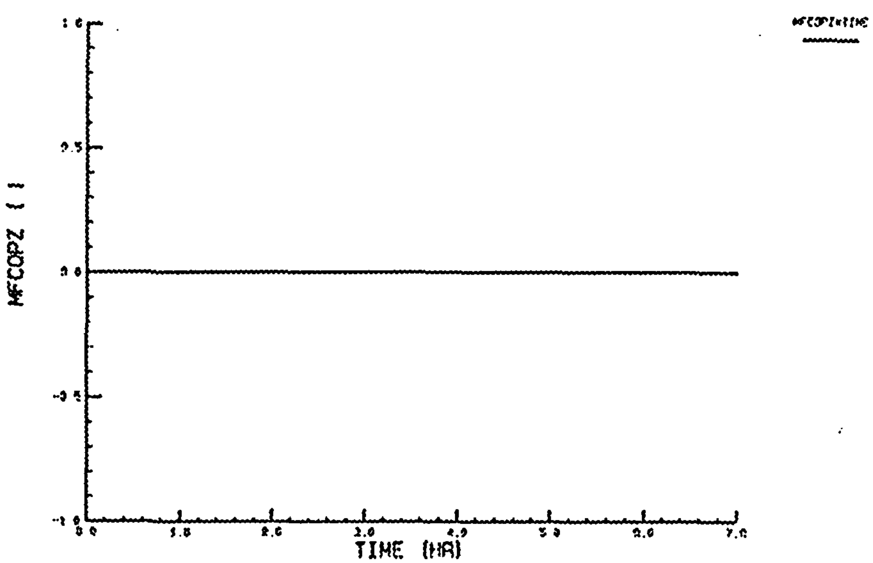

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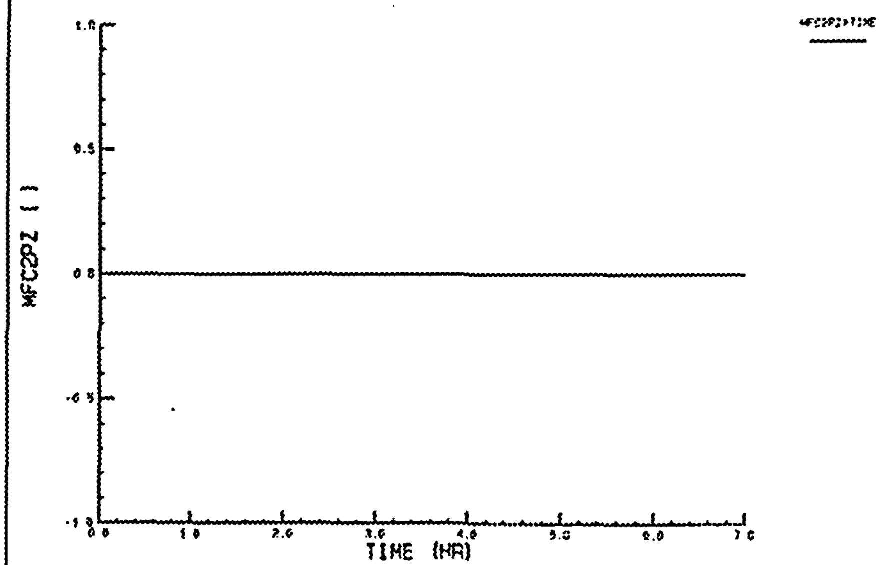

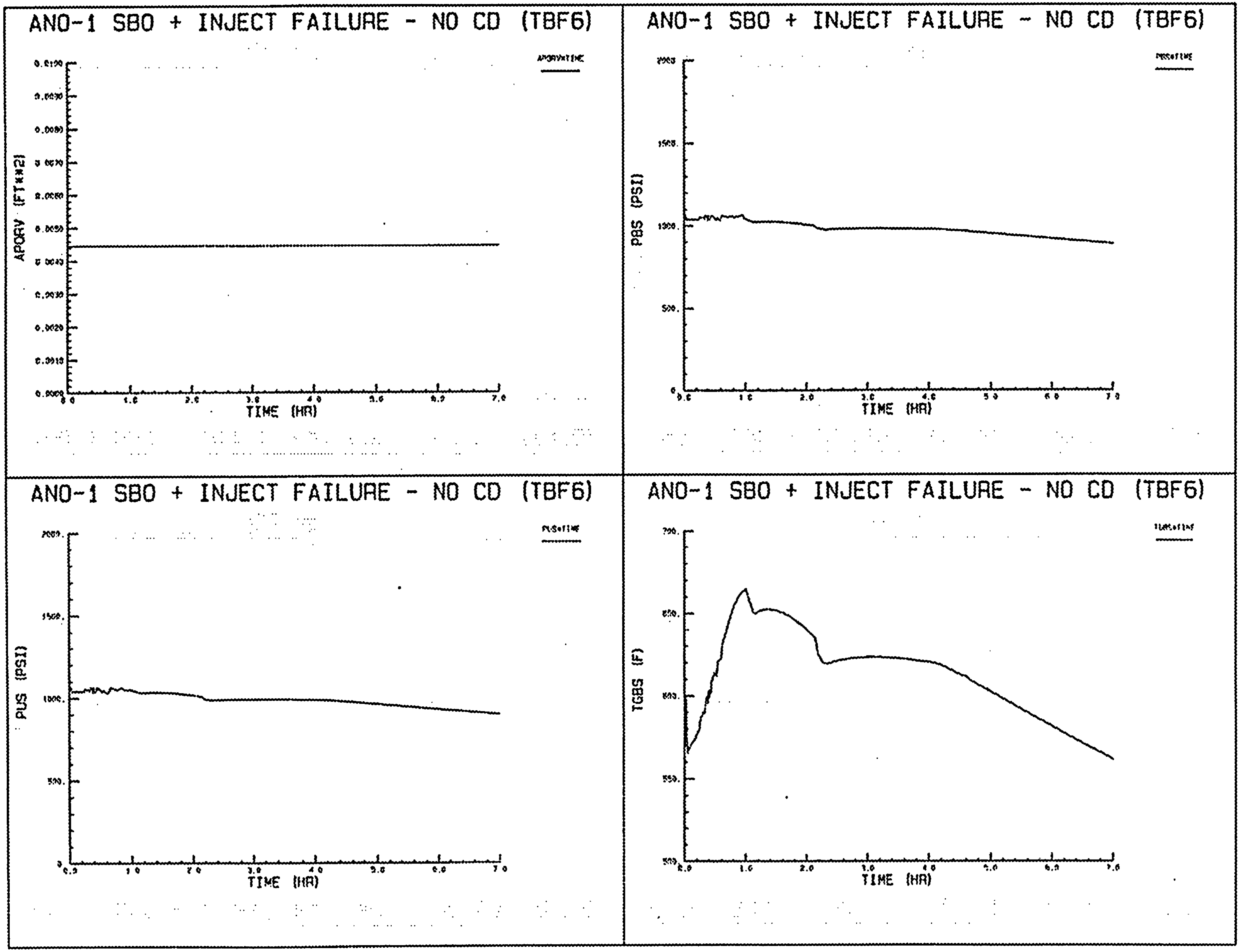
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APORV (FT**2)
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
PBS (PSI)
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
PUS (PSI)
TIME (HR)
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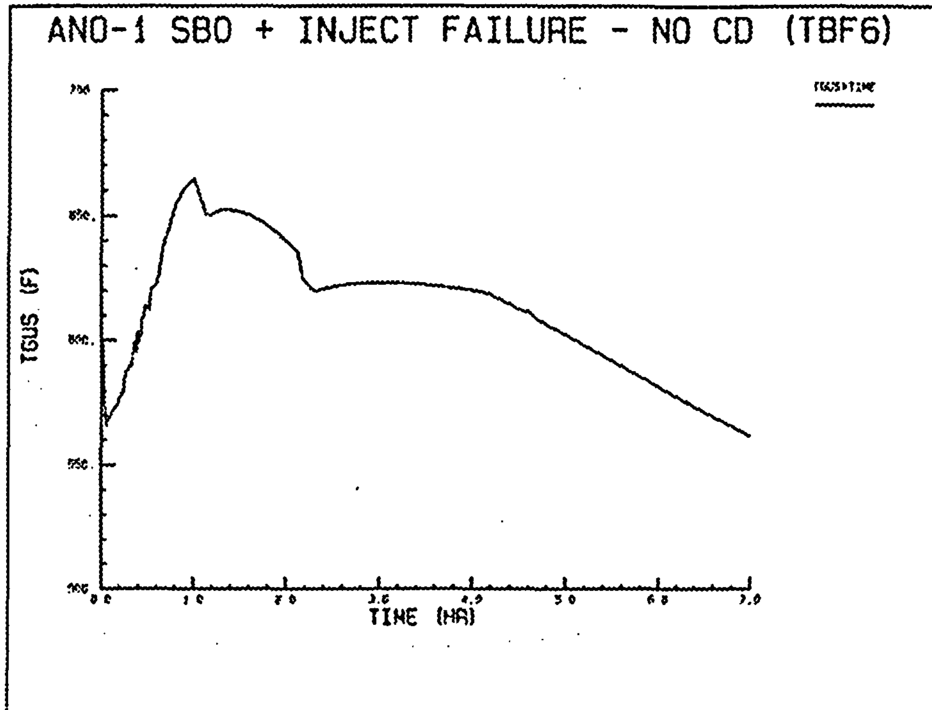
TGBS (F)
TIME (HR)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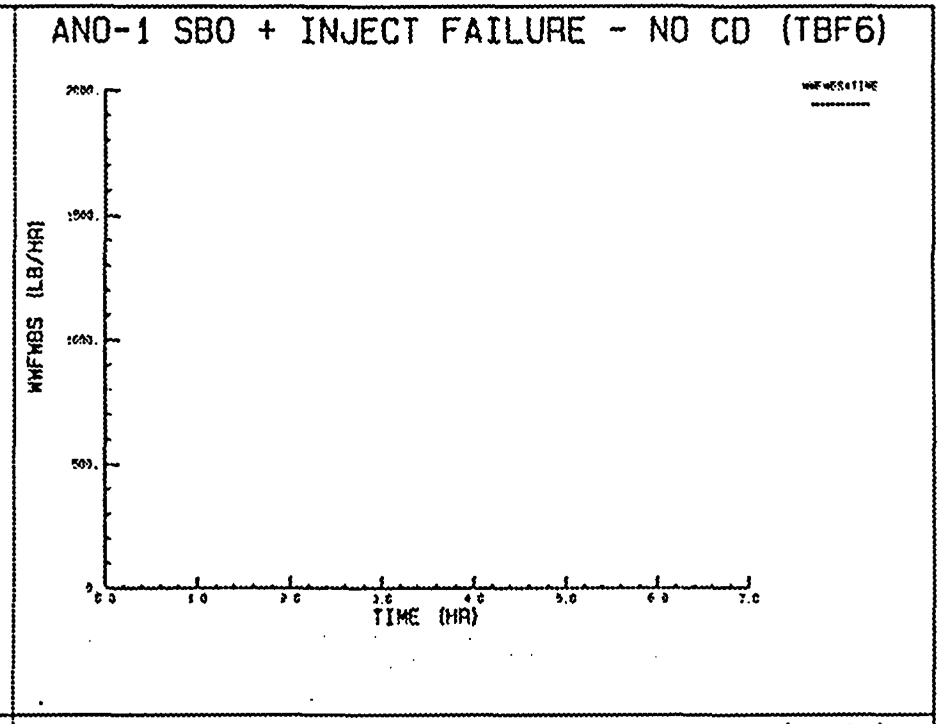
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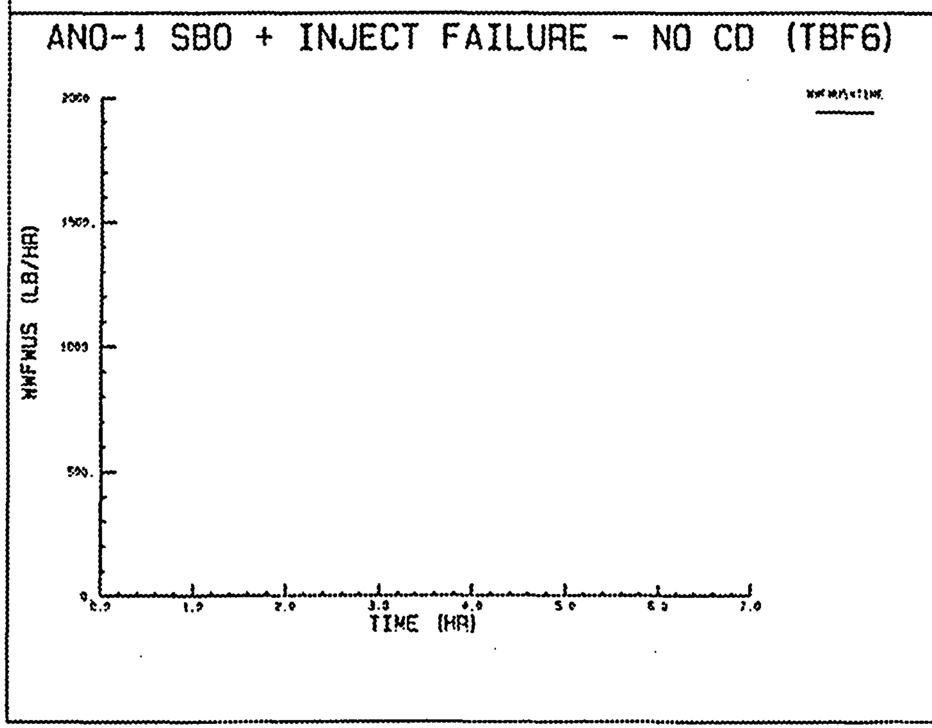
TIME (HR)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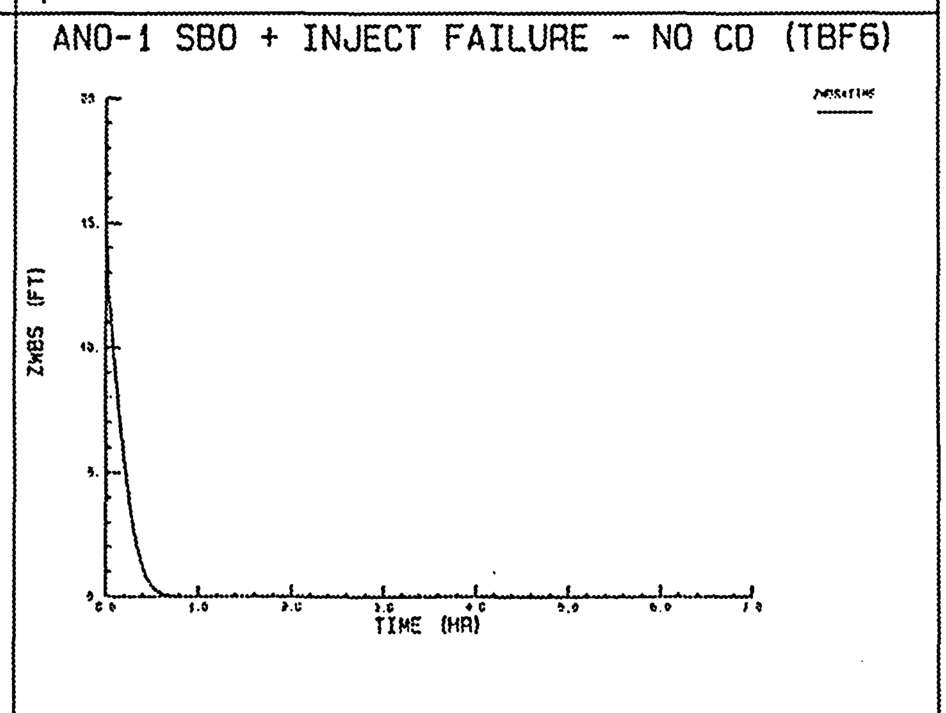
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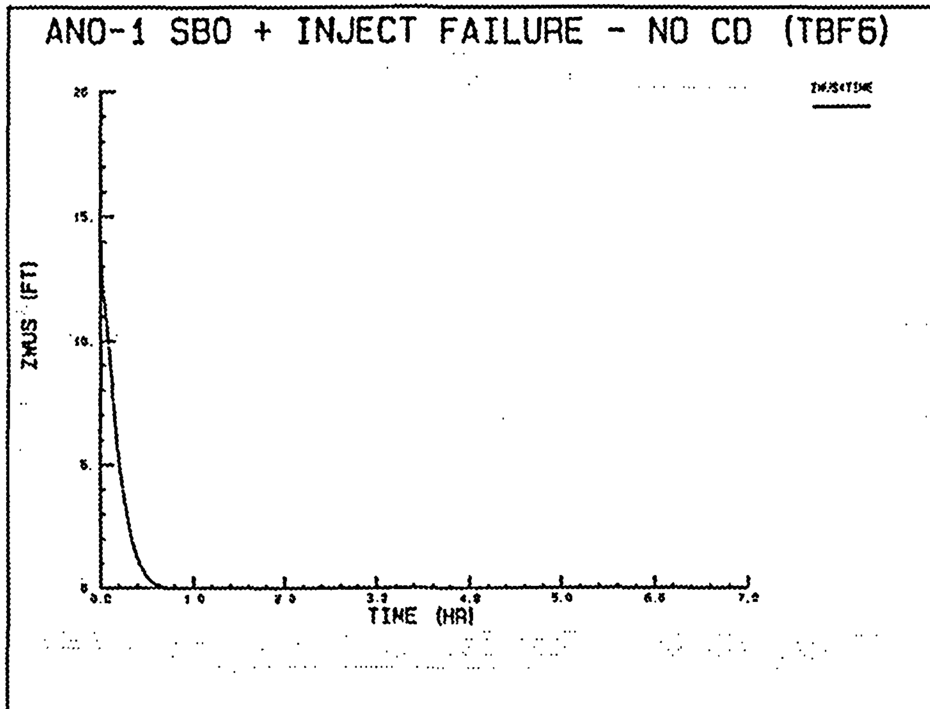
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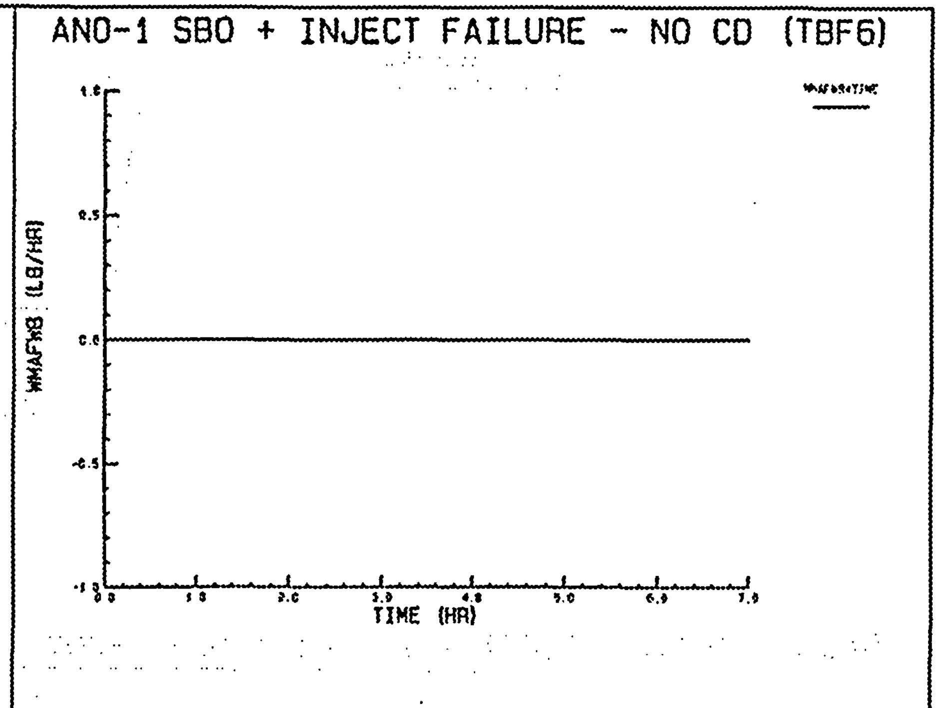
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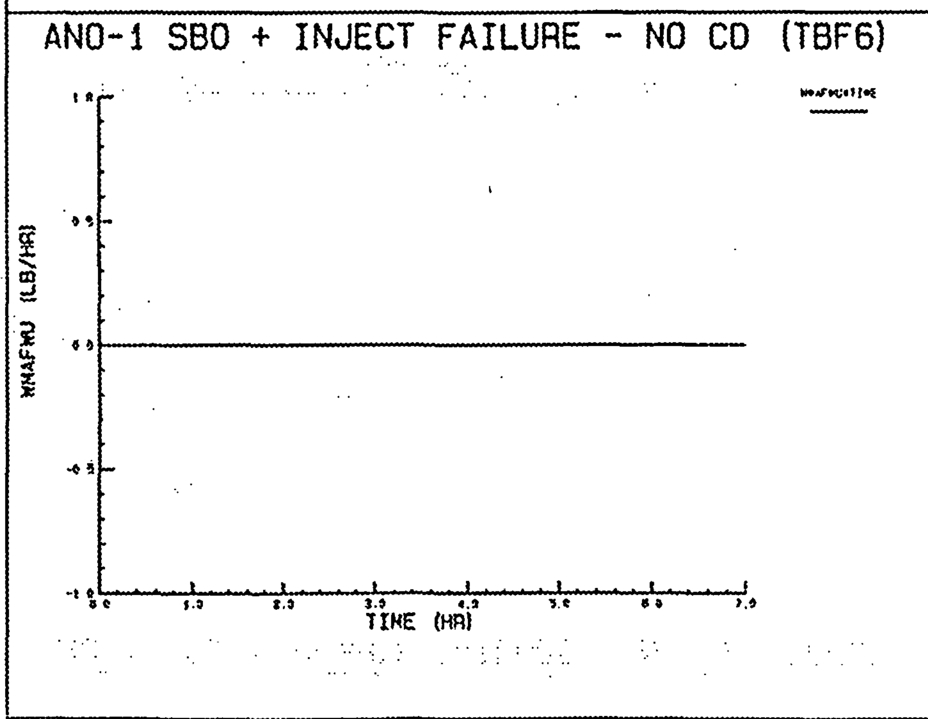
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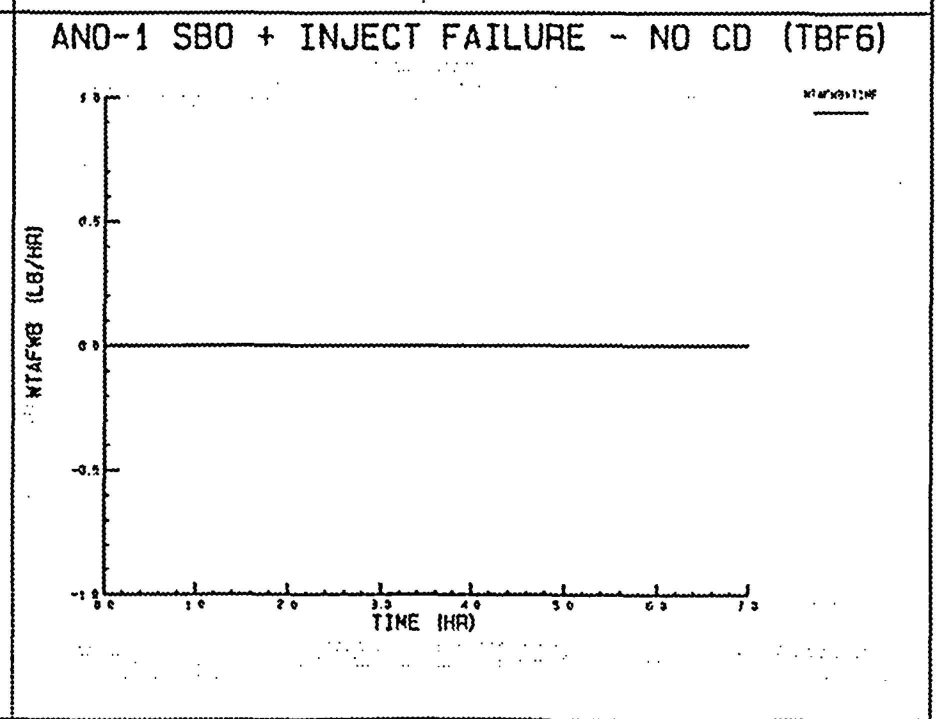
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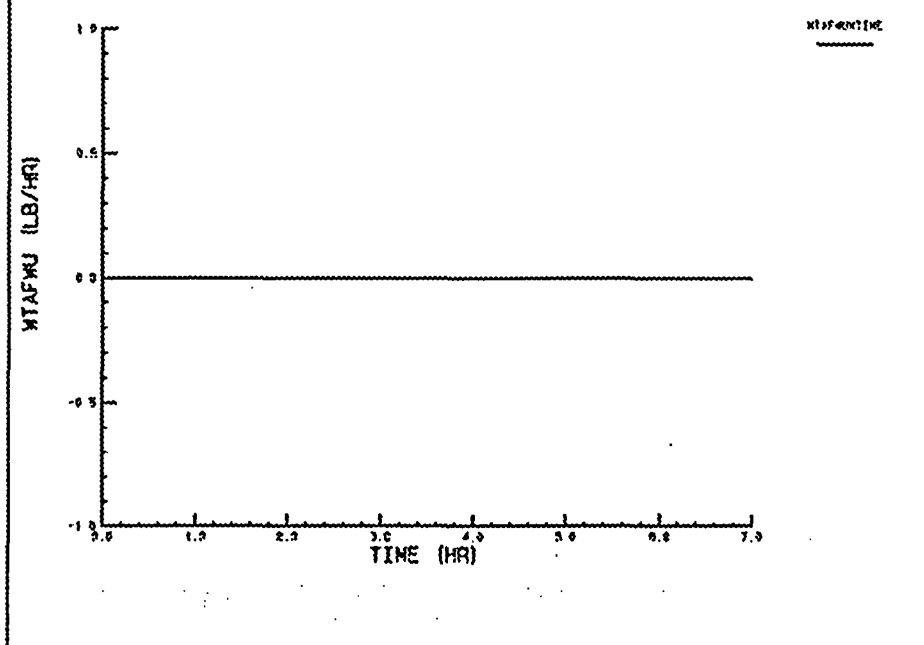

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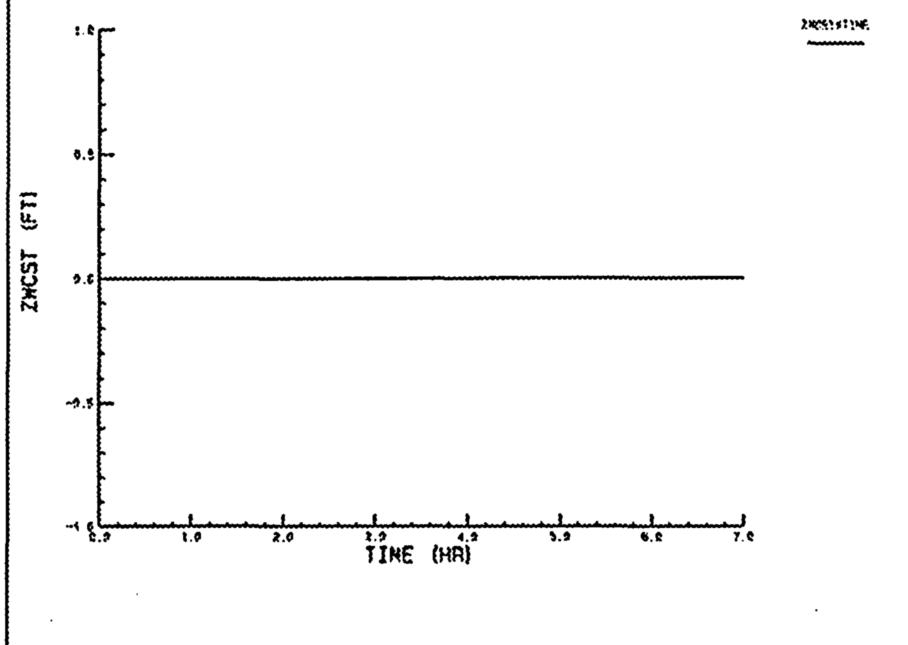

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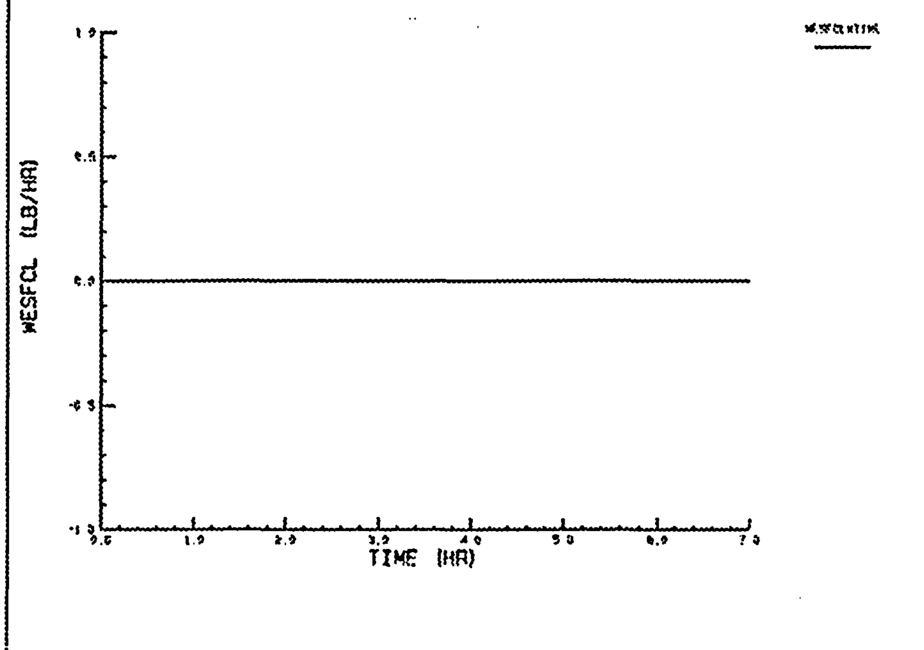

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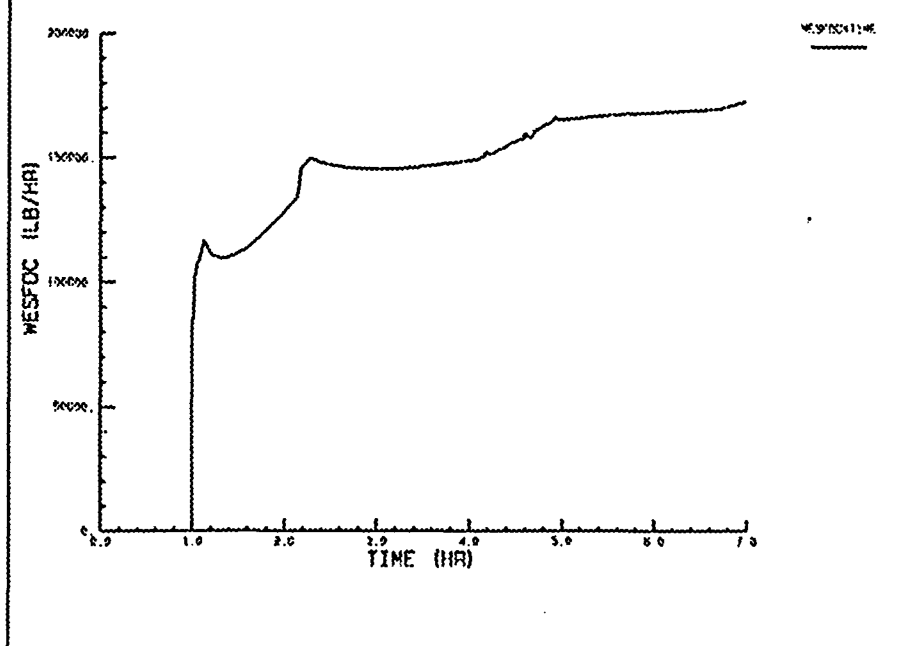

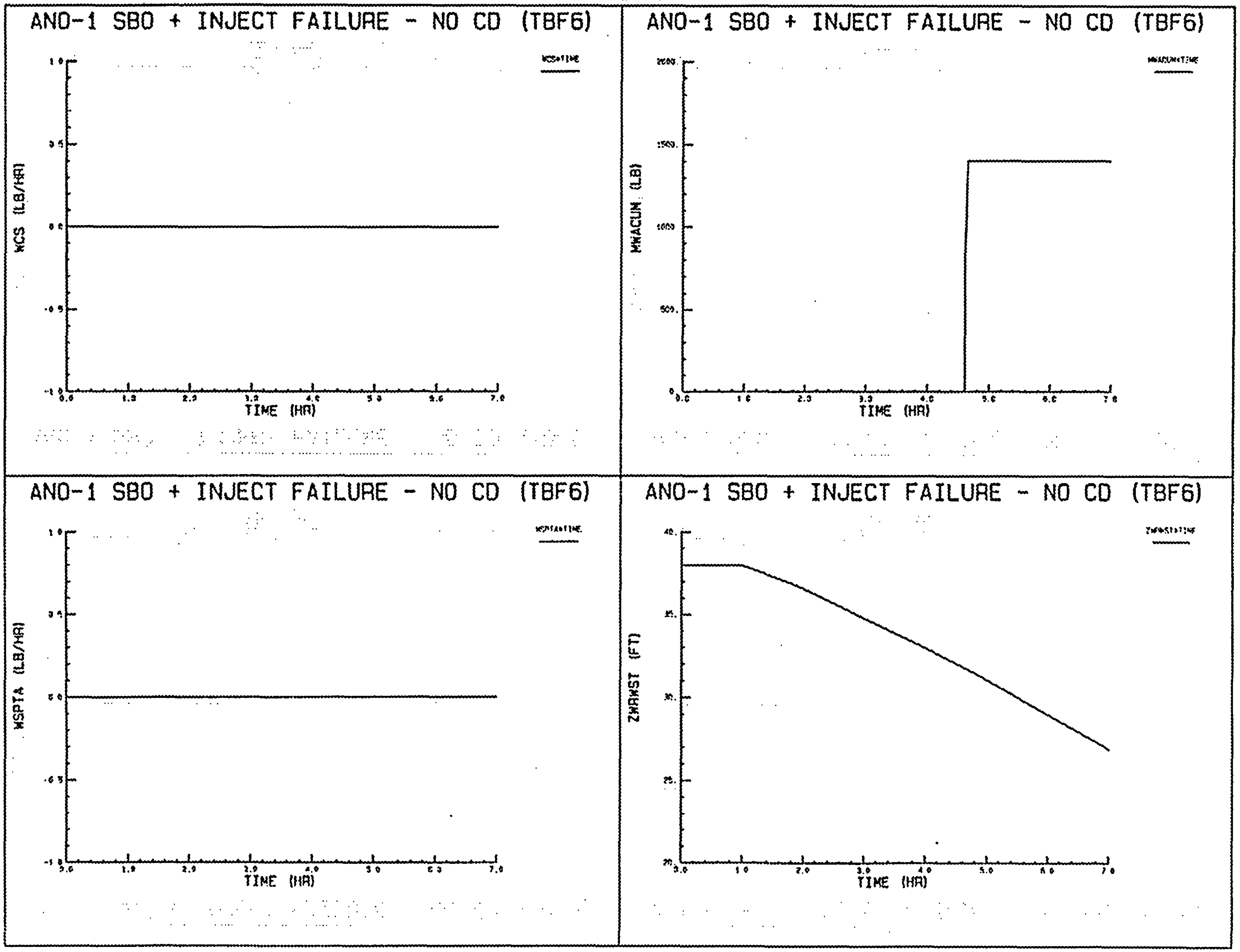
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TIME (HR)
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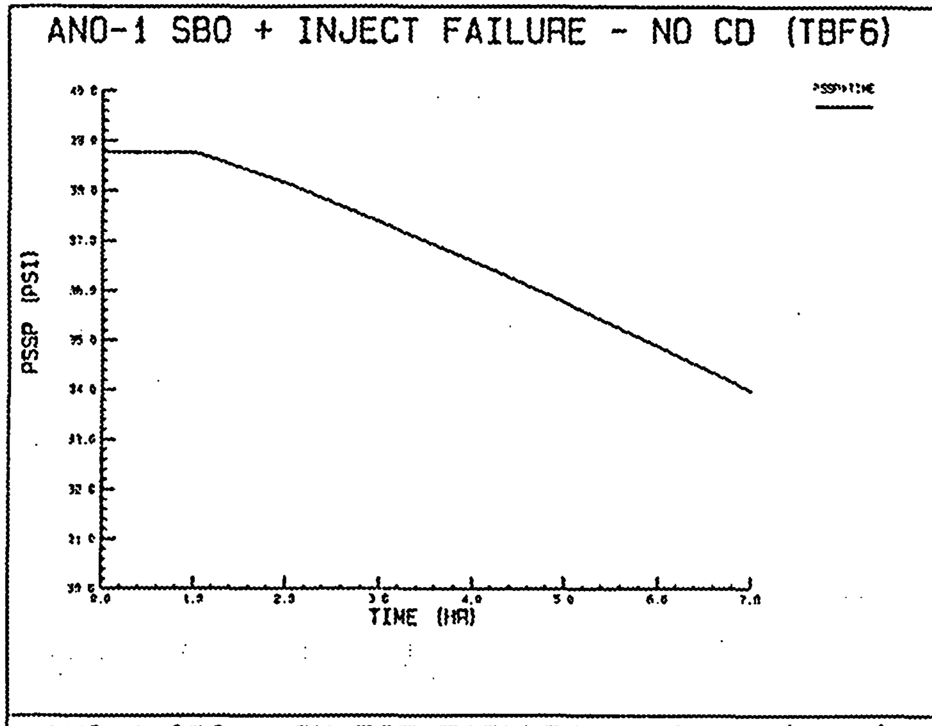
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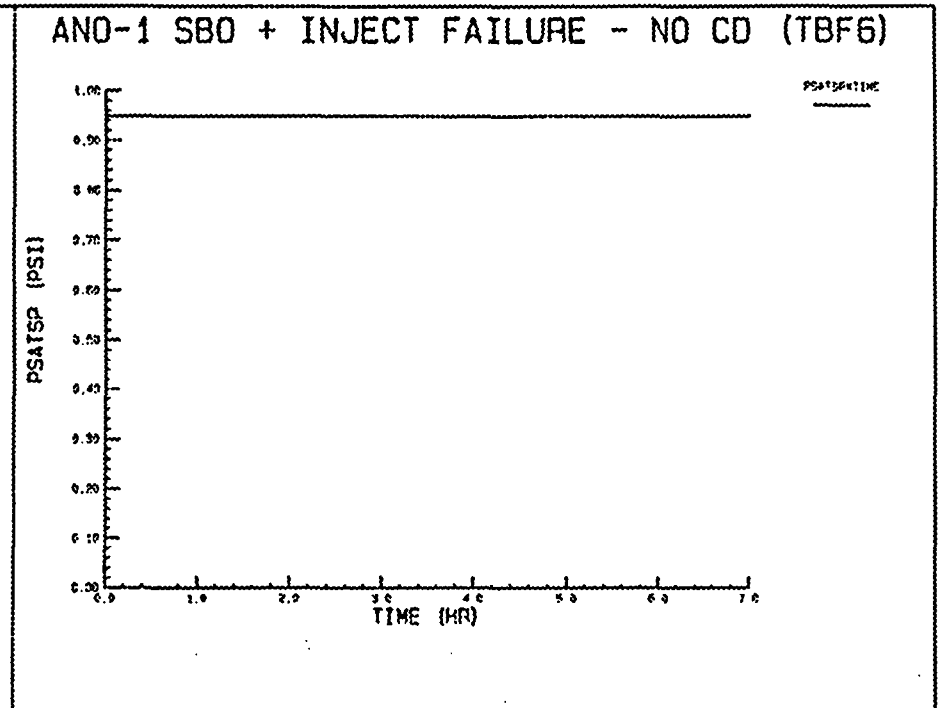
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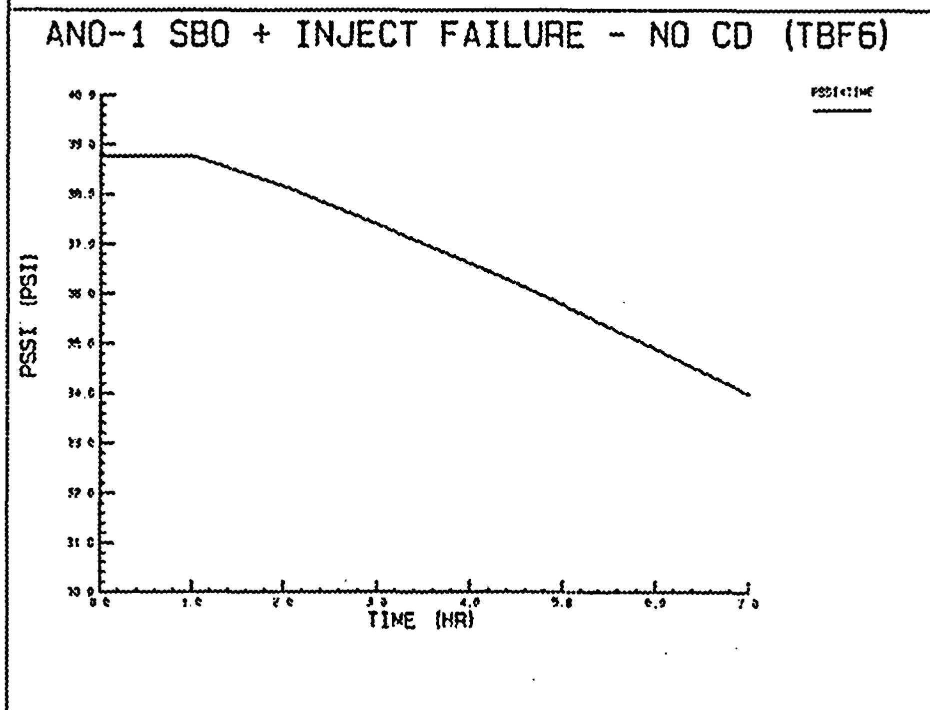
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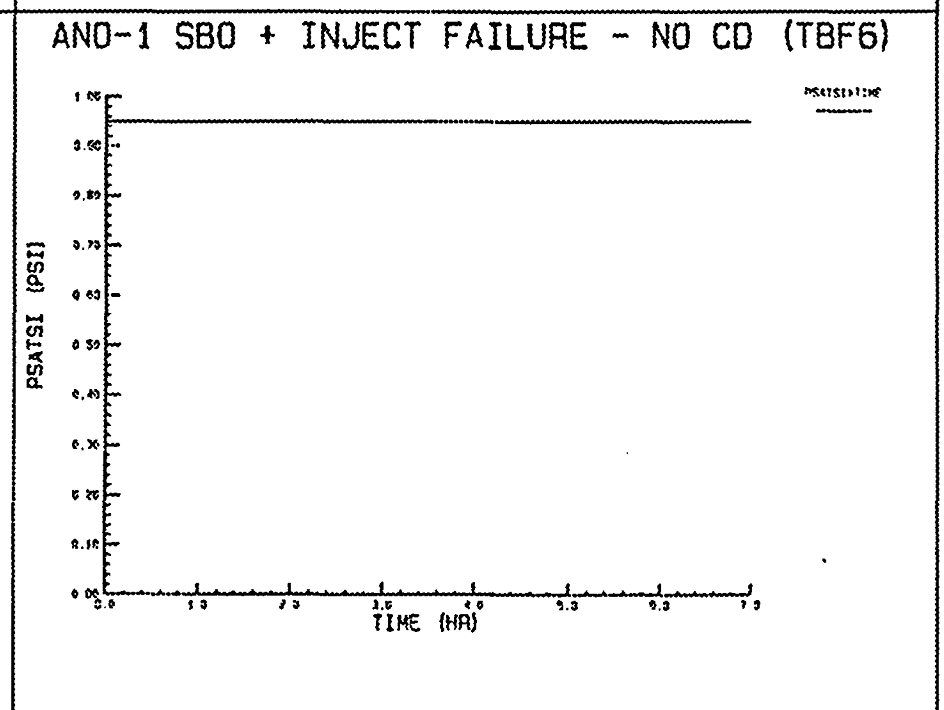
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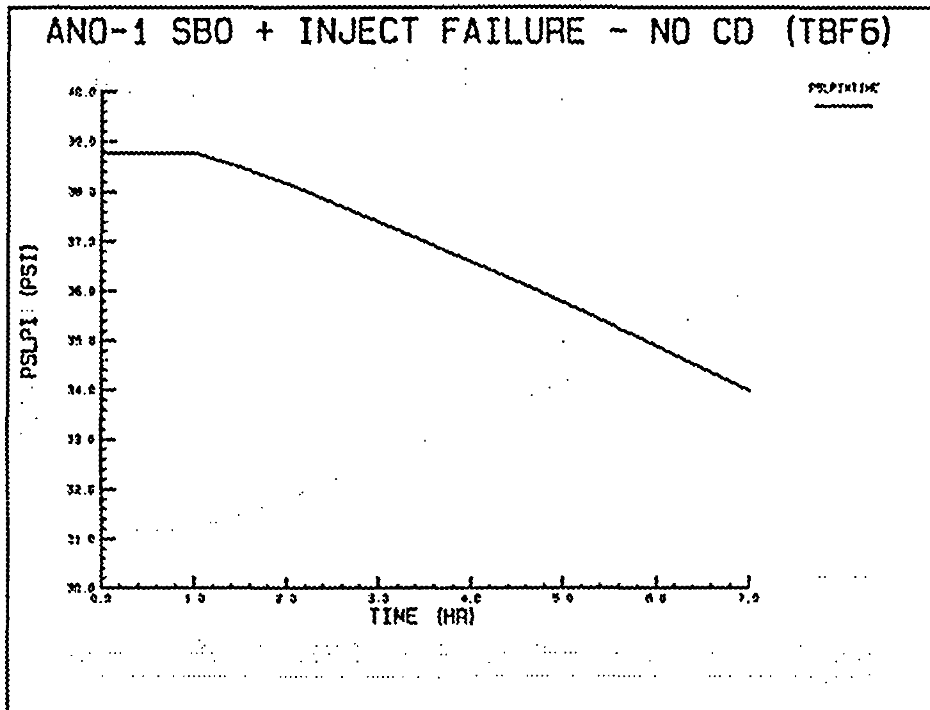
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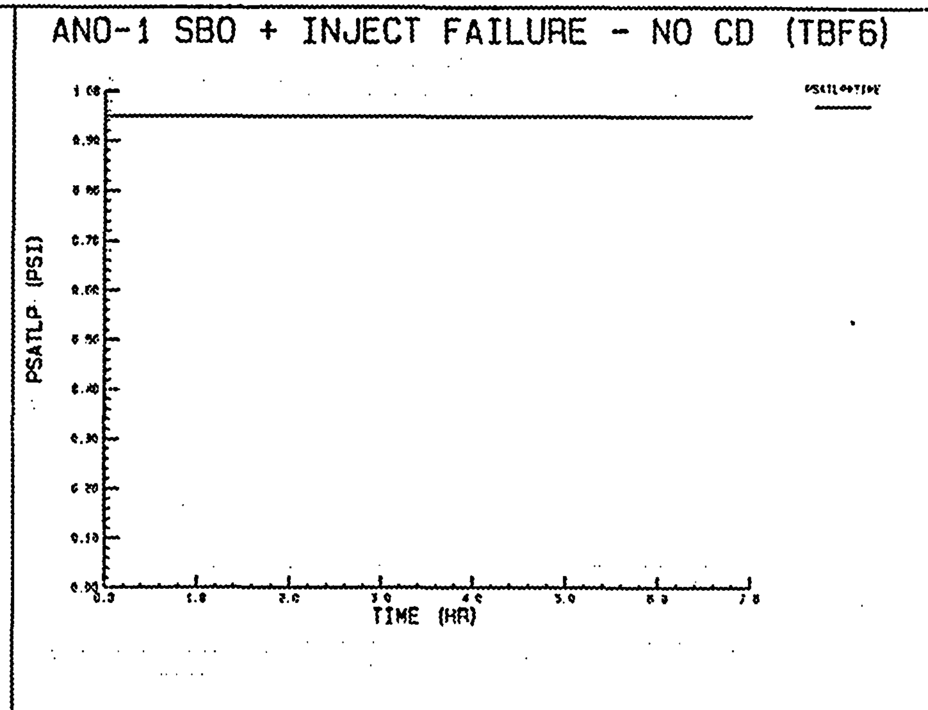
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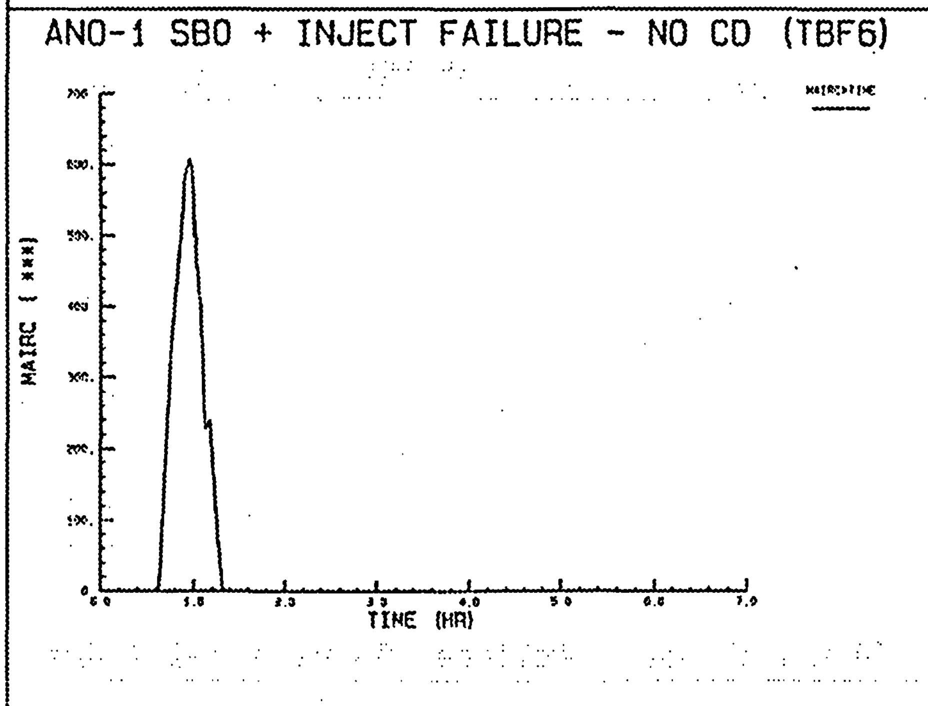
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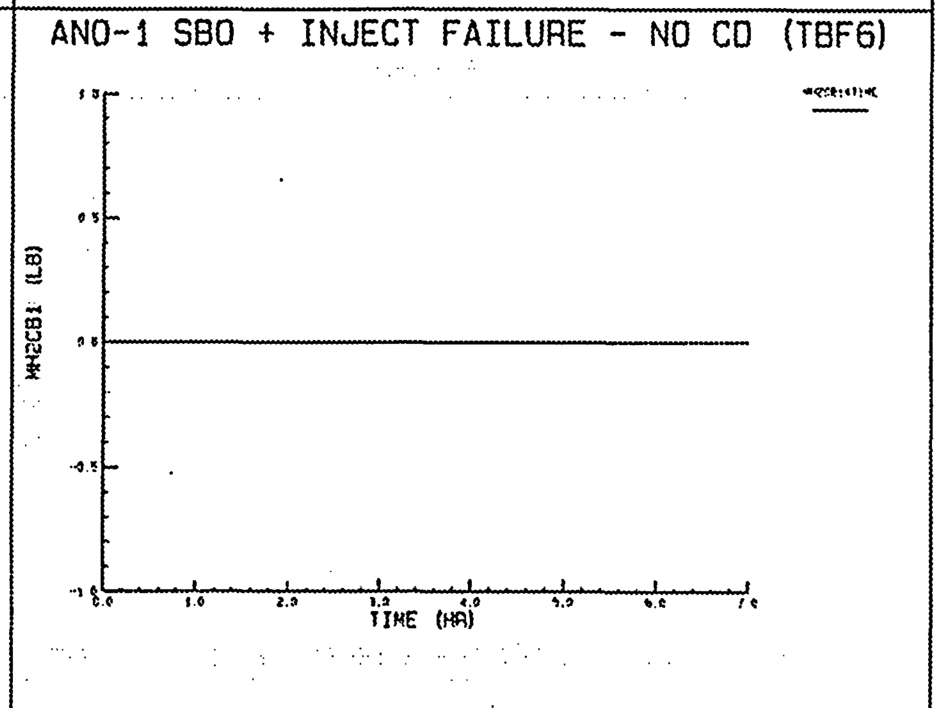
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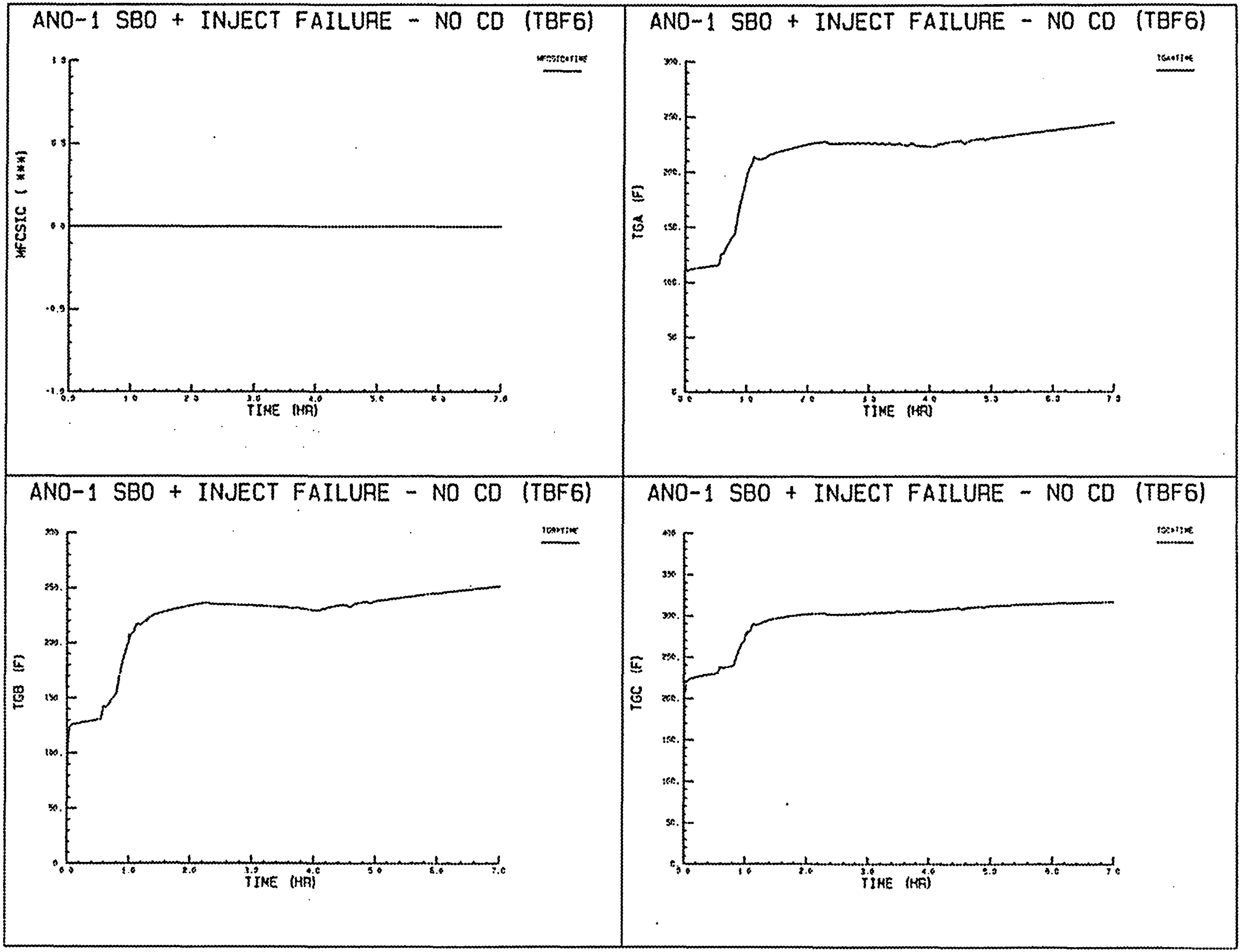
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TIME (HR)
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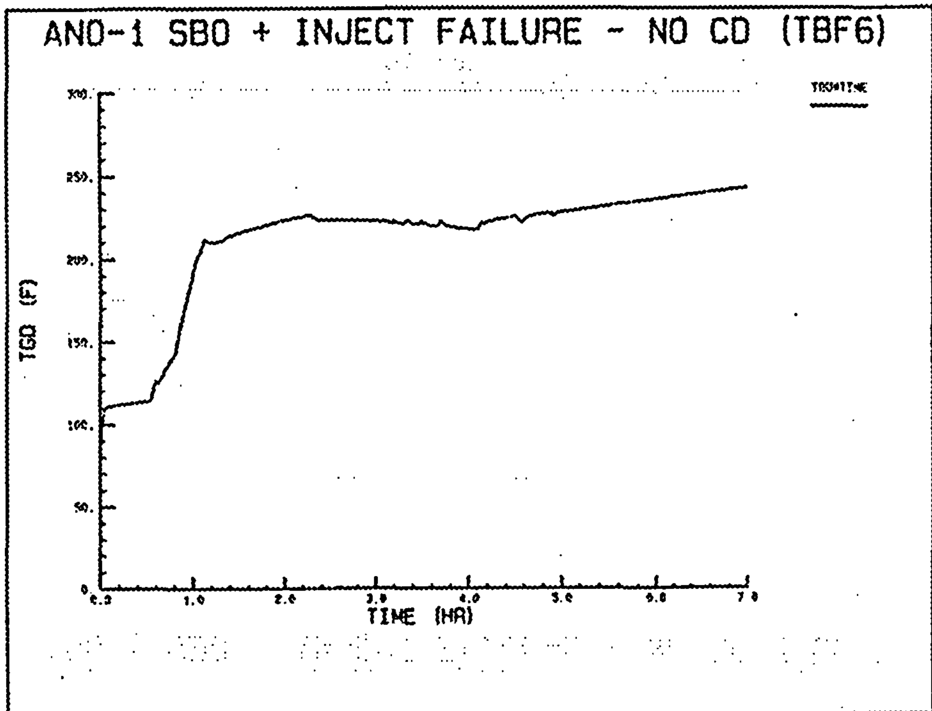
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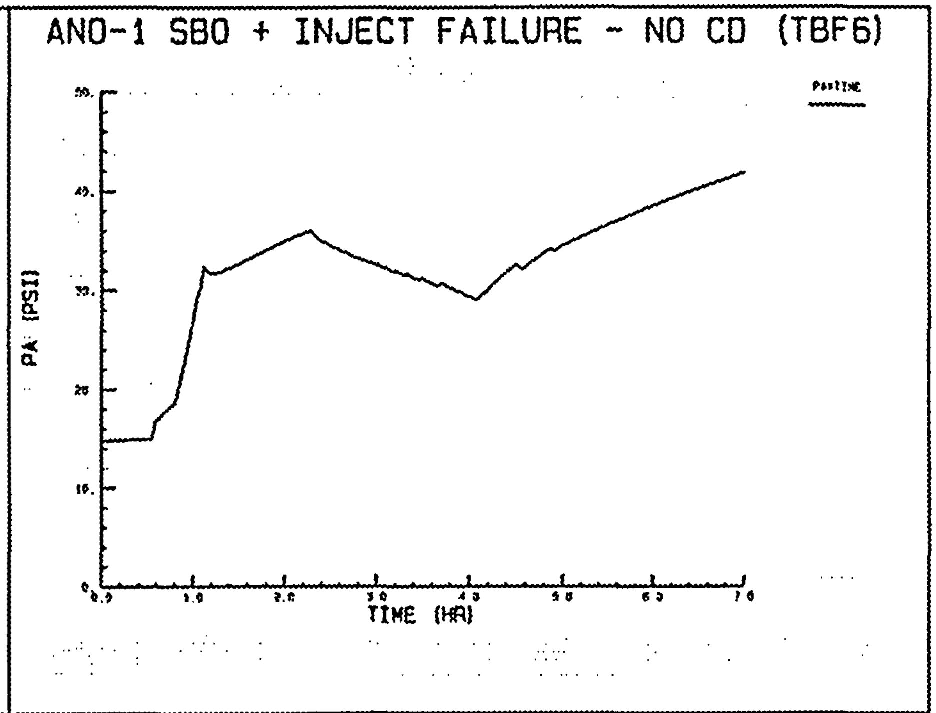
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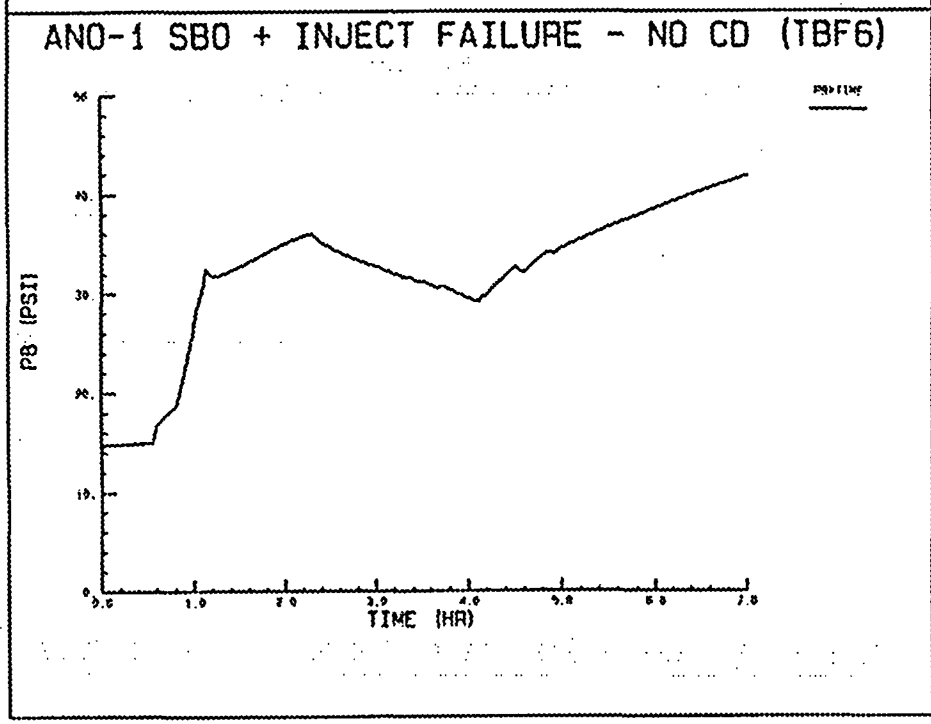
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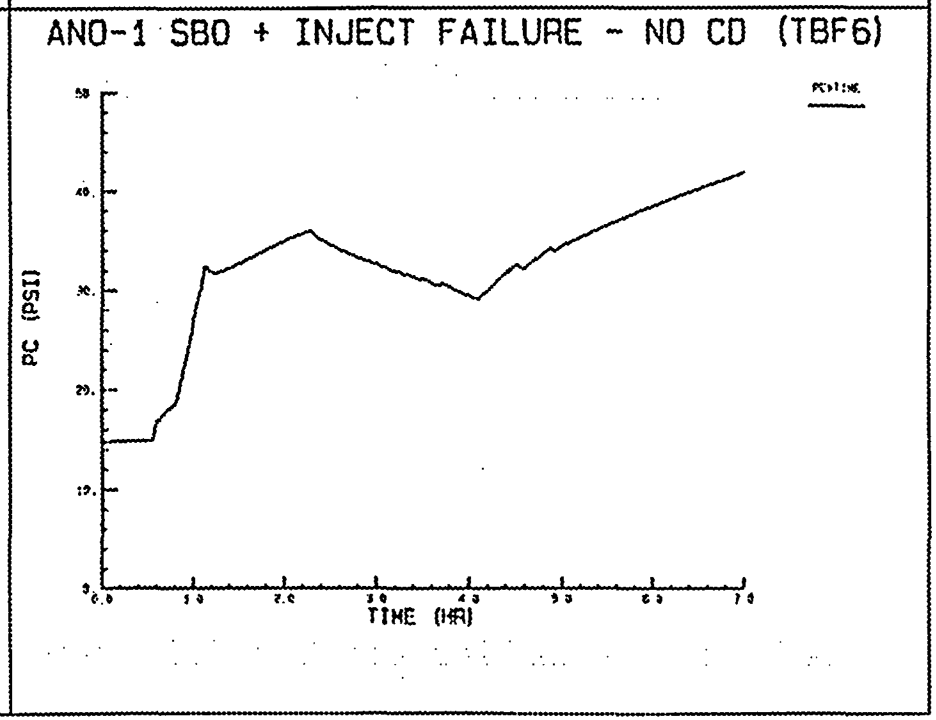
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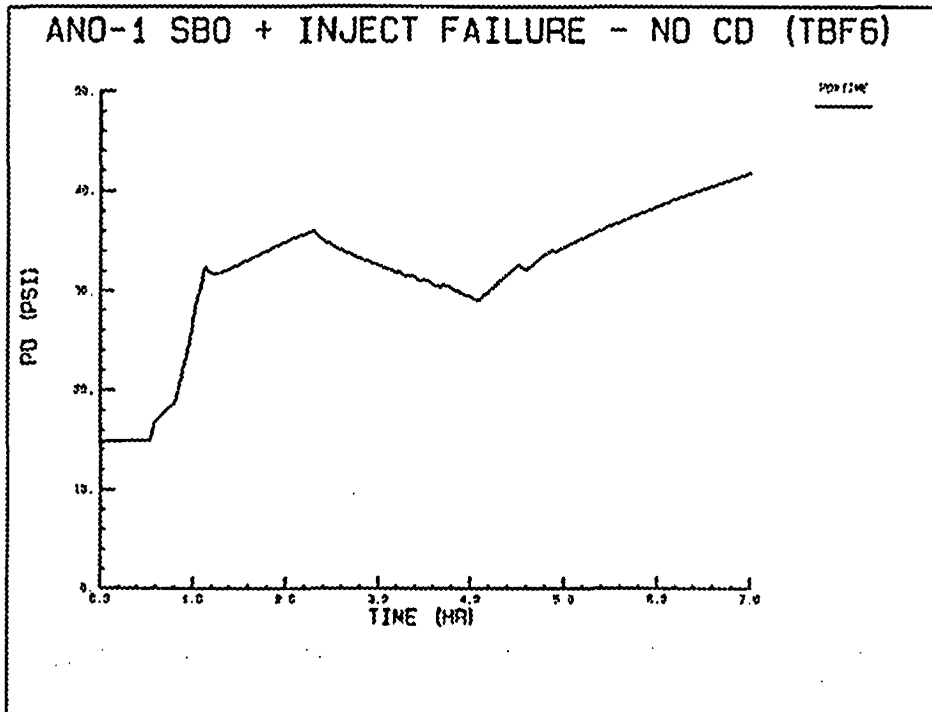
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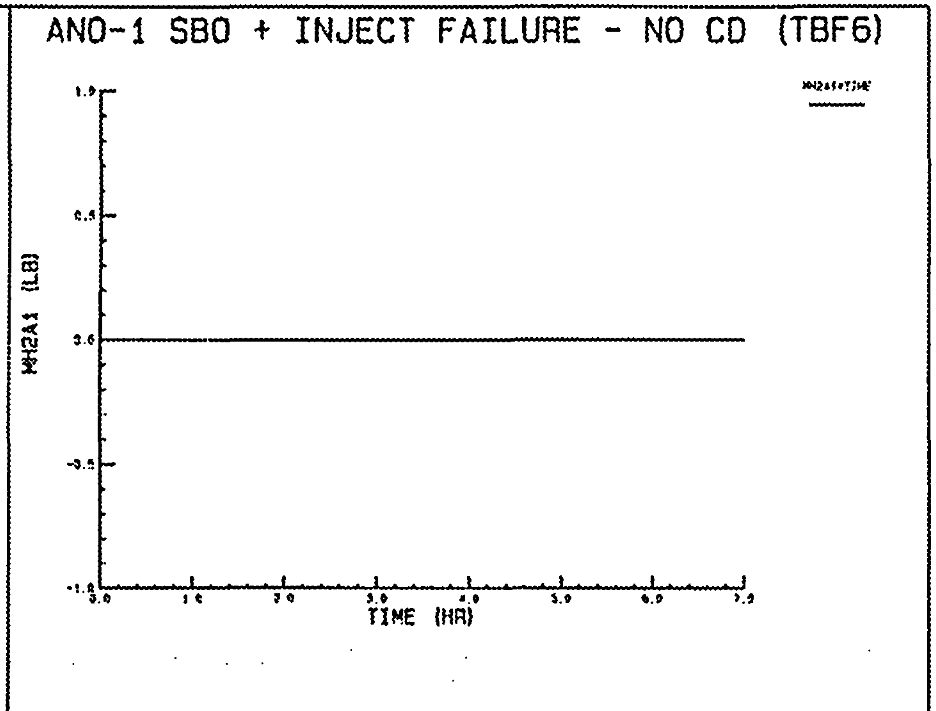
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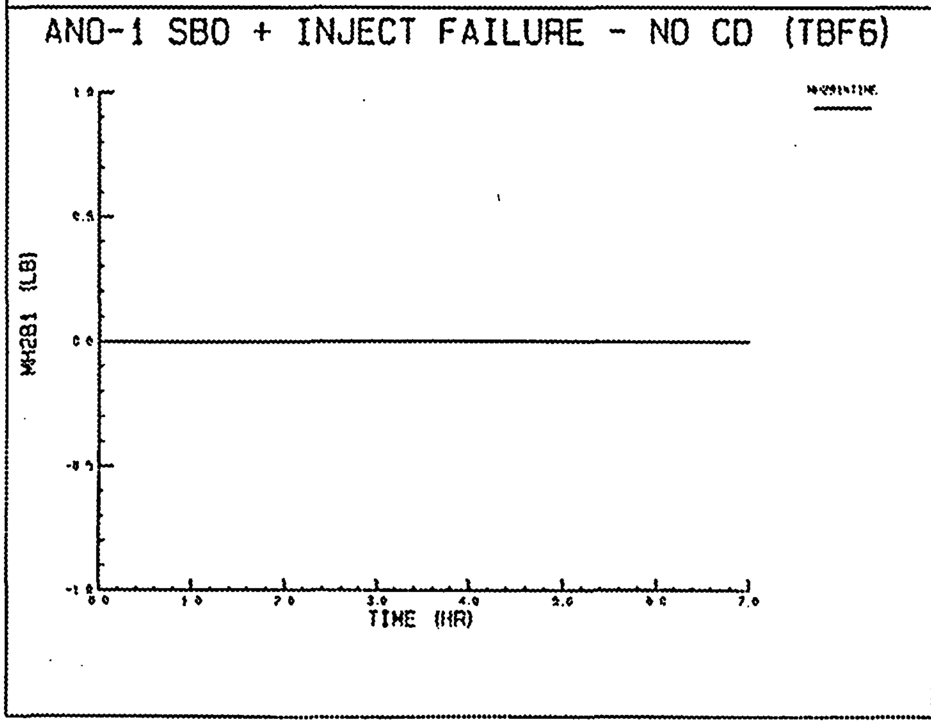
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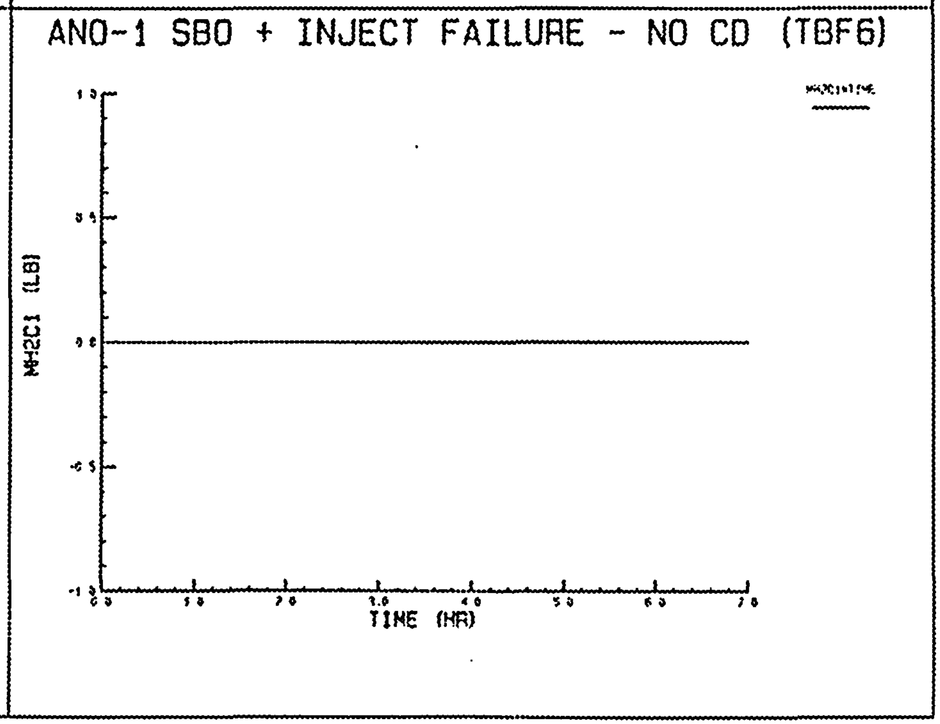
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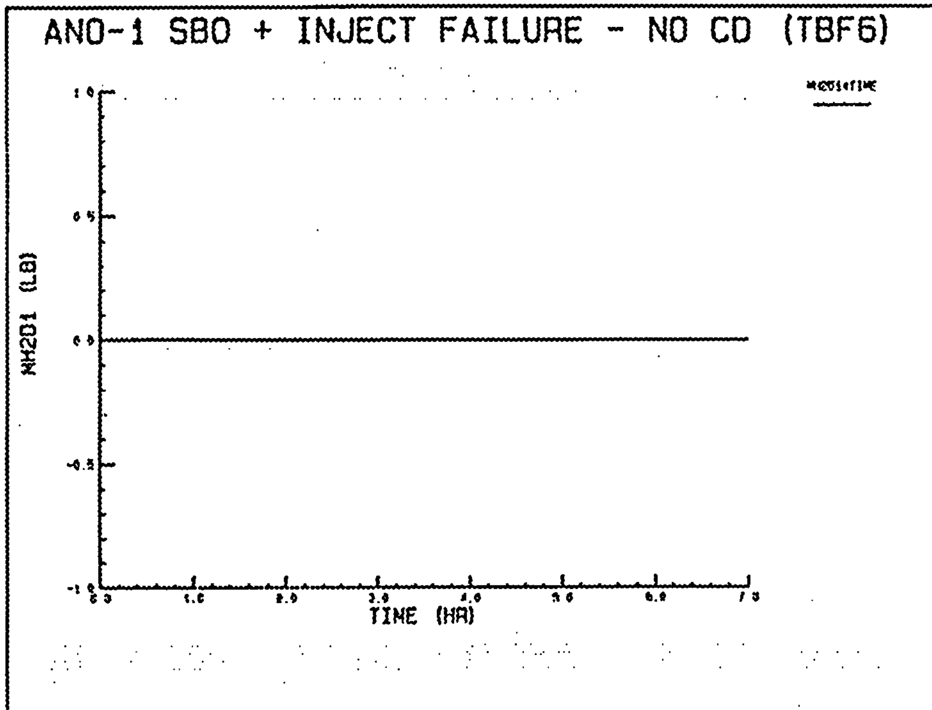

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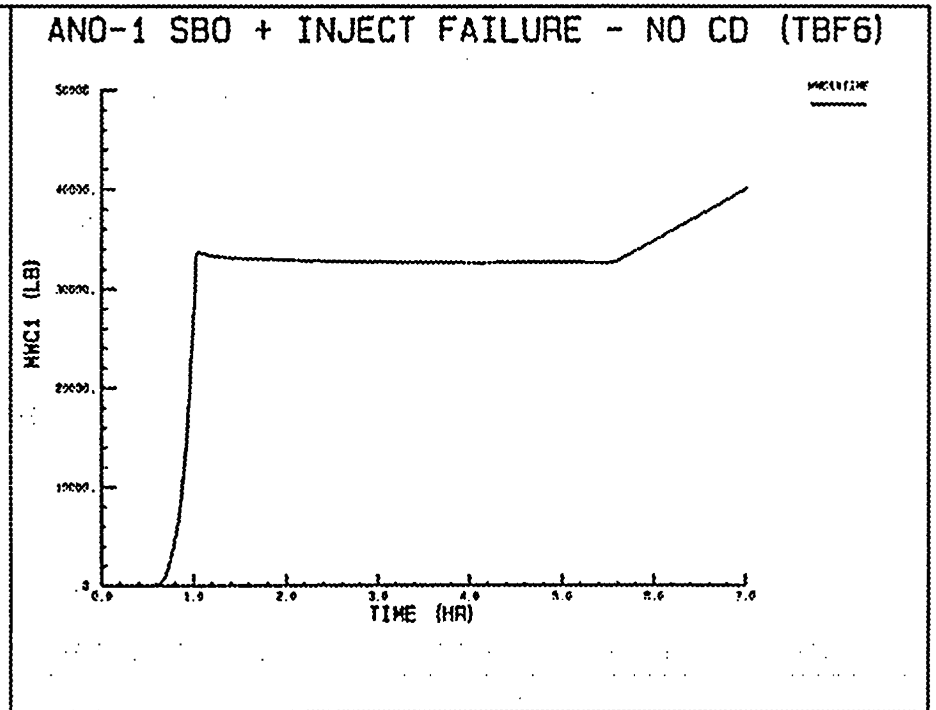

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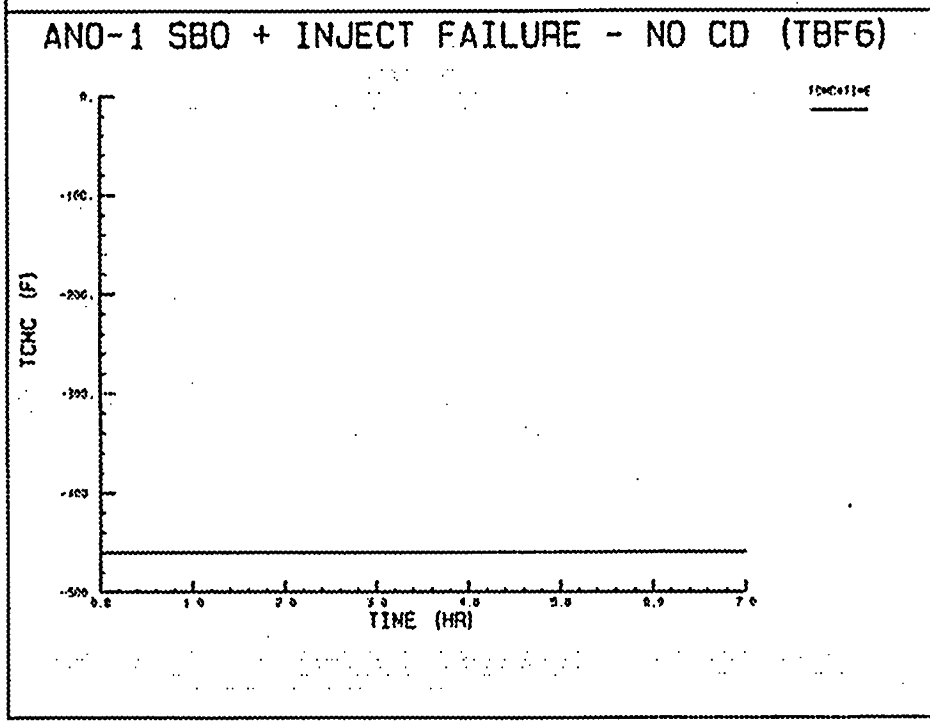

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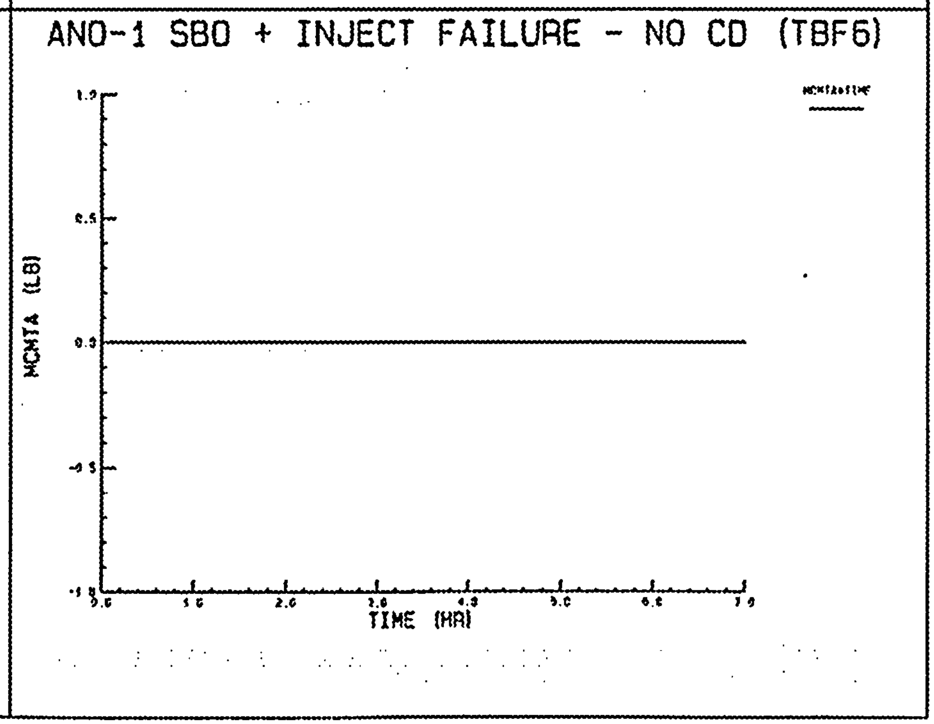

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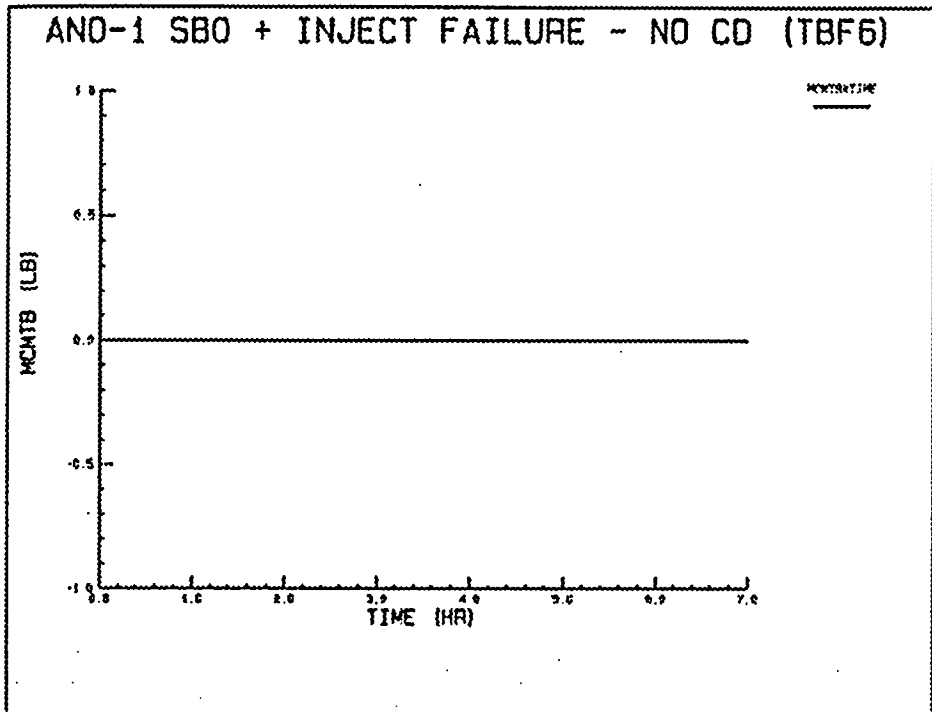
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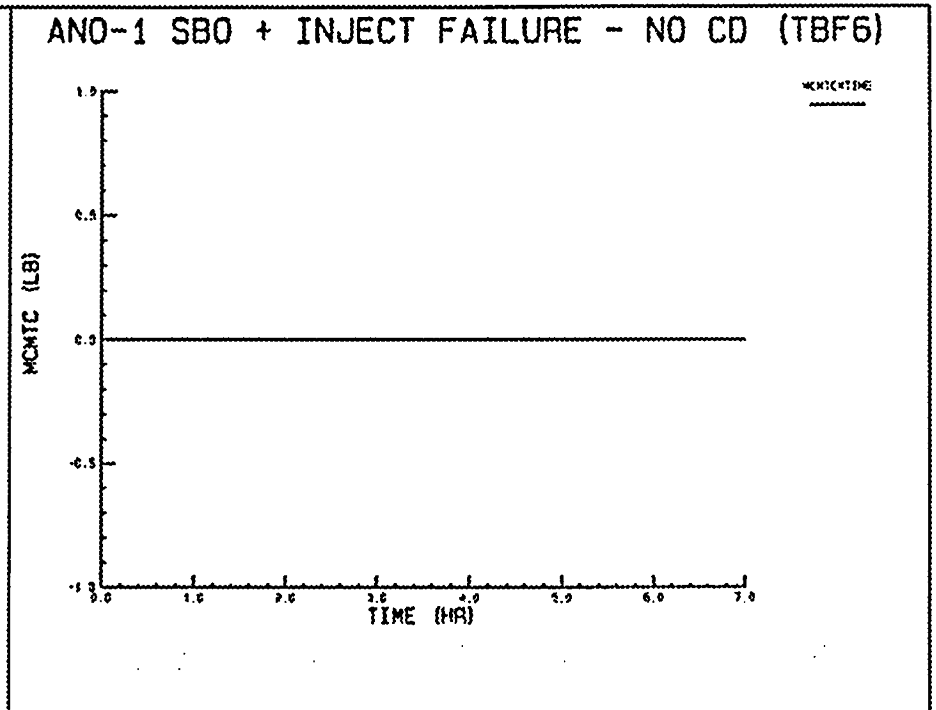
TIME (HR)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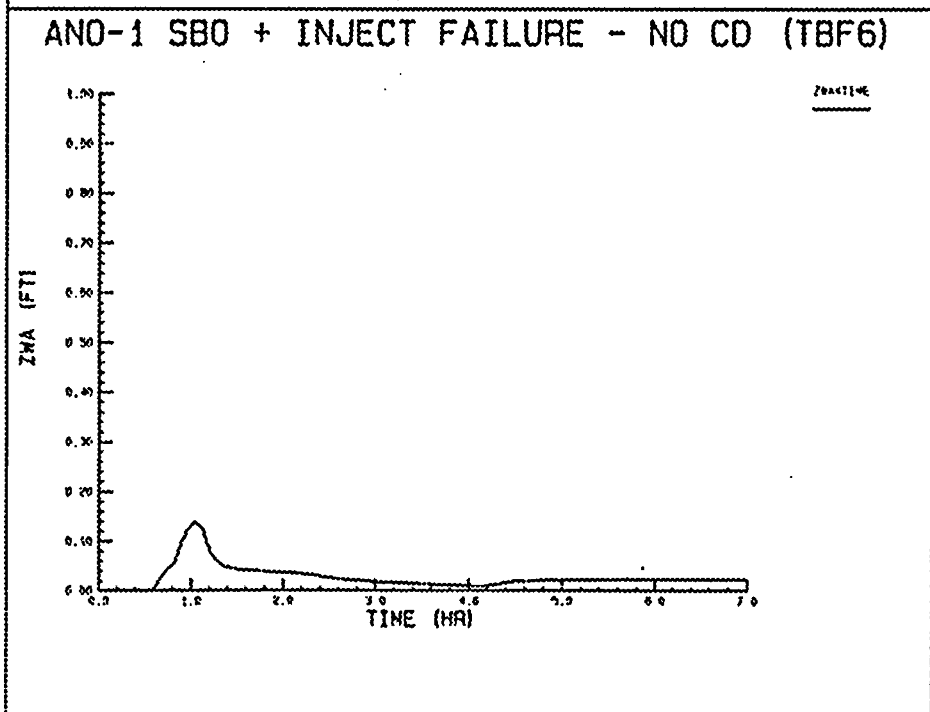
MCMTC (LB)
TIME (HR)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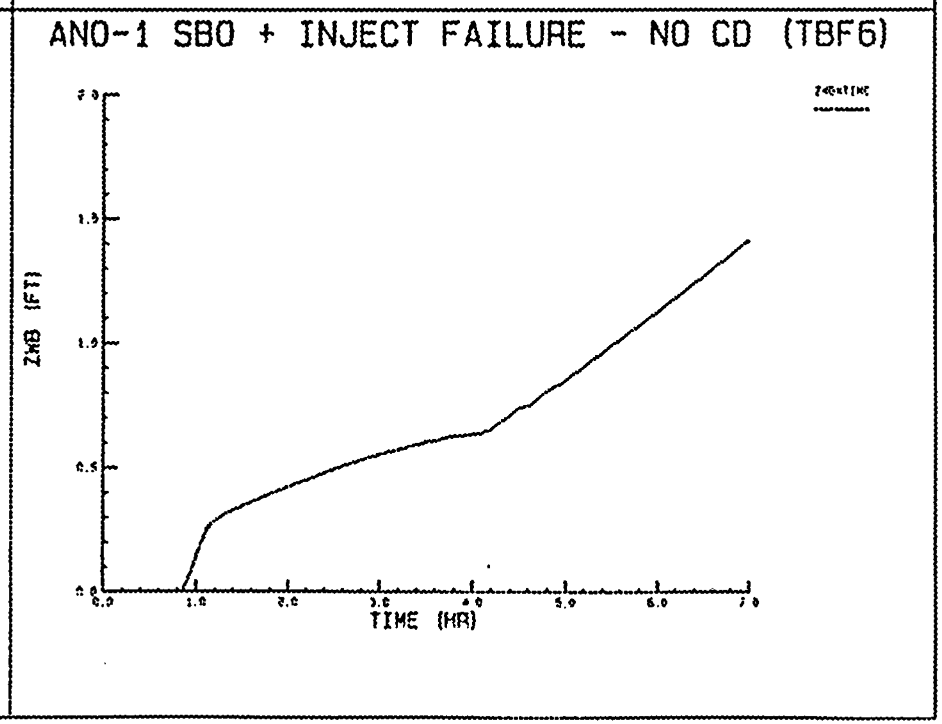
ZWA (FT)
TIME (HR)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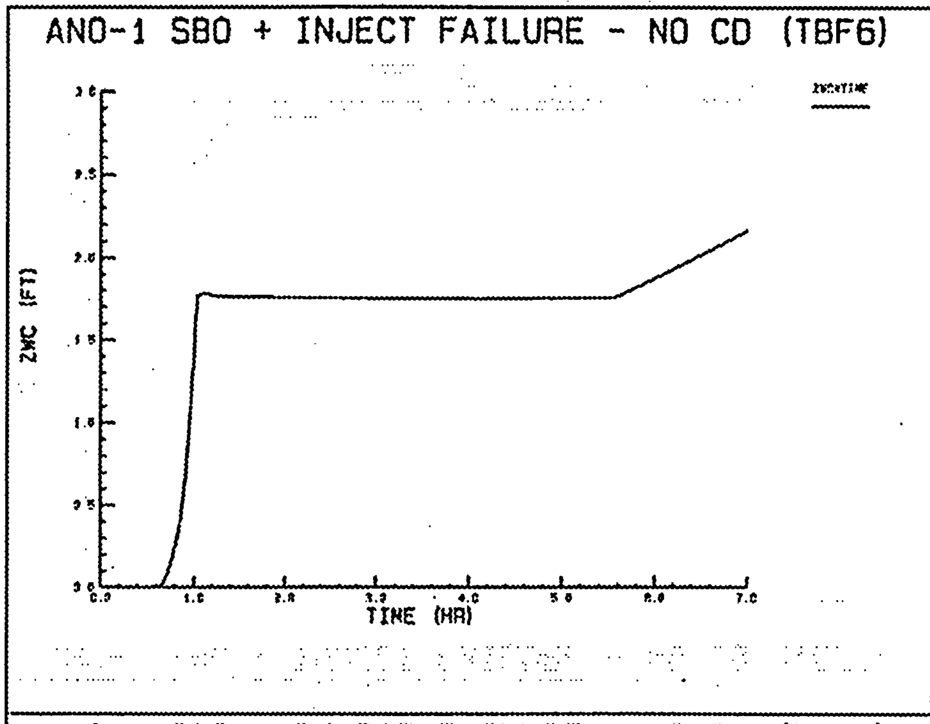
ZWB (FT)
TIME (HR)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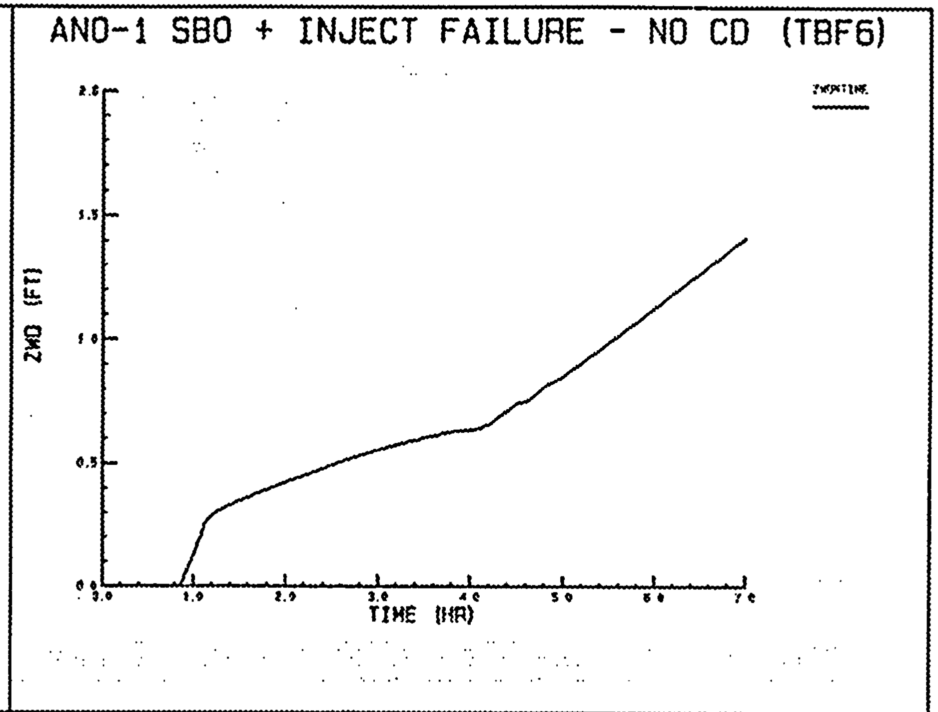
TIME (HR)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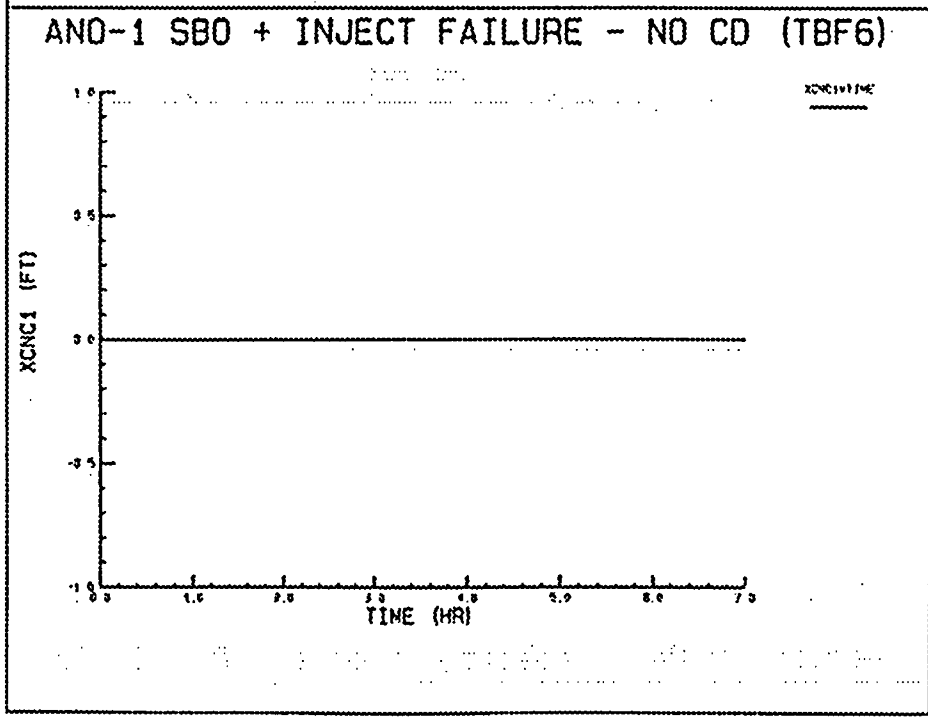
ZWD (FT)
TIME (HR)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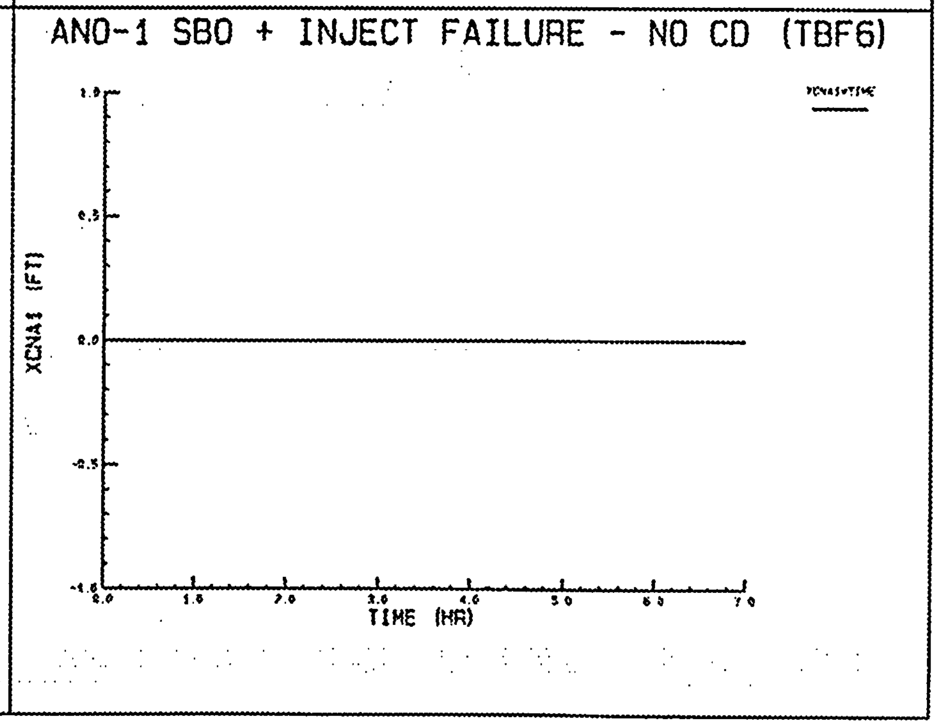
XCNC1 (FT)
TIME (HR)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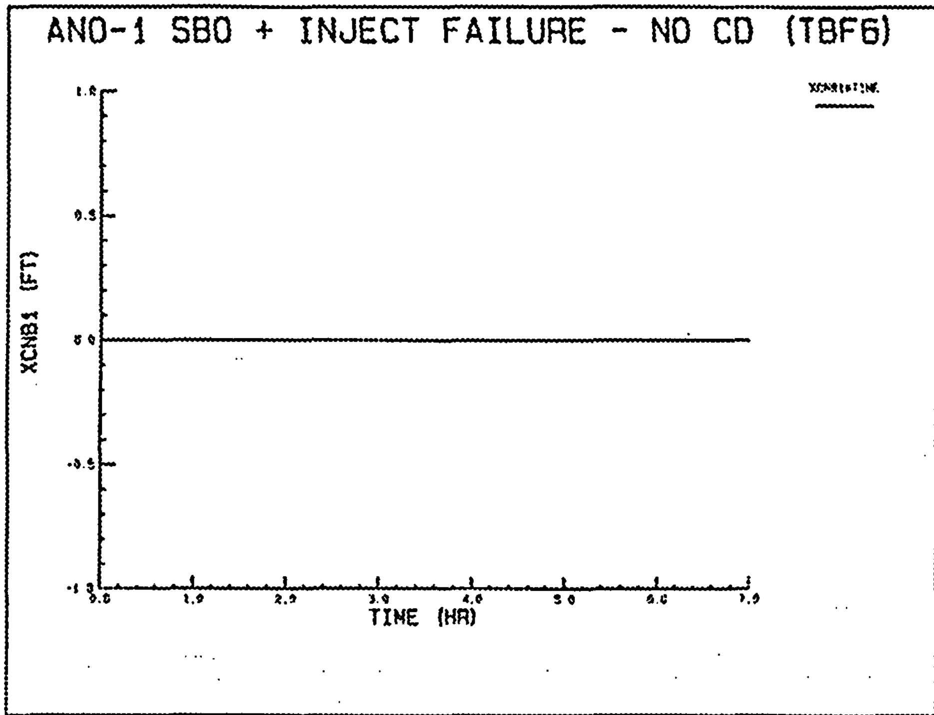
XCNA1 (FT)
TIME (HR)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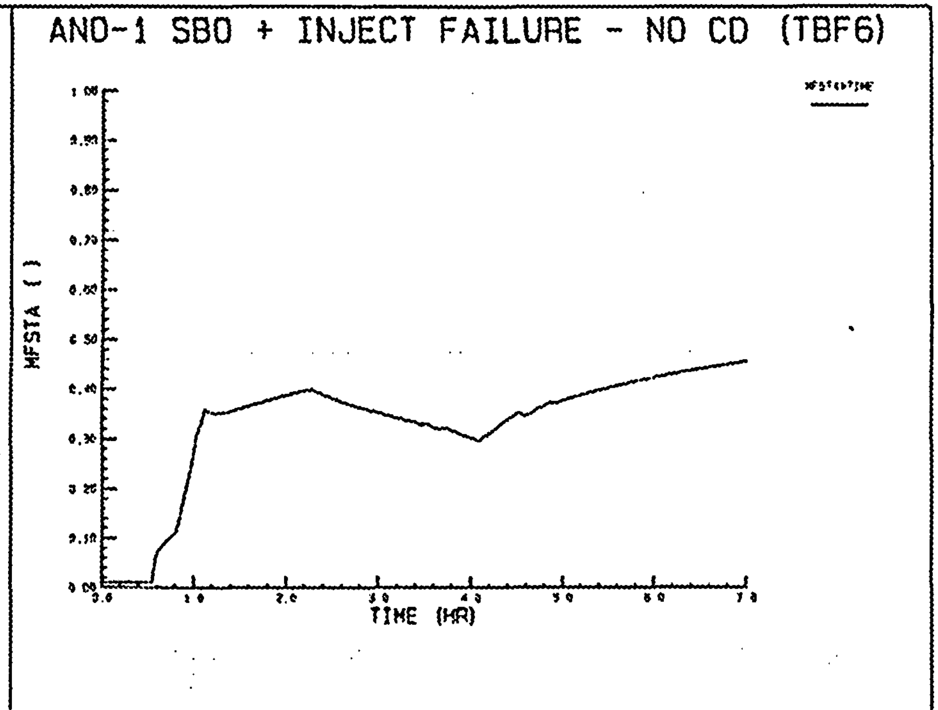
TIME (HR)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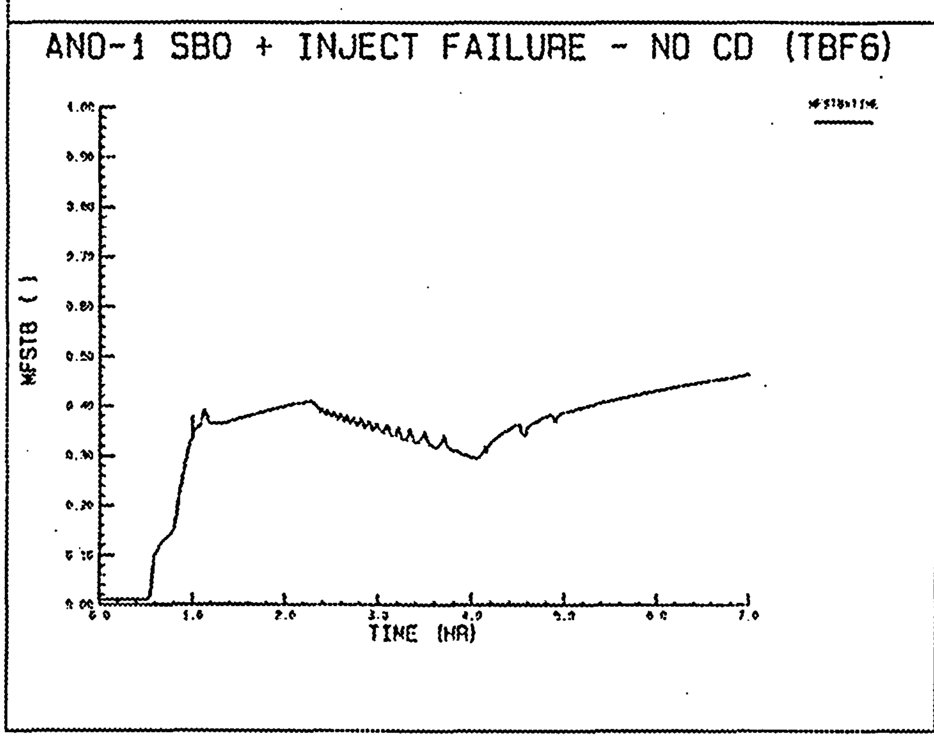
MFSTA ( )
TIME (HR)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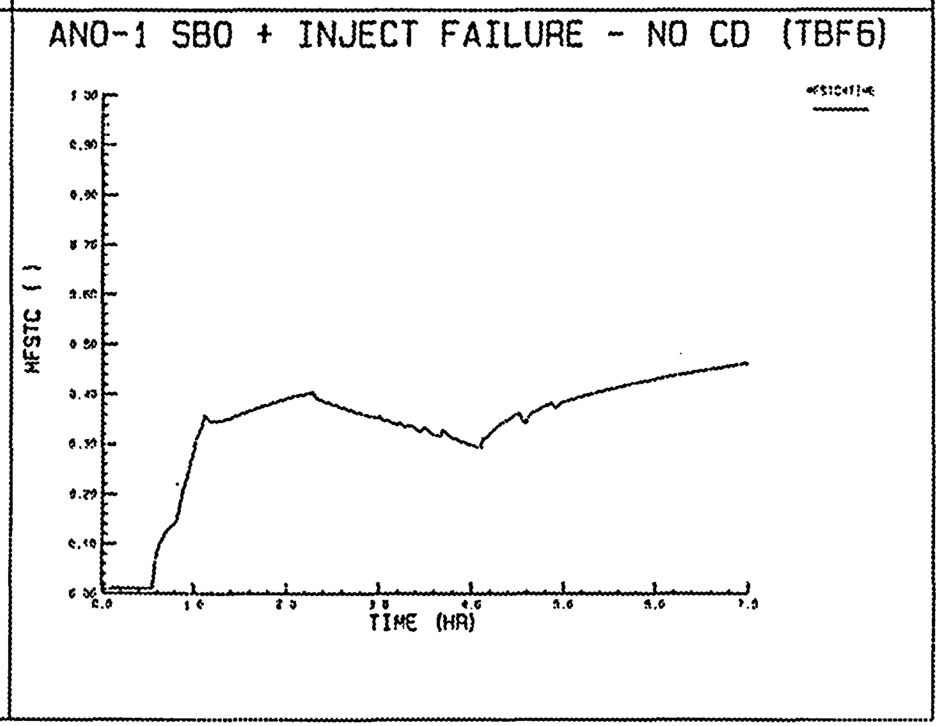
MFSTB ( )
TIME (HR)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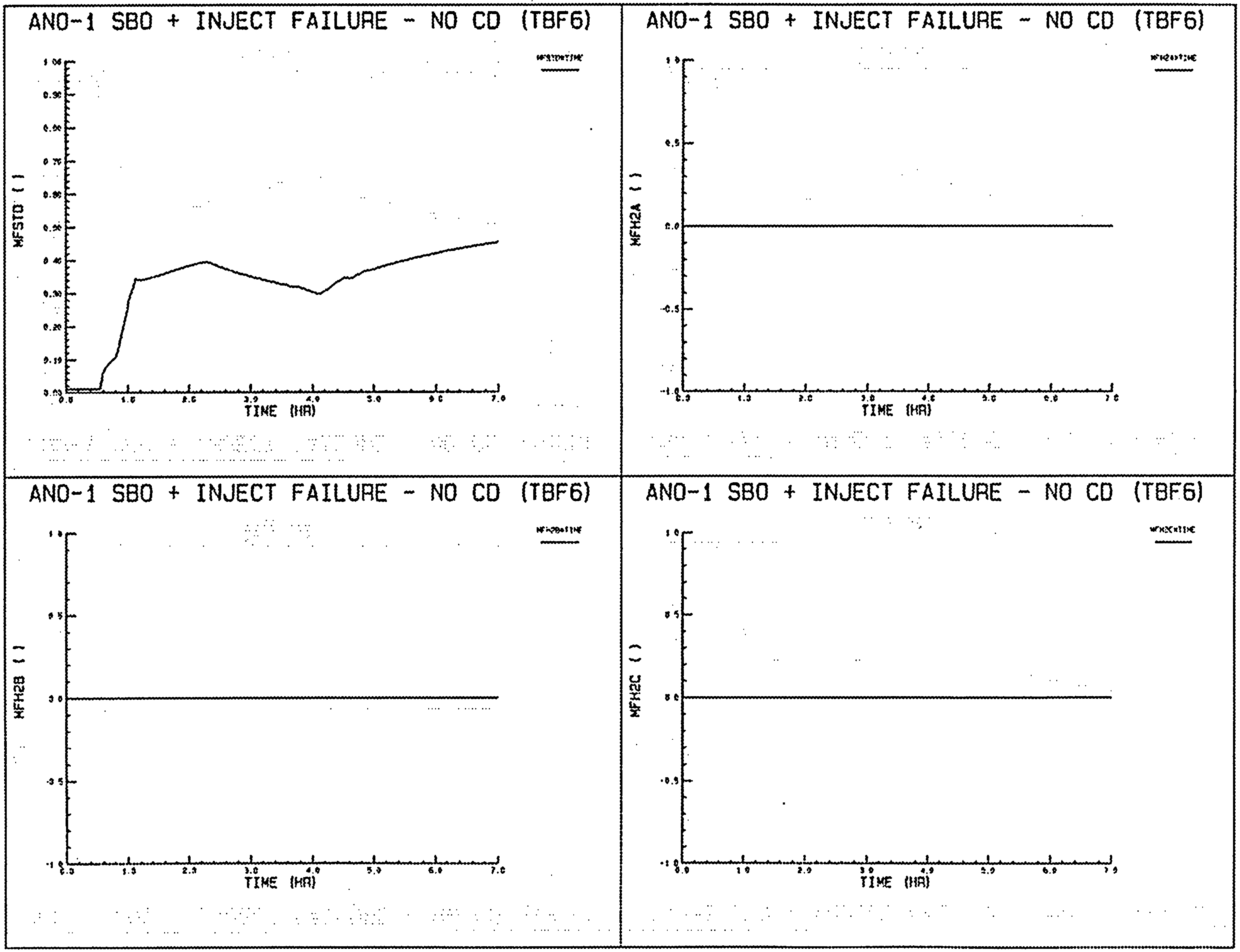
MFSTC ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFSTD ( )
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFH2A ( )
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFH2B ( )
TIME (HR)
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MFH2C ( )
TIME (HR)

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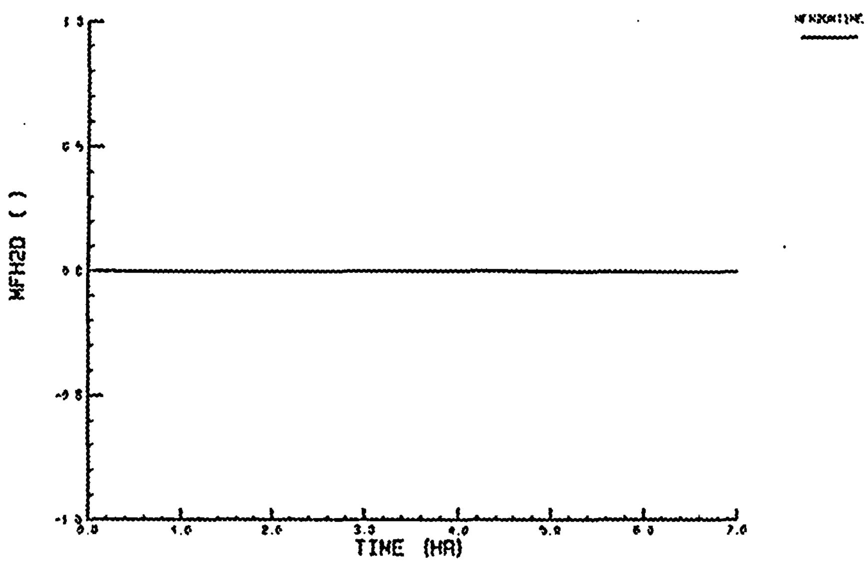

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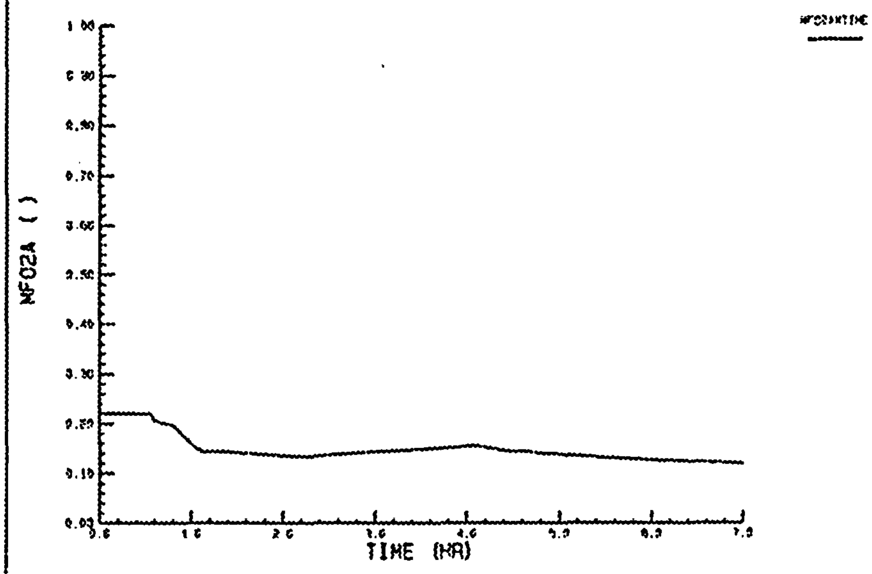

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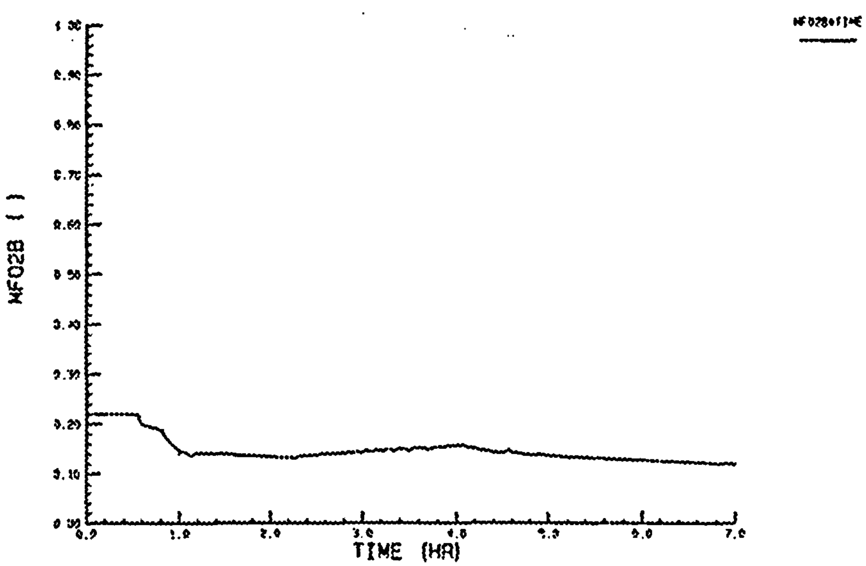

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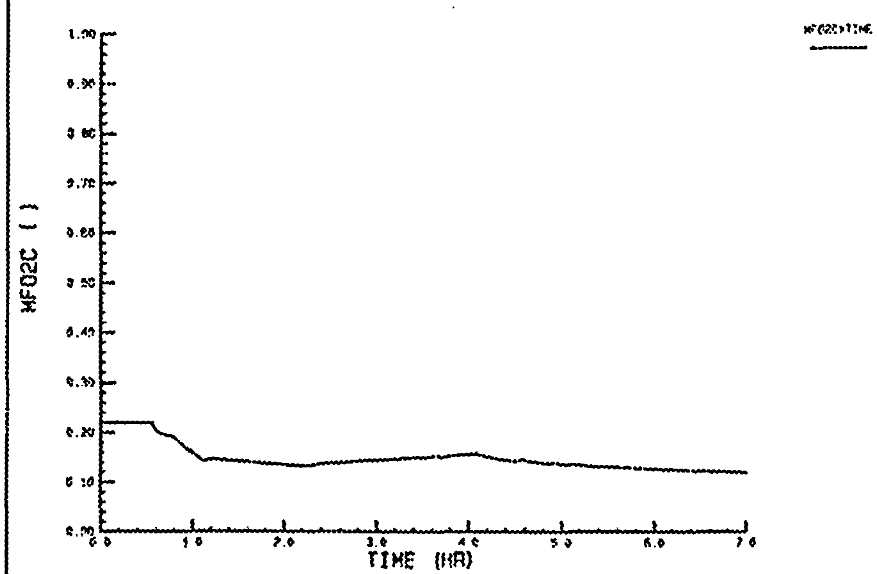

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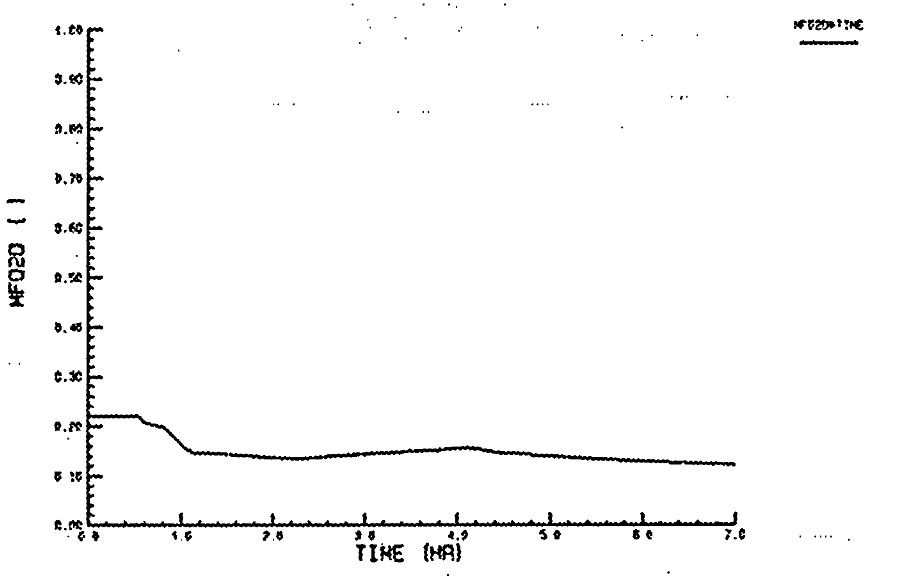

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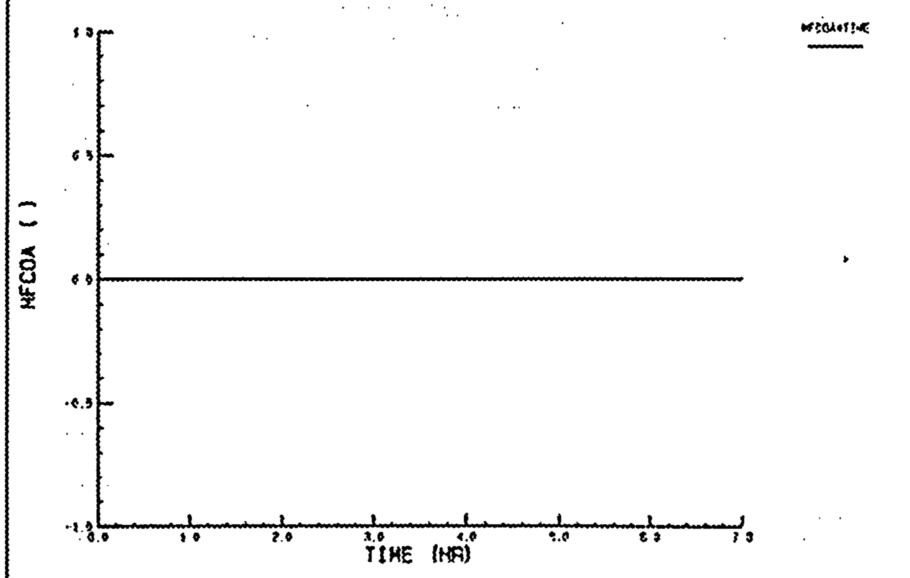

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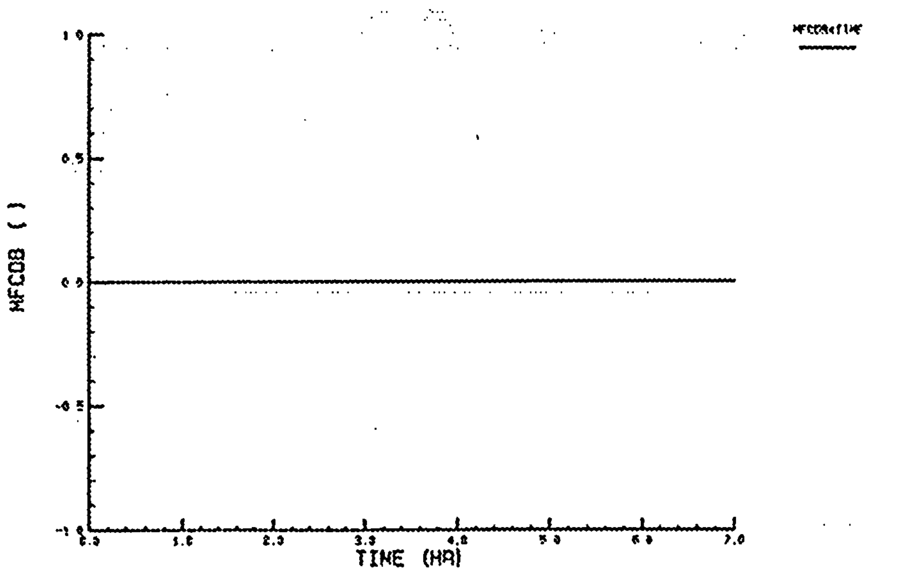

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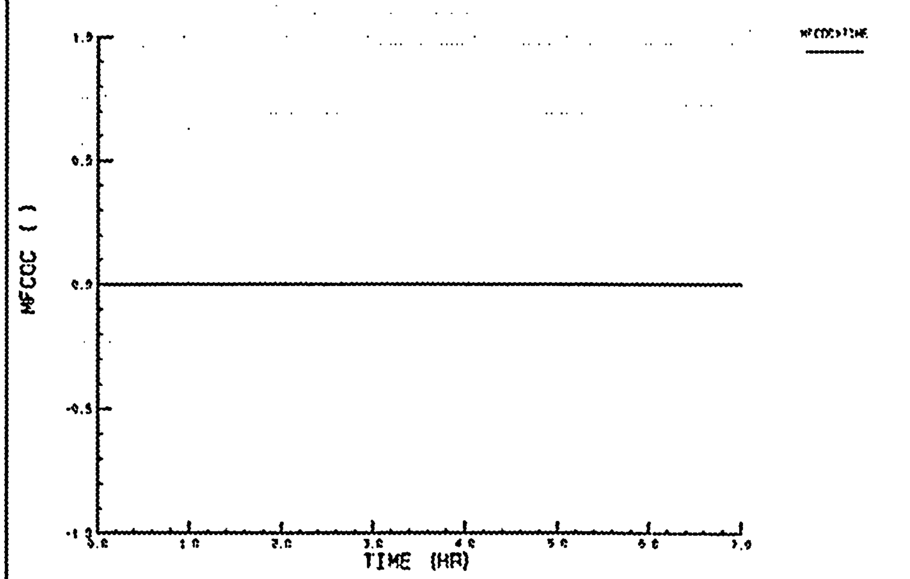
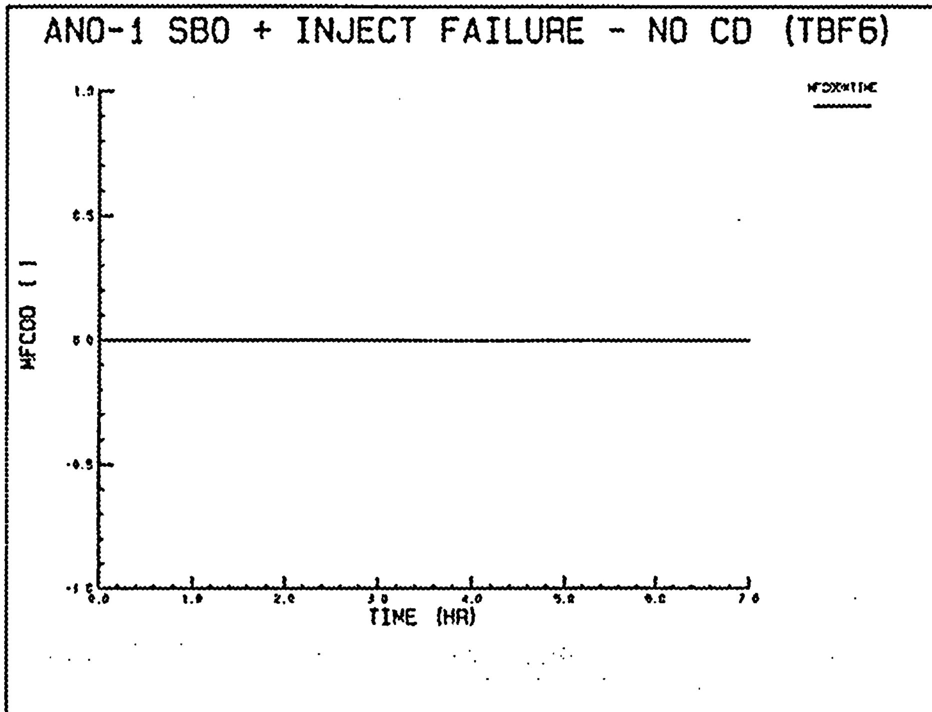
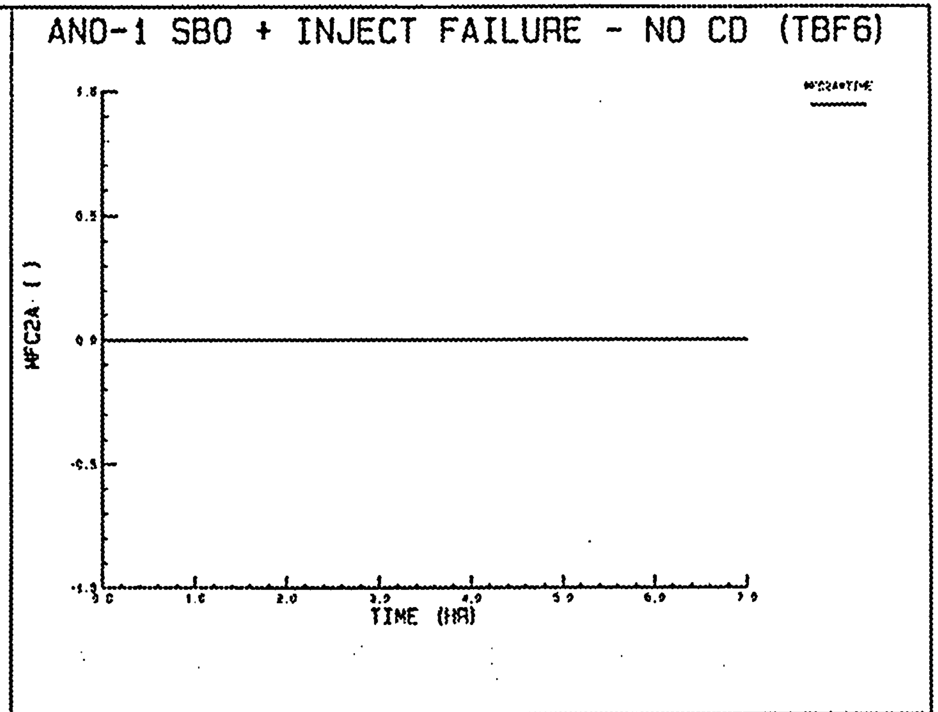
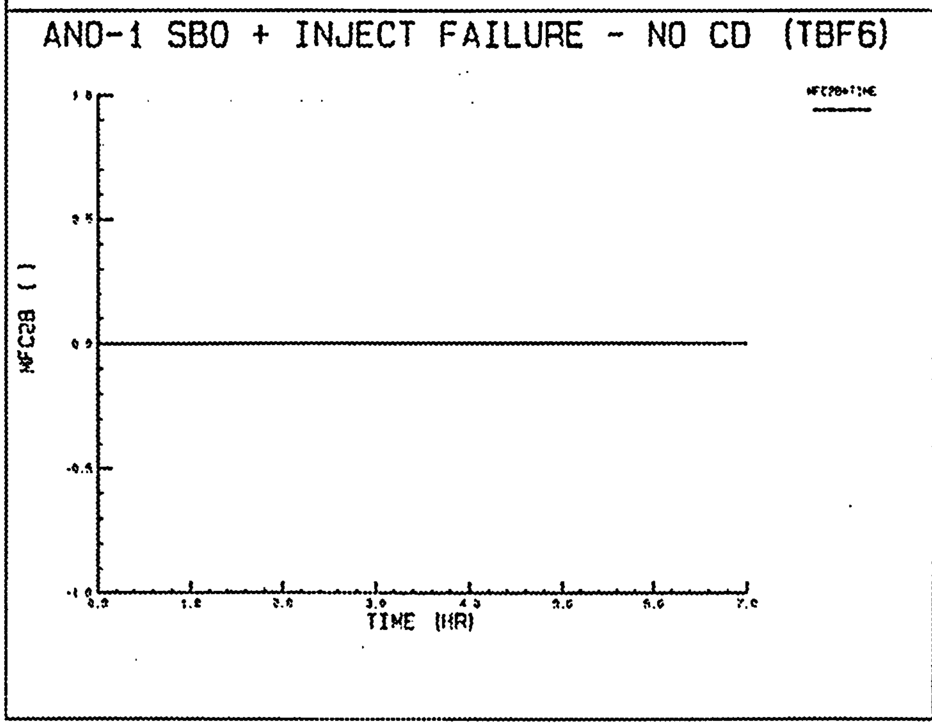
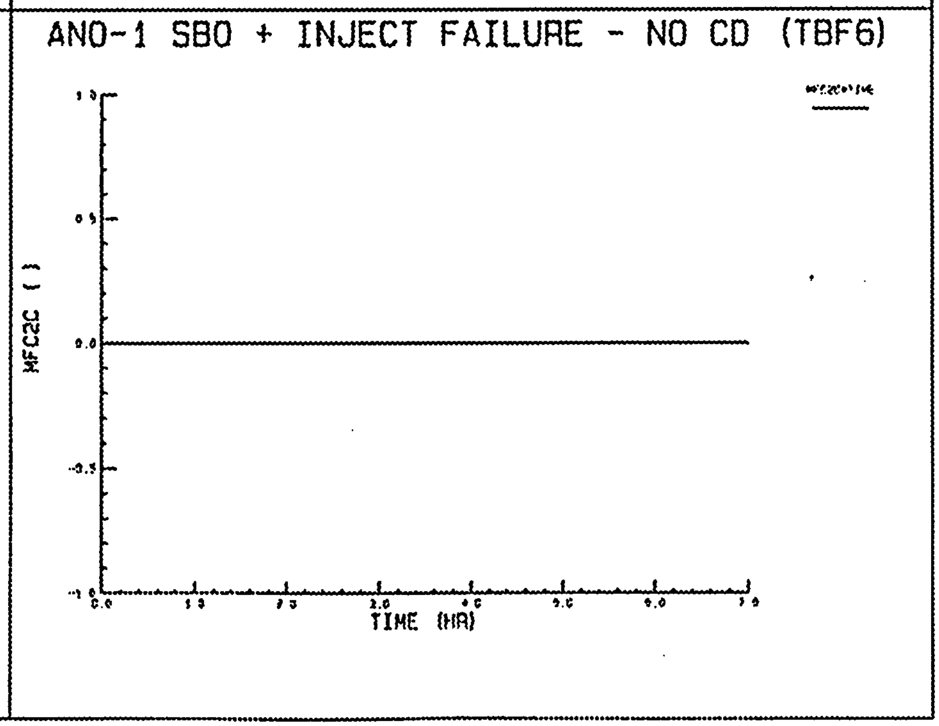


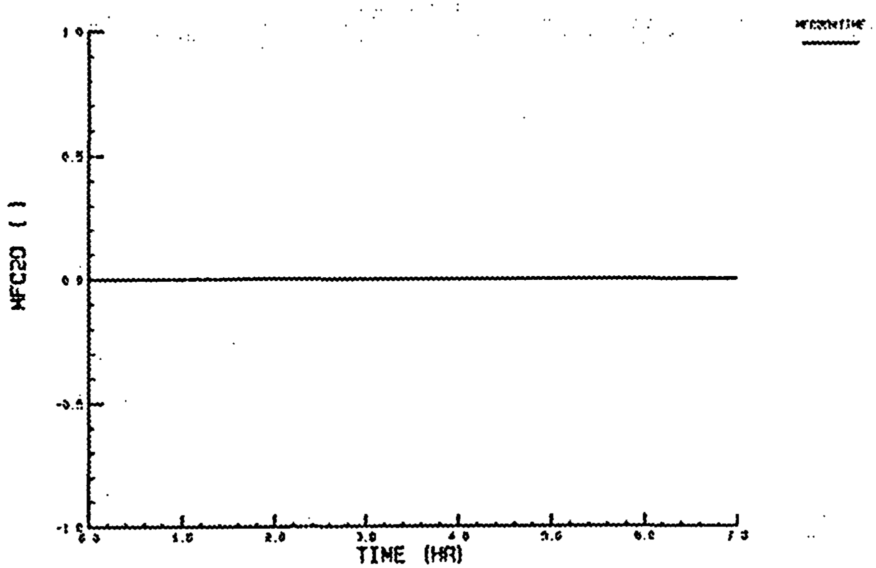

ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFCDO ( )
1.0
0.5
0.0
-0.5
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFC2A ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFC2B ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
MFC2C ( )
TIME (HR)

ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)



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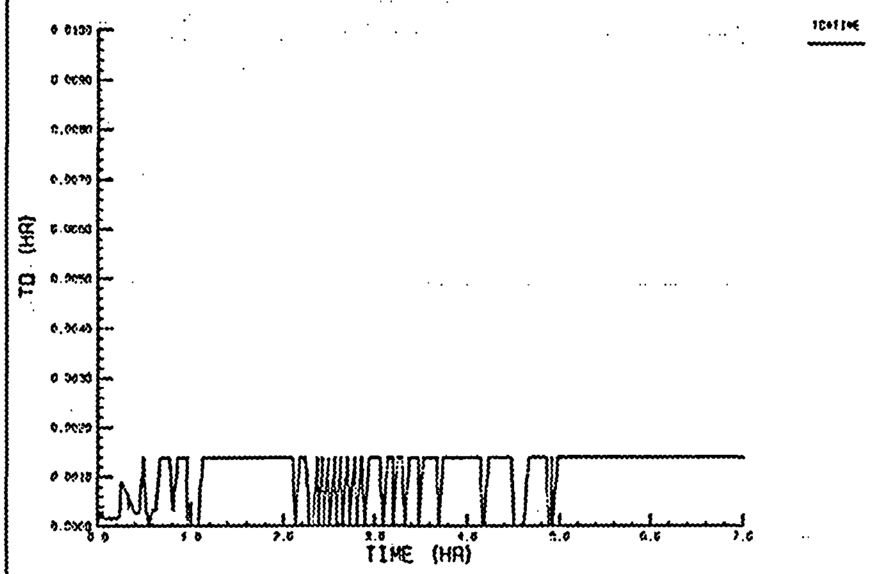

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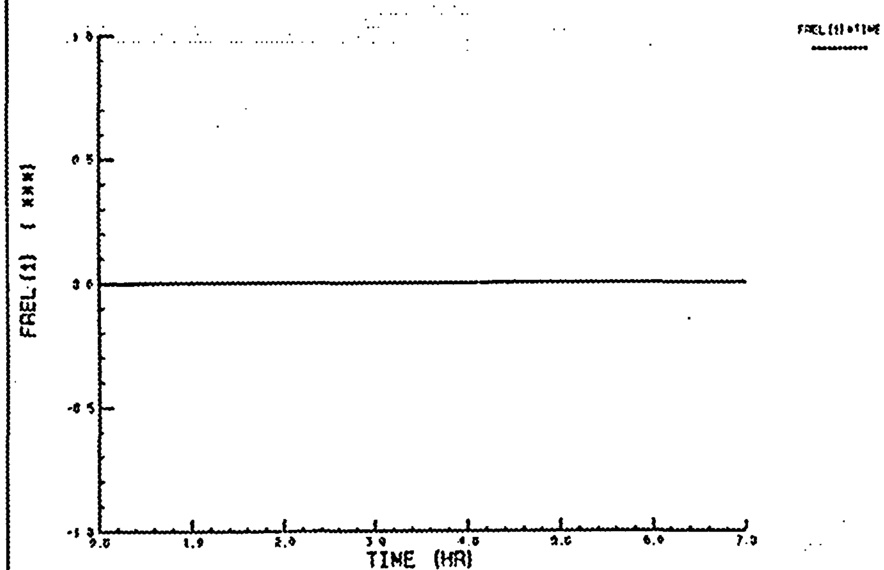

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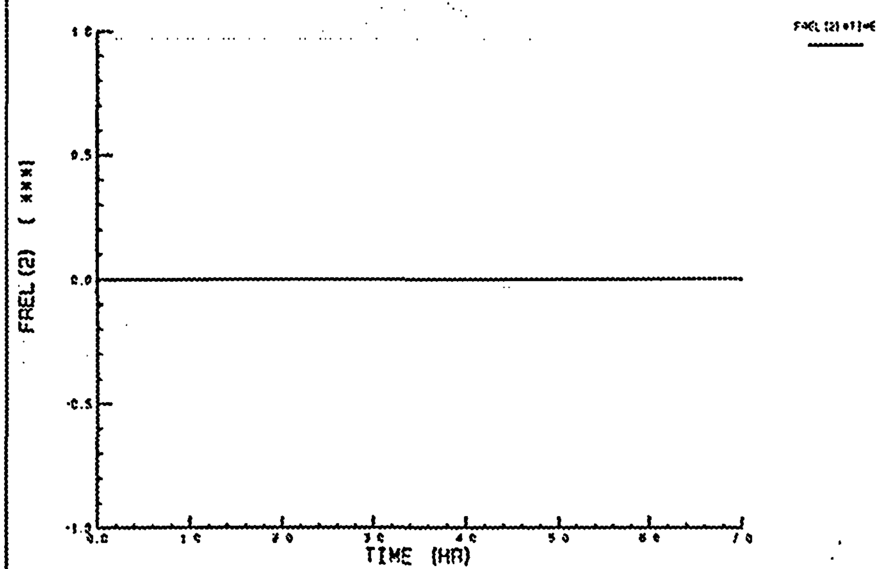
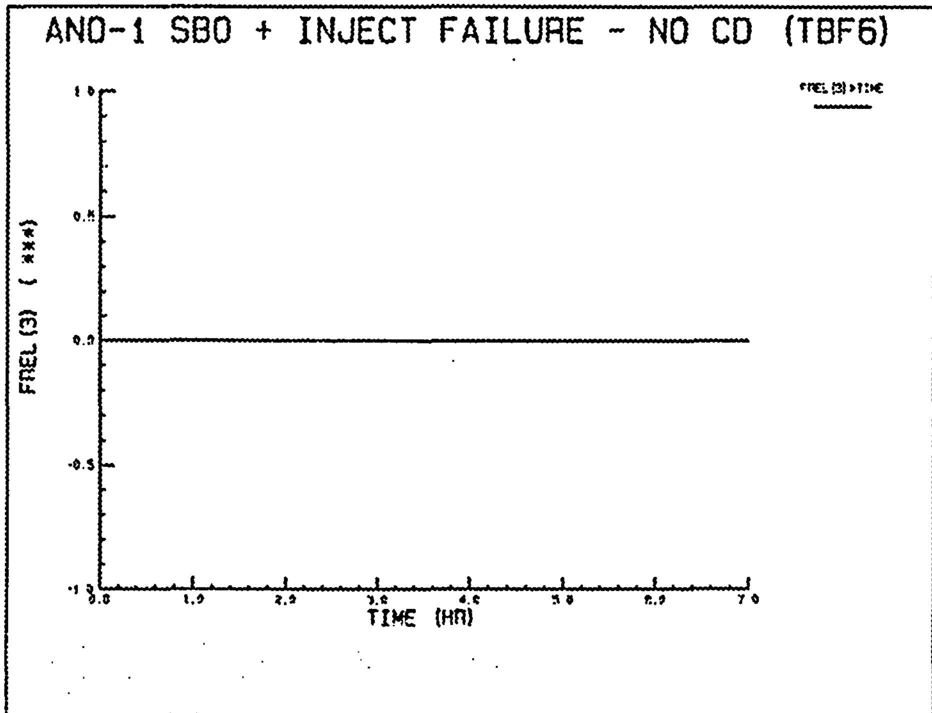
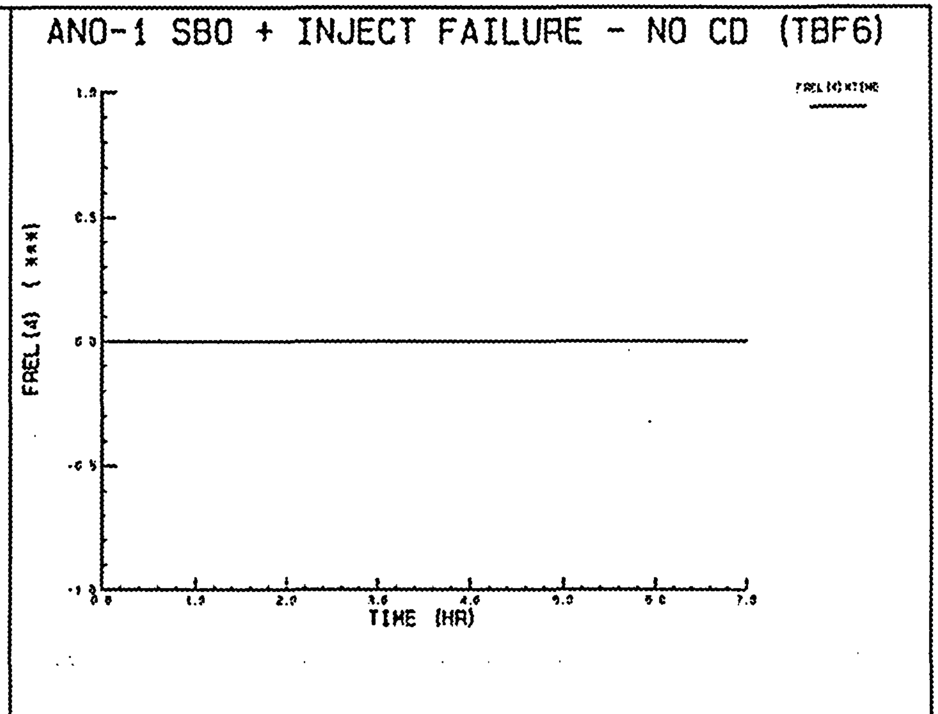



ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
FREL(3) (***)
TIME (HR)
1.0
0.5
0.0
-0.5
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0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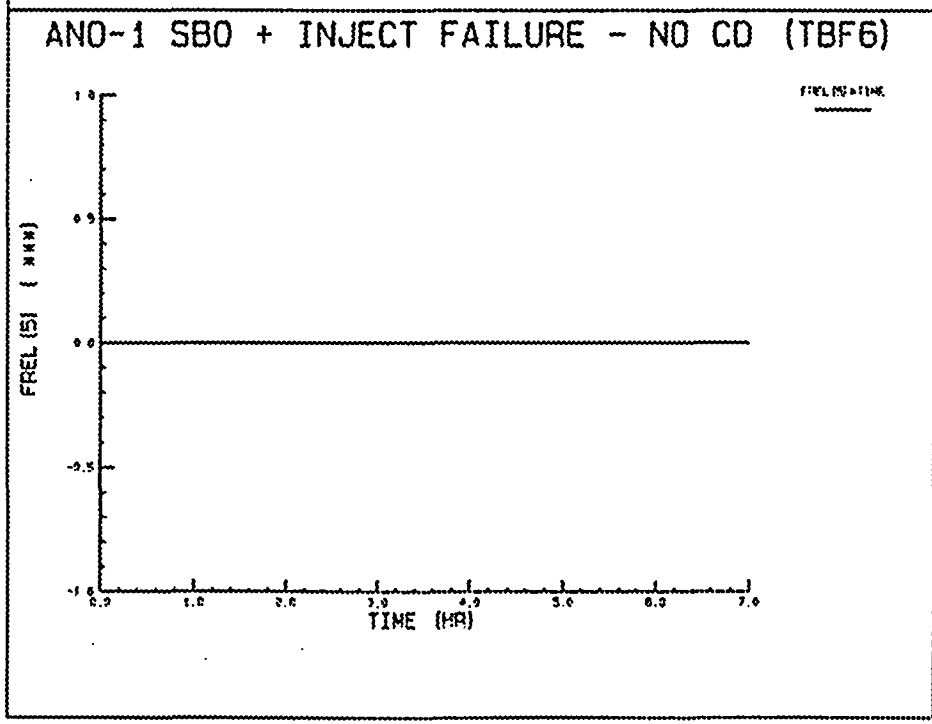
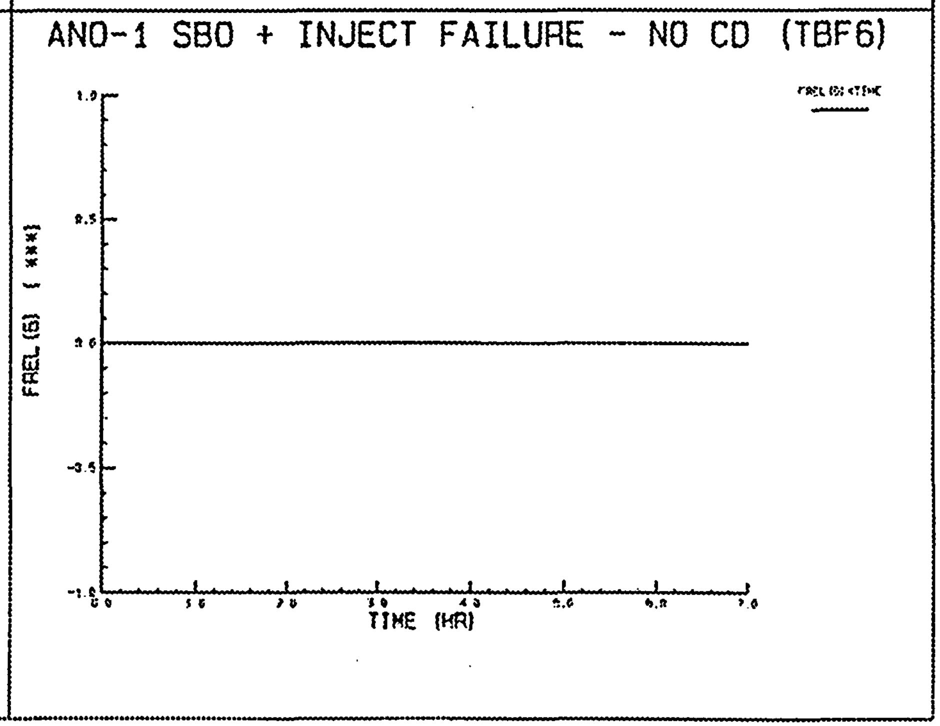
FREL(4) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
FREL(5) (***)
TIME (HR)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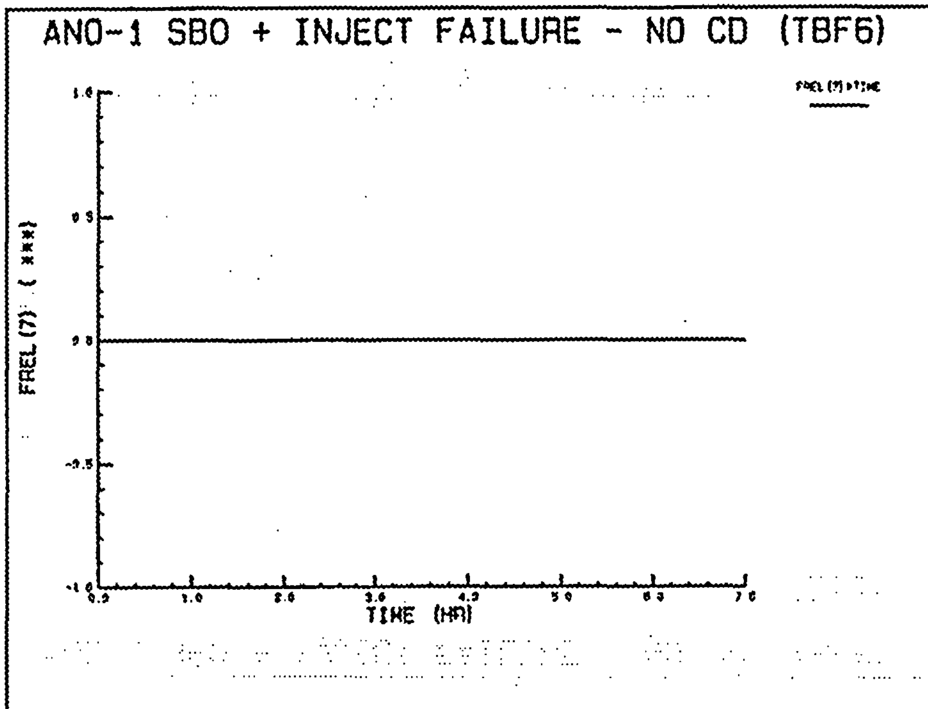
FREL(6) (***)
TIME (HR)



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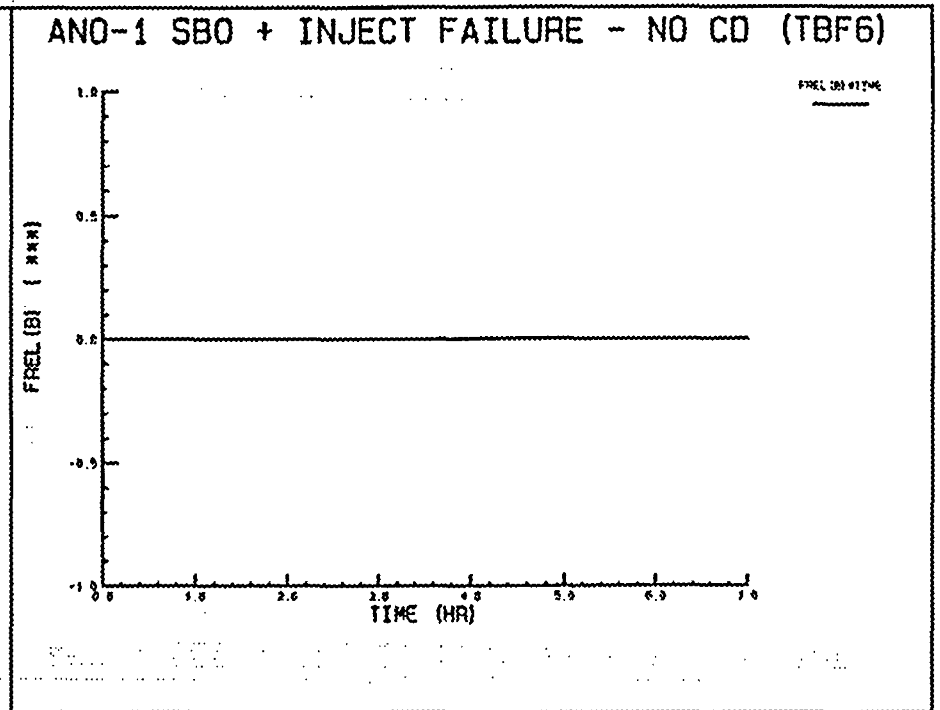

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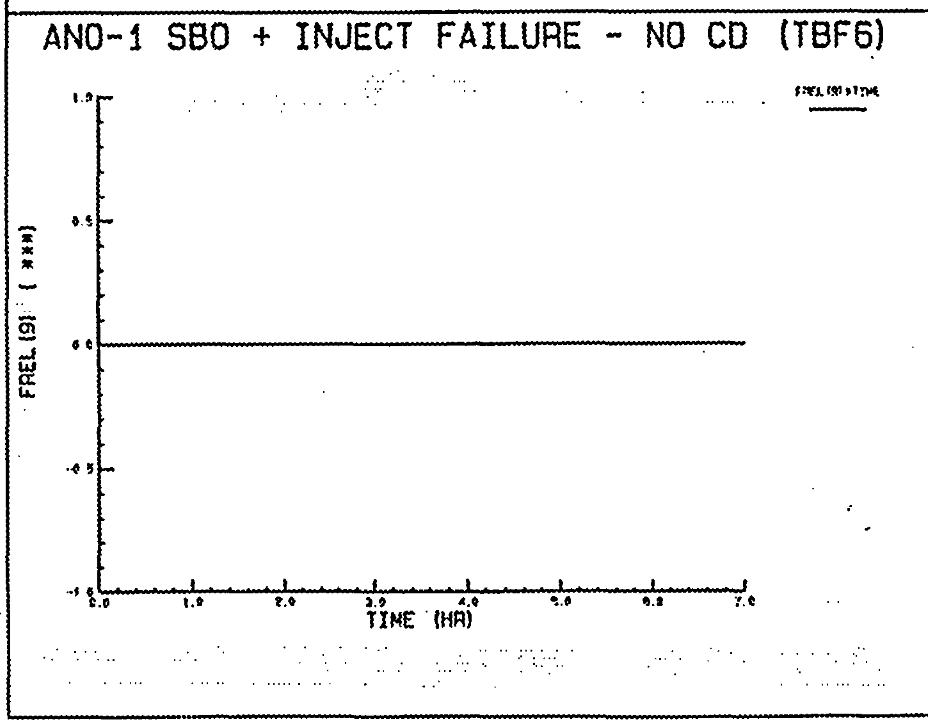

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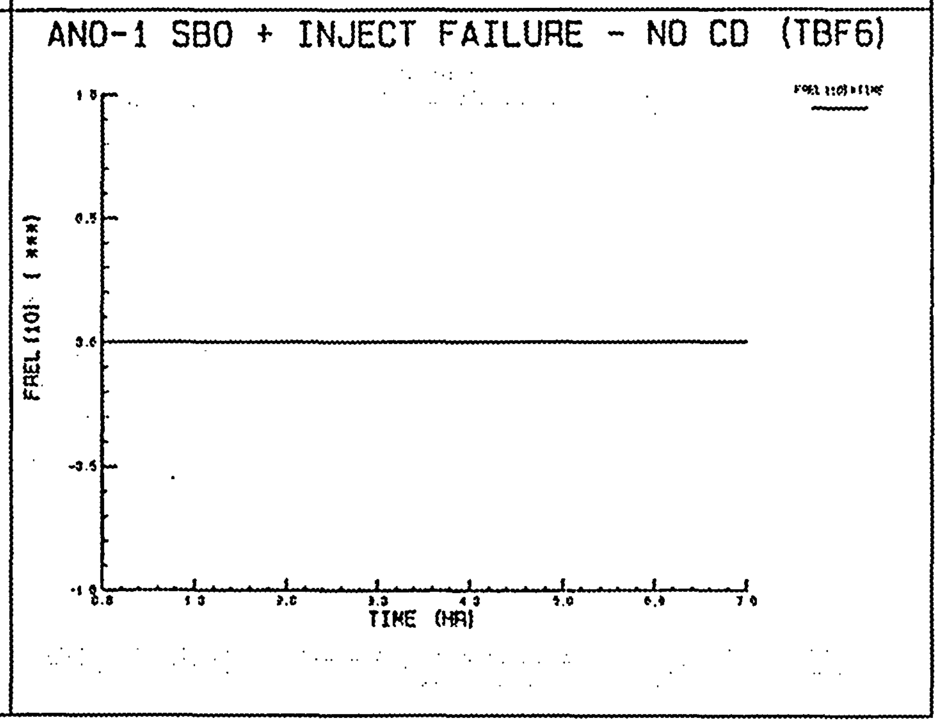
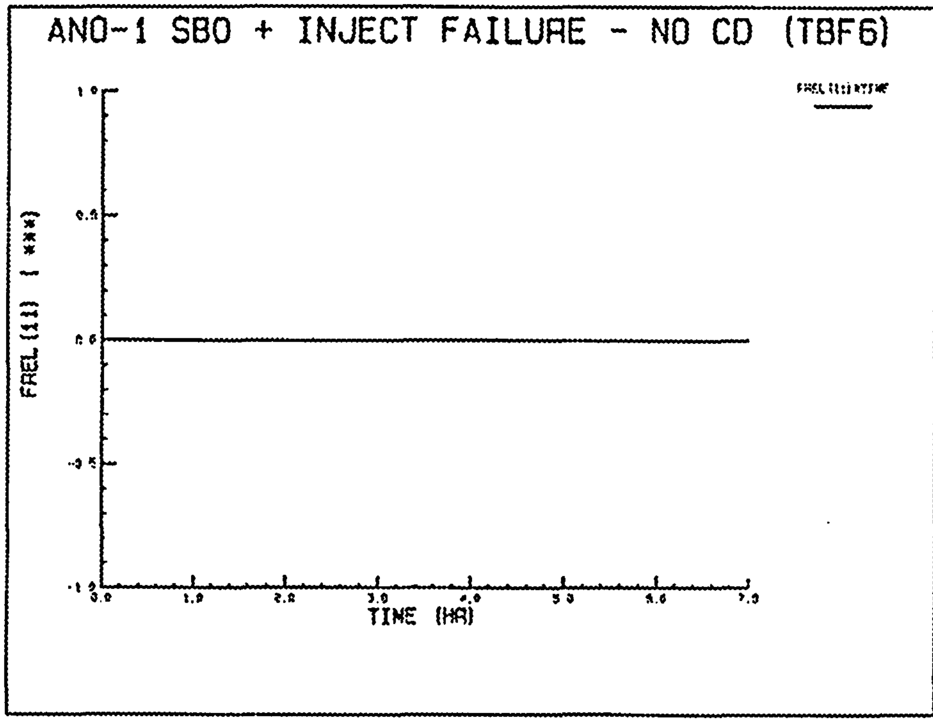


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)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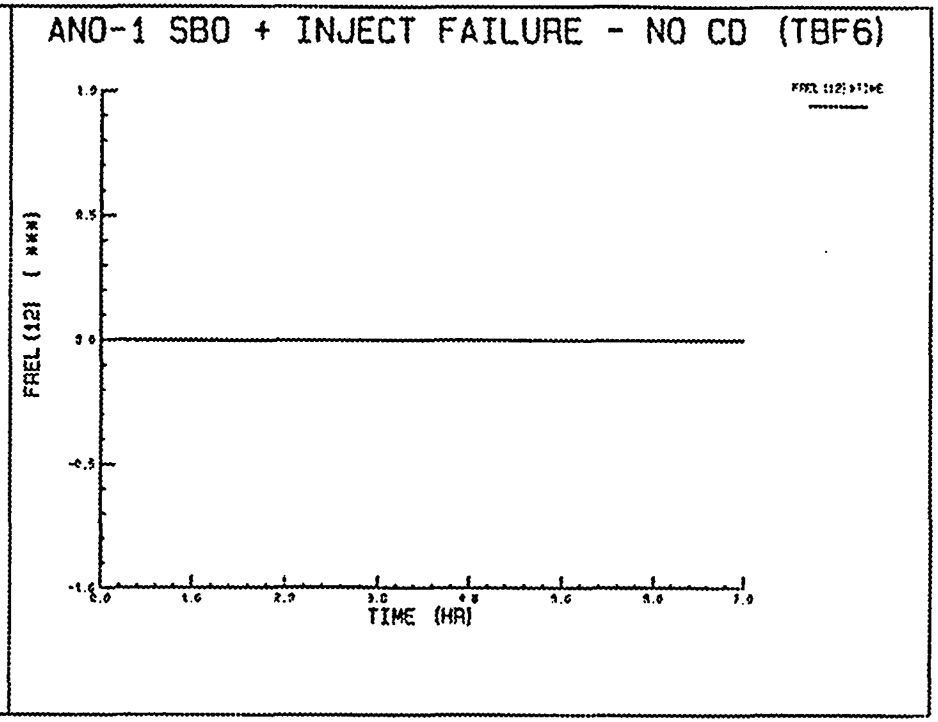
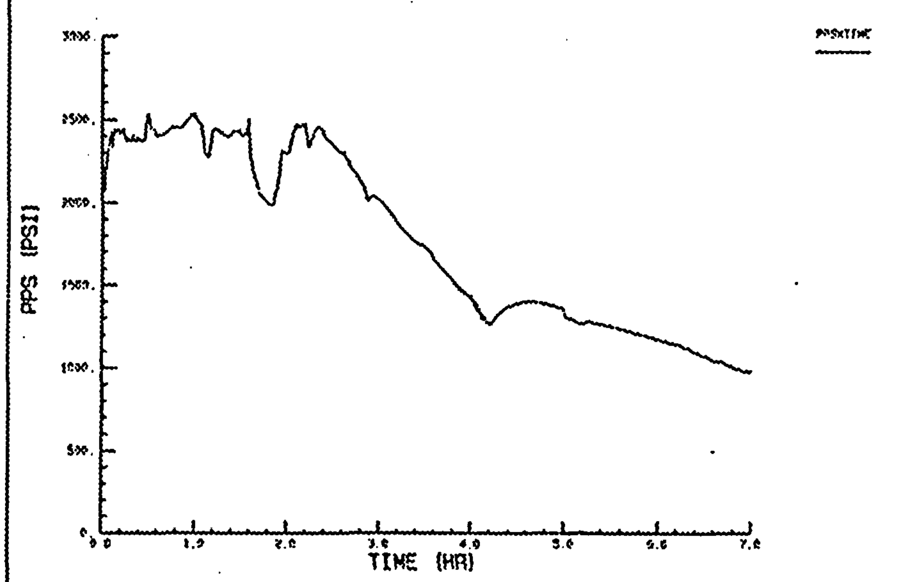
FREL (11) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO CD (TBF6)
FREL (12) (***)
TIME (HR)

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



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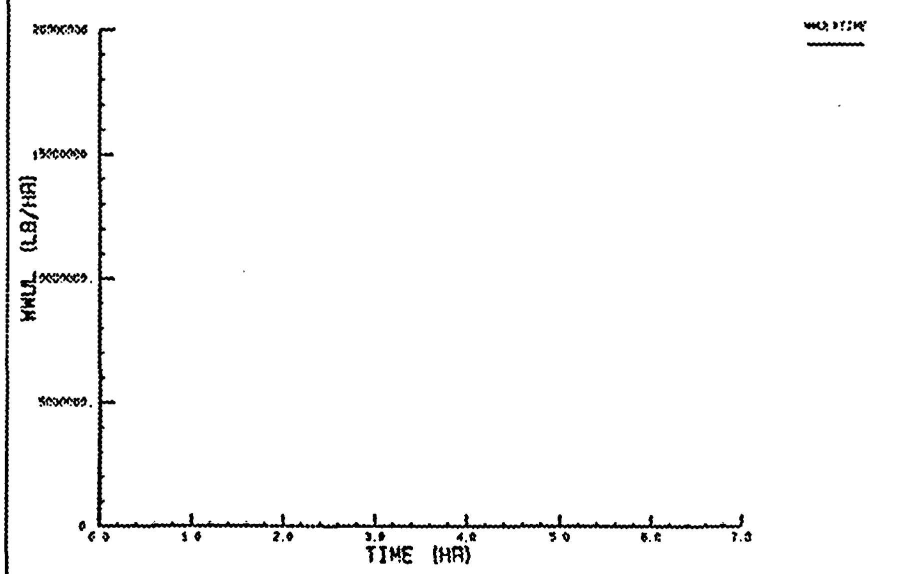

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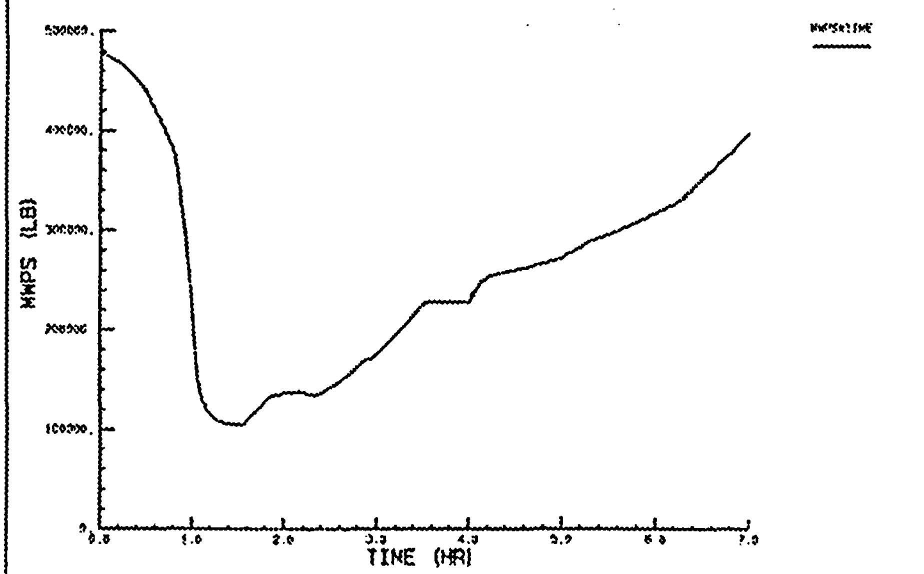
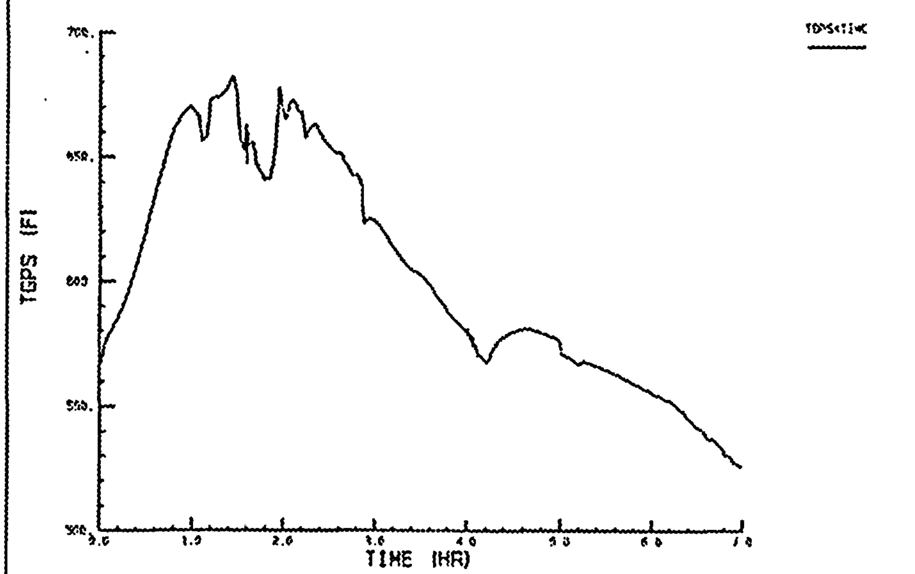
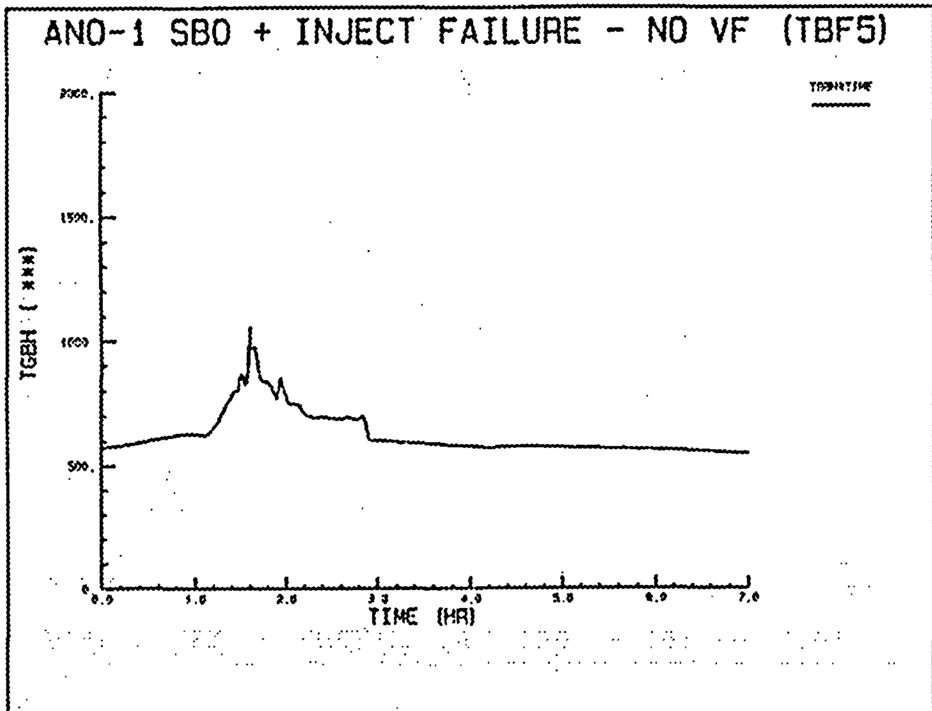
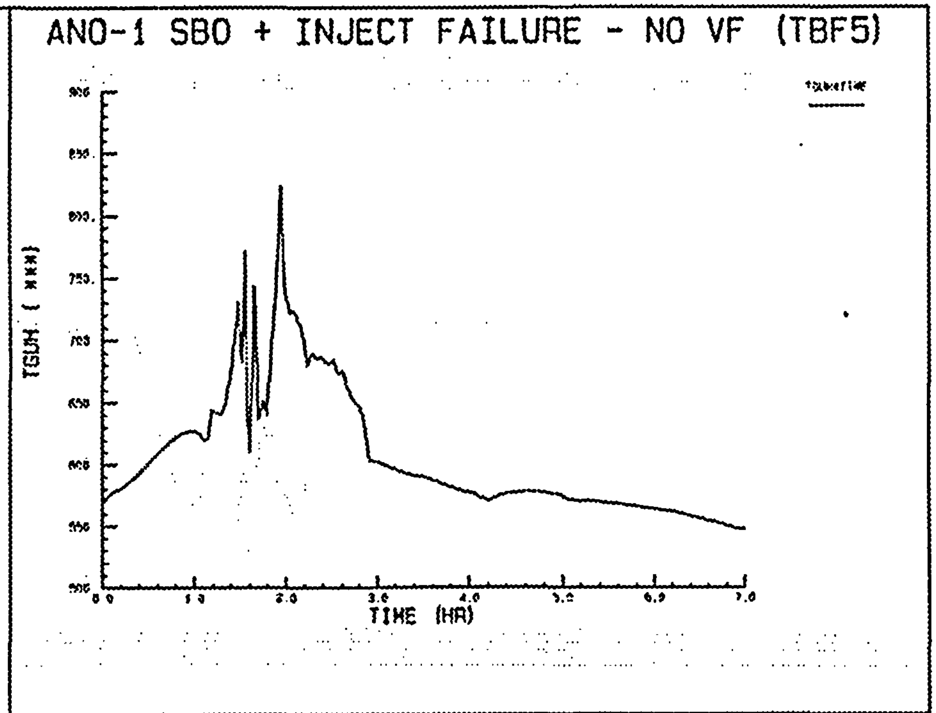
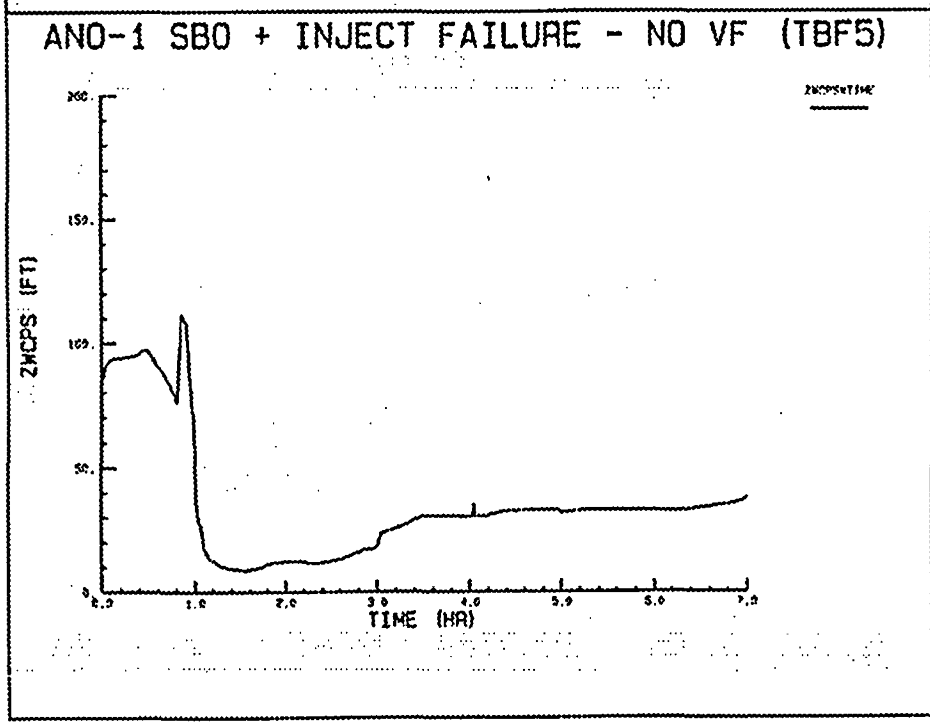


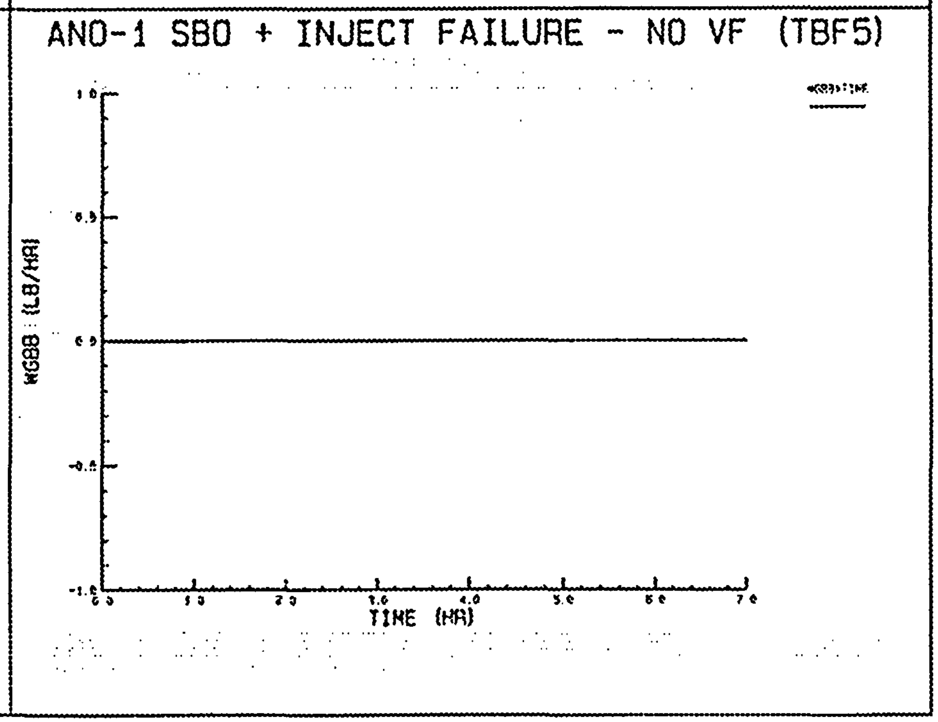
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)

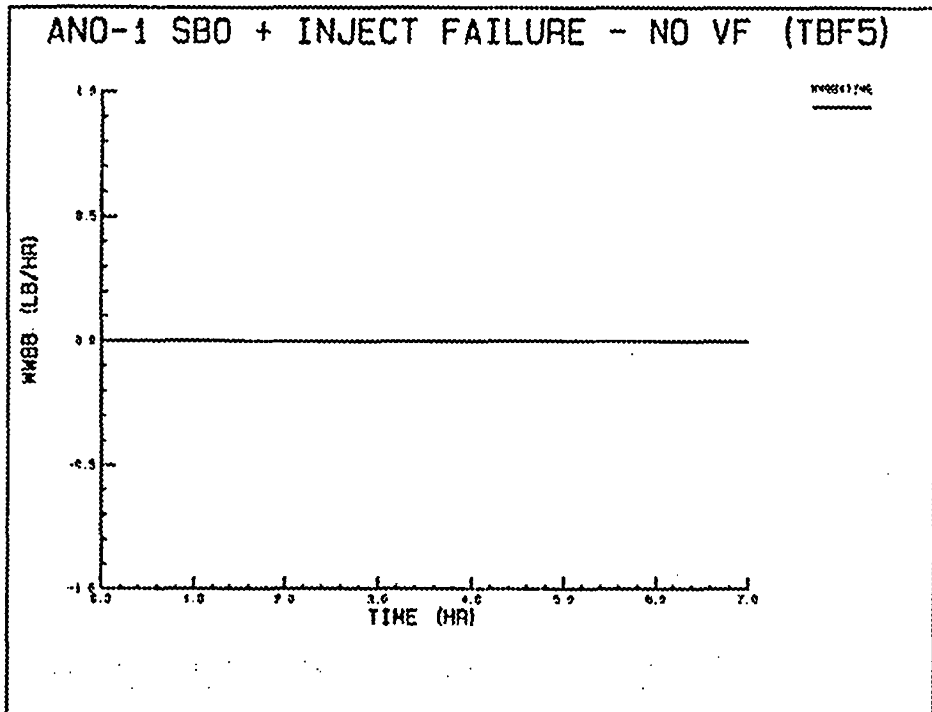



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TGBH (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TGUM (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
ZWCPS (FT)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
WGBB (LB/HR)
TIME (HR)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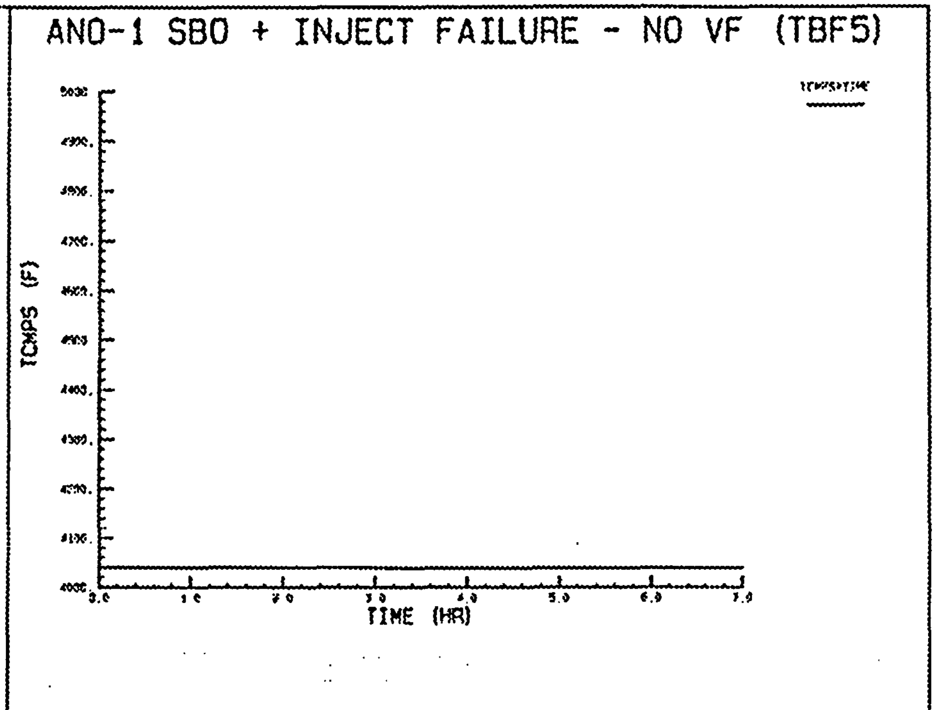
TIME (HR)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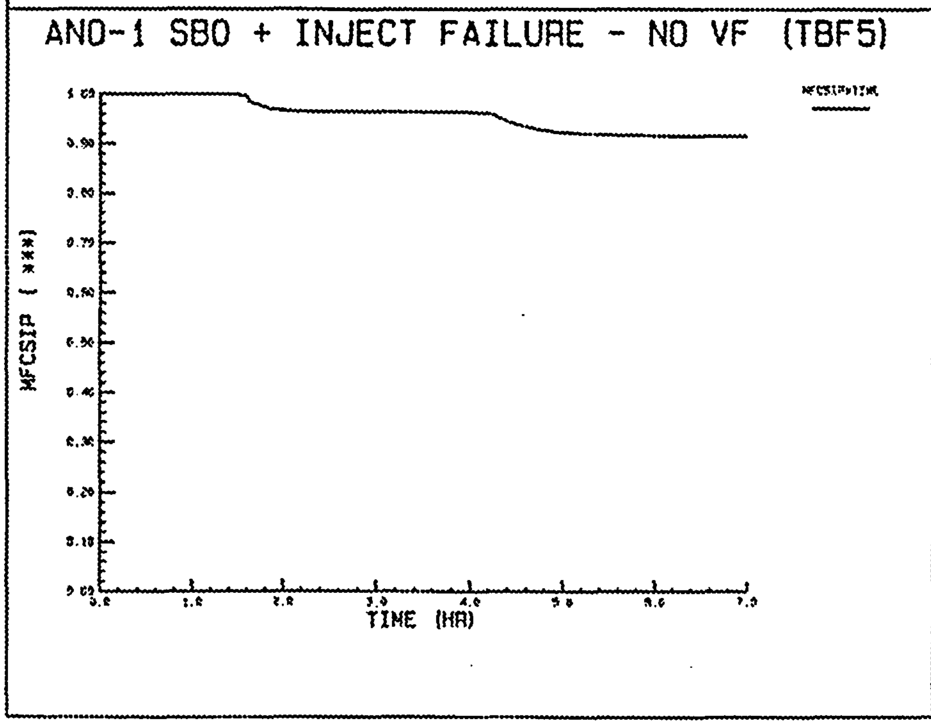
TCMPS (F)
TIME (HR)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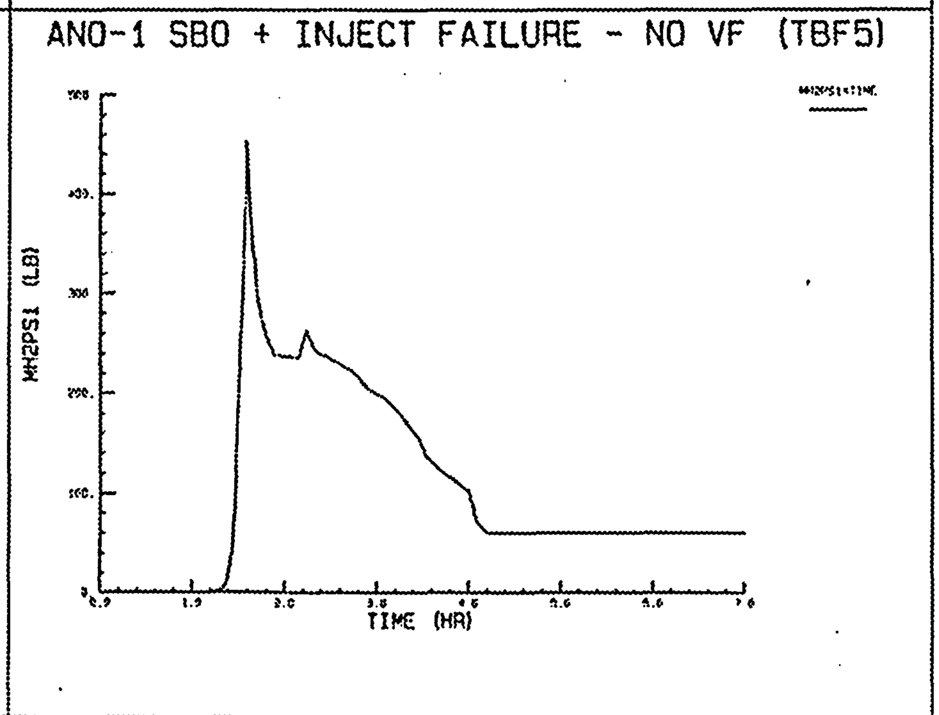
MFCSIP (***)
TIME (HR)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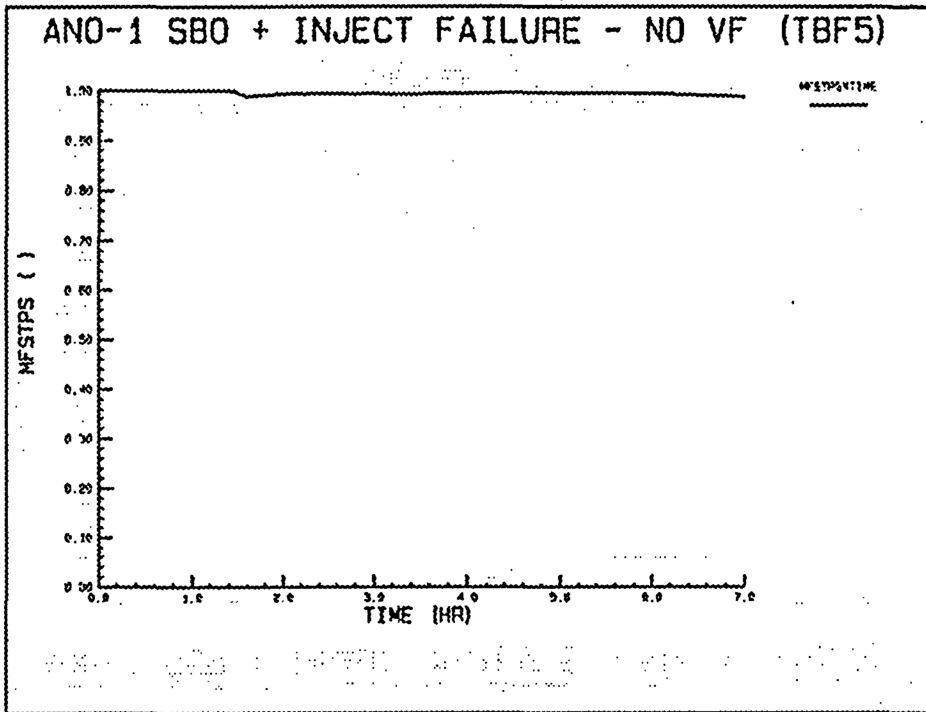
MH2PS1 (LB)
TIME (HR)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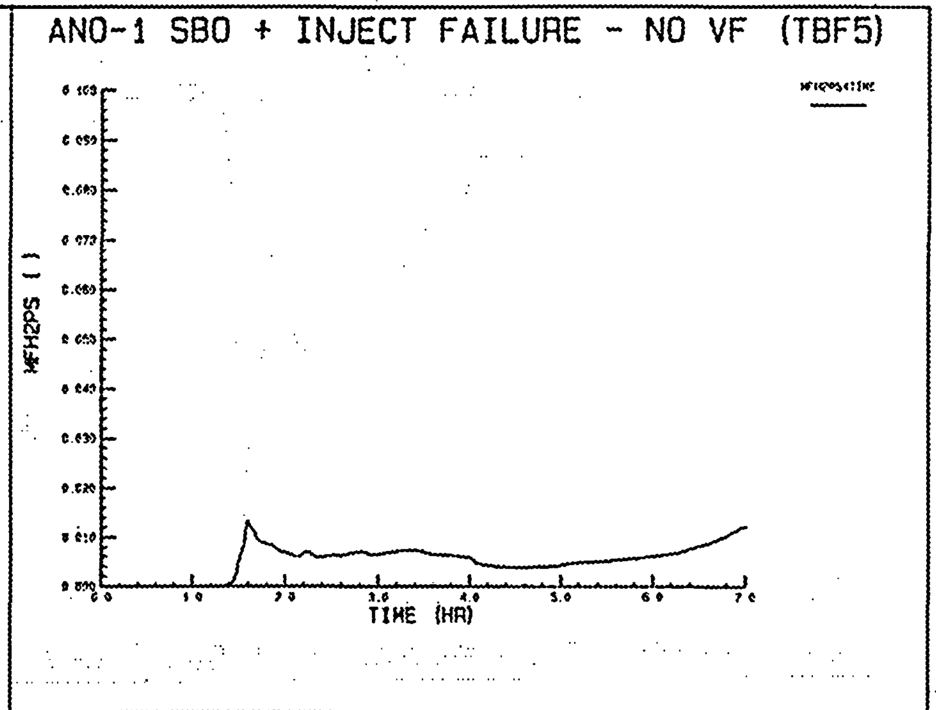
MFSTPS ( )
TIME (HR)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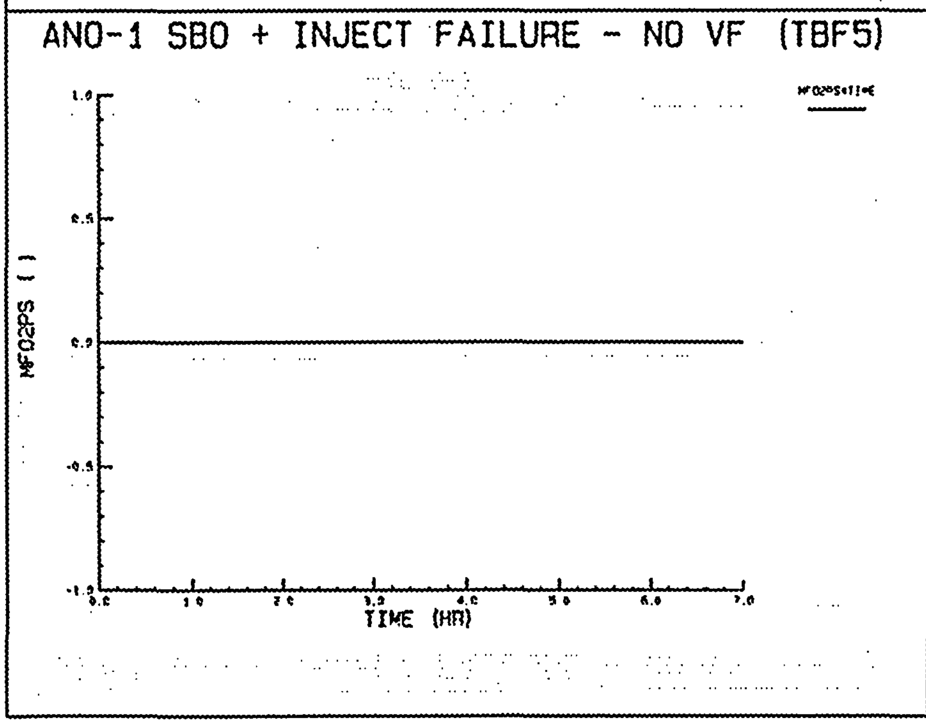
MFH2PS ( )
TIME (HR)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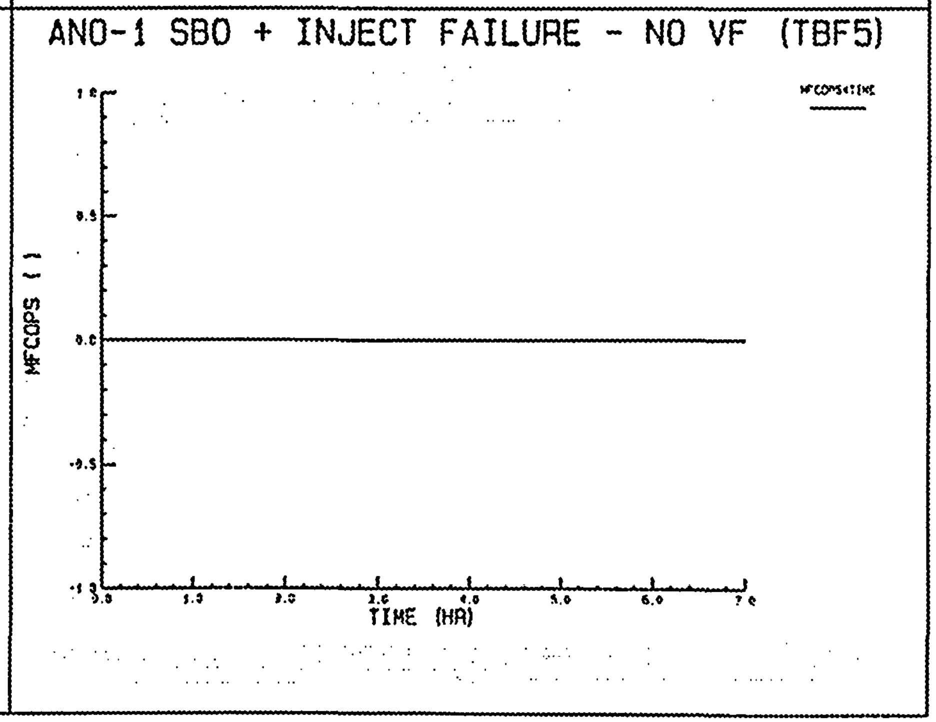
MFO2PS ( )
TIME (HR)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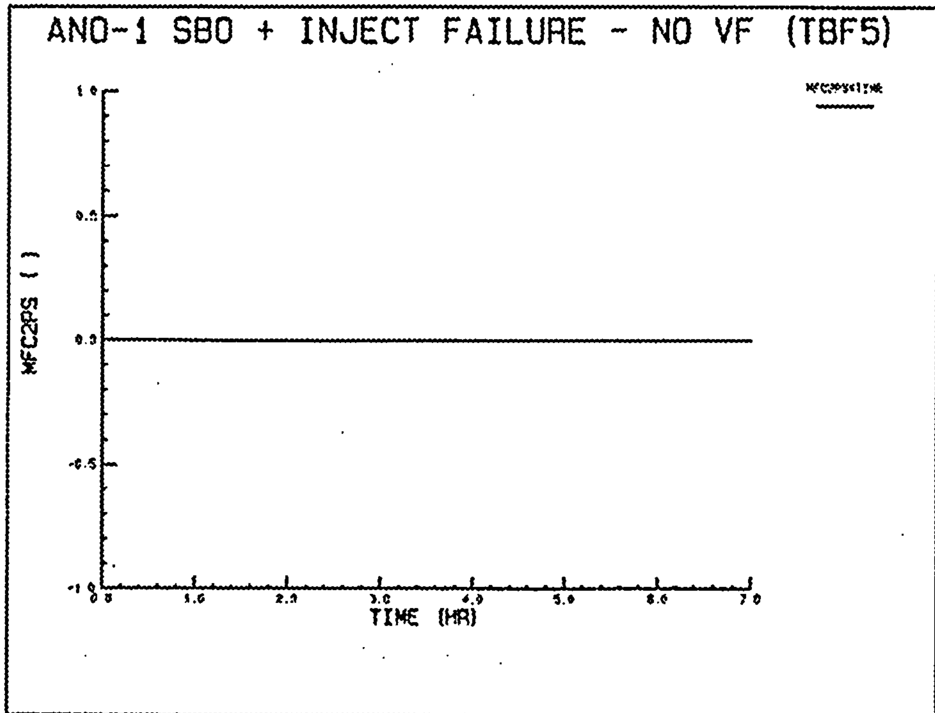
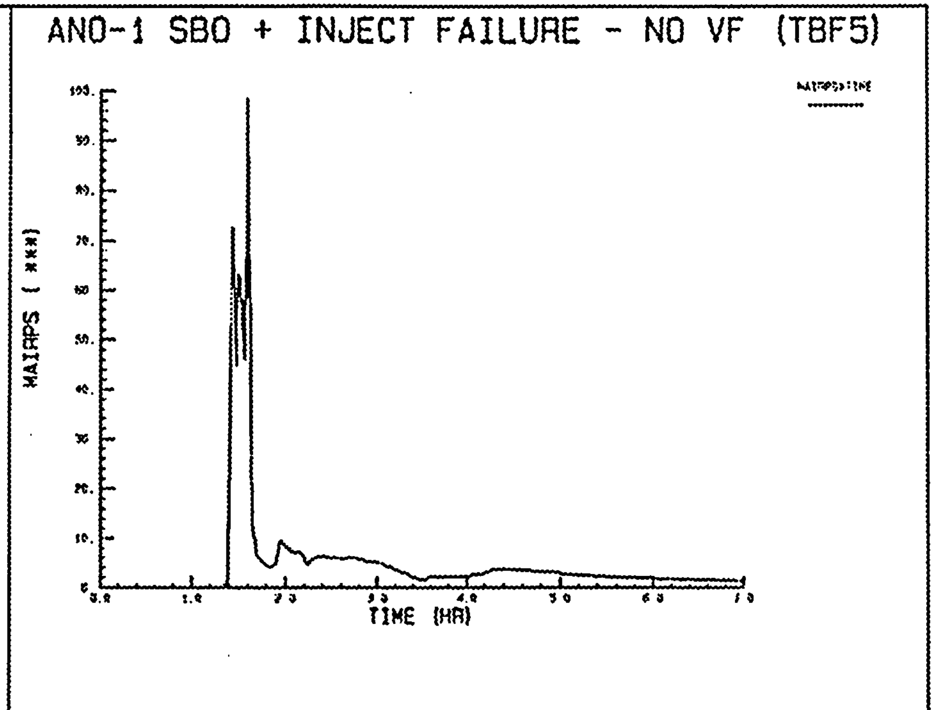
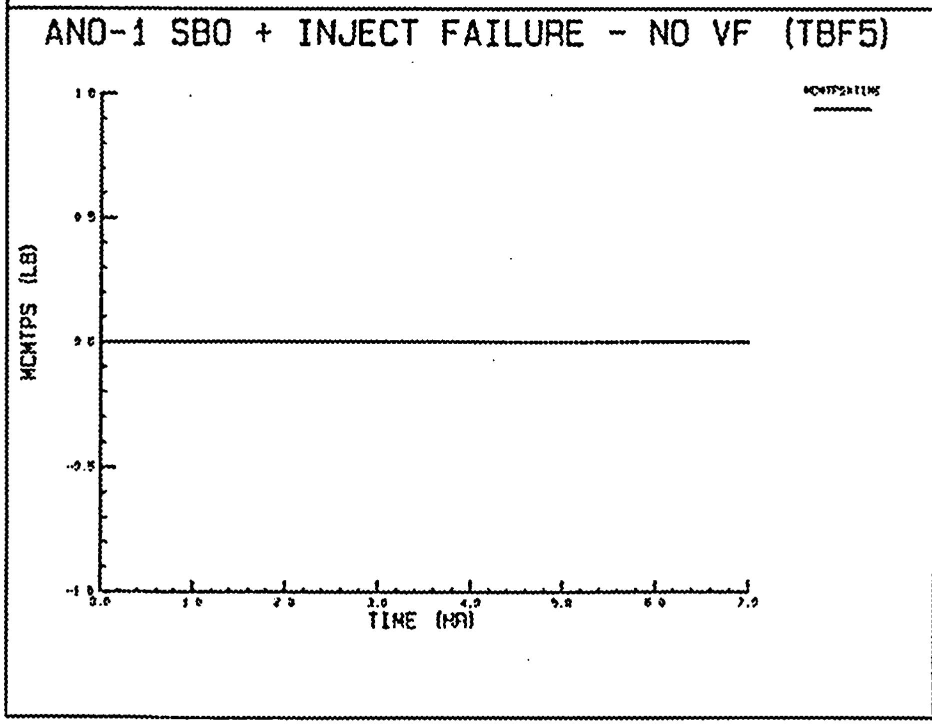
MFCOPS ( )
TIME (HR)



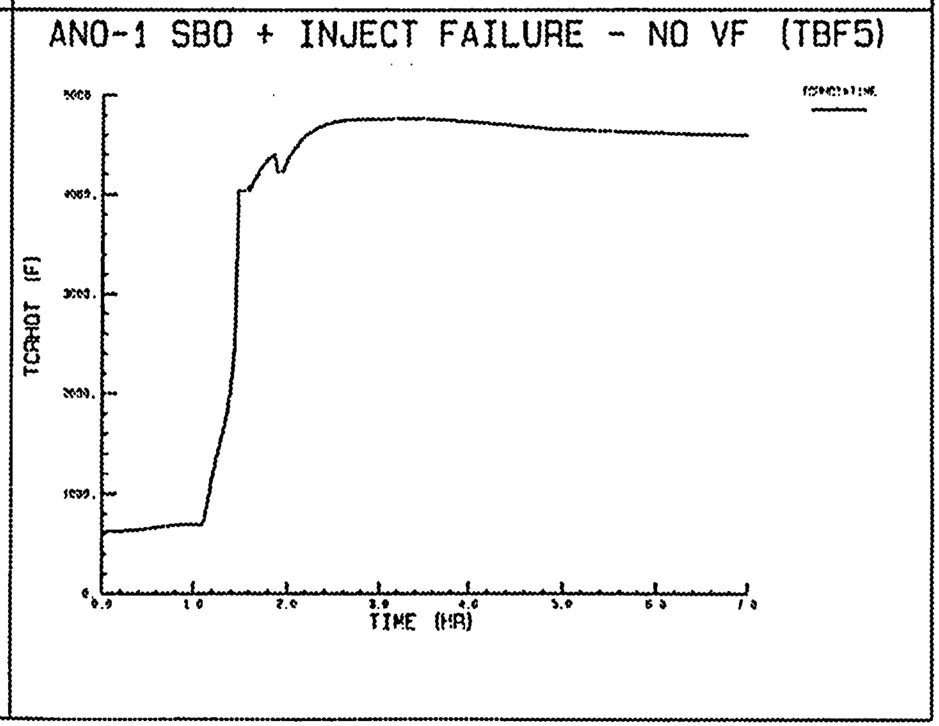
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFC2PS ( )
TIME (HR)



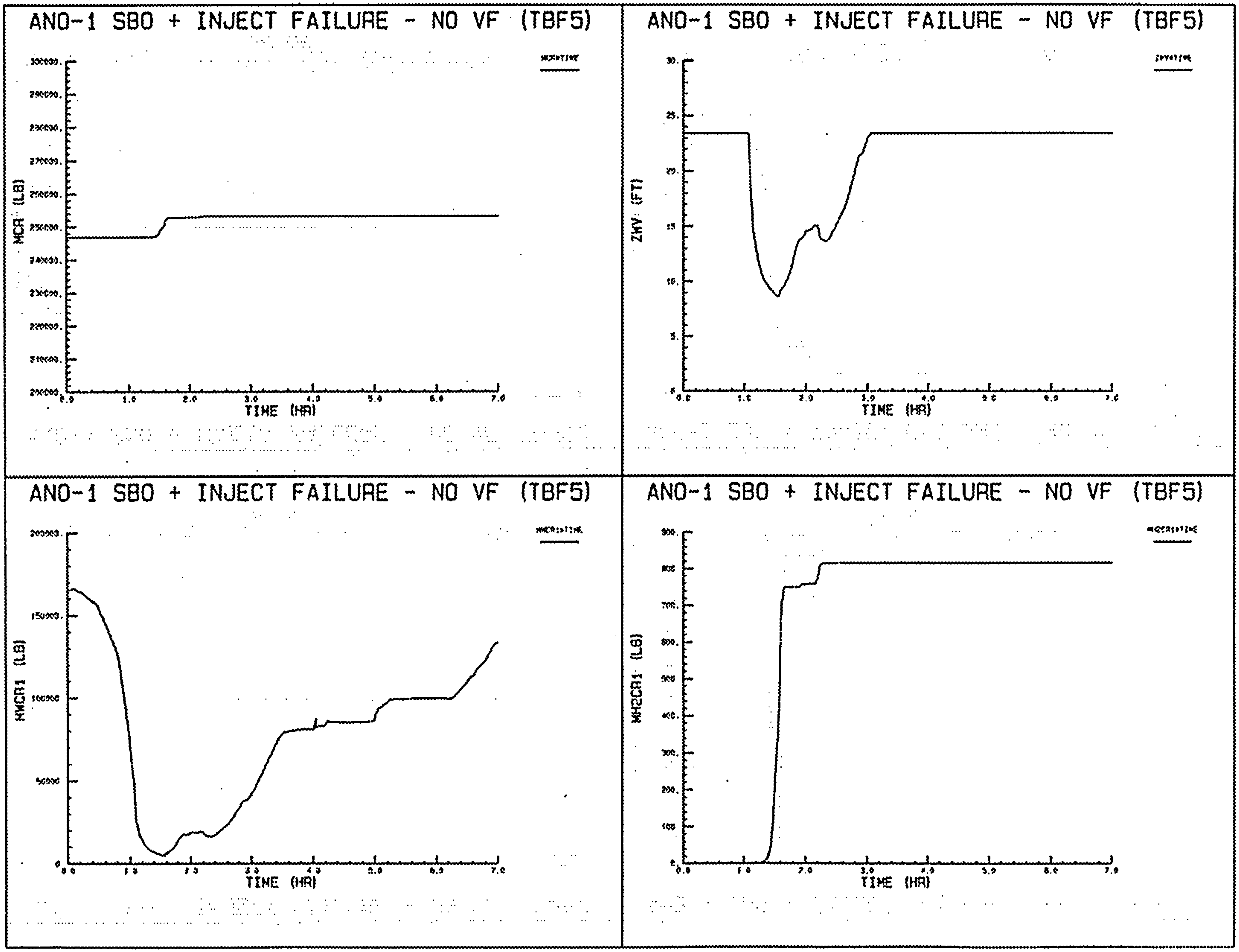
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MAIRPS (***)
TIME (HR)



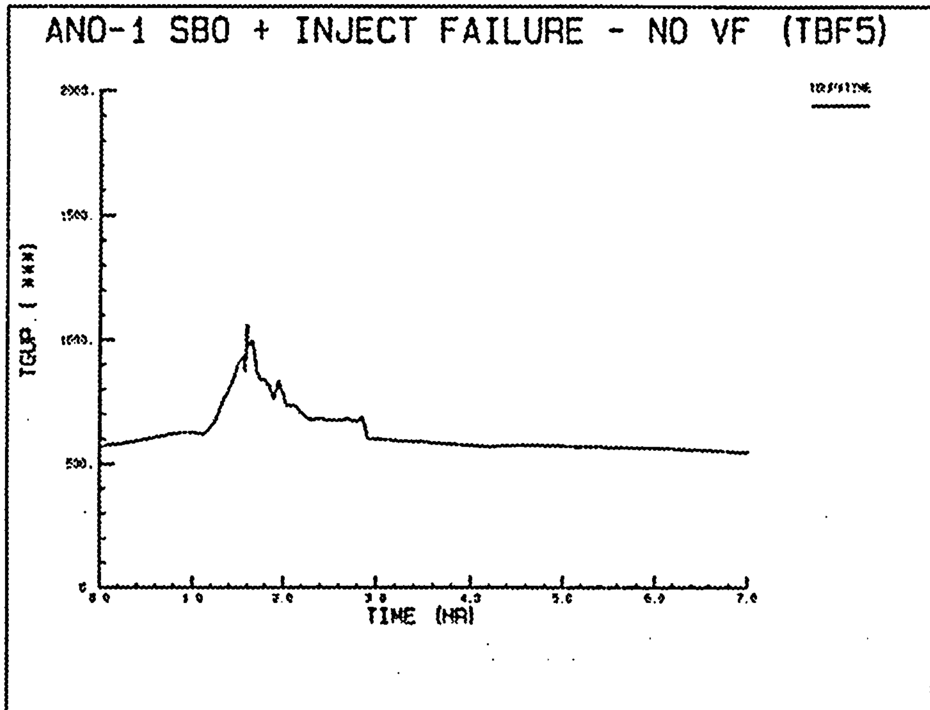
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MCMTPS (LB)
TIME (HR)



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TCRHOT (F)
TIME (HR)



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MCR (LB)
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
ZWV (FT)
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MWCR1 (LB)
TIME (HR)
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MH2CR1 (LB)
TIME (HR)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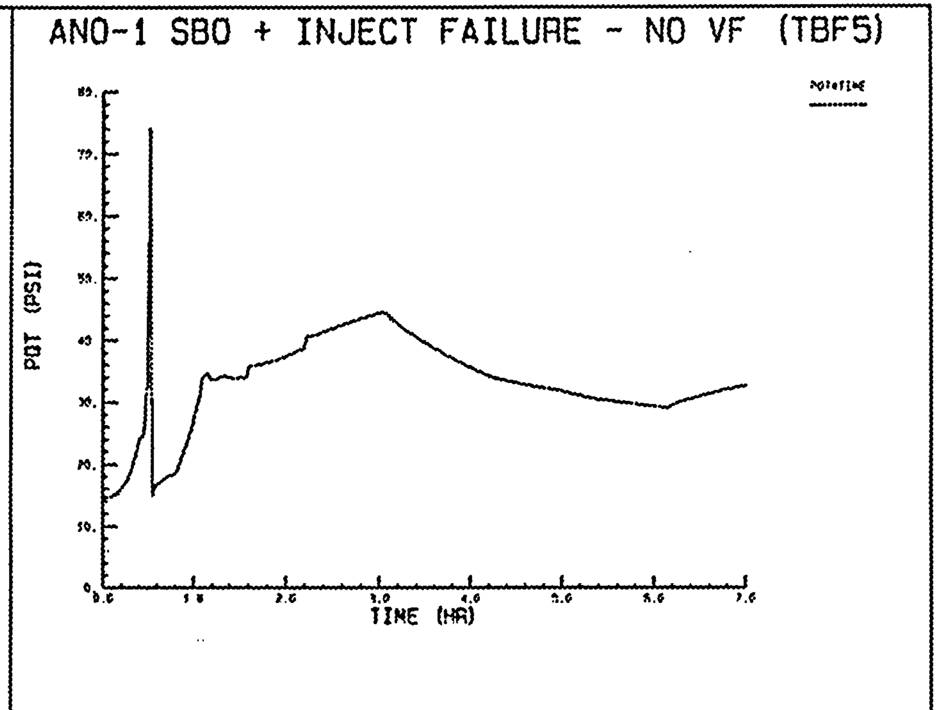
TGUP (***)
TIME (HR)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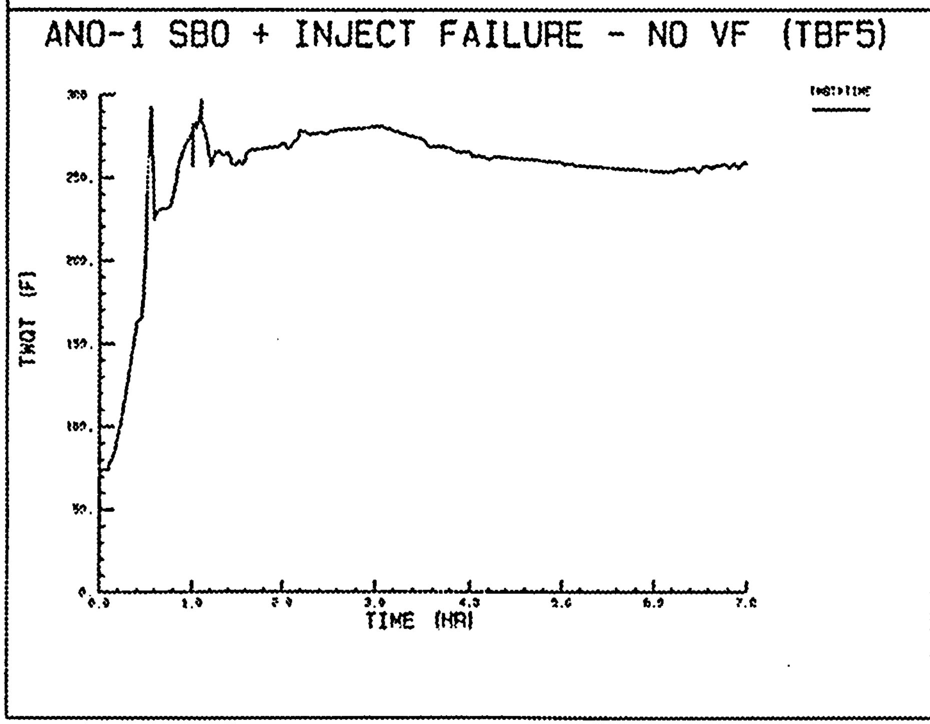
PDT (PSI)
TIME (HR)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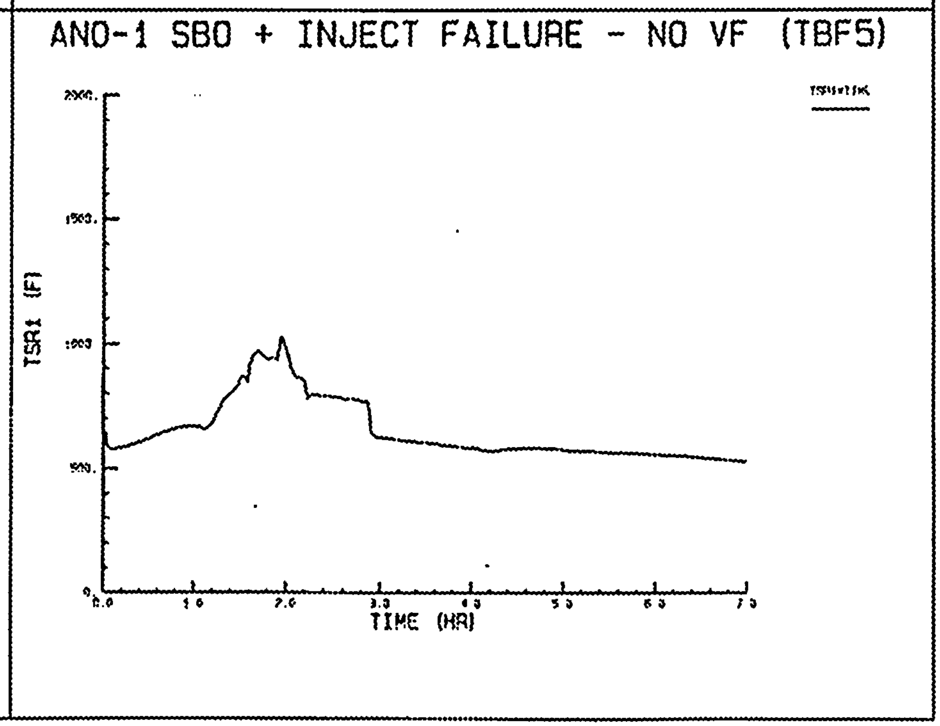
TWOT (F)
TIME (HR)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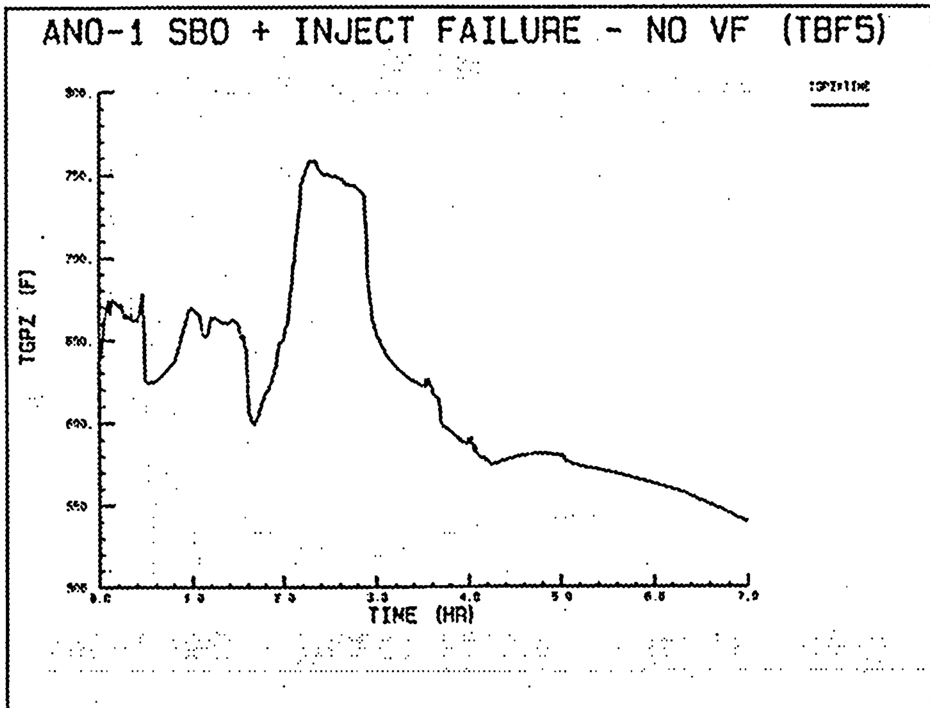
TSR1 (F)
TIME (HR)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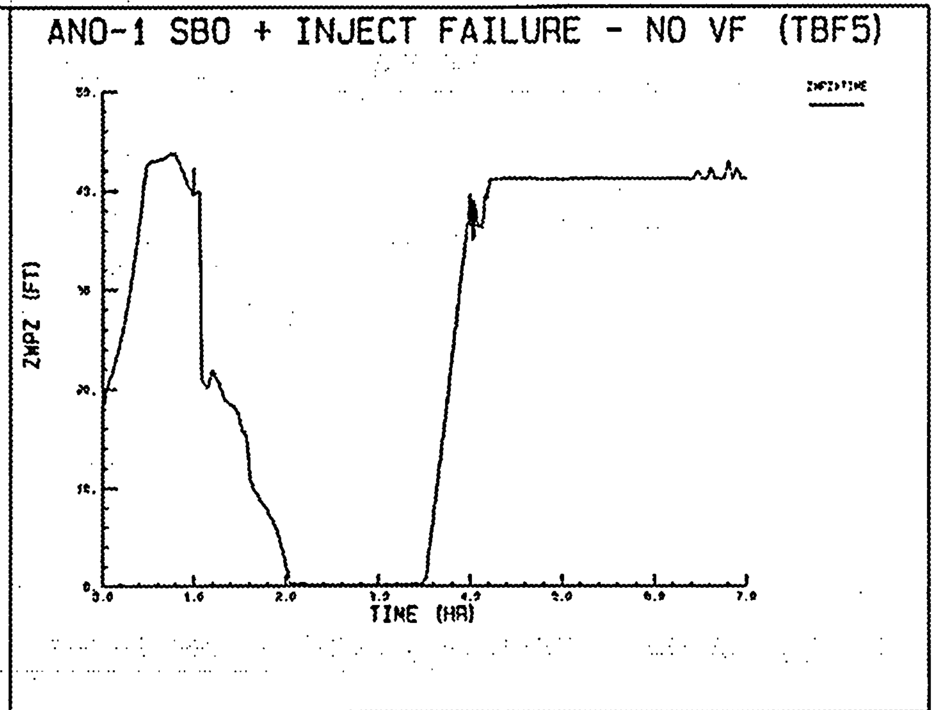
TGPZ (F)
TIME (HR)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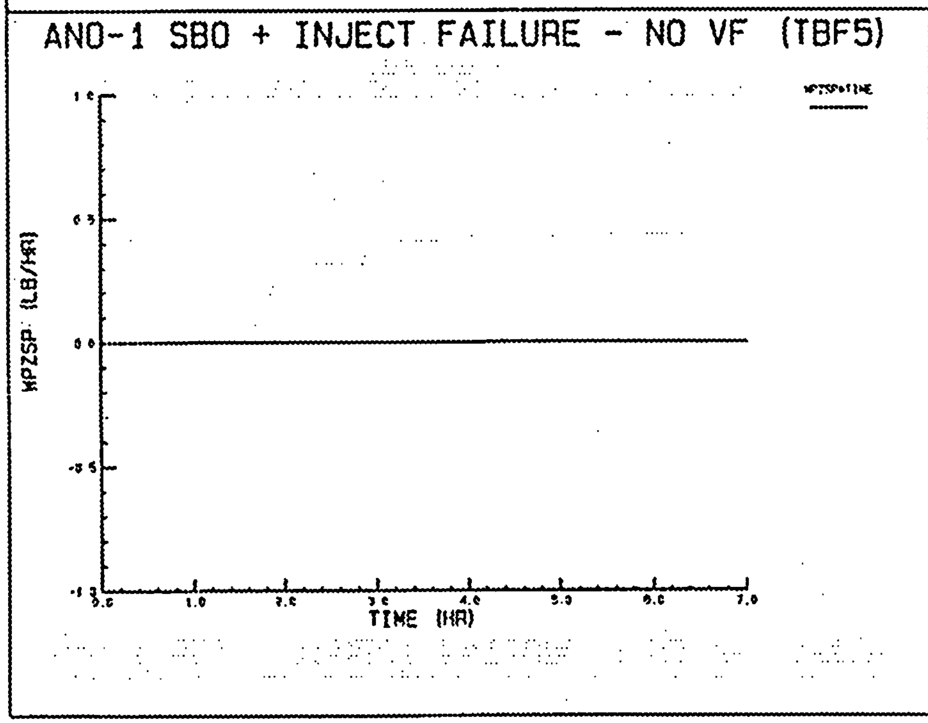
TIME (HR)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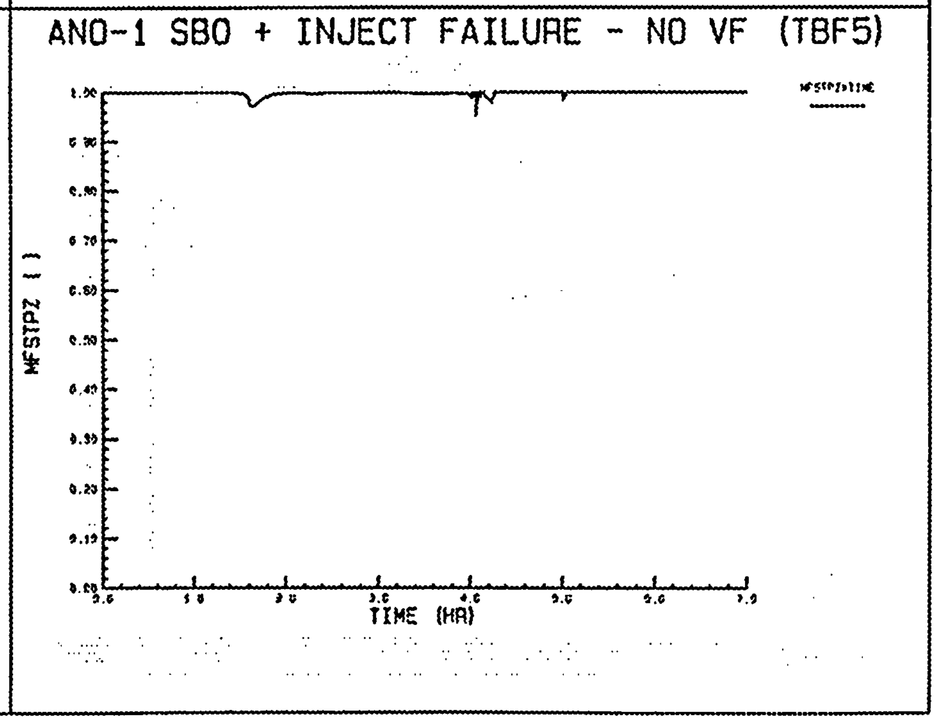
TIME (HR)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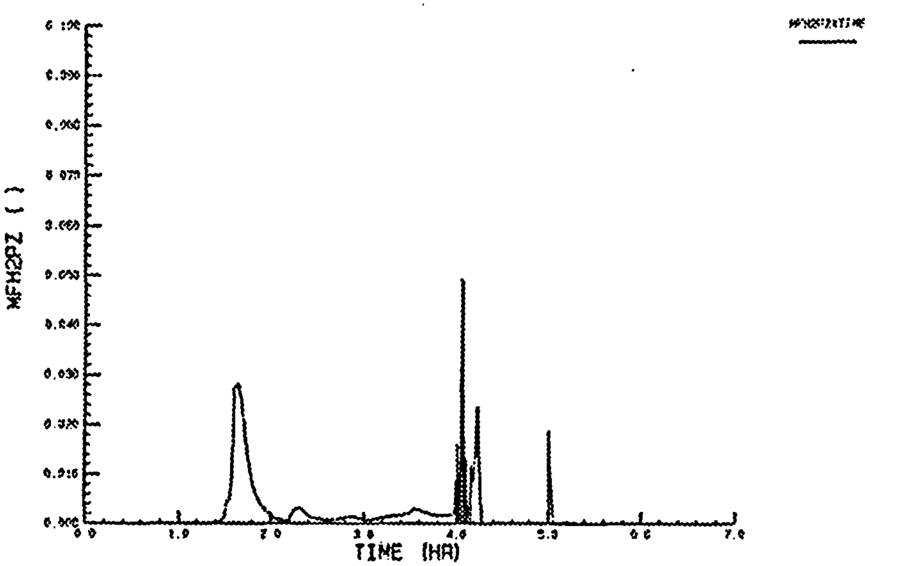
WFSTPZ ( )
TIME (HR)

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



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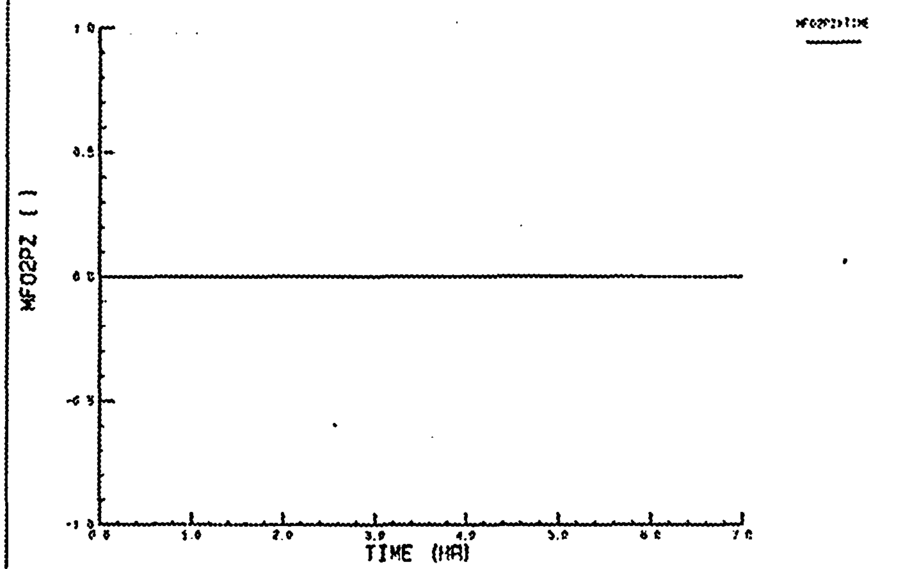

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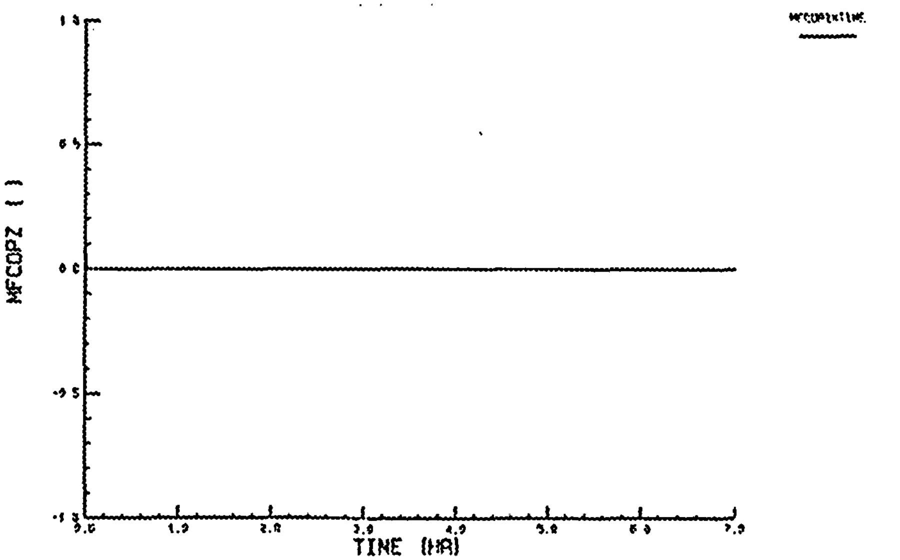

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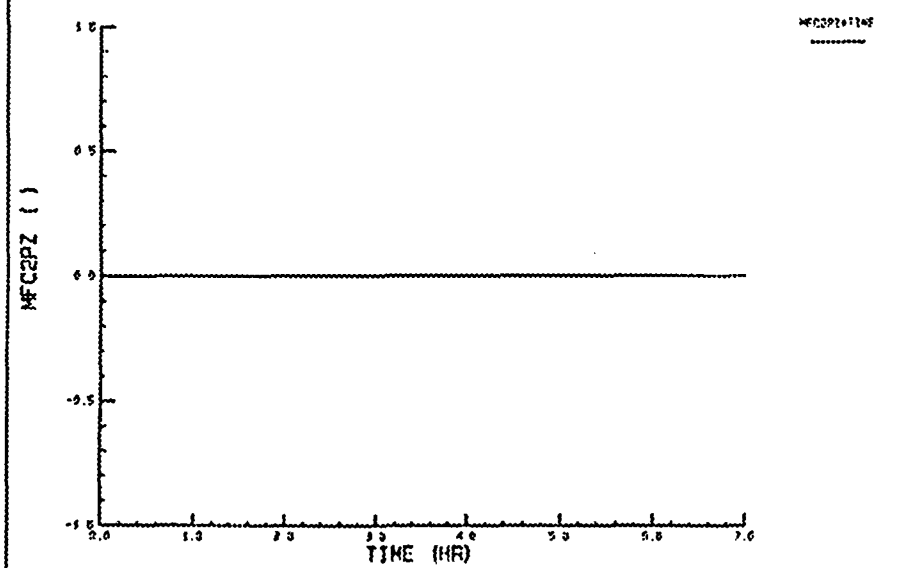

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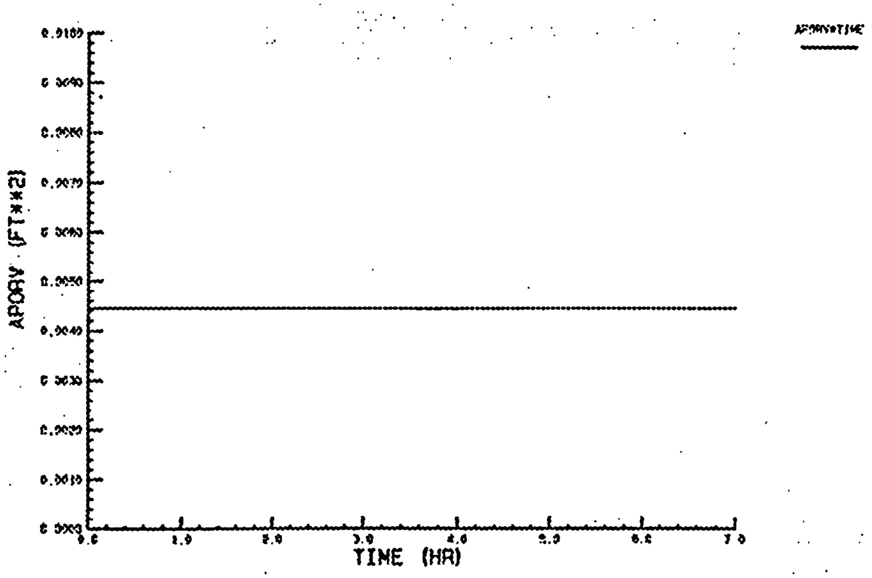

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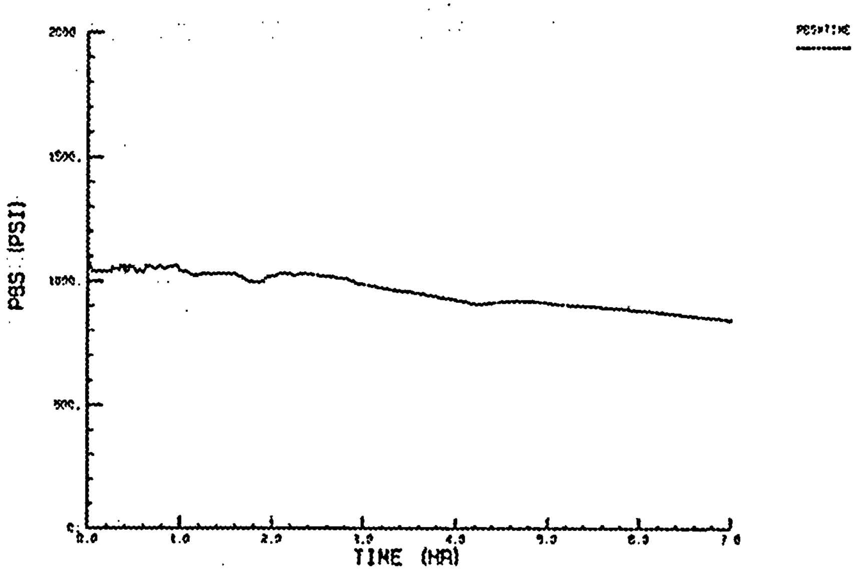

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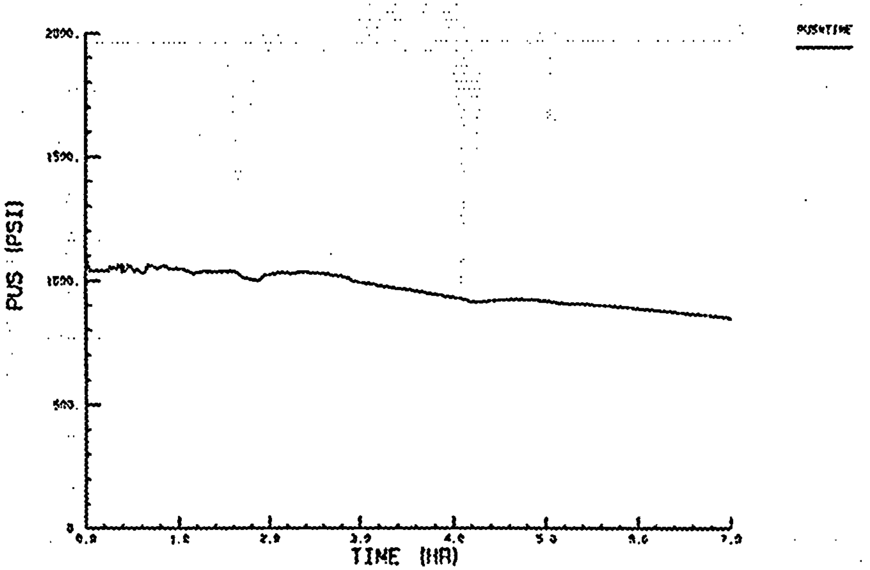

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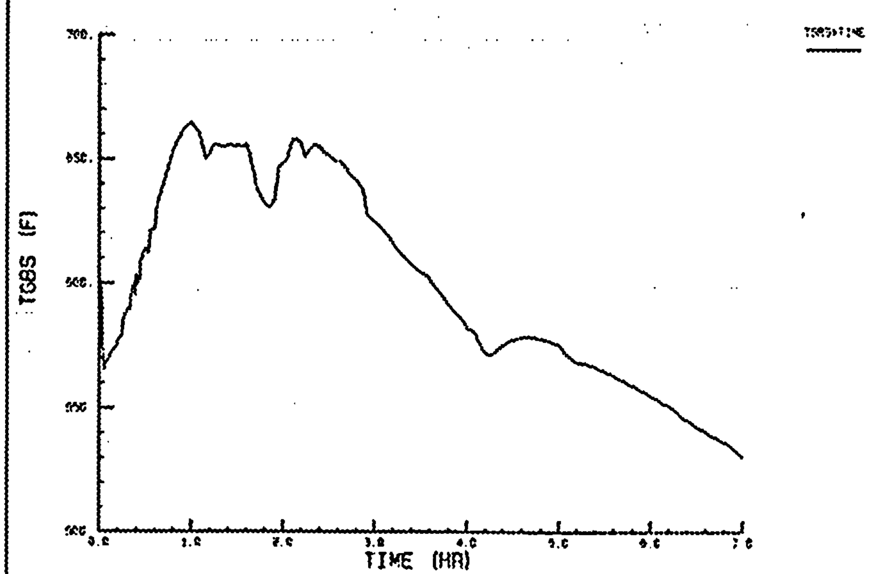
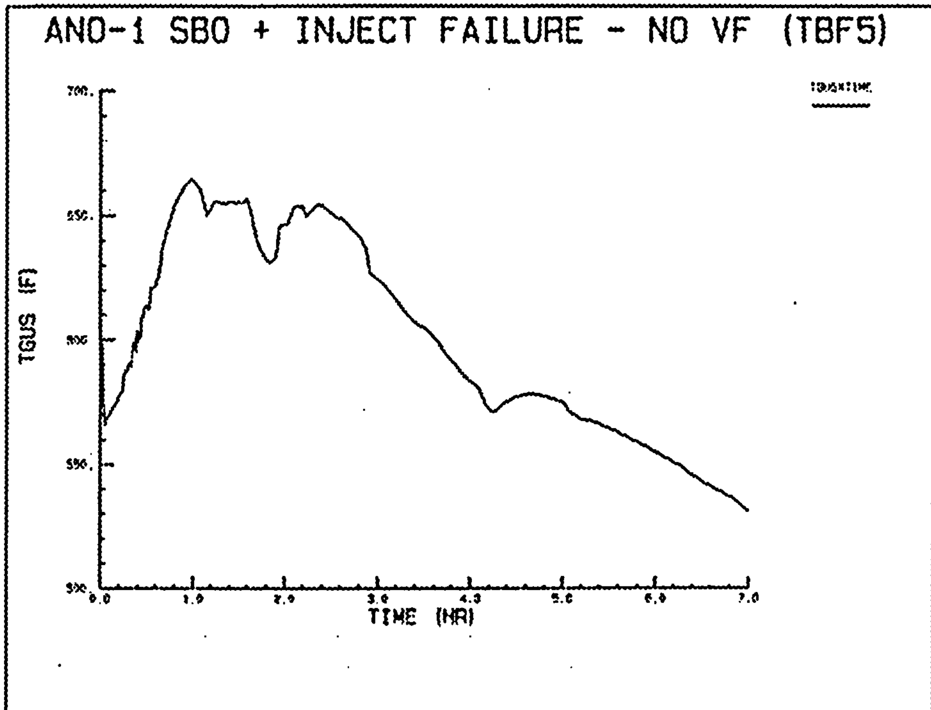
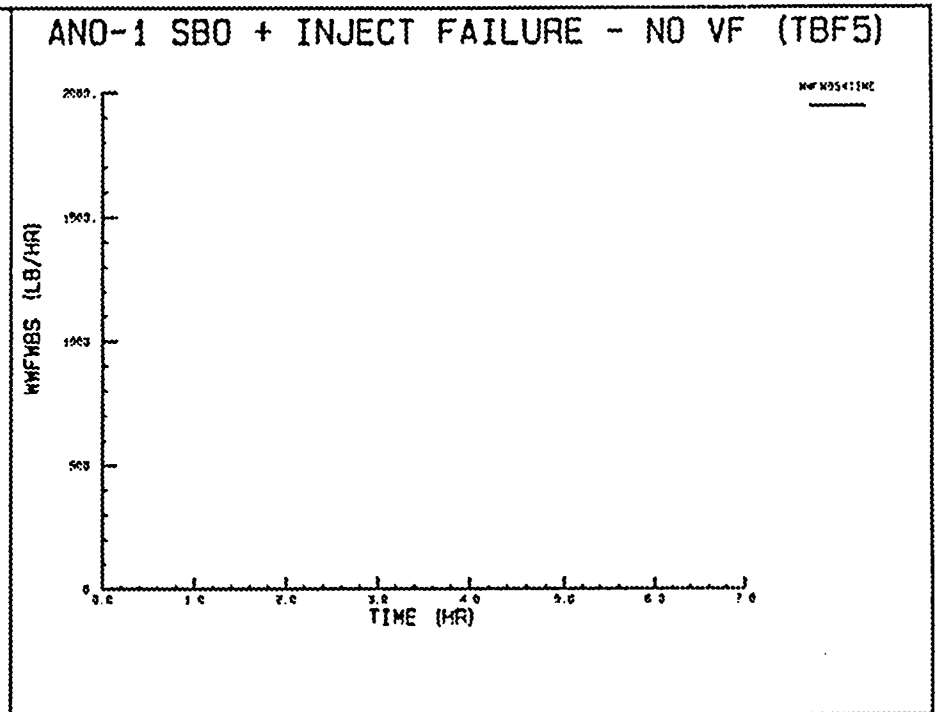
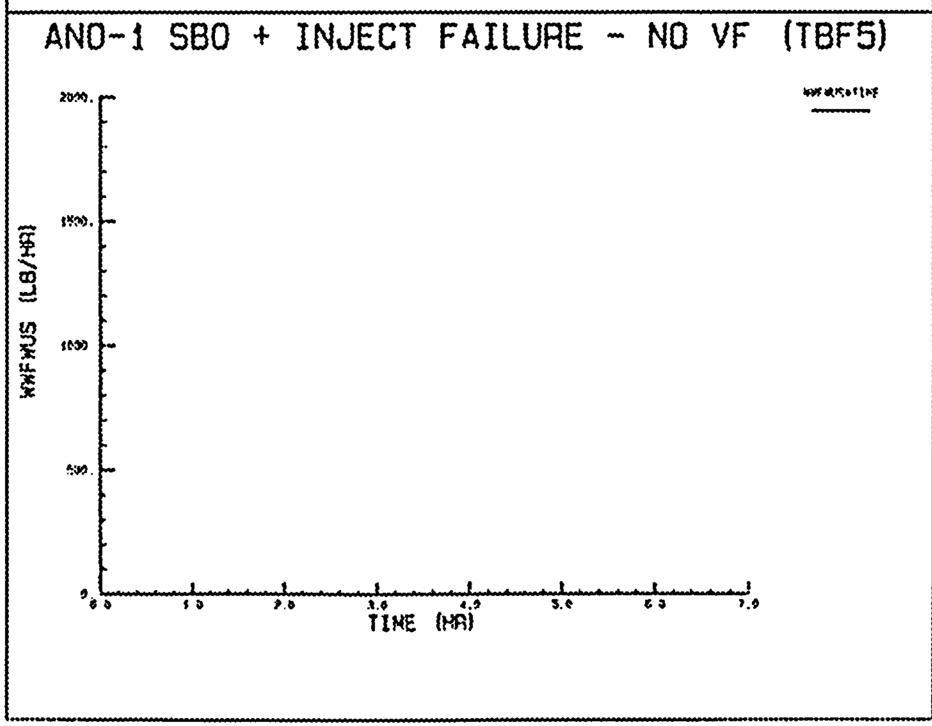



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TGUS (F)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
WWFWBS (LB/HR)
TIME (HR)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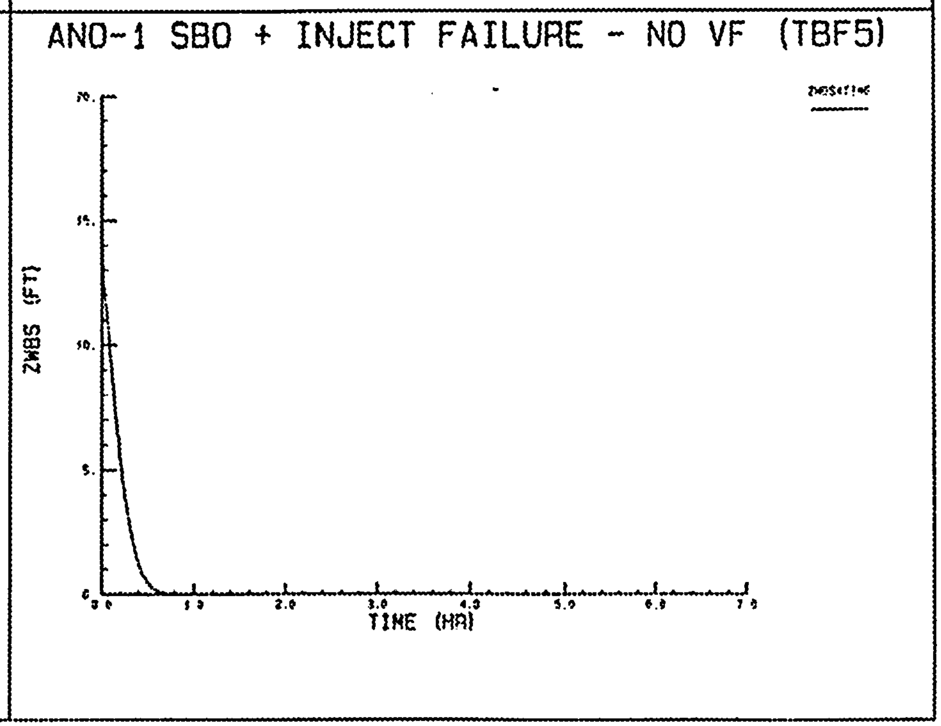
WWFWUS (LB/HR)
TIME (HR)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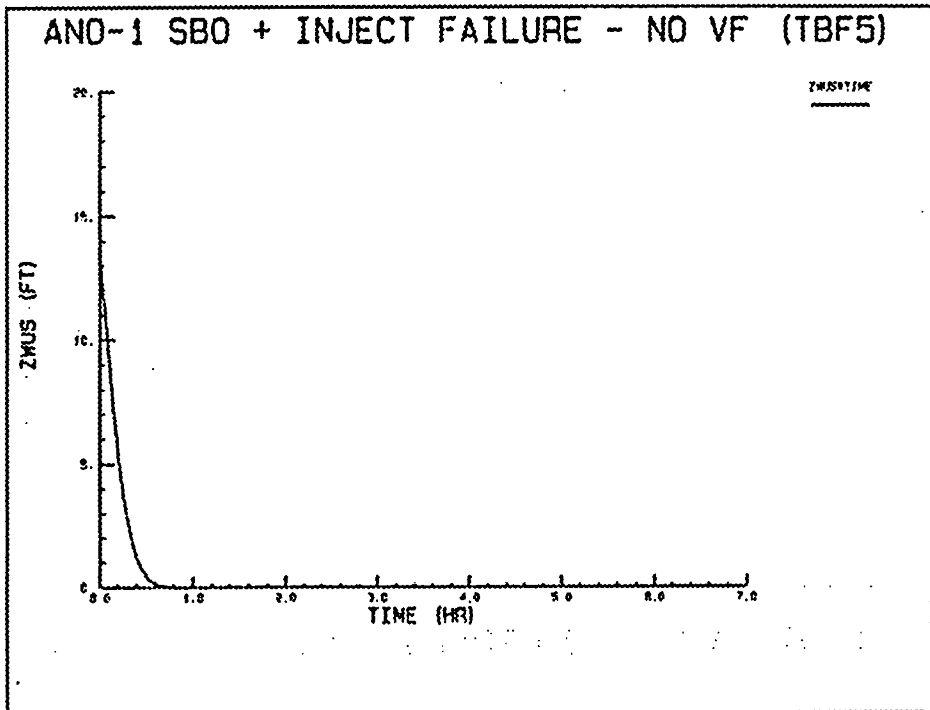
ZWBS (FT)
TIME (HR)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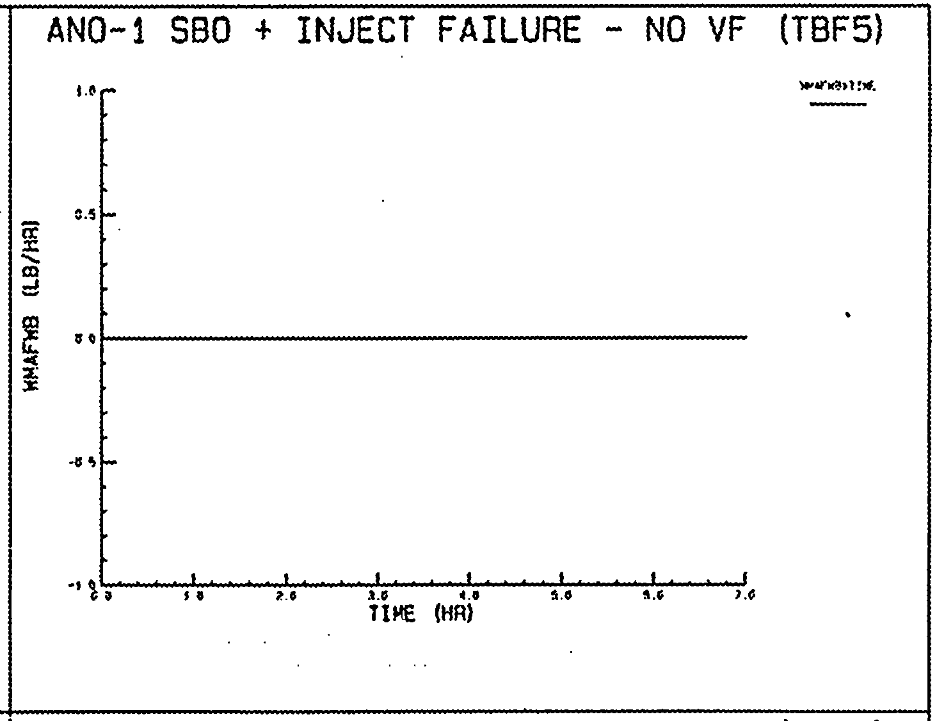
TIME (HR)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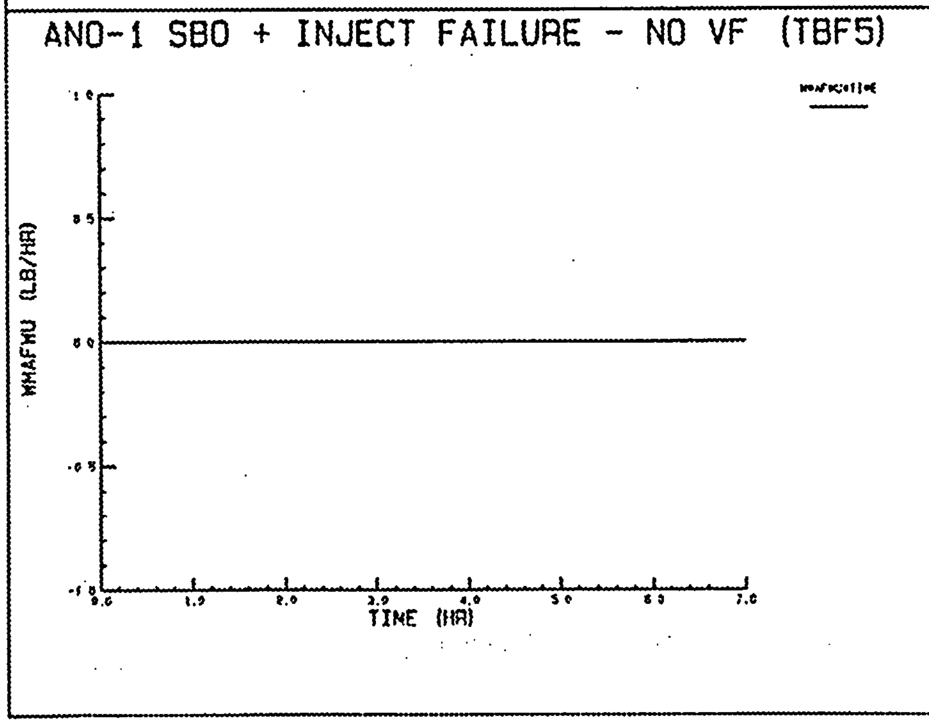
TIME (HR)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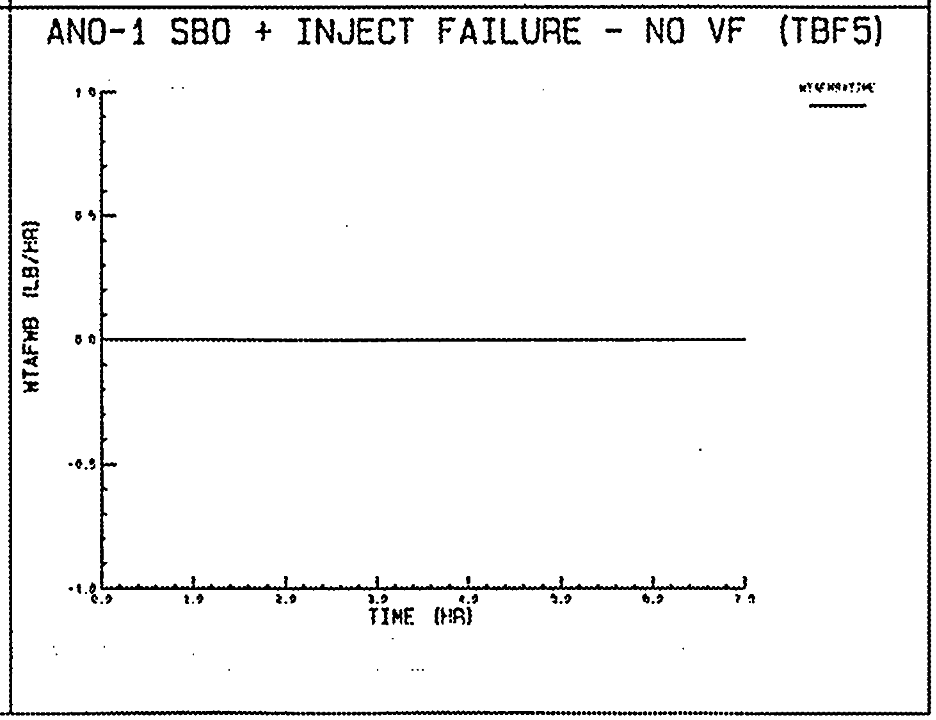
WMAFWU (LB/HR)
TIME (HR)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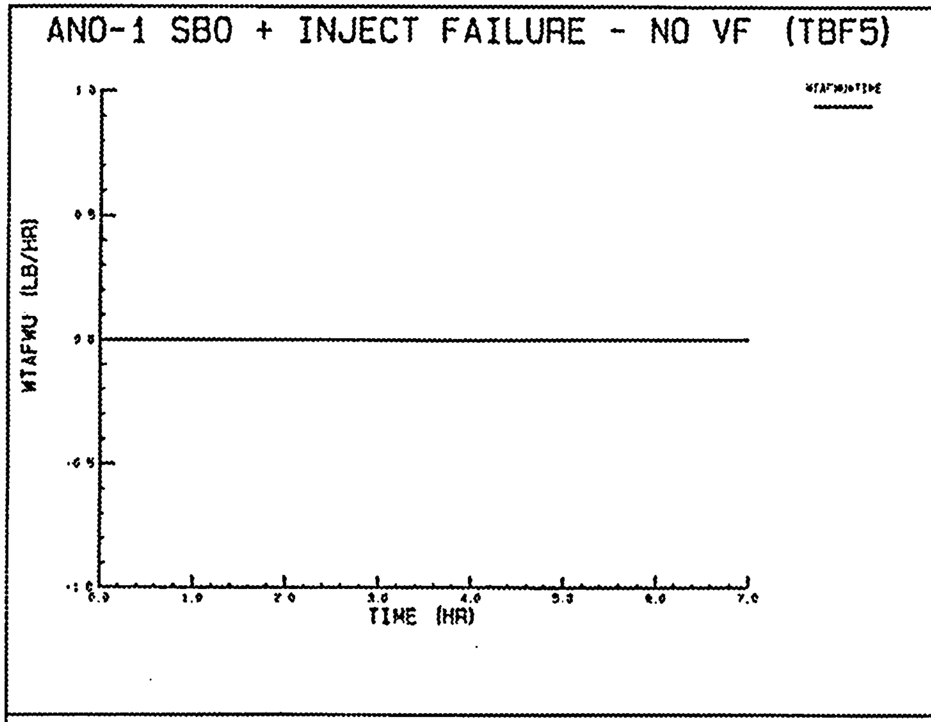
TIME (HR)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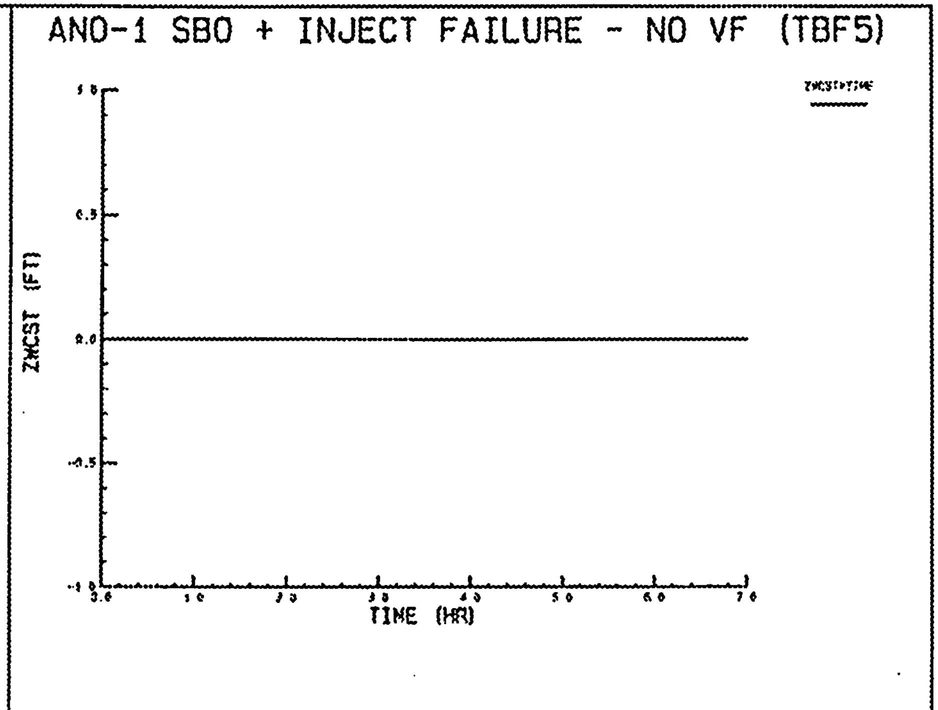
WTAFWU (LB/HR)
TIME (HR)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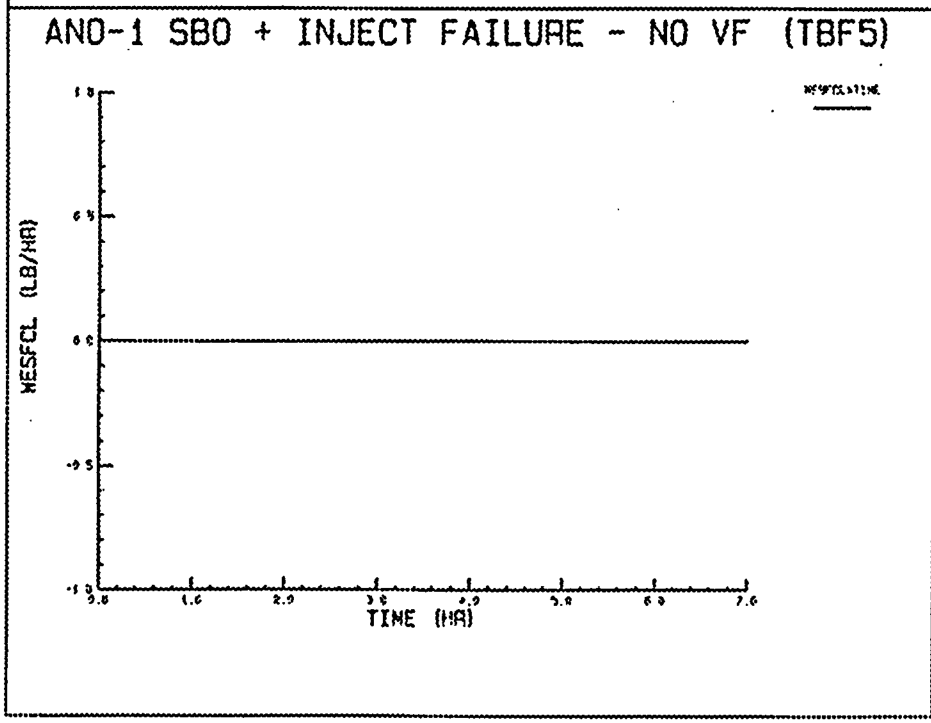
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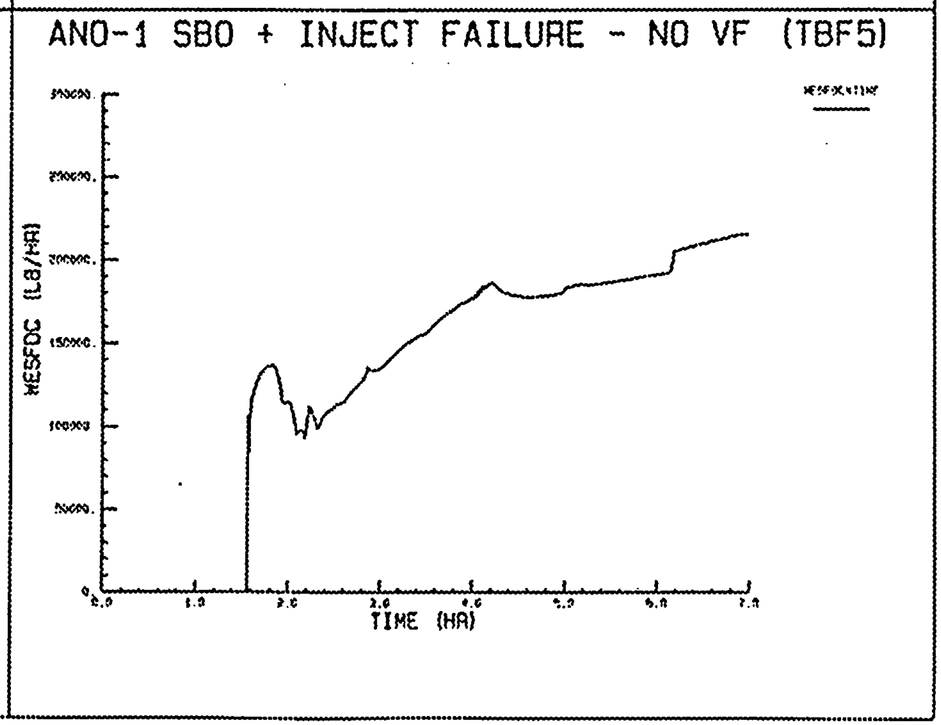
TIME (HR)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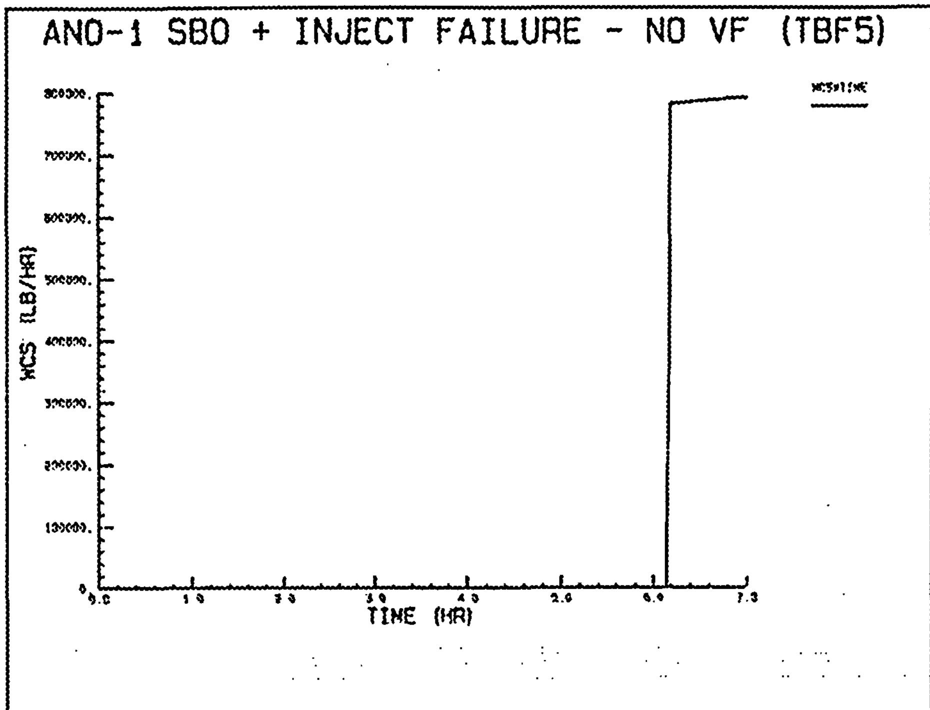
TIME (HR)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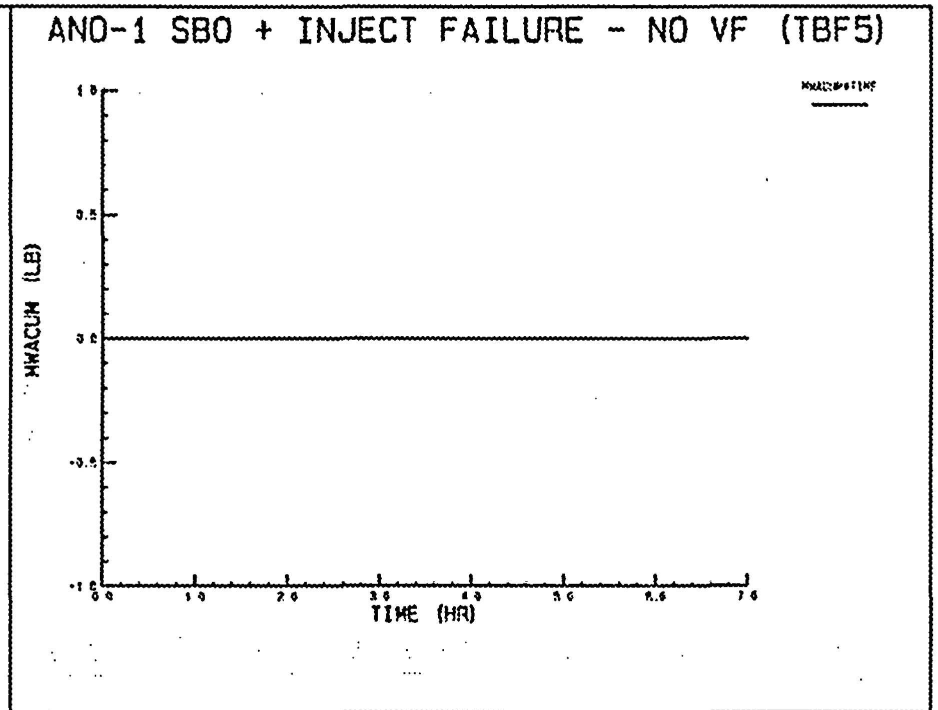
WCS (LB/HR)
TIME (HR)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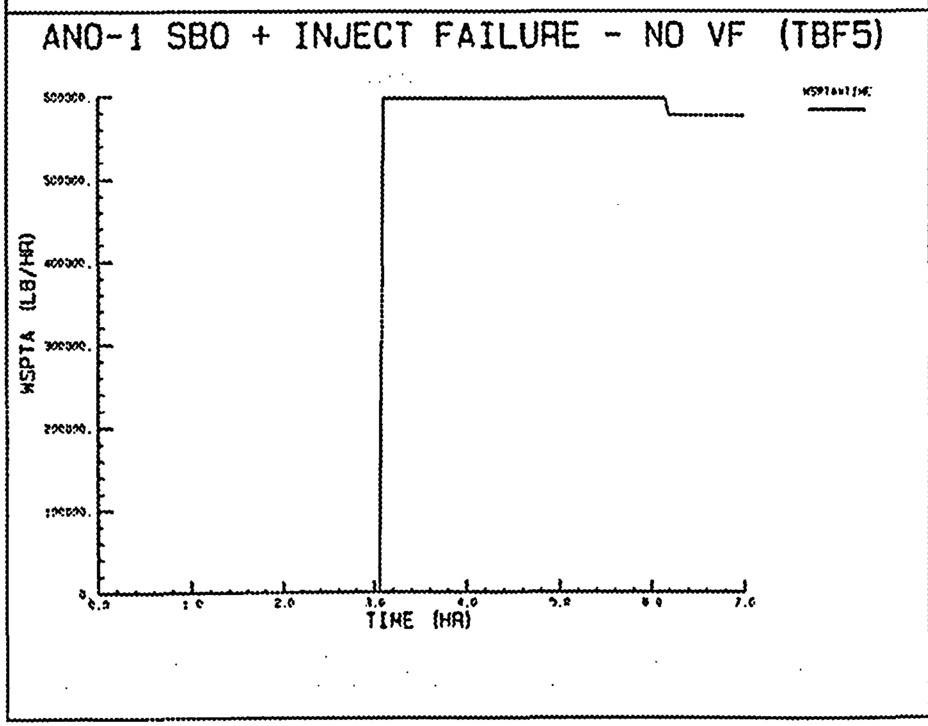
MWACUM (LB)
TIME (HR)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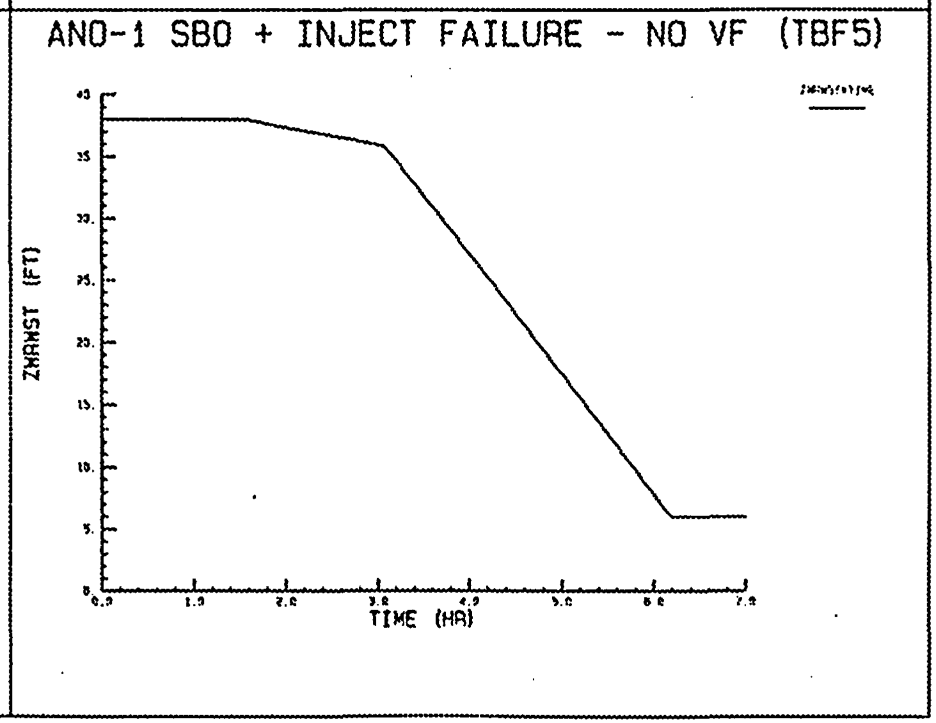
WSPTA (LB/HR)
TIME (HR)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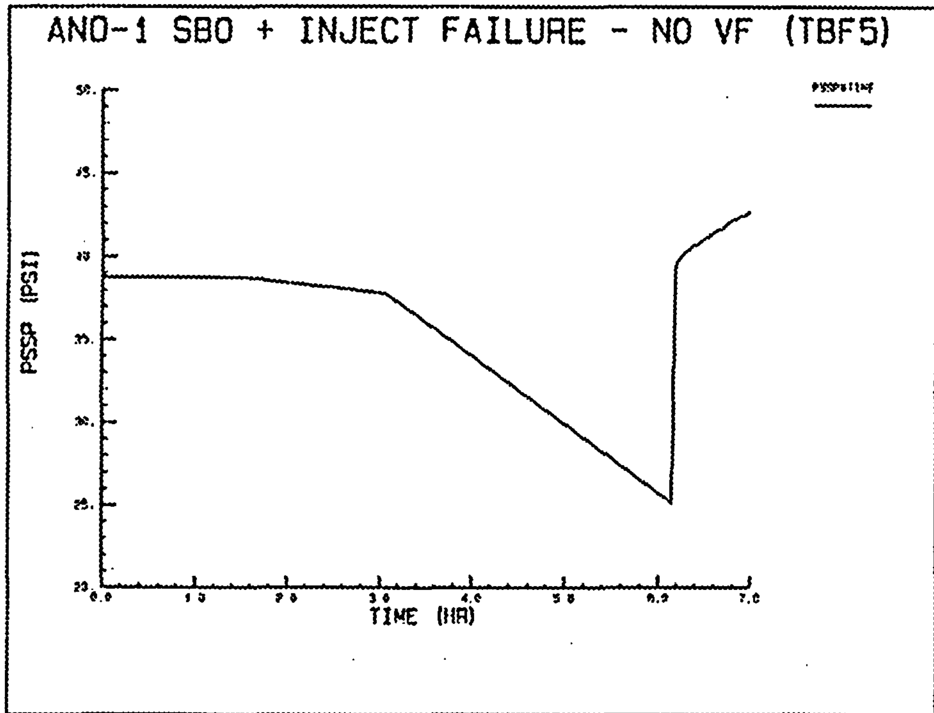
TIME (HR)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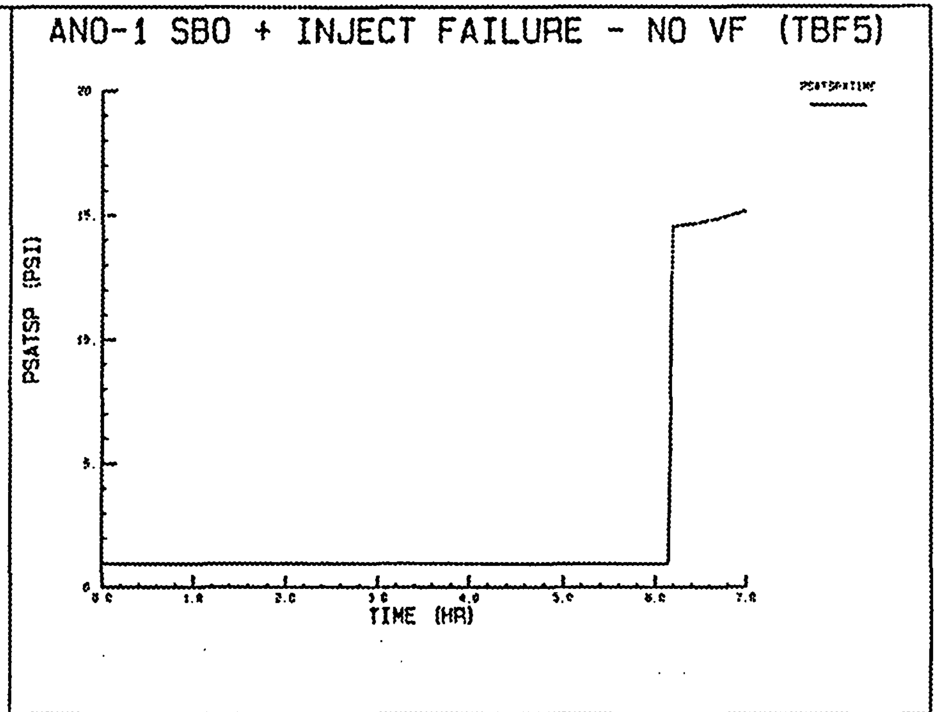
PSSP (PSI)
TIME (HR)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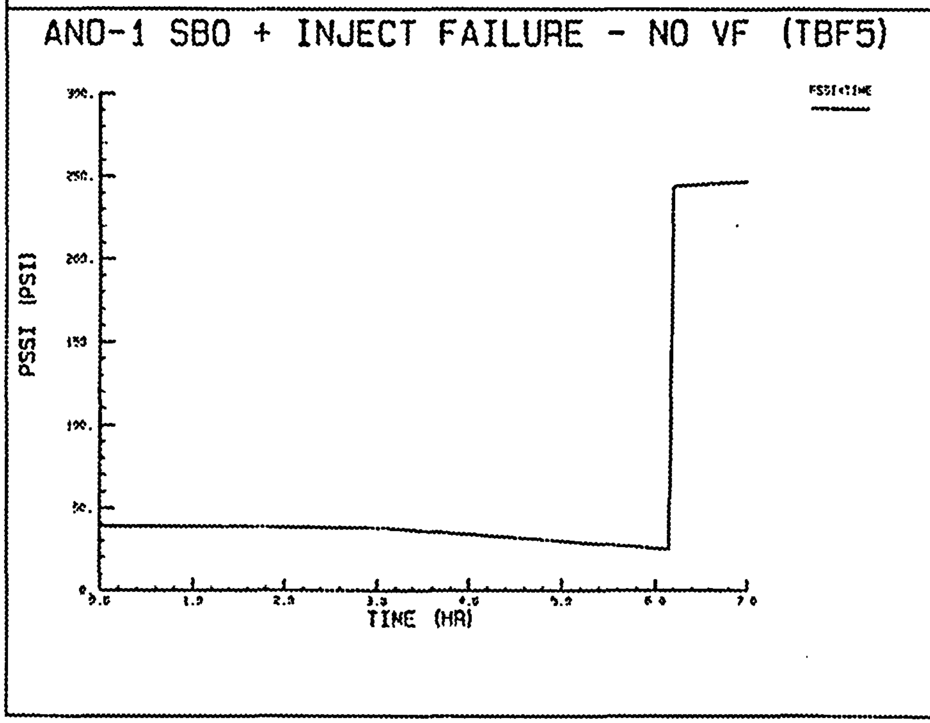
TIME (HR)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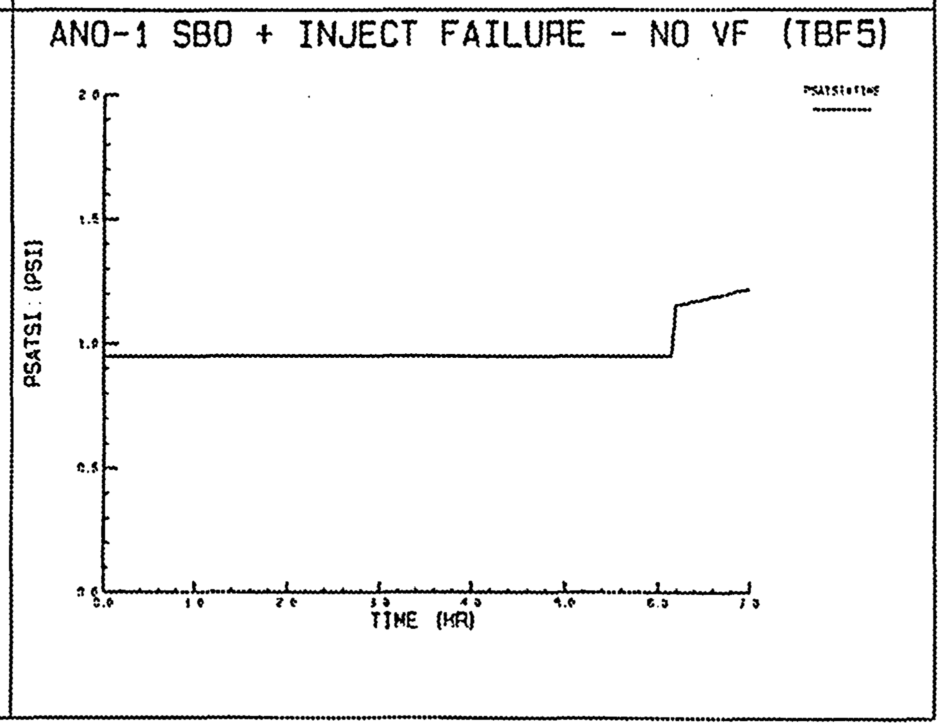
PSSI (PSI)
TIME (HR)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PSATSI (PSI)
TIME (HR)

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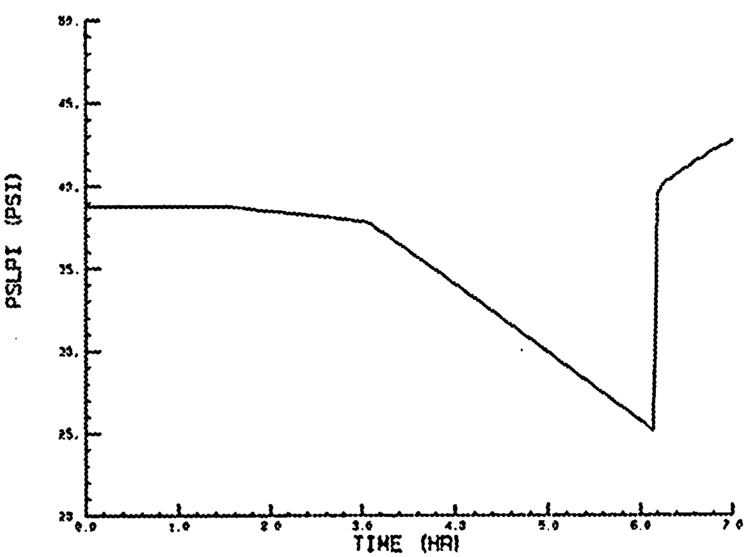
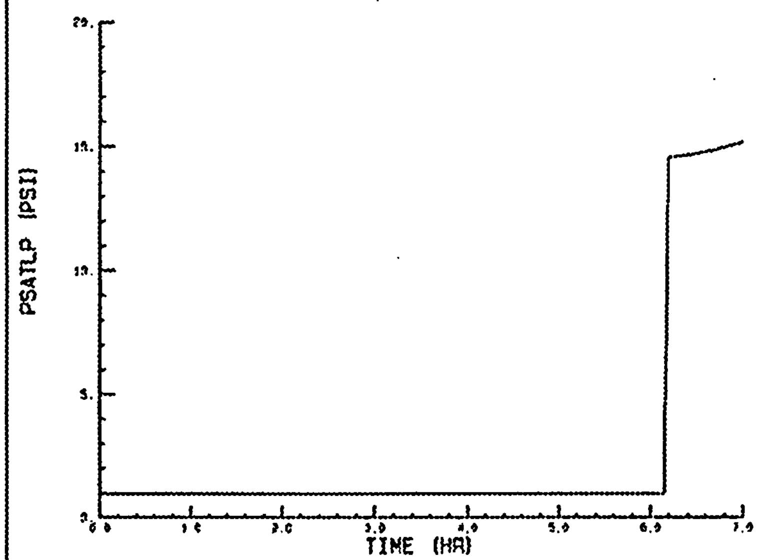


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



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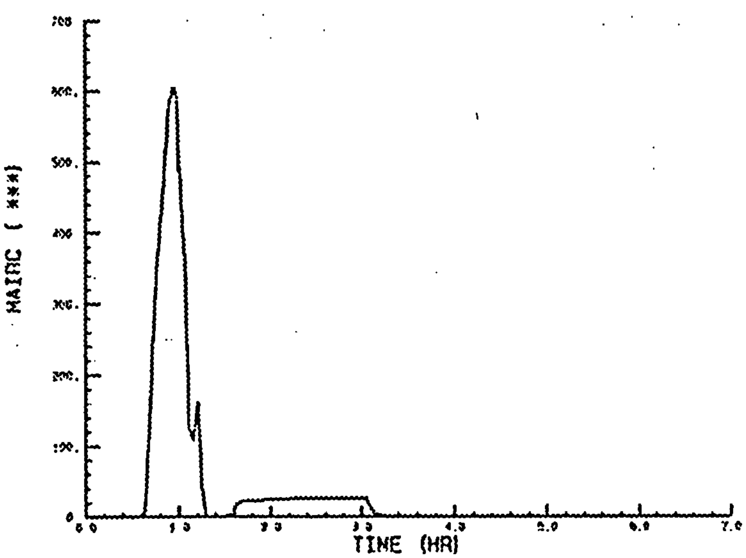

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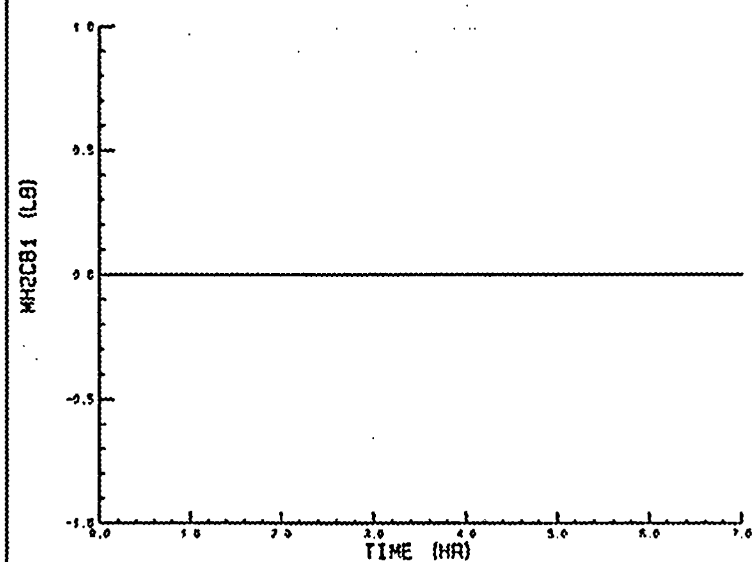
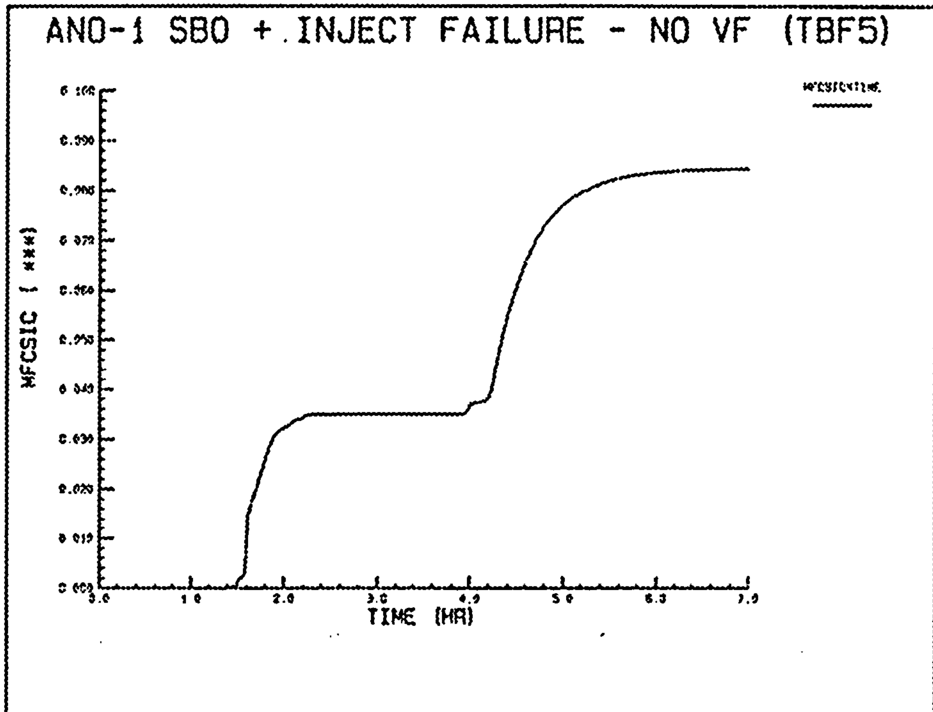
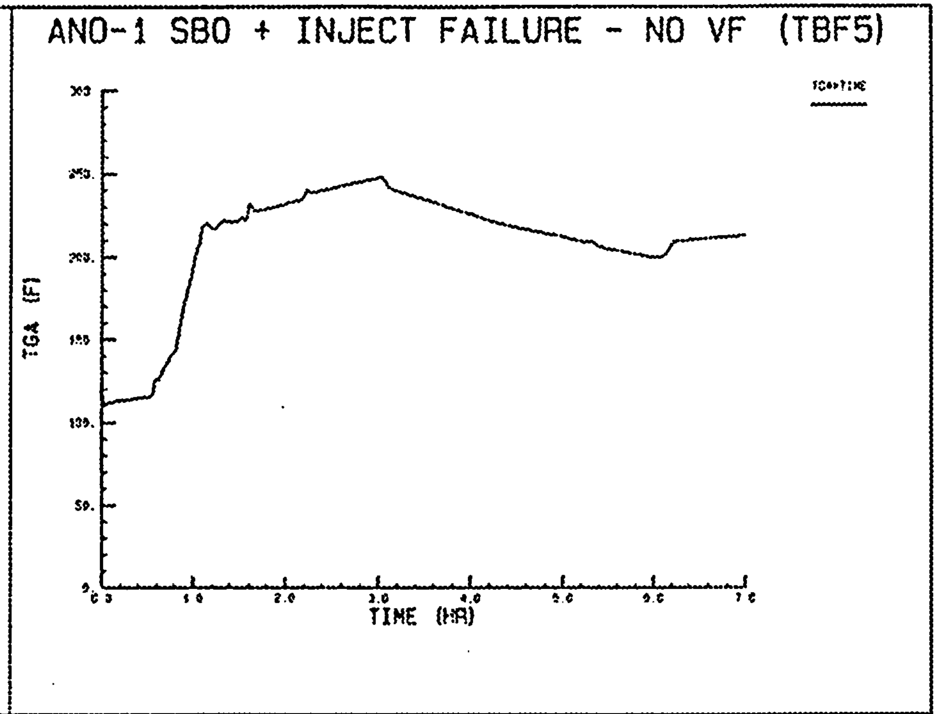
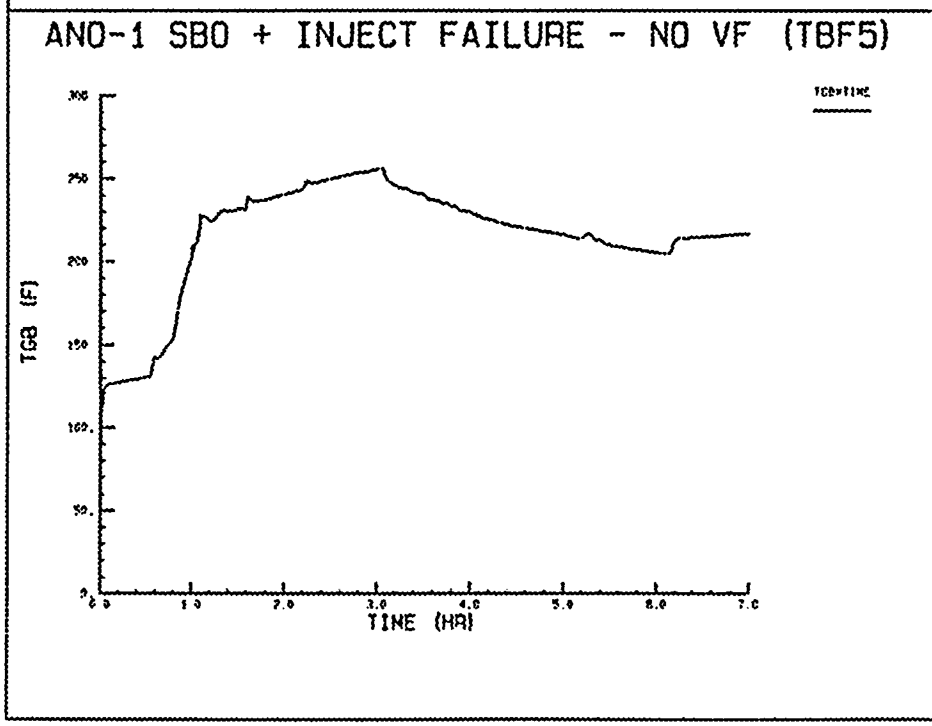




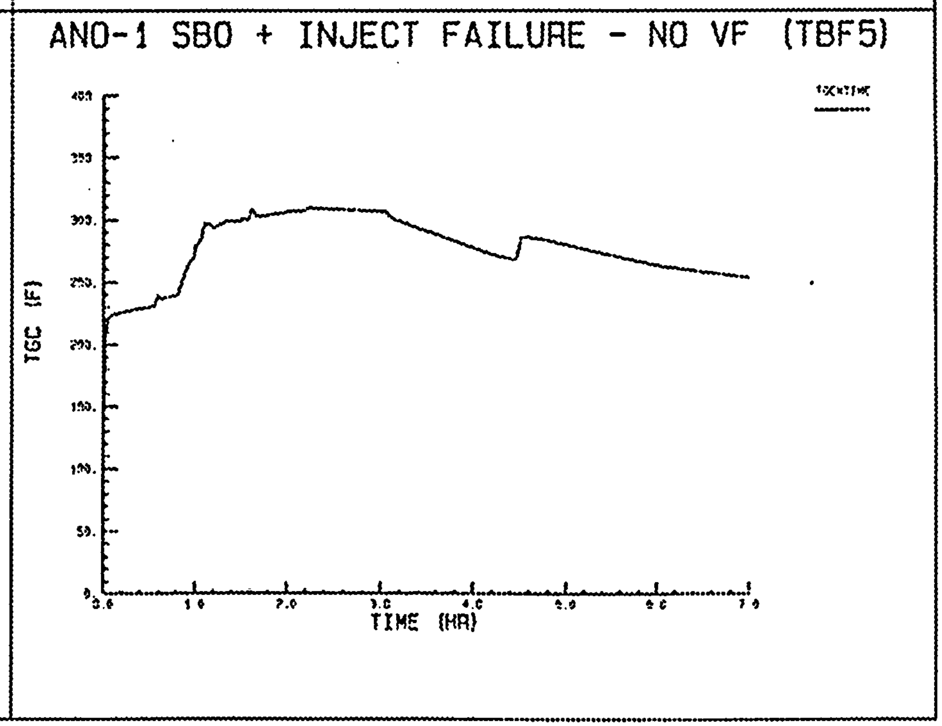
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFCSIC (***)
TIME (HR)



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TGA (F)
TIME (HR)

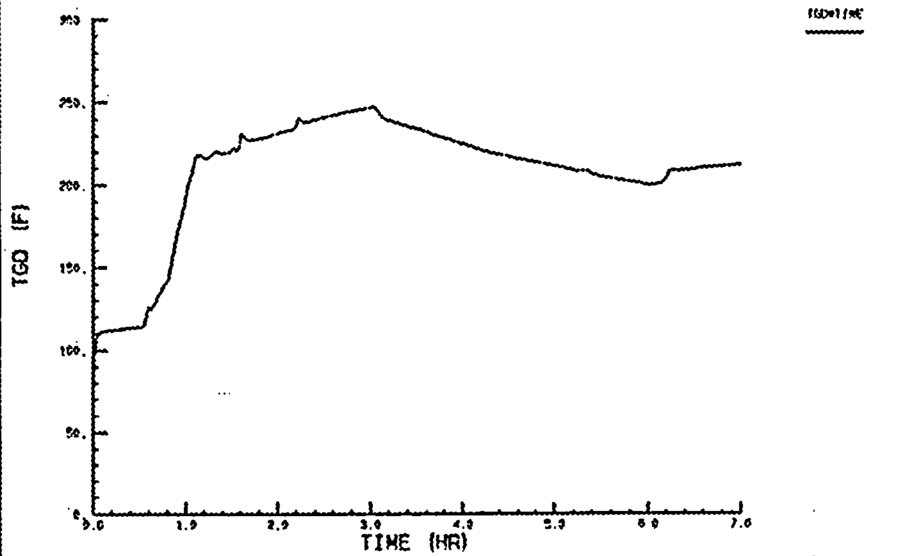


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TGB (F)
TIME (HR)



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TGC (F)
TIME (HR)

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



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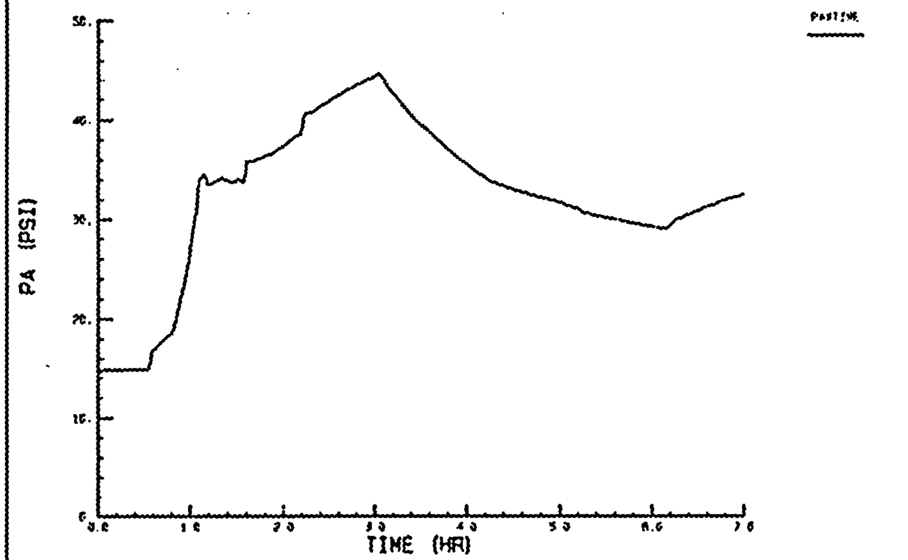

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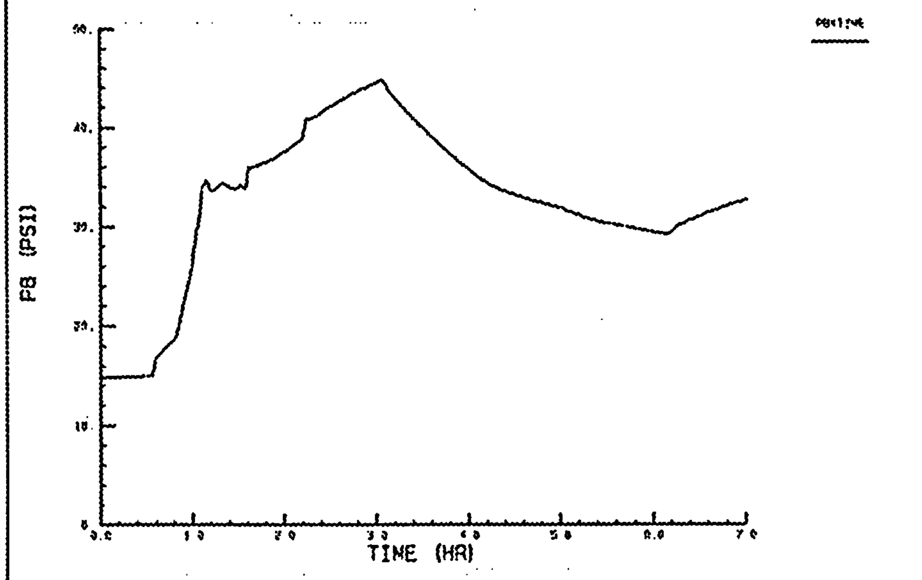

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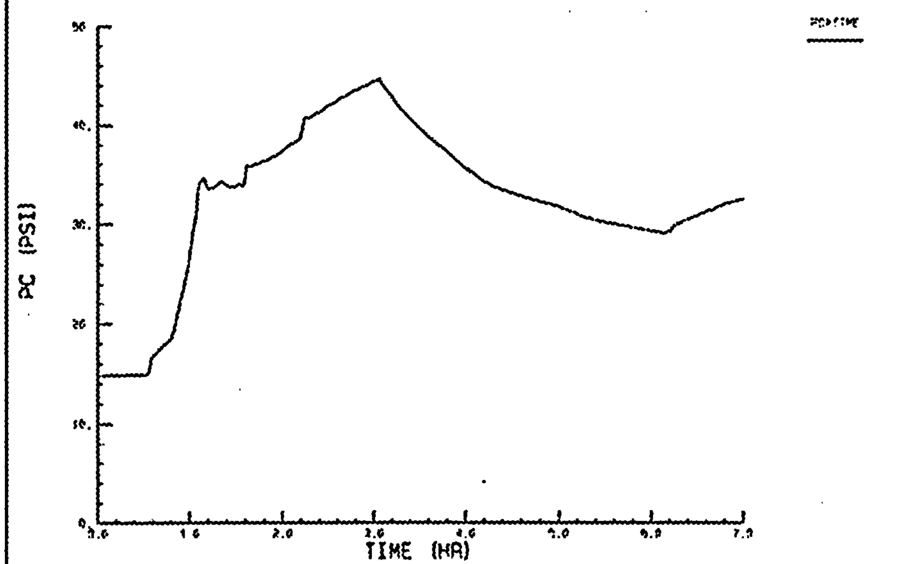

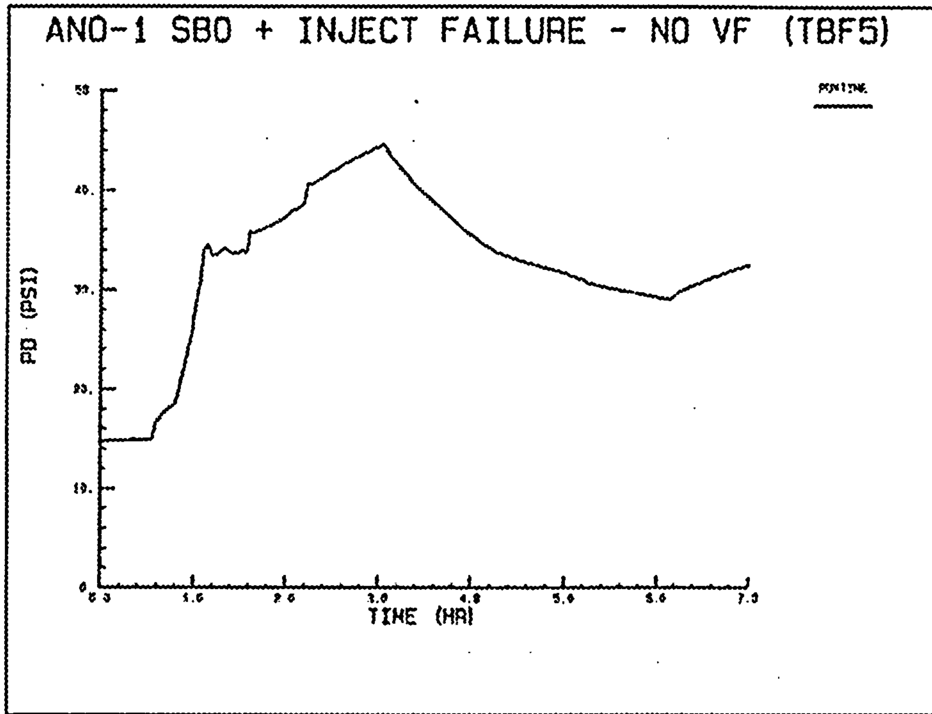
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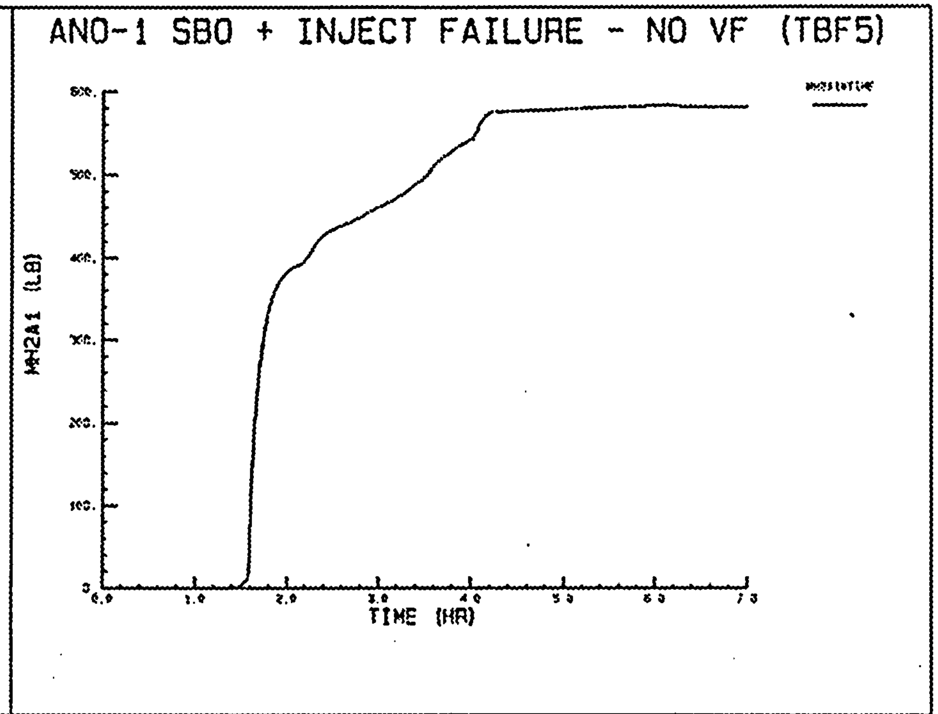
PD (PSI)
TIME (HR)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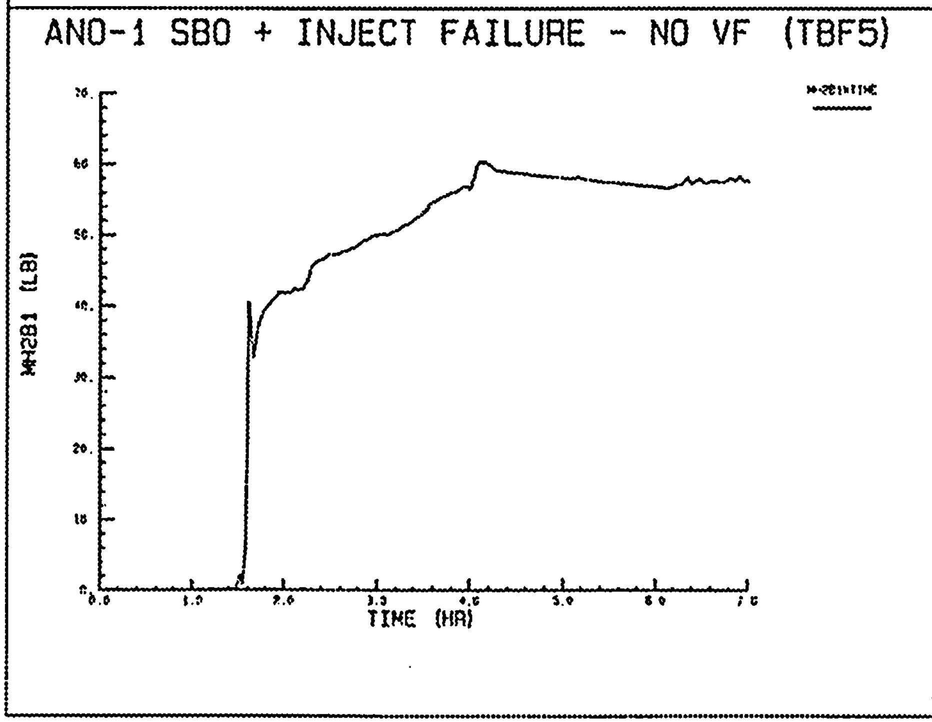
MH2A1 (LB)
TIME (HR)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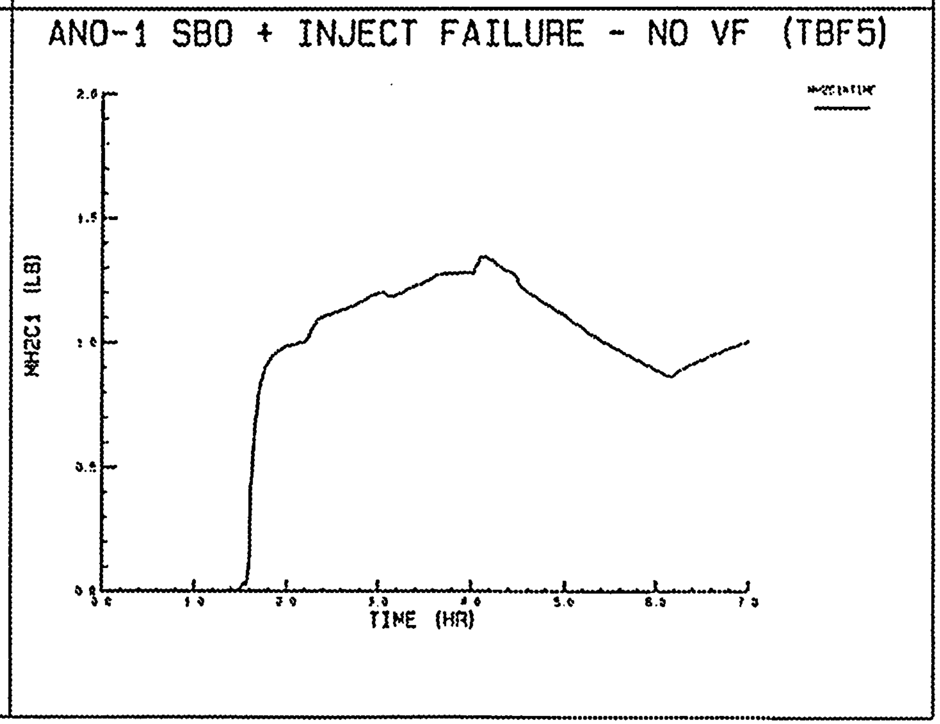
MH2B1 (LB)
TIME (HR)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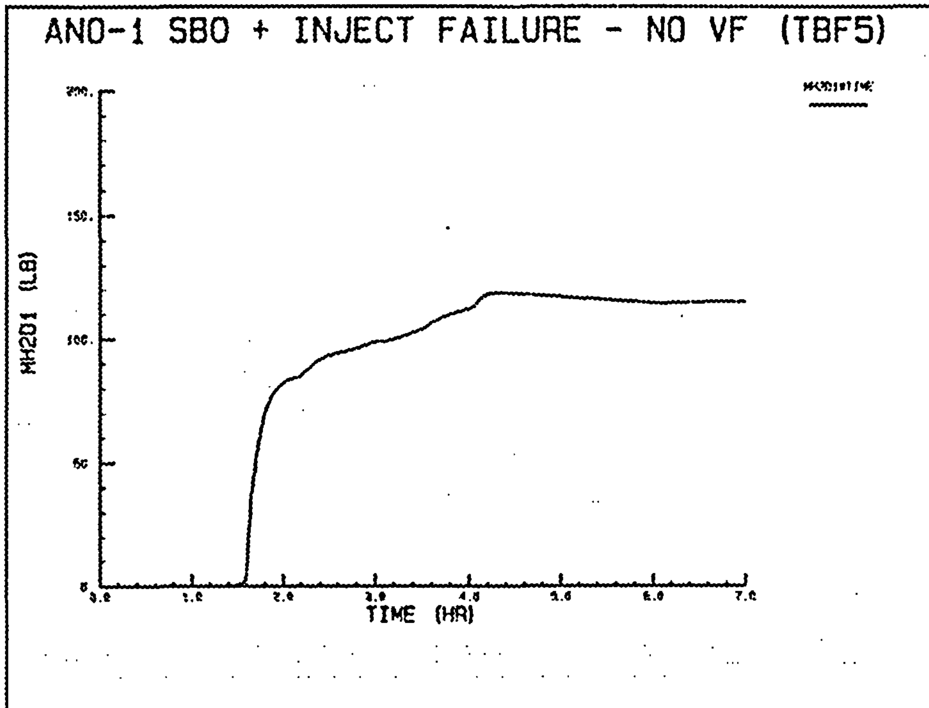
MH2C1 (LB)
TIME (HR)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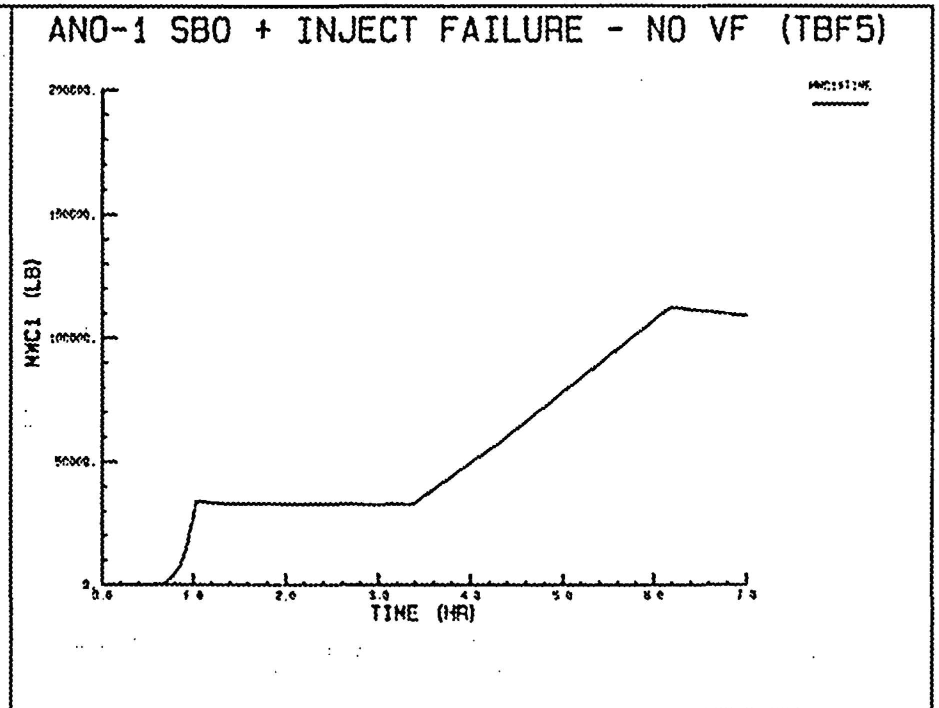
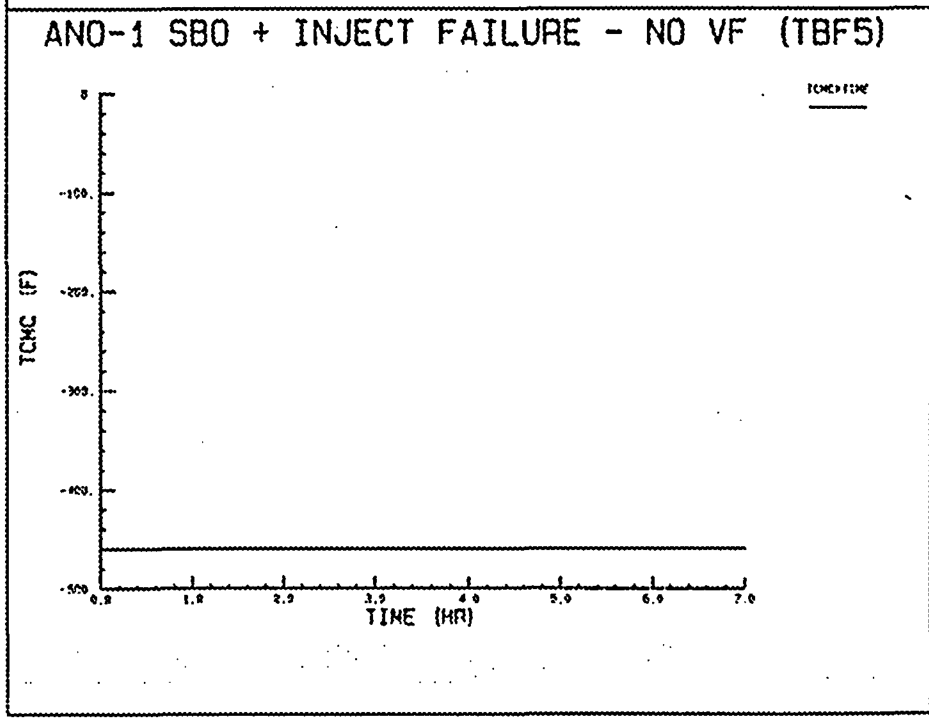
MH2O1 (LB)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TIME (HR)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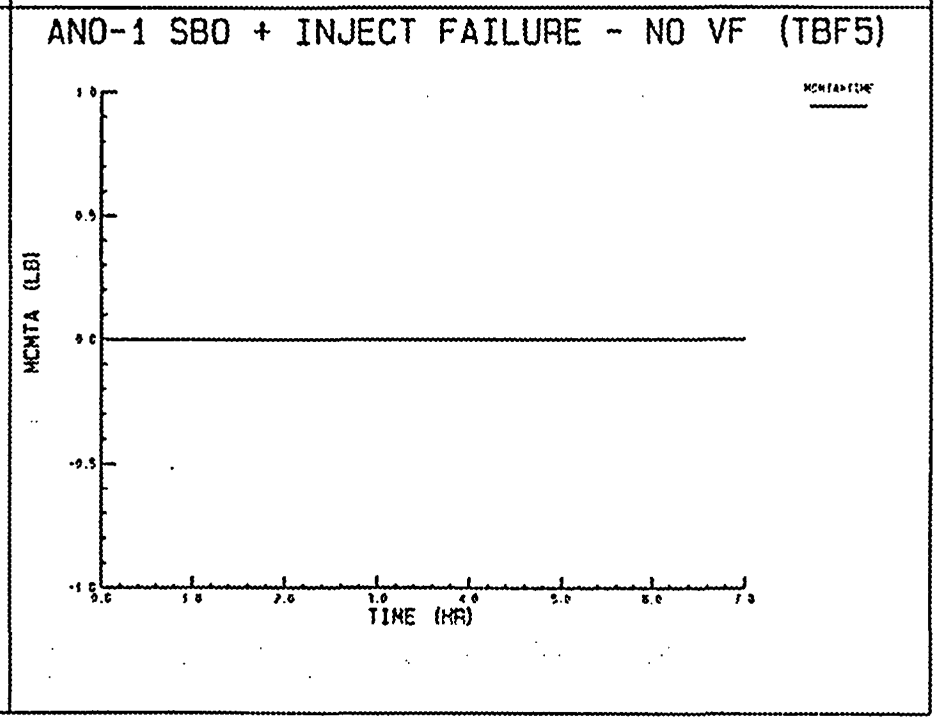
TCMC (F)
TIME (HR)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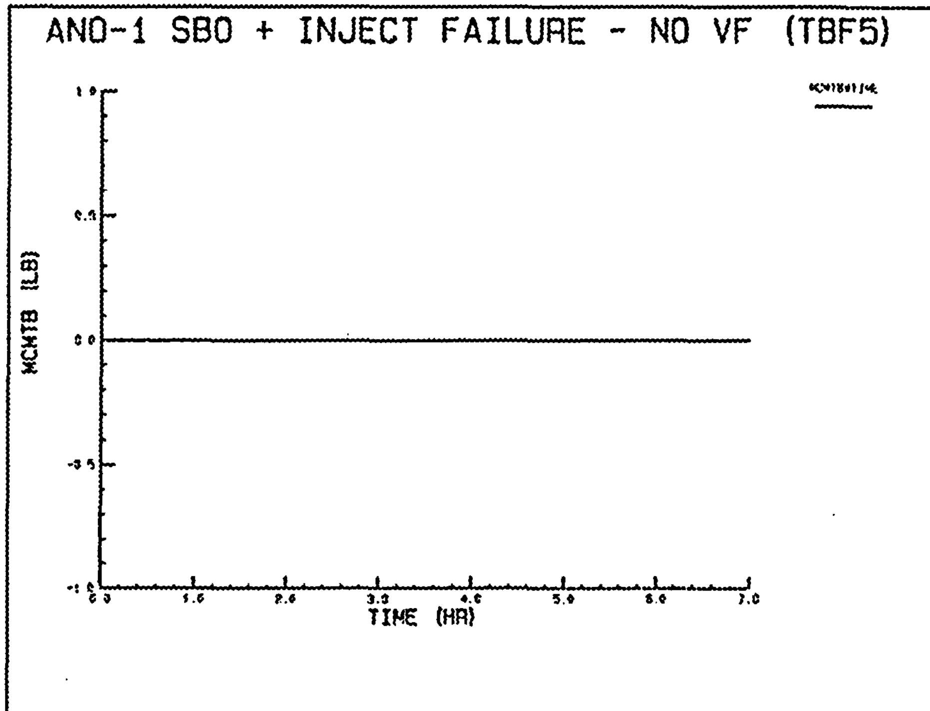
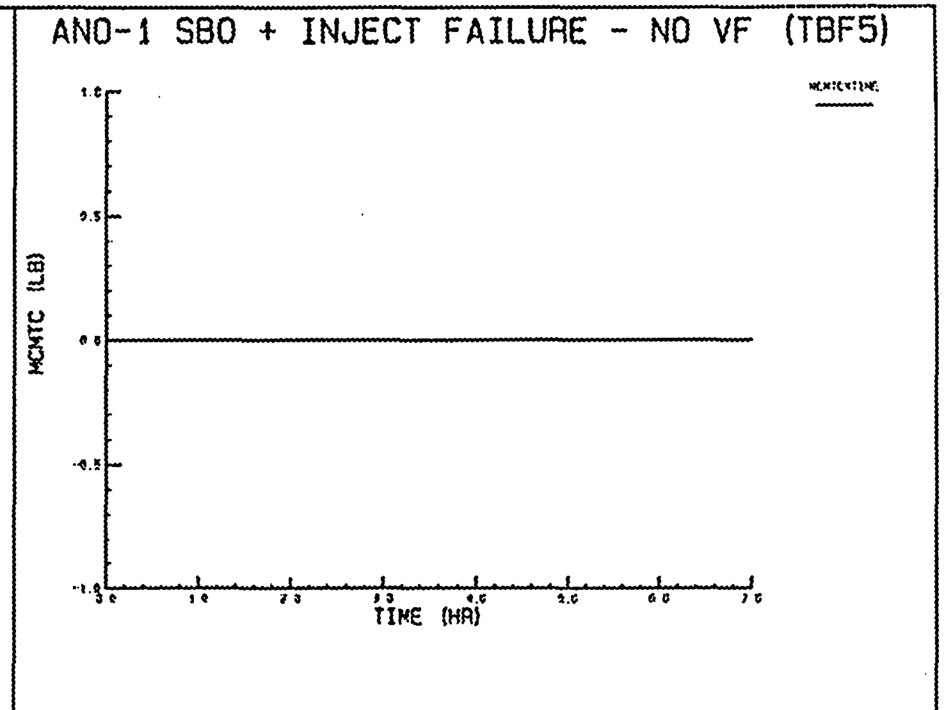
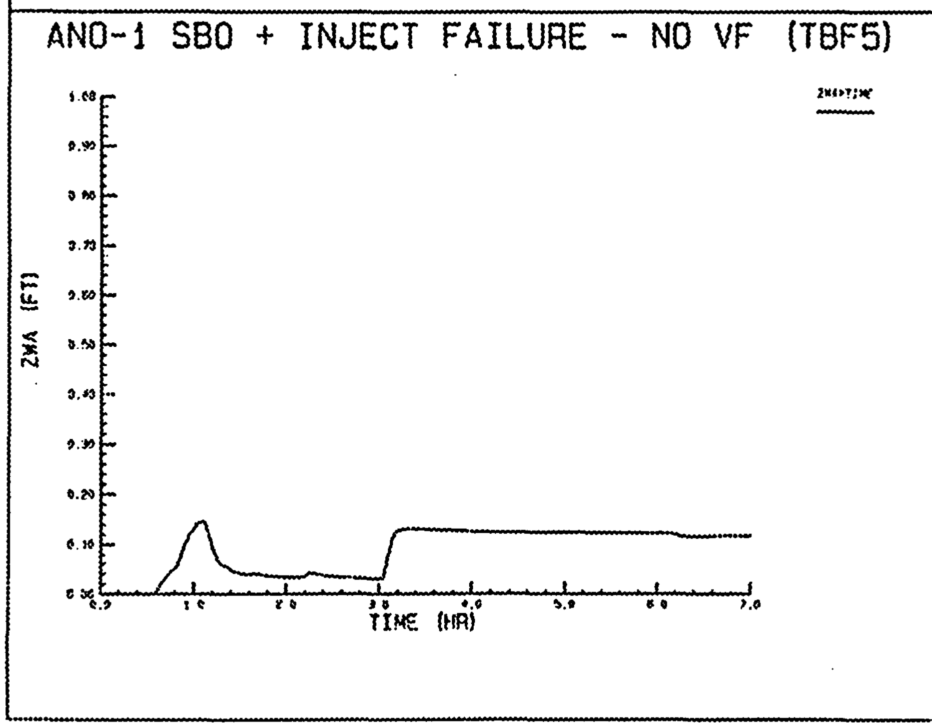
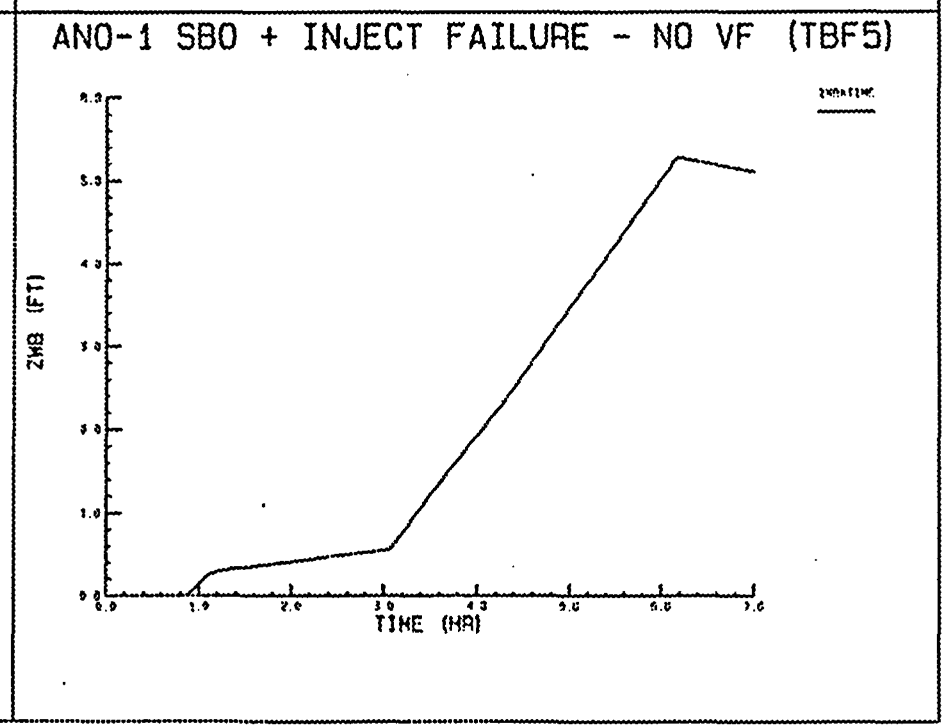
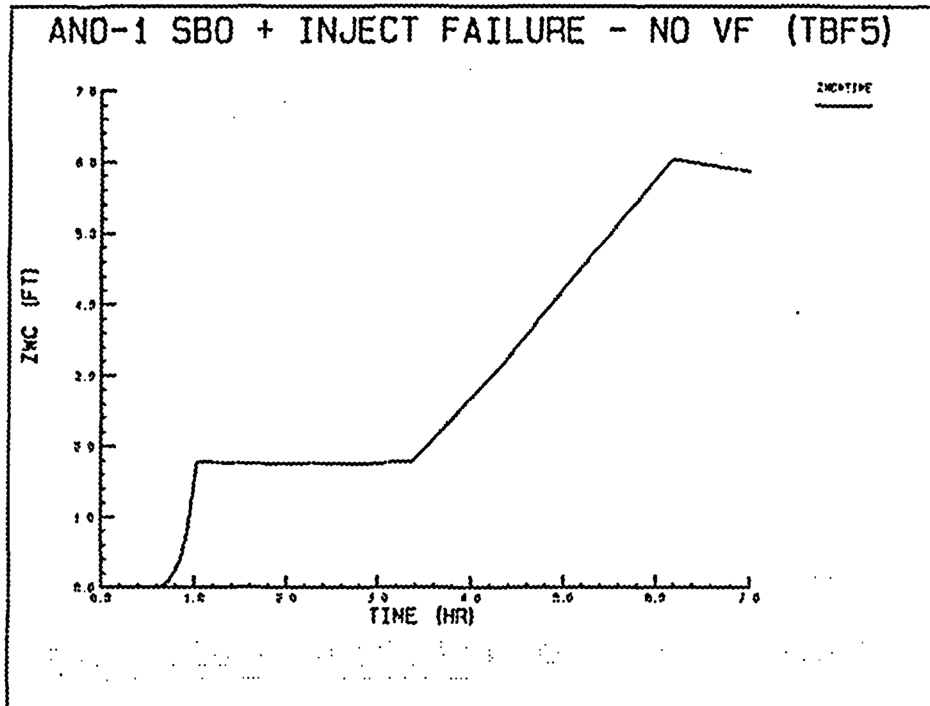
MCMTA (LB)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MCMTB (LB)
TIME (HR)
1.0
0.5
0.0
-0.5
-1.0
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MCMTC (LB)
TIME (HR)
1.0
0.5
0.0
-0.5
-1.0


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
ZWA (FT)
TIME (HR)
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
ZWB (FT)
TIME (HR)
5.0
4.0
3.0
2.0
1.0
0.0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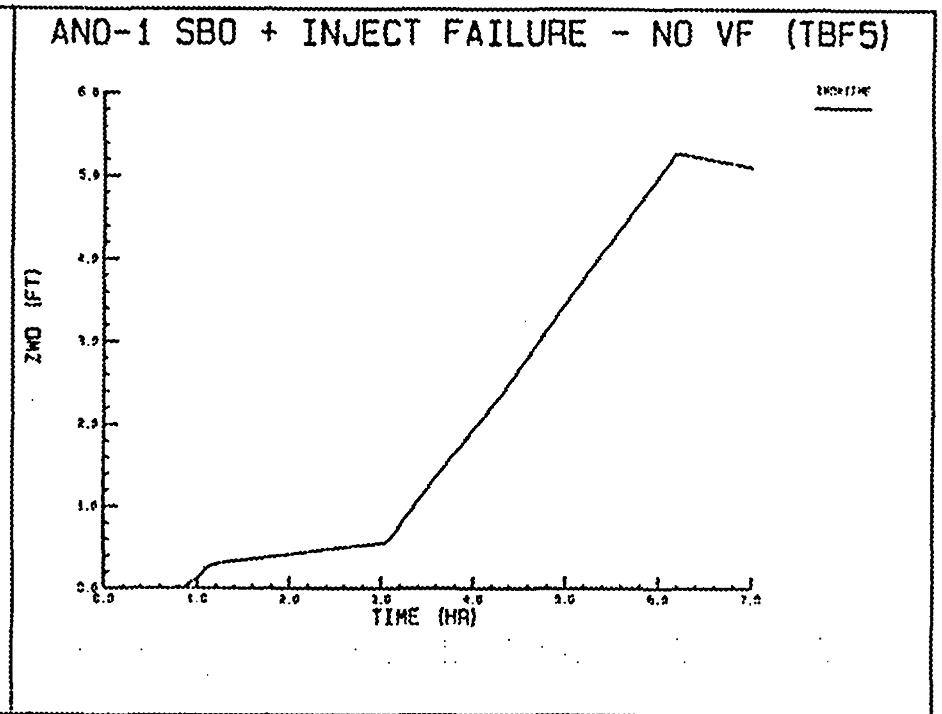
ZWC (FT)
TIME (HR)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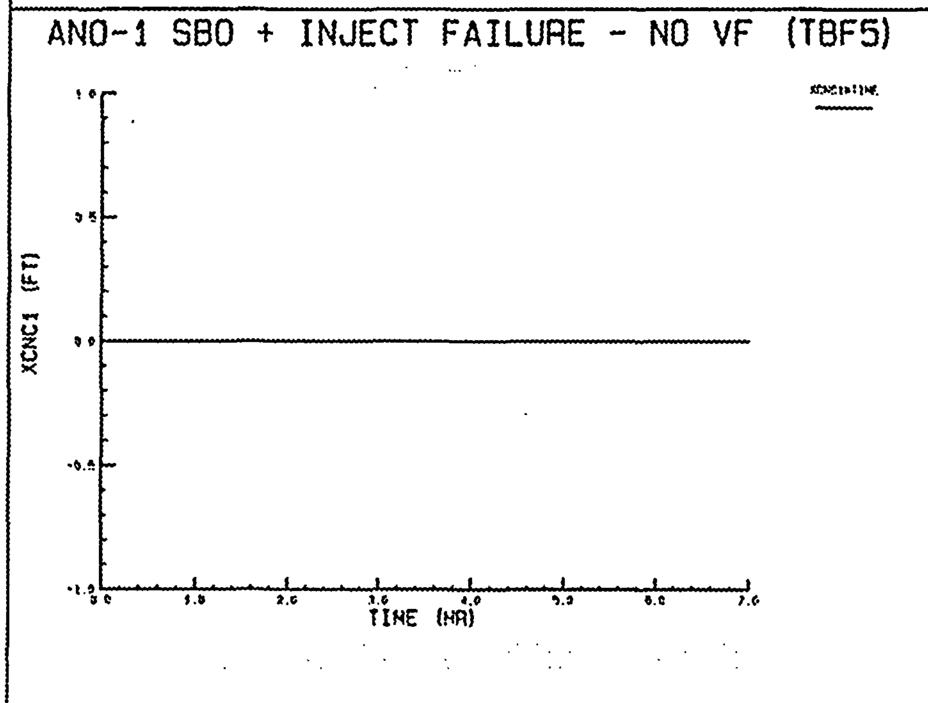
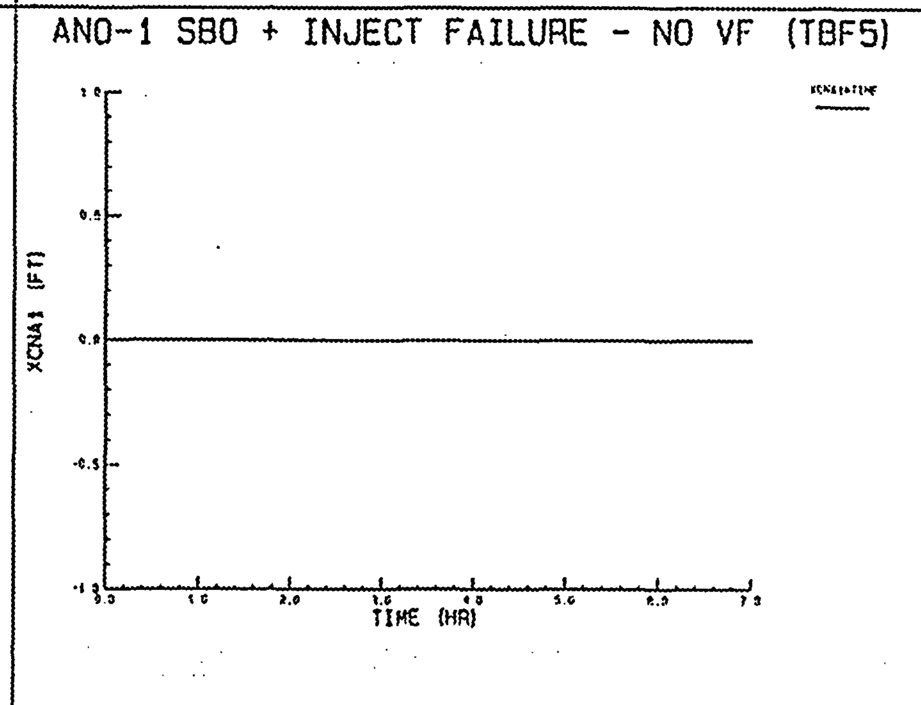
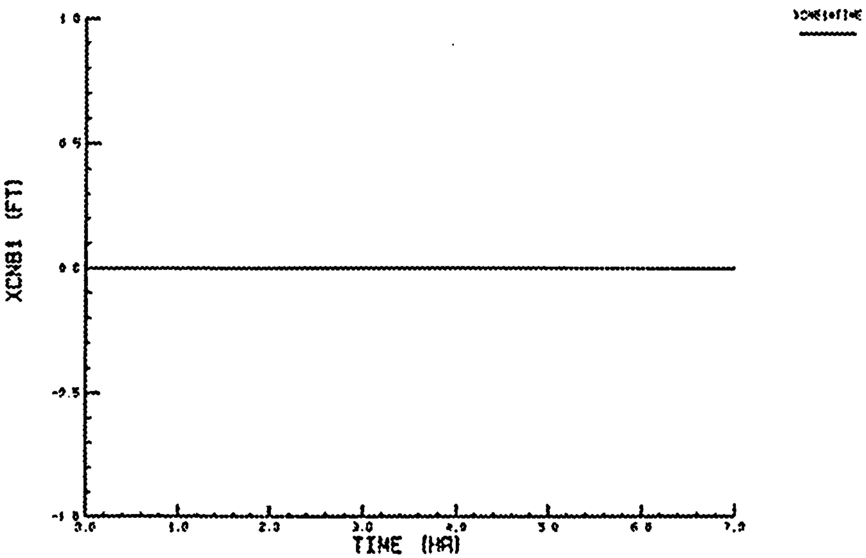
ZWD (FT)
TIME (HR)

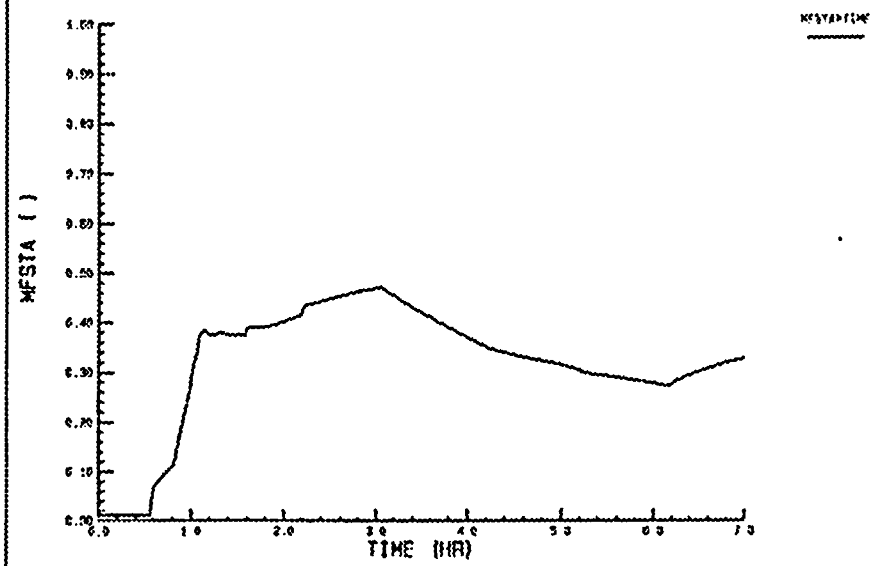

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
XCNC1 (FT)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
XCNA1 (FT)
TIME (HR)

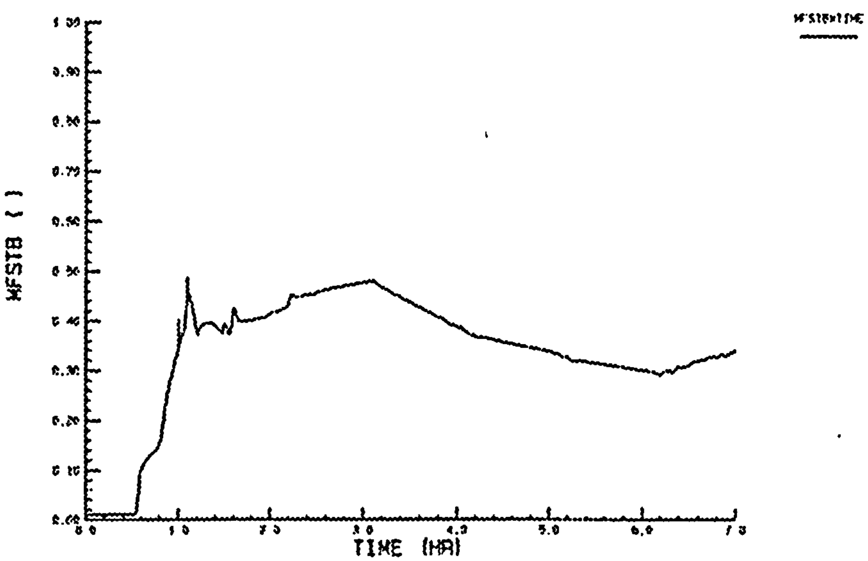
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



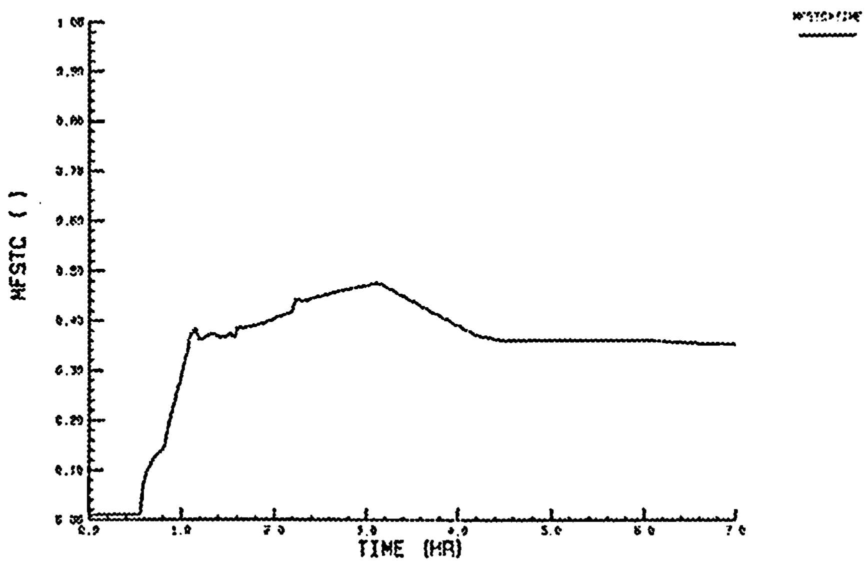
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



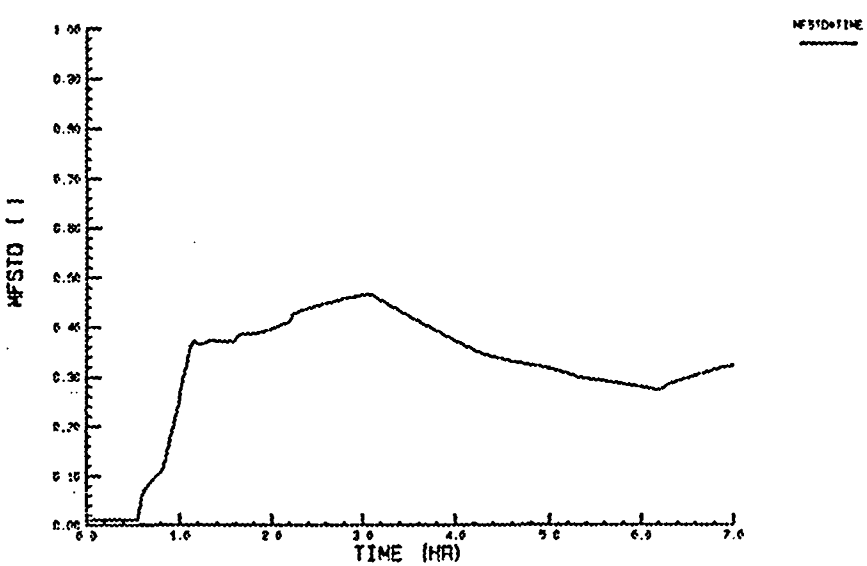
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



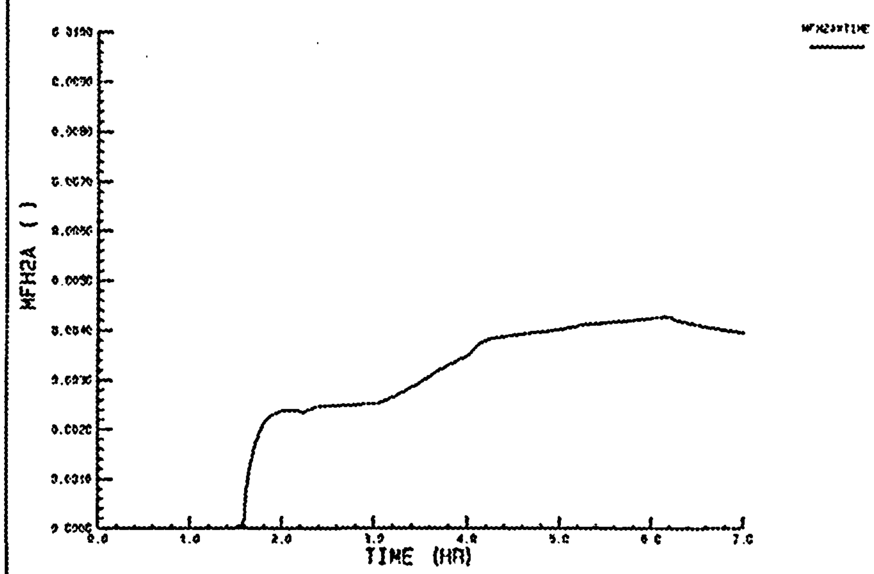
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



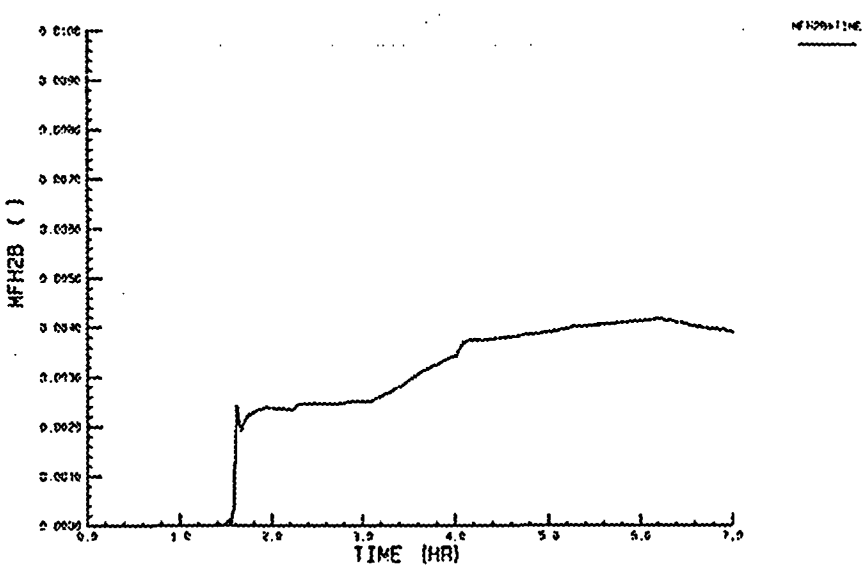
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)



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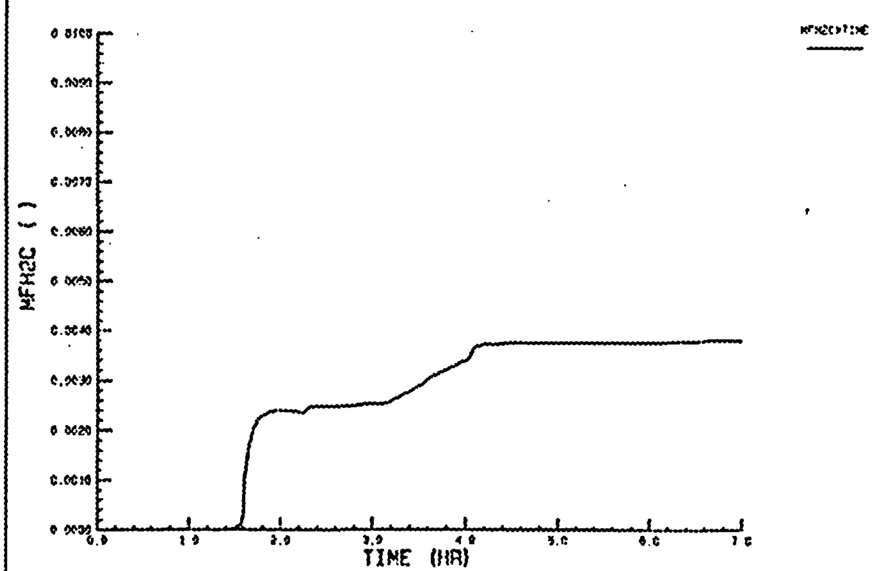

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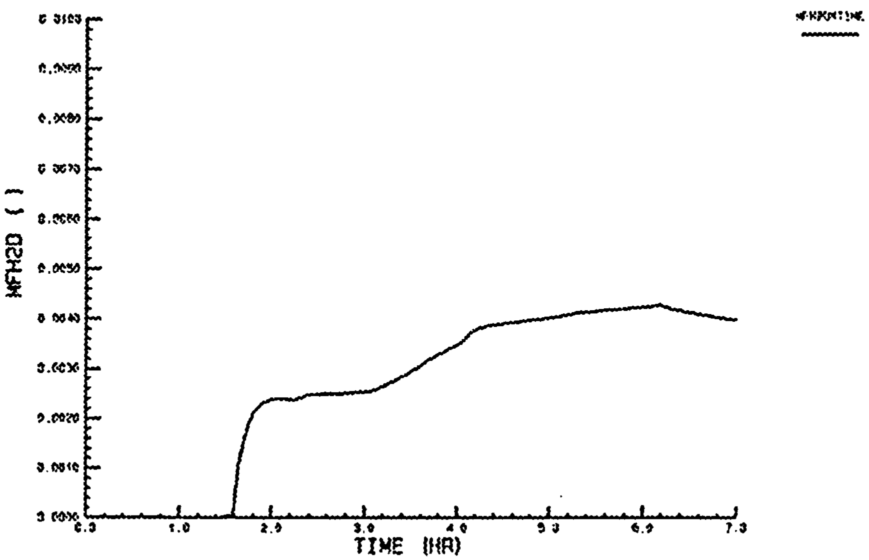
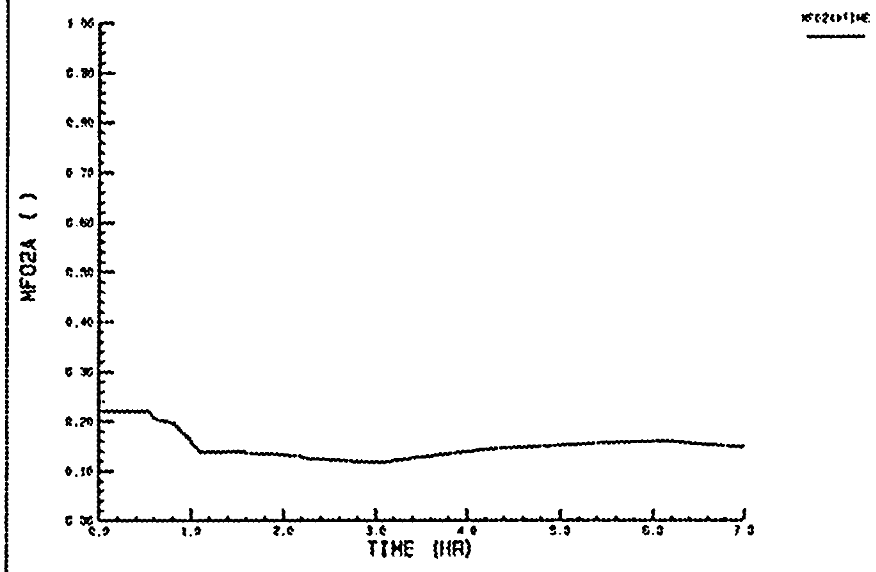
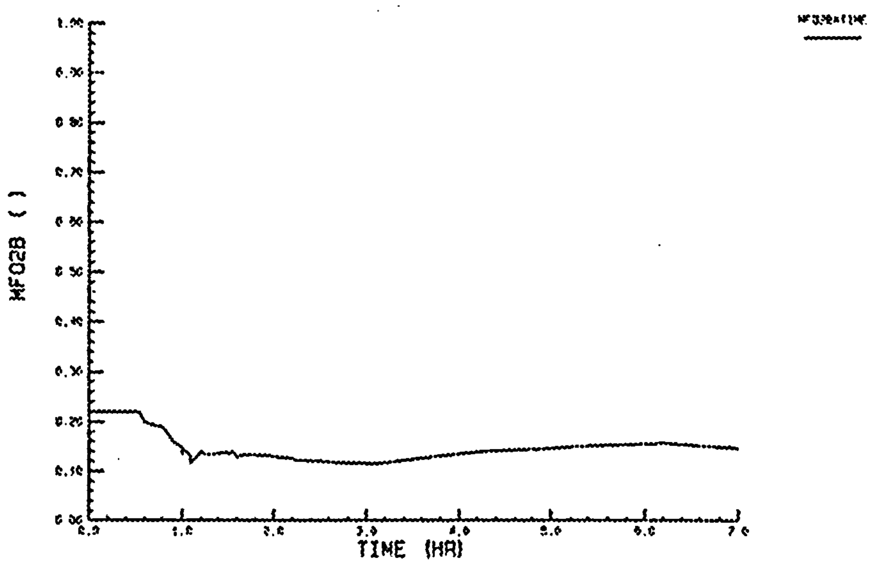


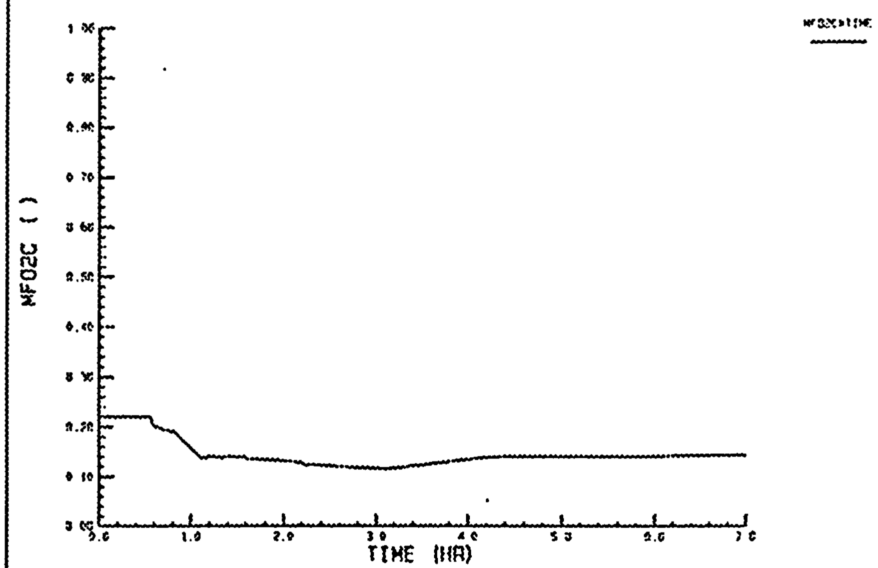
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)

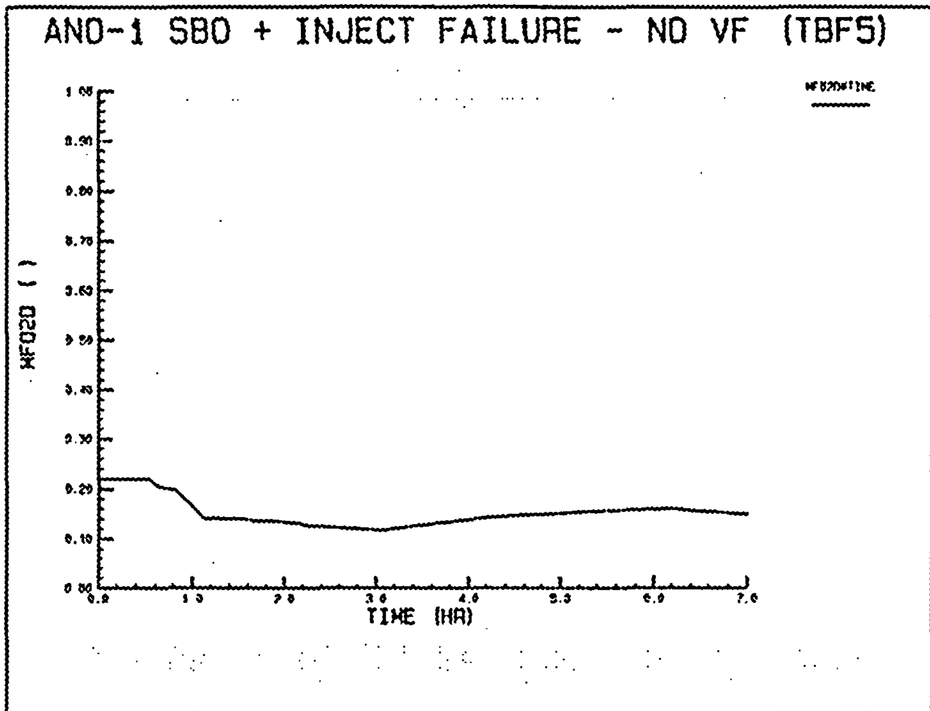


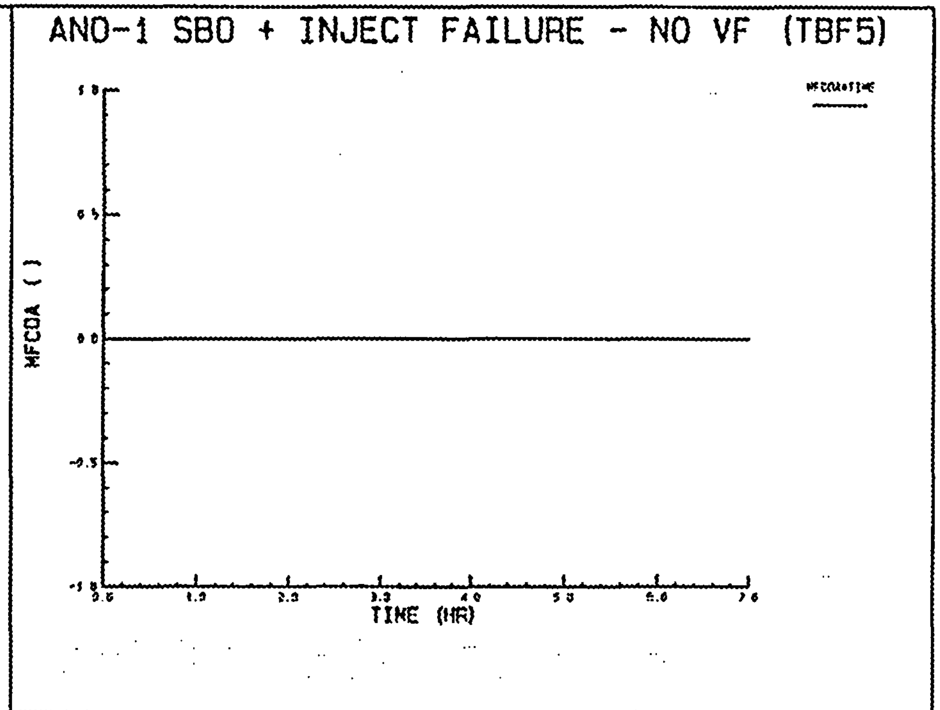
ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)

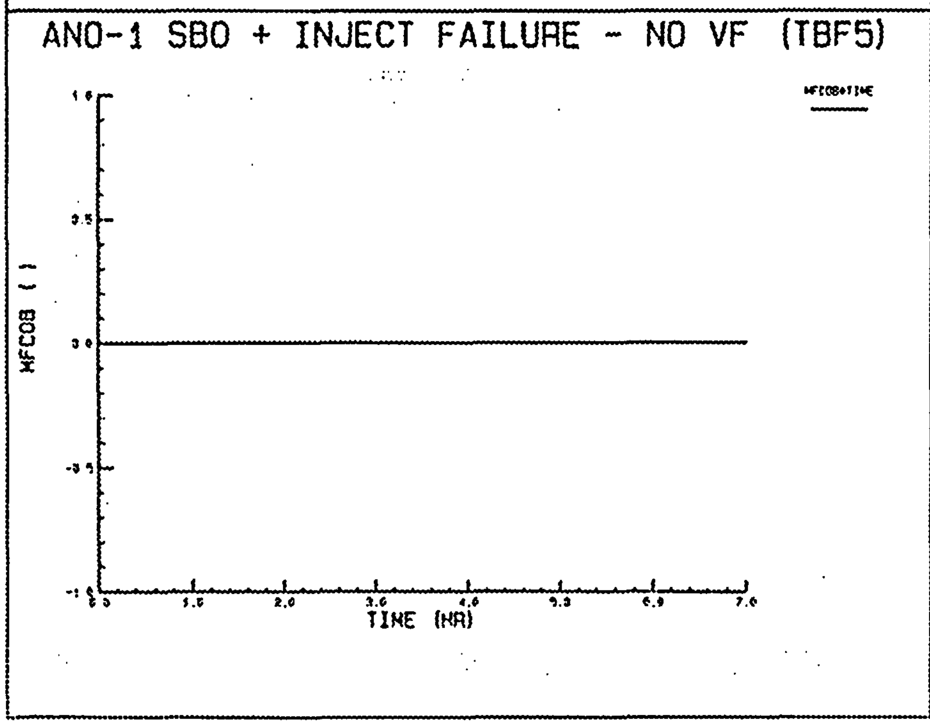


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)




ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFO2D ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFCOA ( )
TIME (HR)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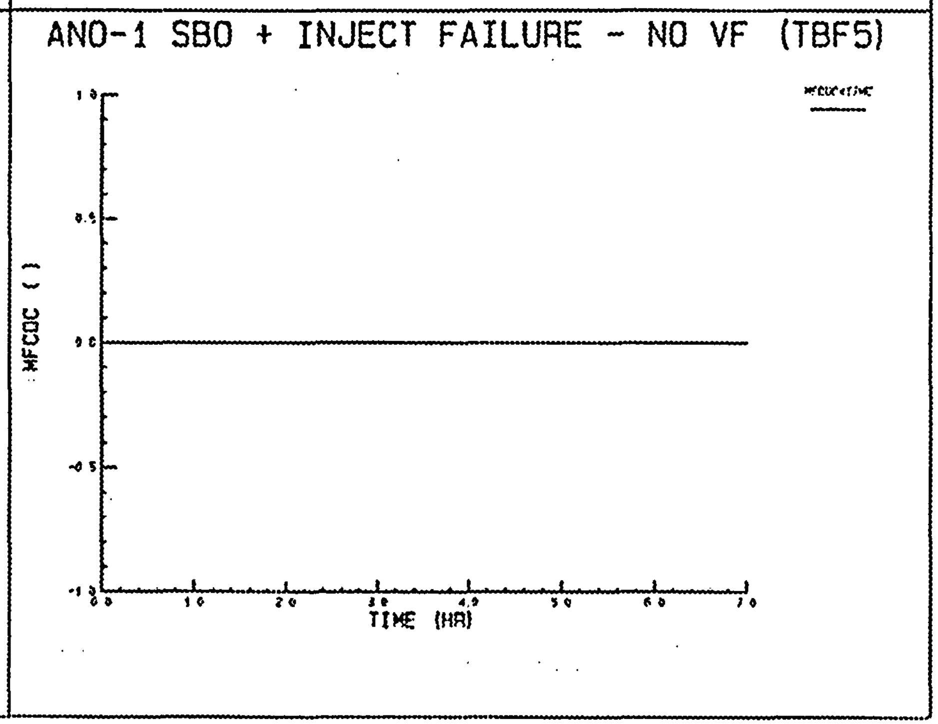
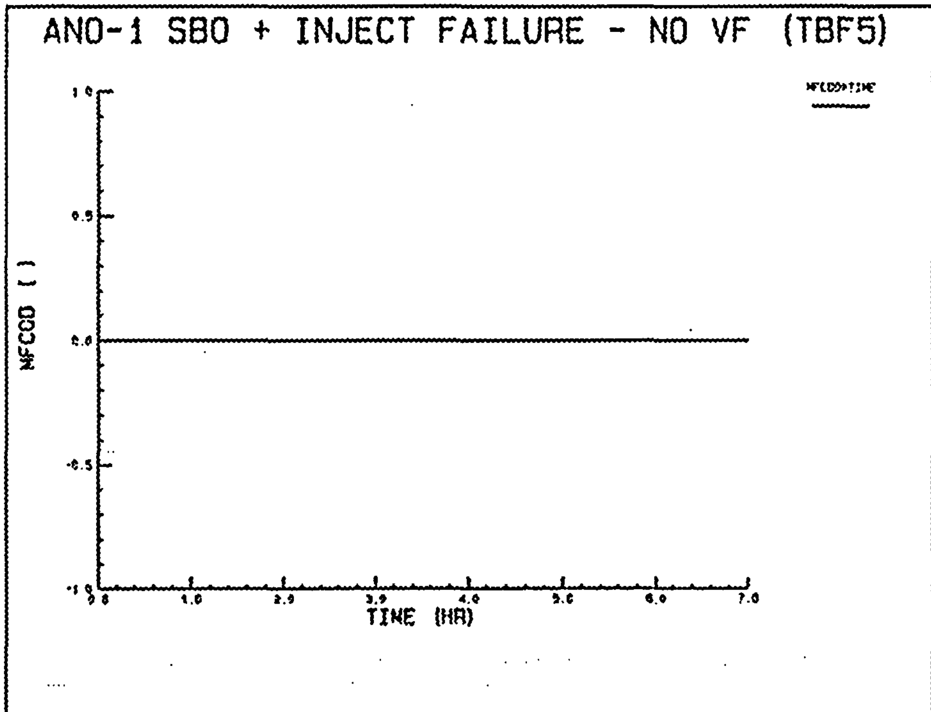
MFCOB ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFCOC ( )
TIME (HR)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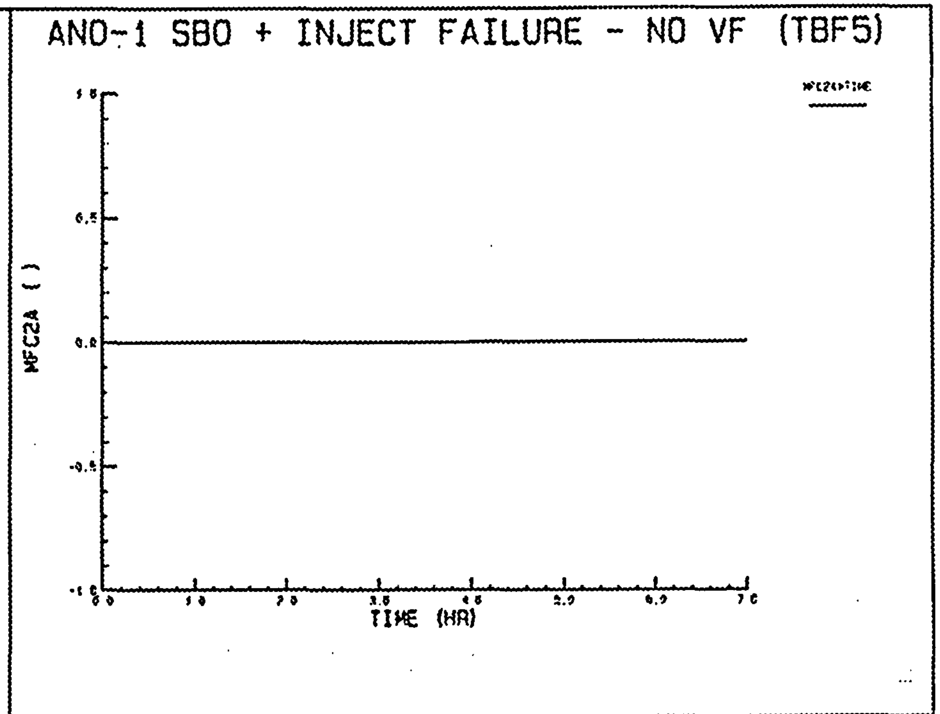
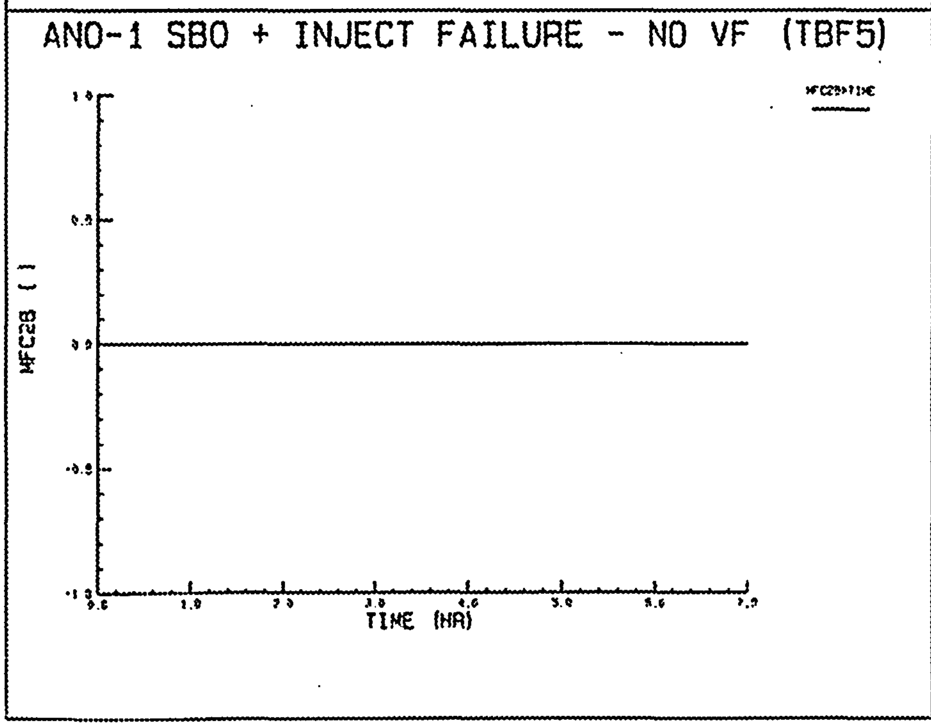
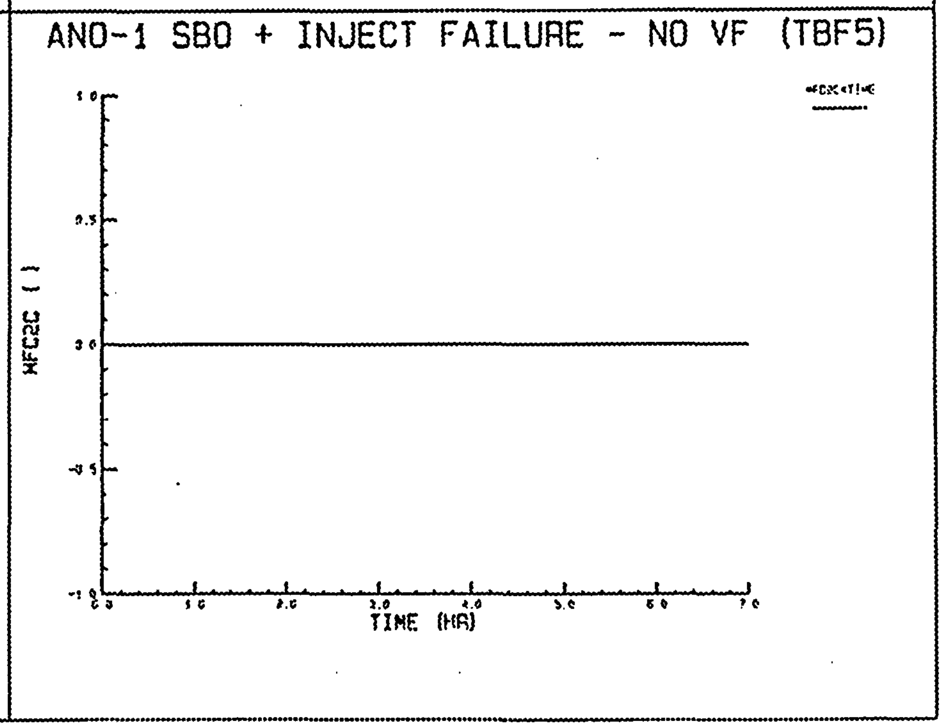
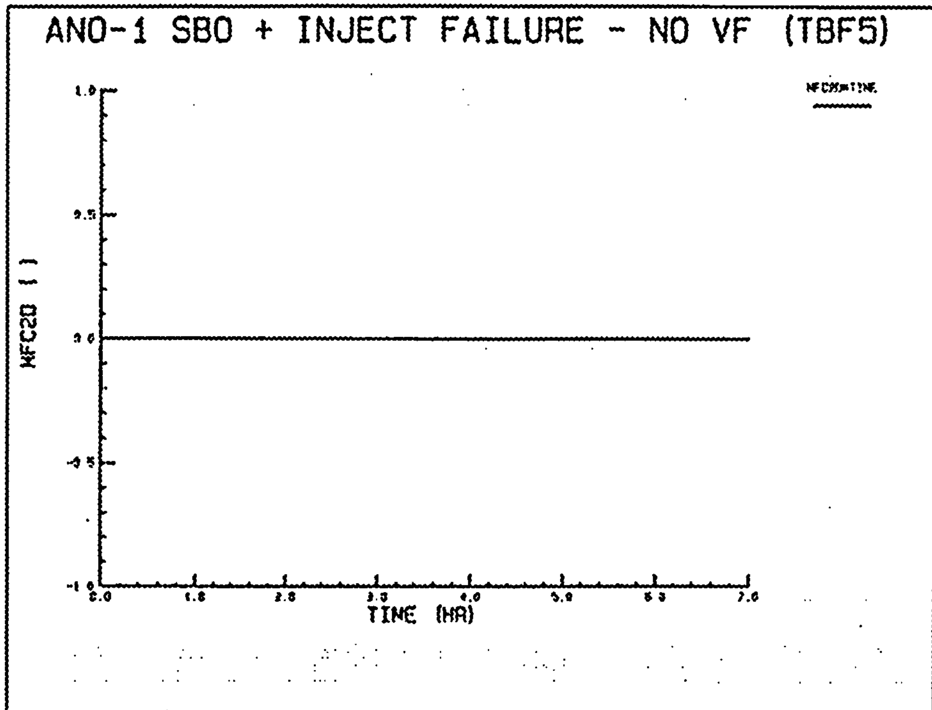
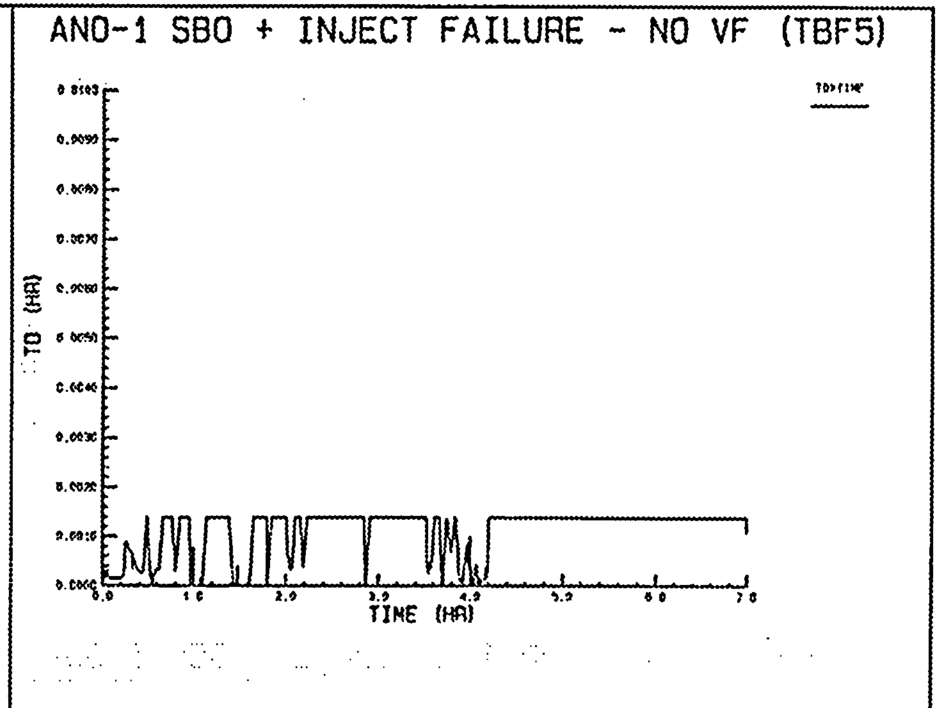
MFCDD ( )
TIME (HR)

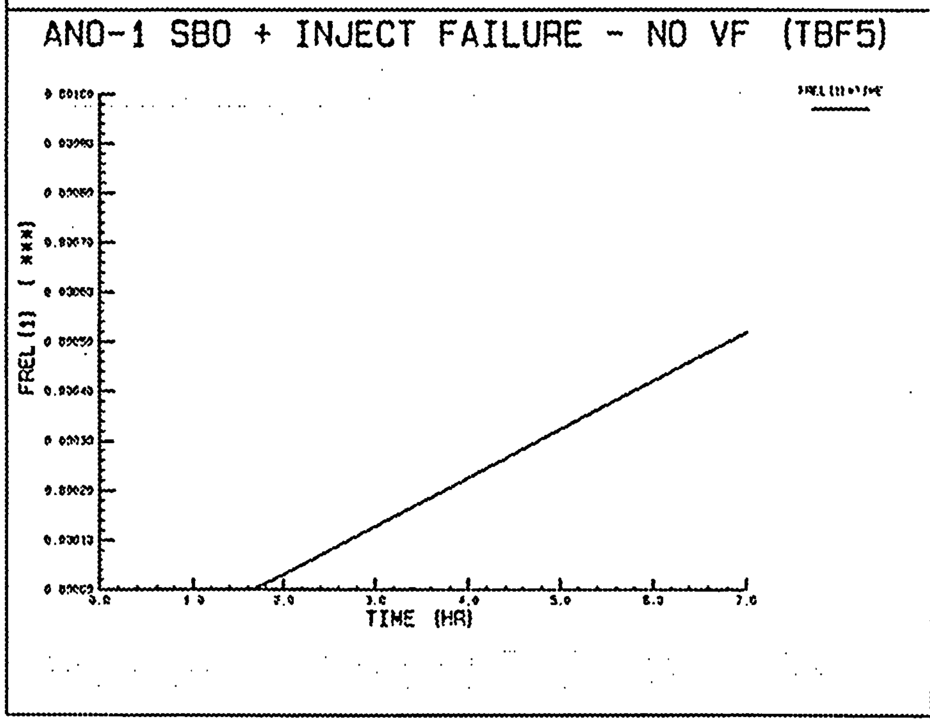

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFC2A ( )
TIME (HR)

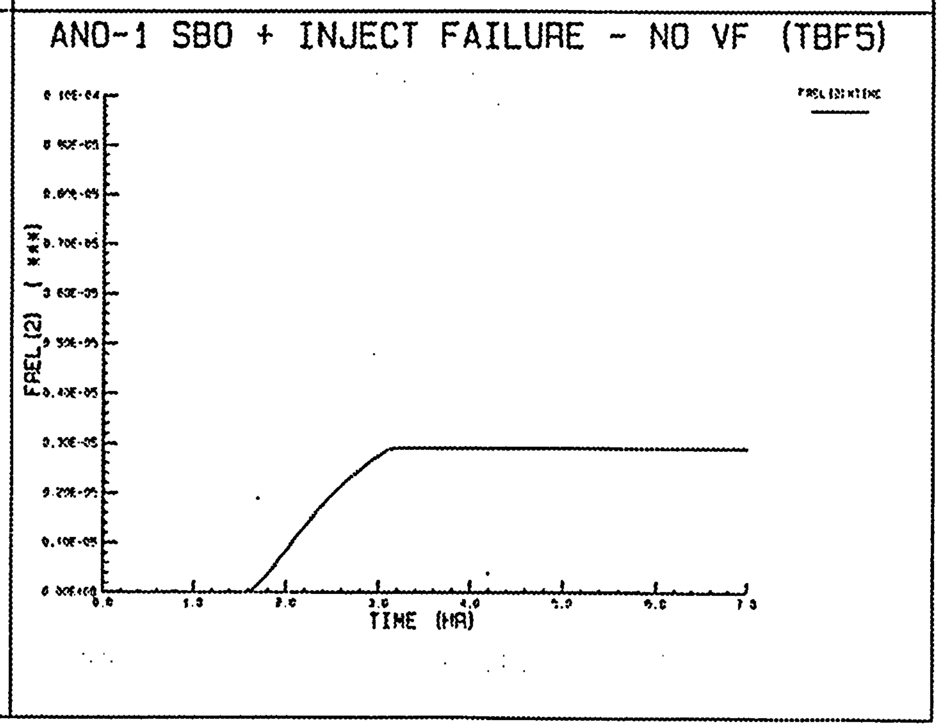

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFC2B ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
MFC2C ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
WFC2D ( )
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
TD (HR)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(1) (***)
TIME (HR)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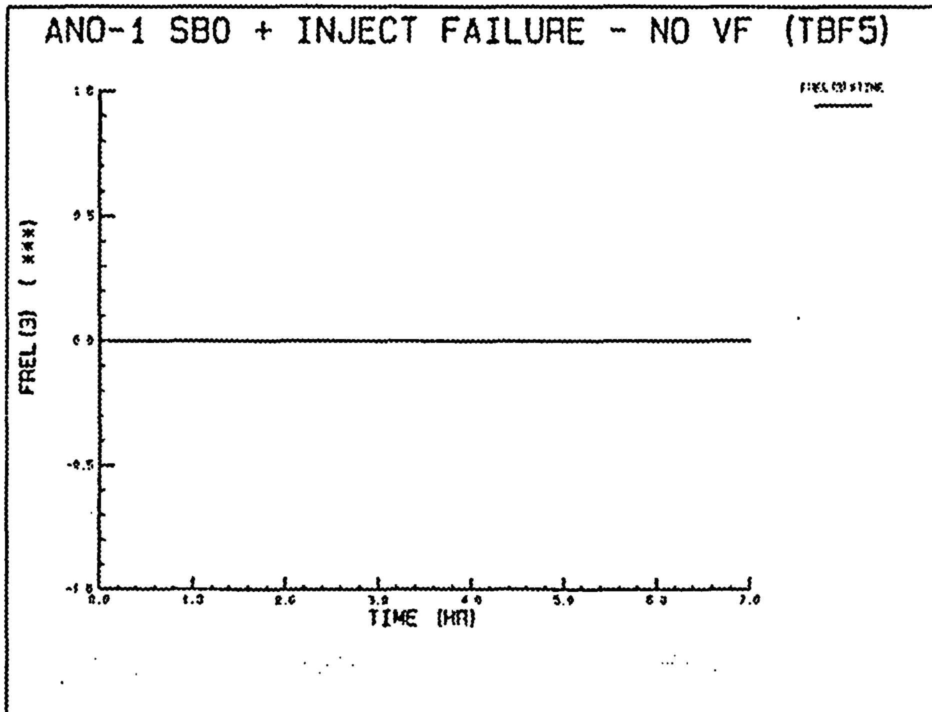
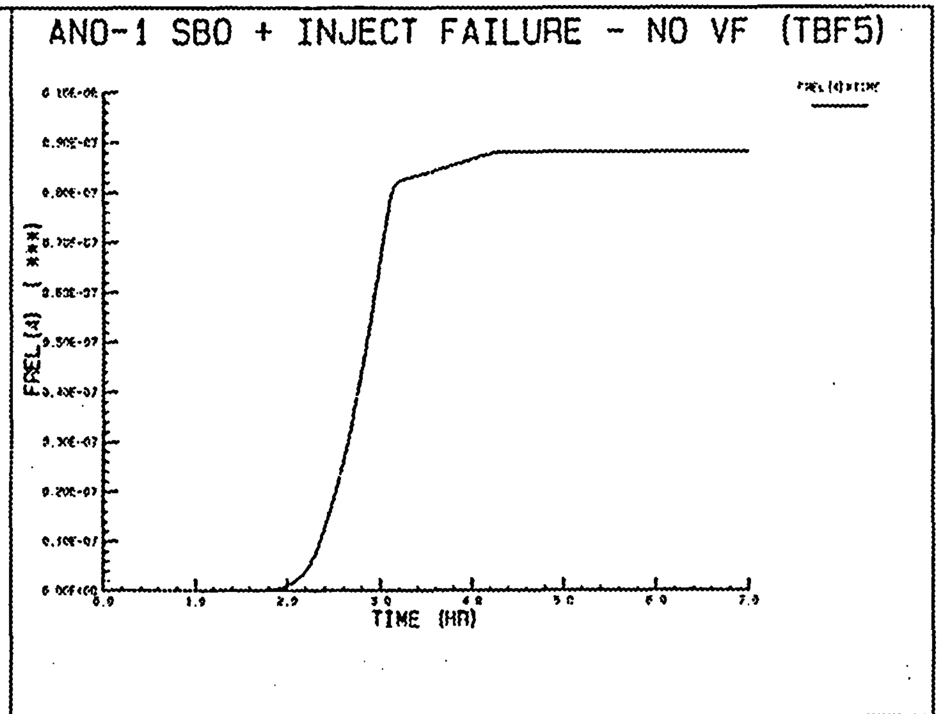
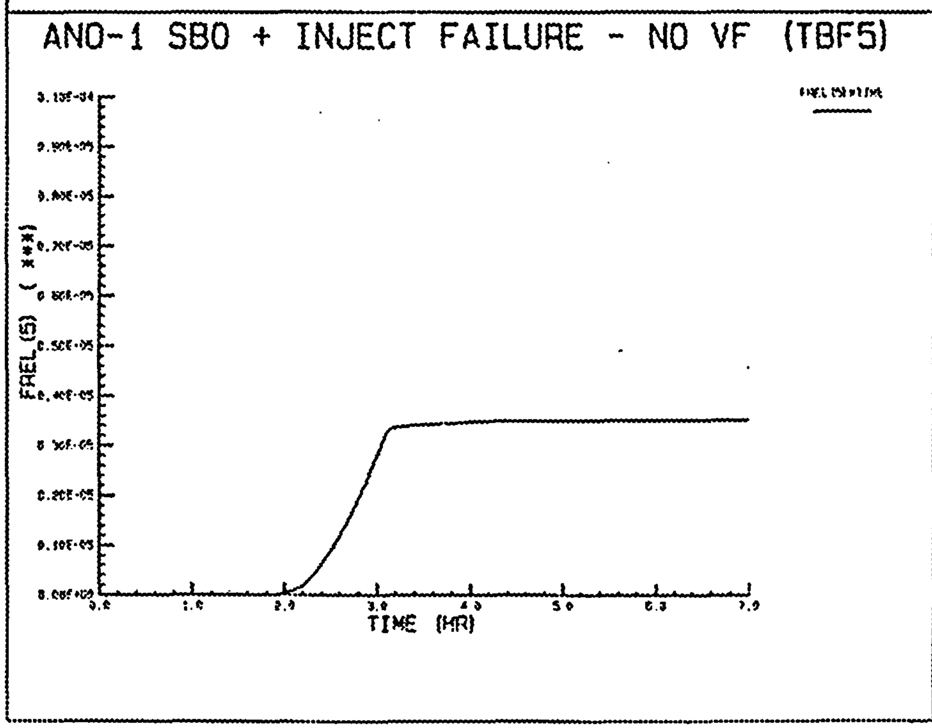
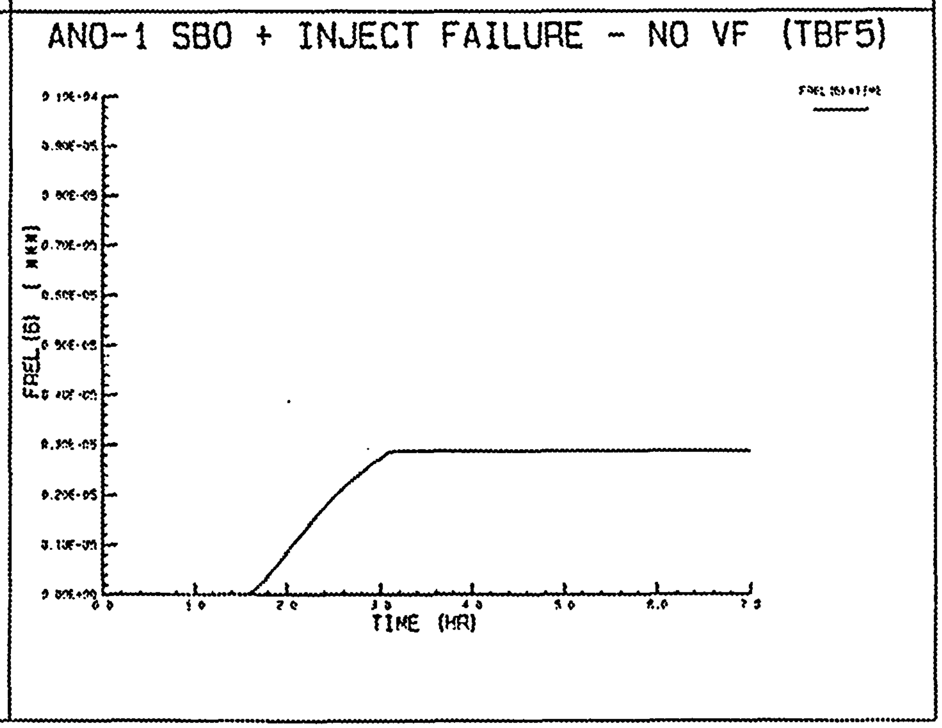
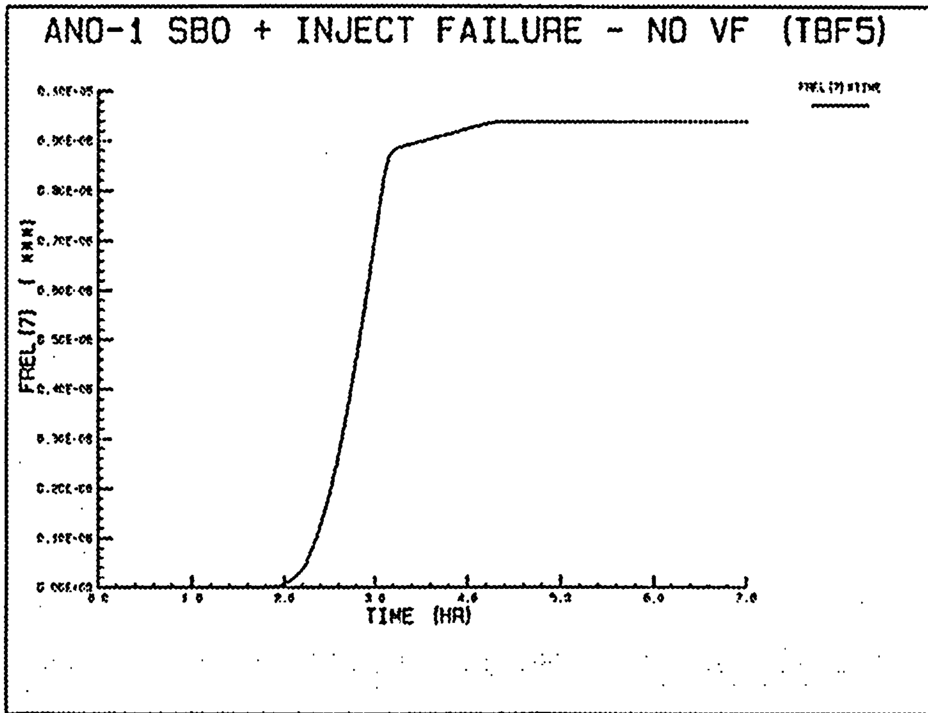
FREL(2) (***)
TIME (HR)

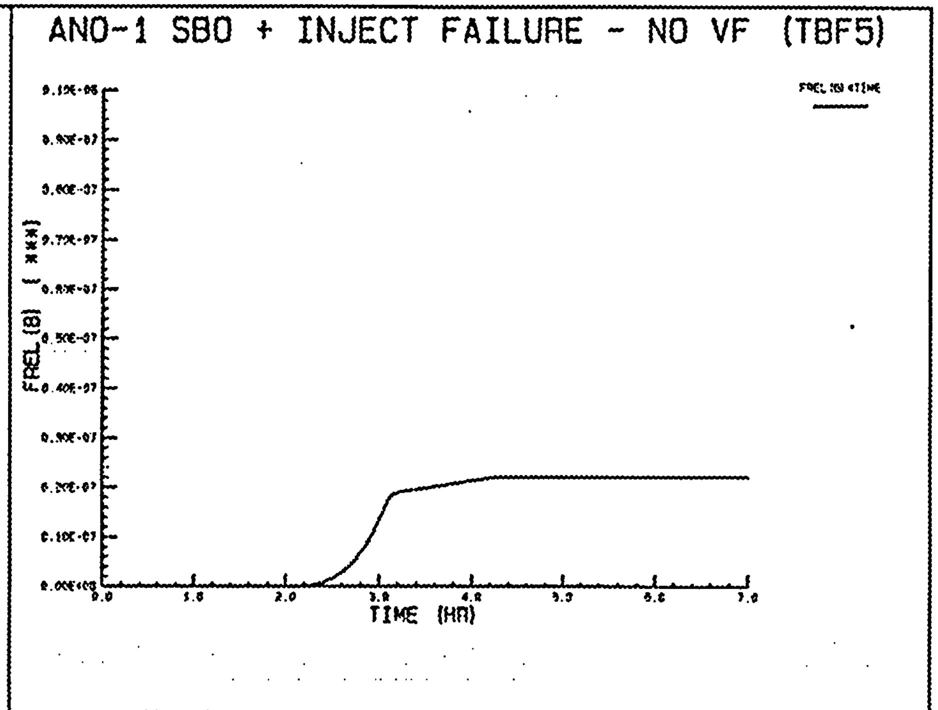

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(3) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(4) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(5) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(6) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(7) (***)
TIME (HR)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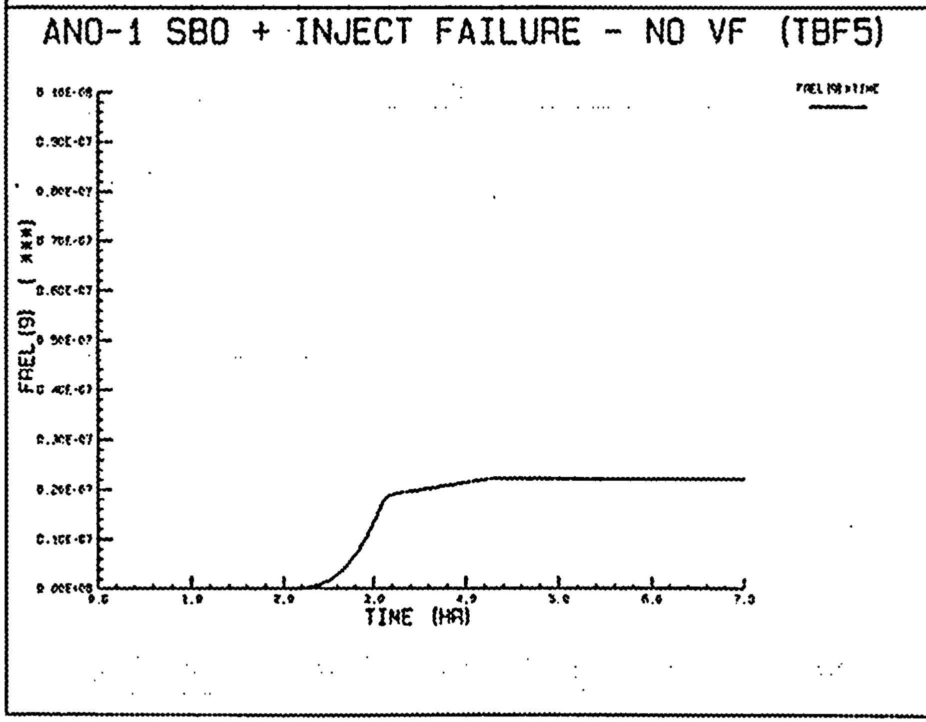
FREL(8) (***)
TIME (HR)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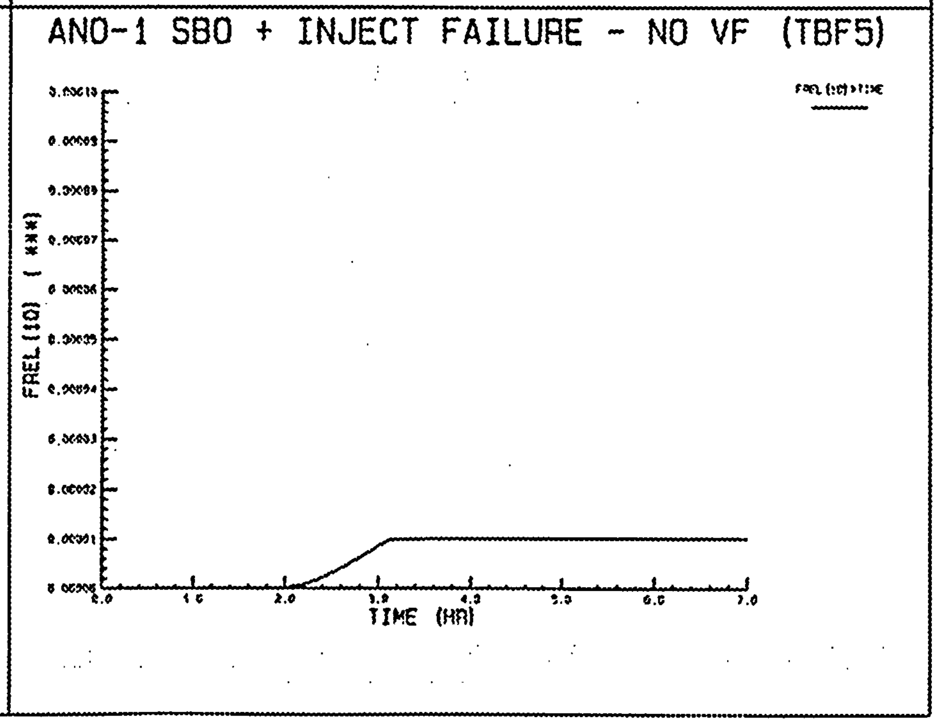
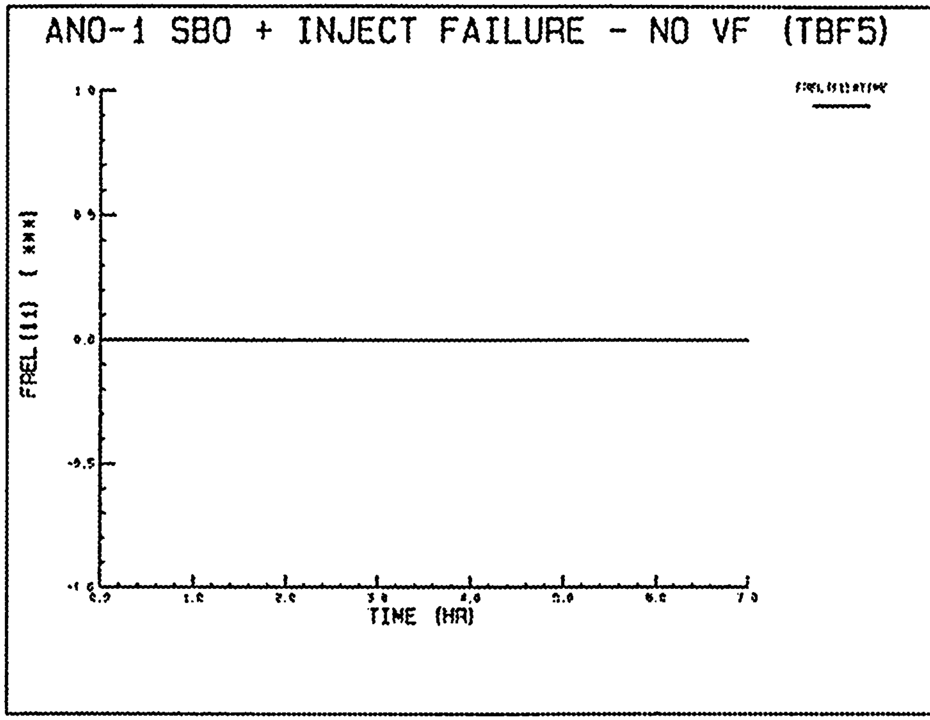
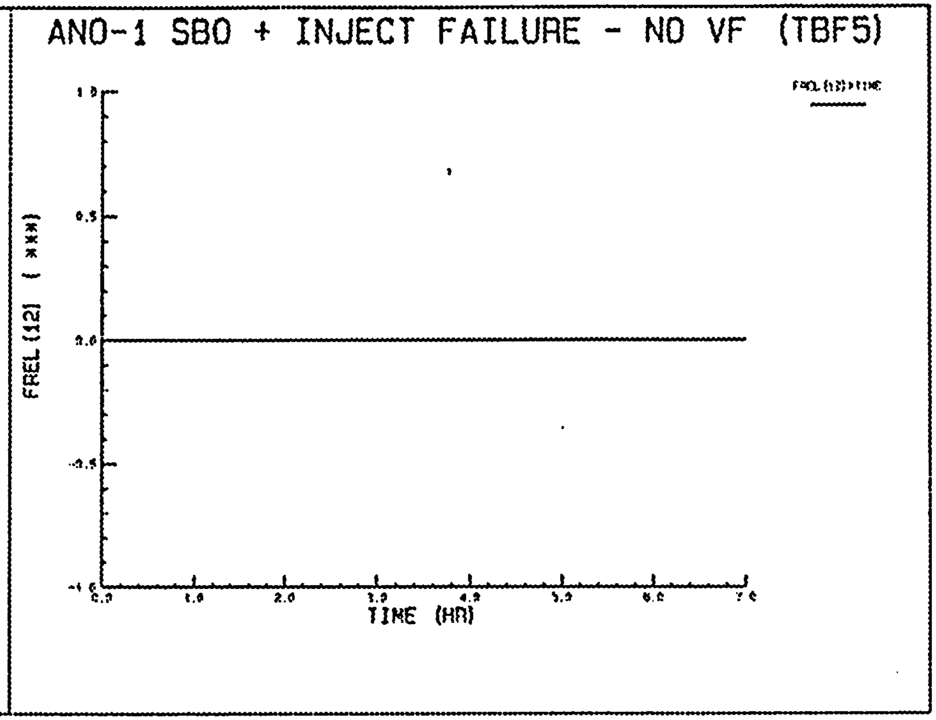
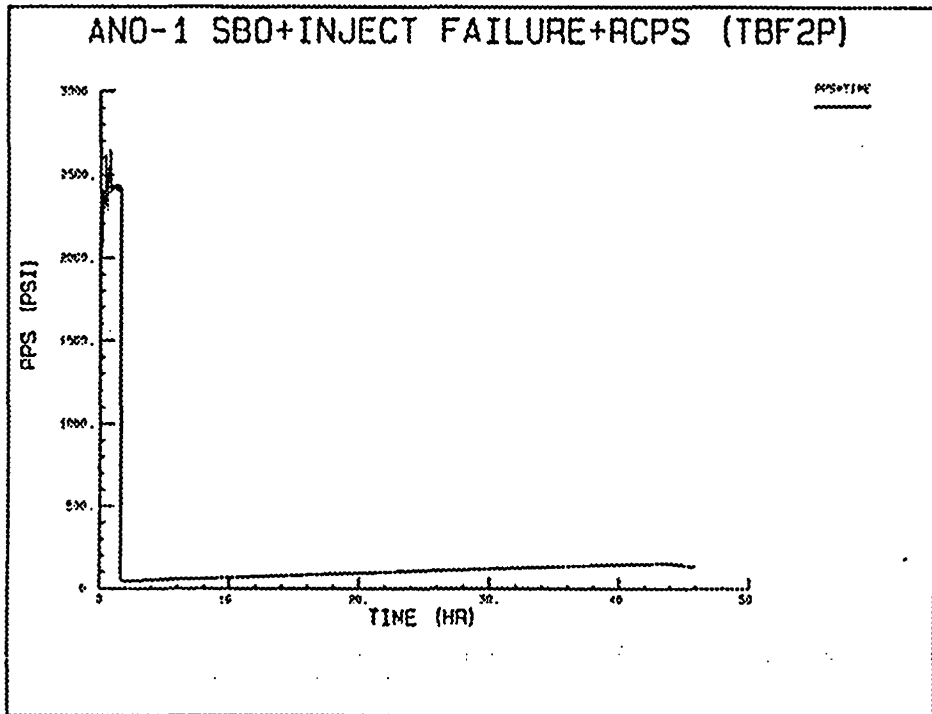
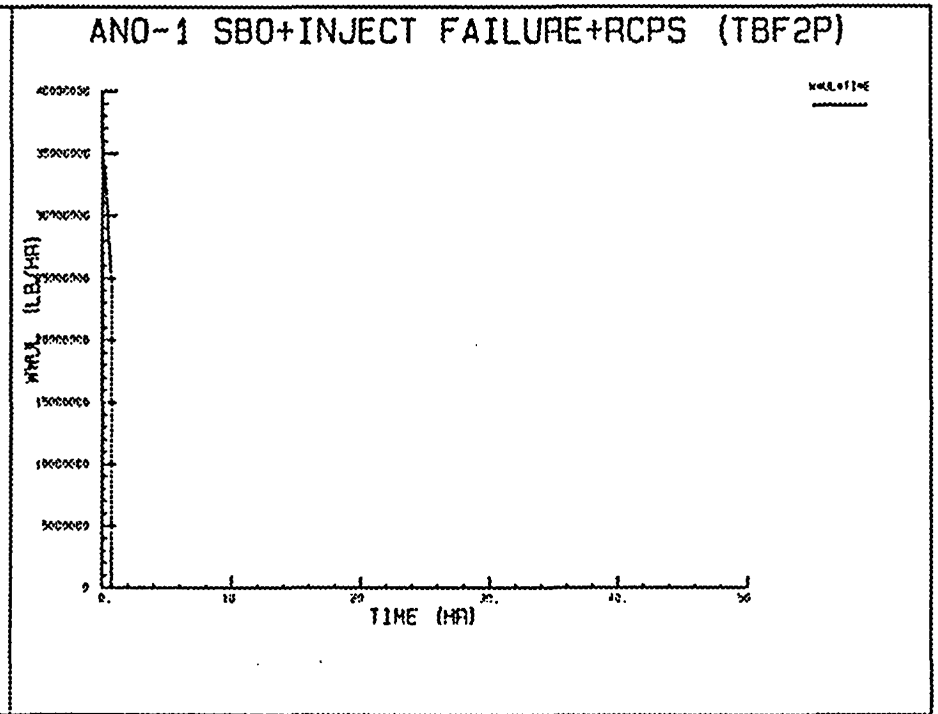
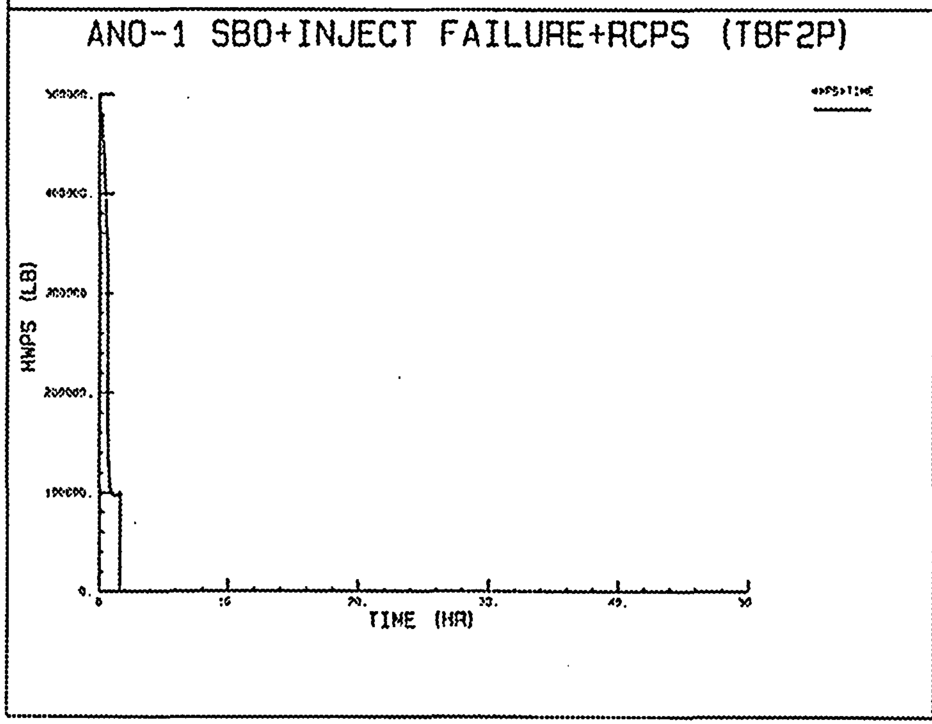
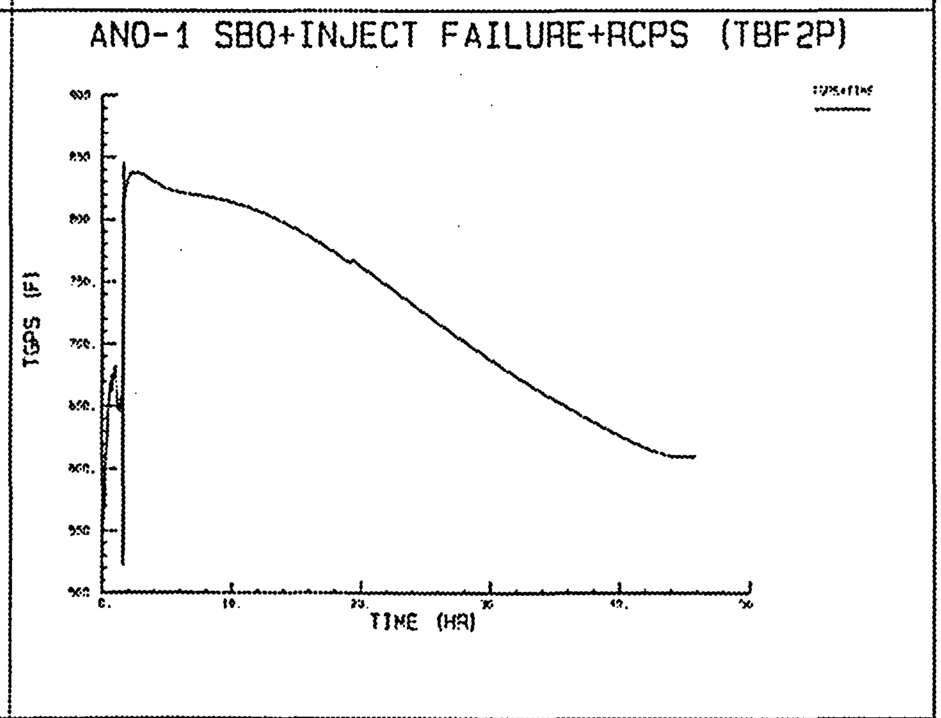
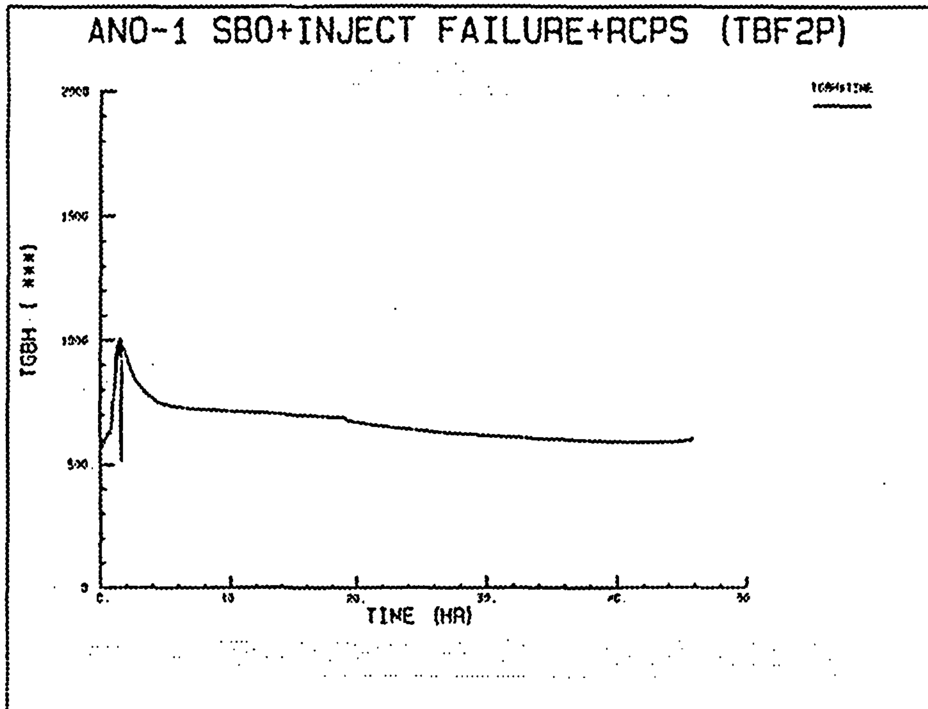
FREL(9) (***)
TIME (HR)

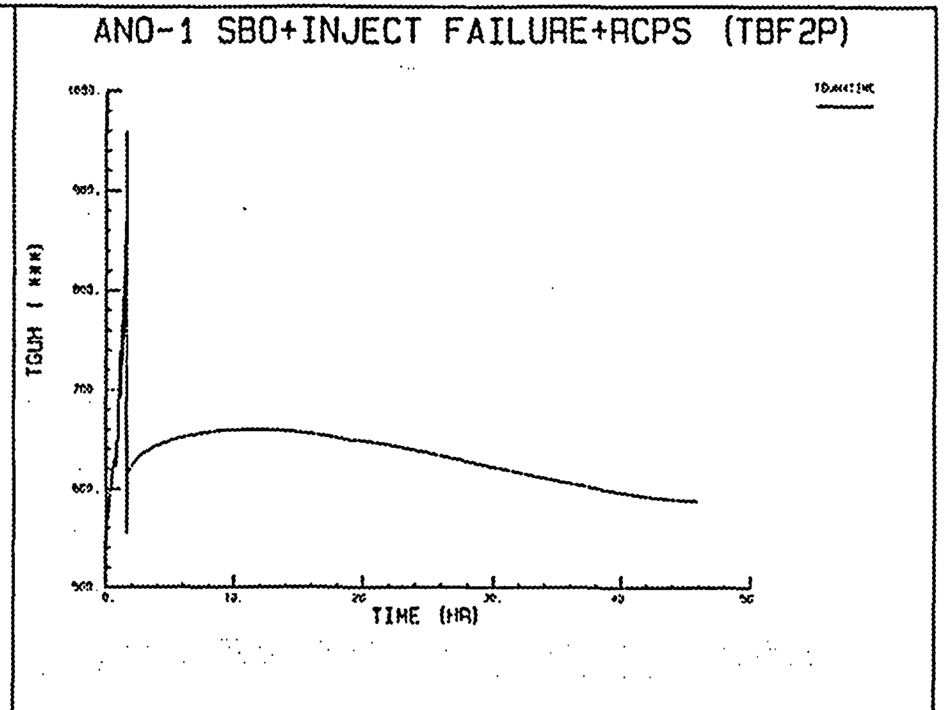

ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(10) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(11) (***)
TIME (HR)


ANO-1 SBO + INJECT FAILURE - NO VF (TBF5)
FREL(12) (***)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
PPS (PSI)
TIME (HR)

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
WMUL (LB/HR)
TIME (HR)

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MWPS (LB)
TIME (HR)

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
TGPS (F)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
TGBH (***)
TIME (HR)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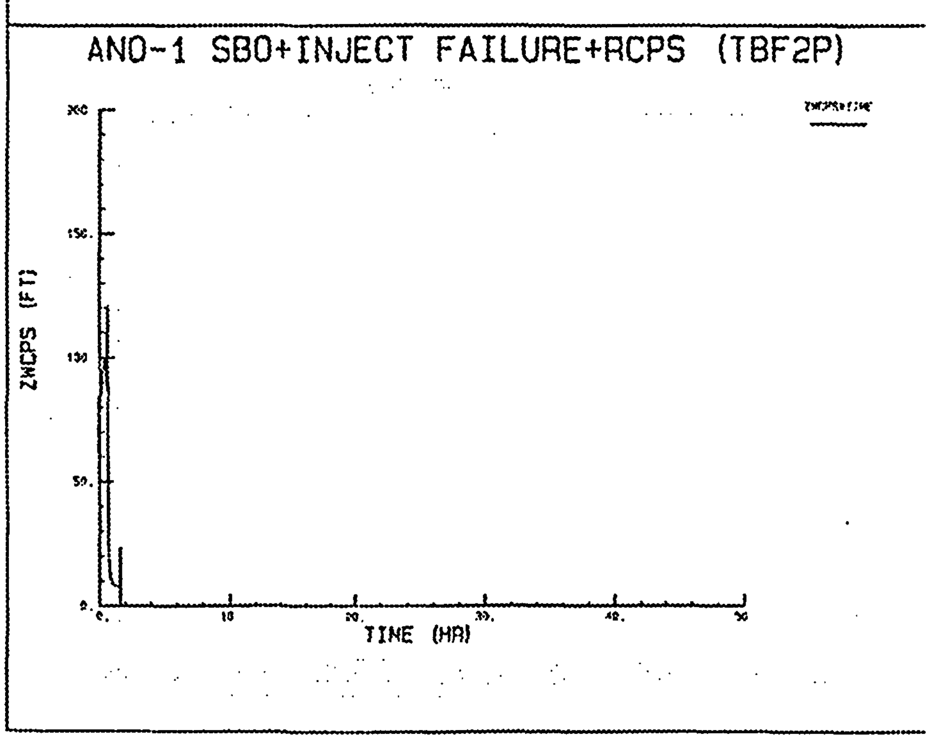
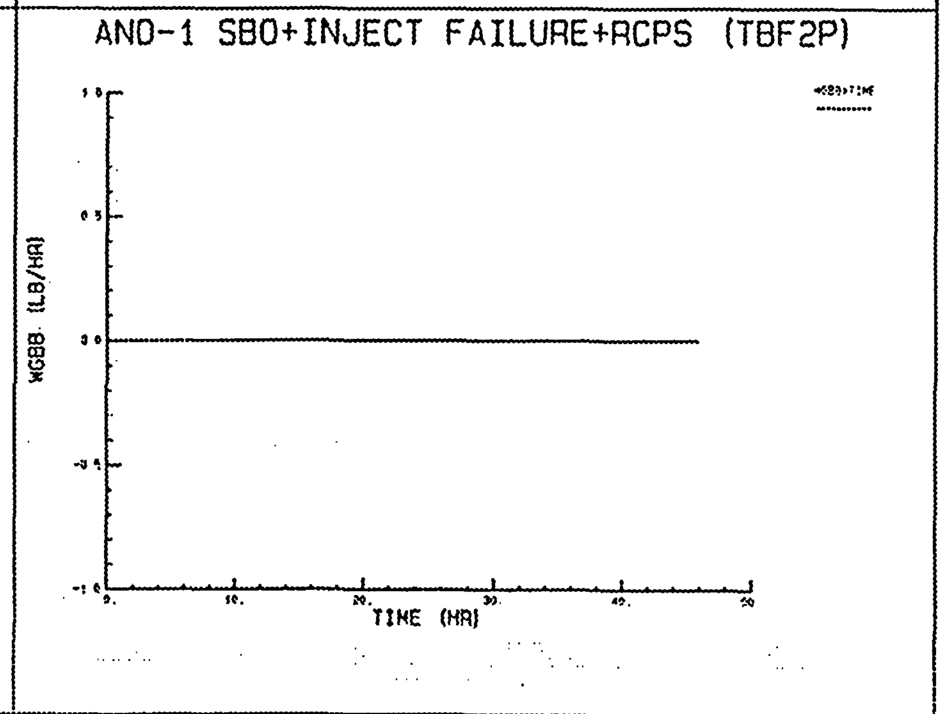
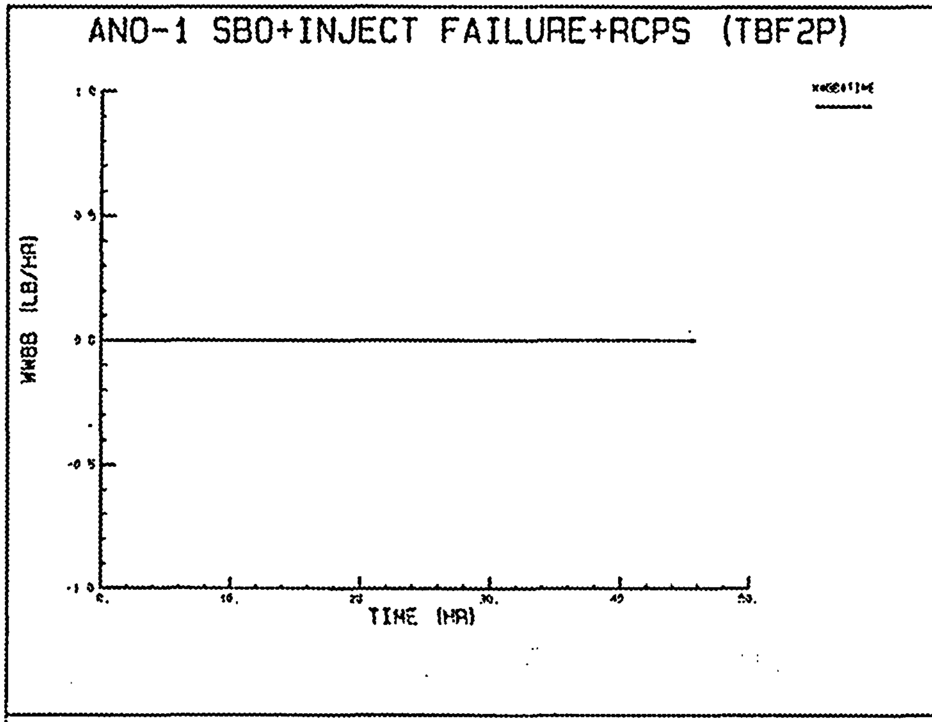
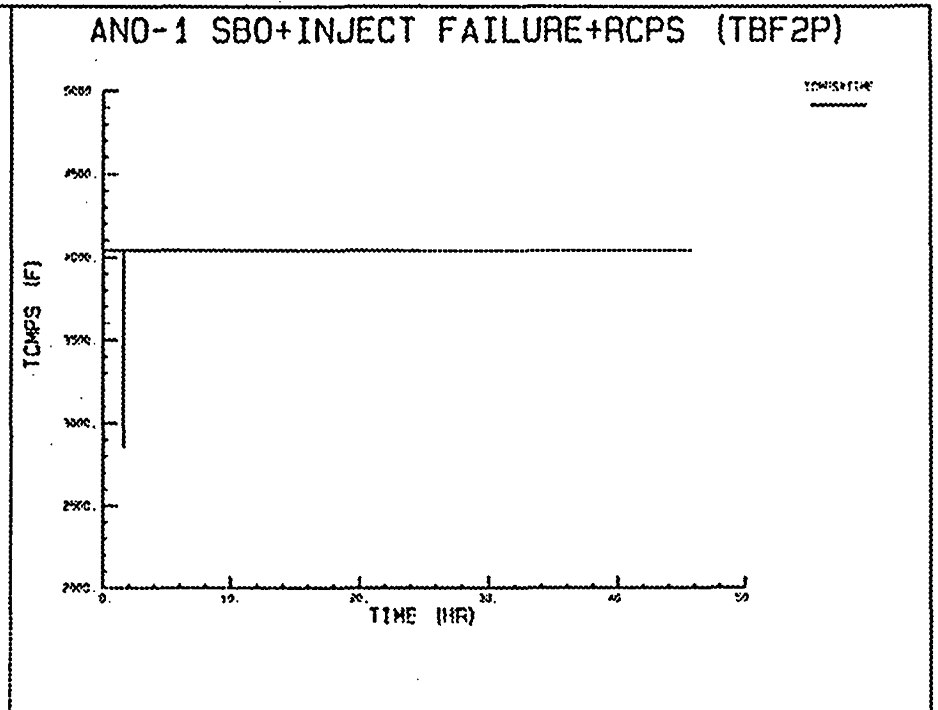
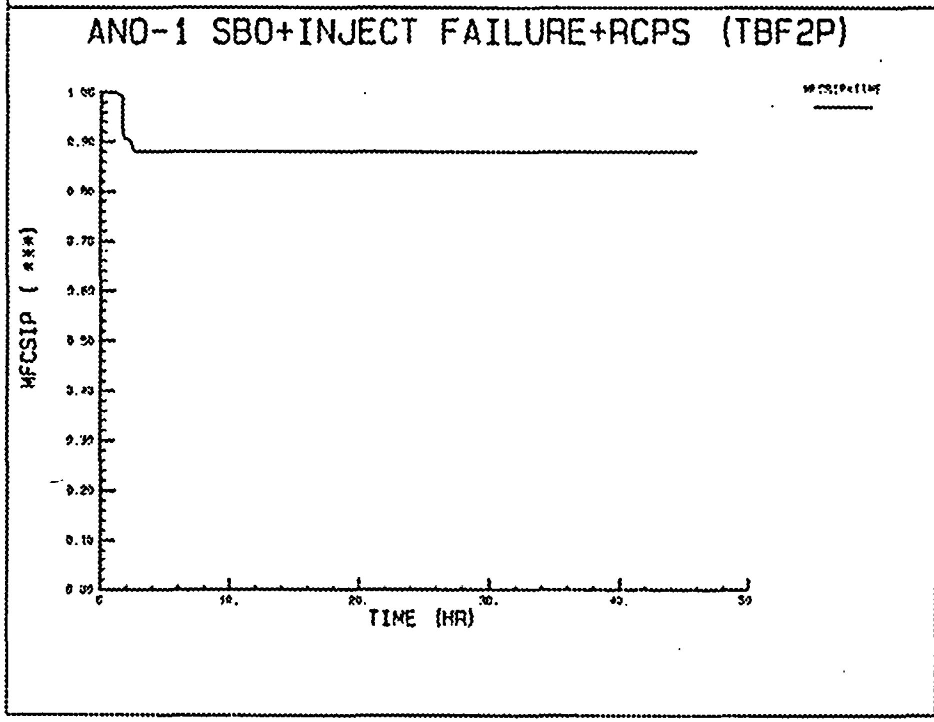
TGUH (***)
TIME (HR)

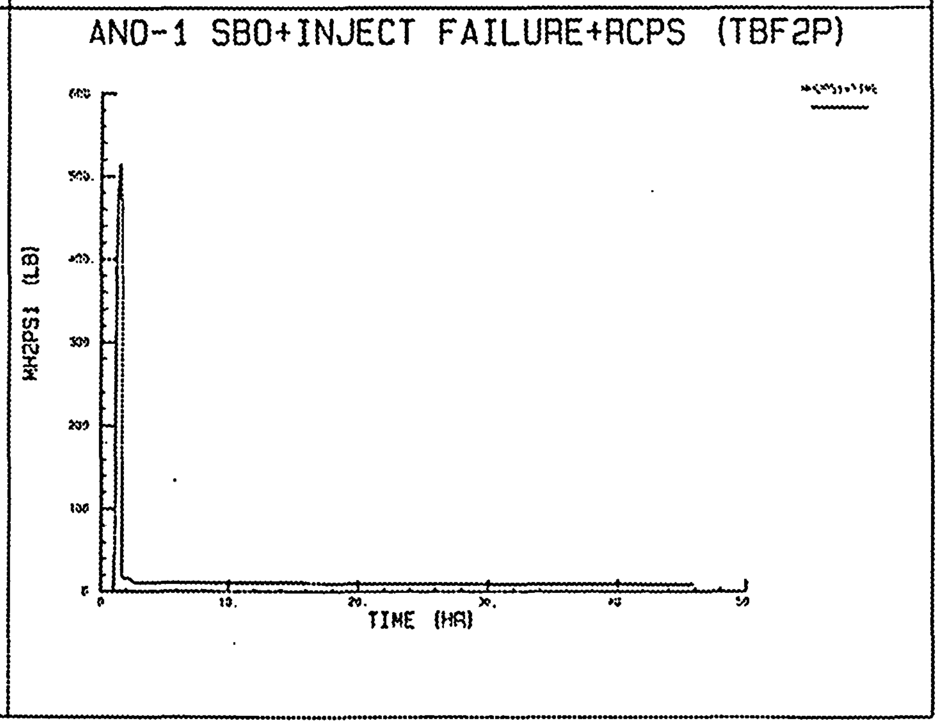

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
ZWCPS (FT)
TIME (HR)

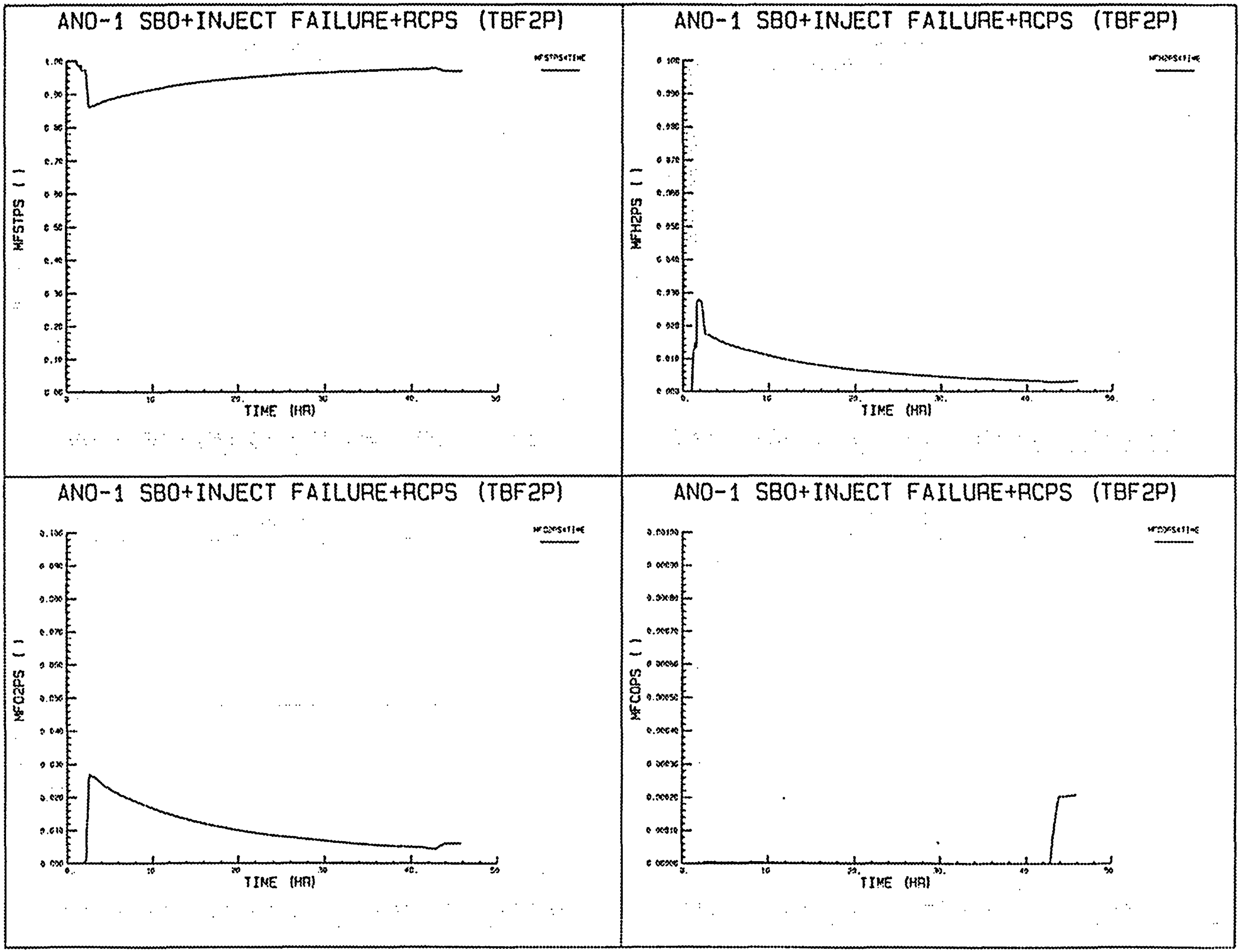

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
WGBB (LB/HR)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
WWBB (LB/HR)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
TCMPS (F)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
WFCSIP (***)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MH2PS1 (LB)
TIME (HR)



ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MFSTPS ( )
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MFH2PS ( )
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MFC02PS ( )
TIME (HR)
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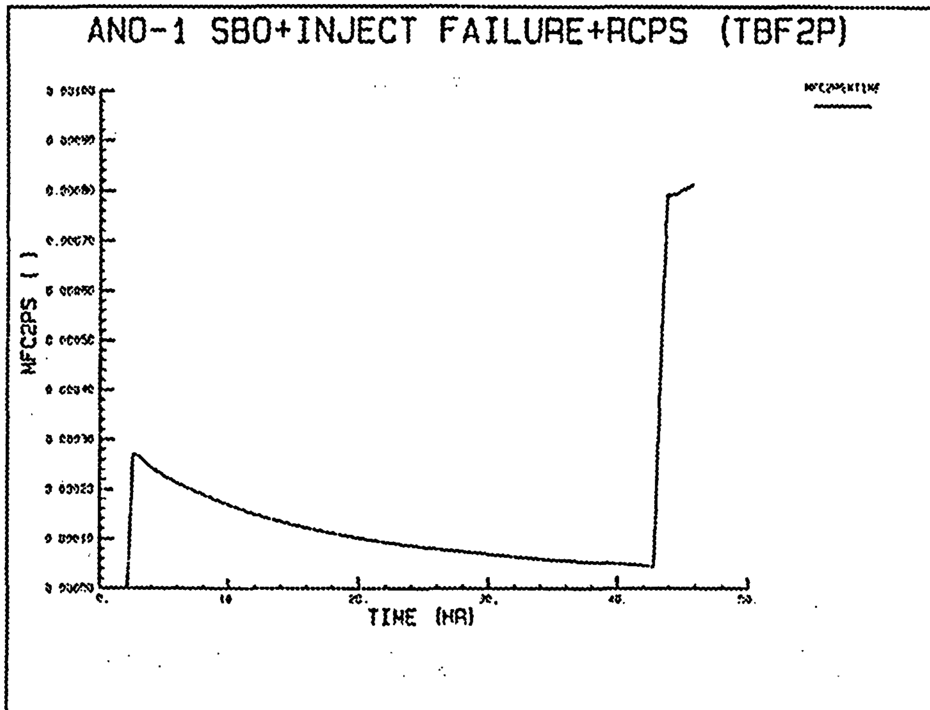
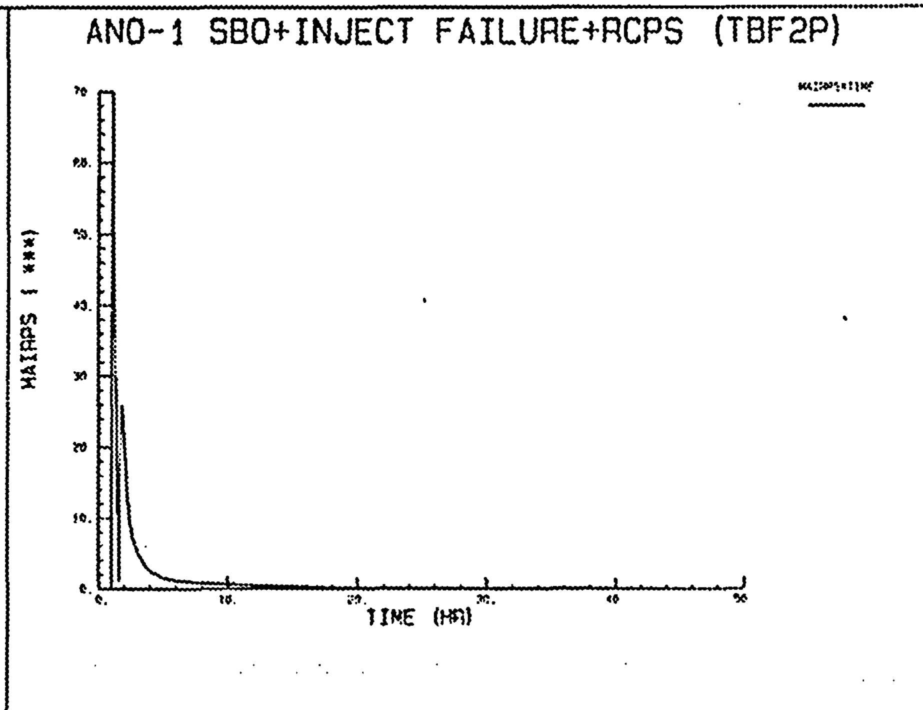
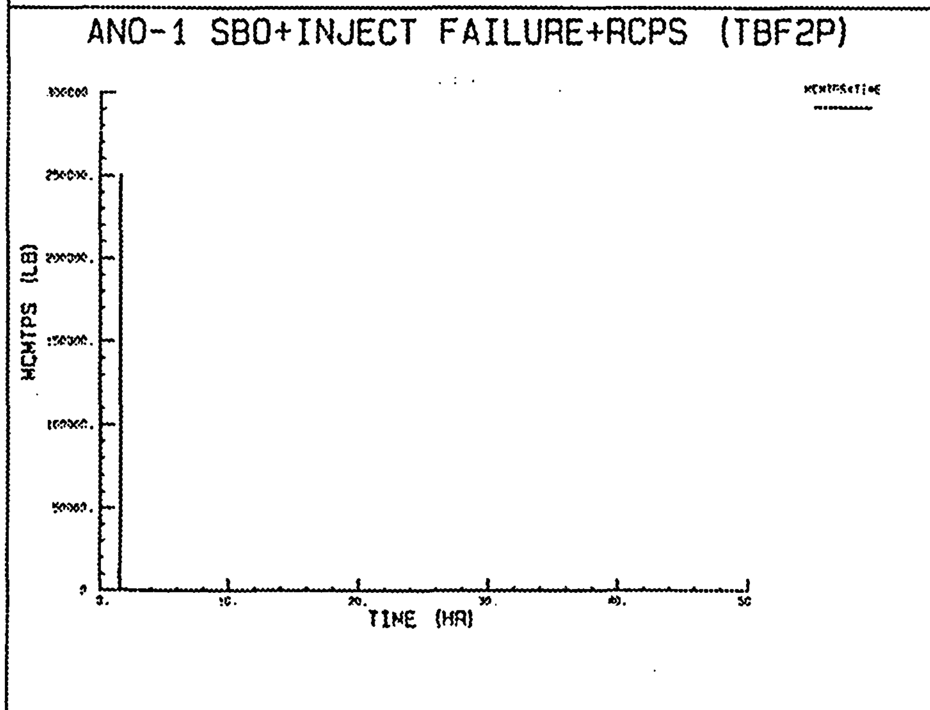
MFCOPS ( )
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MFC2PS ( )
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MAIRPS (***)
TIME (HR)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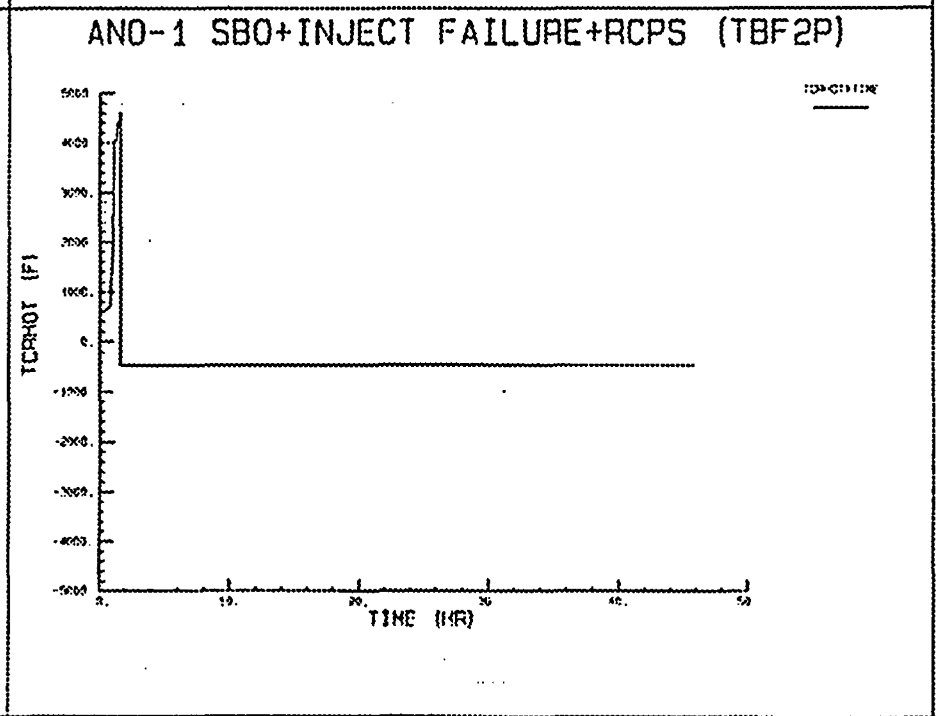
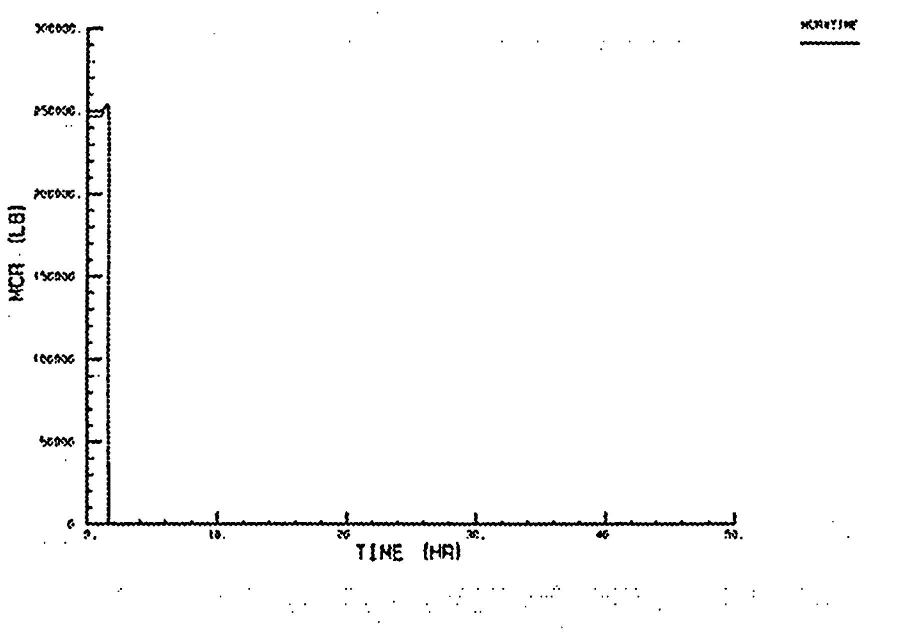
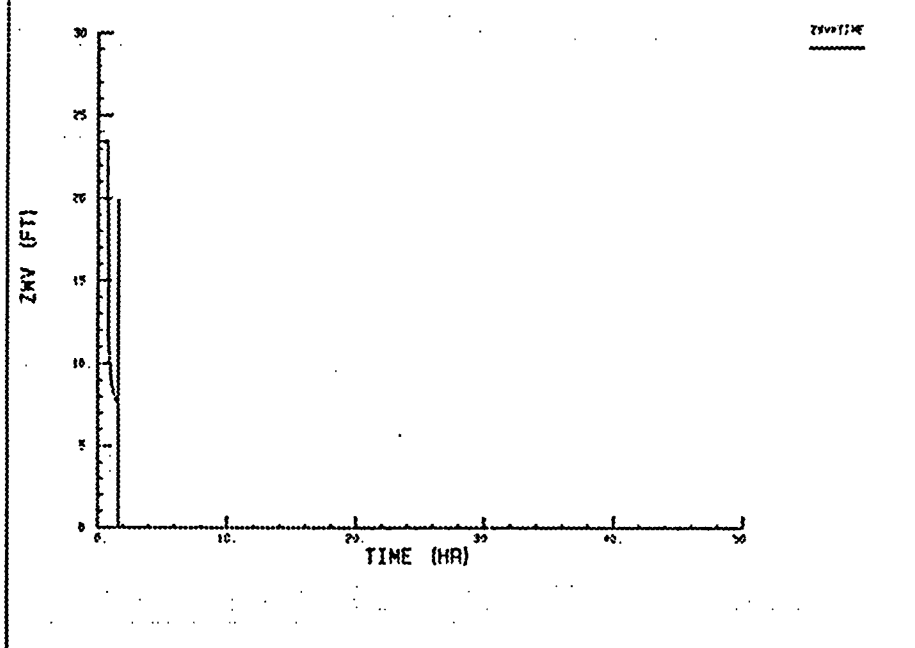
MCMTPS (LB)
TIME (HR)


ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
TCRHOT (F)
TIME (HR)

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)



ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)



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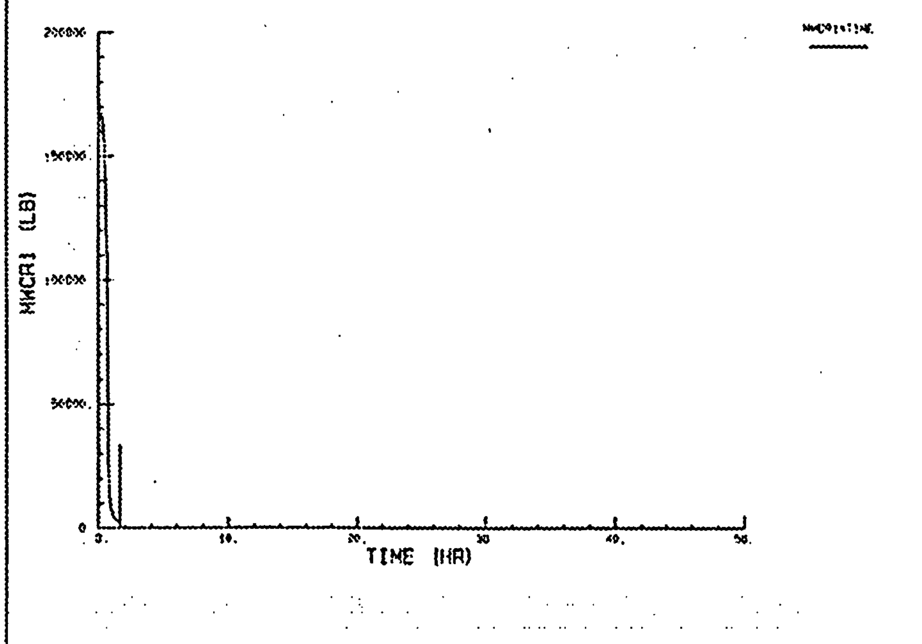

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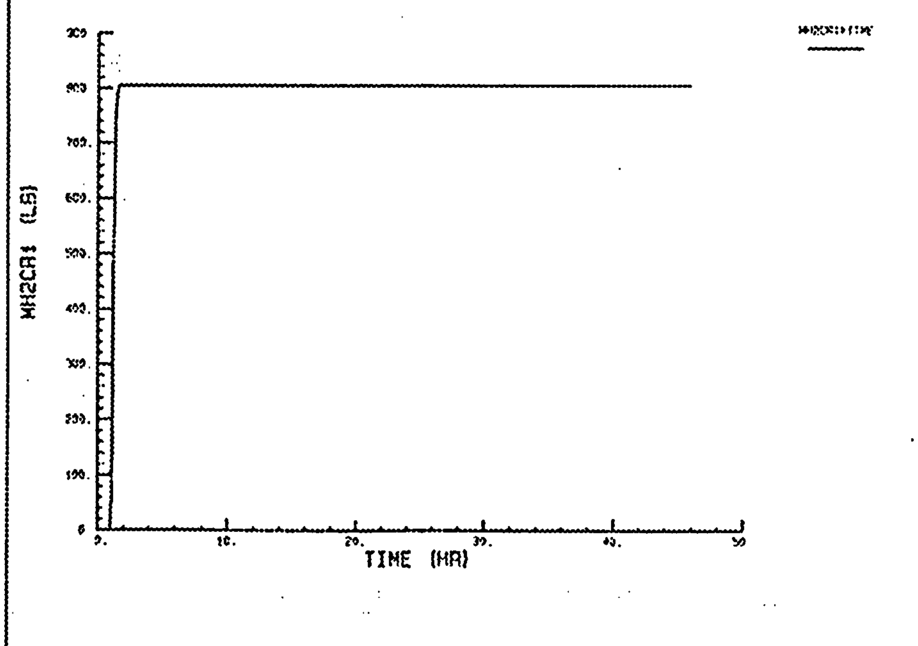

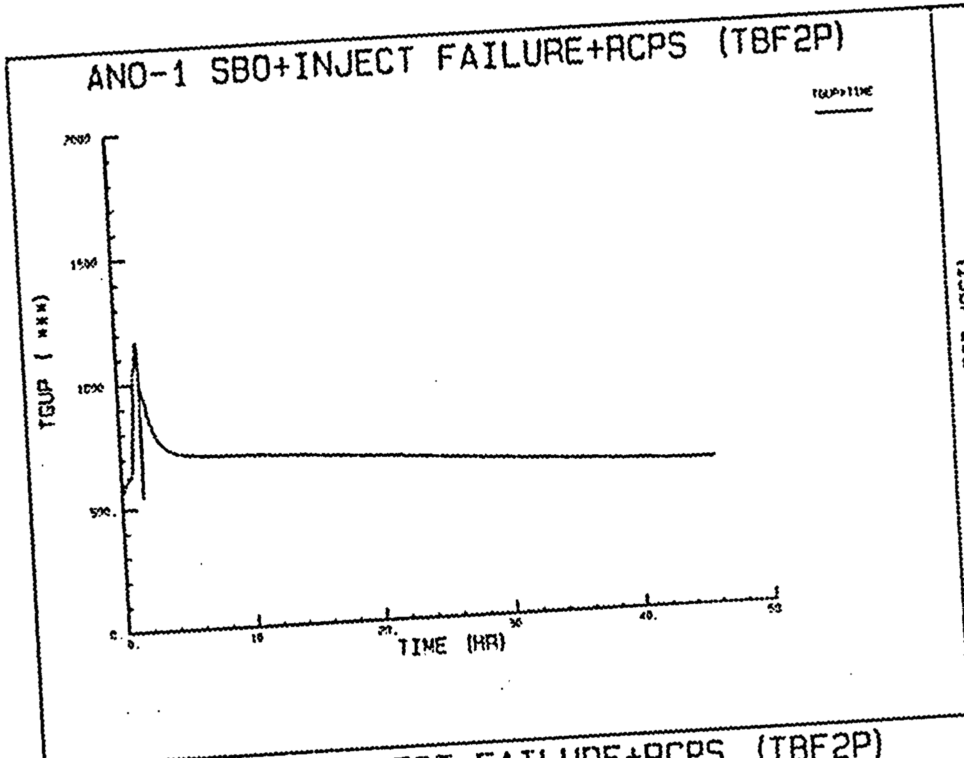
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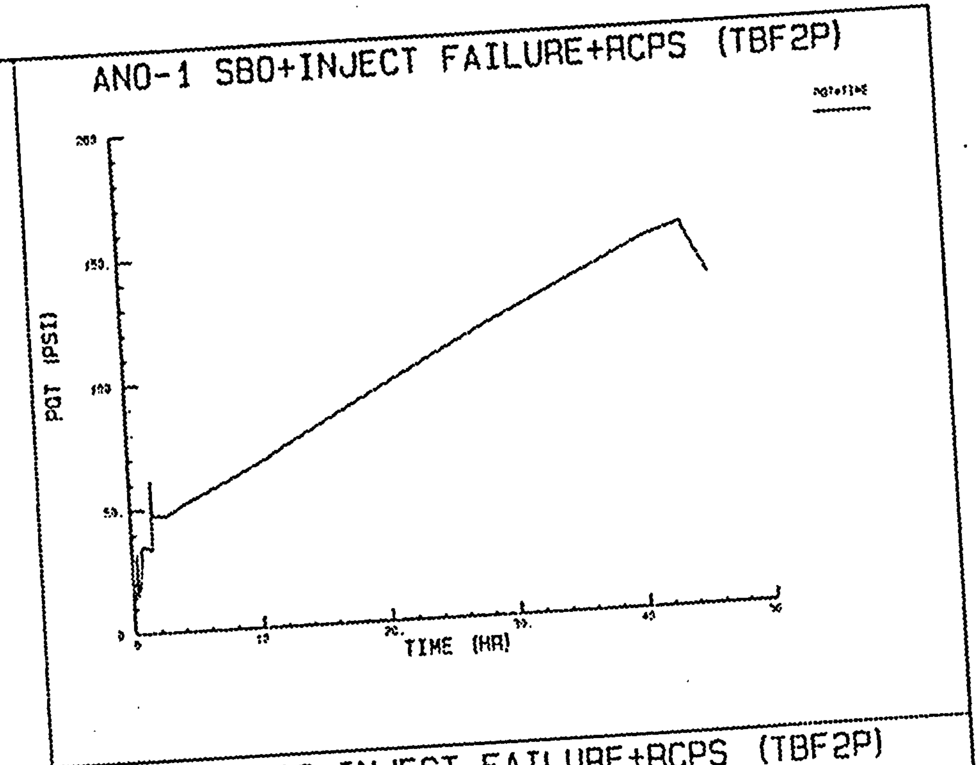
TGUP (***)
TIME (HR)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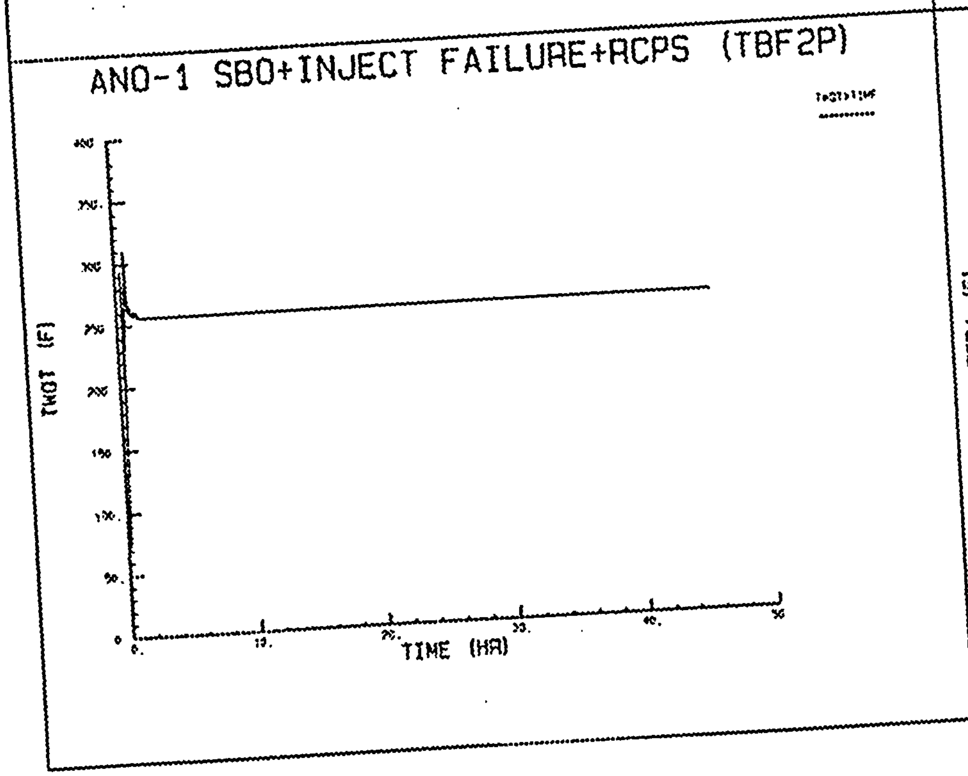
PQT (PSI)
TIME (HR)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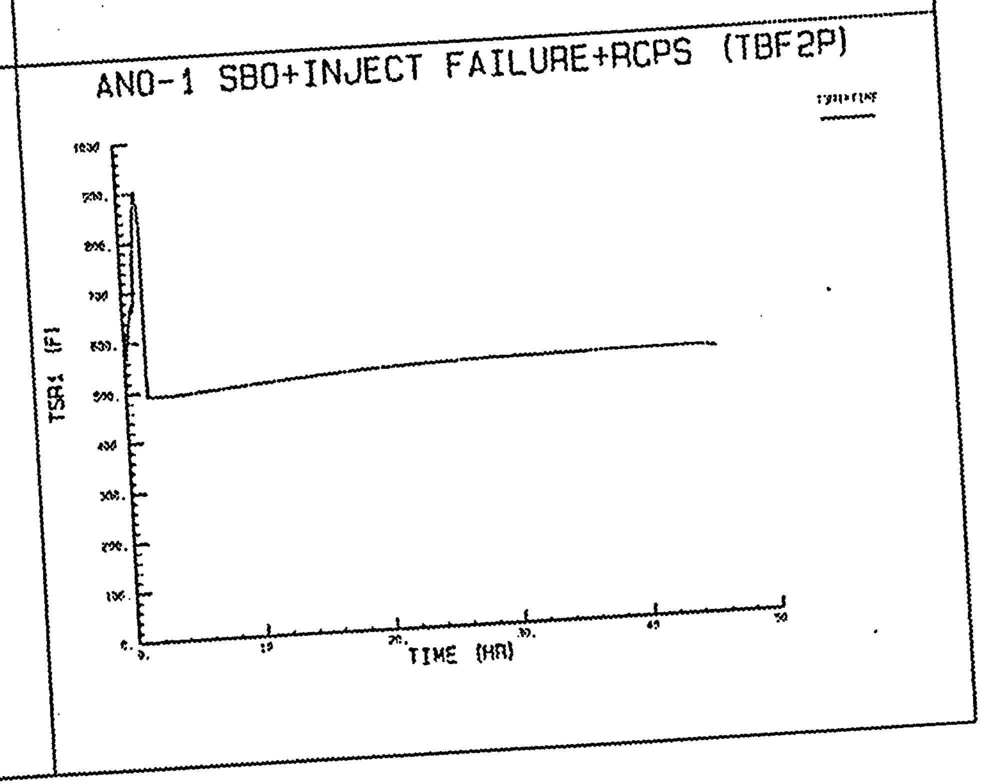
THOT (F)
TIME (HR)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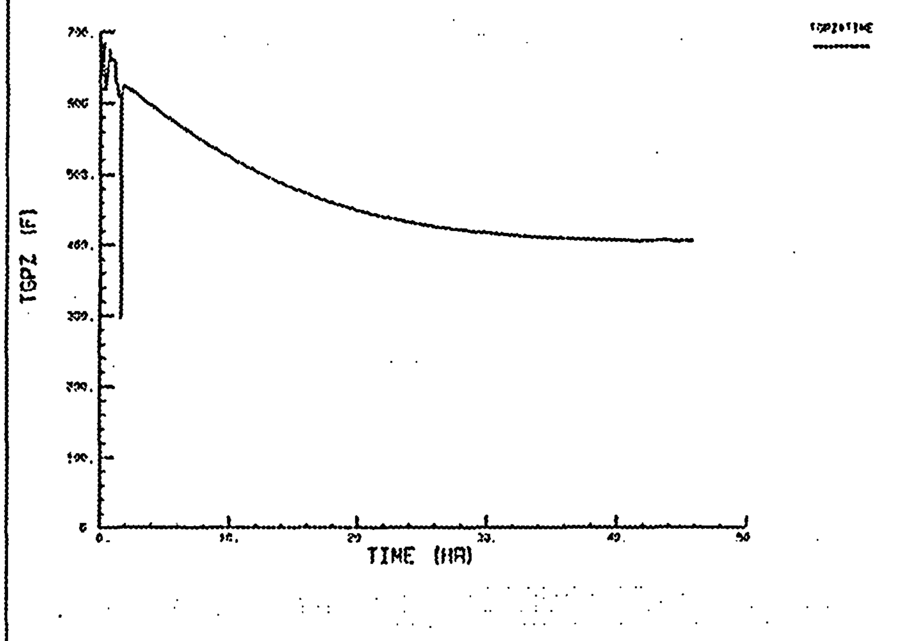
TSR1 (F)
TIME (HR)

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)



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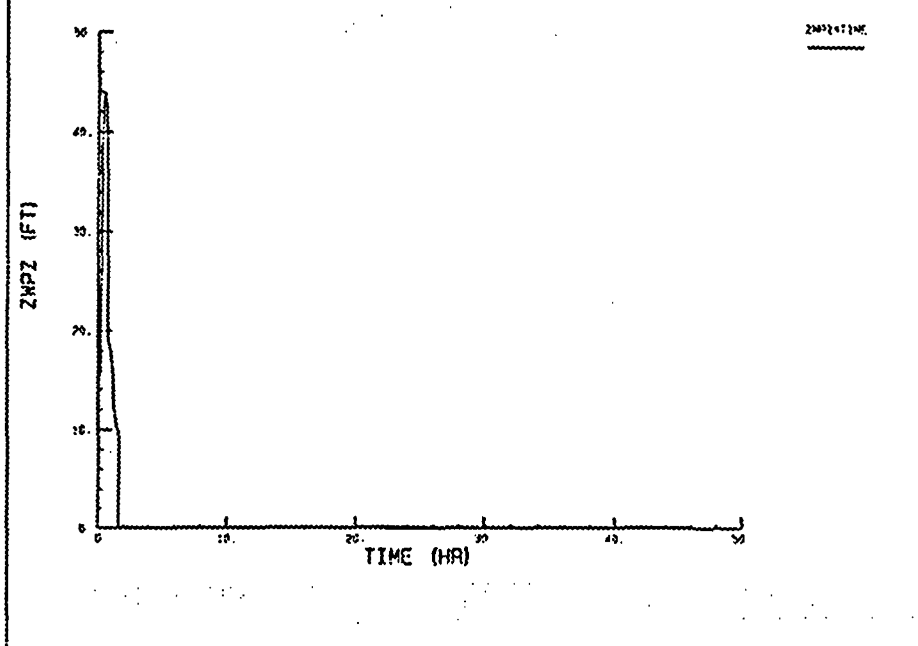

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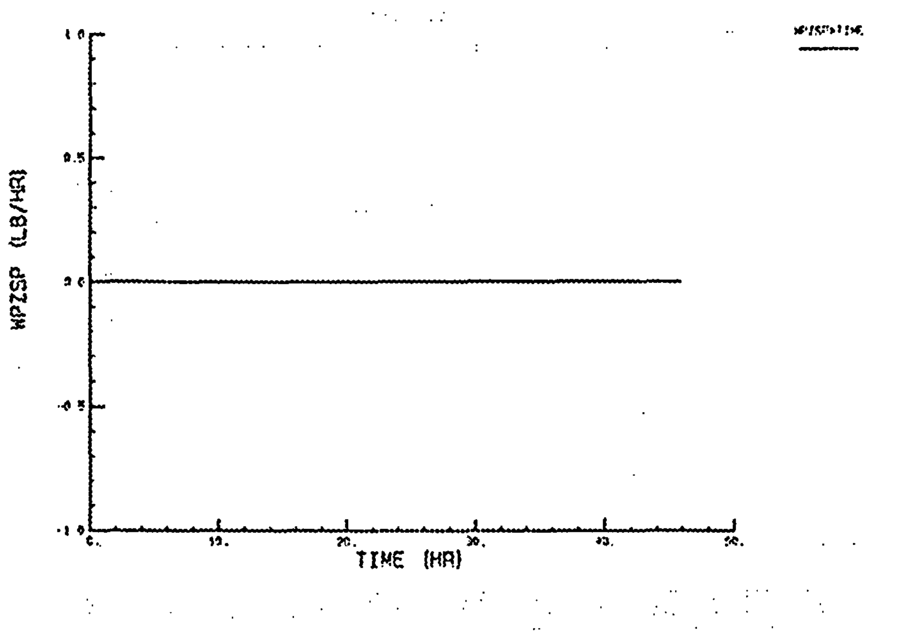

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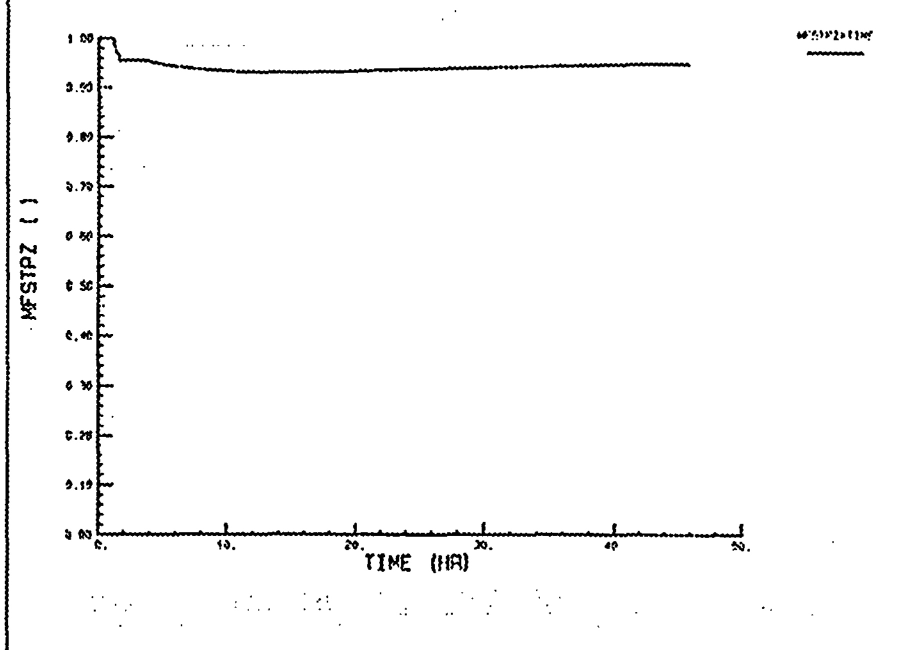

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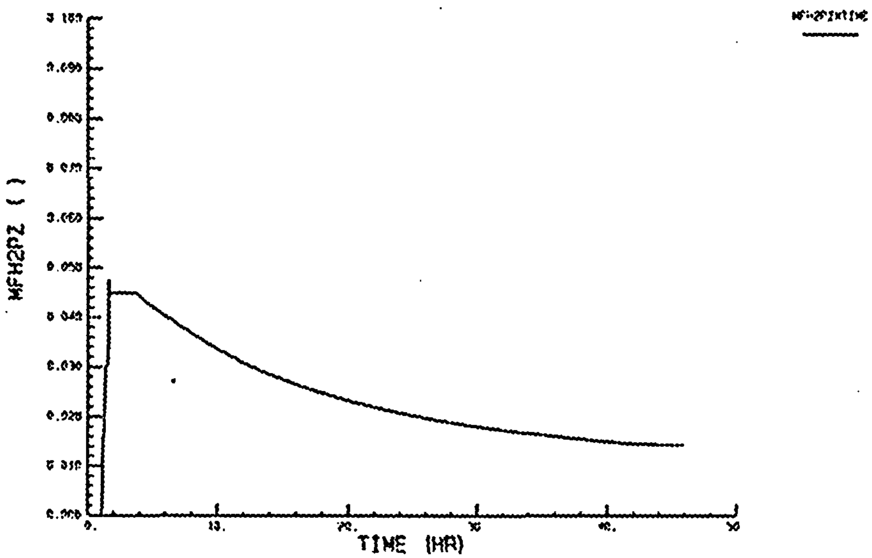

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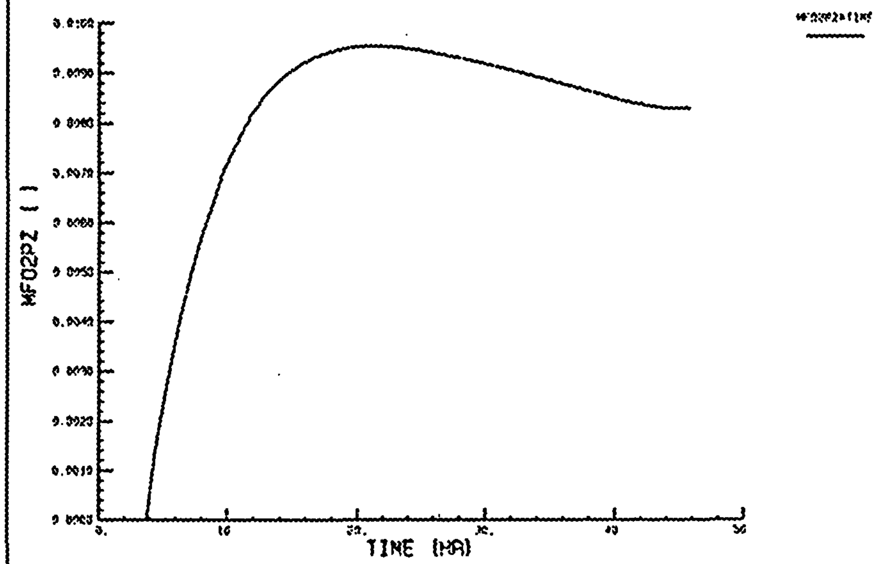

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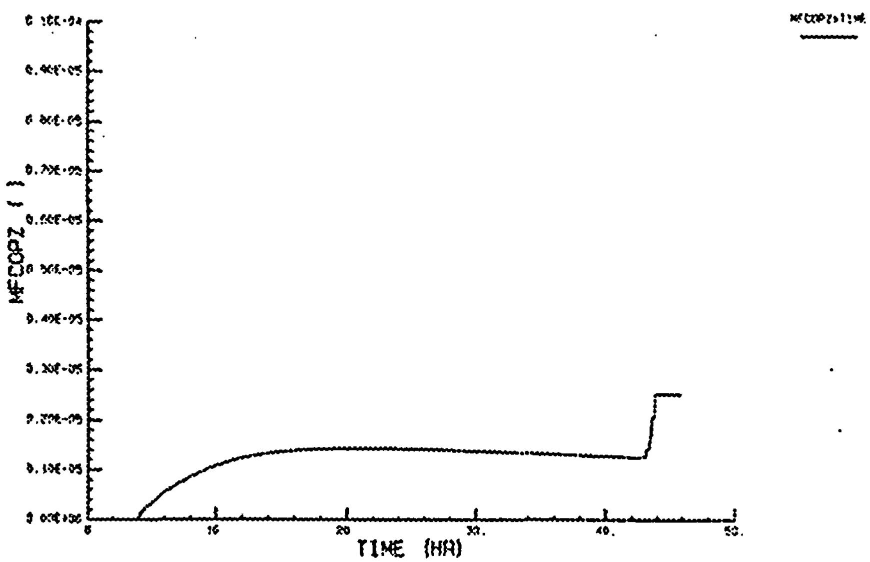

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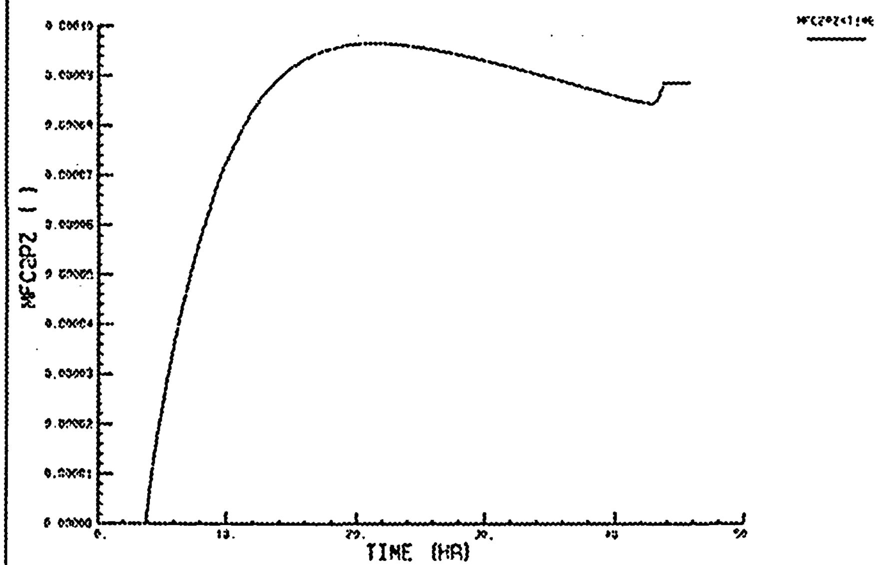

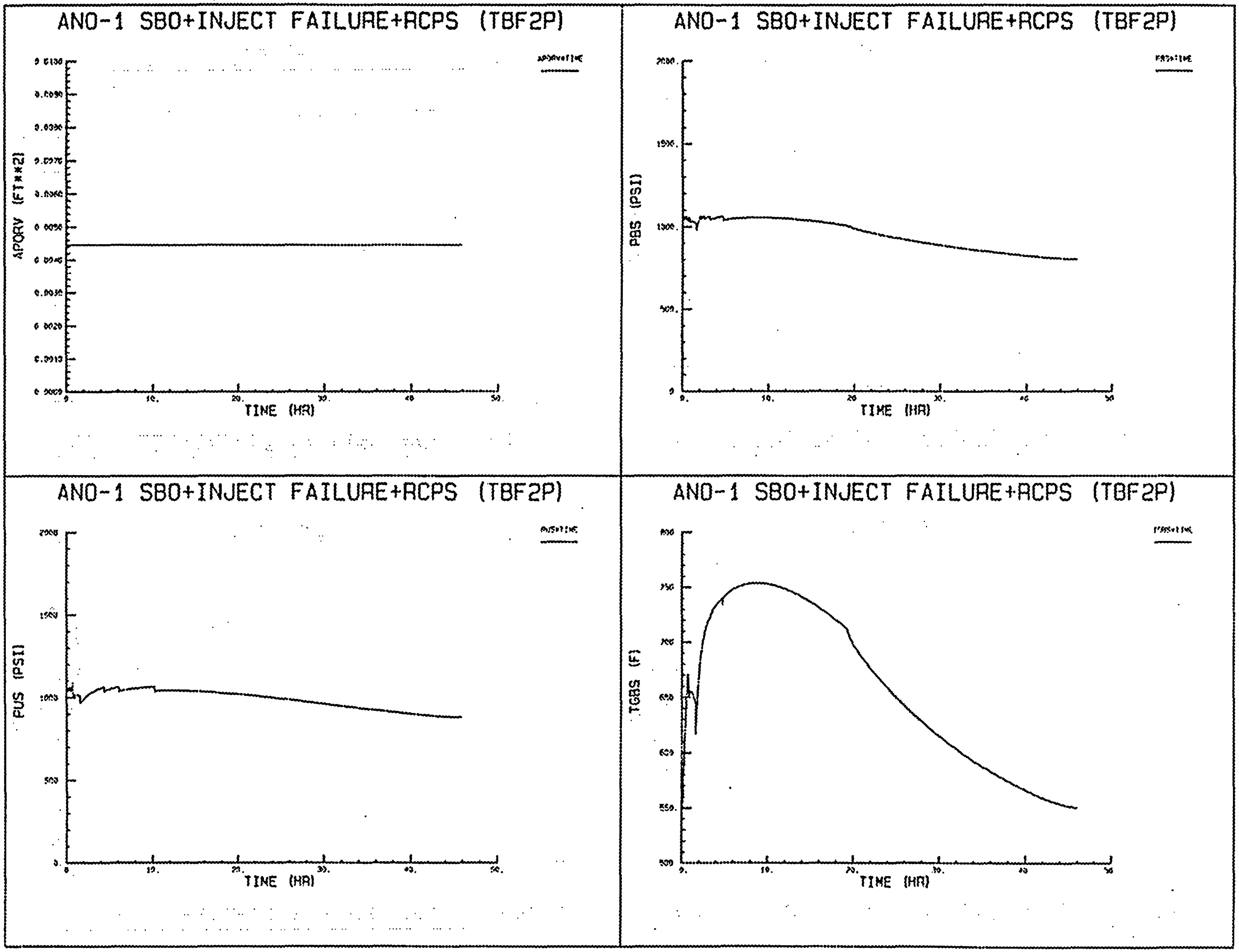
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
APORV (FT**2)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
PBS (PSI)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
PUS (PSI)
TIME (HR)
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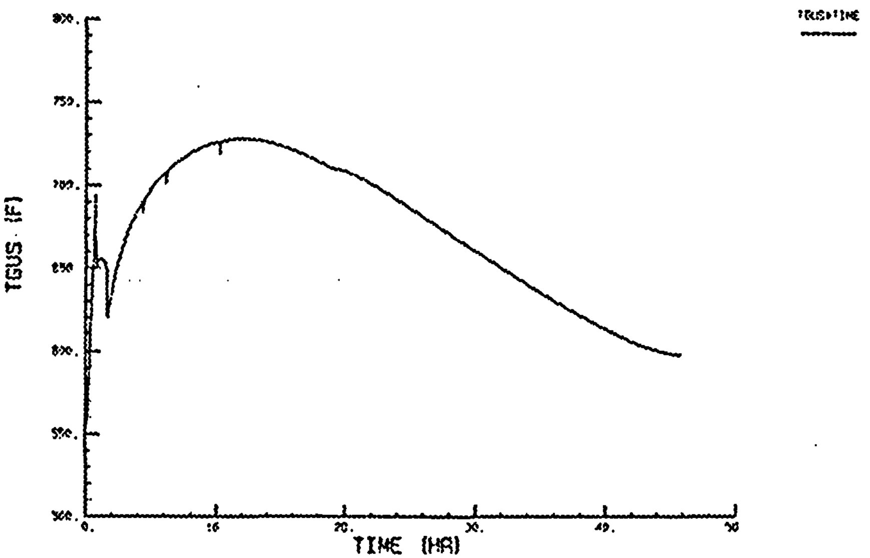
TGBS (F)
TIME (HR)

ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)



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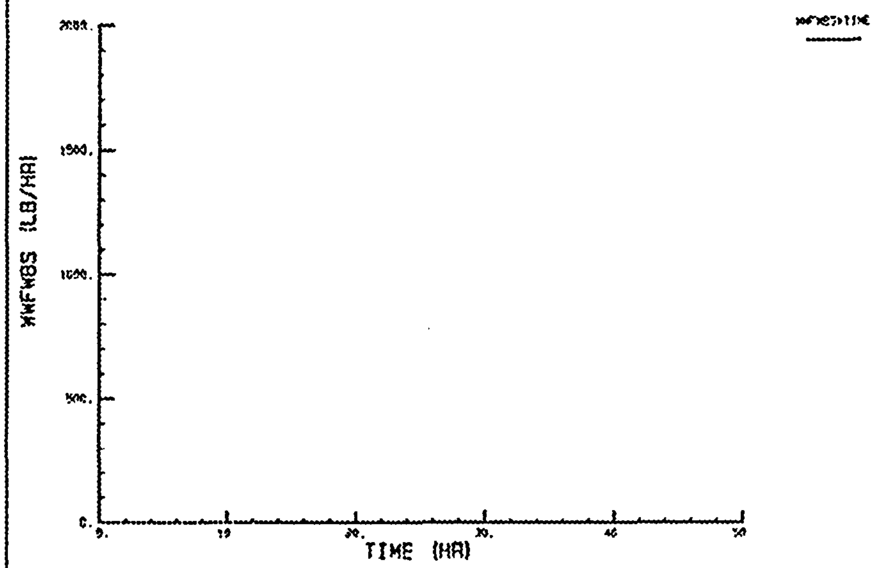

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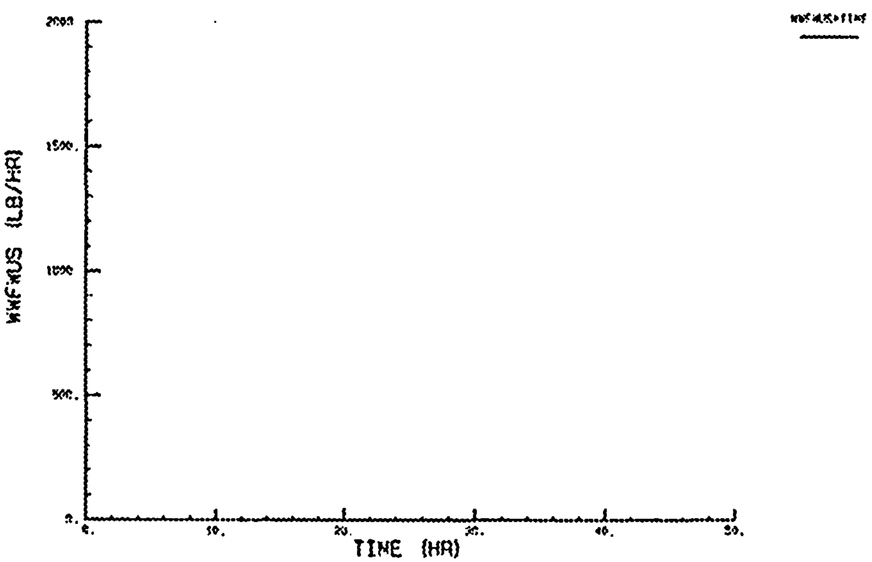

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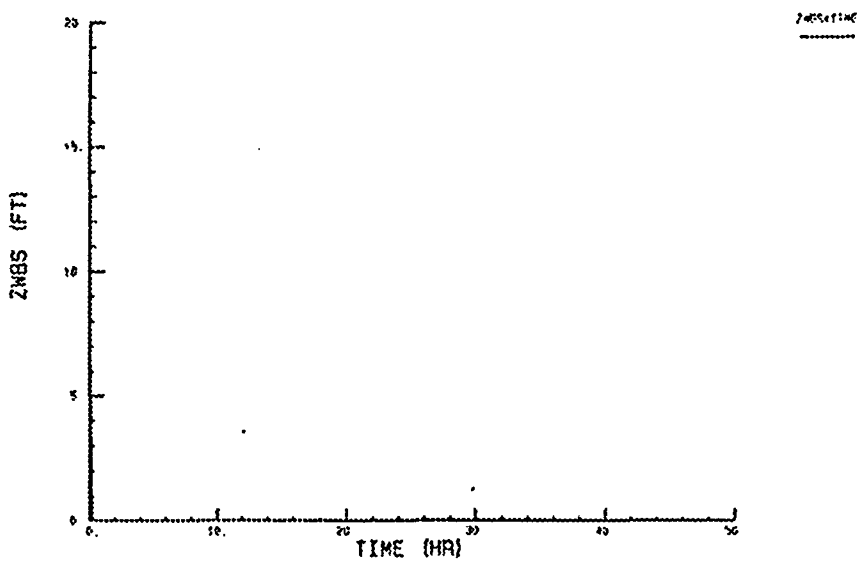

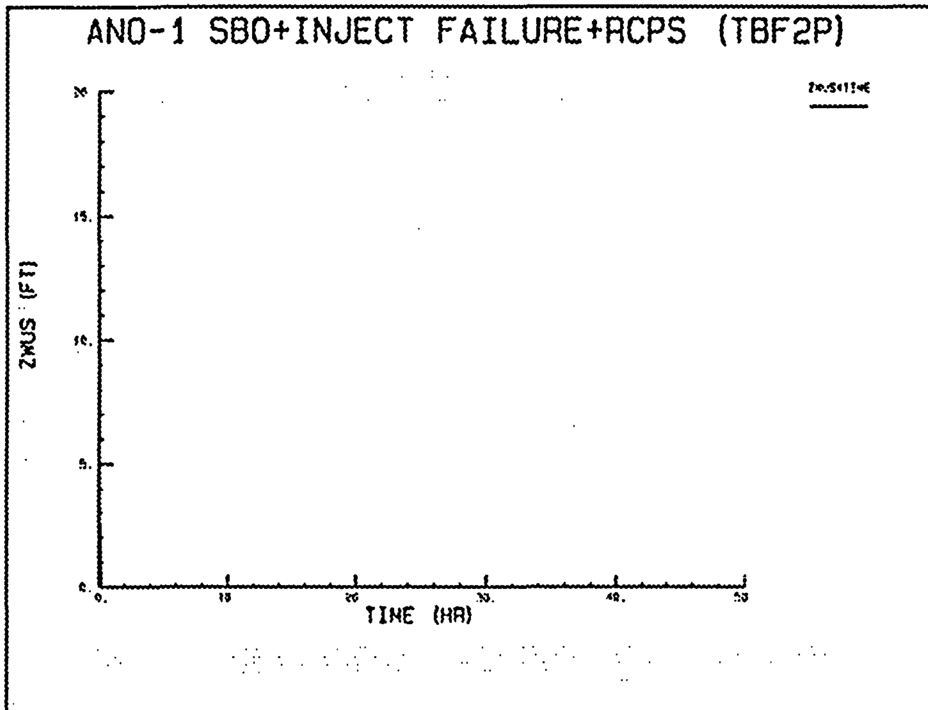
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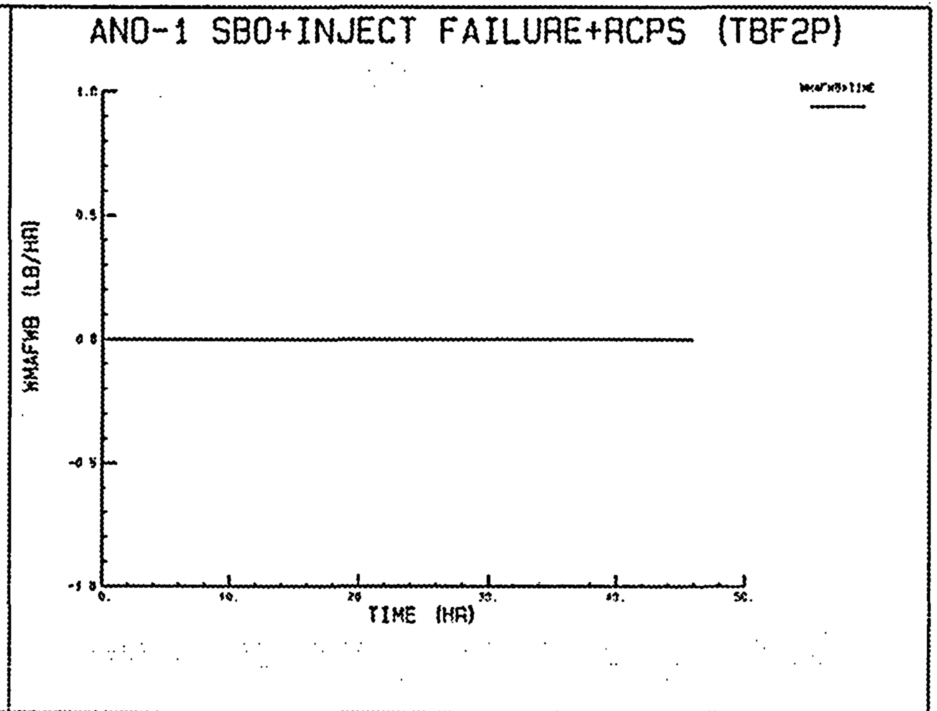
ZWUS (FT)
TIME (HR)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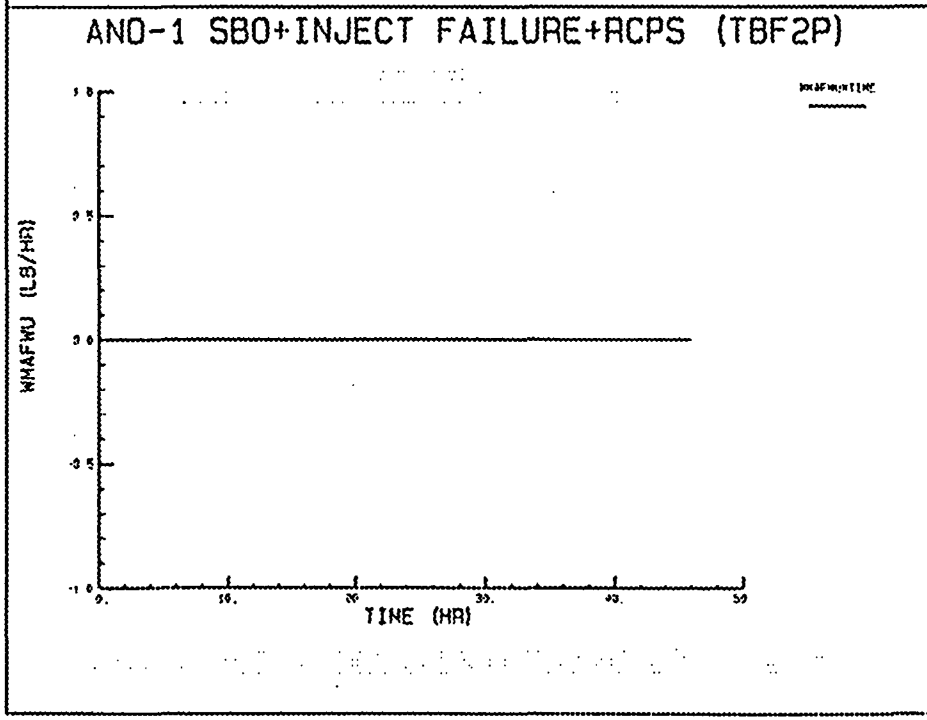
WMAFWB (LB/HR)
TIME (HR)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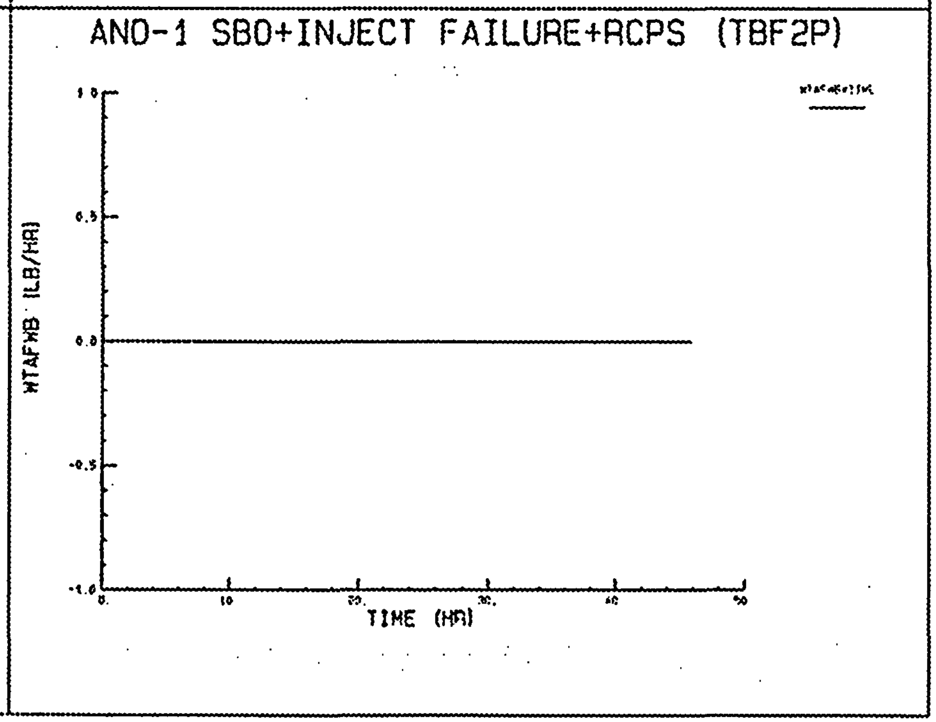
WMAFWU (LB/HR)
TIME (HR)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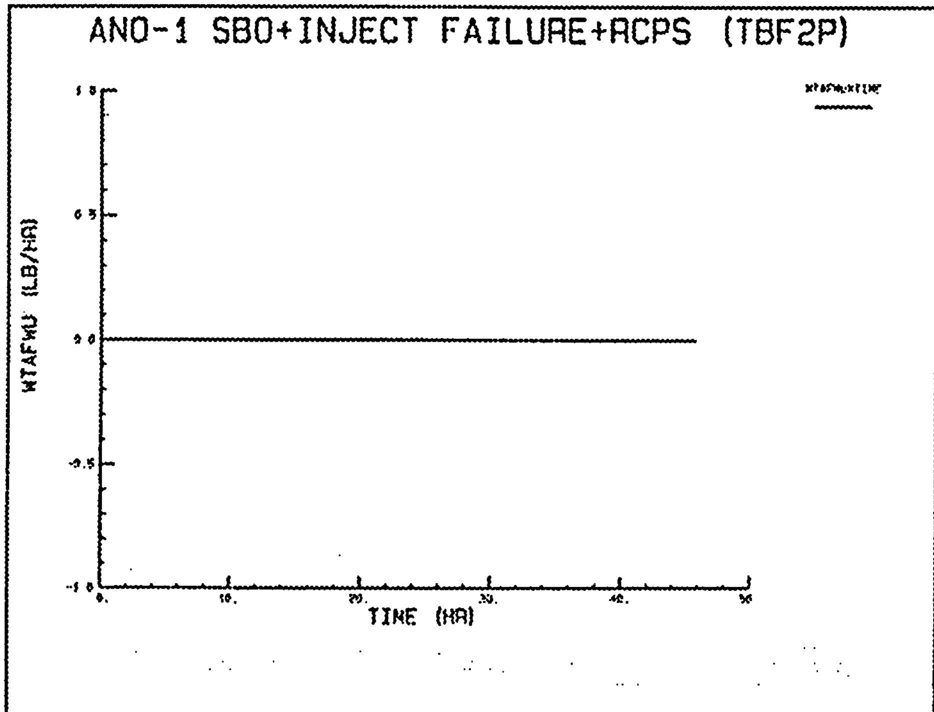
TIME (HR)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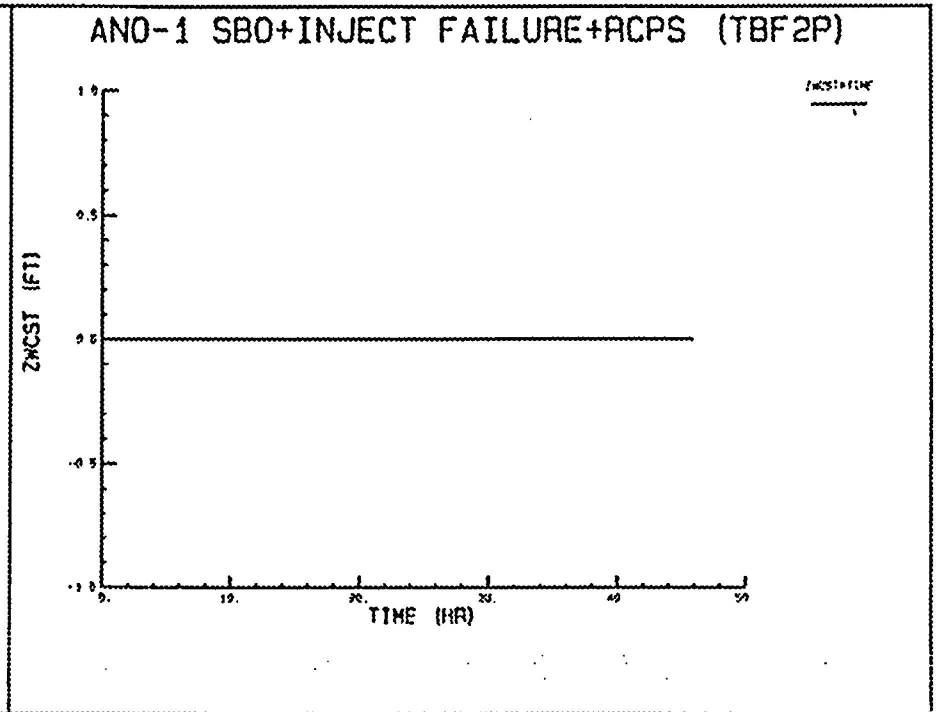
WTAFWU (LB/HR)
TIME (HR)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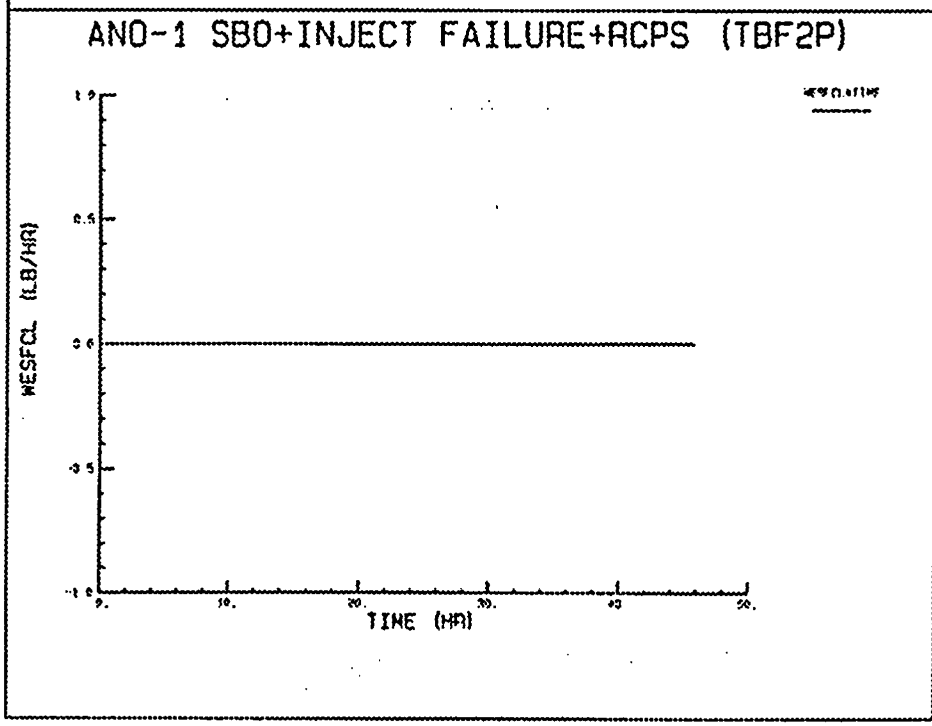
TIME (HR)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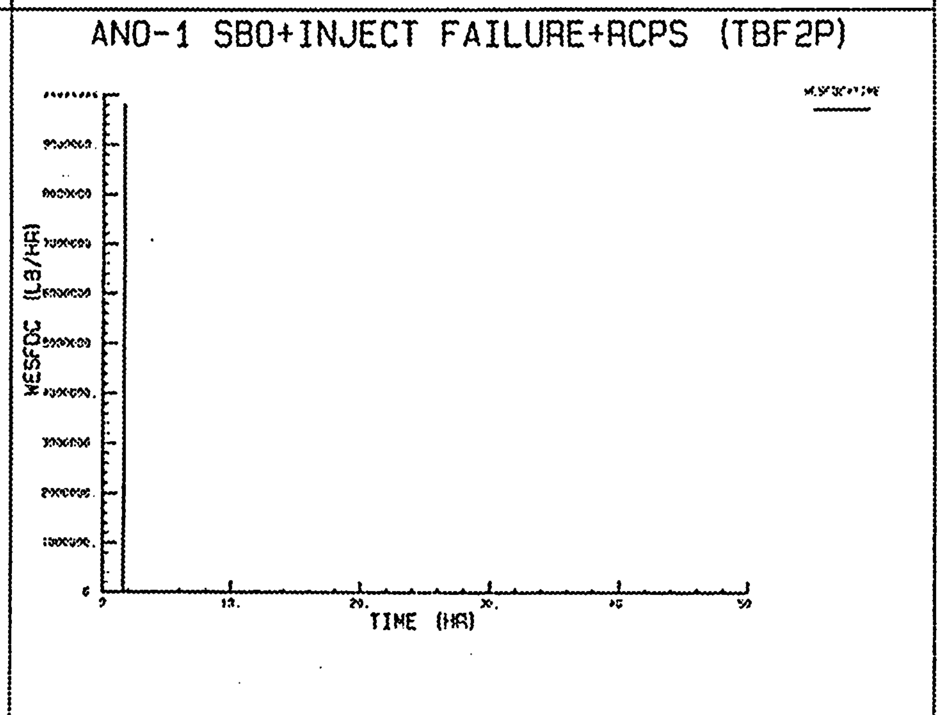
TIME (HR)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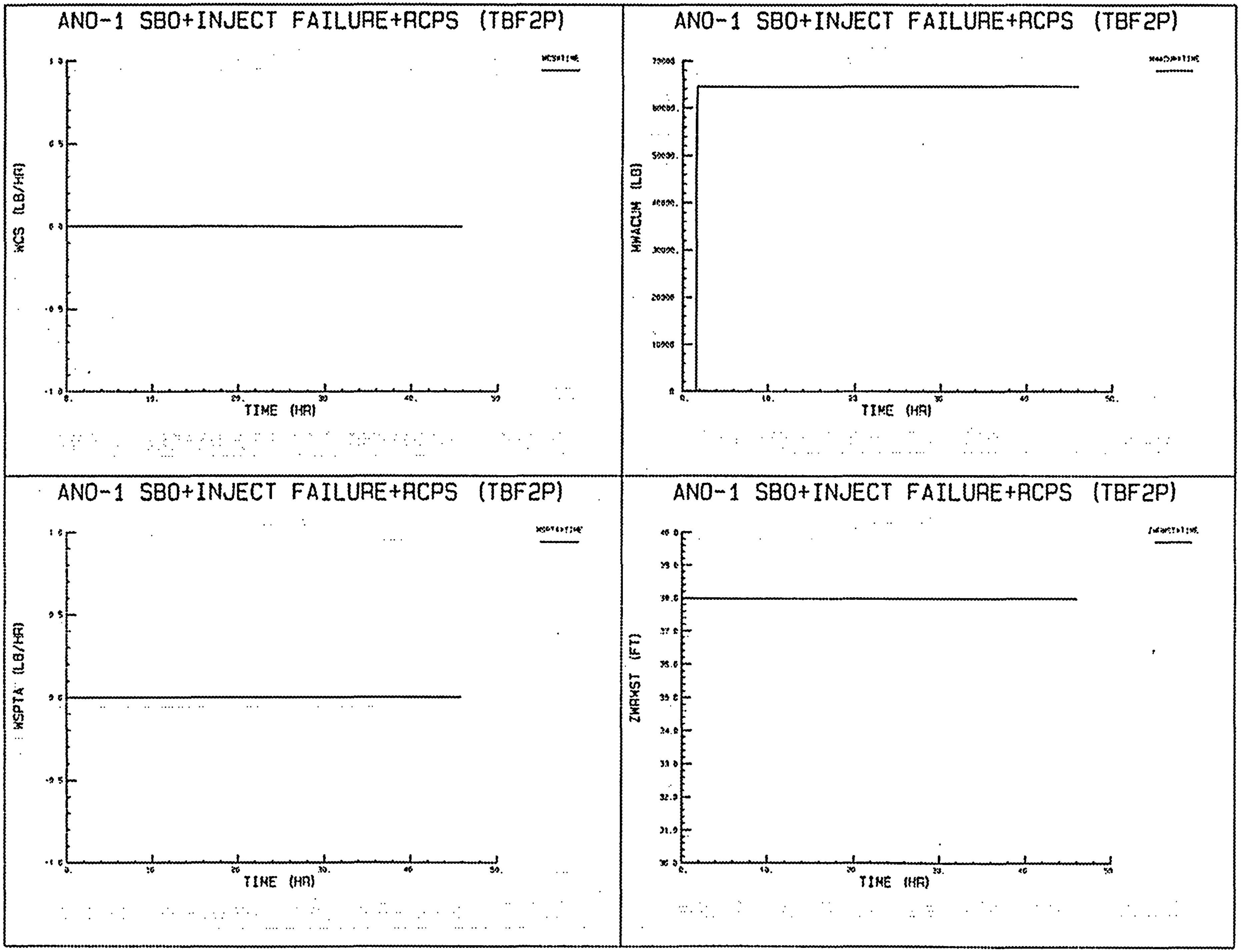
TIME (HR)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WCS (LB/HR)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MWACUM (LB)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
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TIME (HR)
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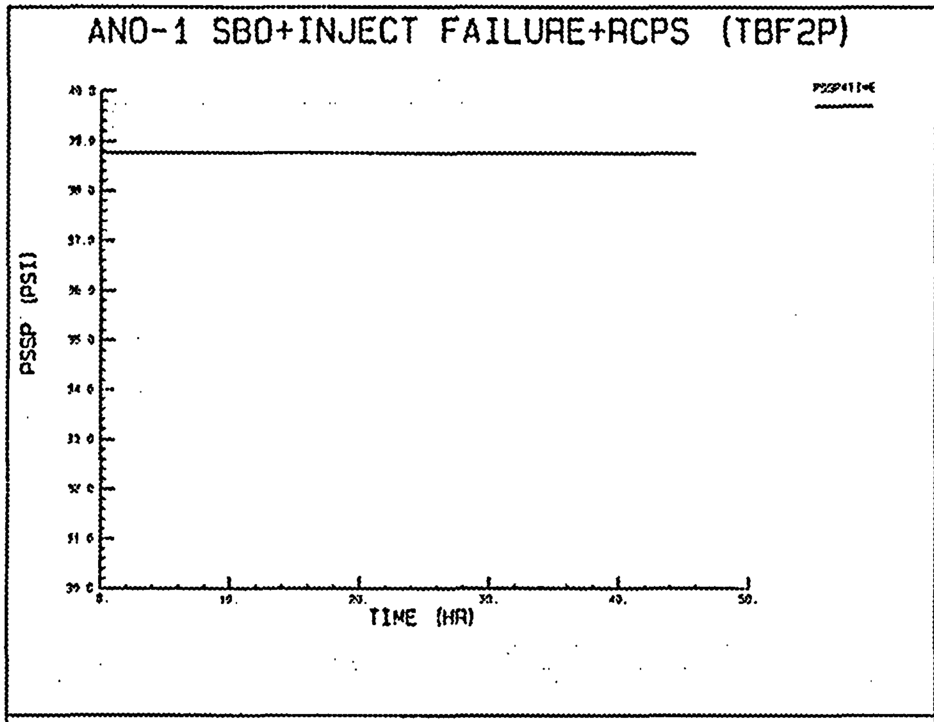
TIME (HR)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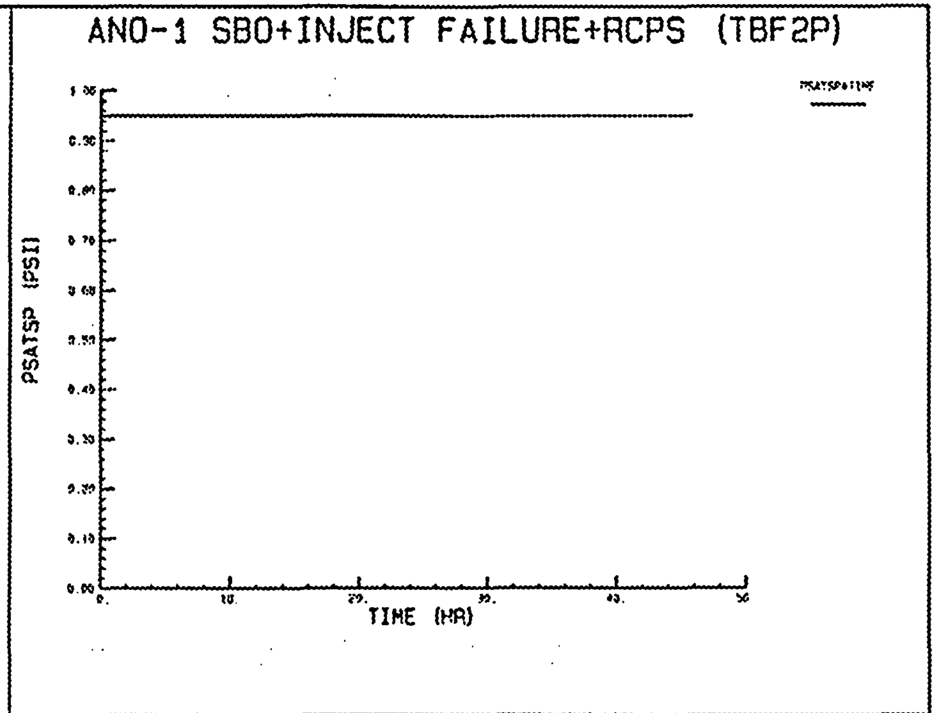
TIME (HR)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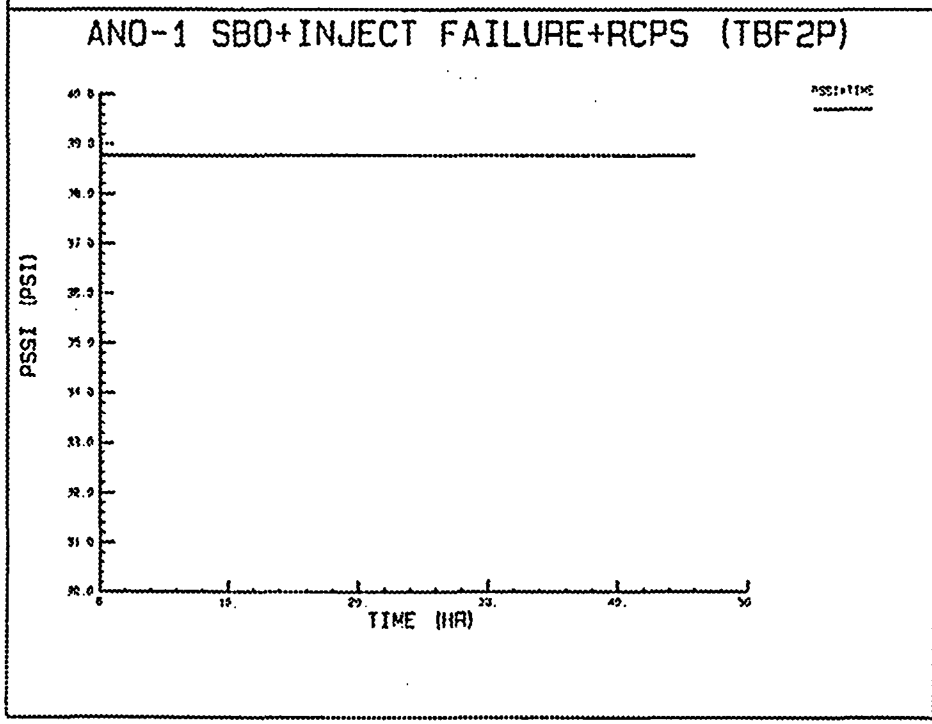
TIME (HR)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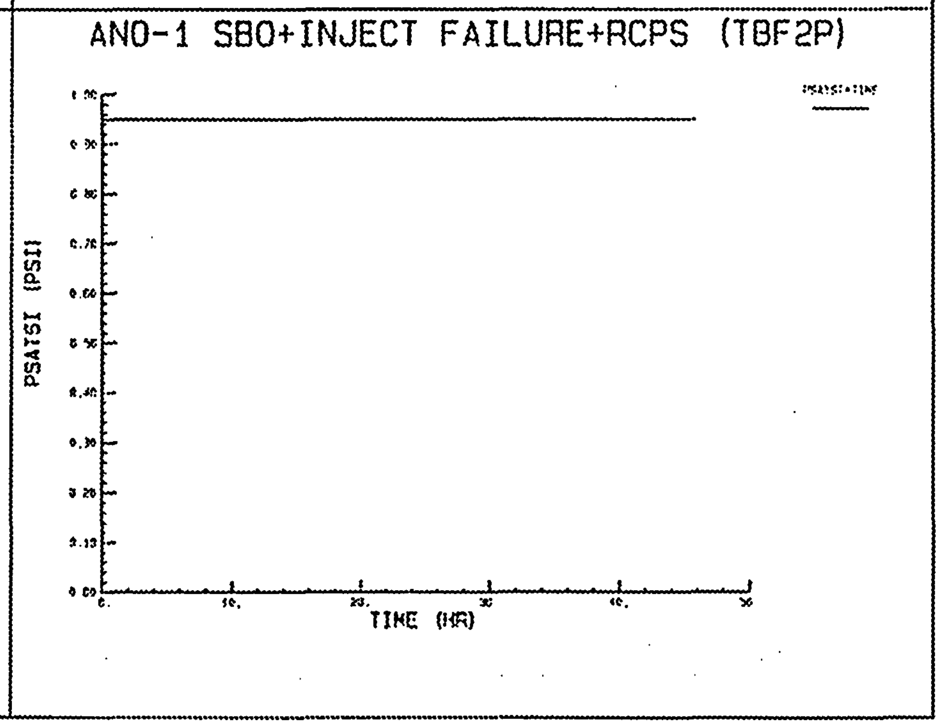
TIME (HR)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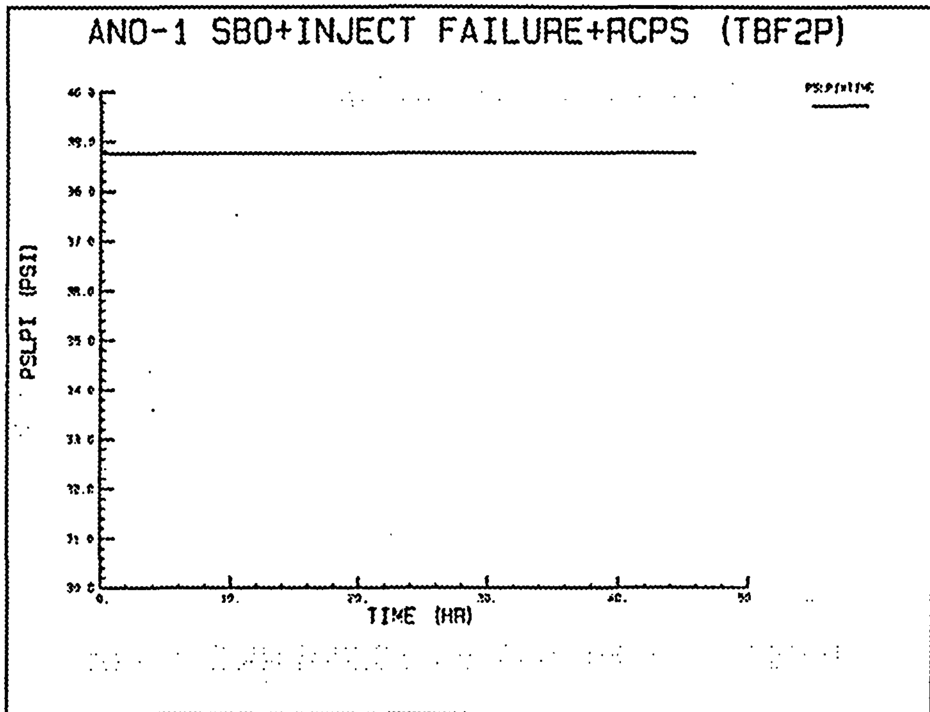
TIME (HR)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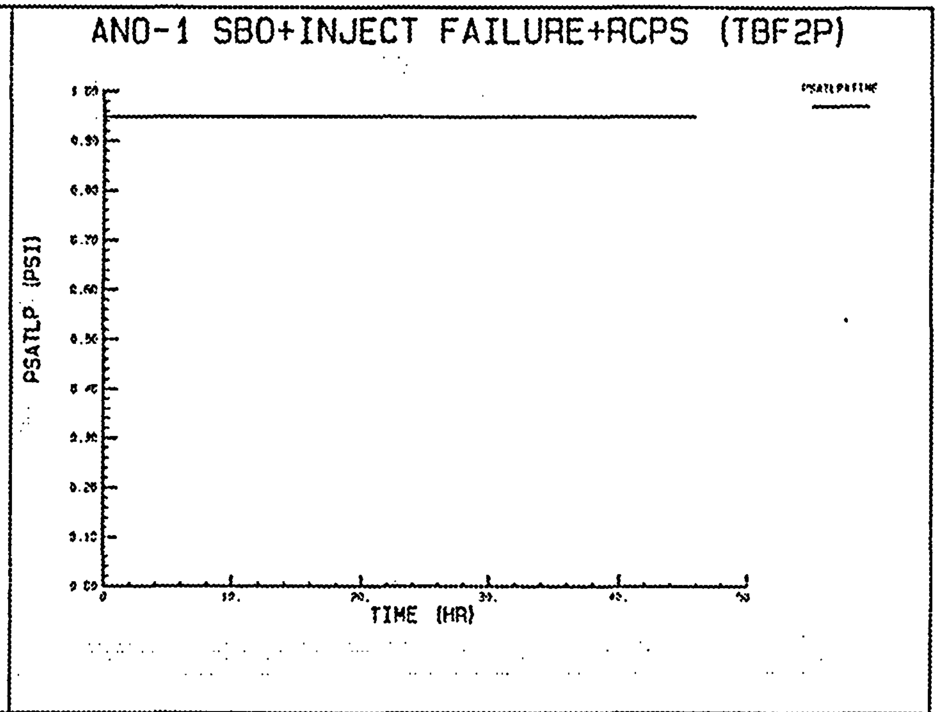
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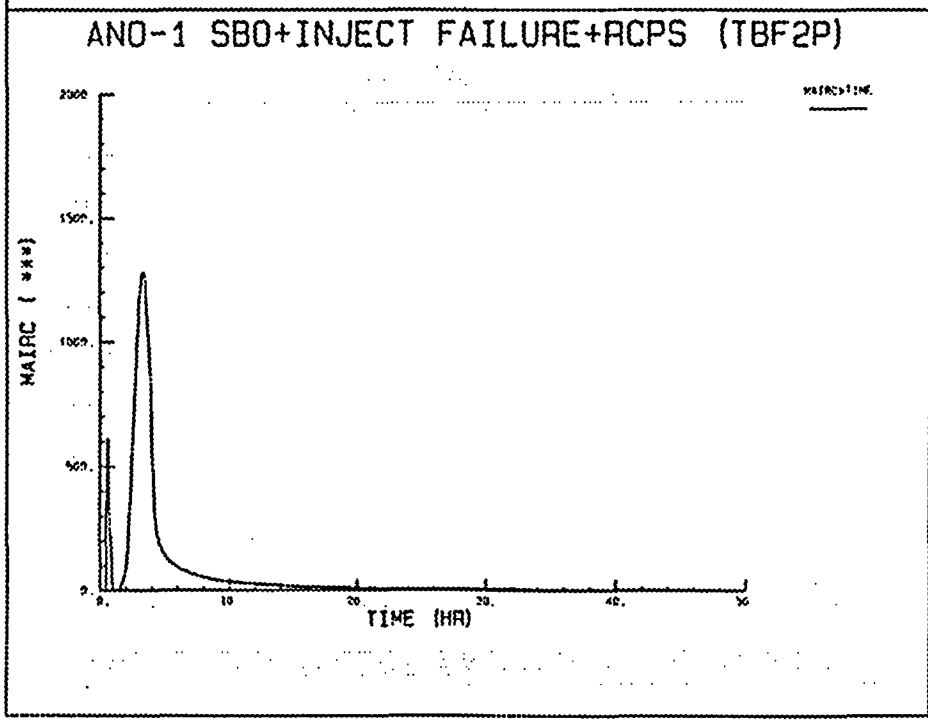
TIME (HR)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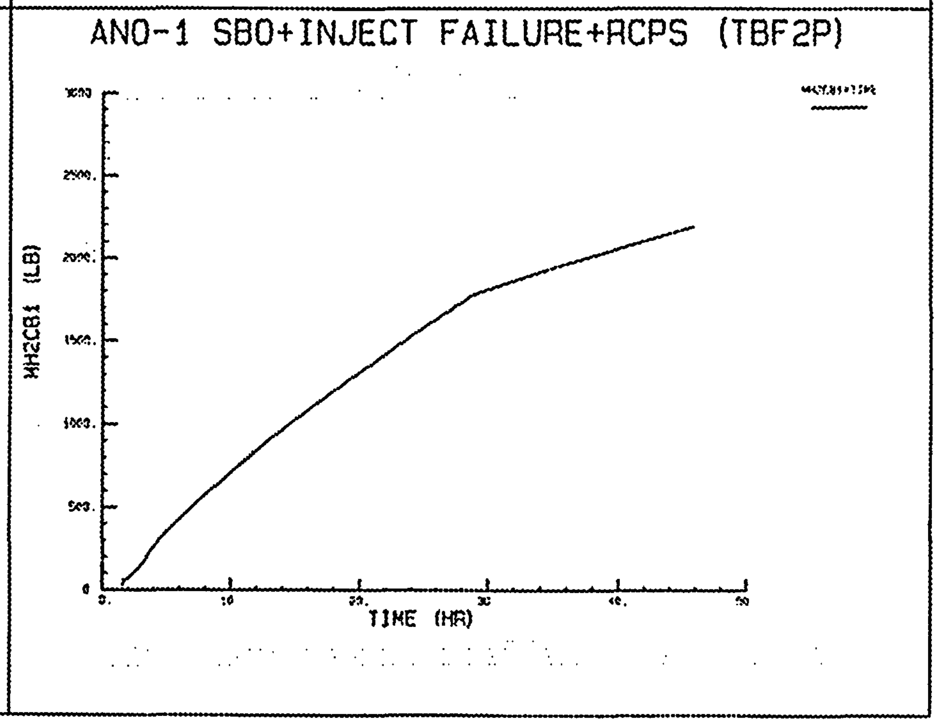
MAIRC (***)
TIME (HR)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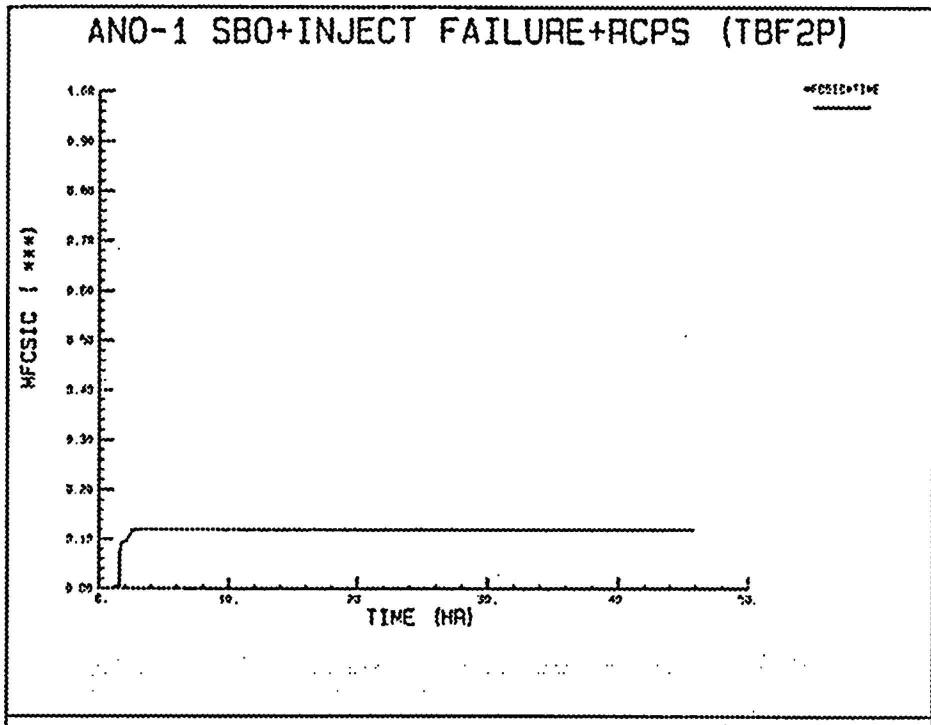
WH2CB1 (LB)
TIME (HR)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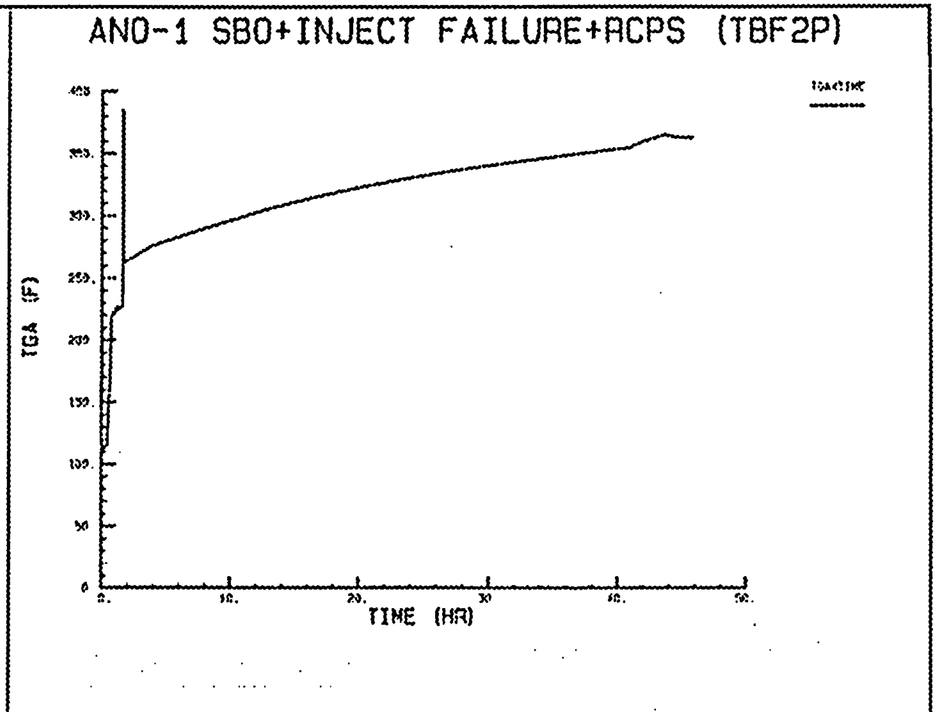
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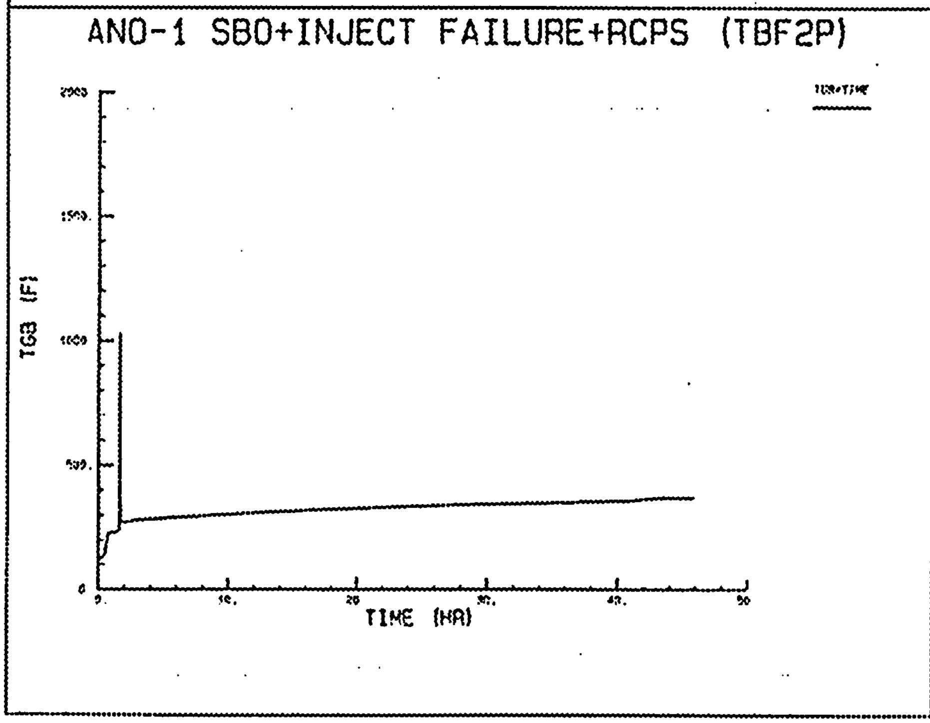
TGA (F)
TIME (HR)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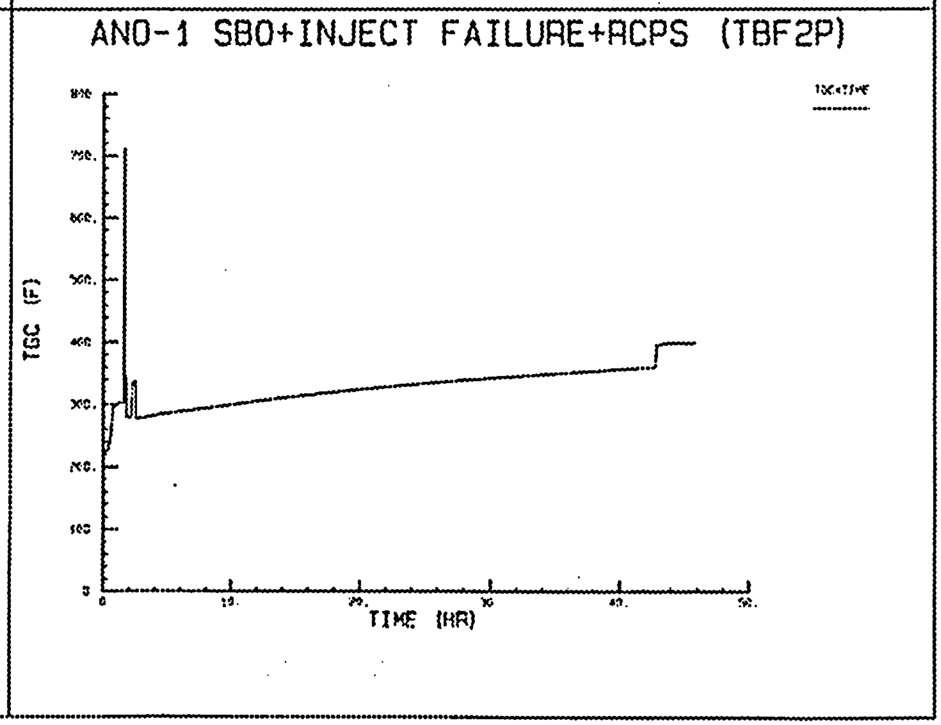
TIME (HR)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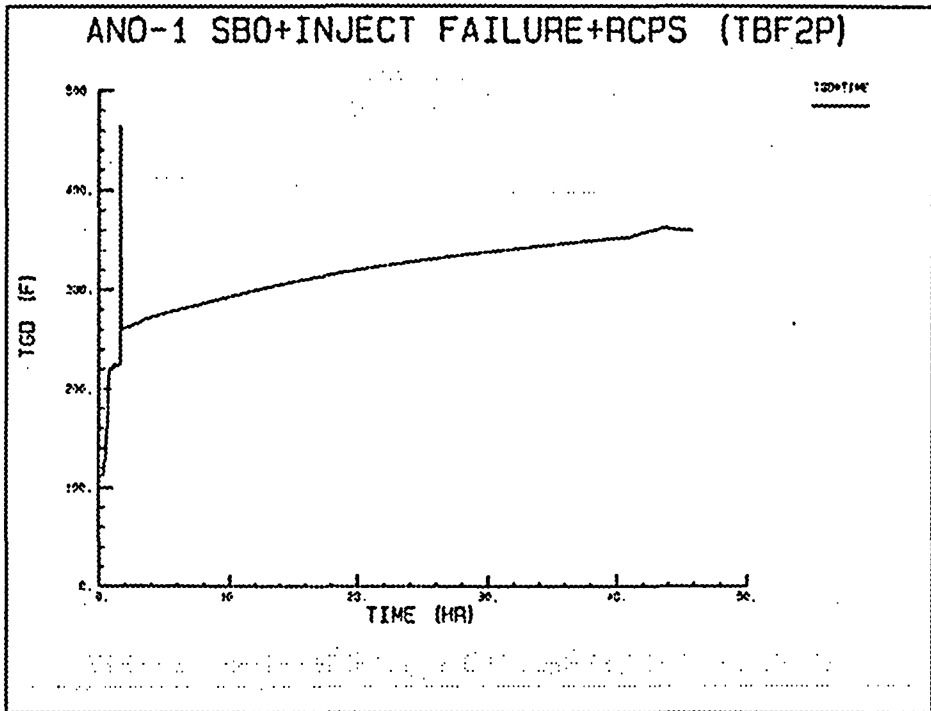
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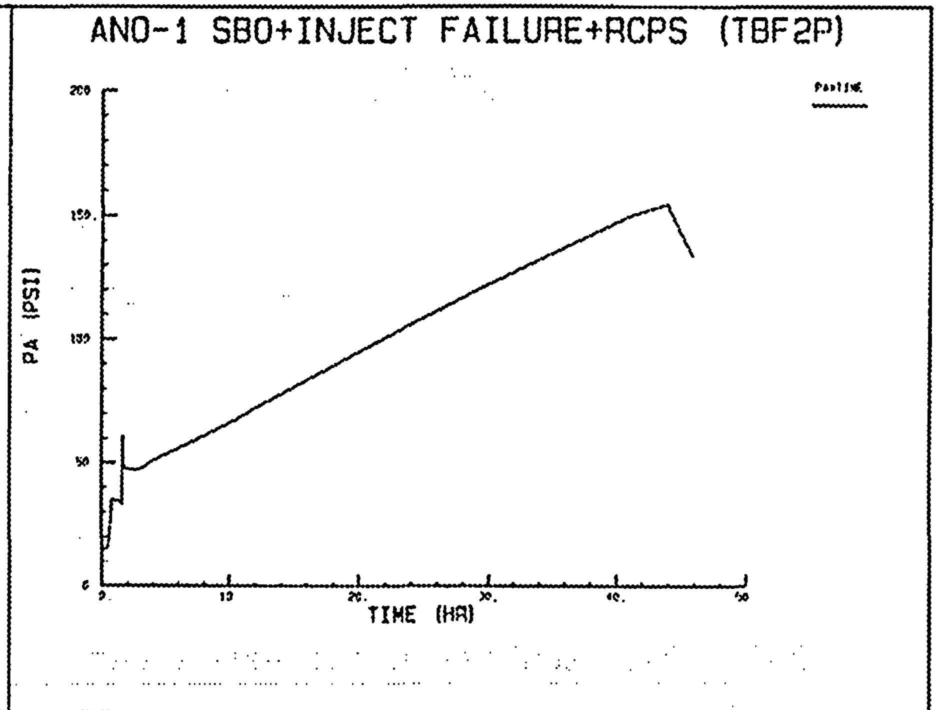
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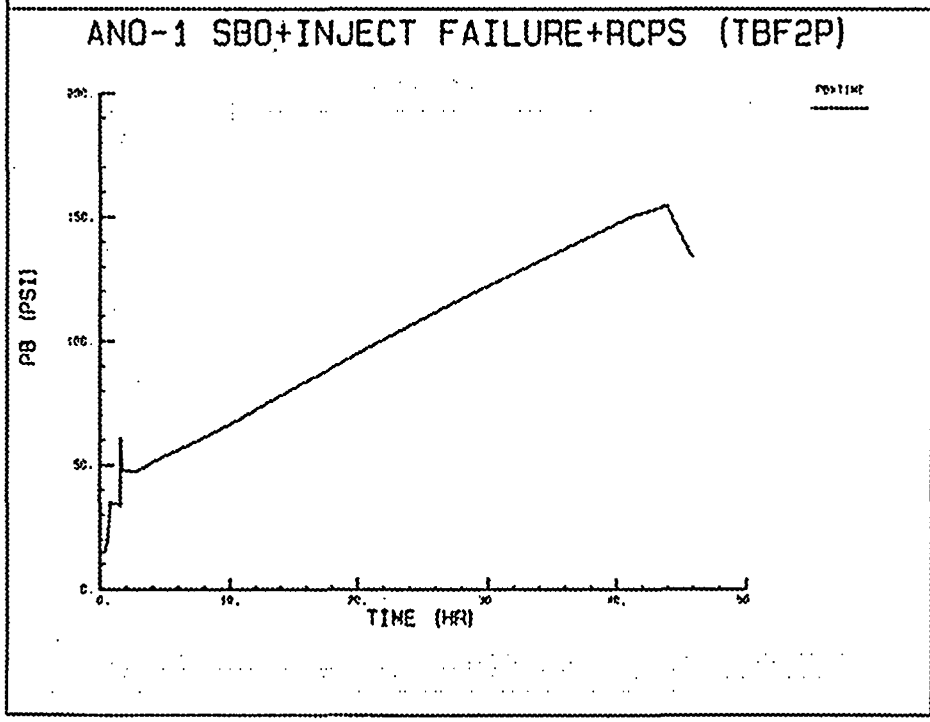
TIME (HR)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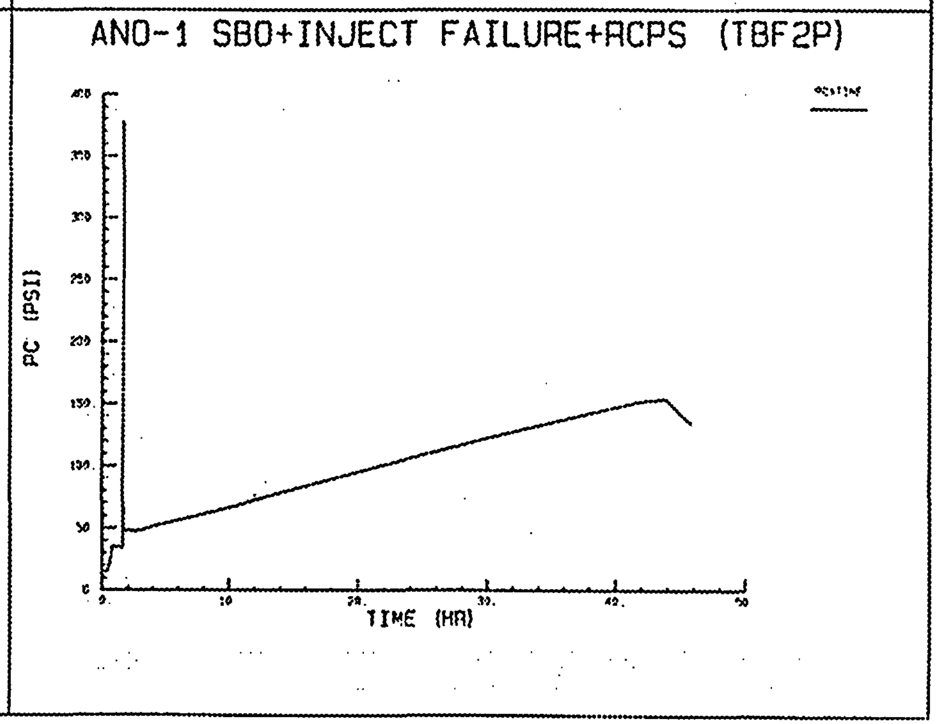
TIME (HR)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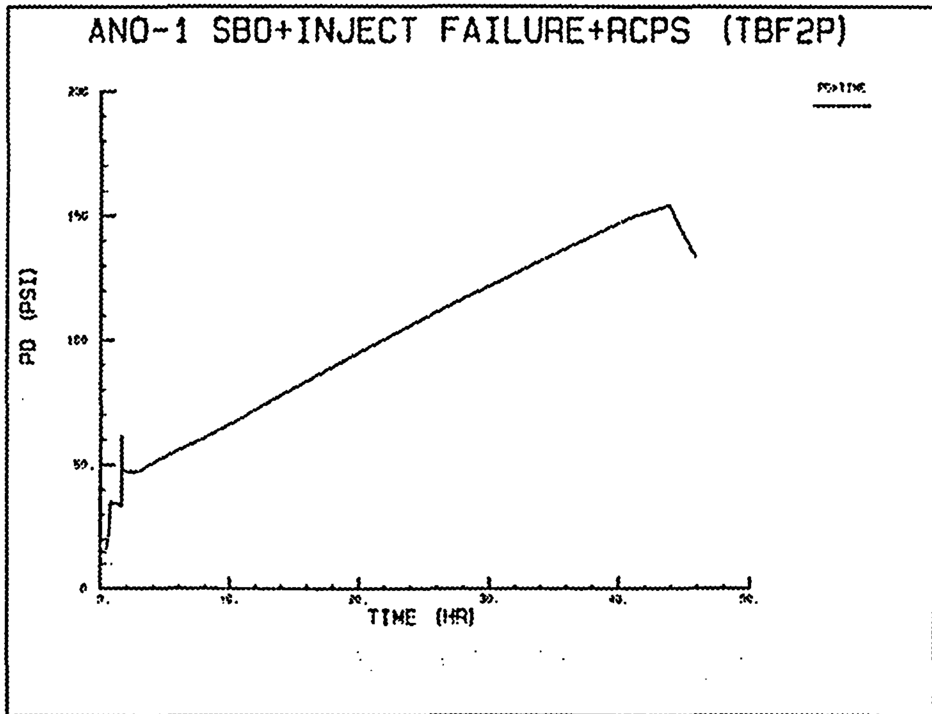
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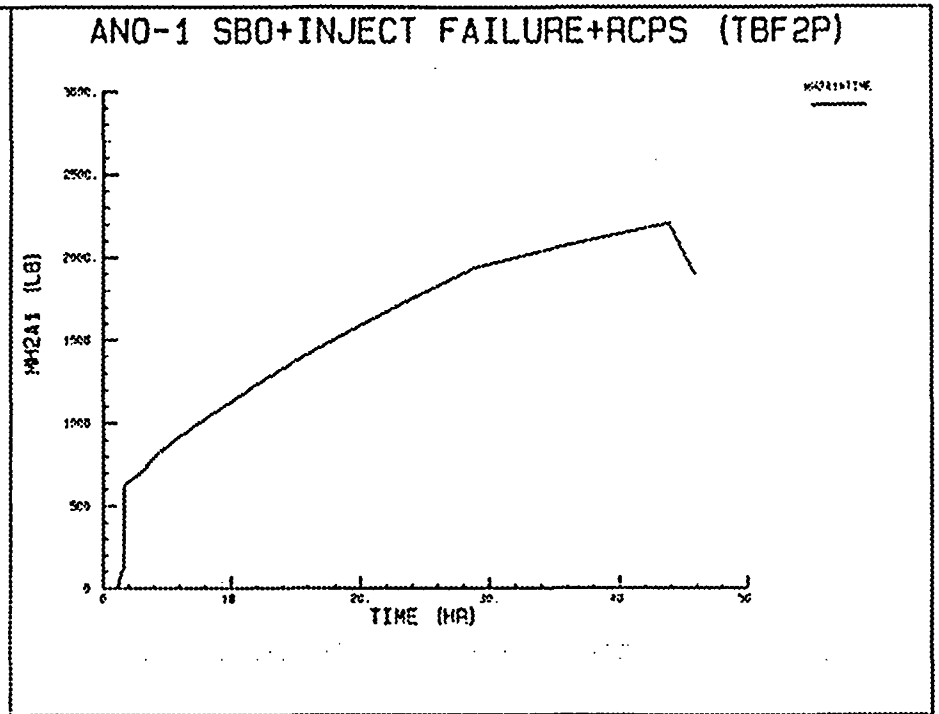
TIME (HR)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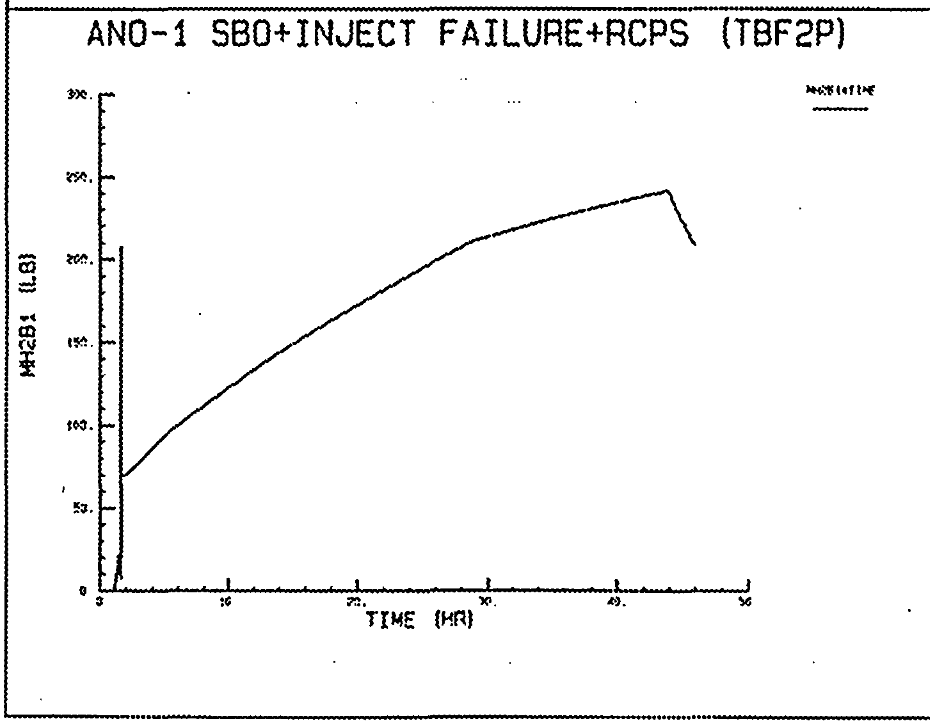
MH2A1 (LB)
TIME (HR)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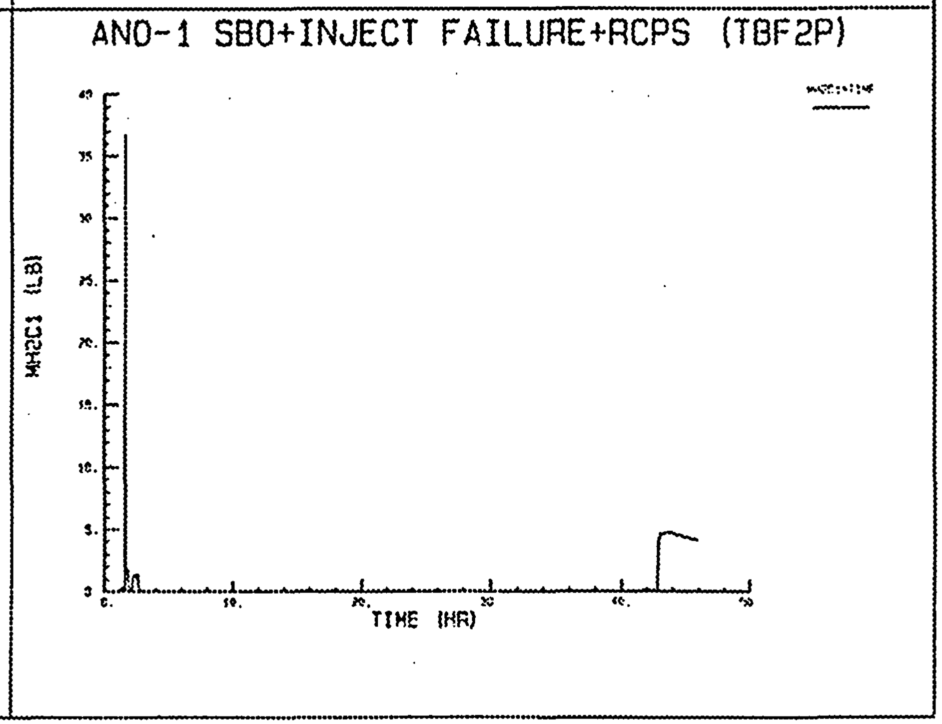
TIME (HR)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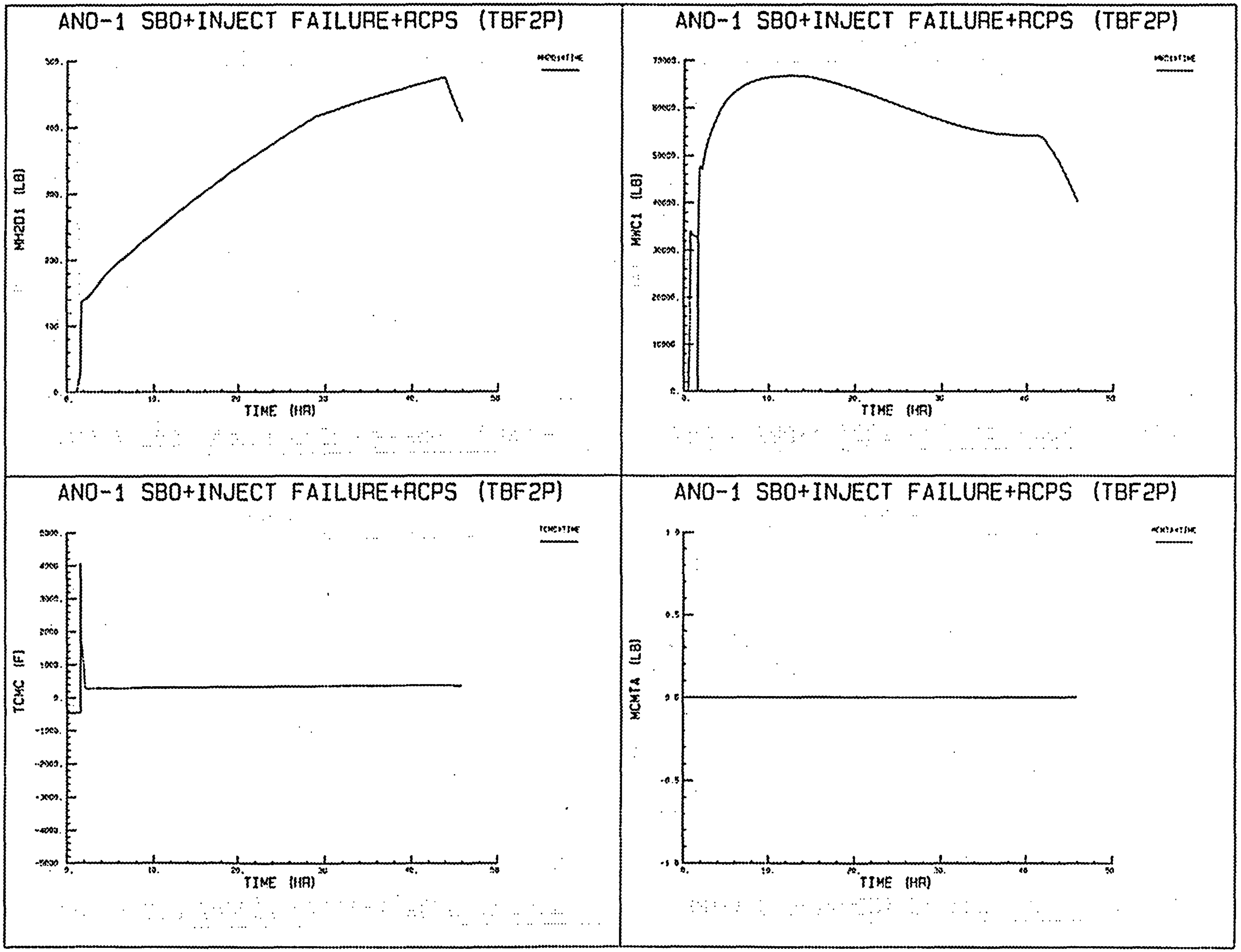
TIME (HR)



ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MH2O1 (LB)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
MWC1 (LB)
TIME (HR)
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TIME (HR)
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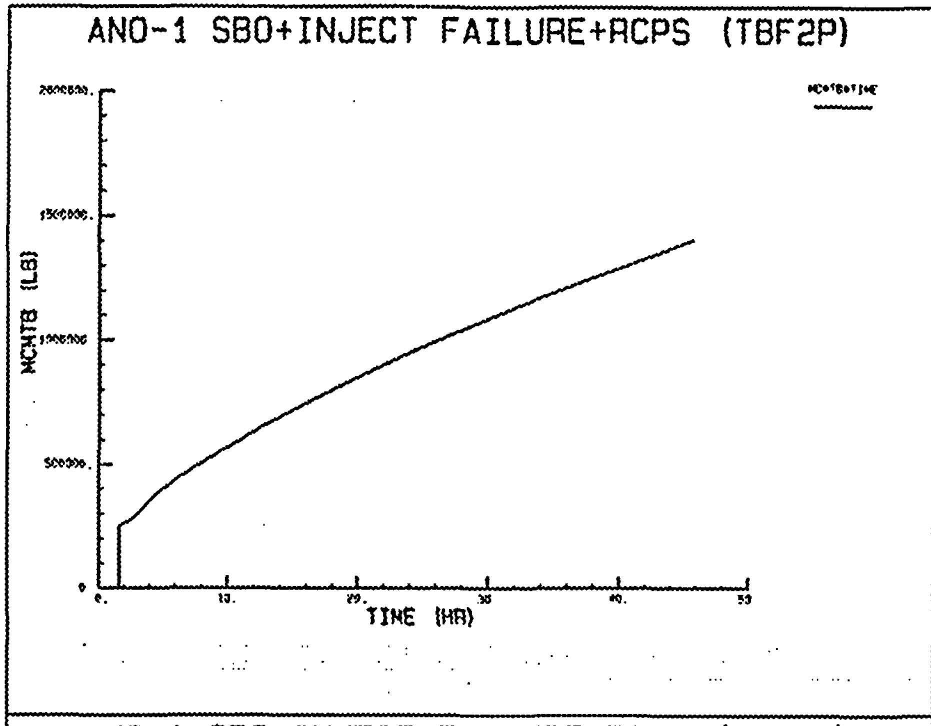
TIME (HR)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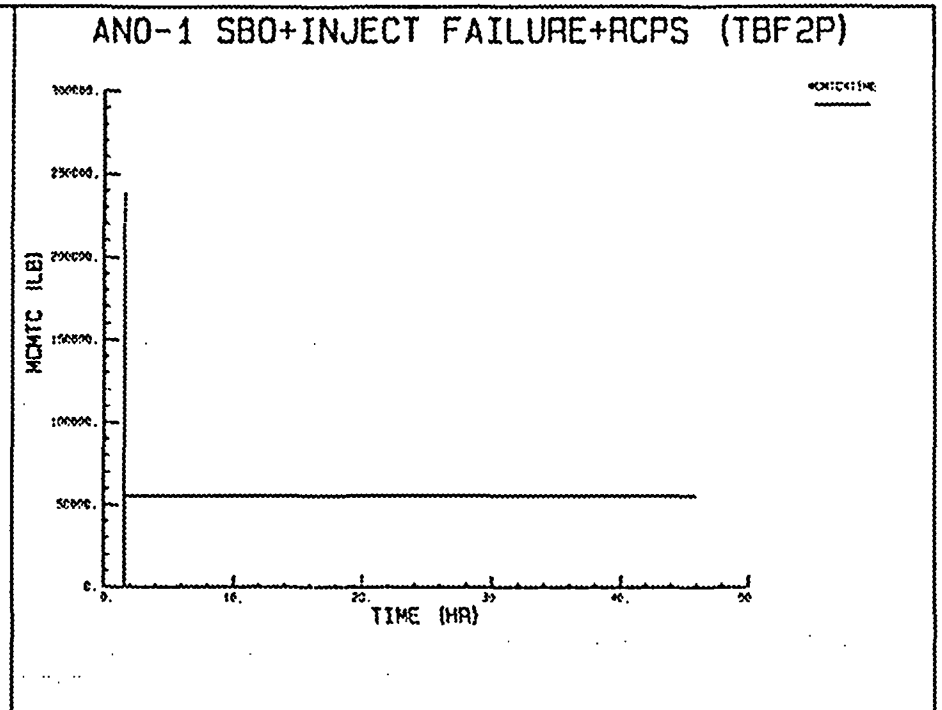
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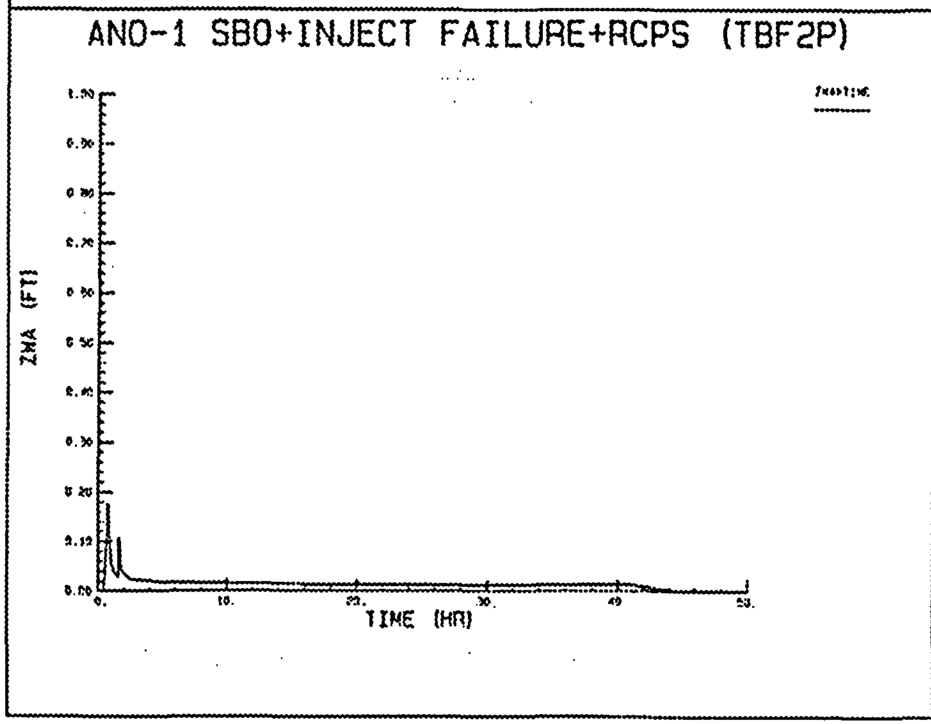
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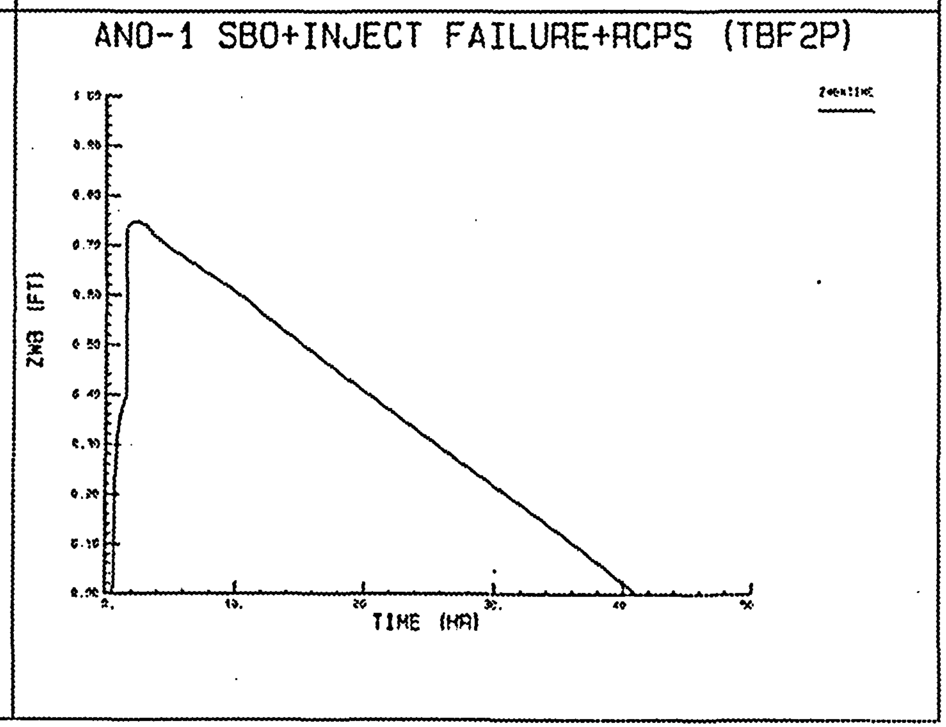
TIME (HR)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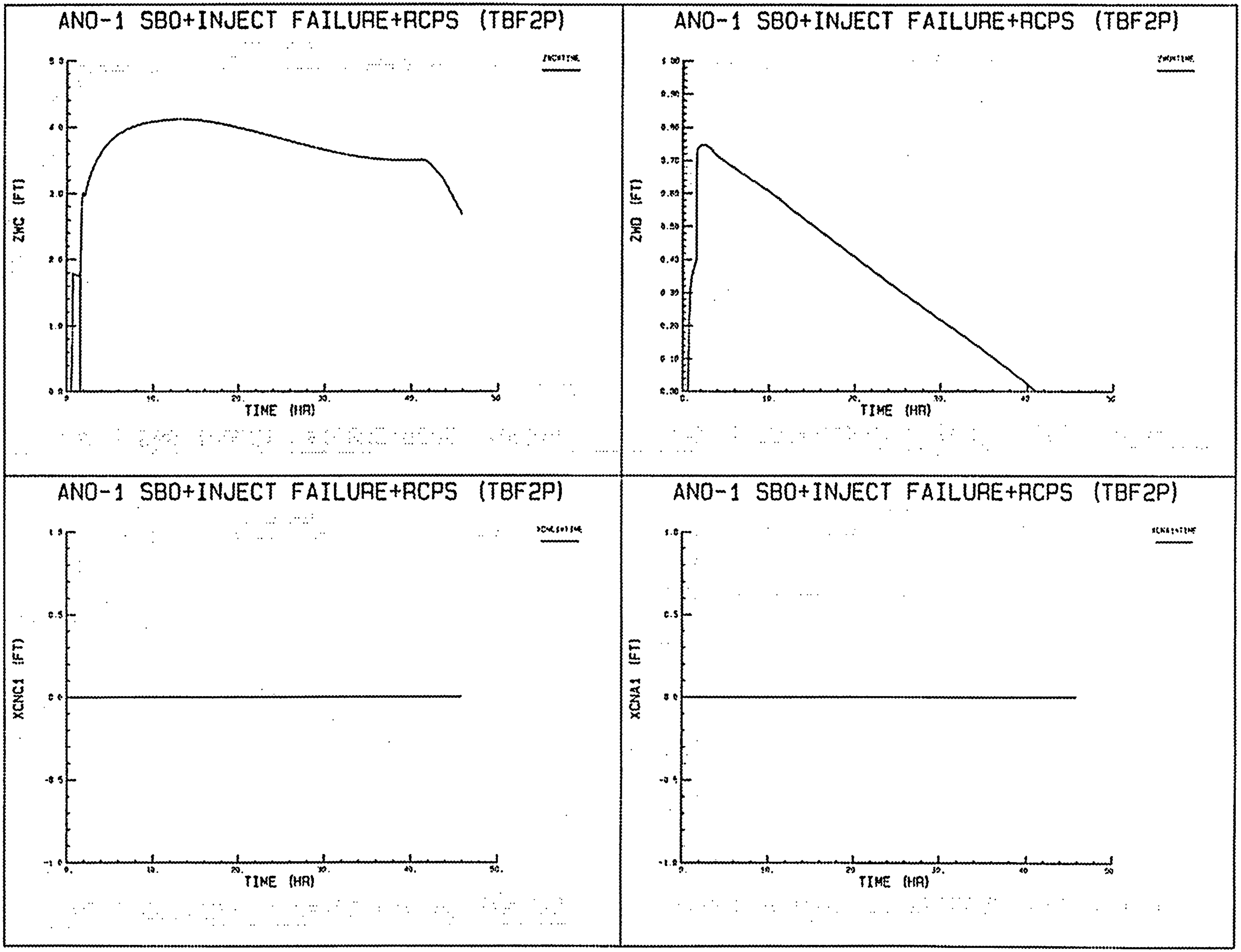
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
ZWC (FT)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
ZWD (FT)
TIME (HR)
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TIME (HR)
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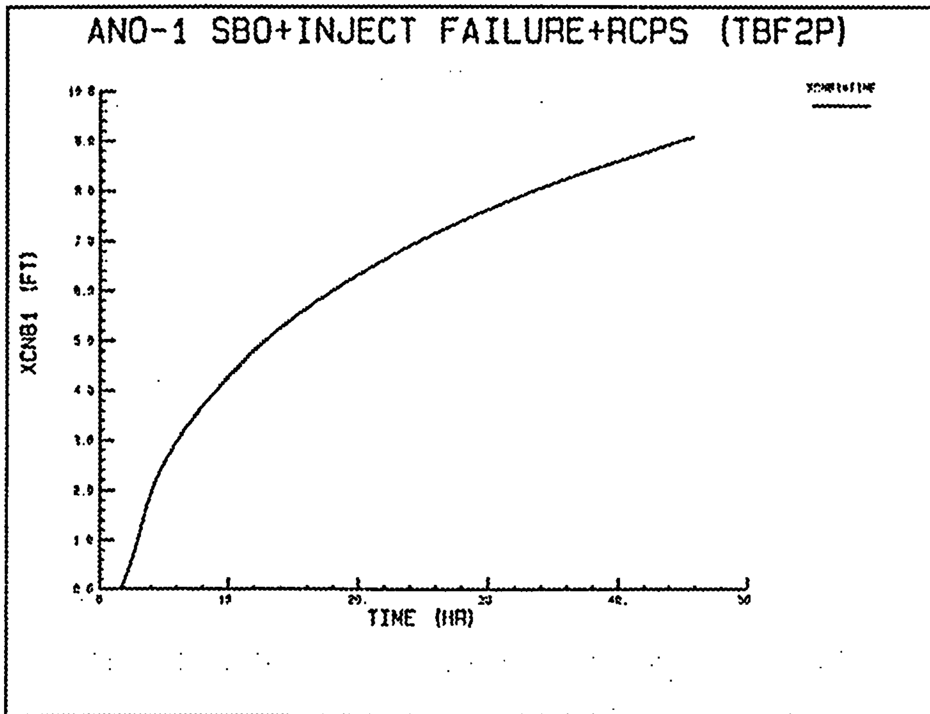
TIME (HR)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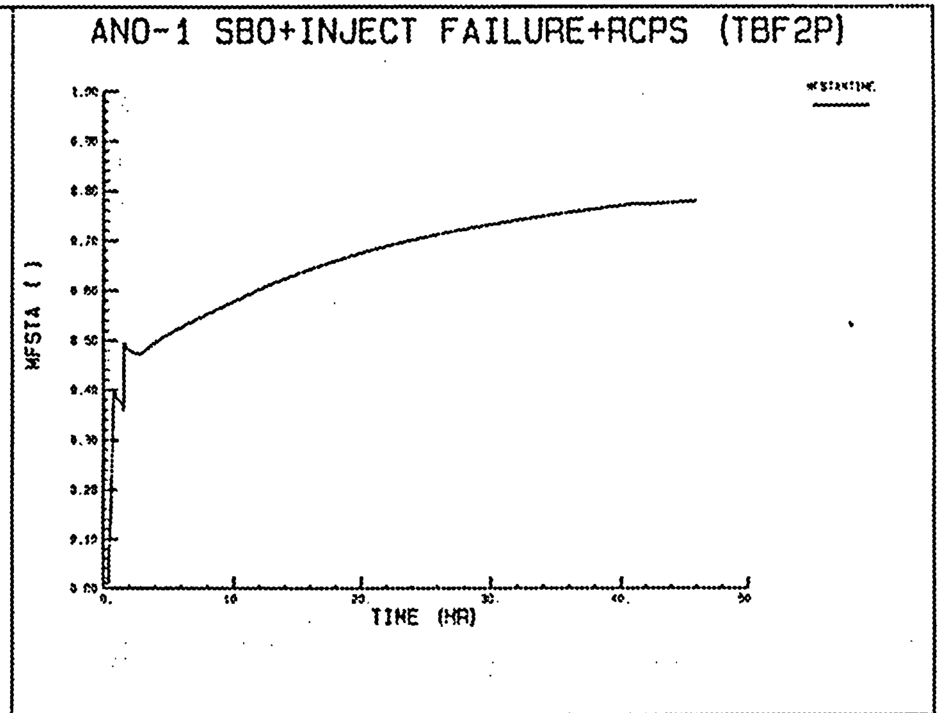
XCNB1 (FT)
TIME (HR)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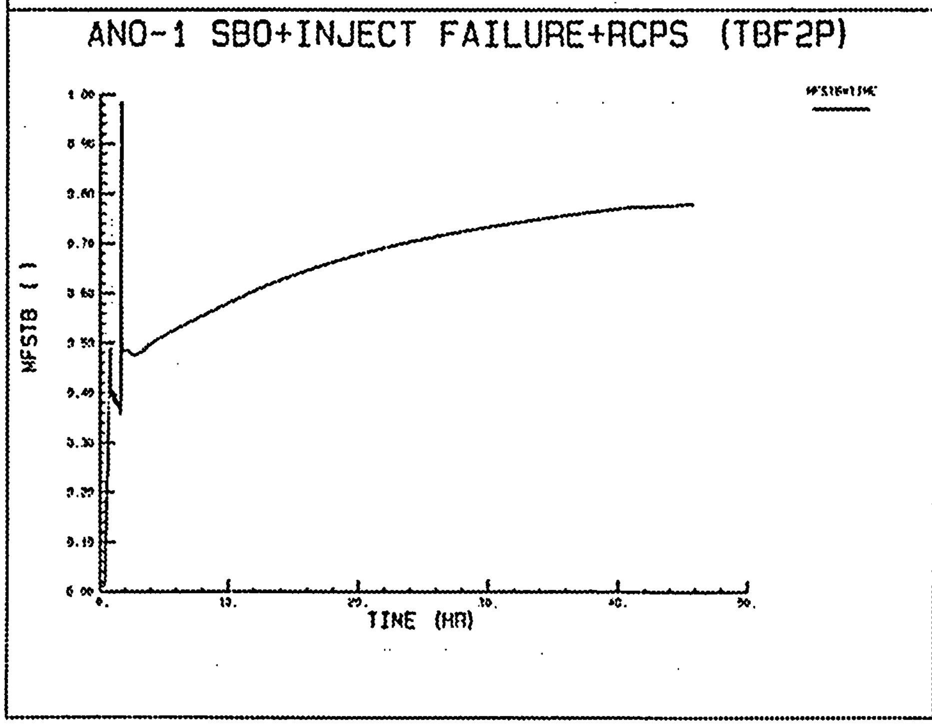
MFSTA ( )
TIME (HR)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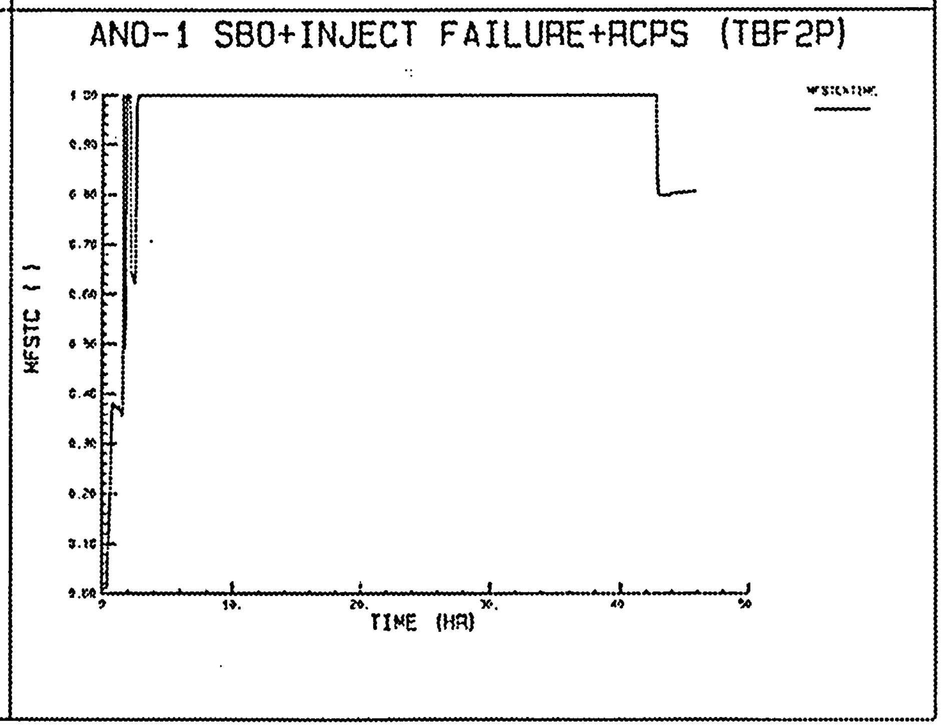
TIME (HR)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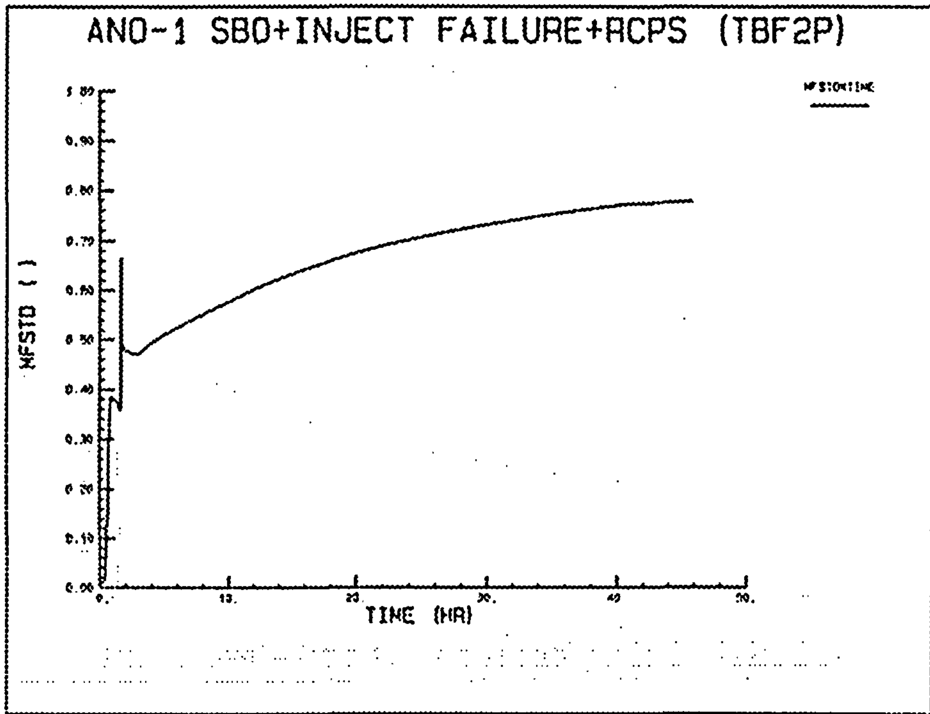
TIME (HR)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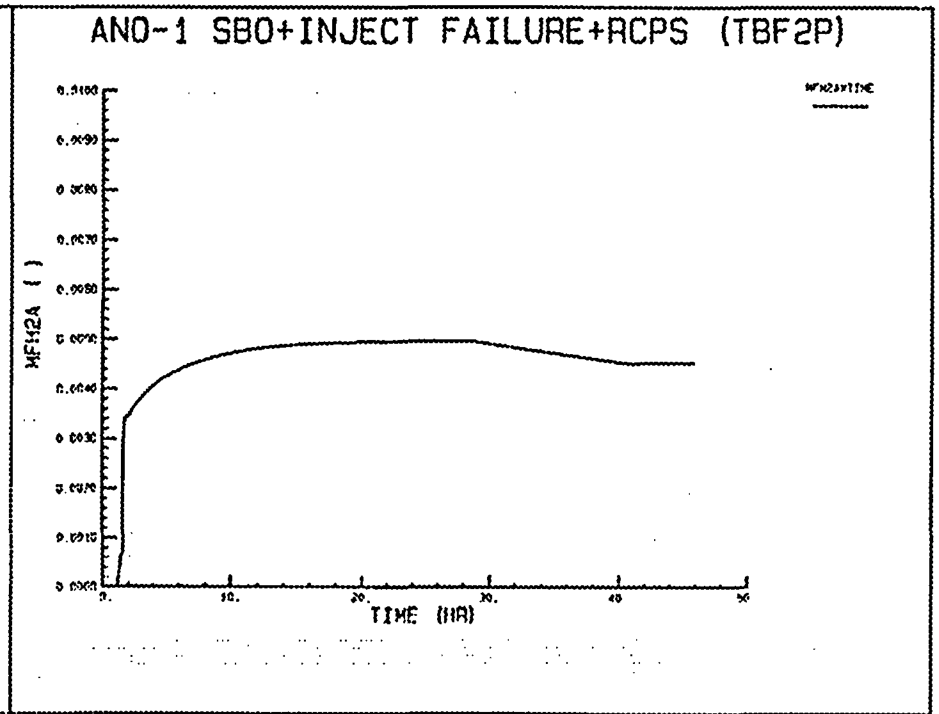
TIME (HR)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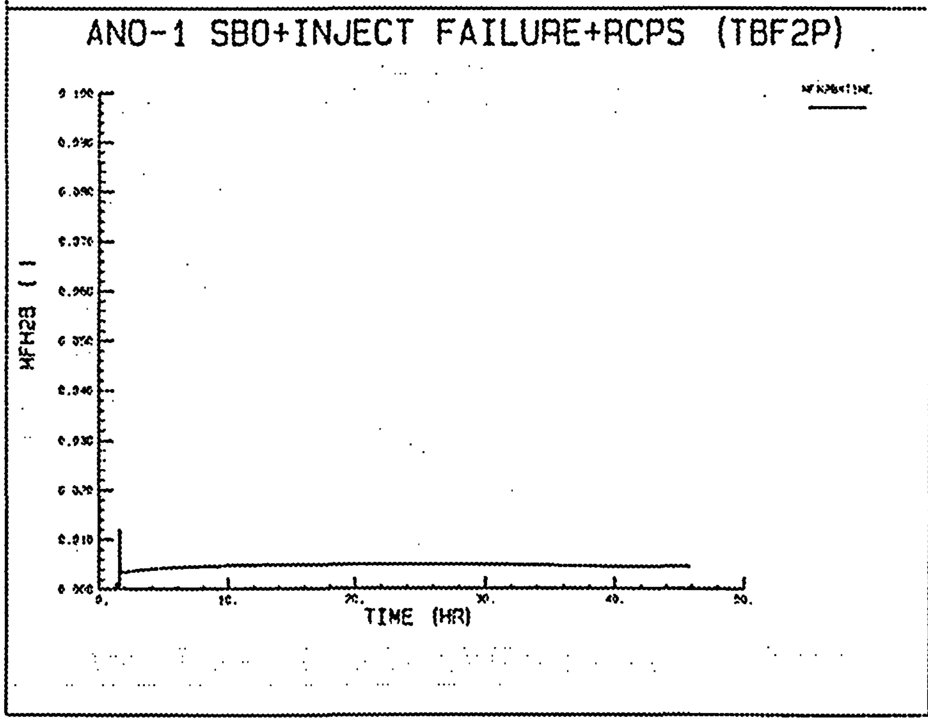
TIME (HR)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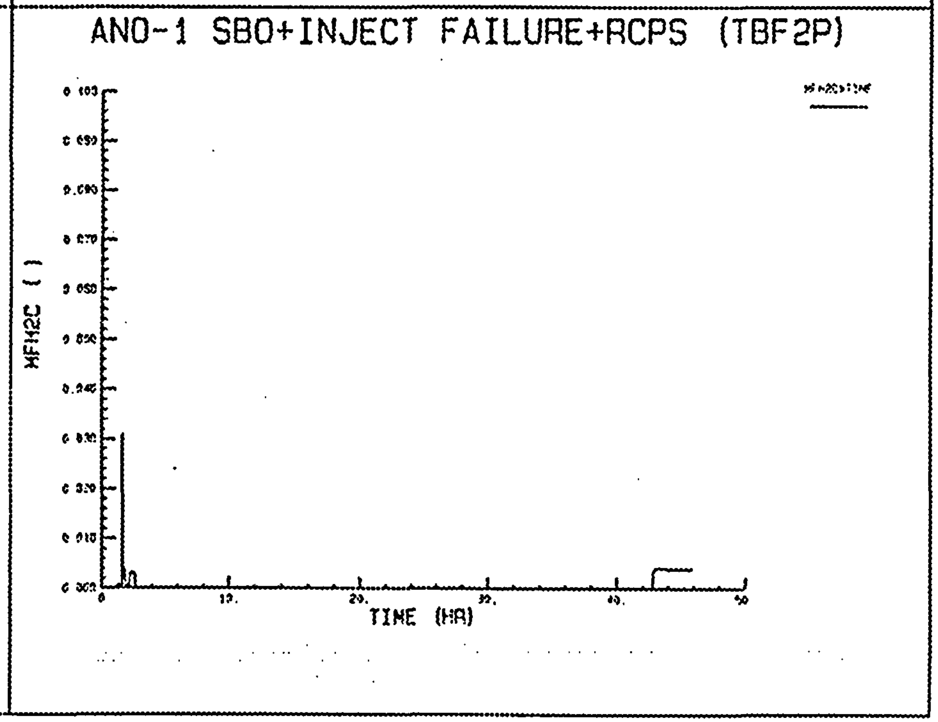
TIME (HR)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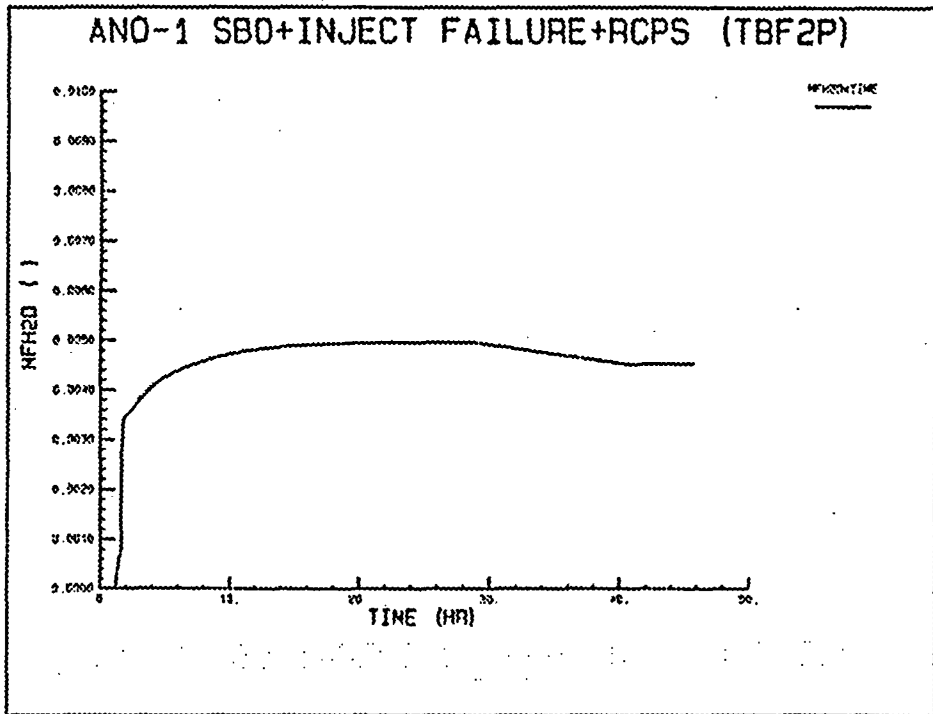
TIME (HR)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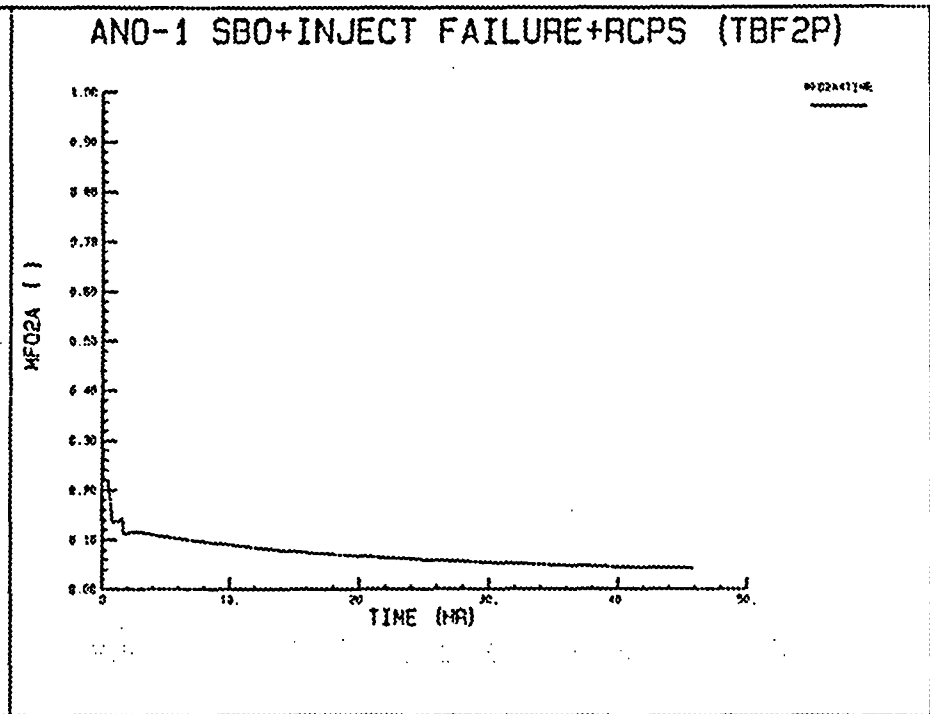
TIME (HR)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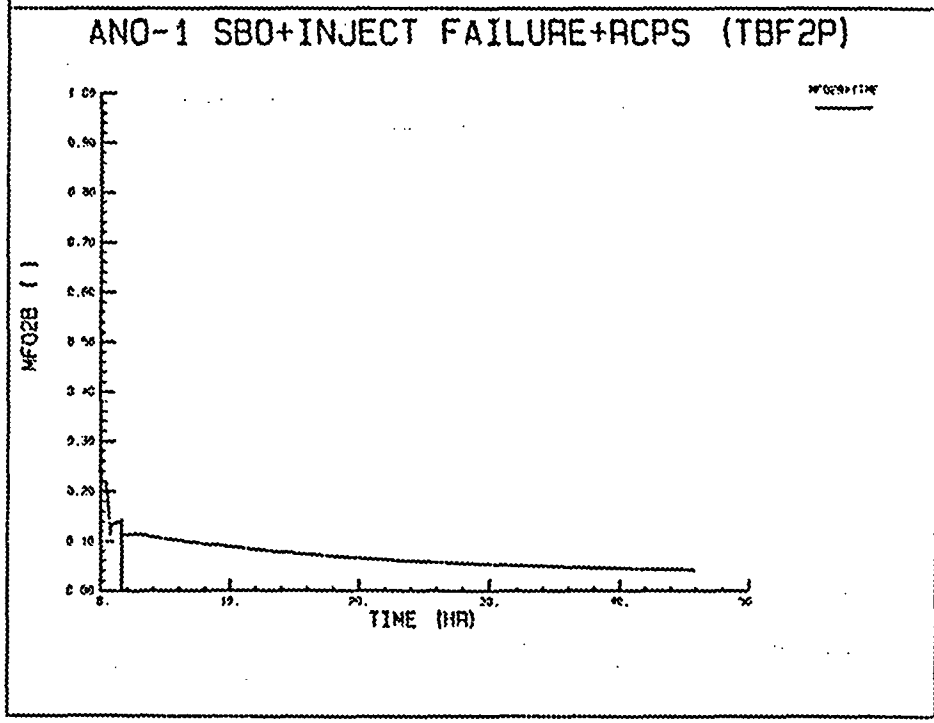
TIME (HR)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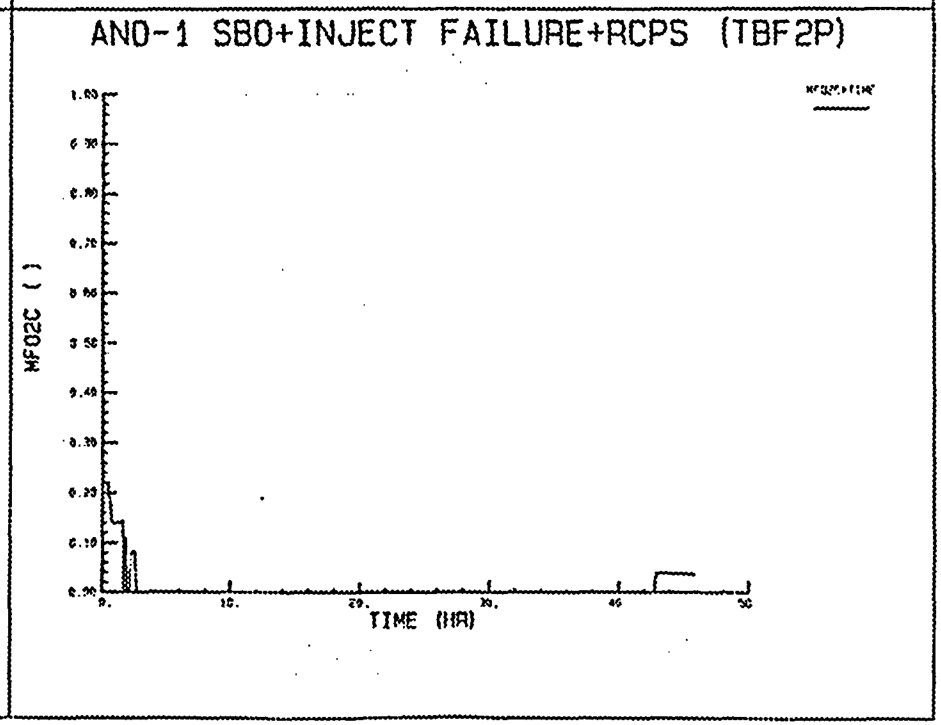
TIME (HR)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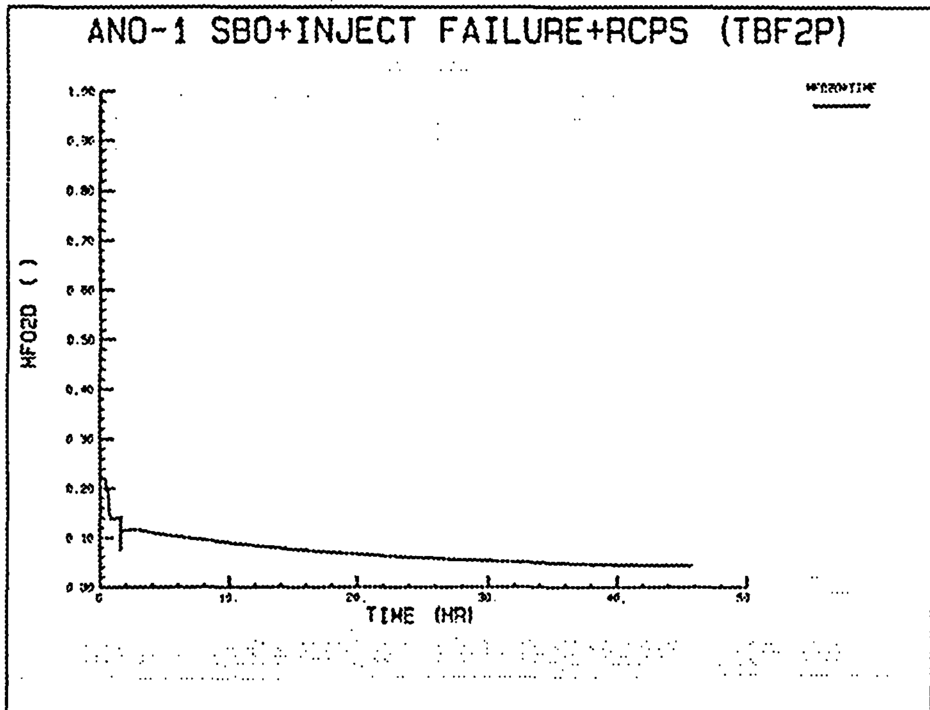
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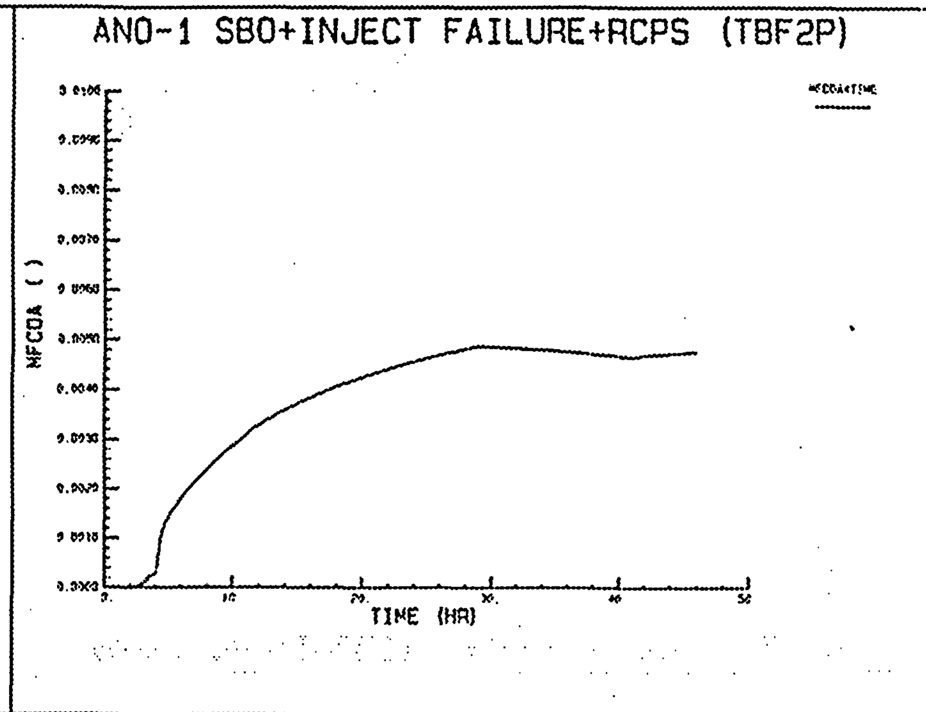
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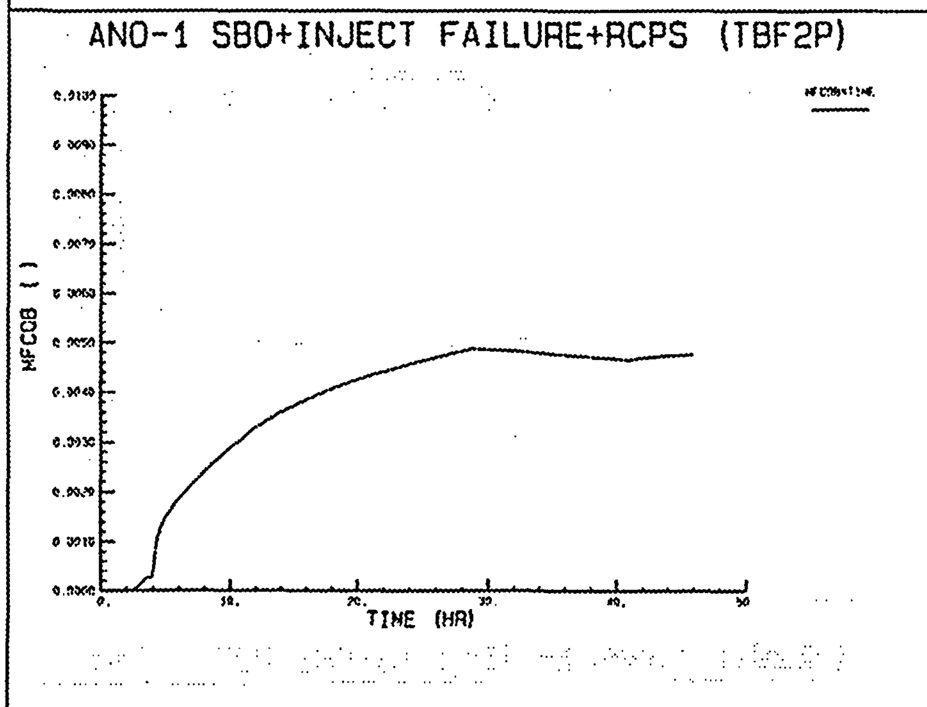
TIME (HR)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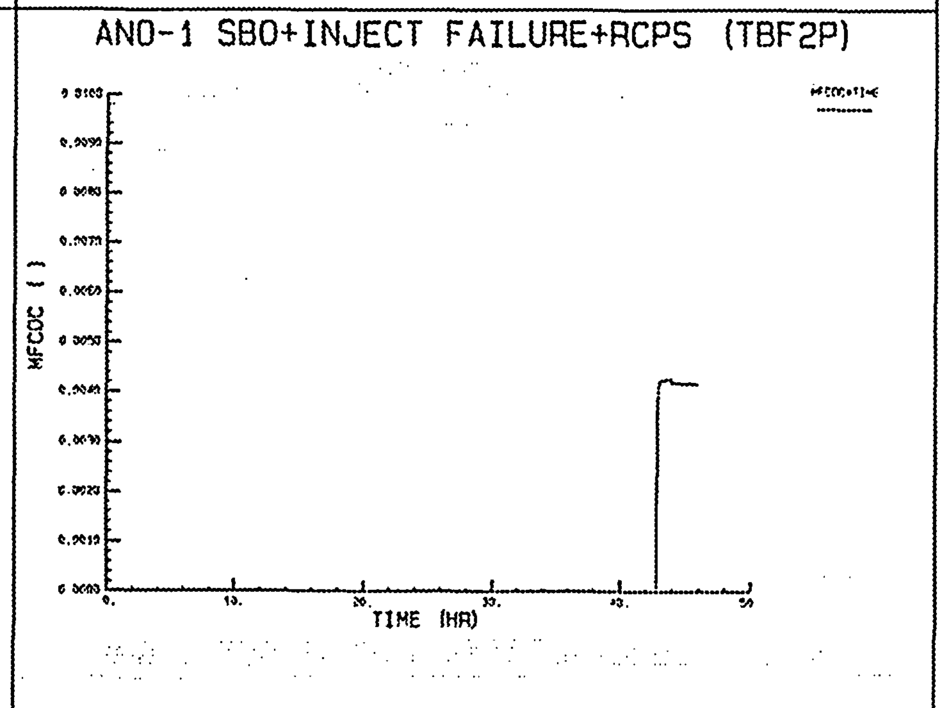
TIME (HR)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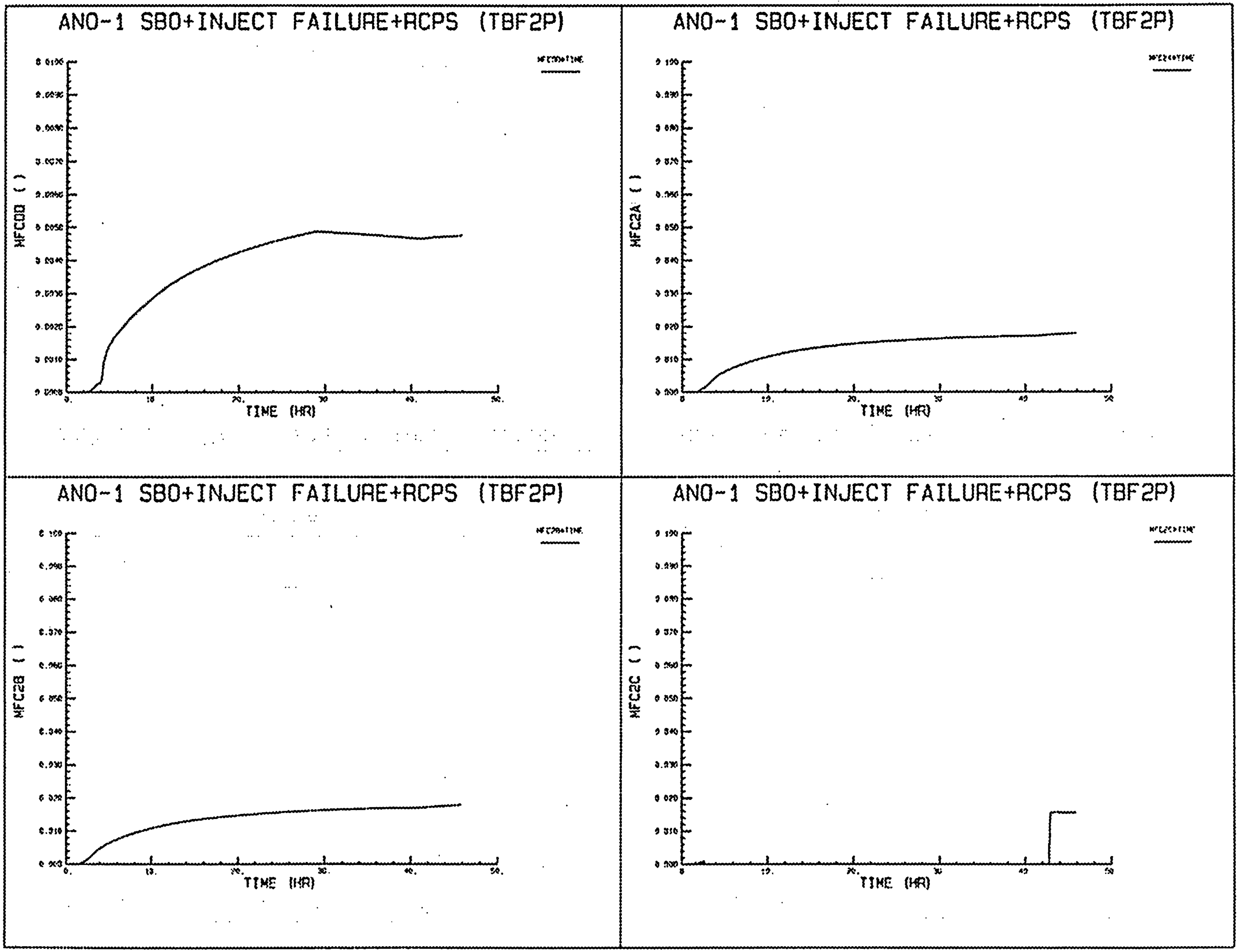
TIME (HR)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MFCOD ( )
TIME (HR)
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MFC2A ( )
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS (TBF2P)
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TIME (HR)
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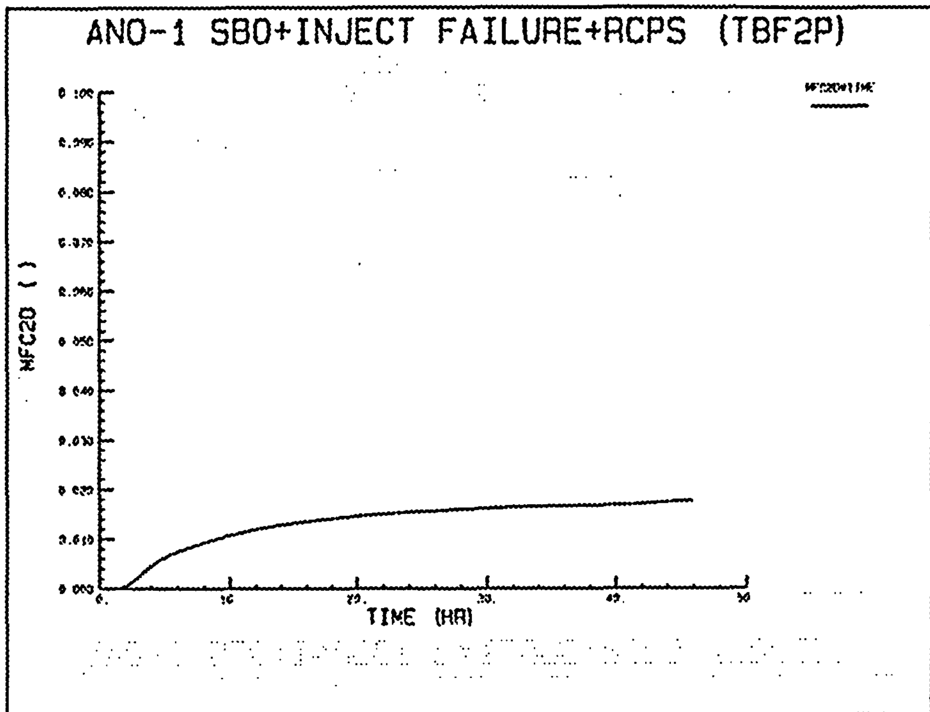
TIME (HR)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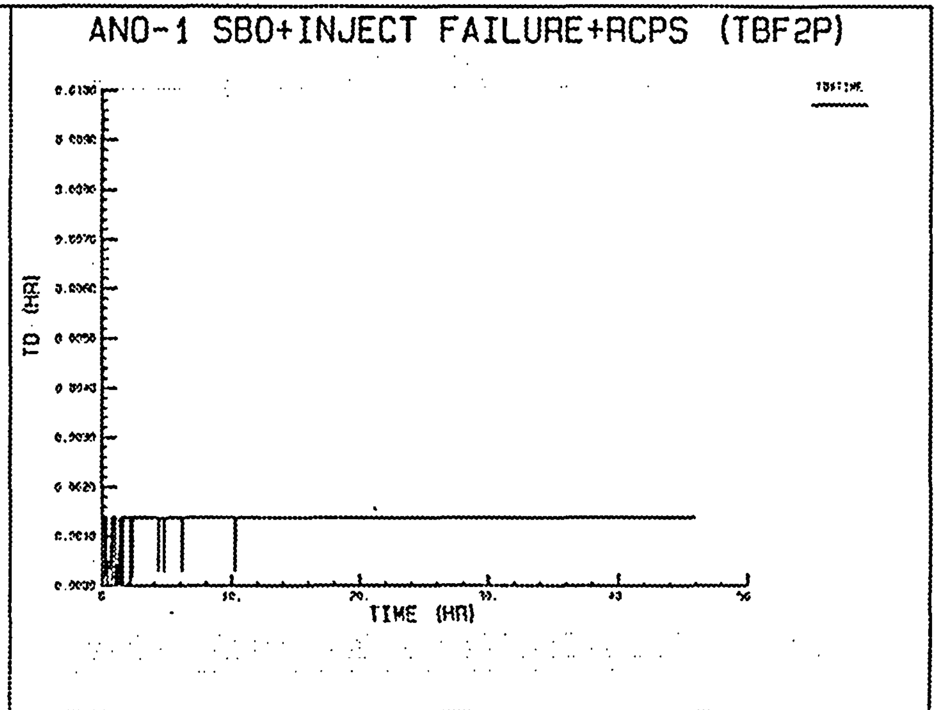
TIME (HR)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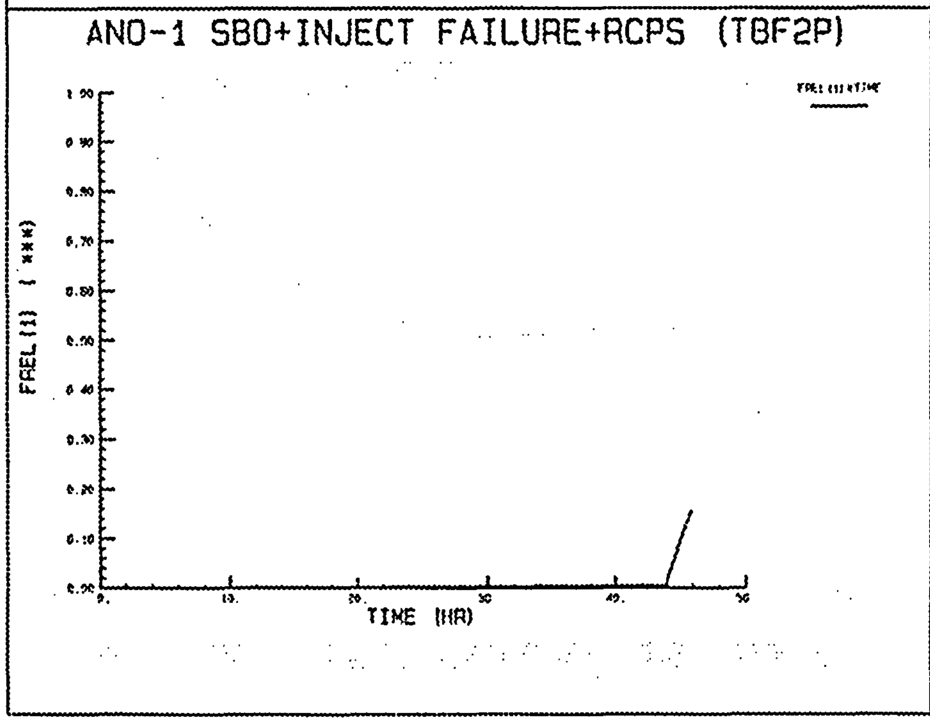
TIME (HR)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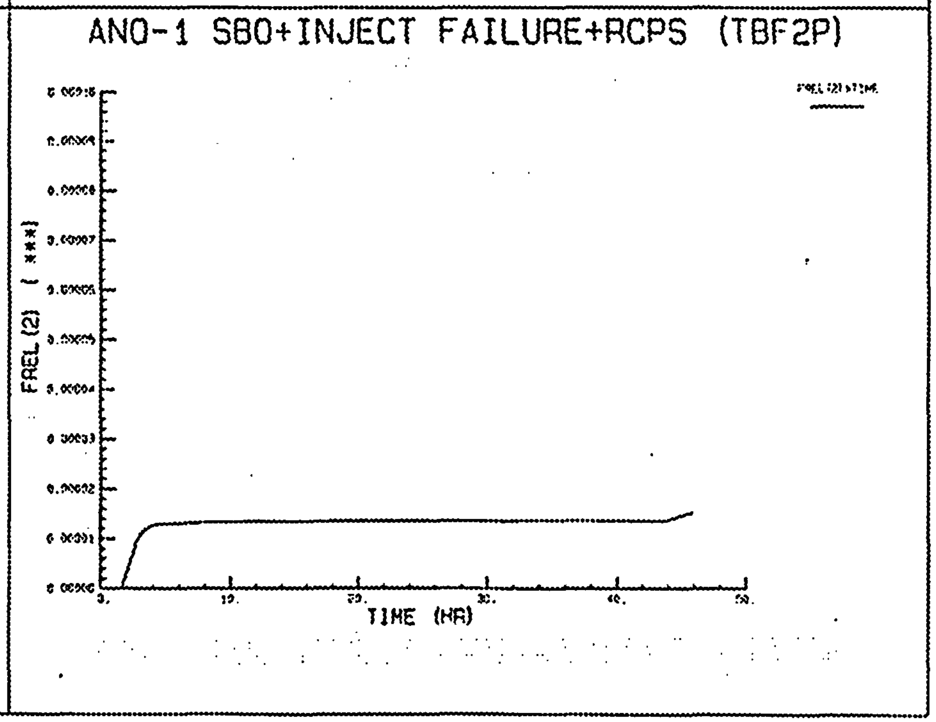
TIME (HR)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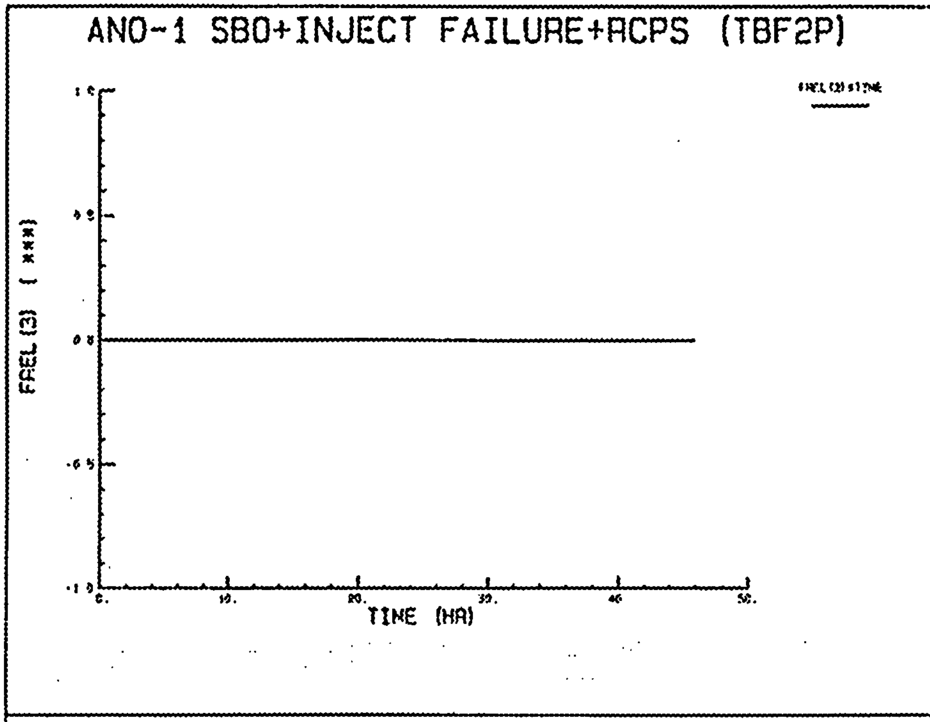
TIME (HR)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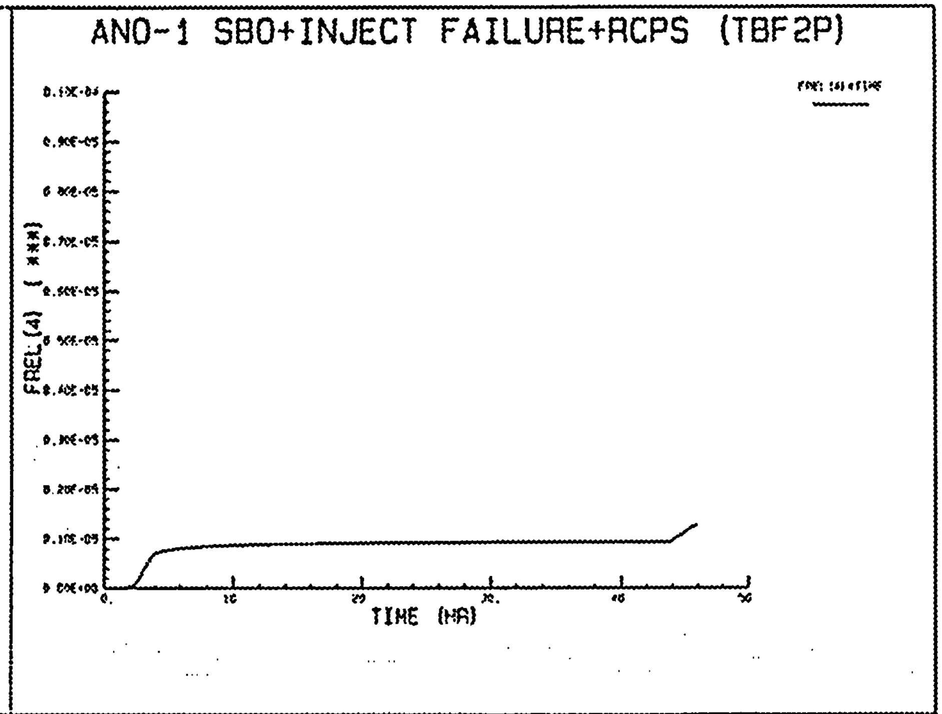
TIME (HR)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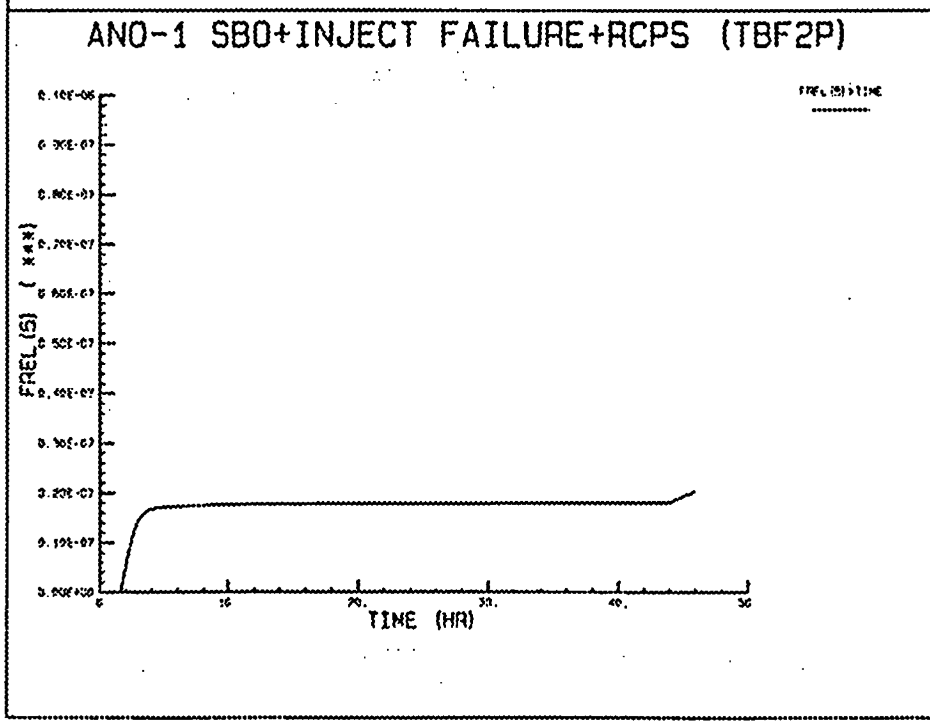
TIME (HR)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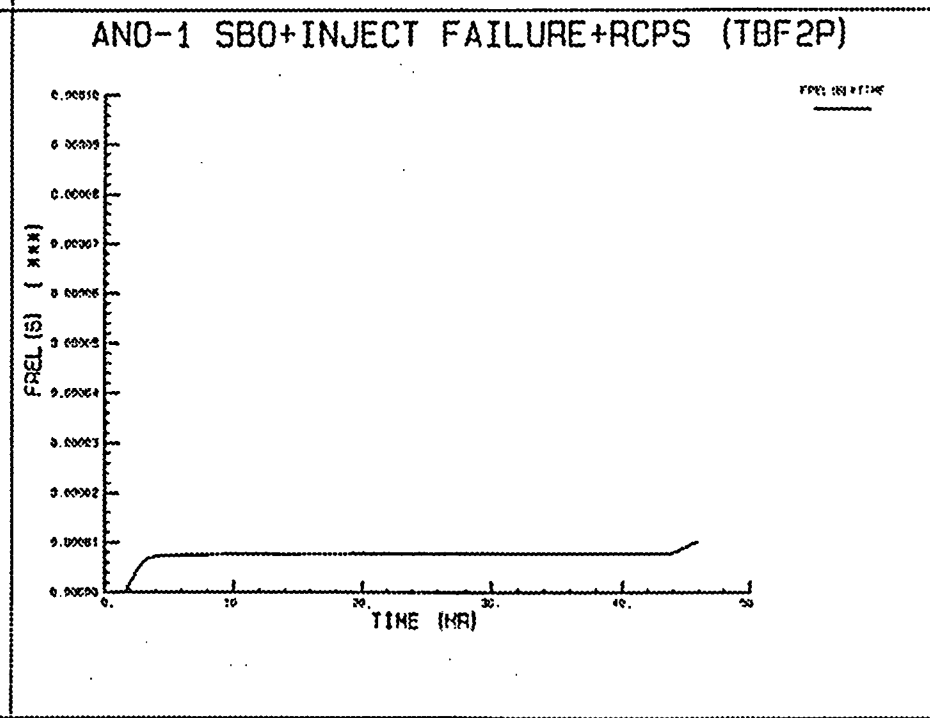
TIME (HR)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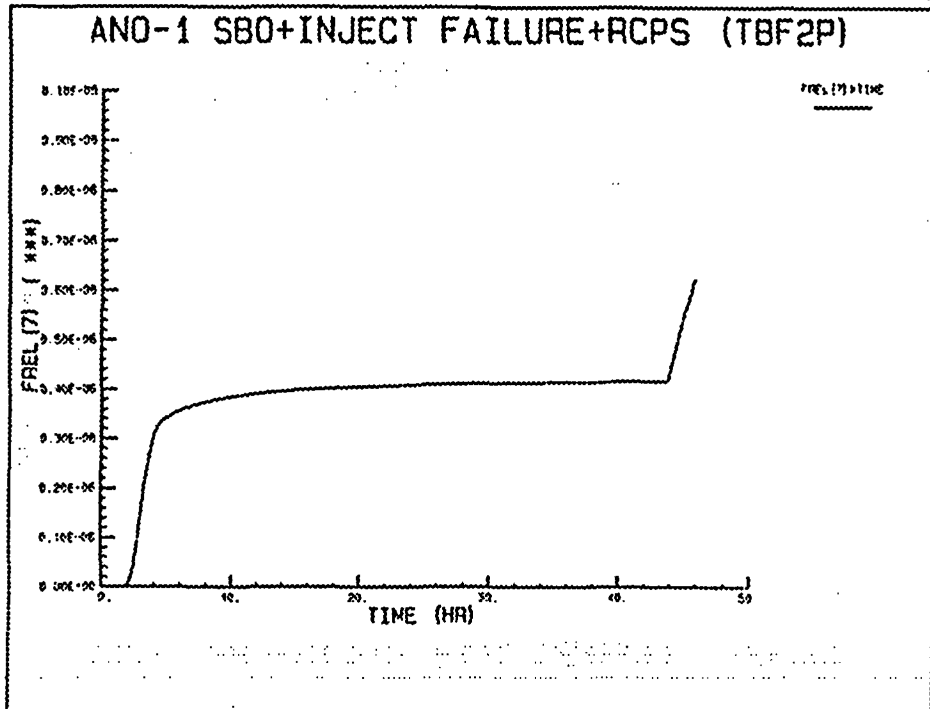
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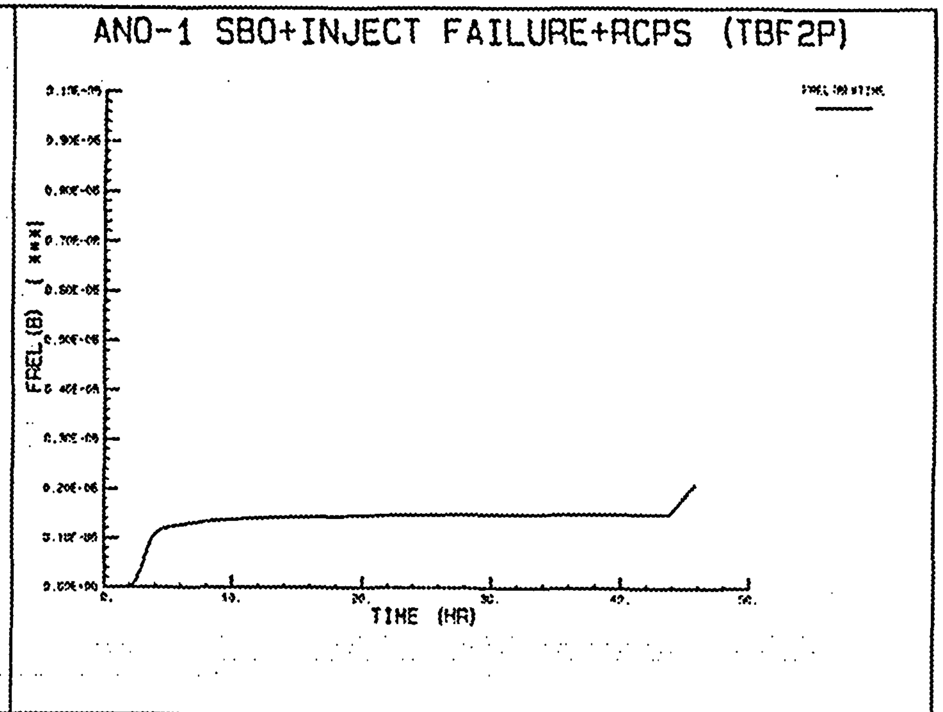
TIME (HR)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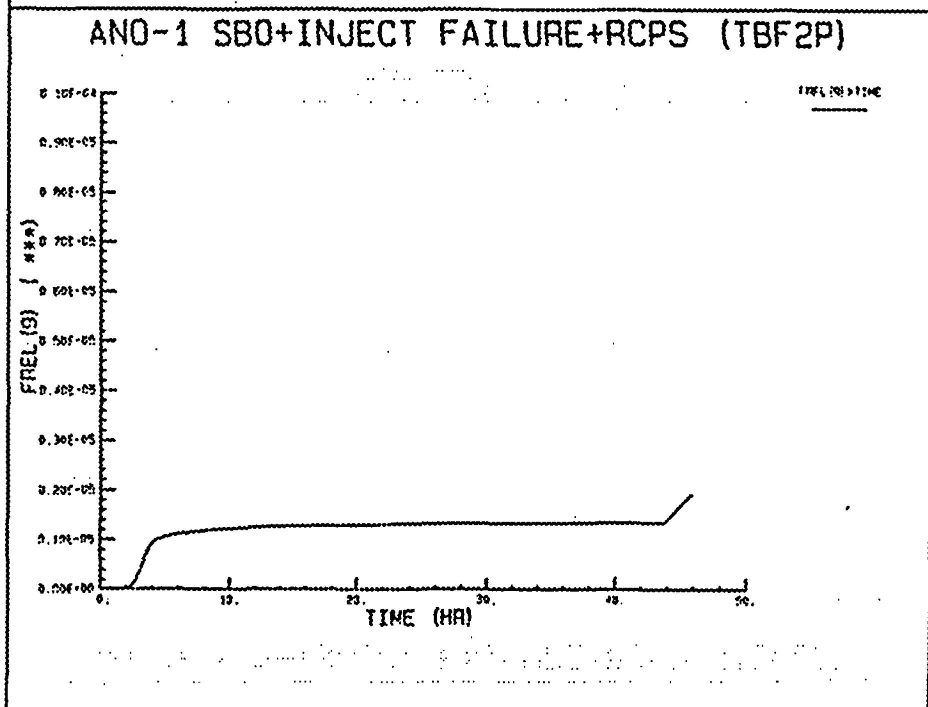
TIME (HR)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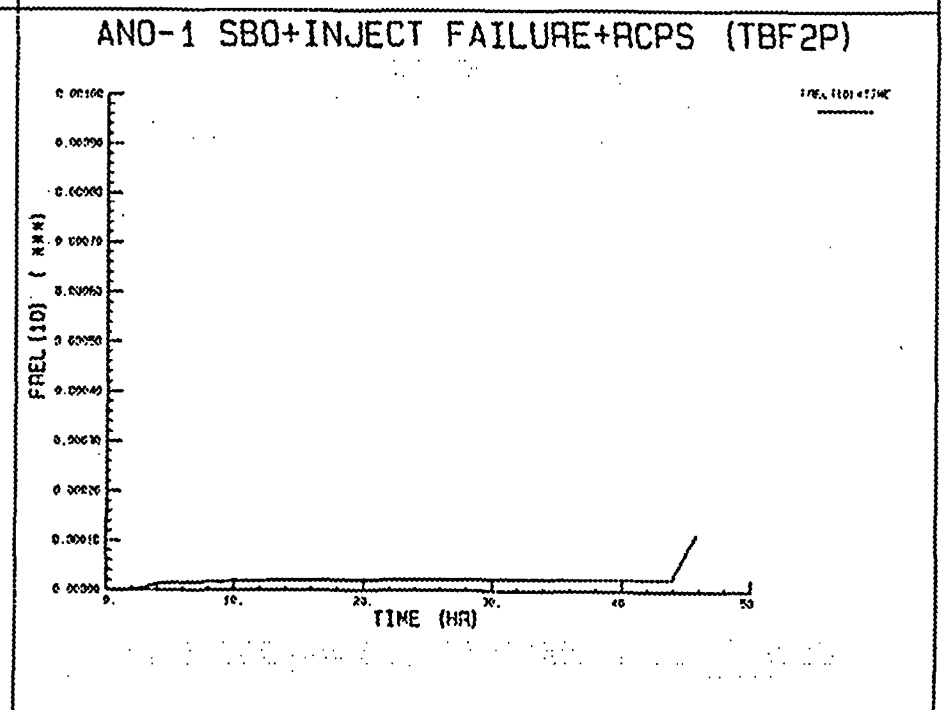
TIME (HR)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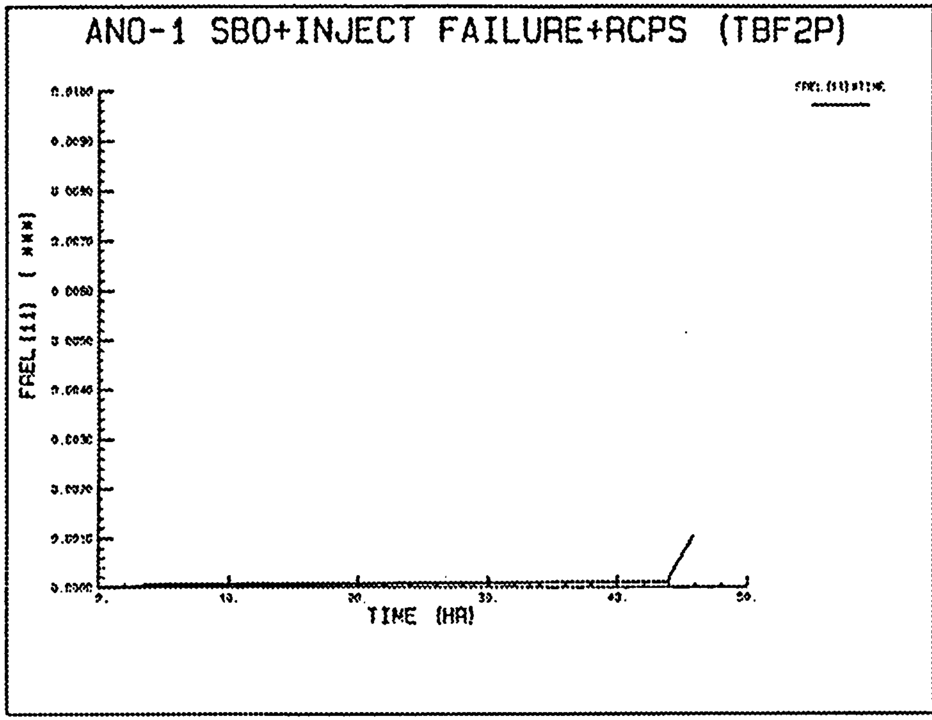
TIME (HR)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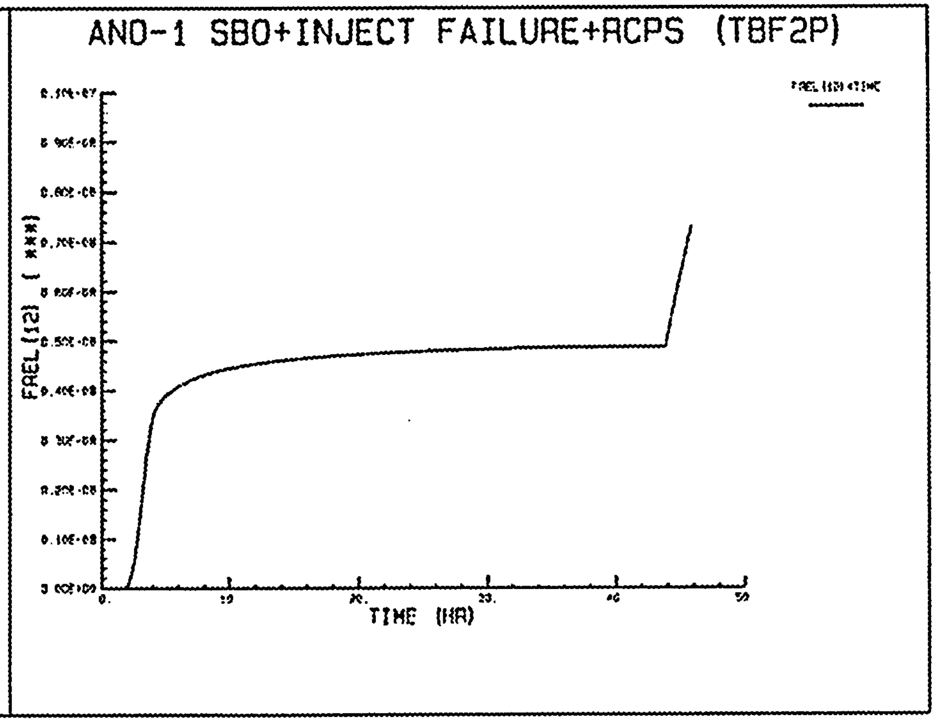
TIME (HR)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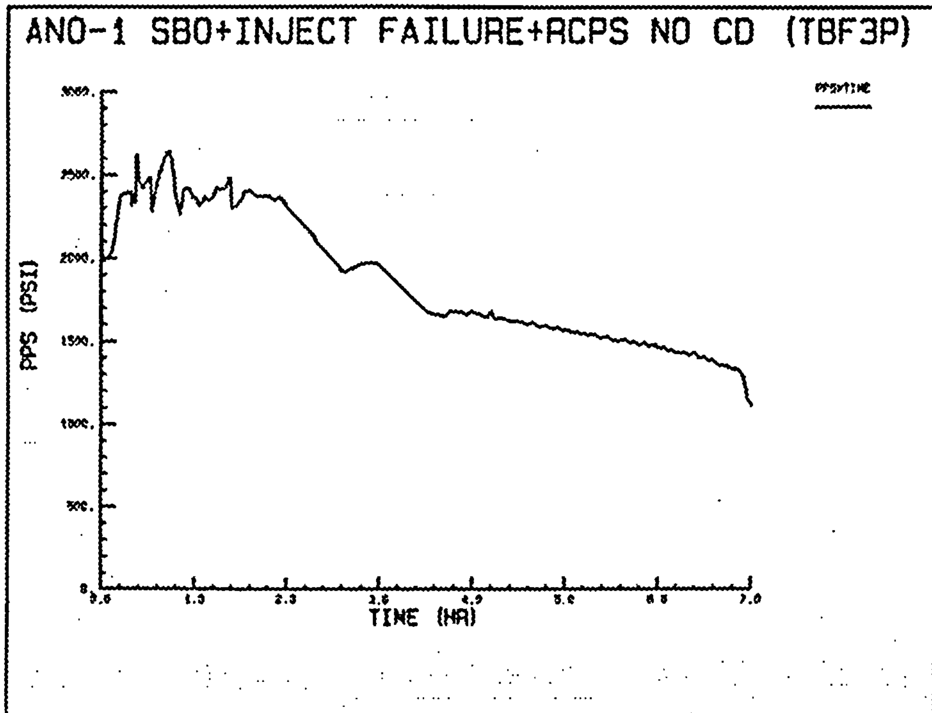
TIME (HR)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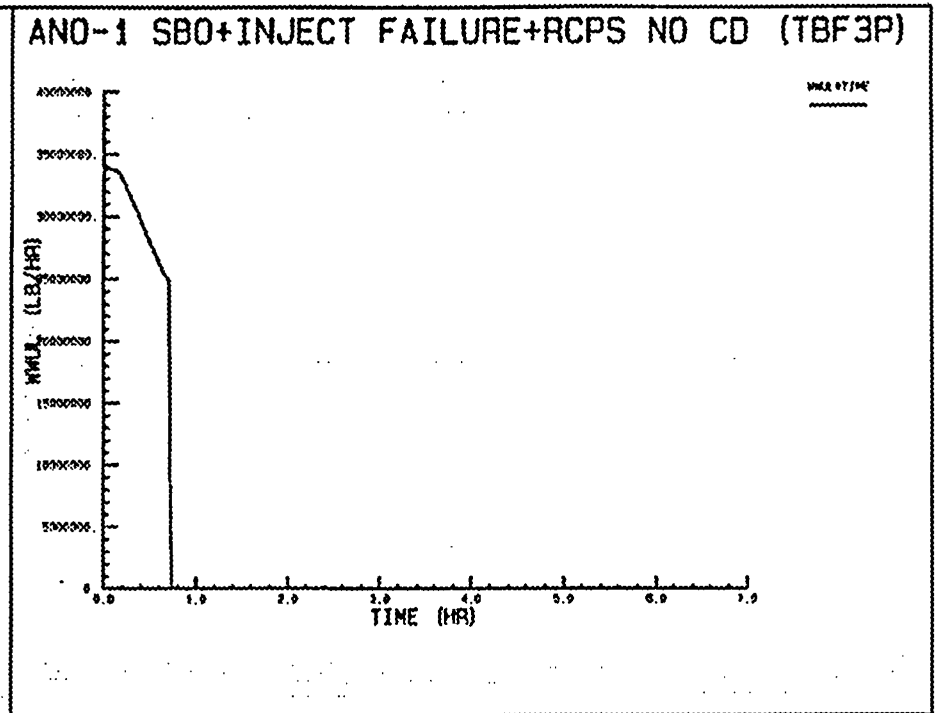
PPS (PSI)
TIME (HR)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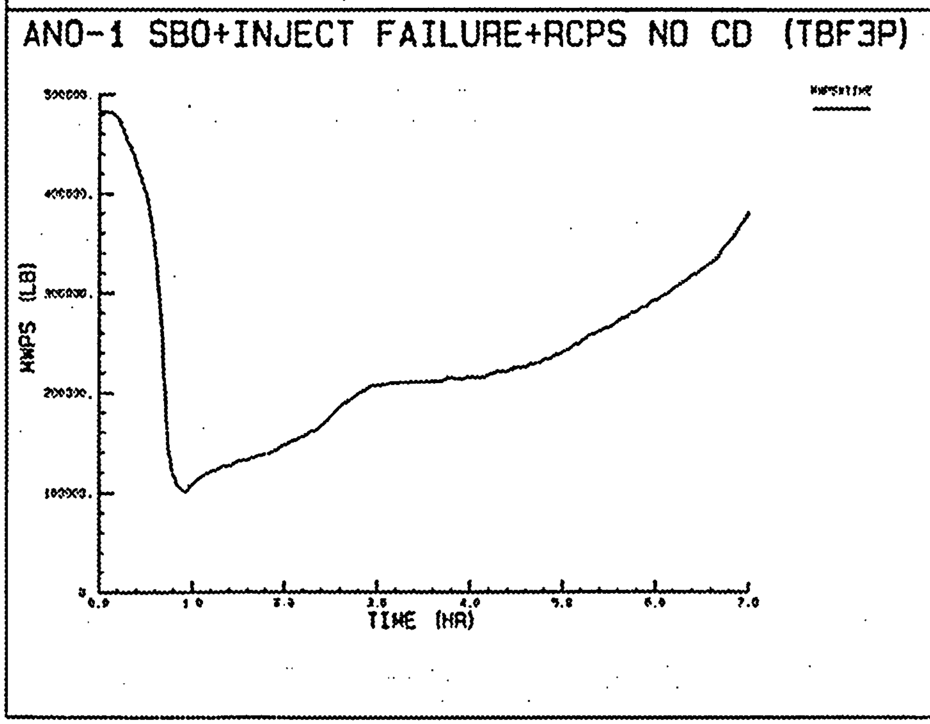
WWUL (LB/HR)
TIME (HR)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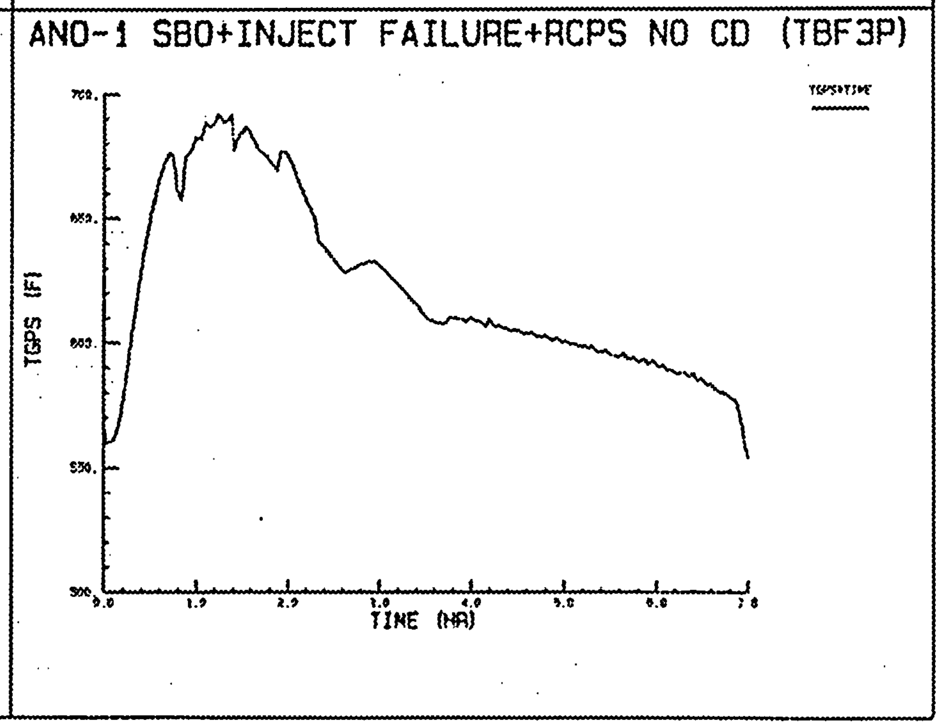
TIME (HR)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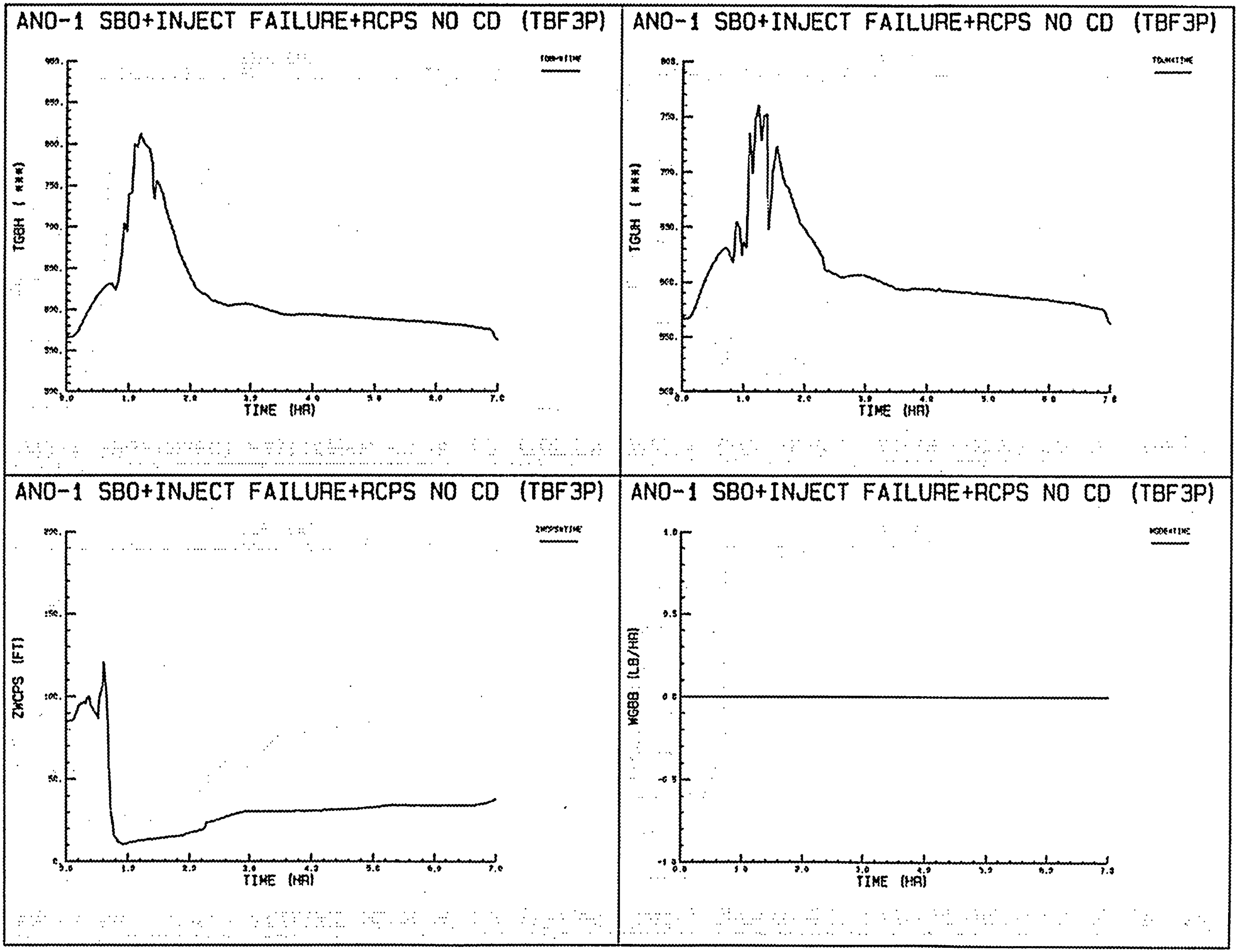
TGPS (F)
TIME (HR)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TGBH (***)
TIME (HR)
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TGUH (***)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS NO CD (TBF3P)
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TIME (HR)
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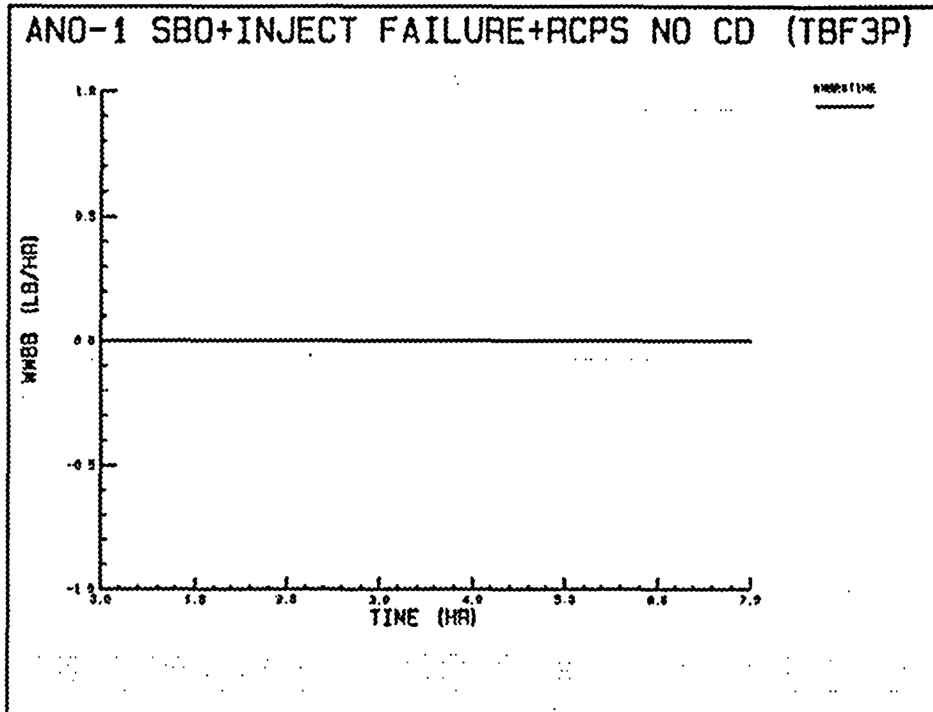
TIME (HR)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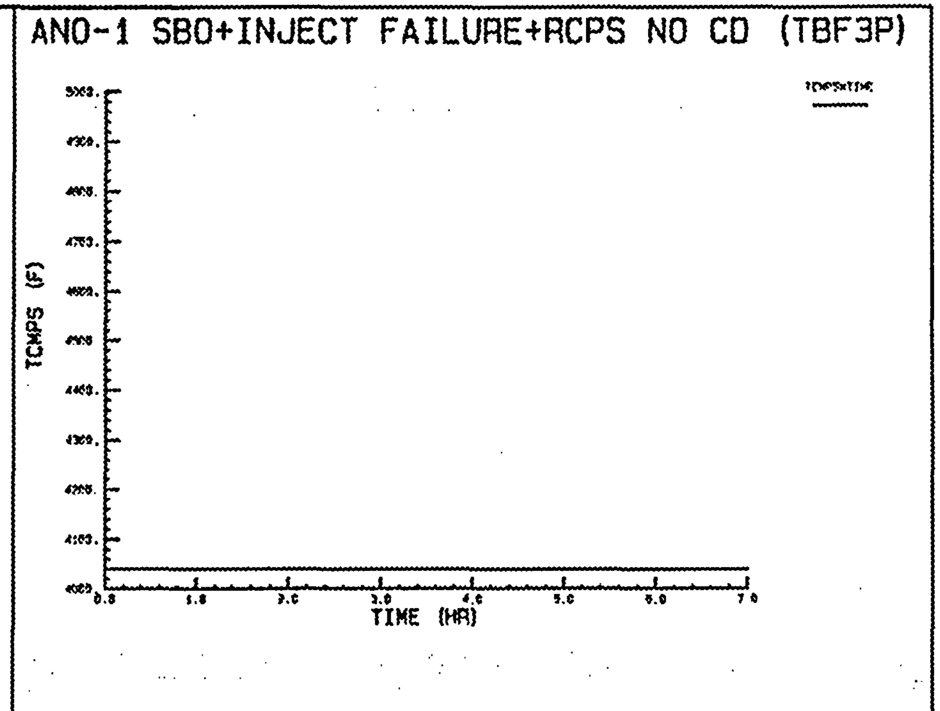
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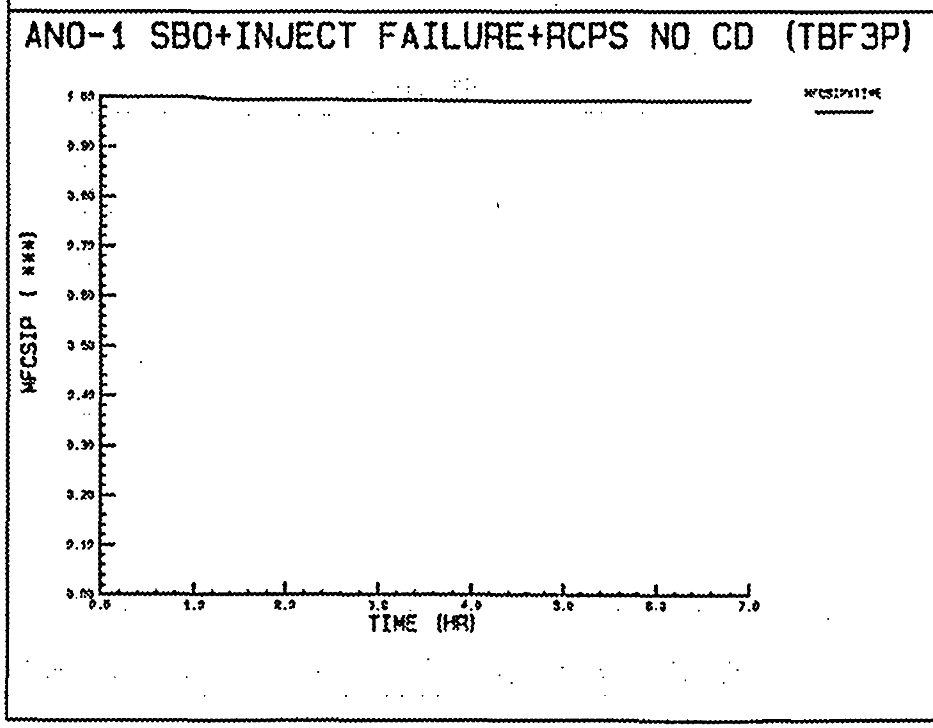
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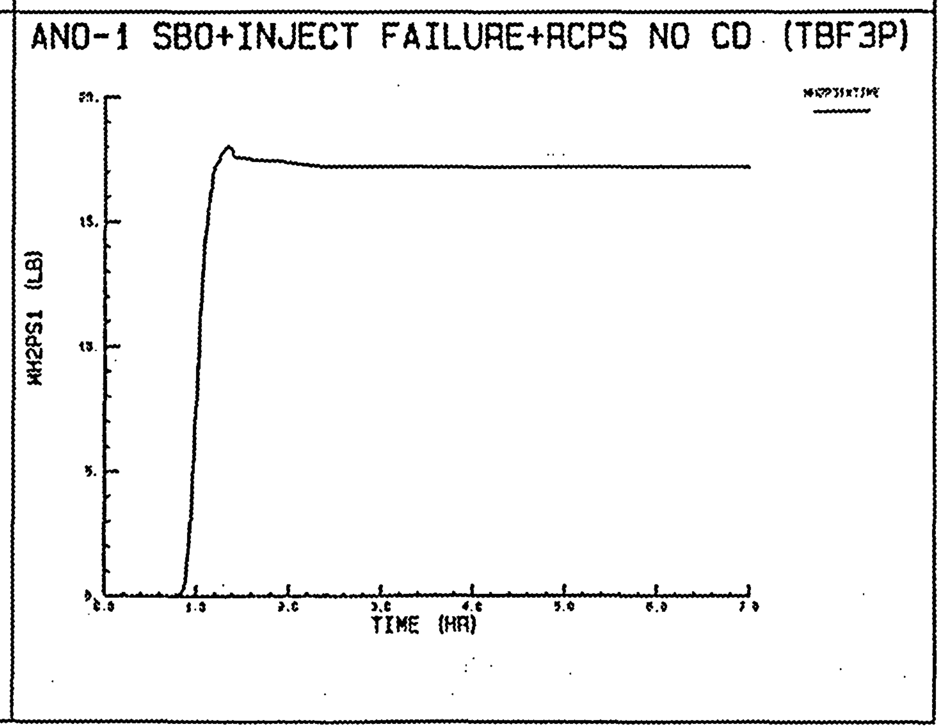
TIME (HR)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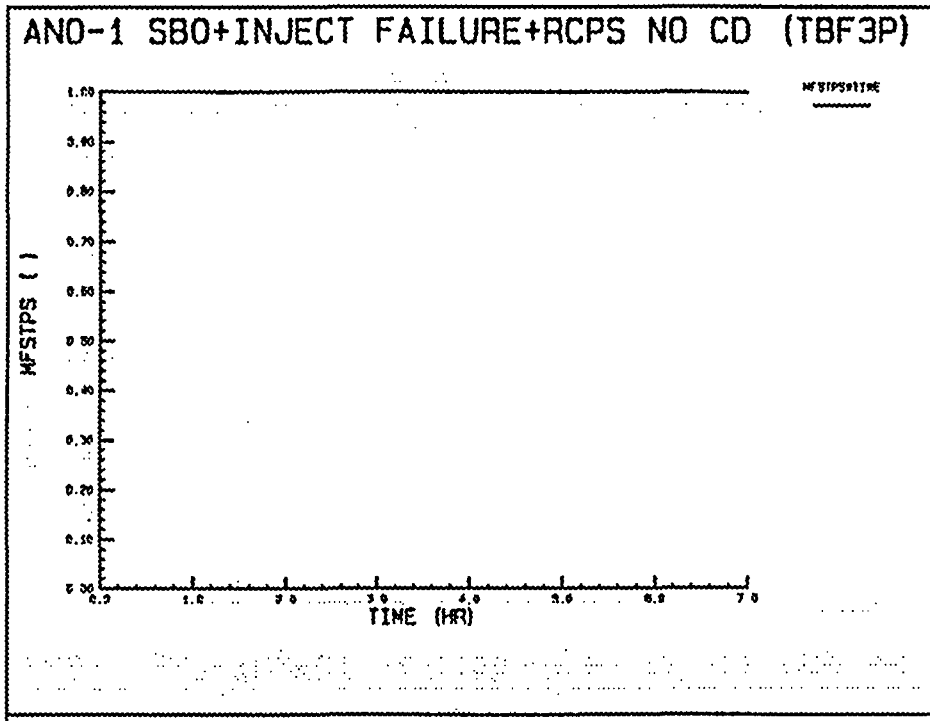
MH2PS1 (LB)
TIME (HR)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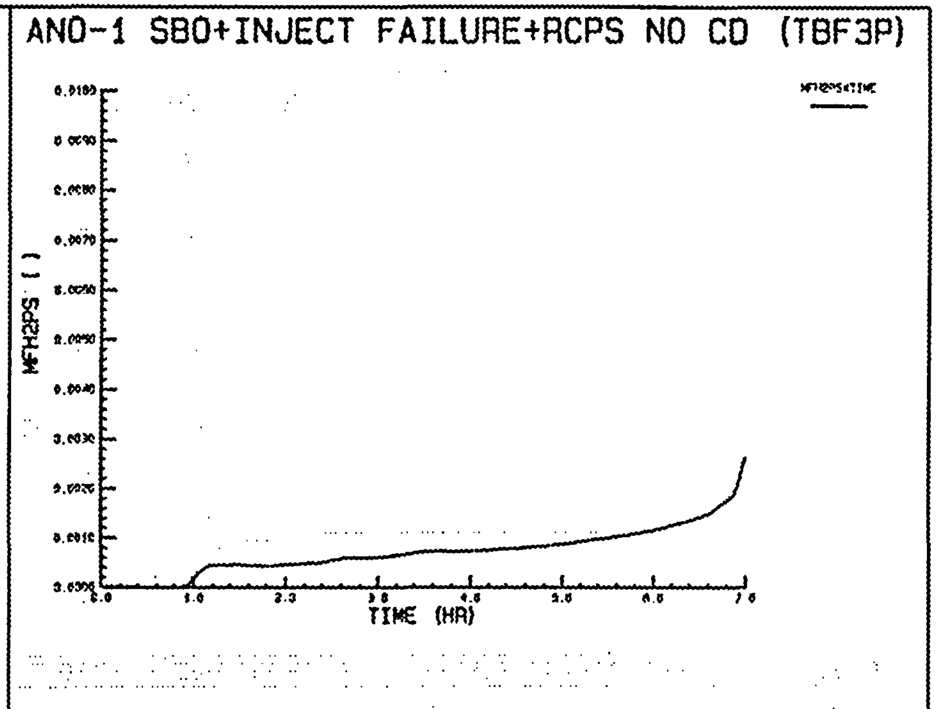
TIME (HR)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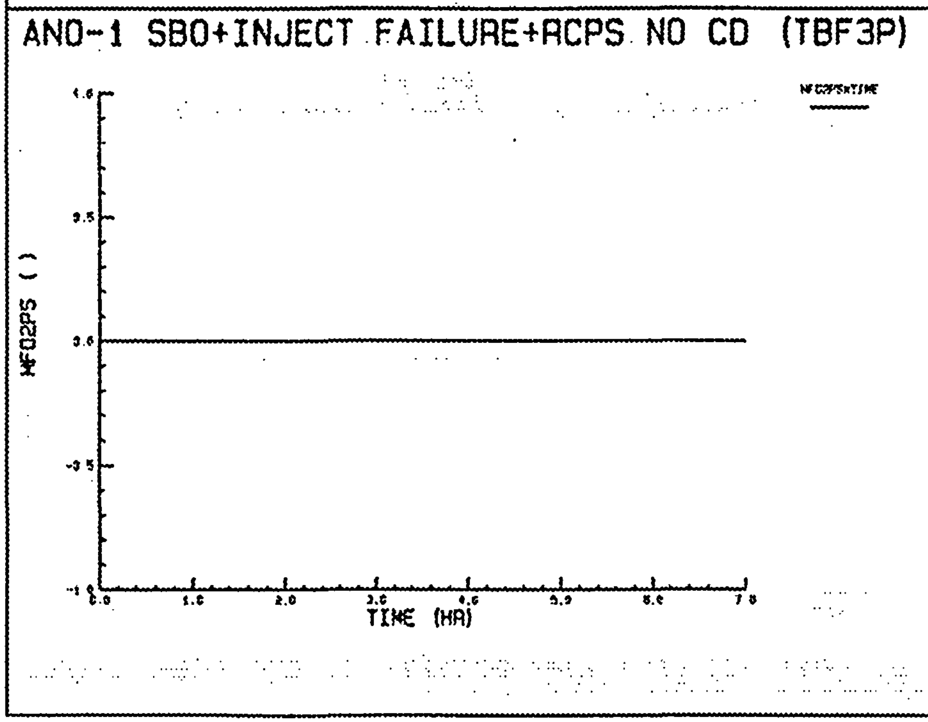
TIME (HR)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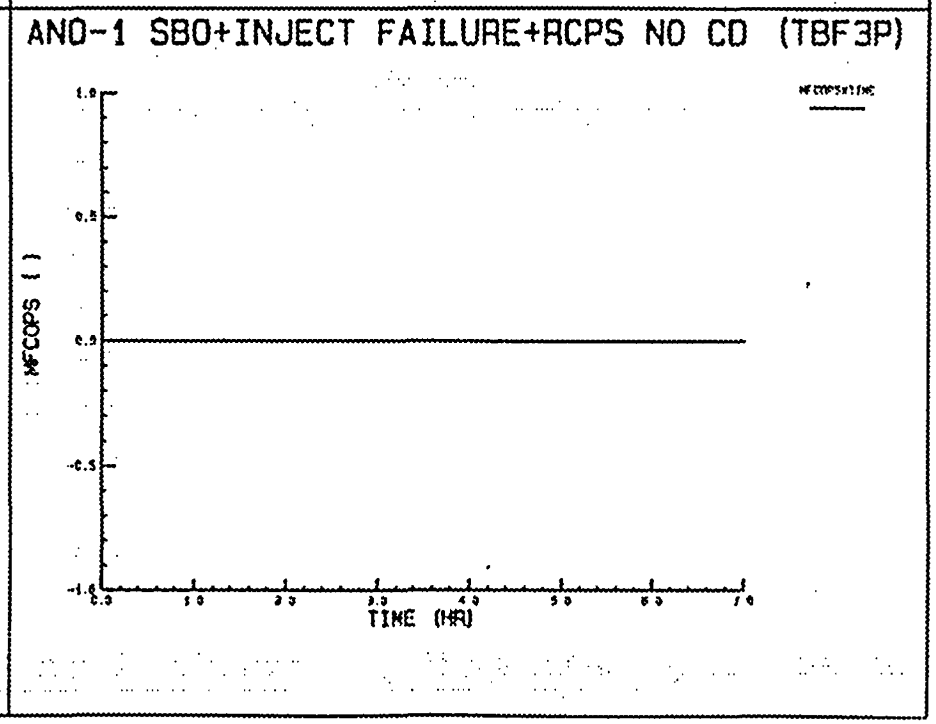
TIME (HR)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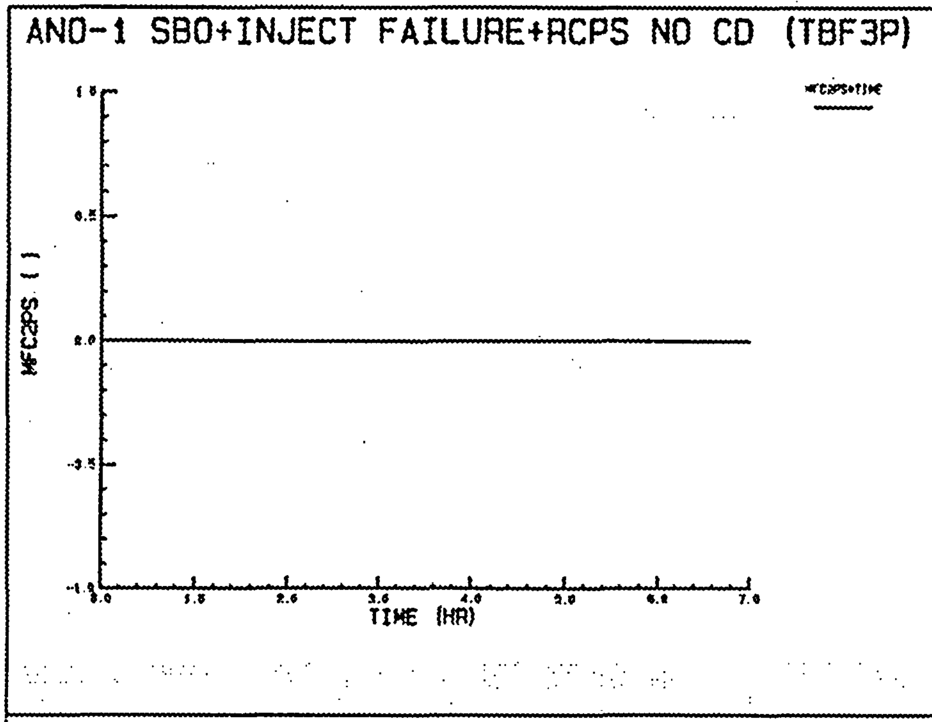
TIME (HR)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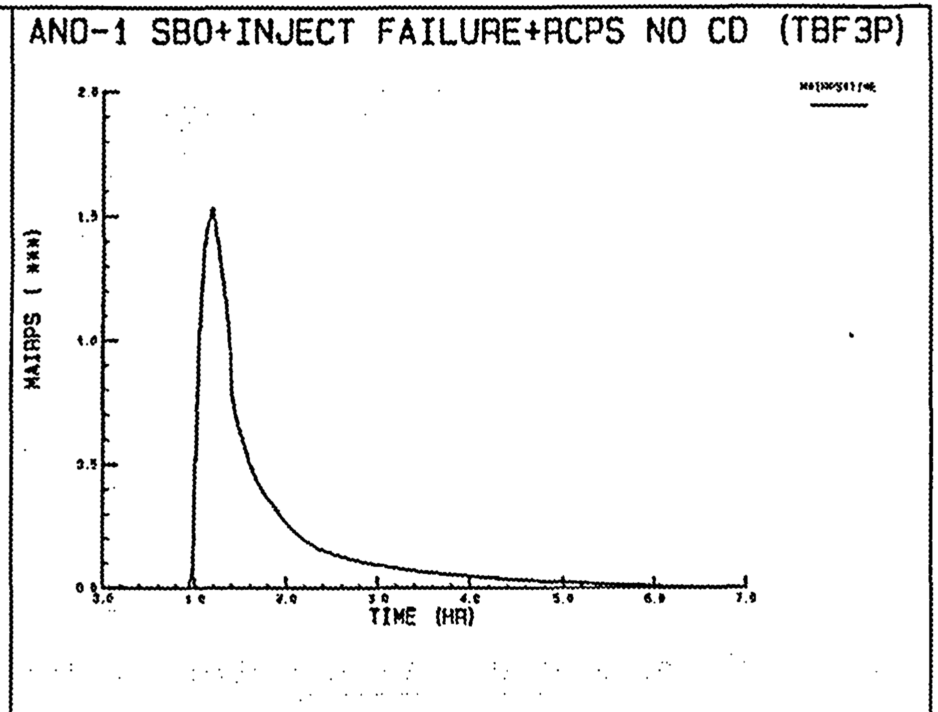
TIME (HR)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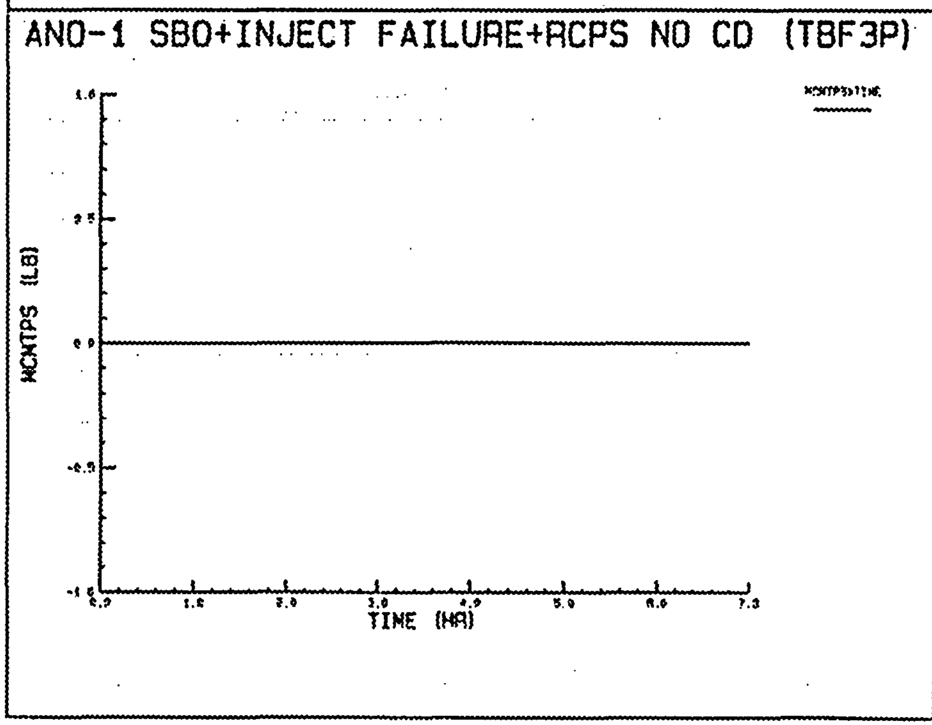
MAIRPS (***)
TIME (HR)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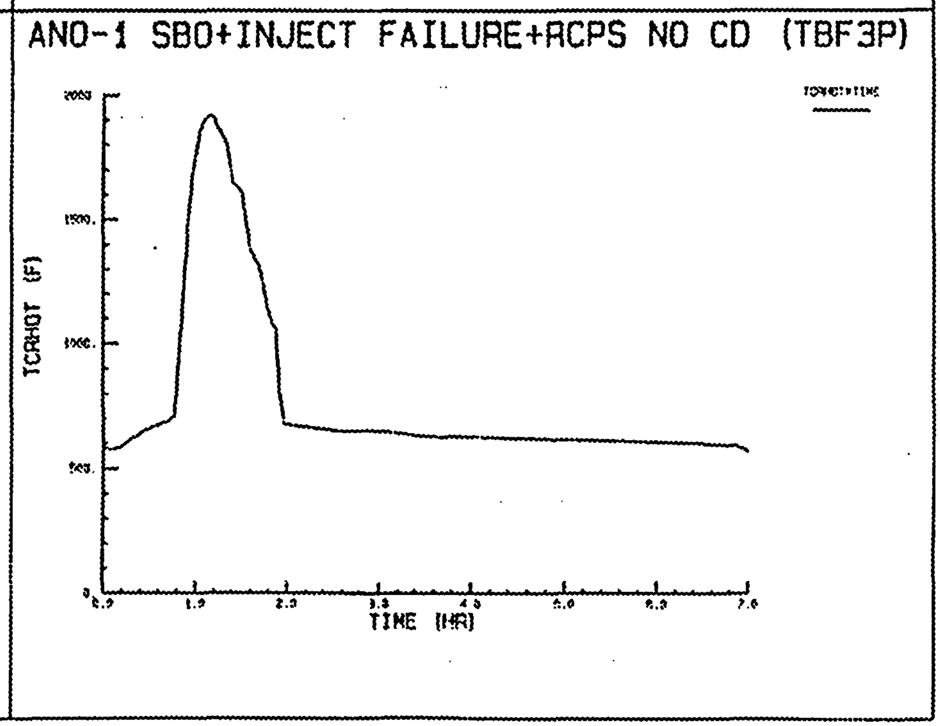
TIME (HR)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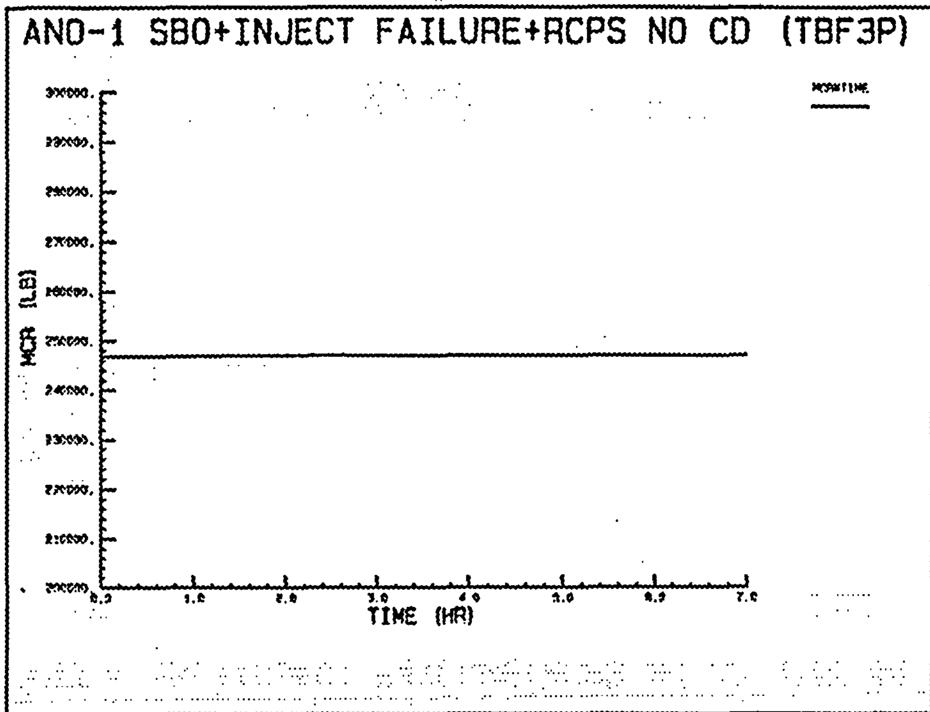
TIME (HR)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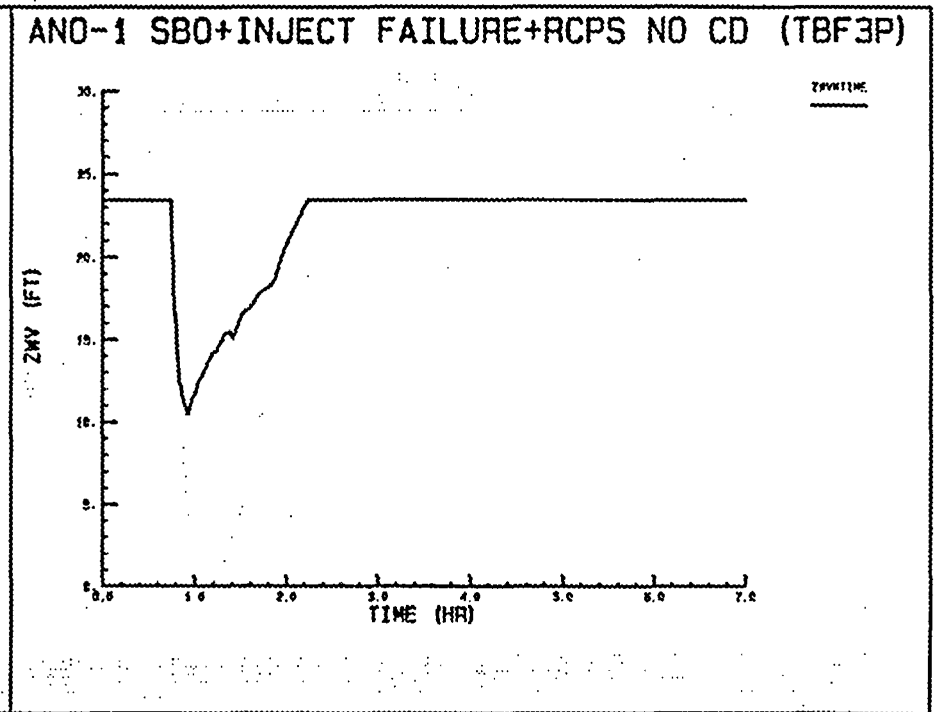
TIME (HR)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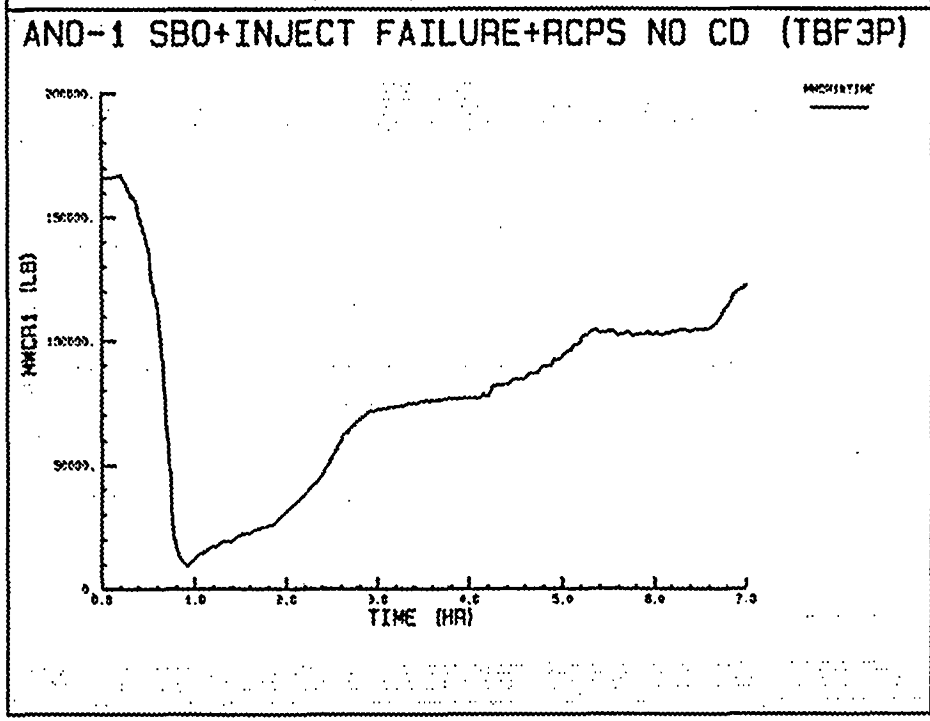
TIME (HR)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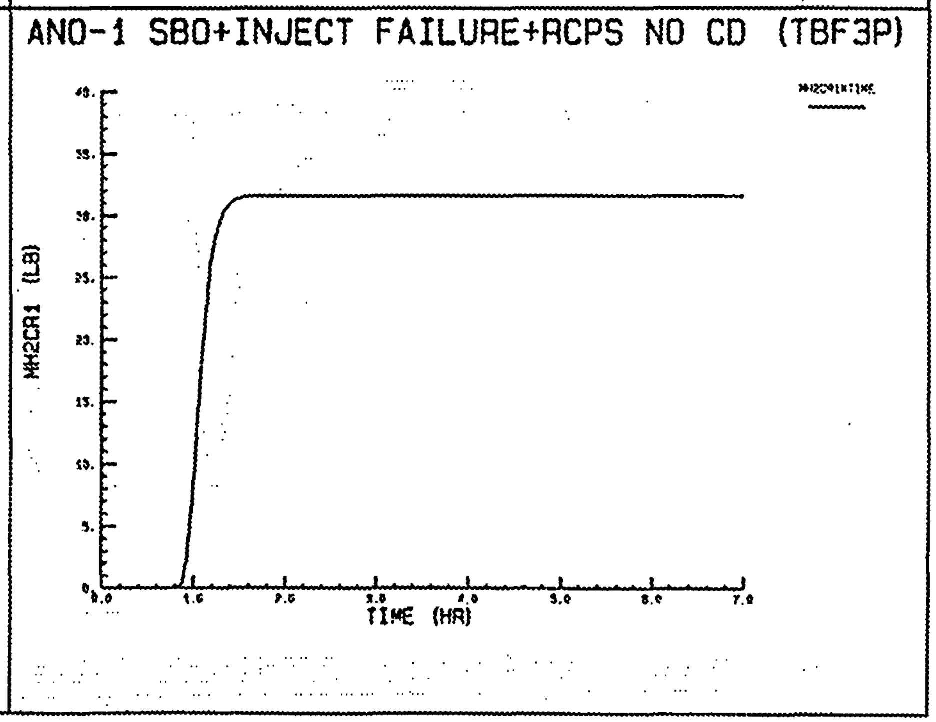
MWCR1 (LB)
TIME (HR)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MH2CR1 (LB)
TIME (HR)

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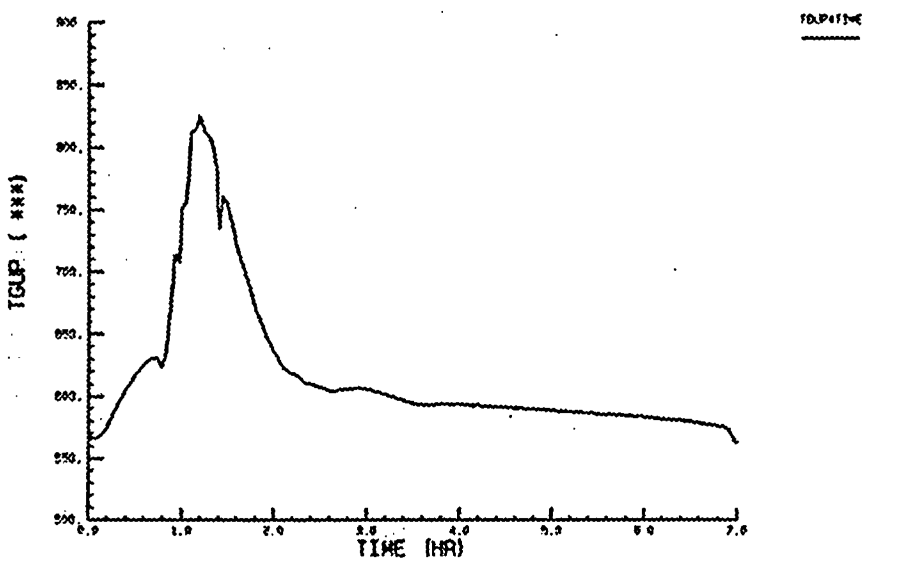

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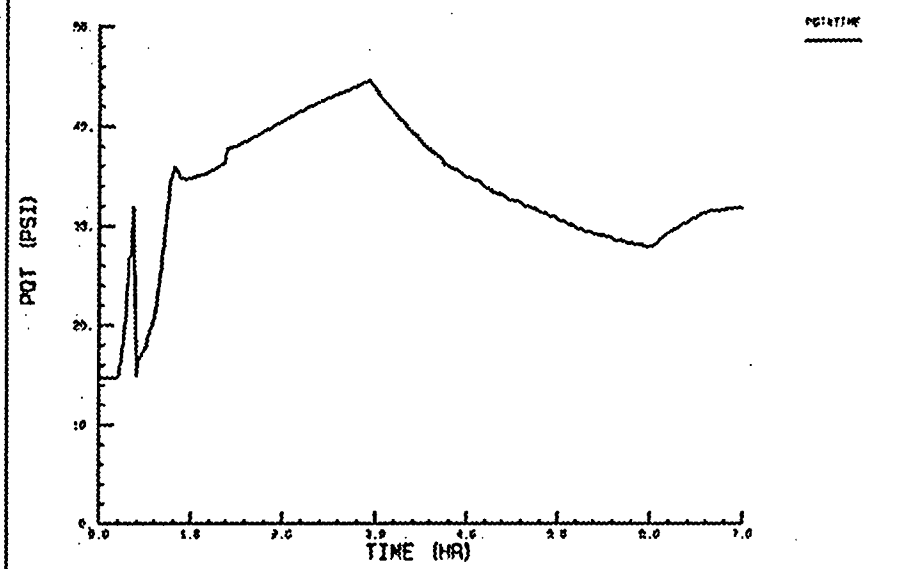

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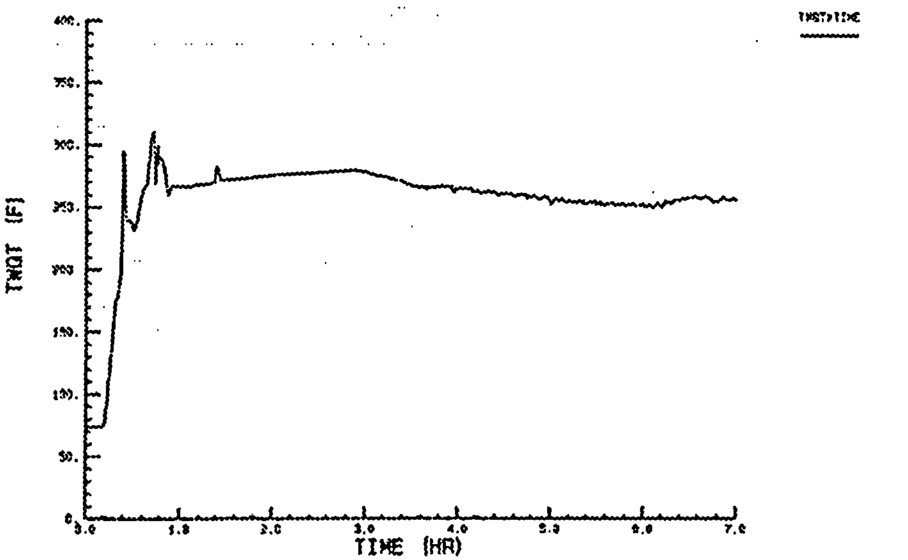

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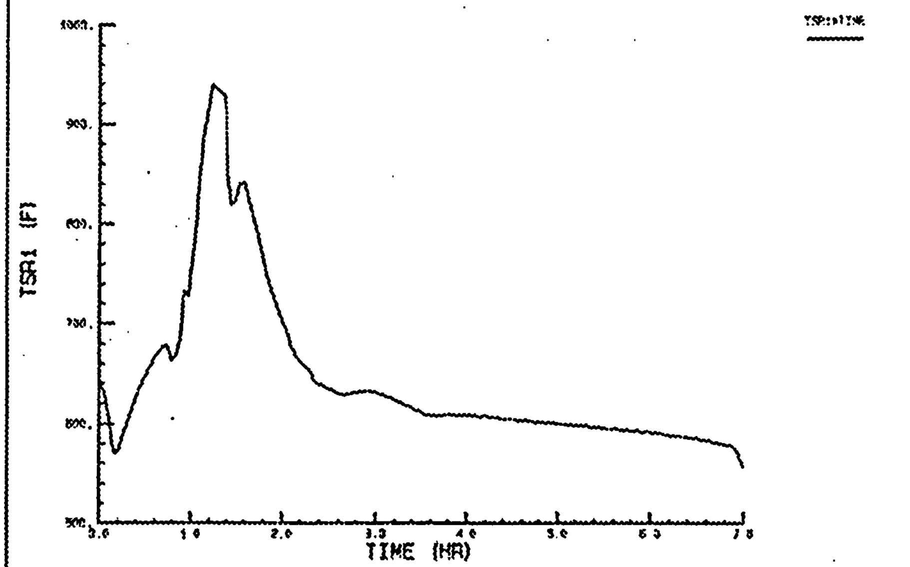

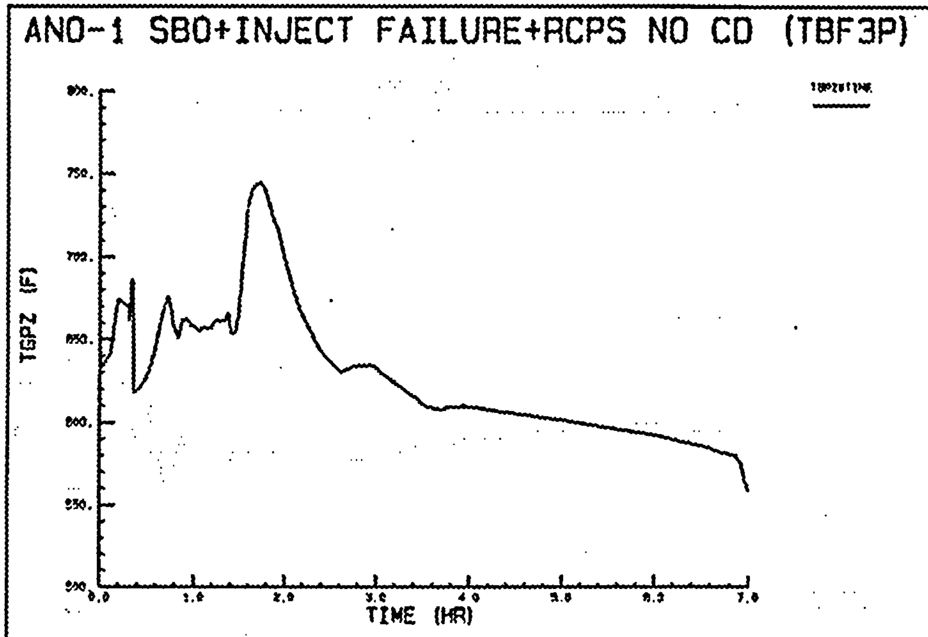
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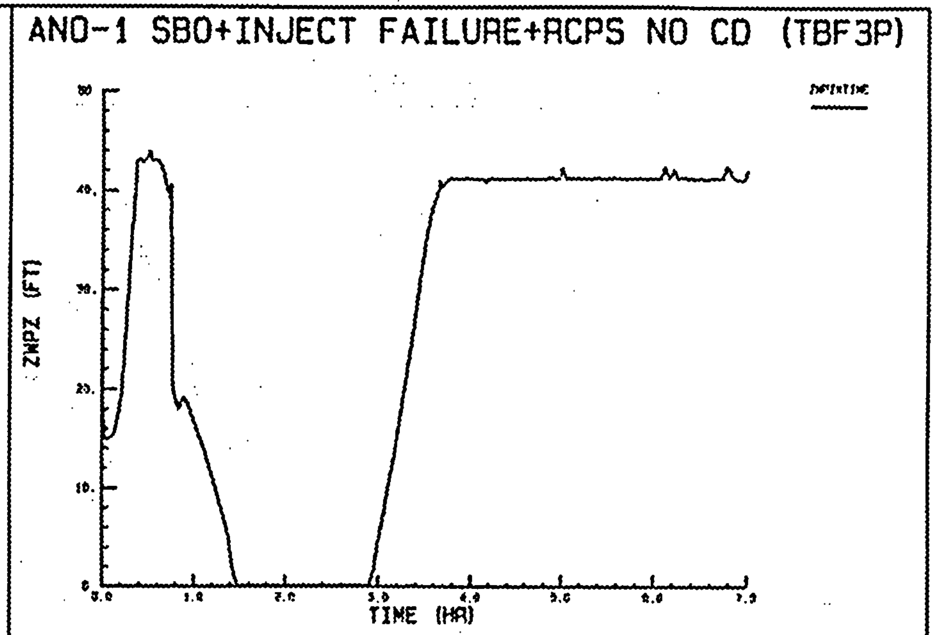
TIME (HR)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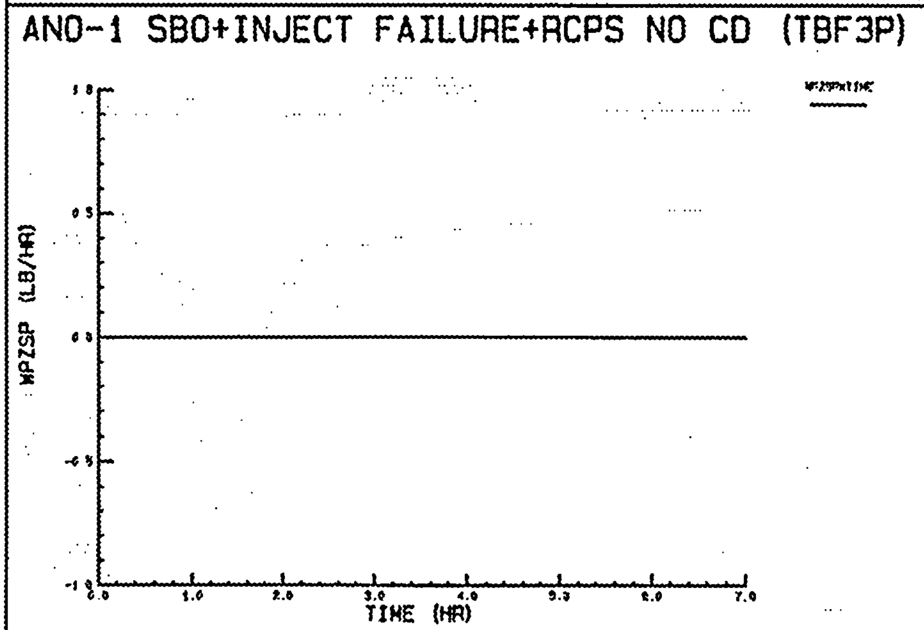
TIME (HR)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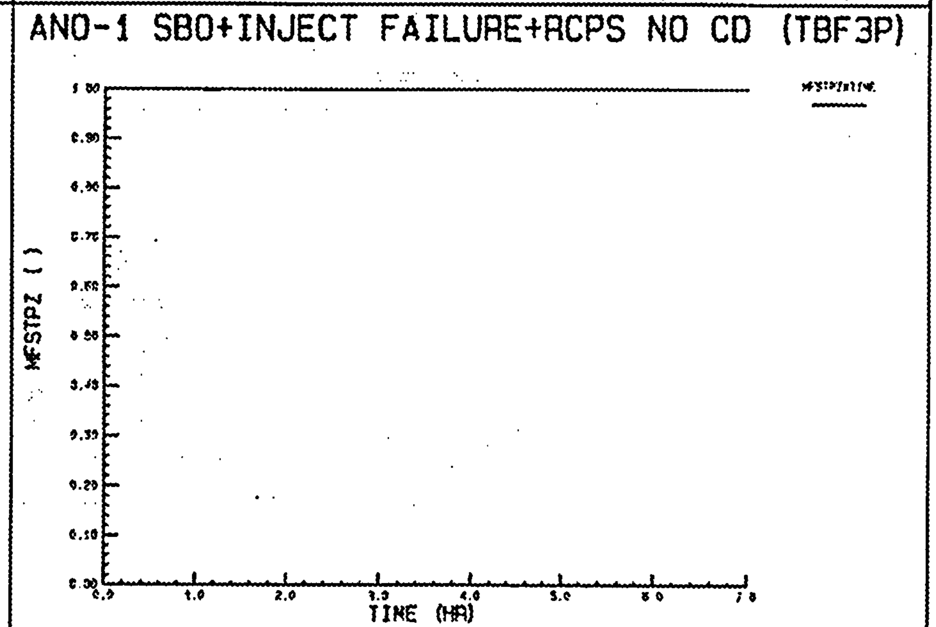
TIME (HR)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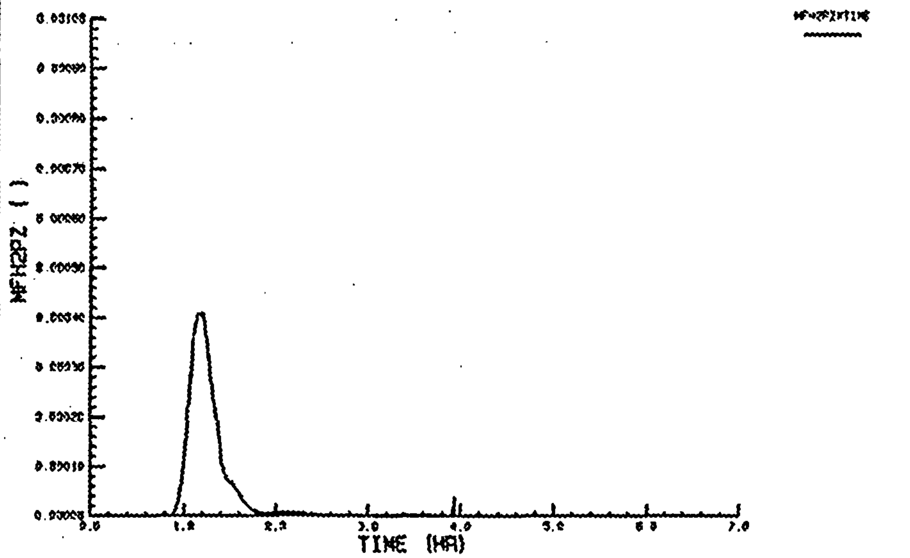

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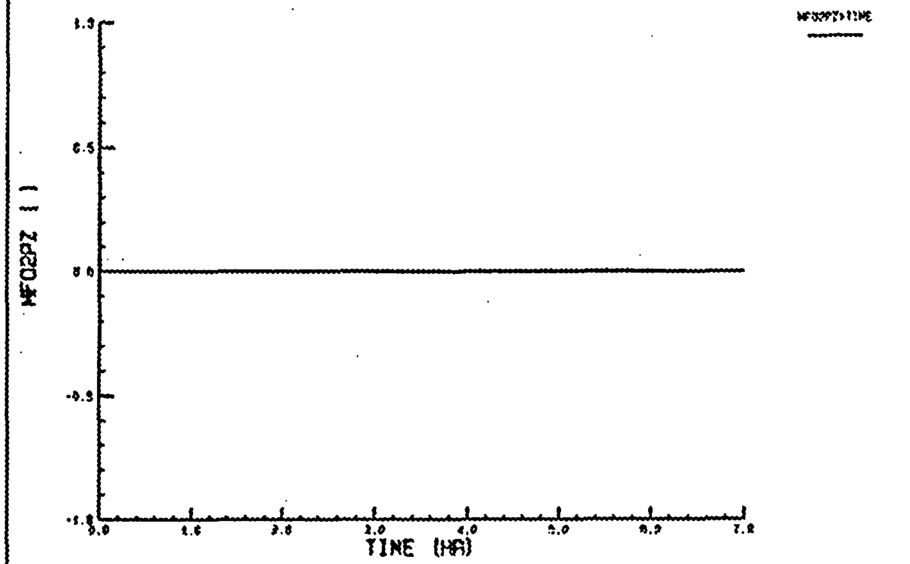

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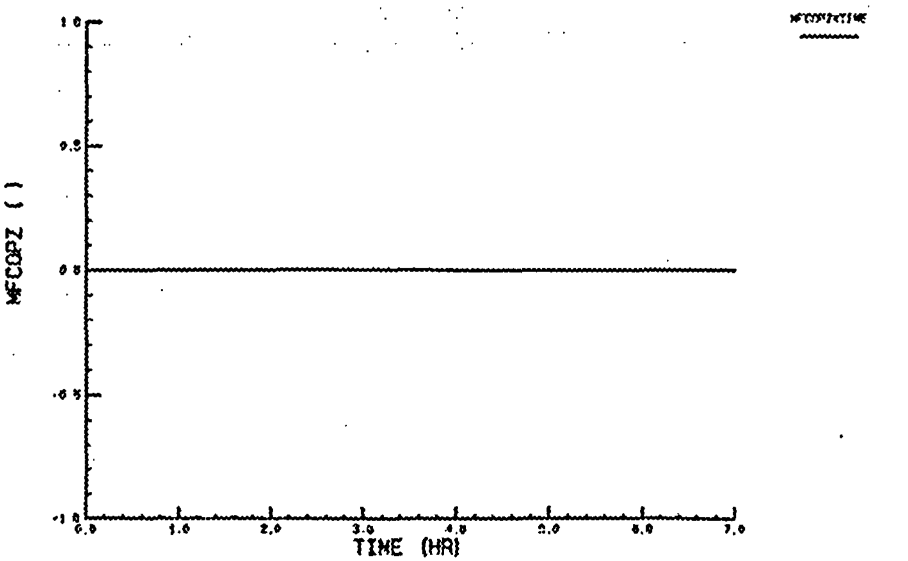

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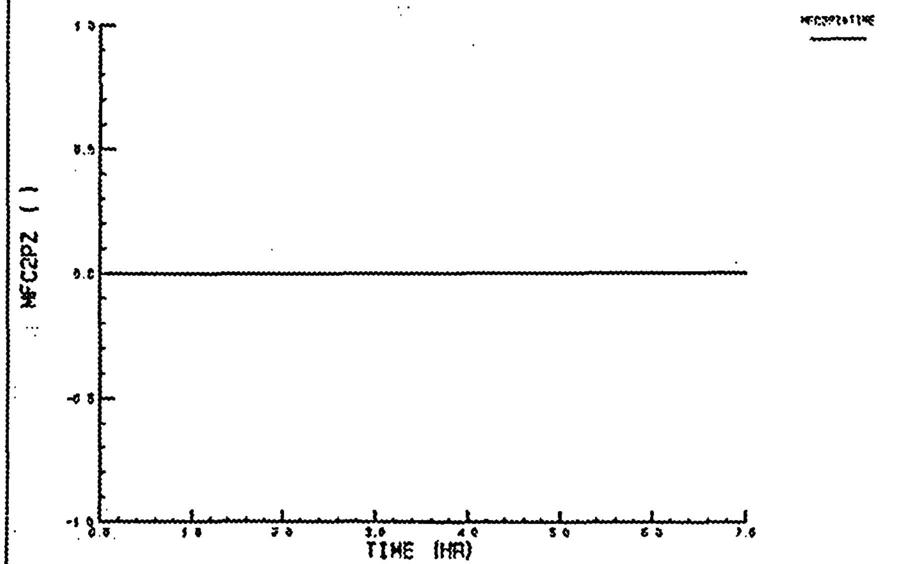

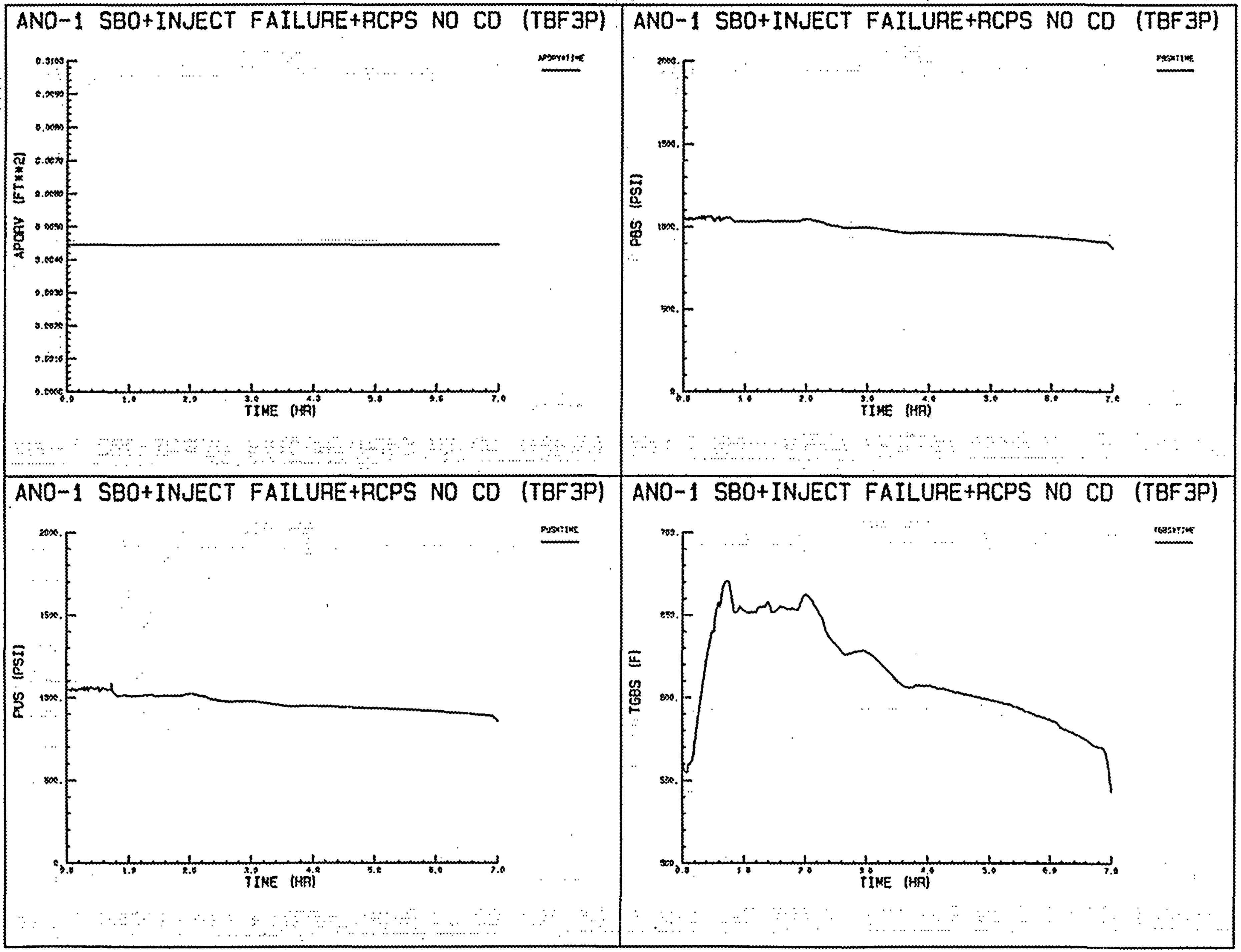

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APORV (FT**2)
TIME (HR)
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PBS (PSI)
TIME (HR)
ANO-1 SBO+INJECT FAILURE+RCPS NO CD (TBF3P)
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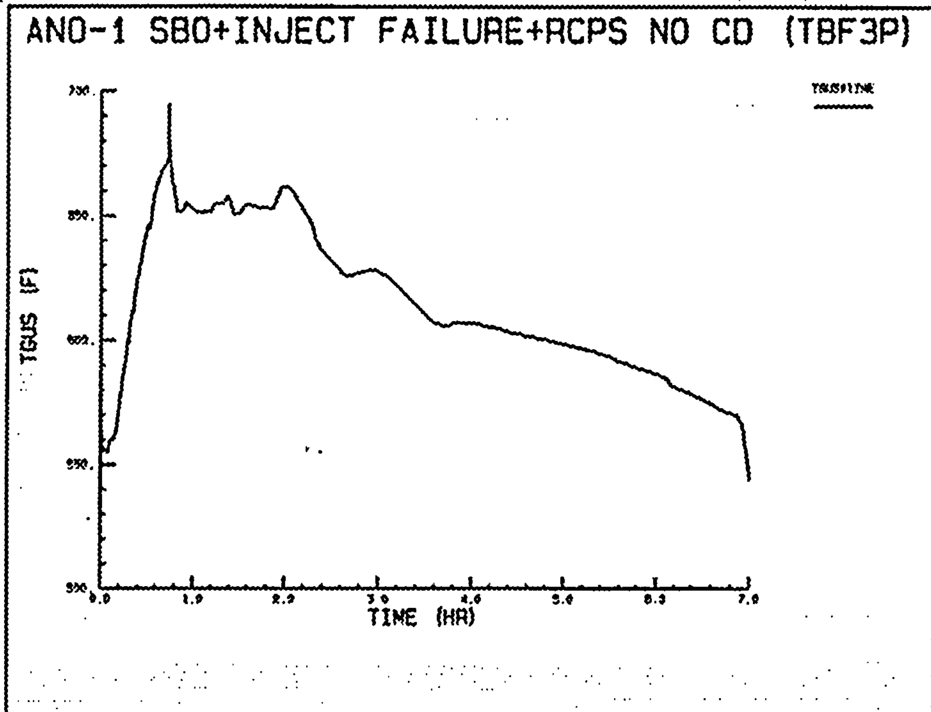
TIME (HR)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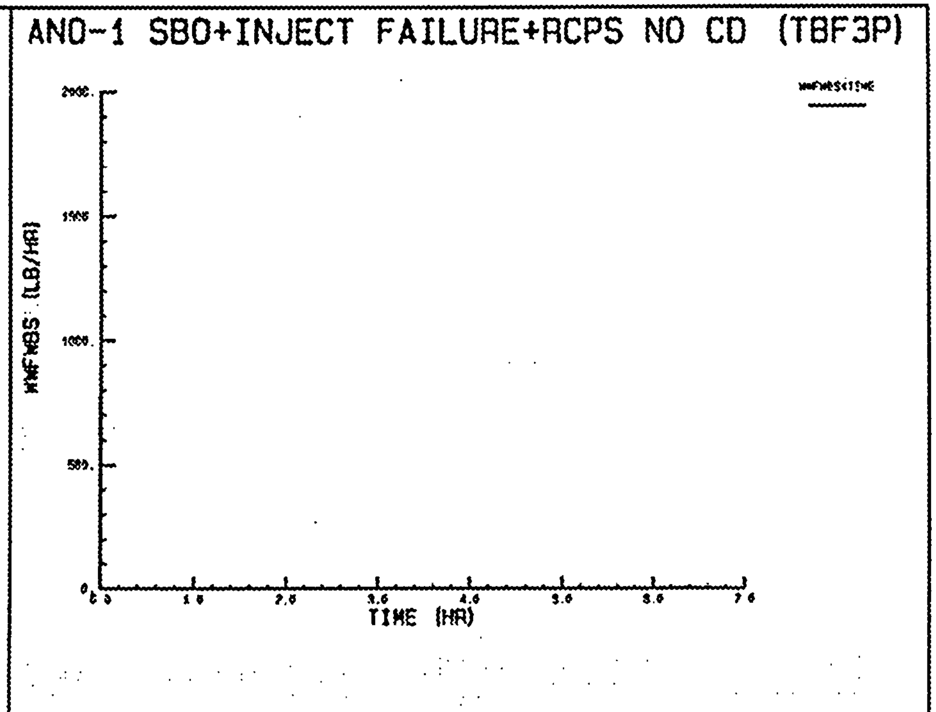
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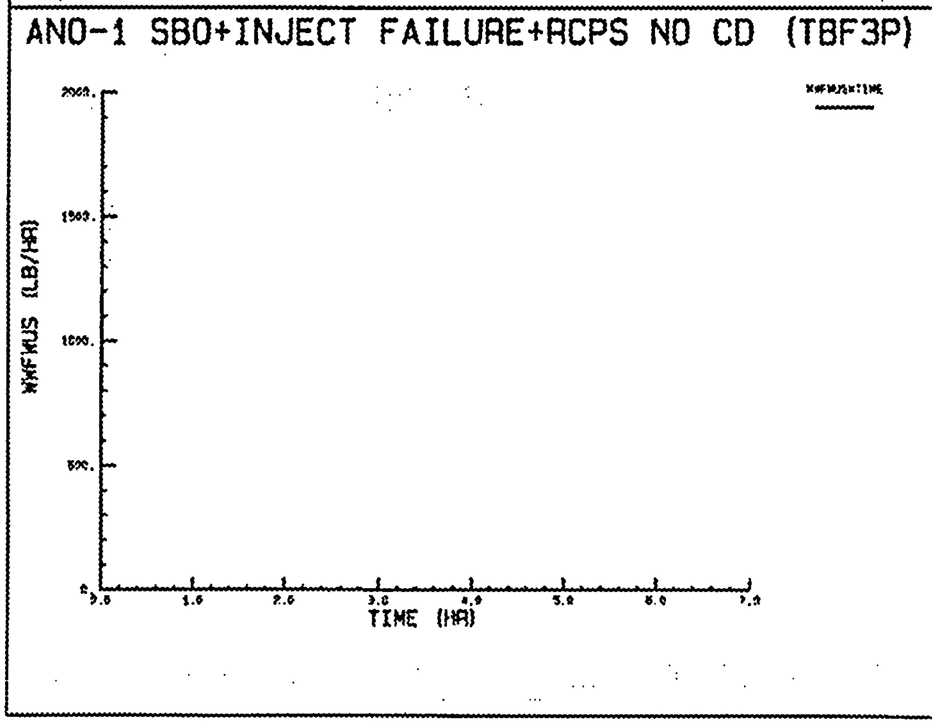
TIME (HR)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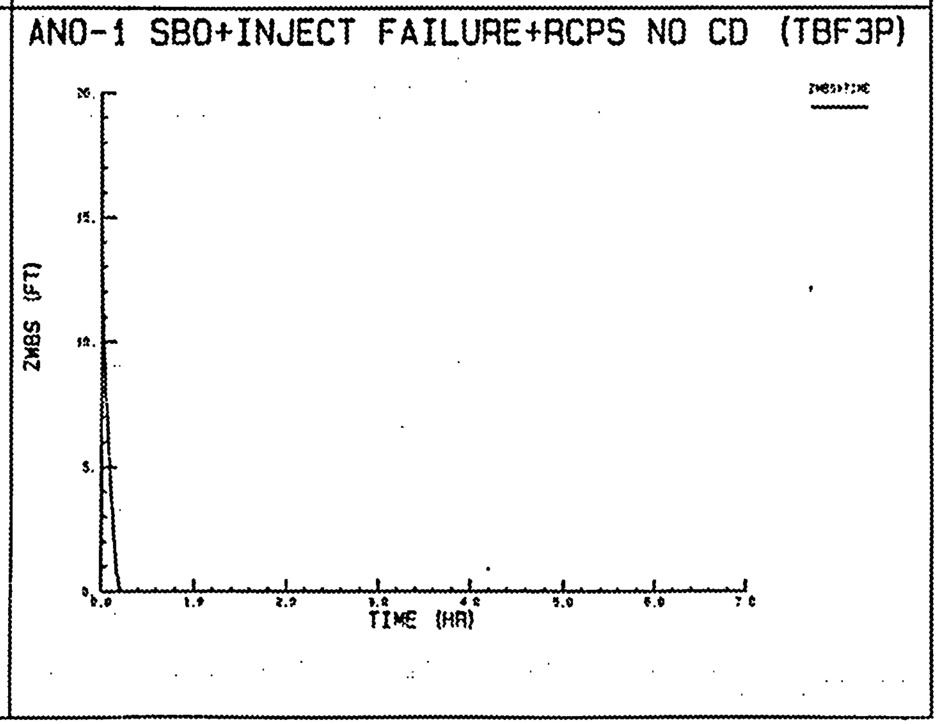
TIME (HR)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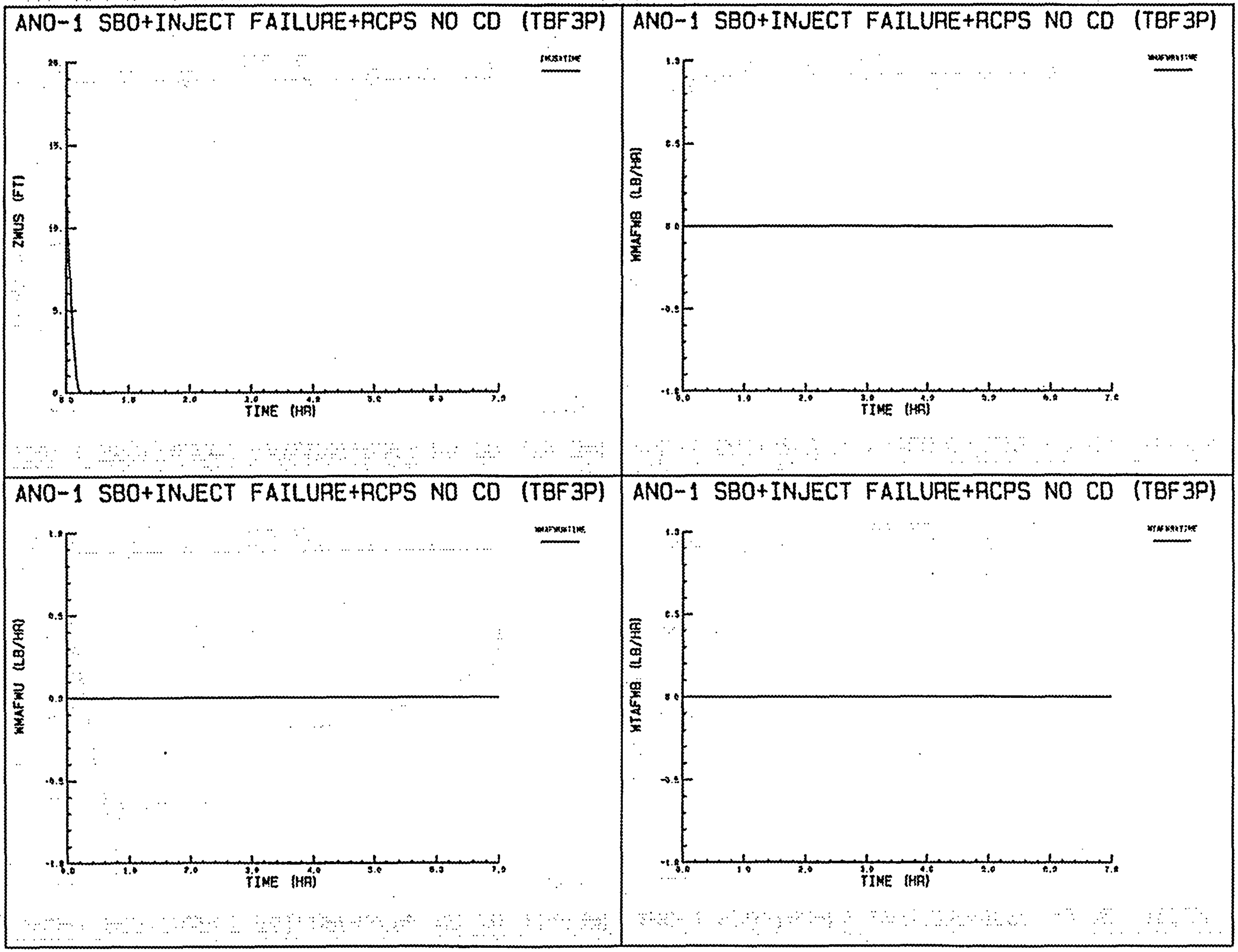
TIME (HR)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TIME (HR)
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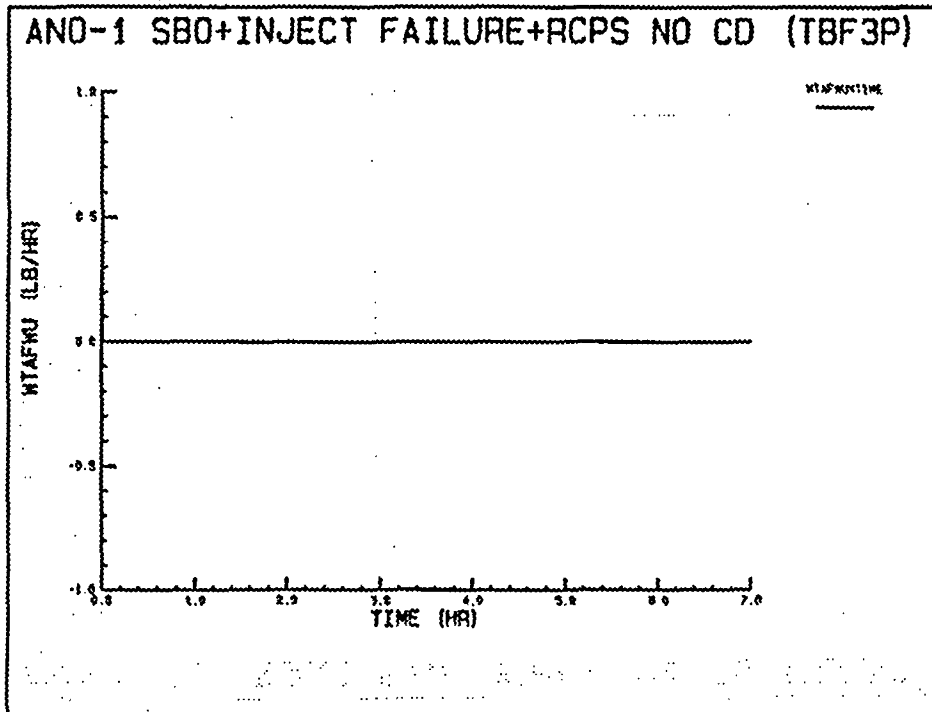
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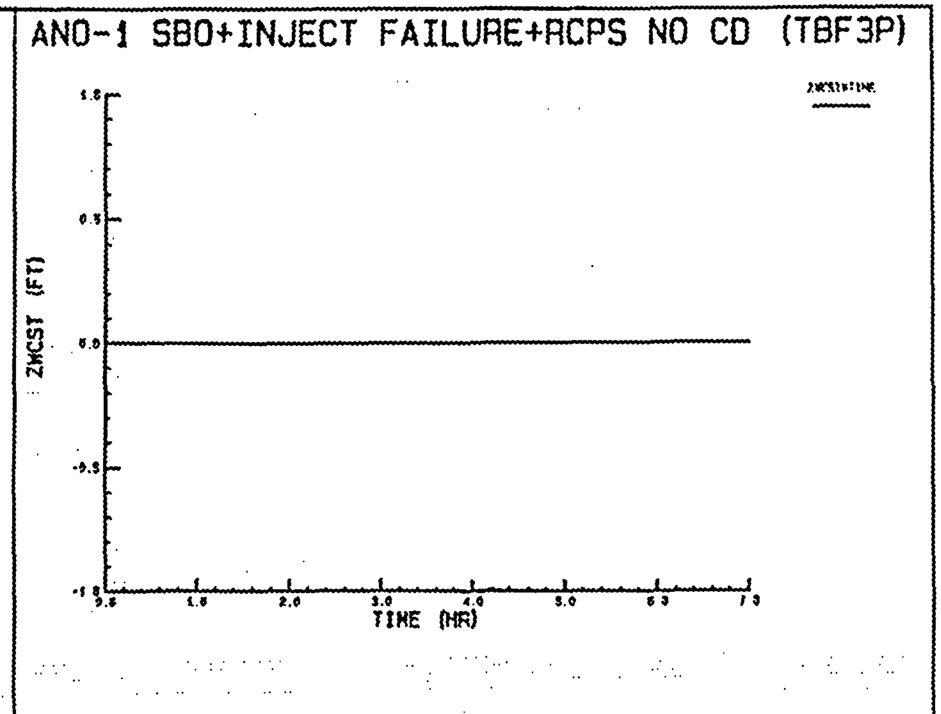
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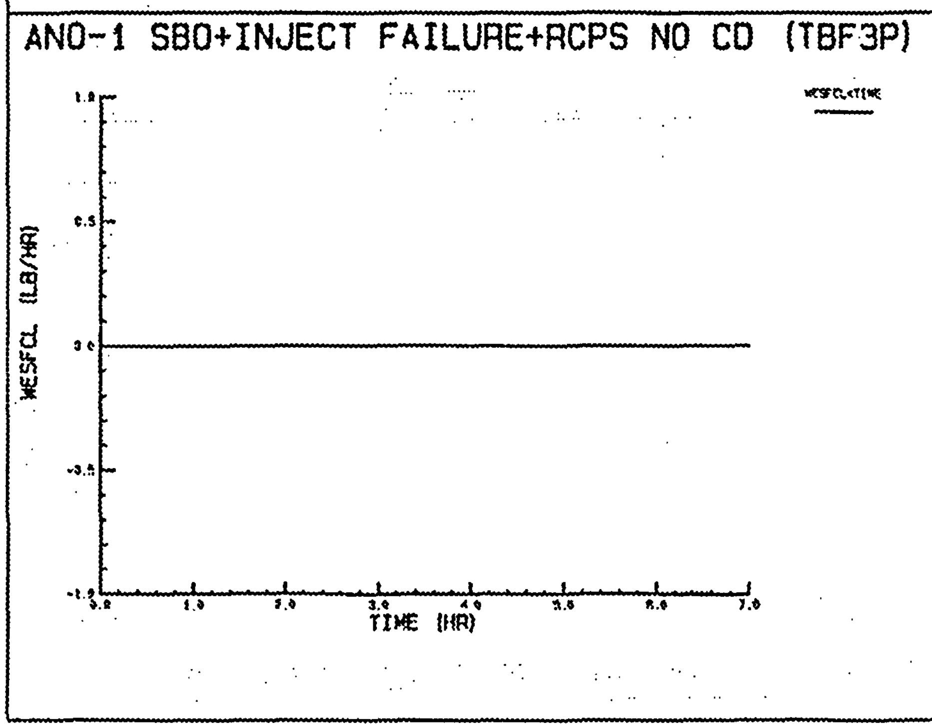
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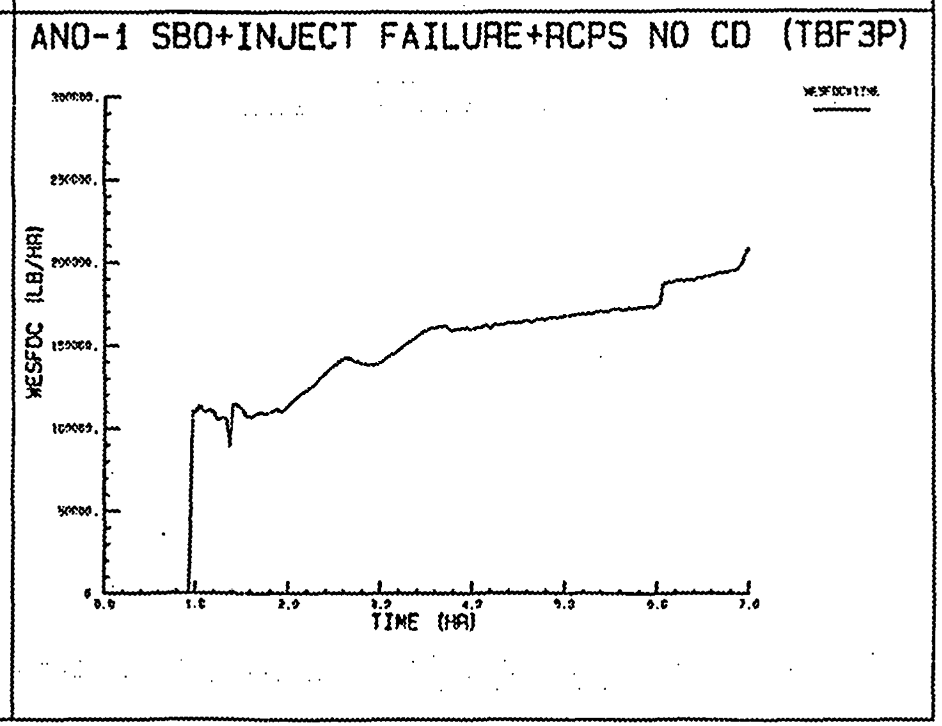
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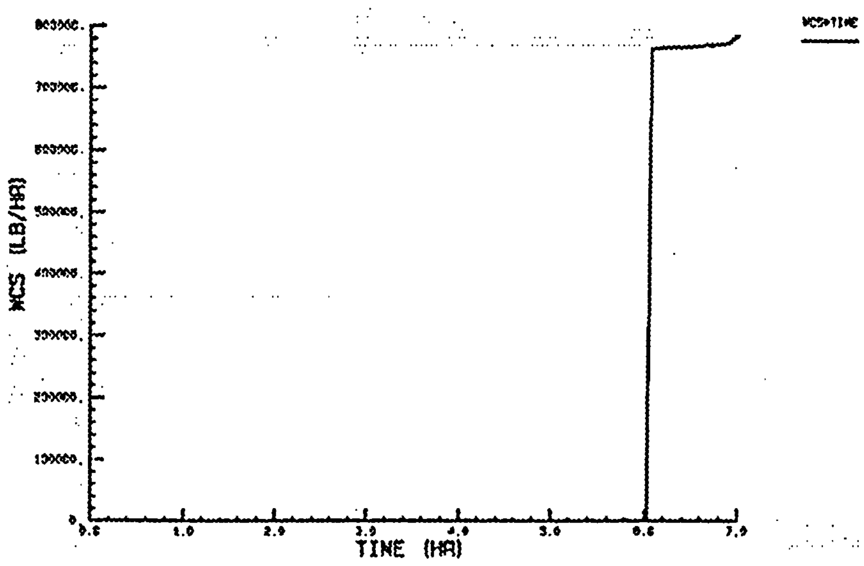

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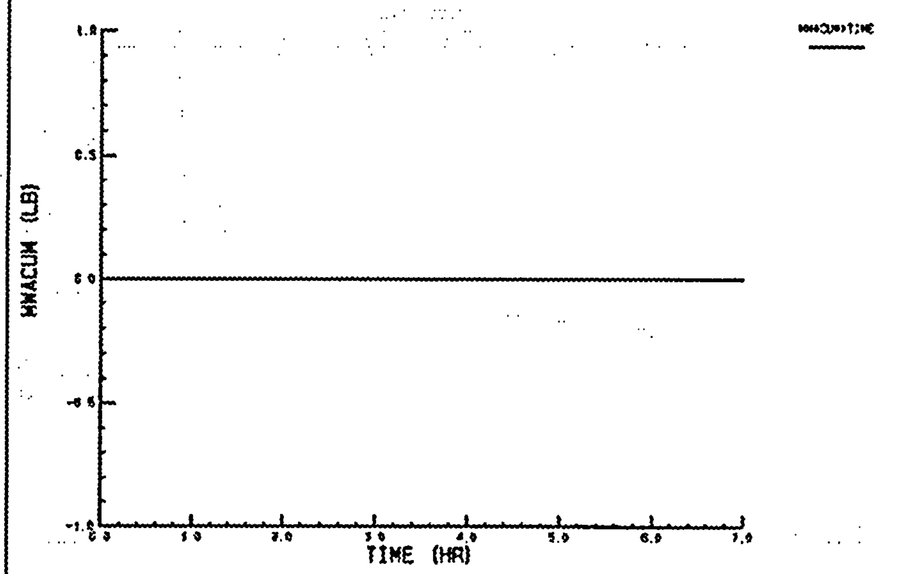

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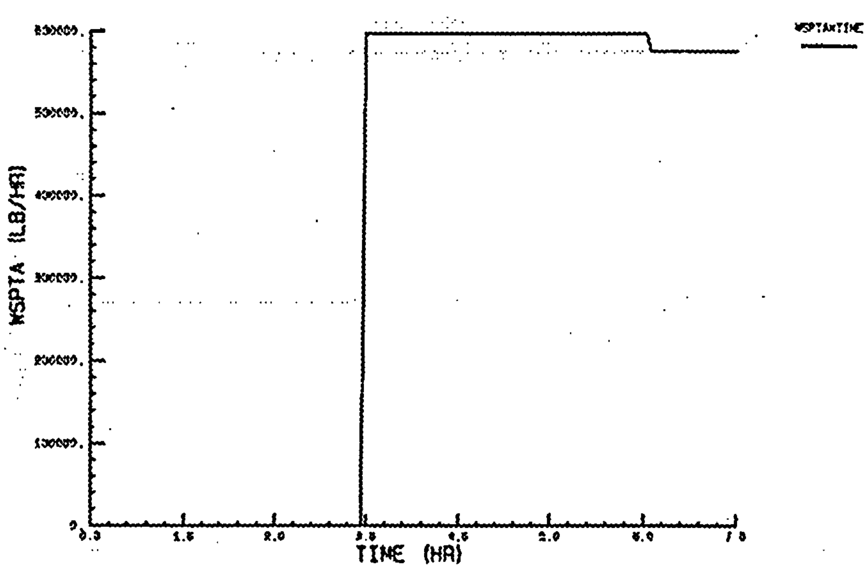

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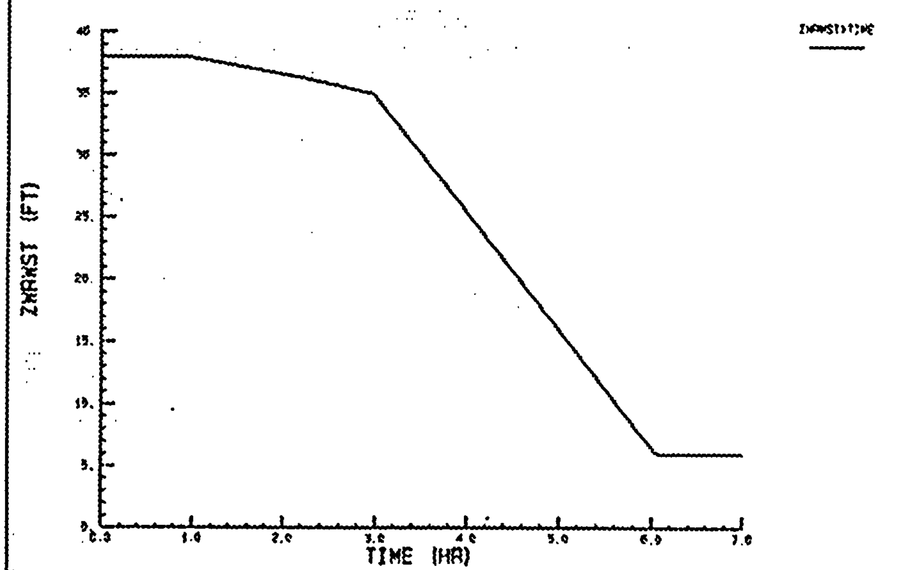

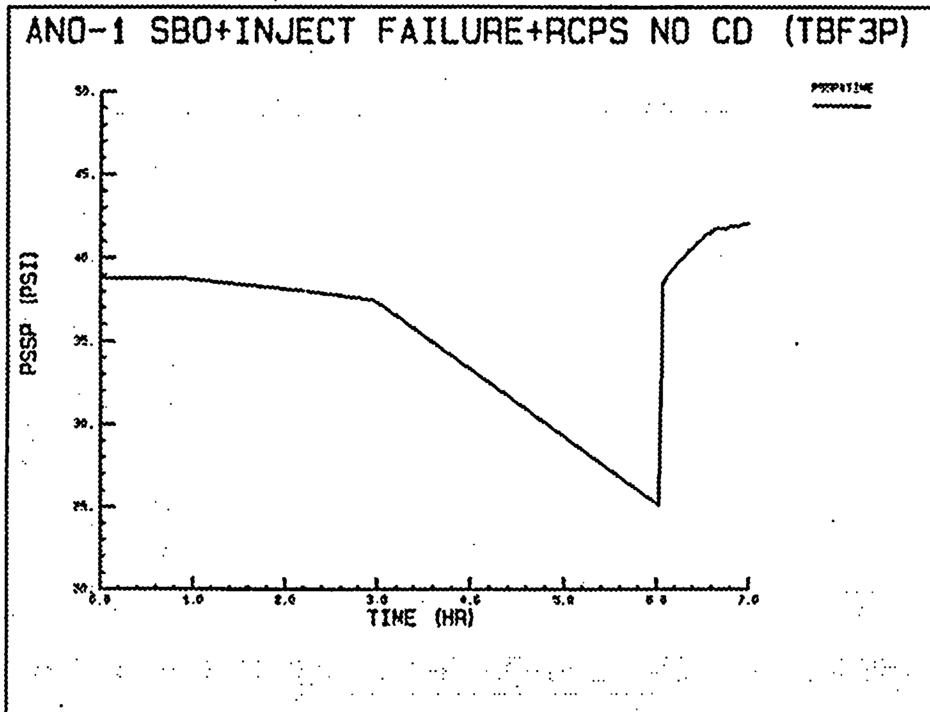
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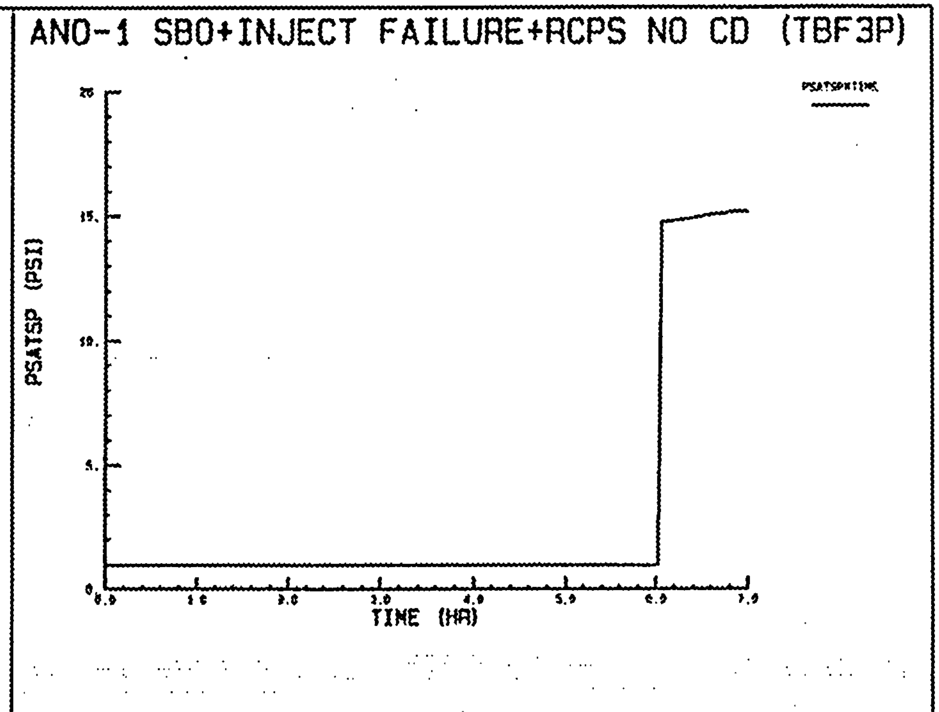
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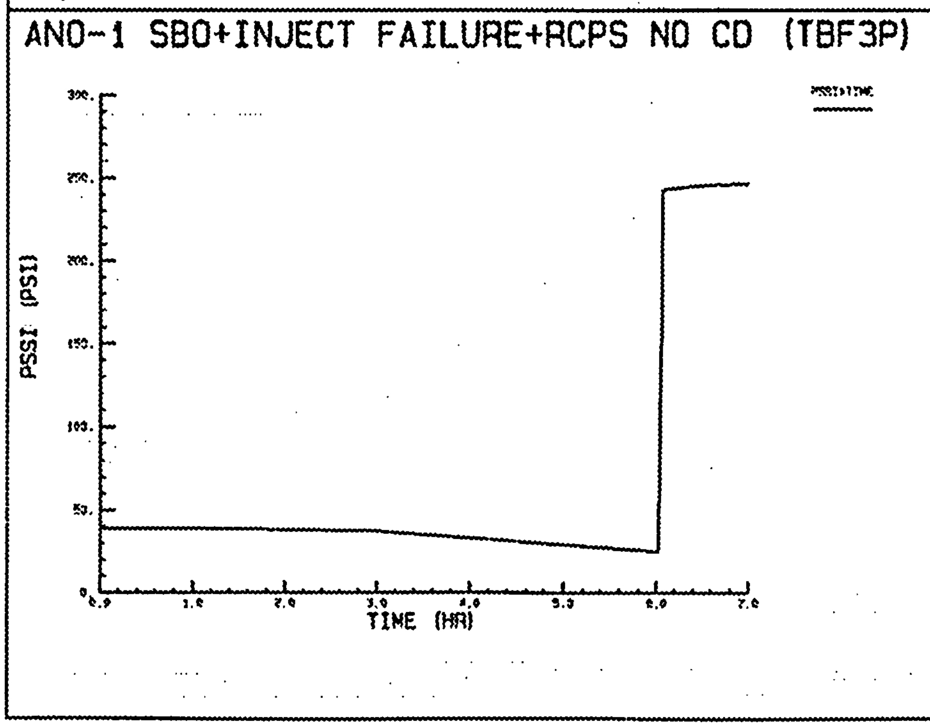
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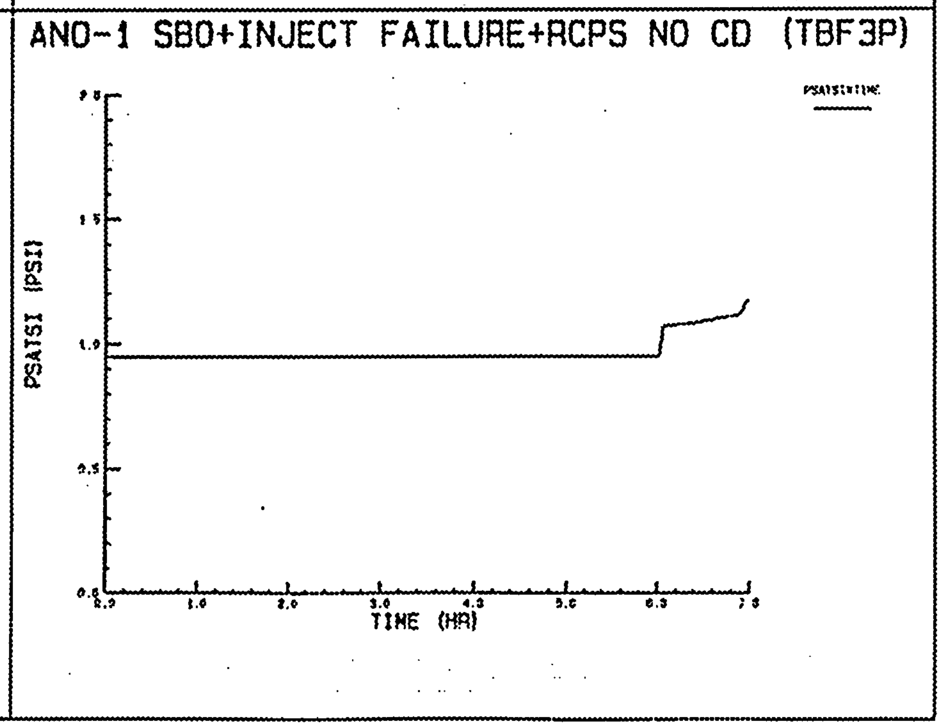
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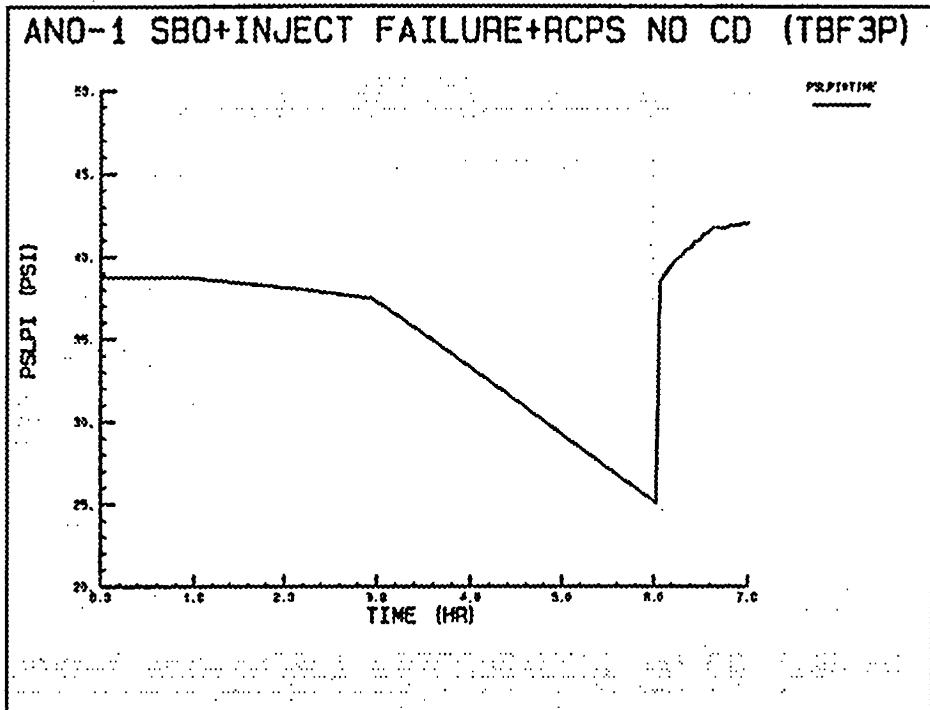
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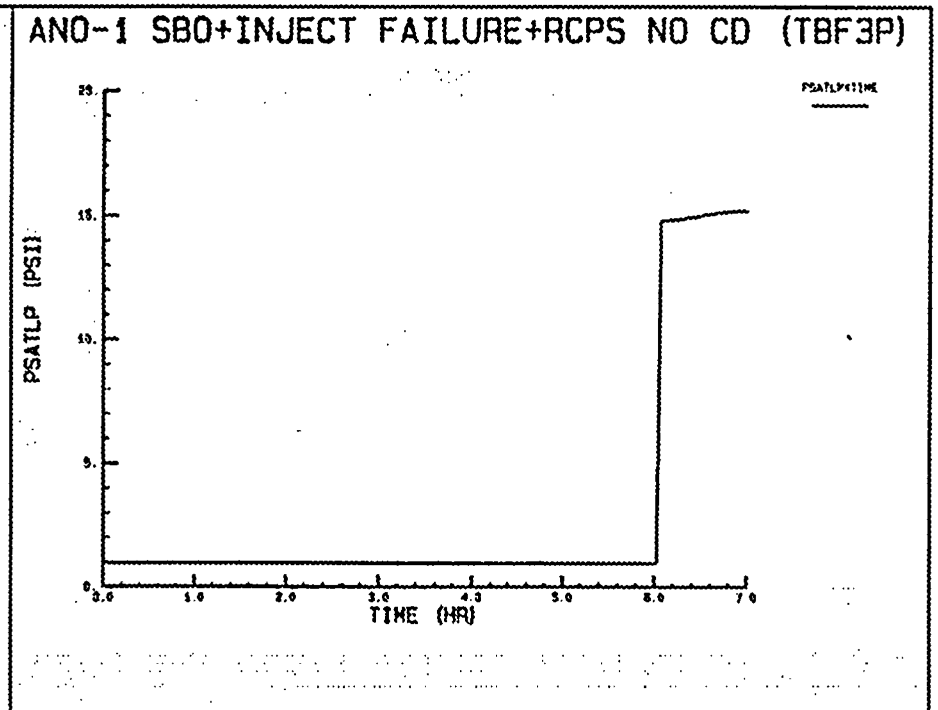
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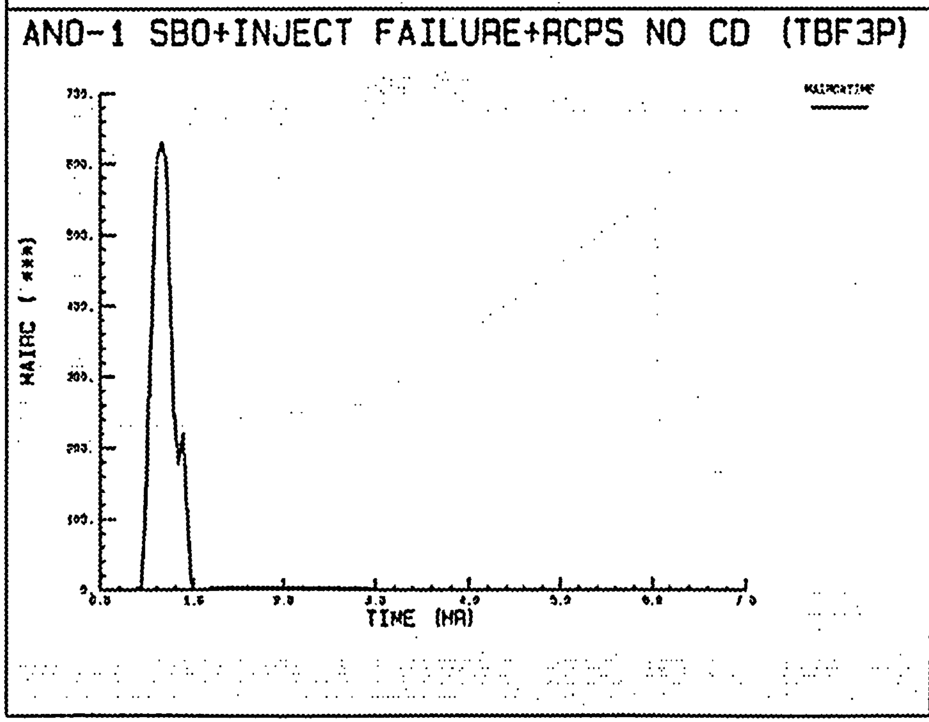
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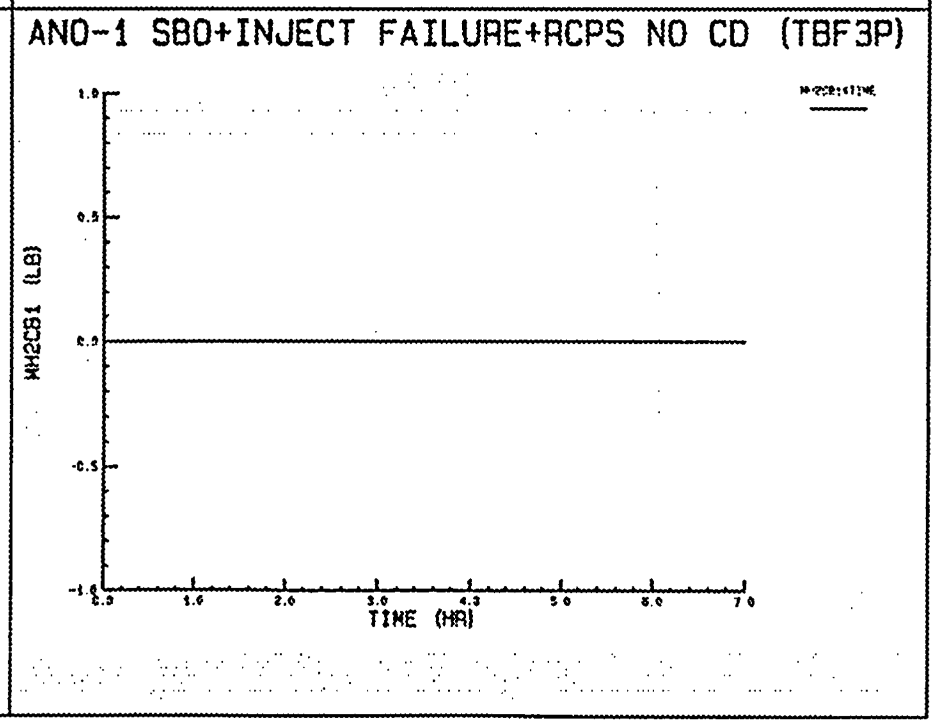
TIME (HR)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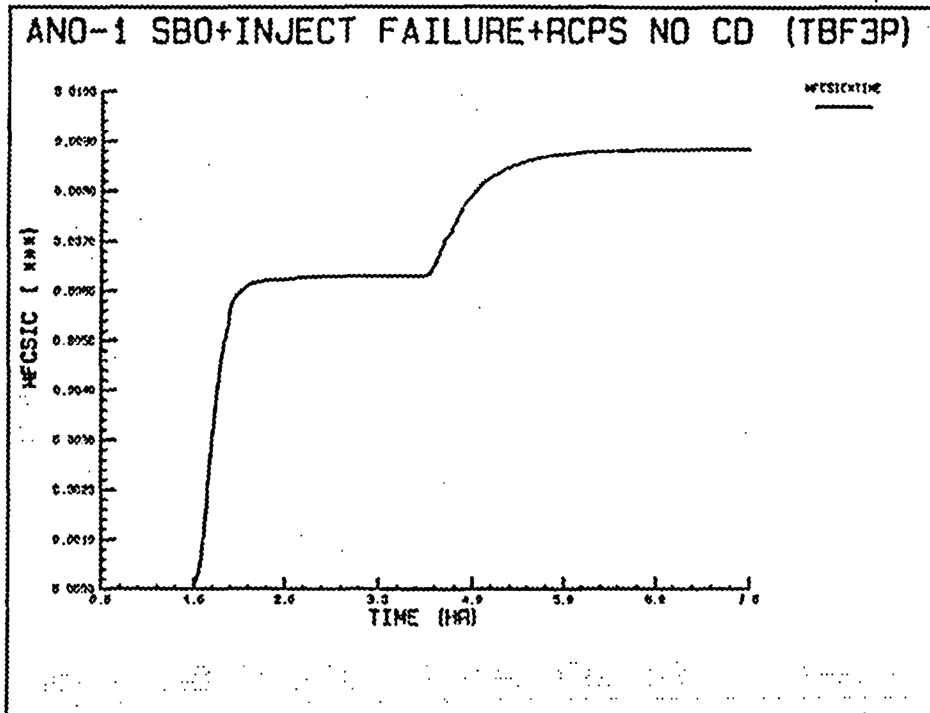
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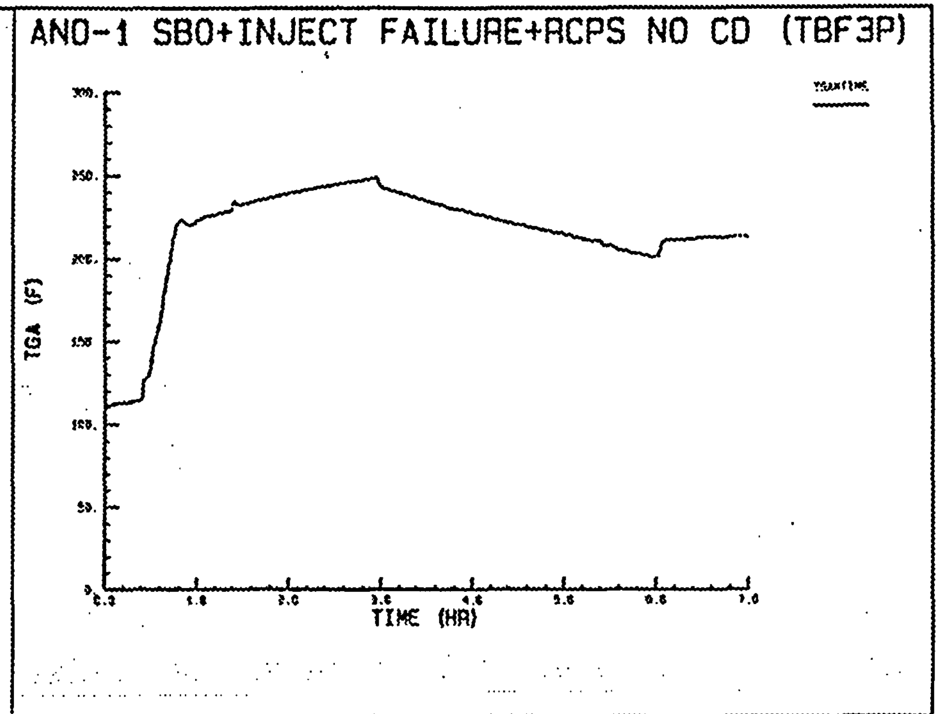
MFCSIC
TIME (HR)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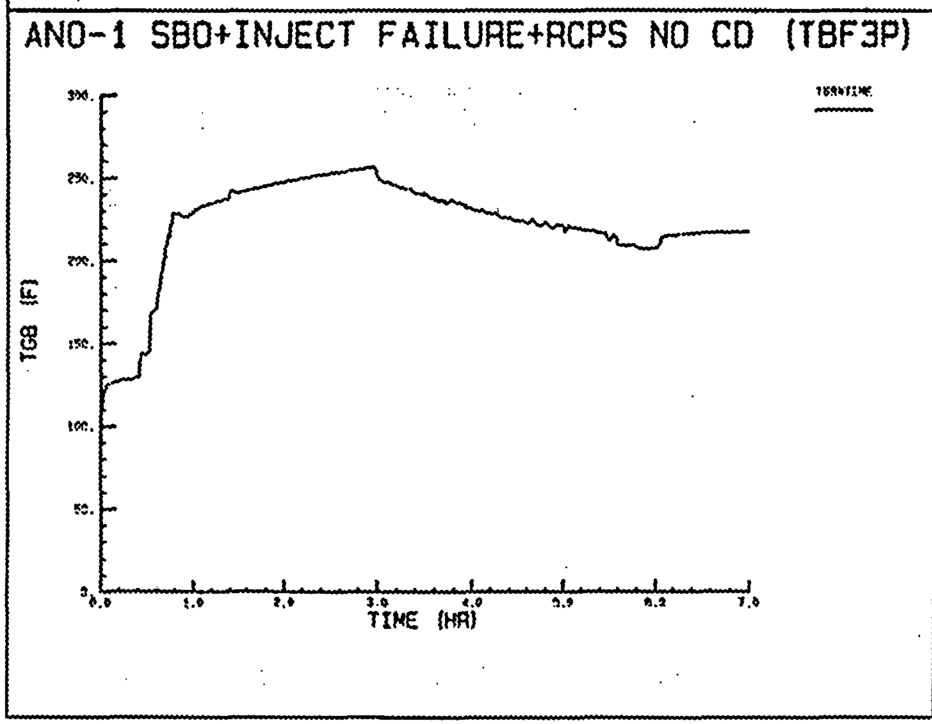
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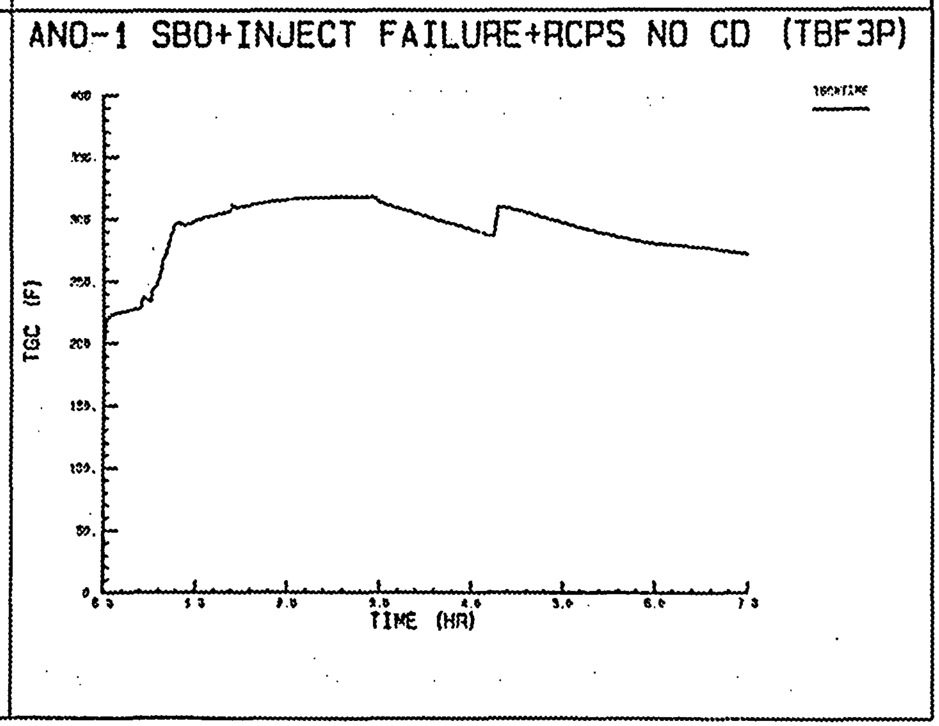
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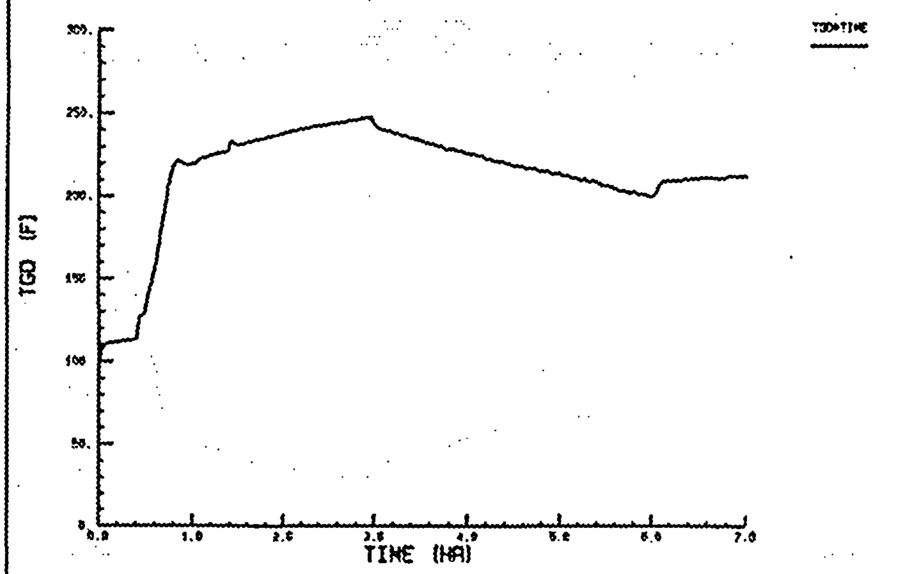

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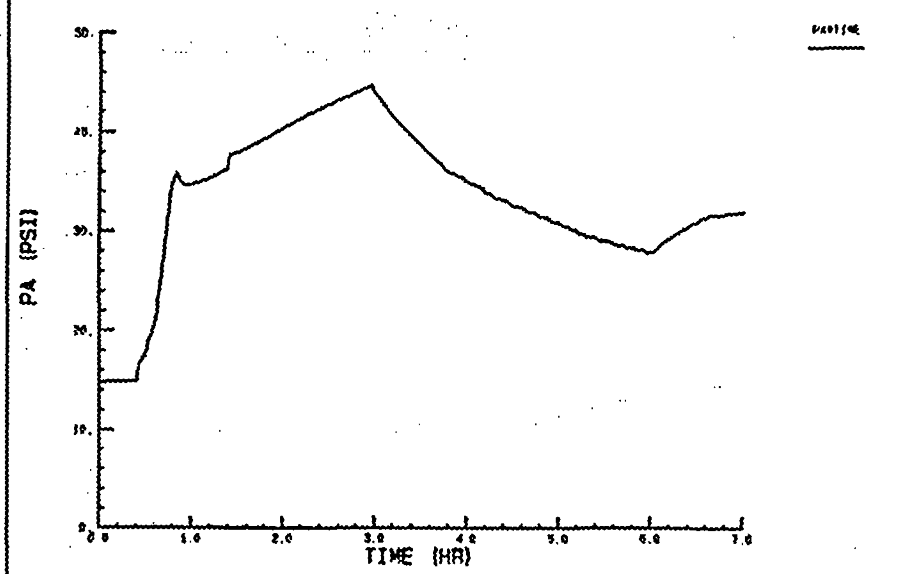

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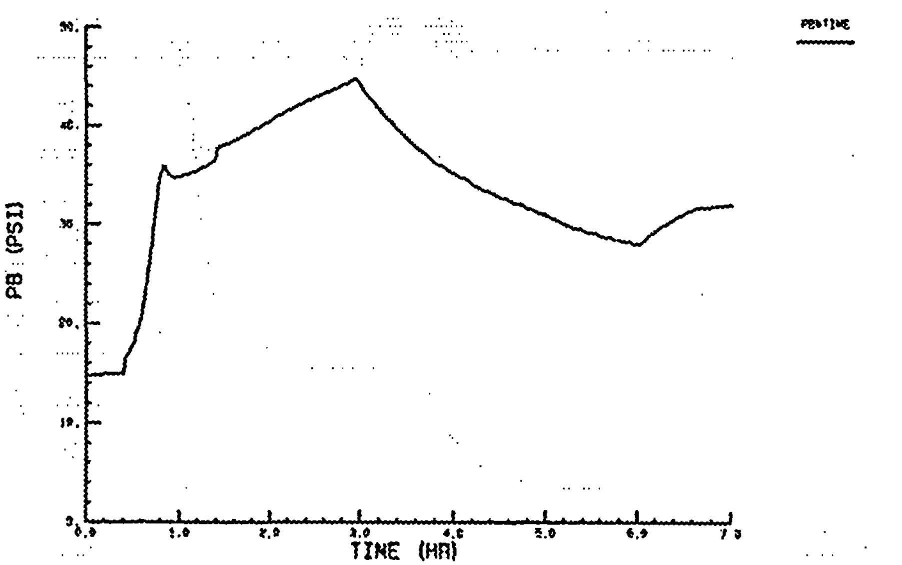

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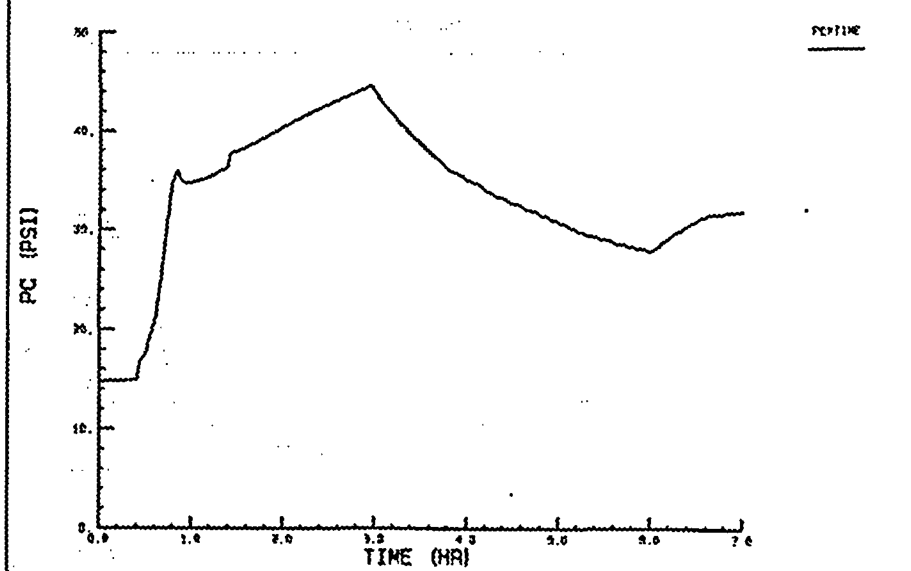

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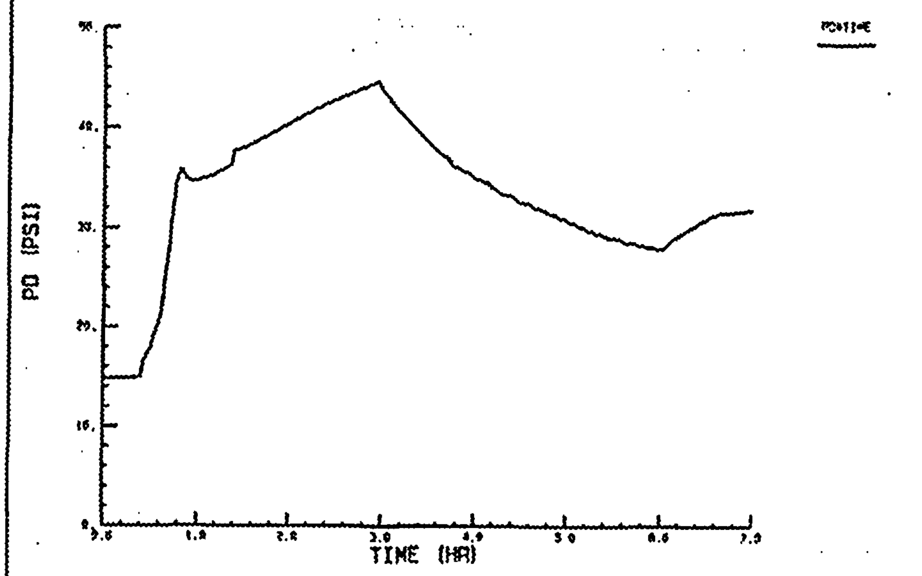

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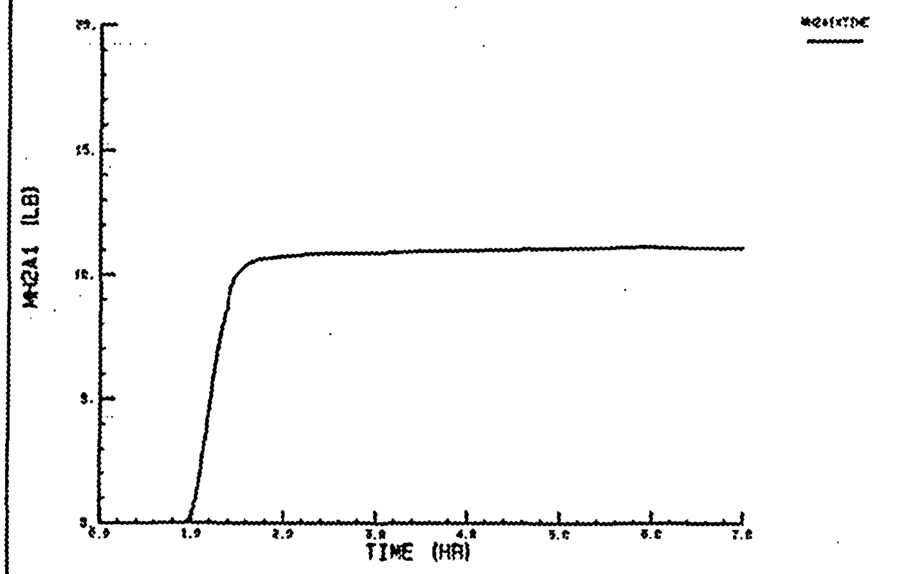

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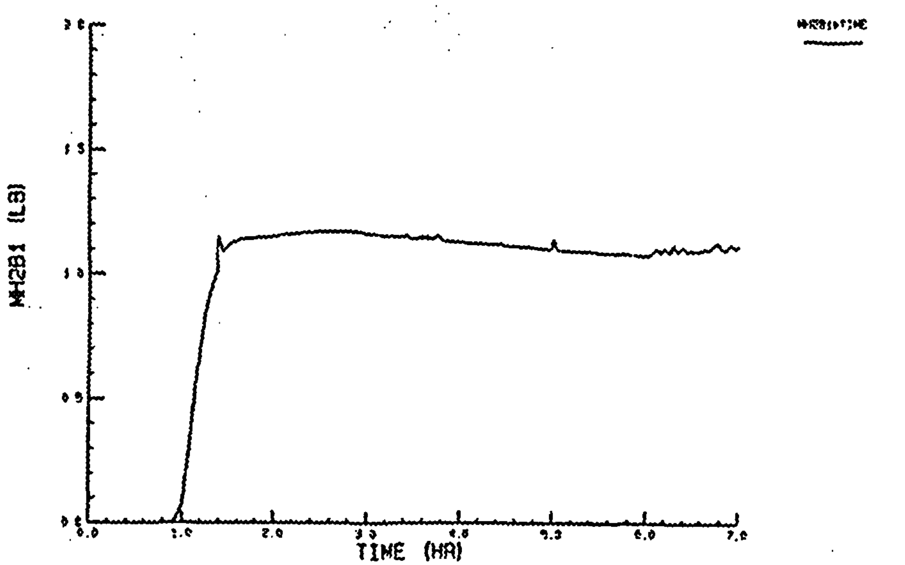

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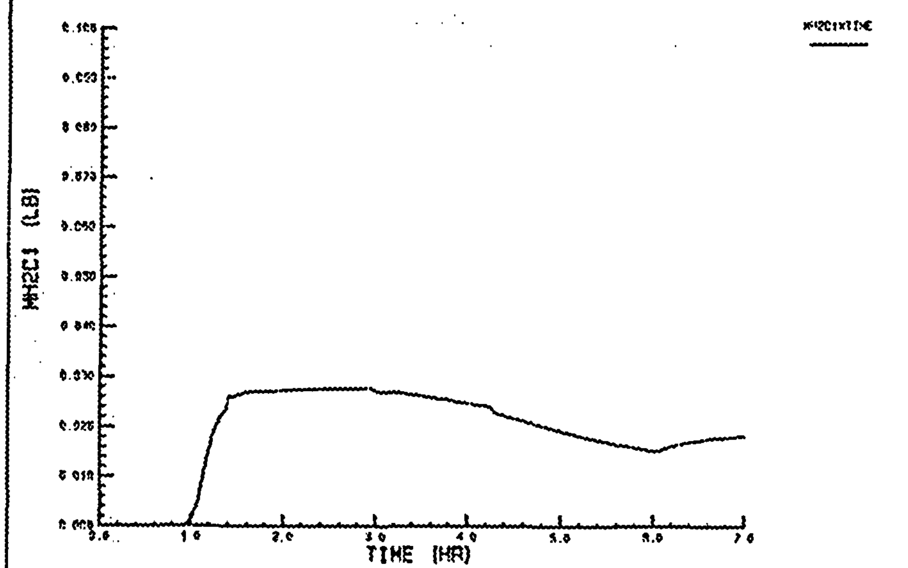

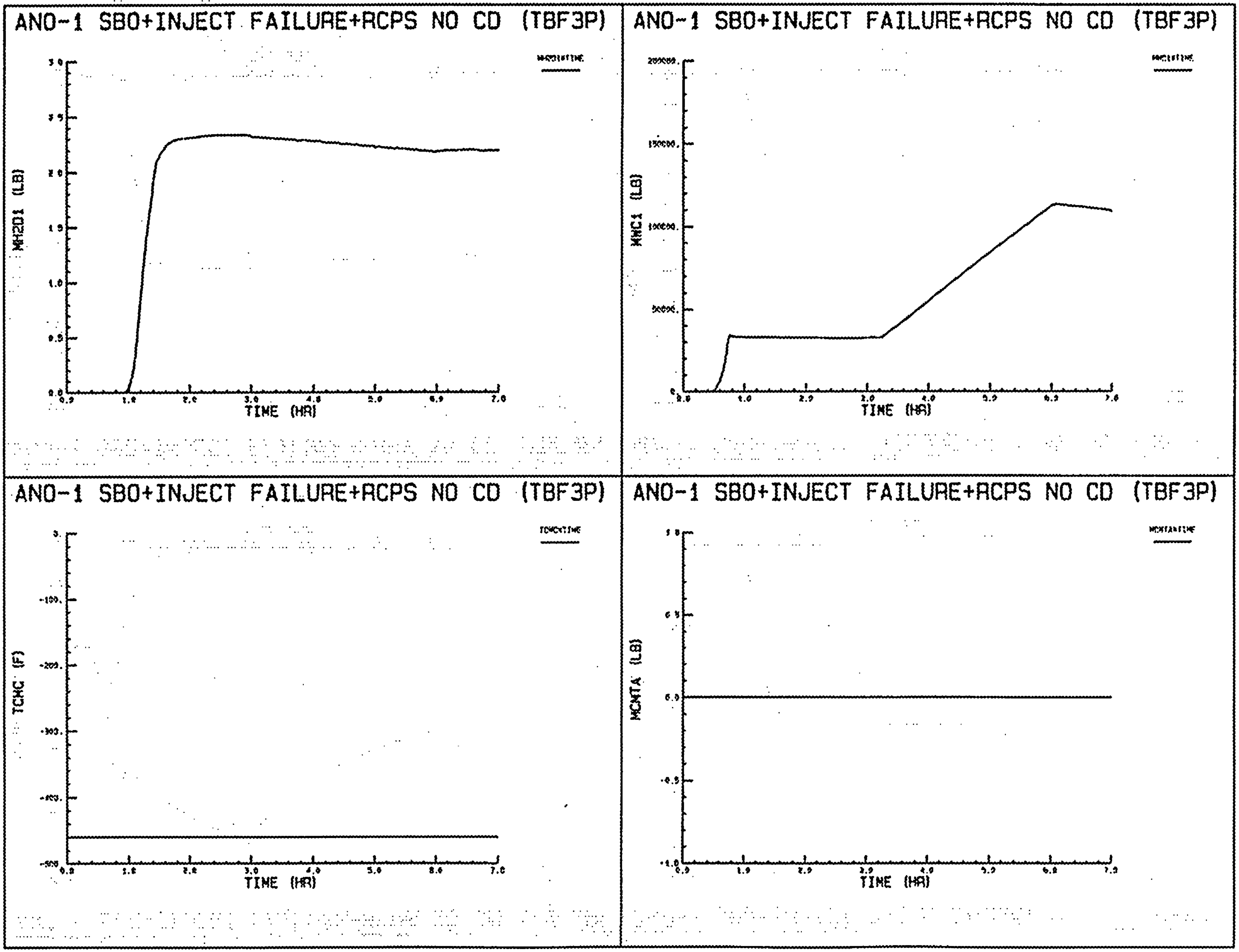
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MH2O1 (LB)
TIME (HR)
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TIME (HR)
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TIME (HR)
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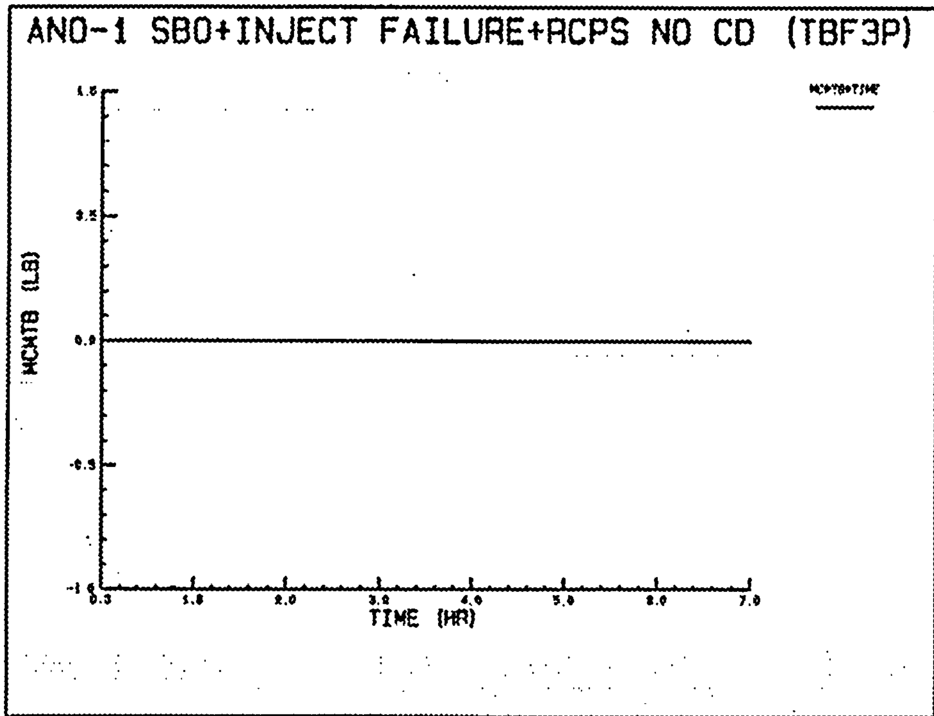
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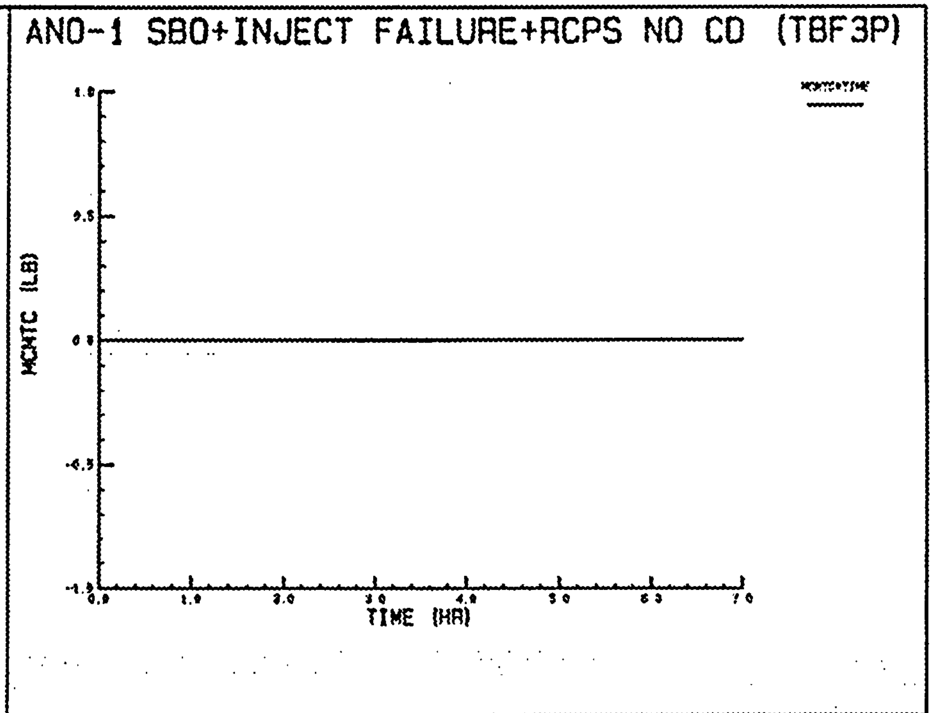
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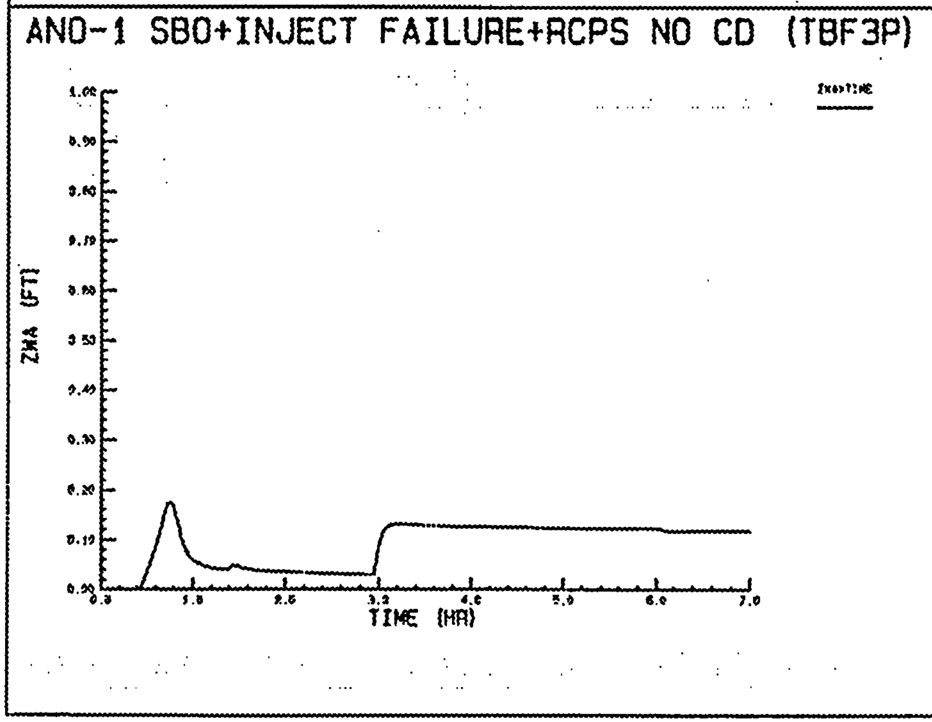
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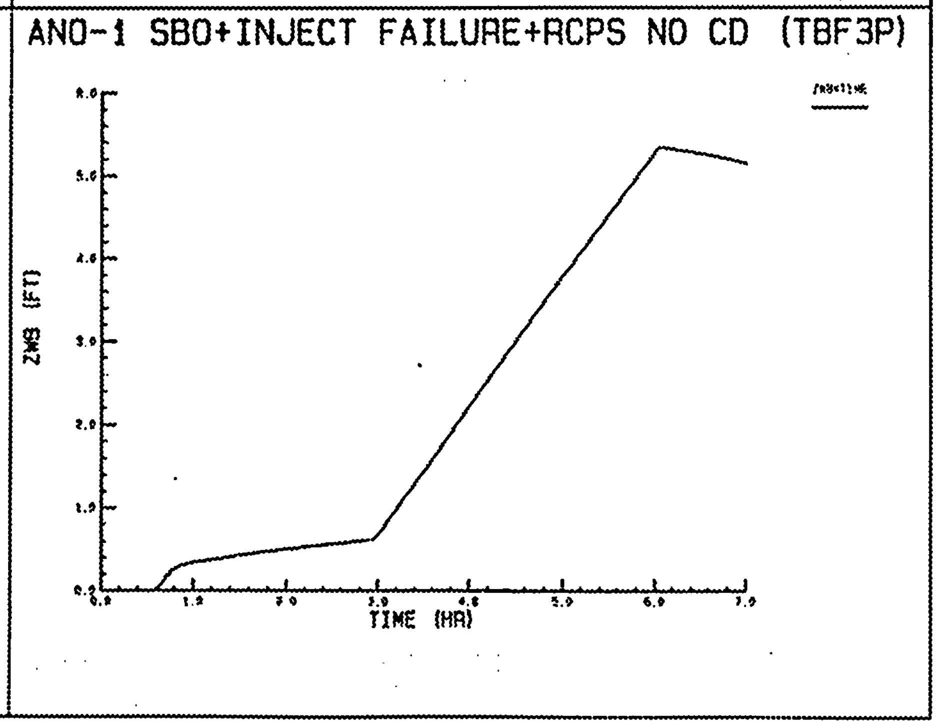
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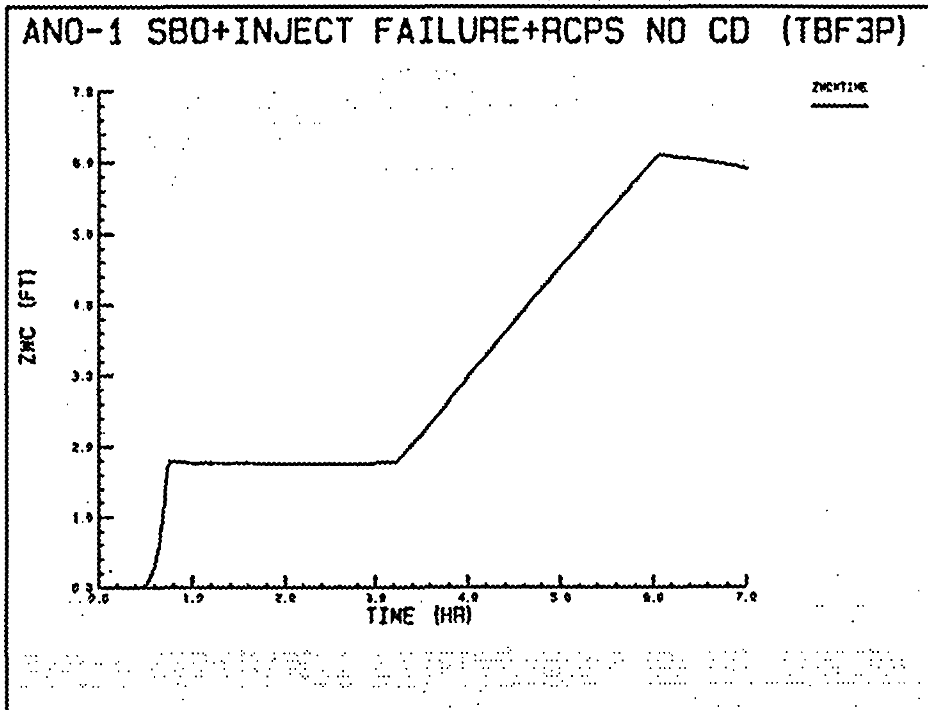
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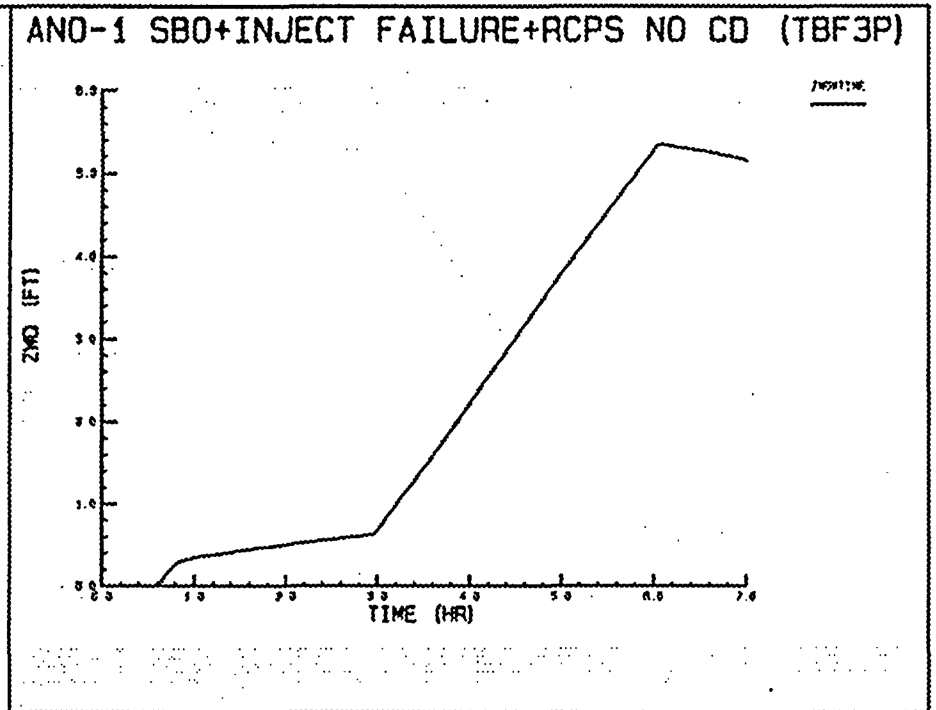
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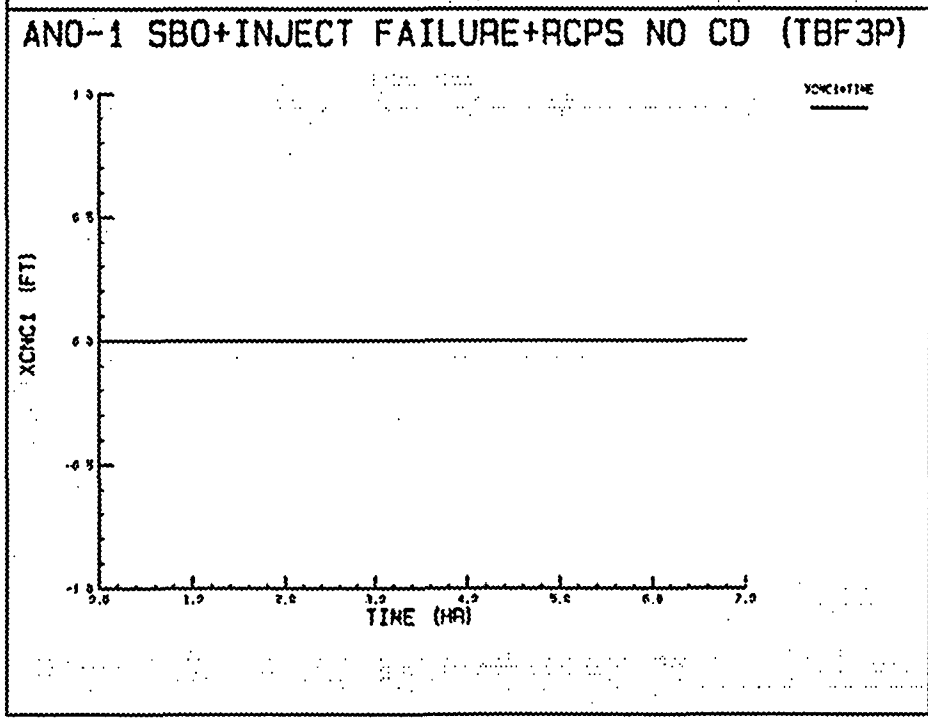
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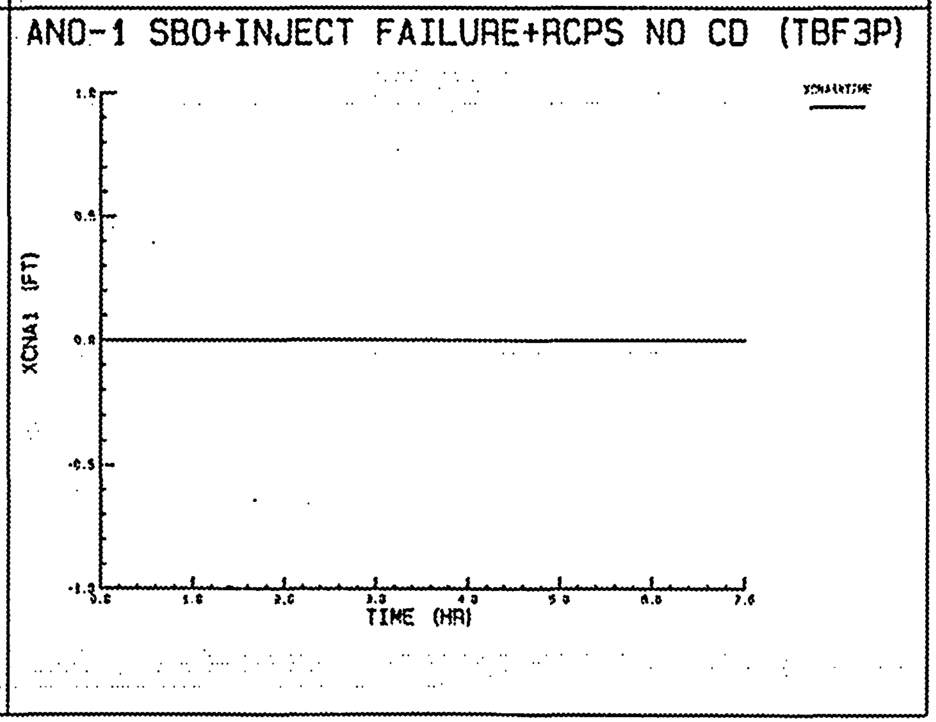
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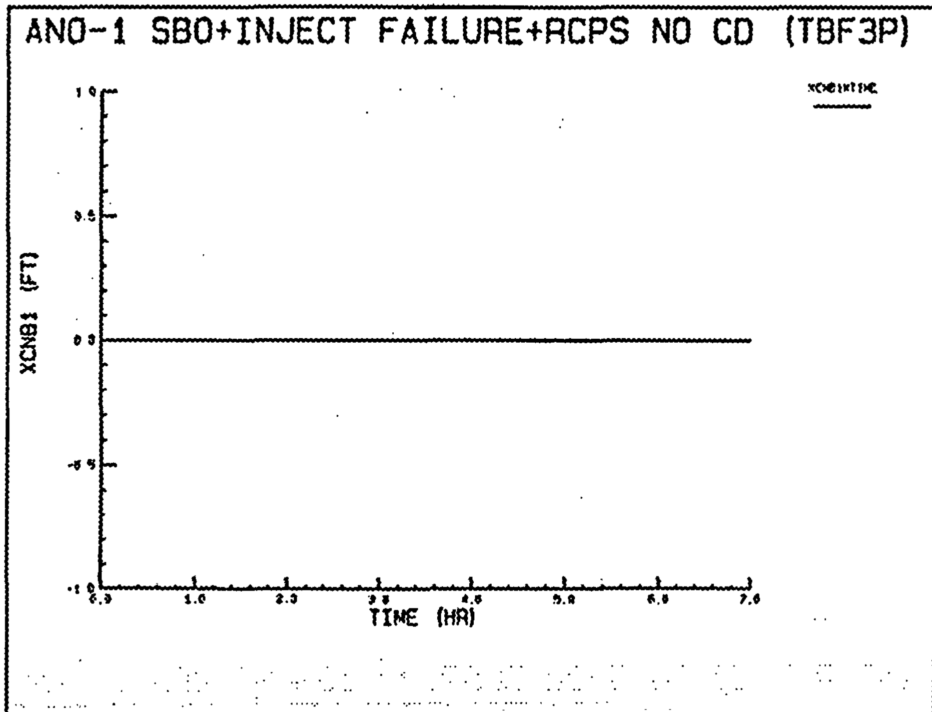
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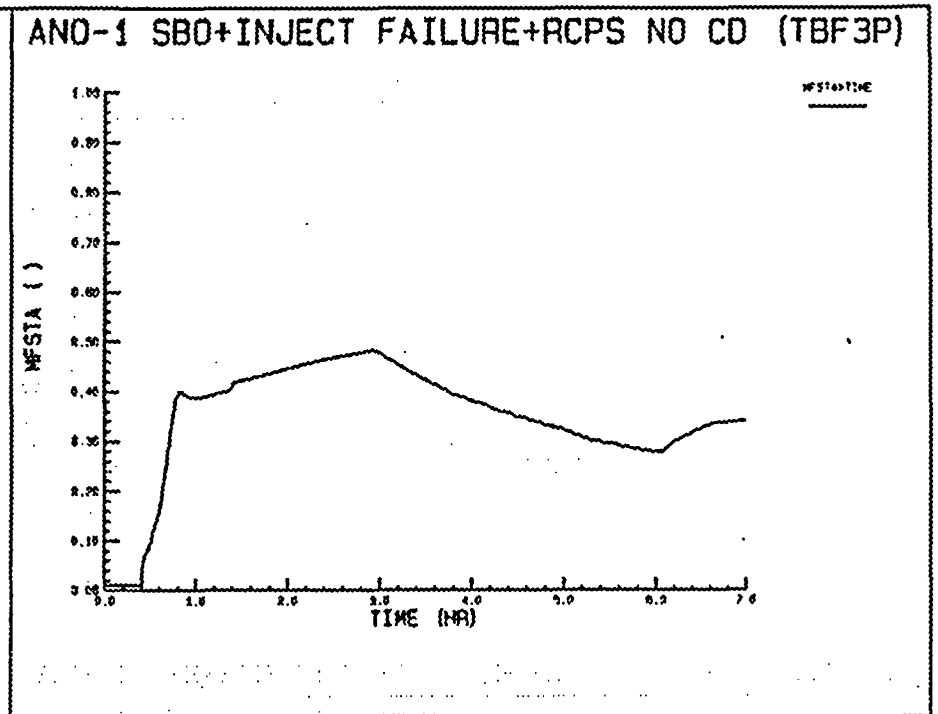
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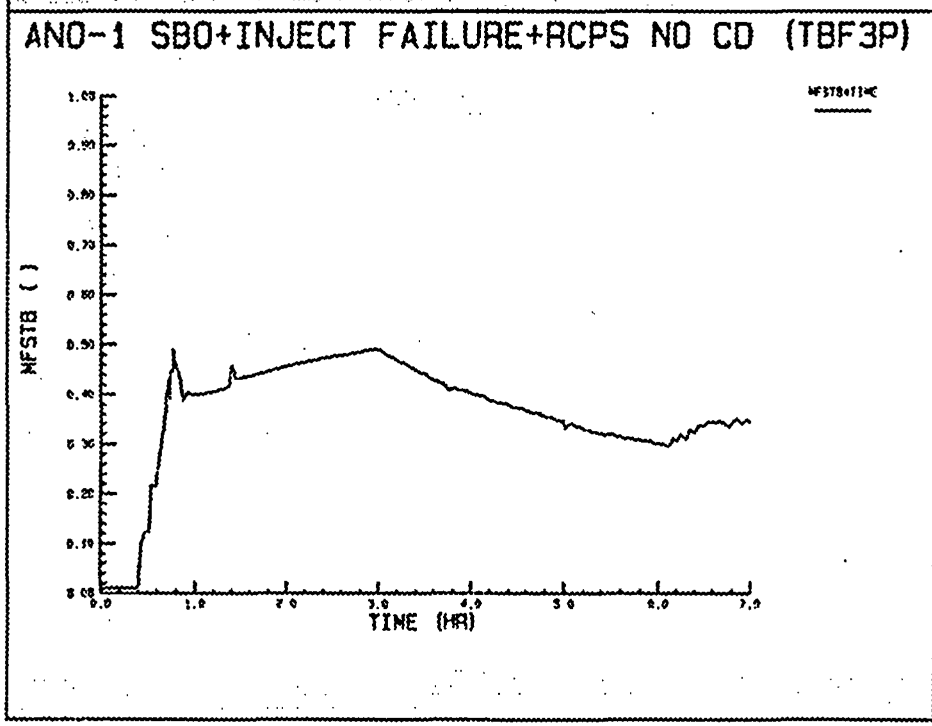
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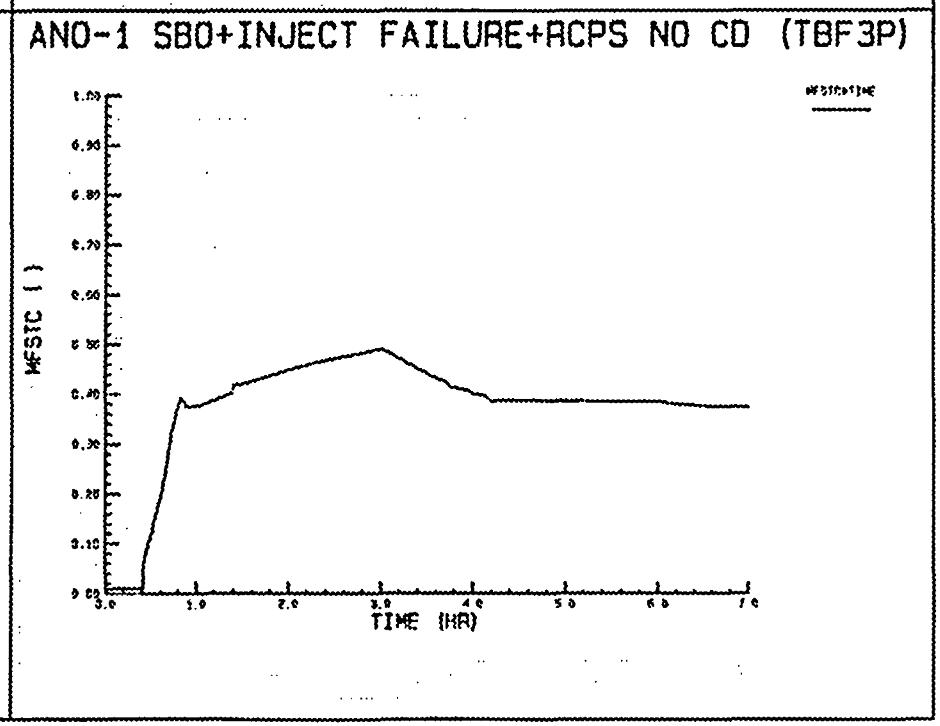
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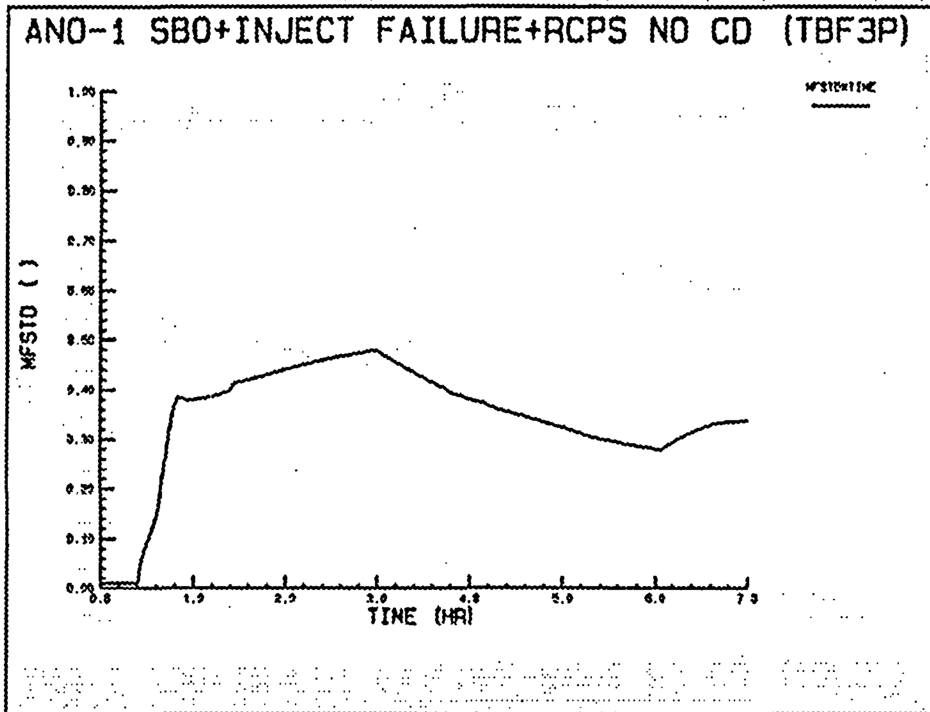
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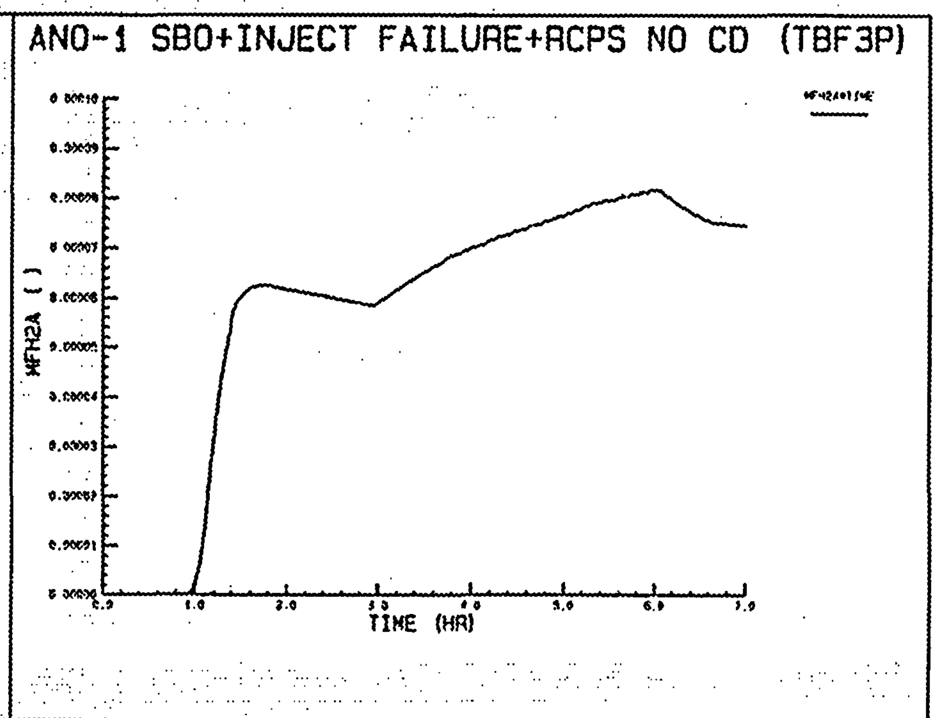
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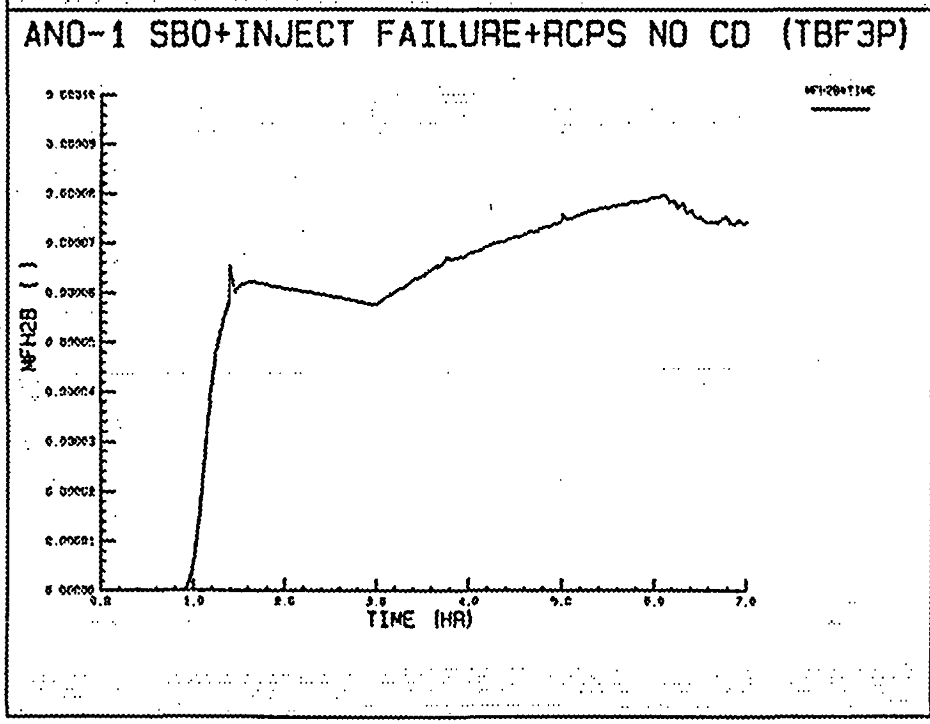
WFH2A ( )
TIME (HR)

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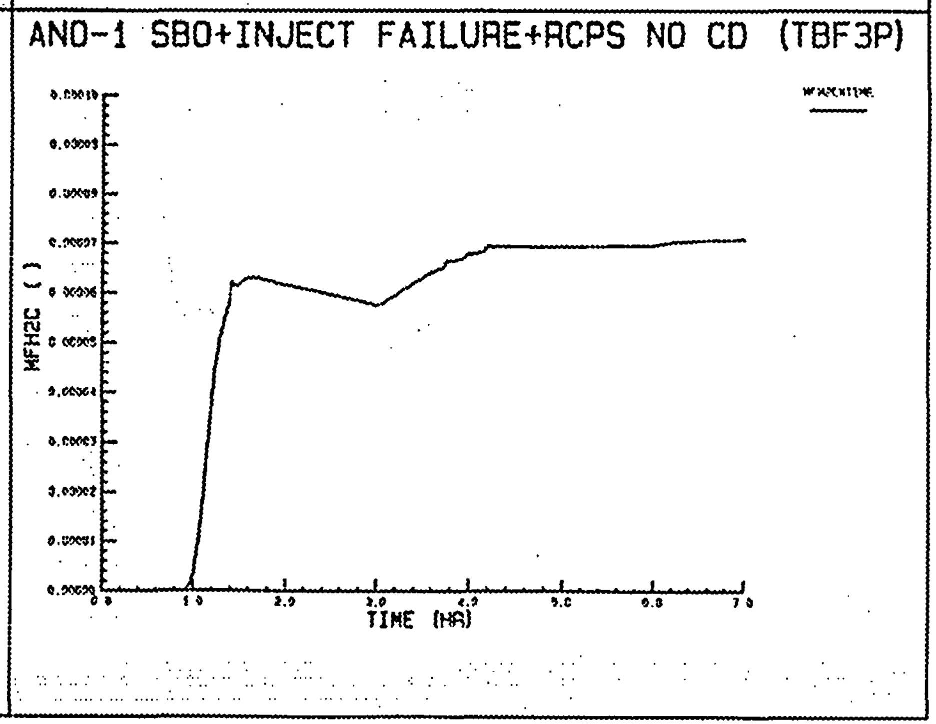
WFH2B ( )
TIME (HR)

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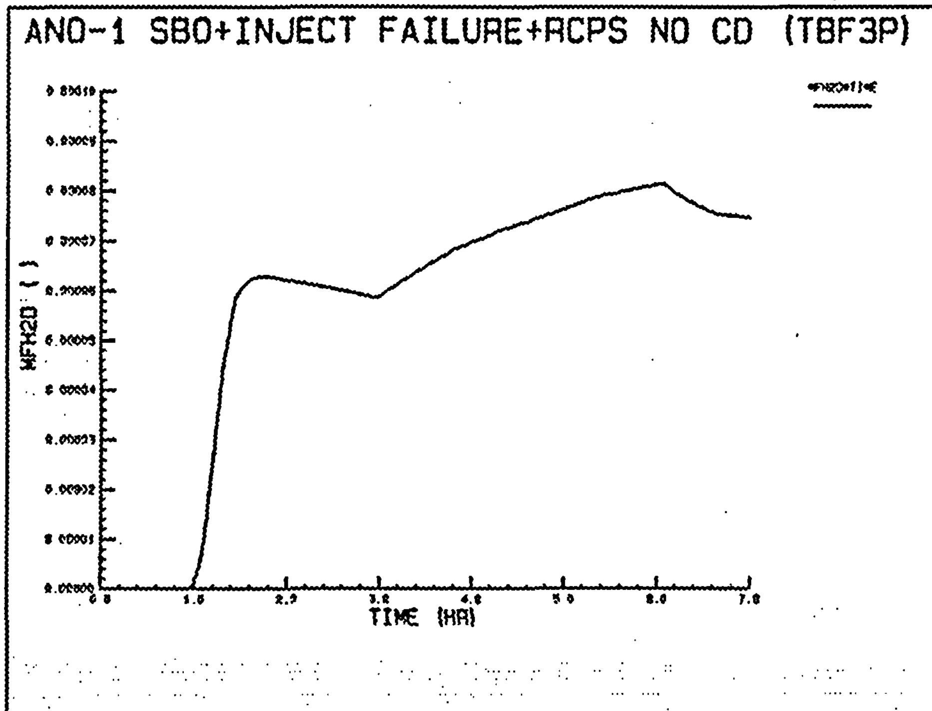
TIME (HR)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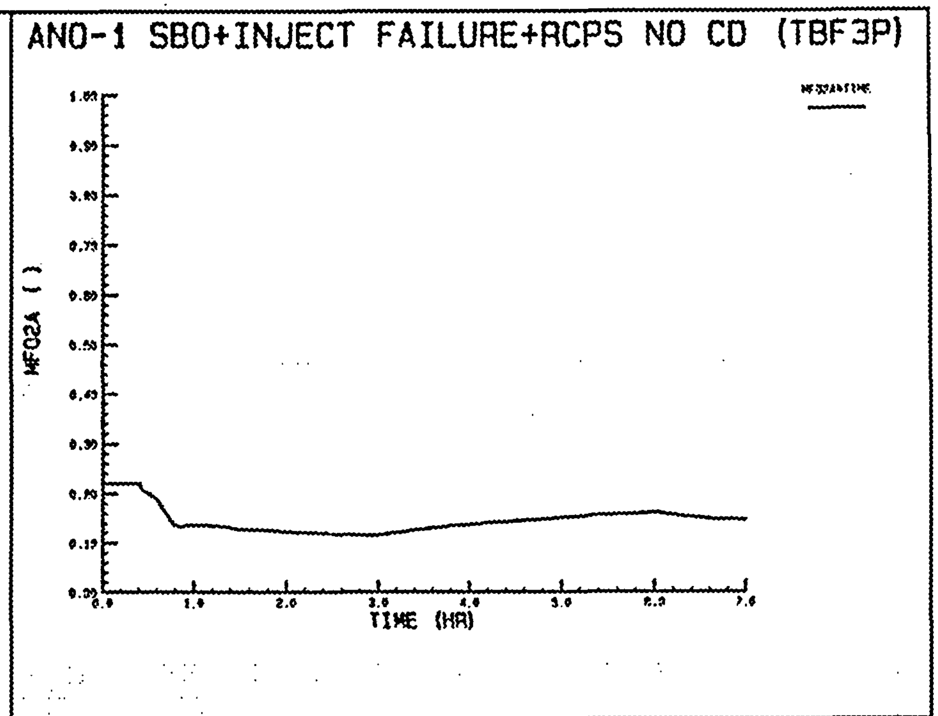
TIME (HR)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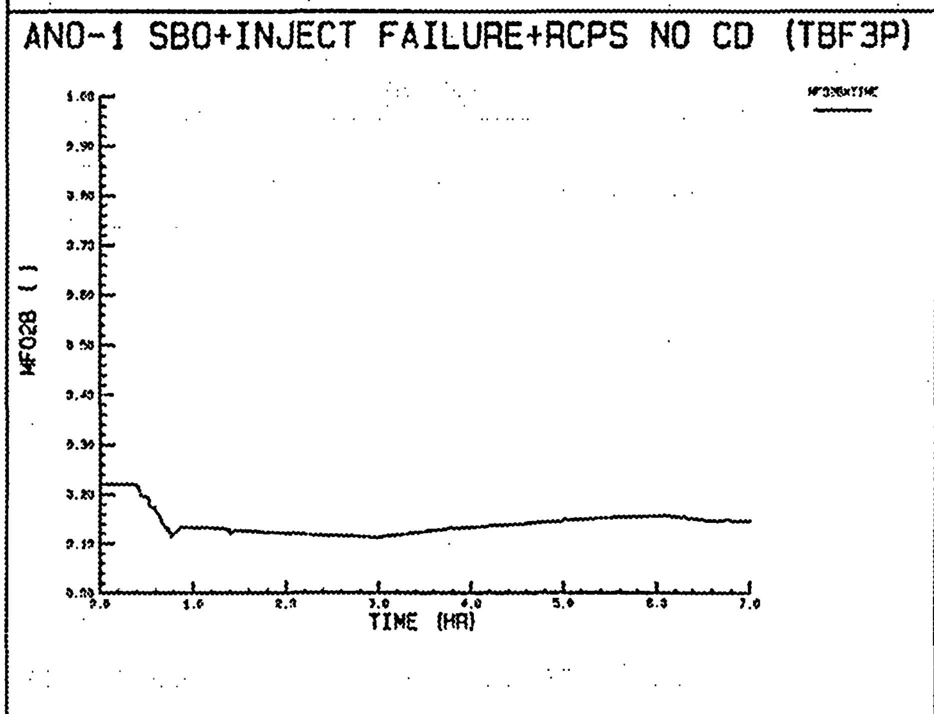
TIME (HR)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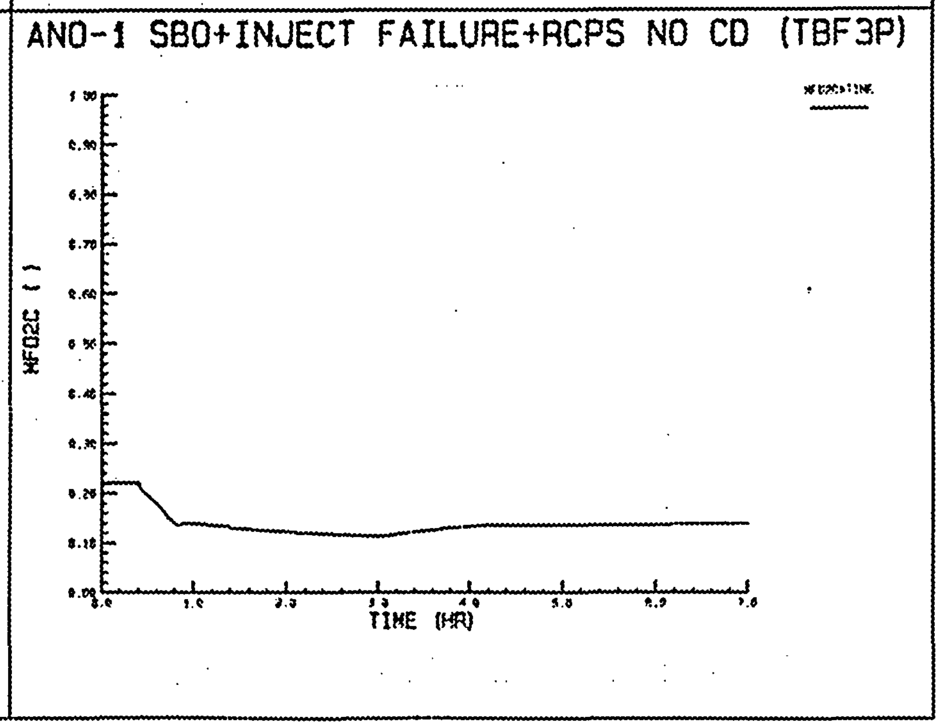
TIME (HR)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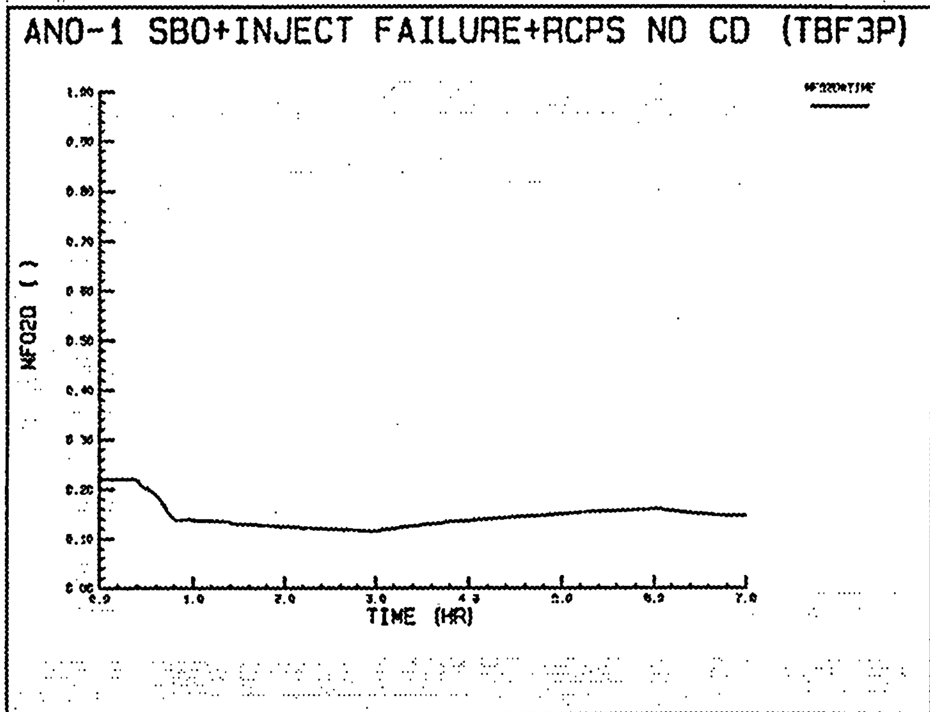
TIME (HR)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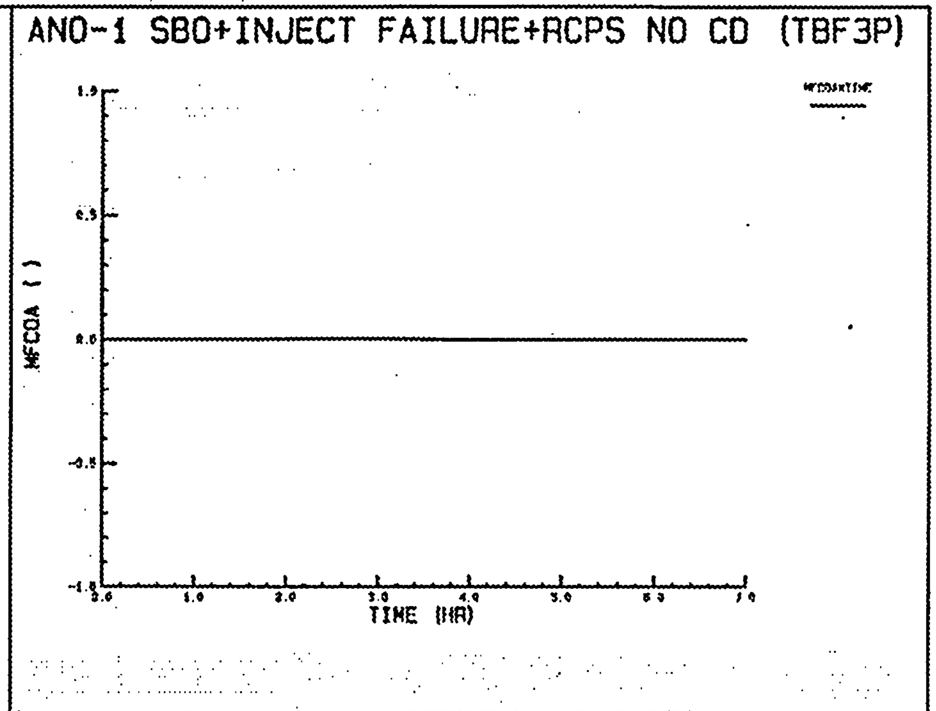
TIME (HR)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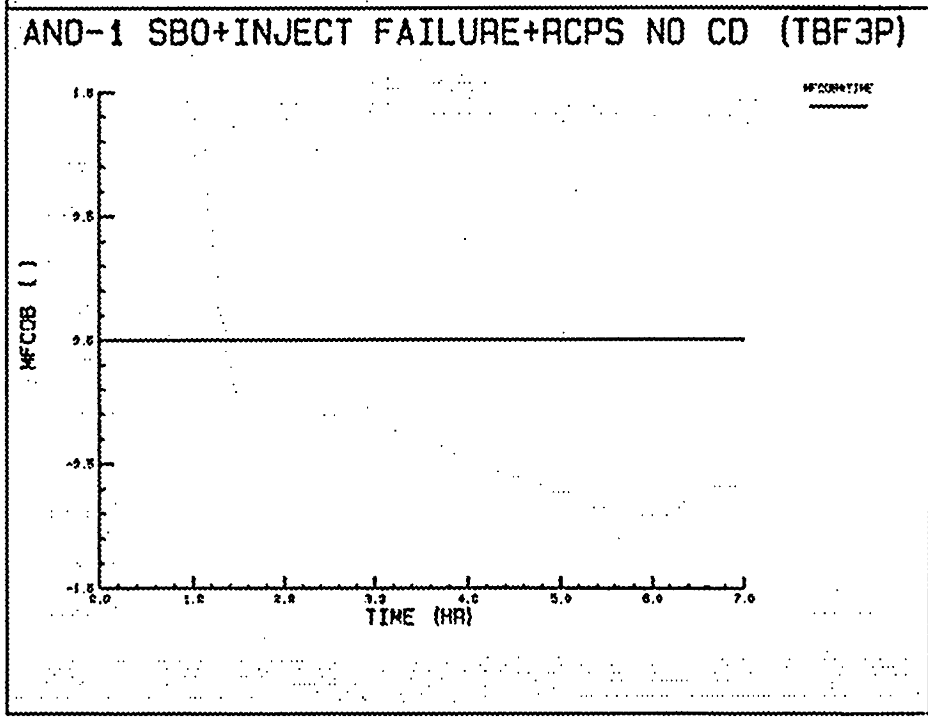
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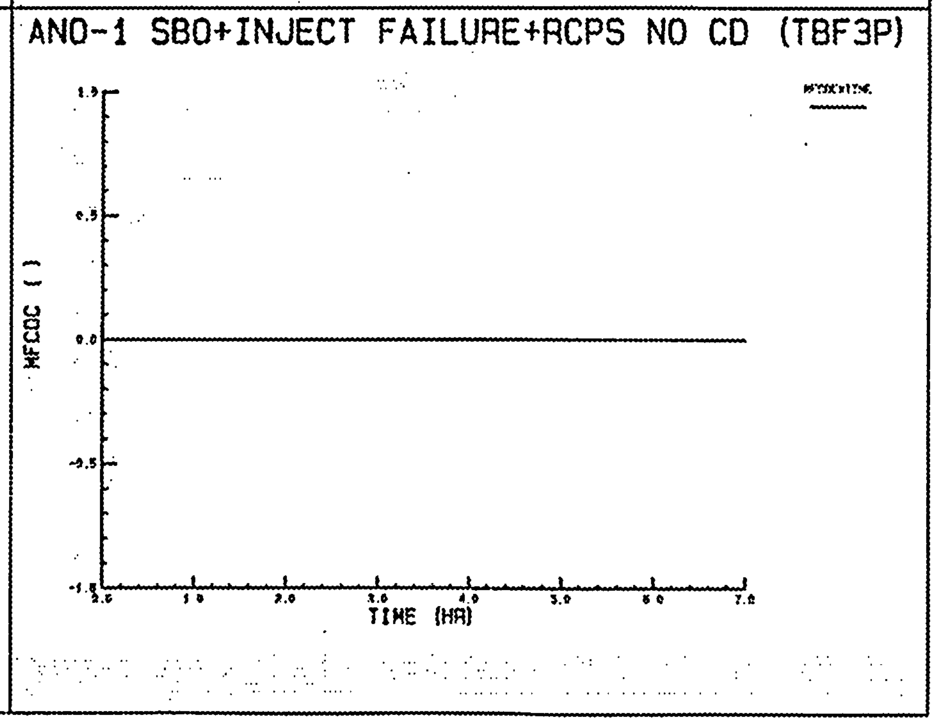
TIME (HR)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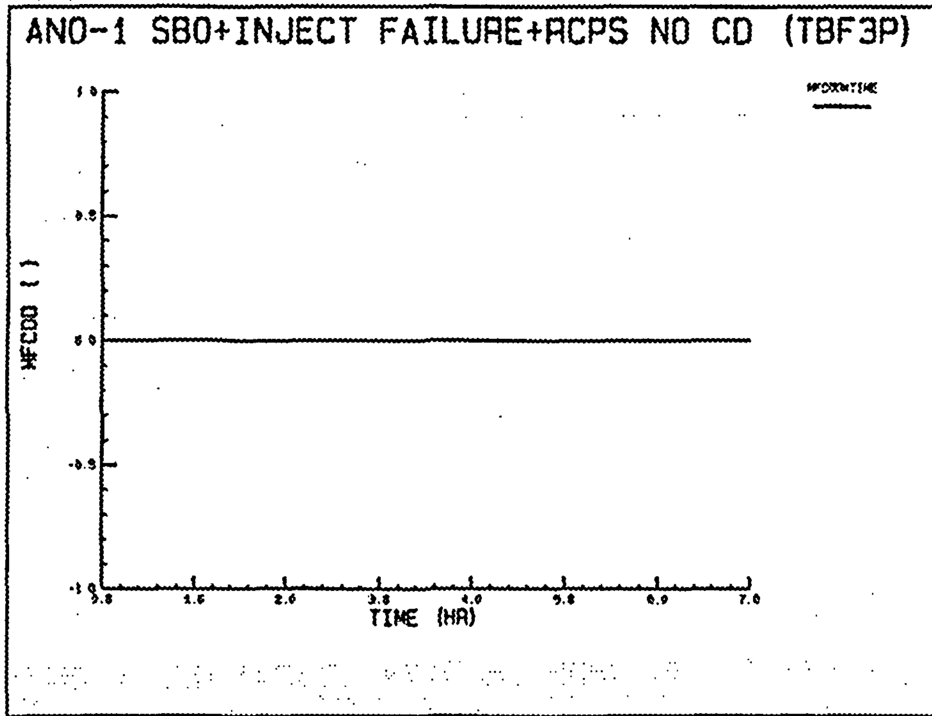
TIME (HR)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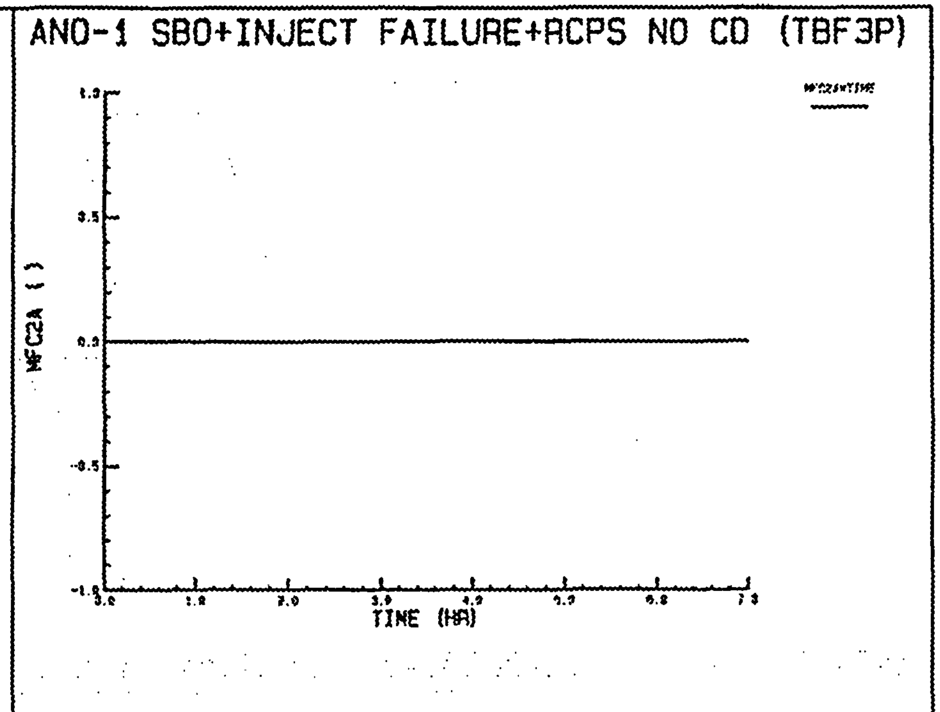
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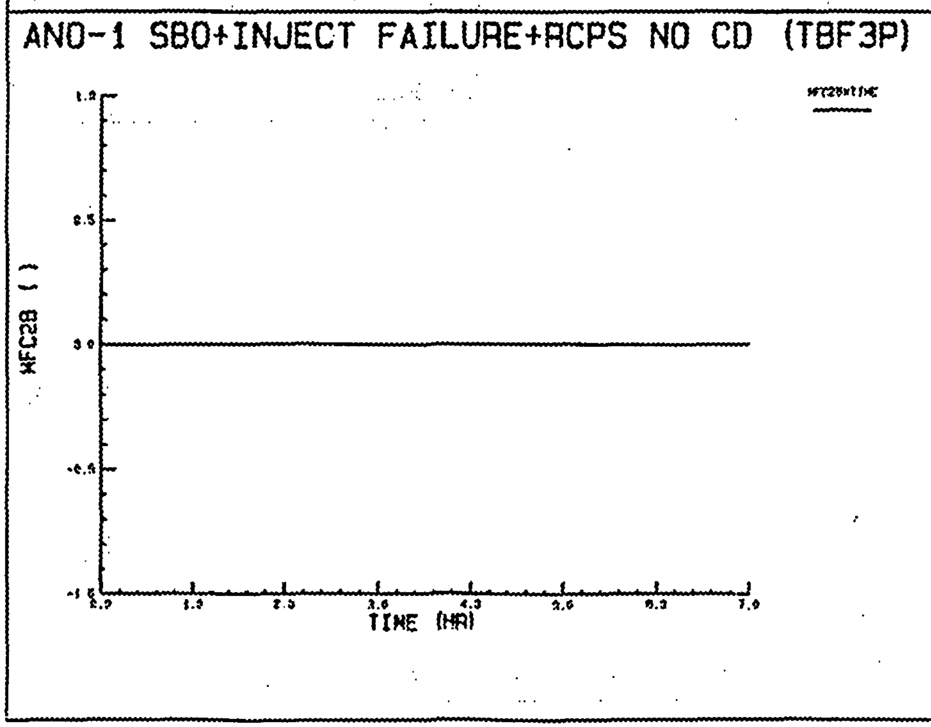
TIME (HR)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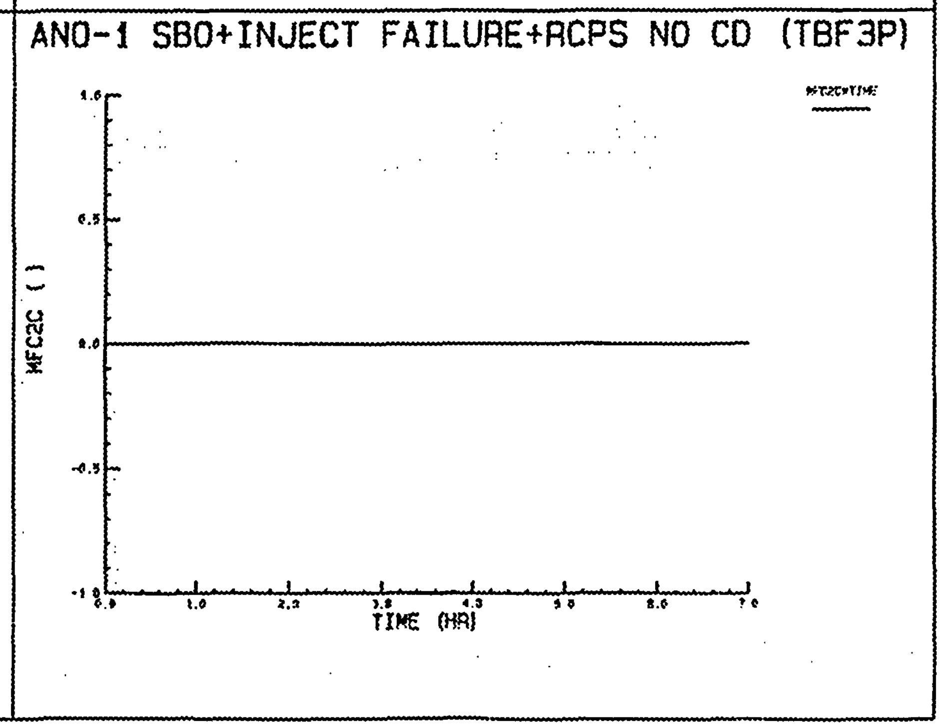
TIME (HR)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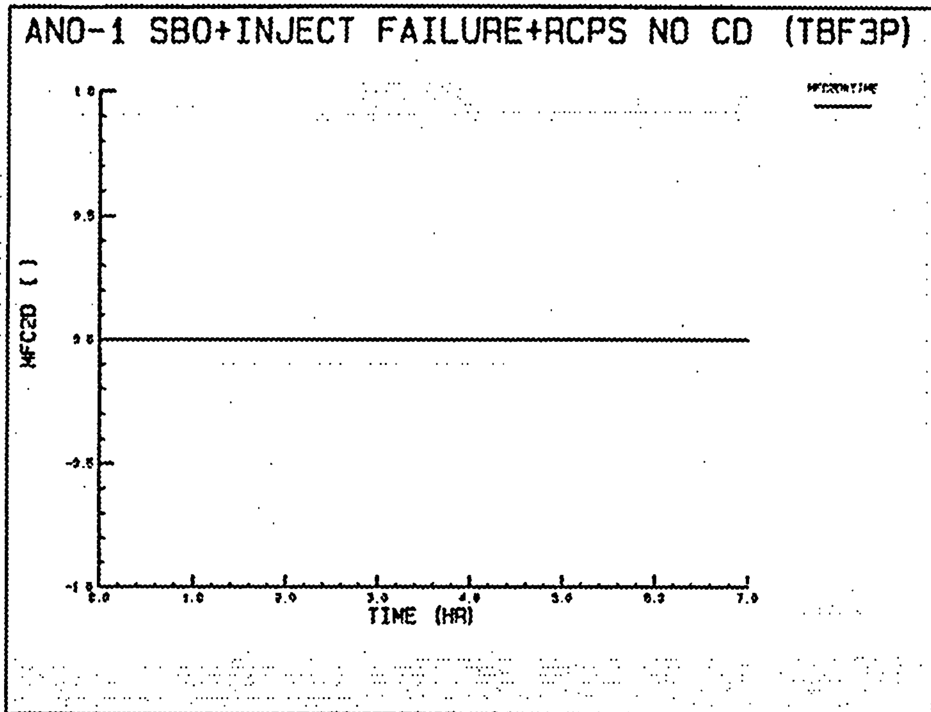
TIME (HR)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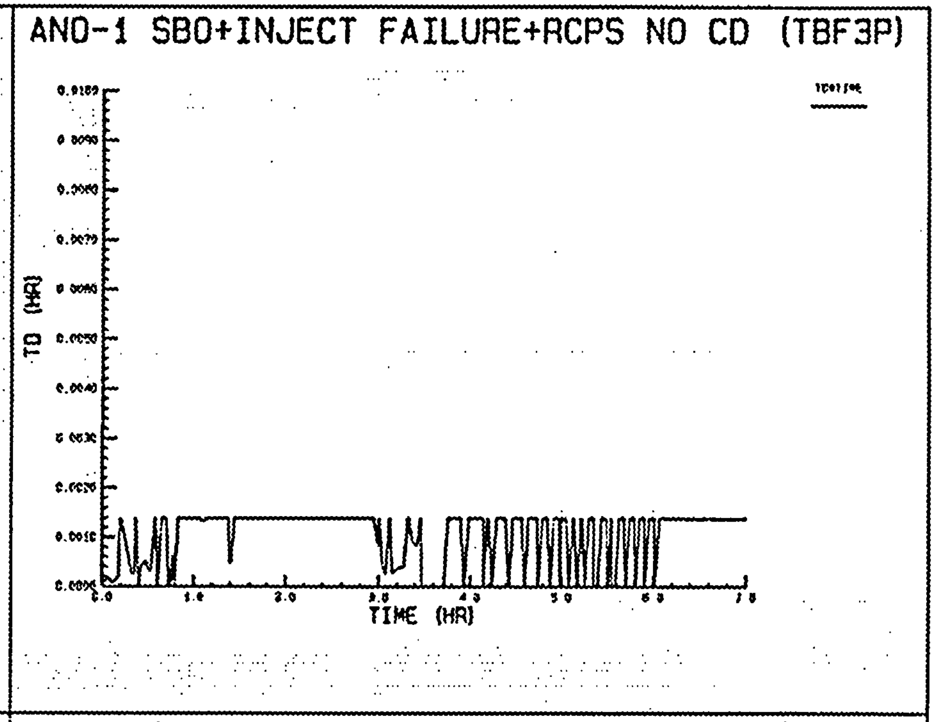
TIME (HR)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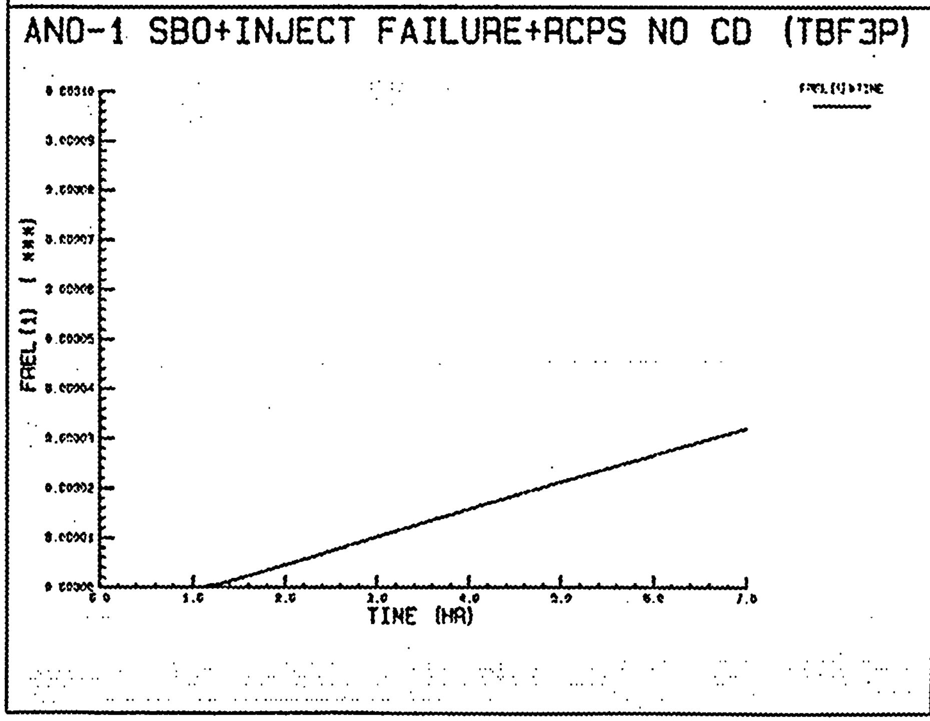
TIME (HR)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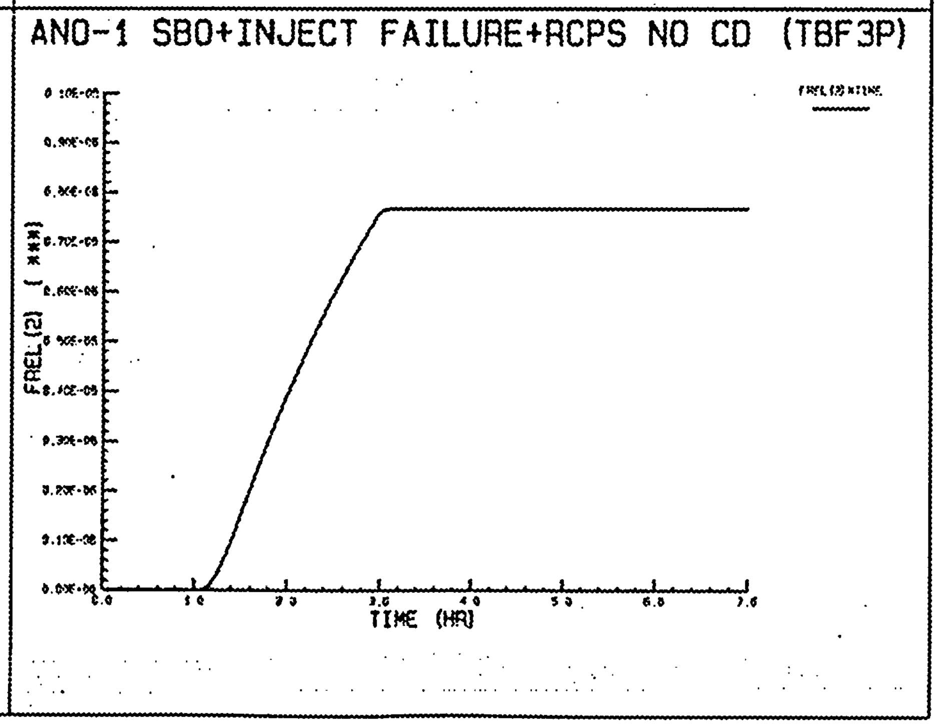
FREL(1) (***)
TIME (HR)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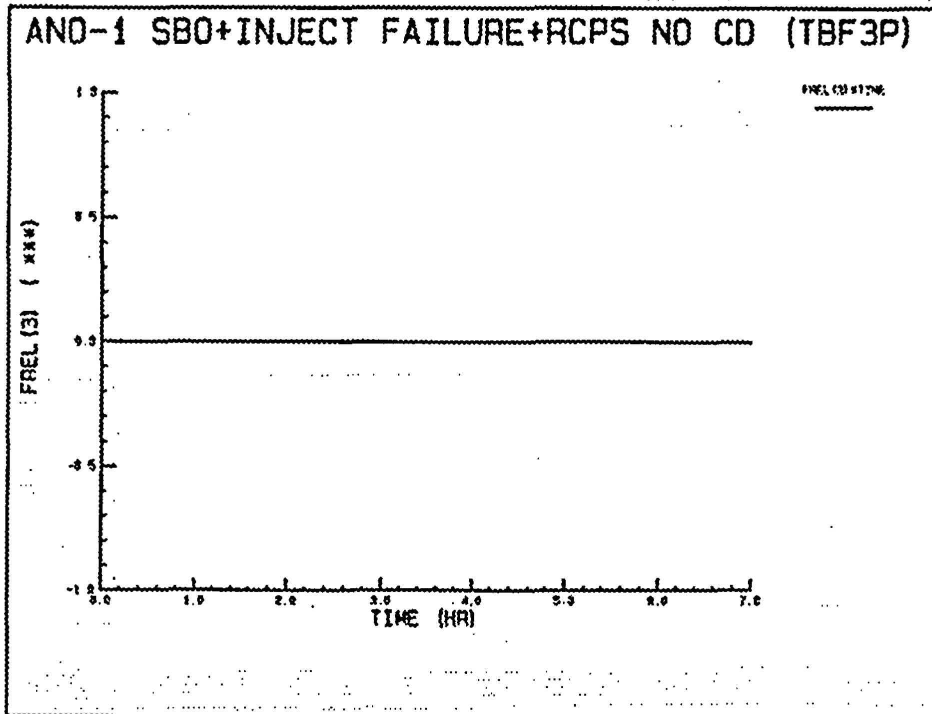
TIME (HR)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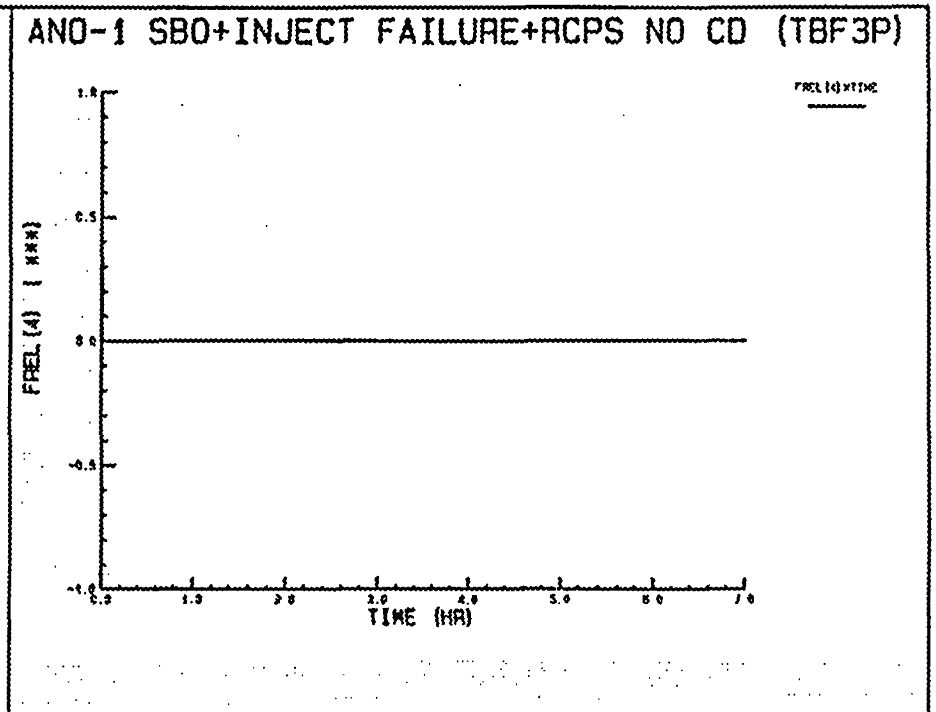
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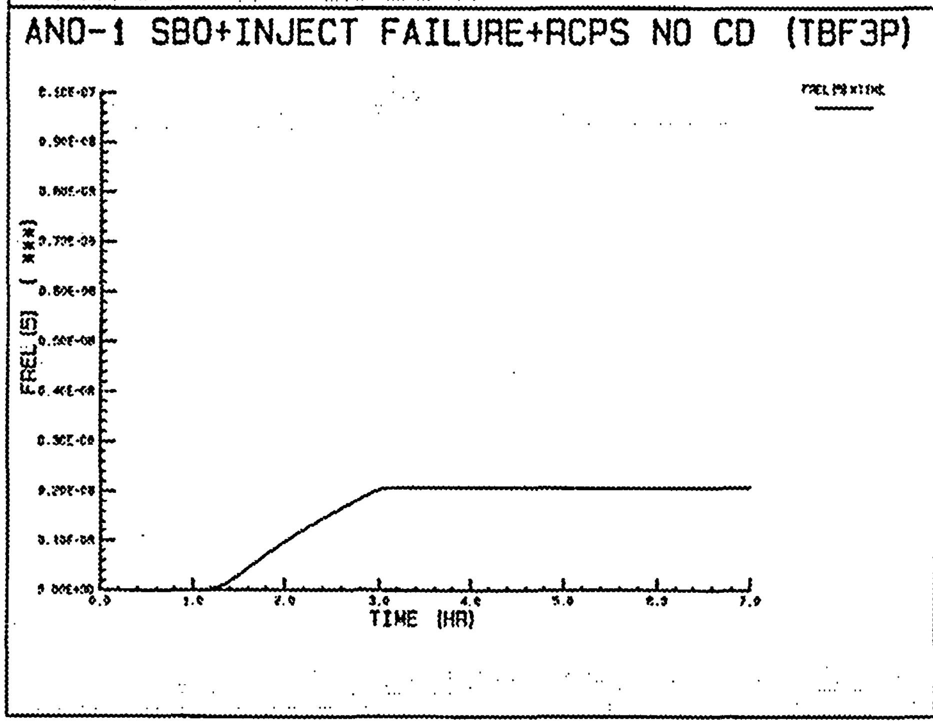
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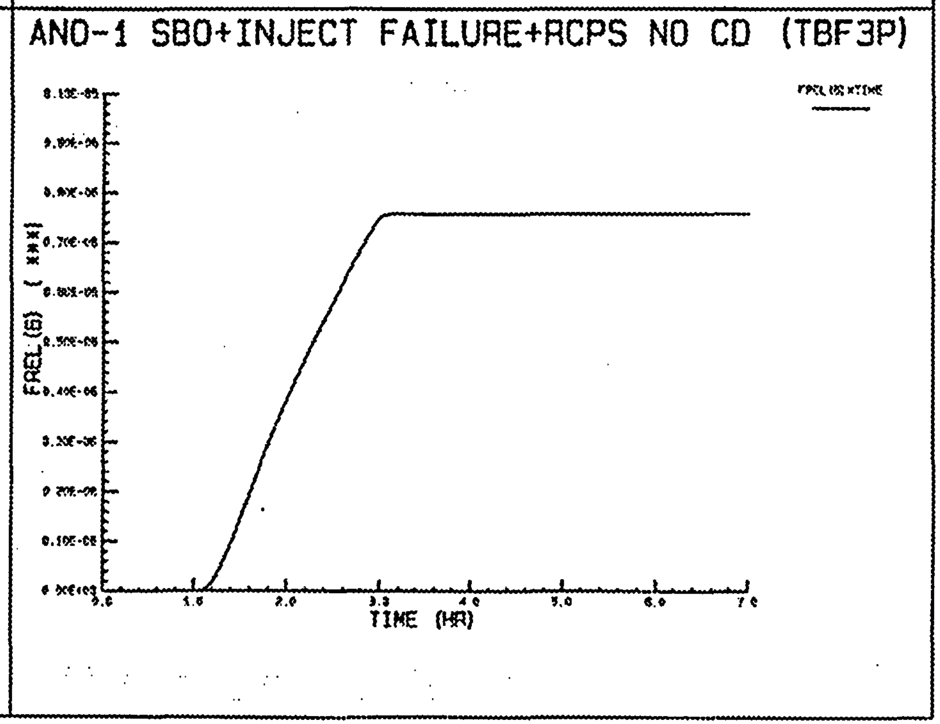
TIME (HR)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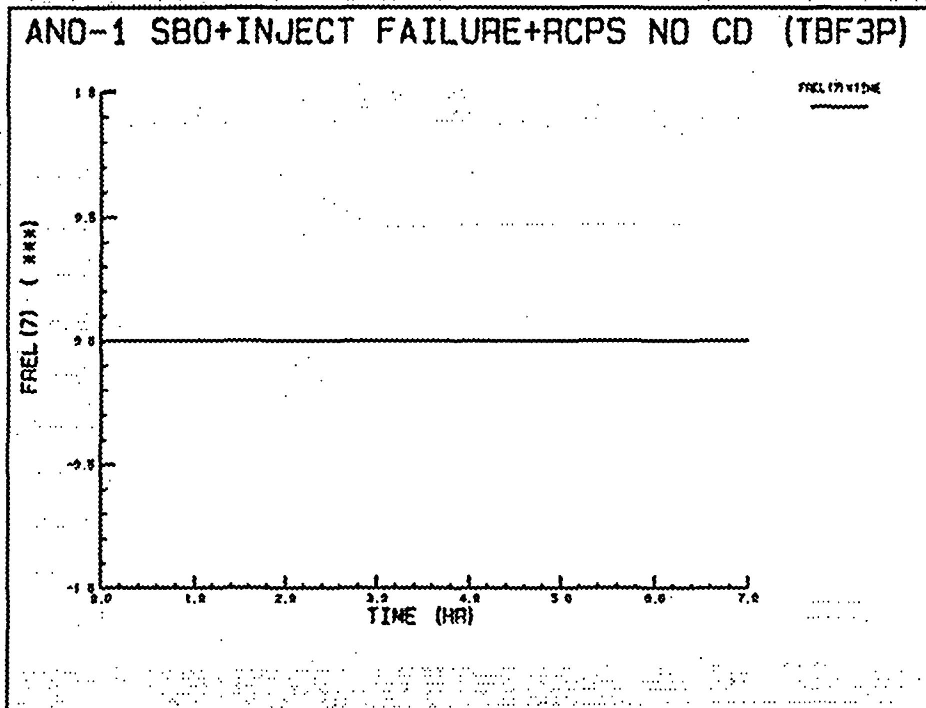
TIME (HR)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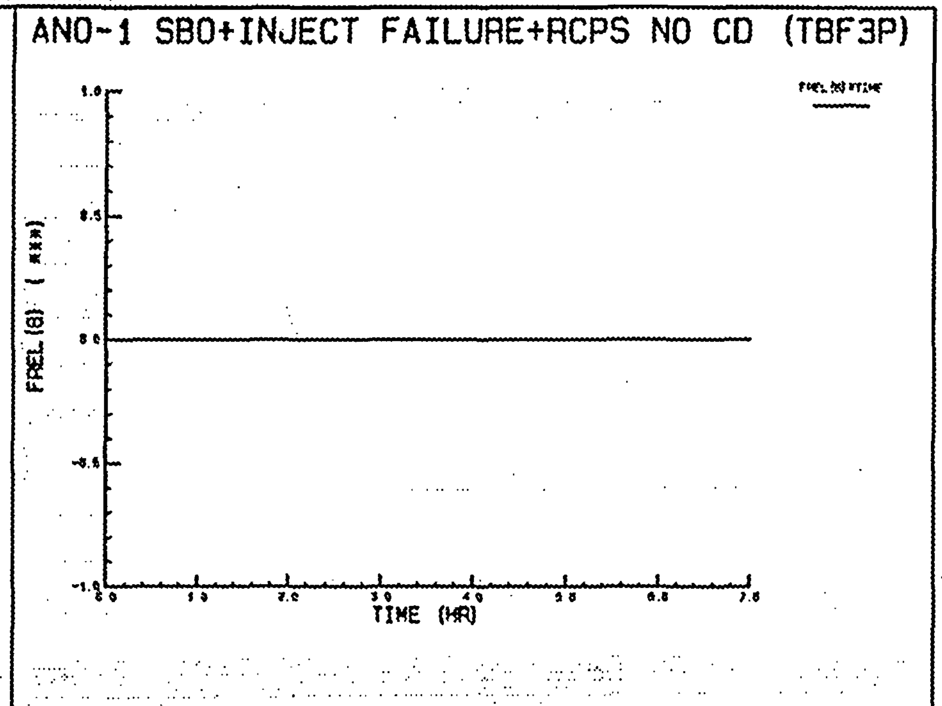
TIME (HR)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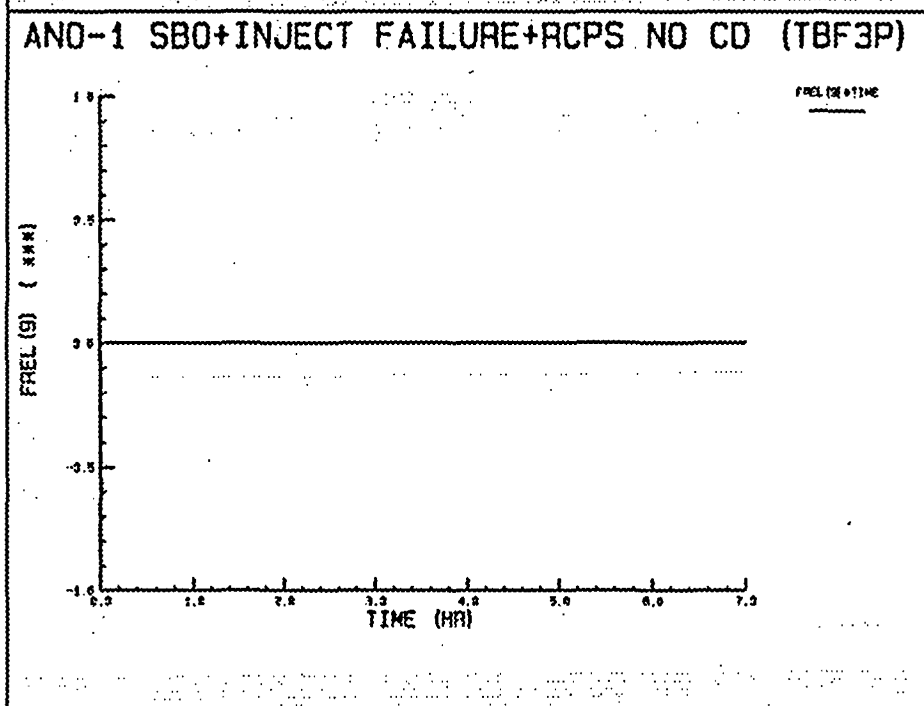
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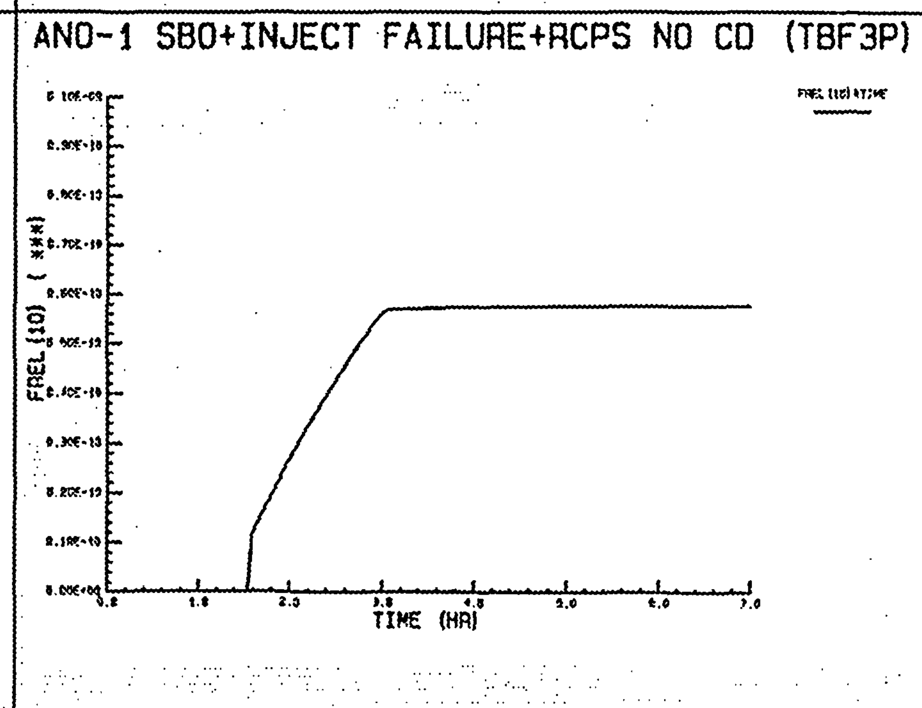
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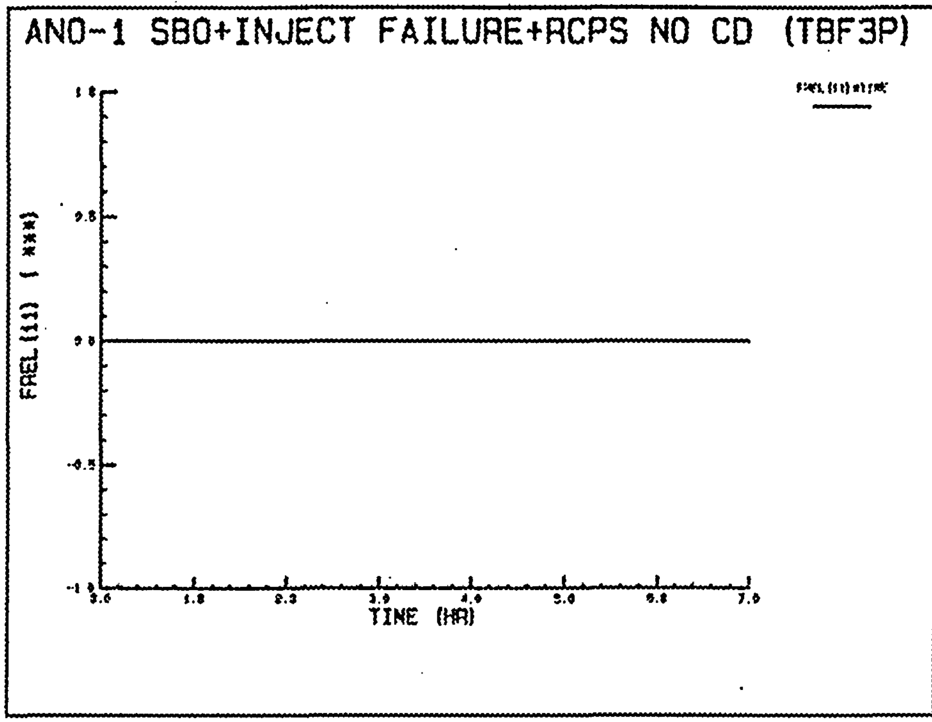
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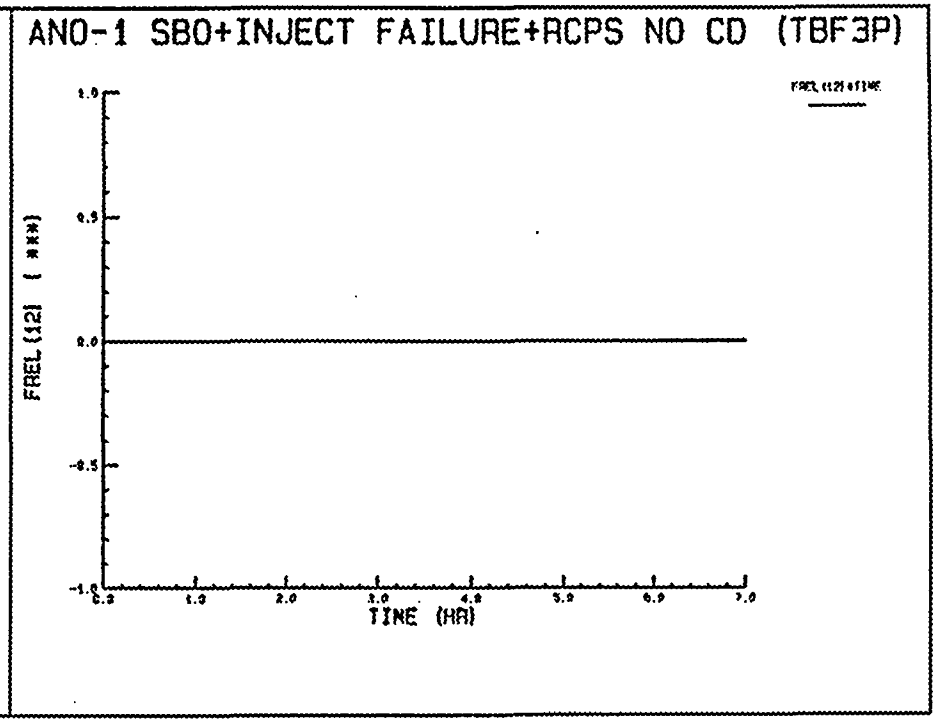
TIME (HR)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FREL(12) (***)
TIME (HR)

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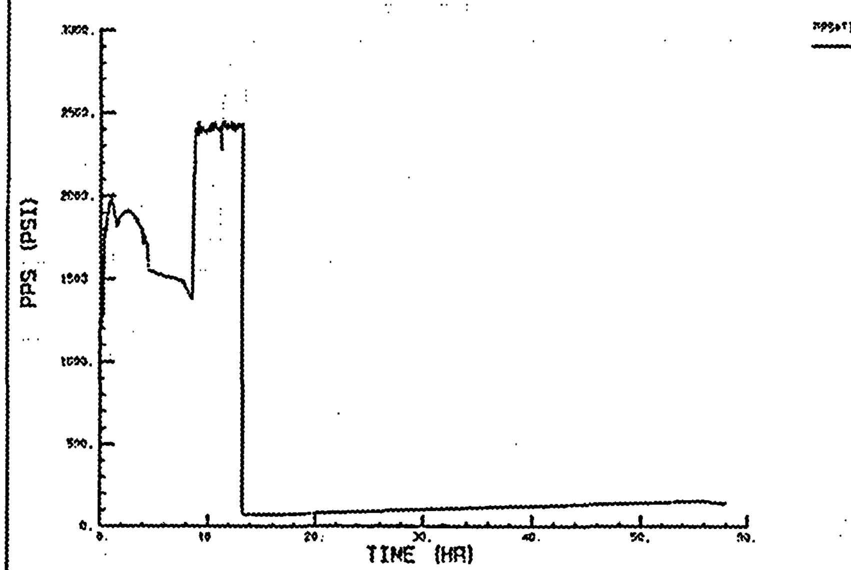

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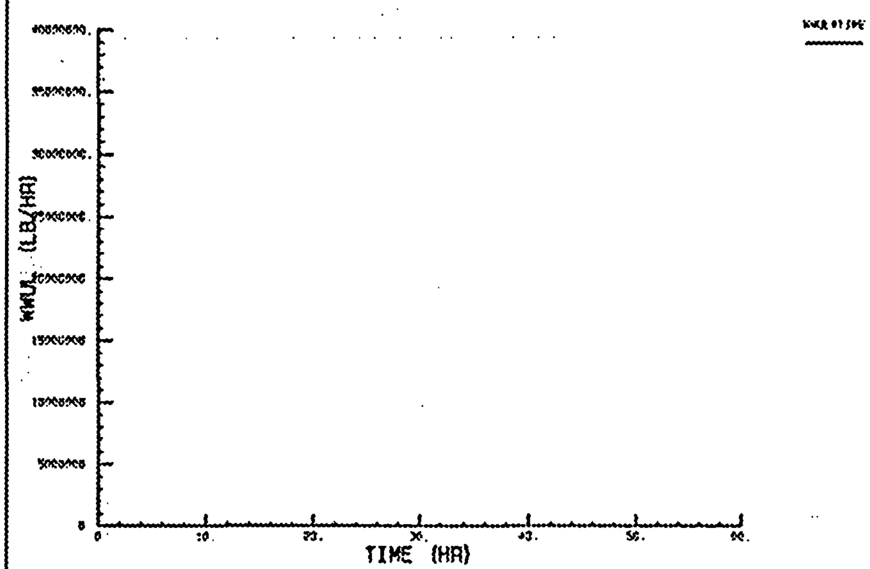

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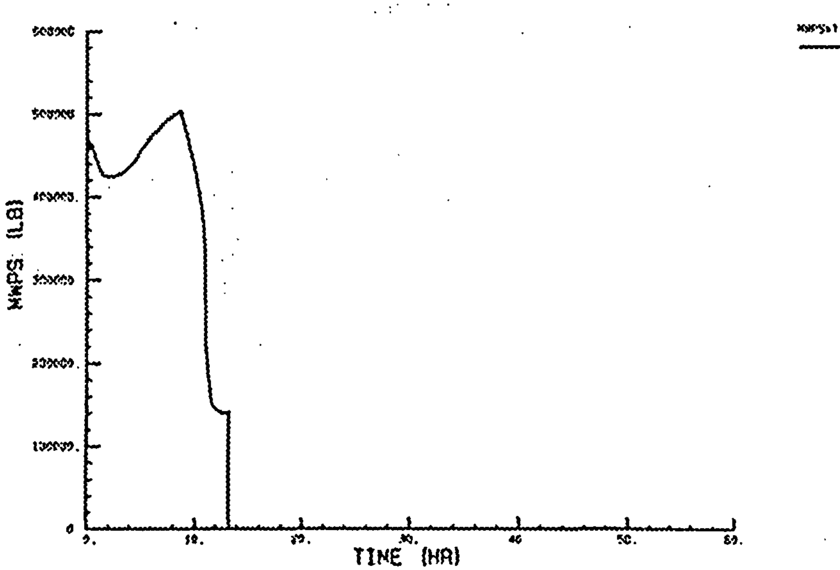

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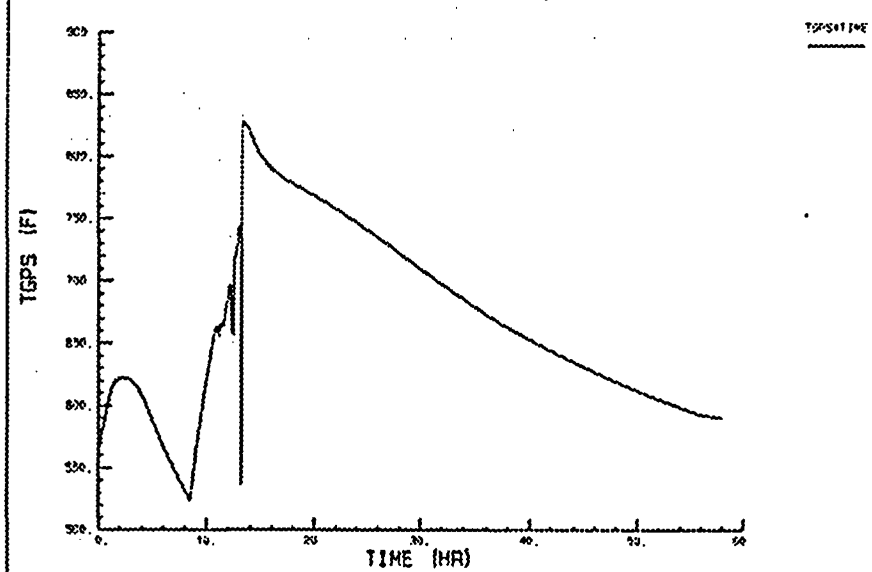

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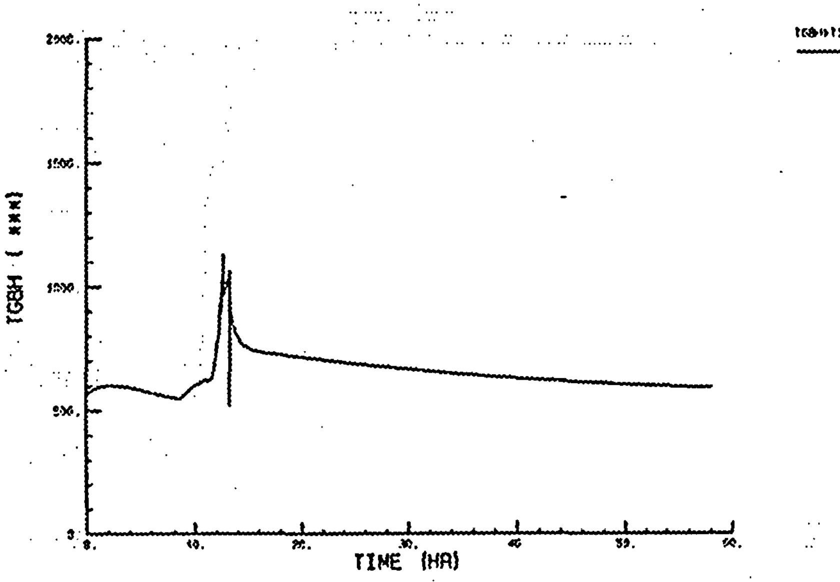

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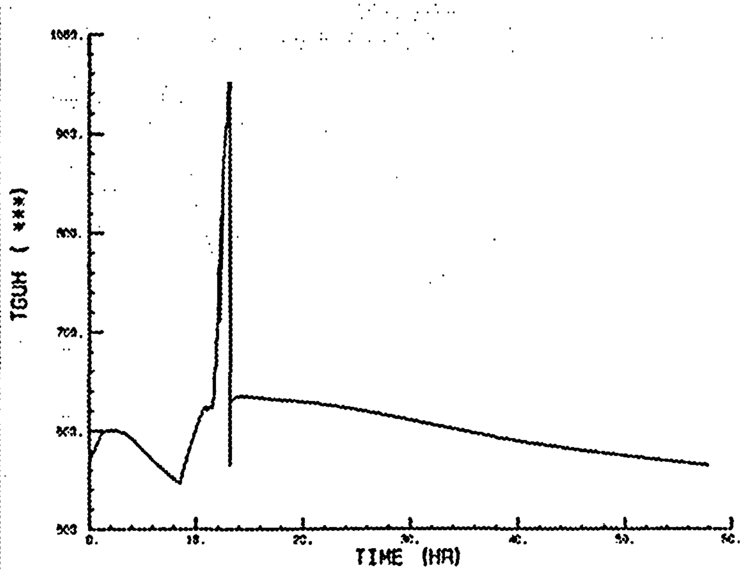

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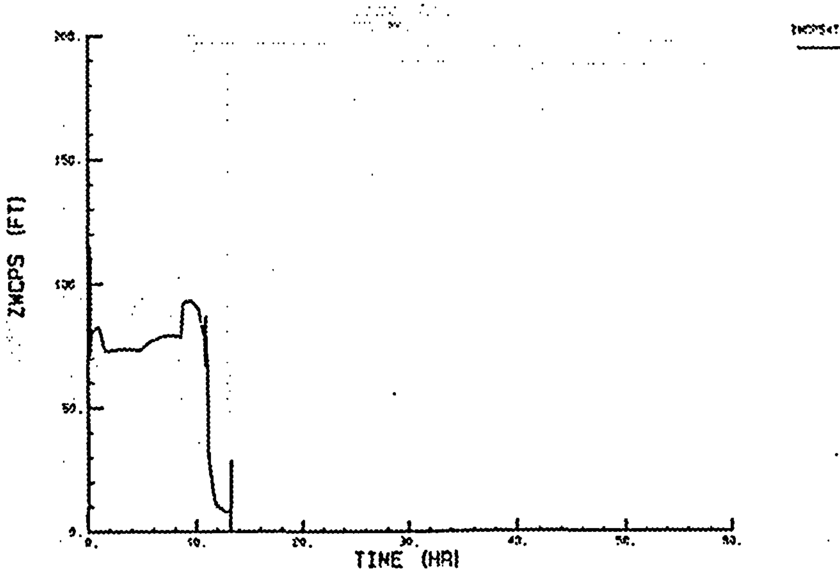

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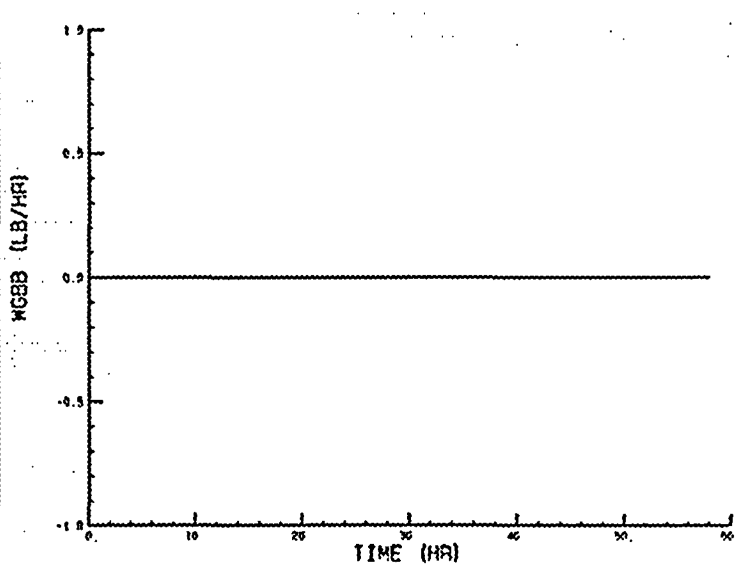

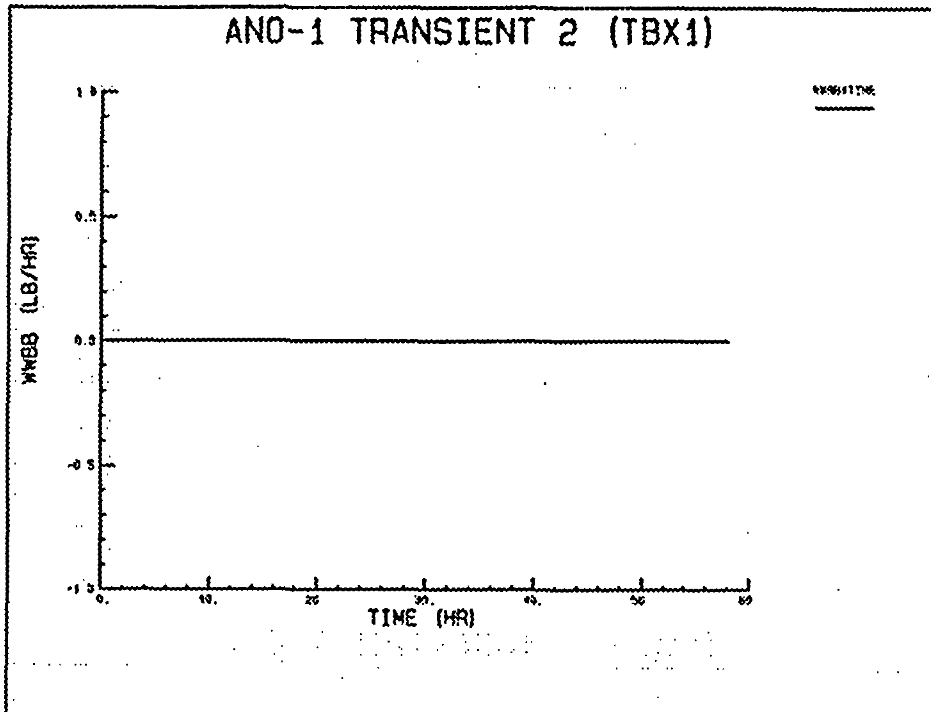
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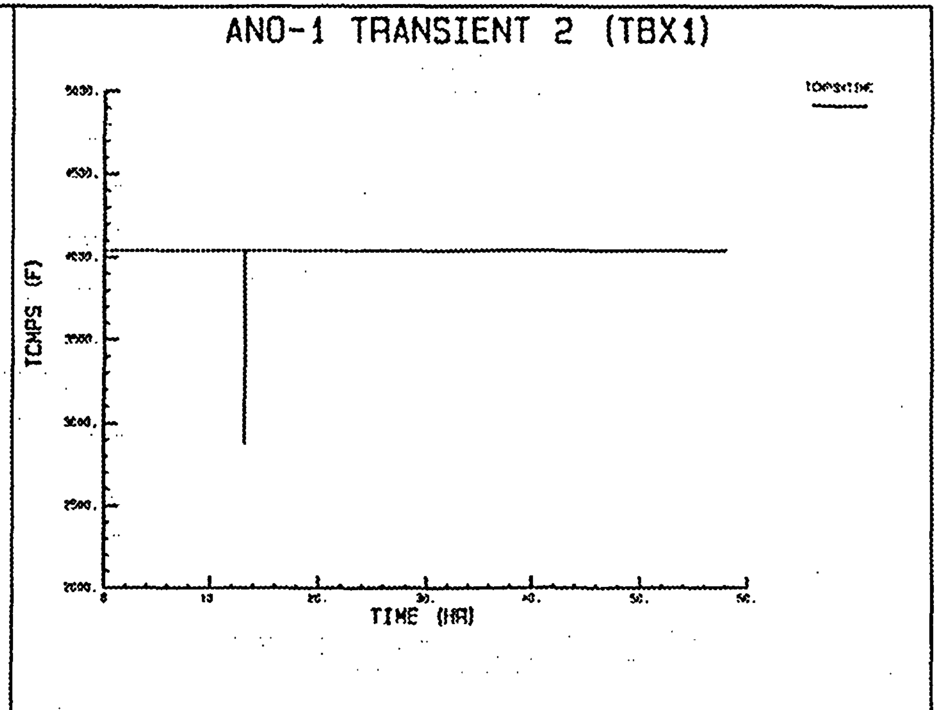
TIME (HR)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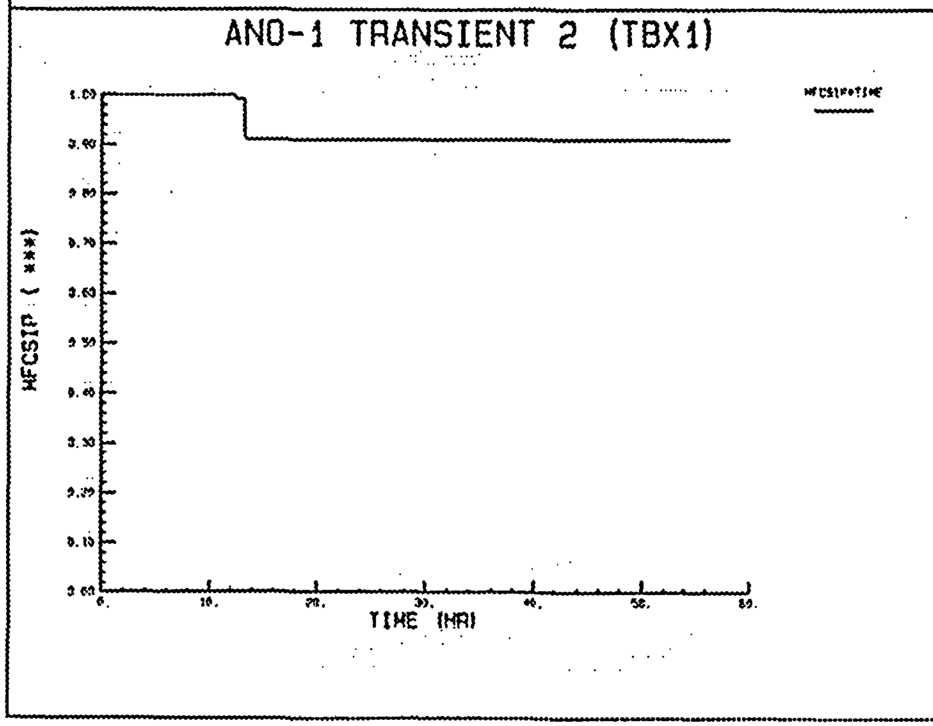
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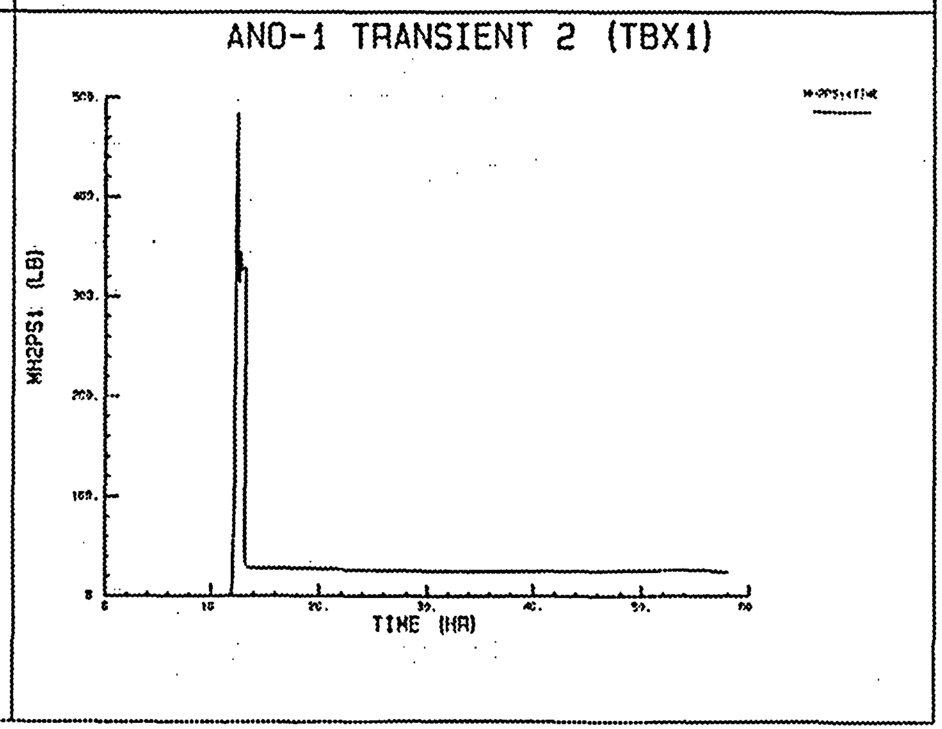
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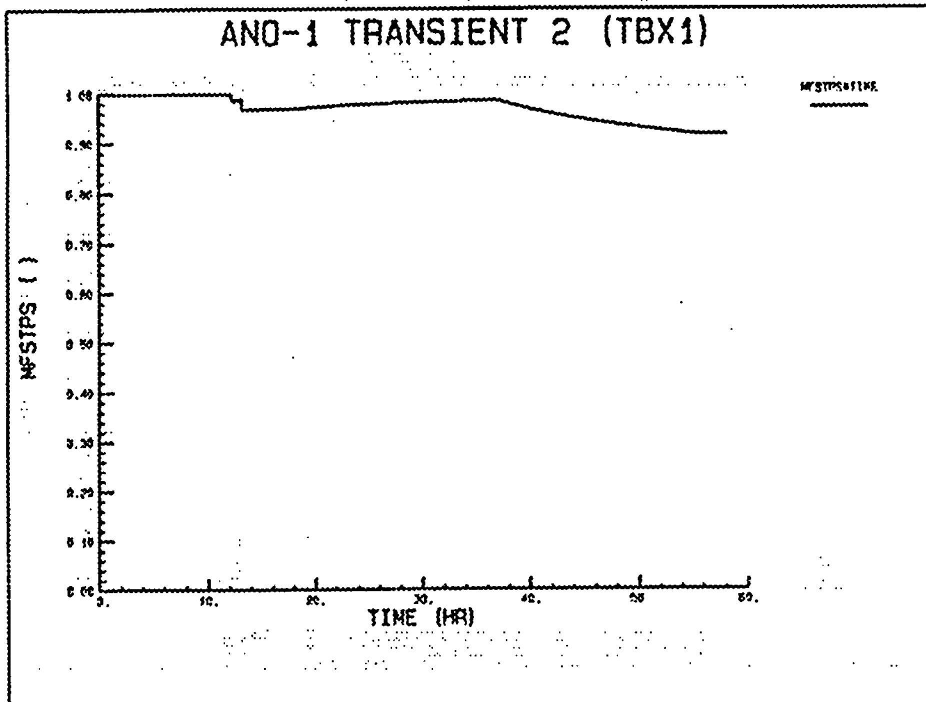
MH2PS1 (LB)
TIME (HR)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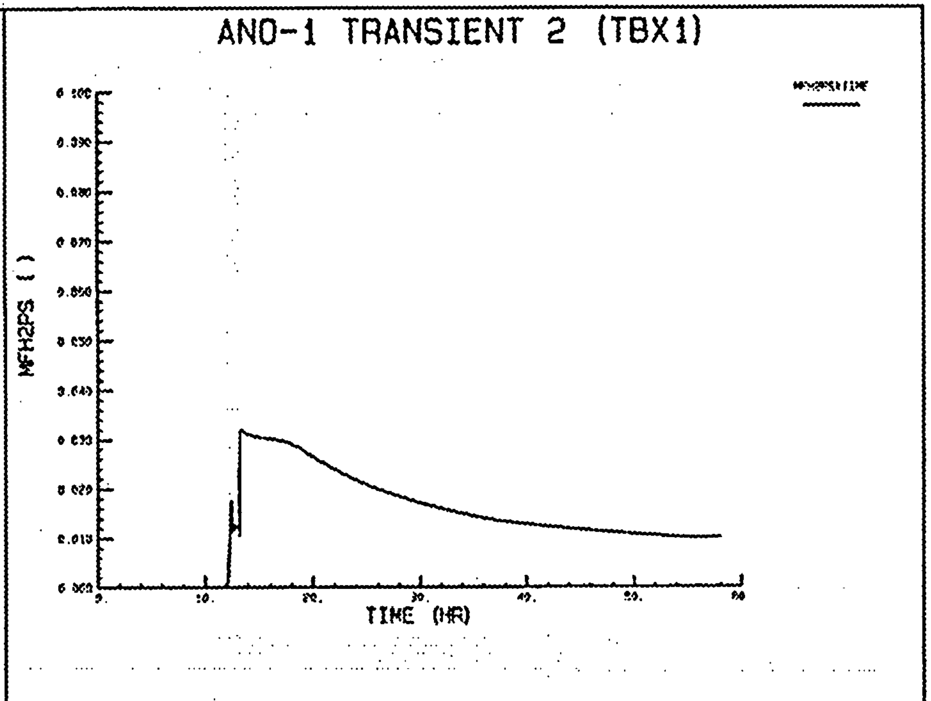
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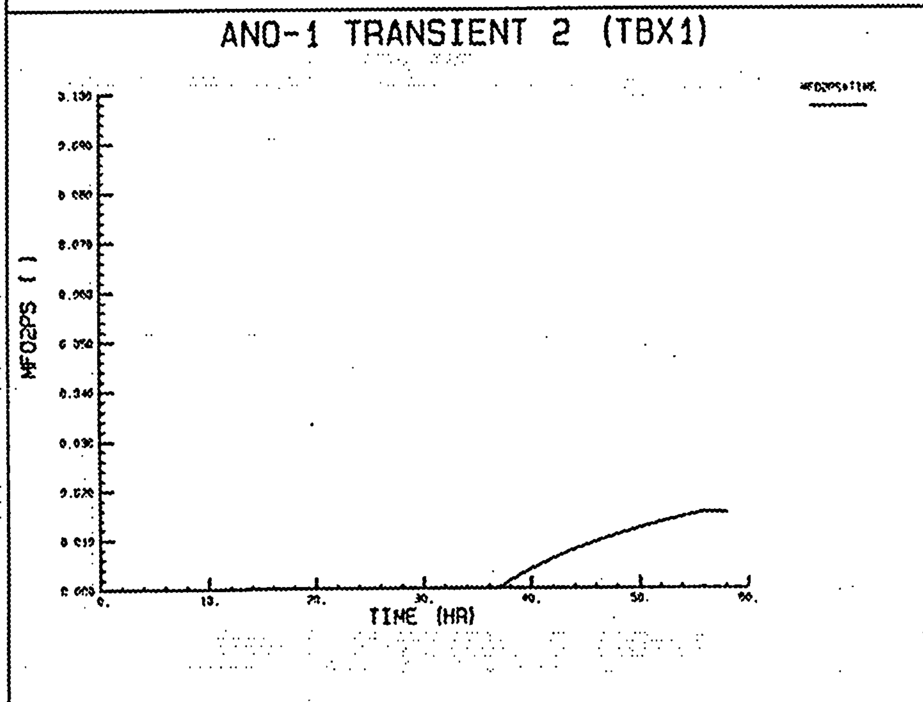
TIME (HR)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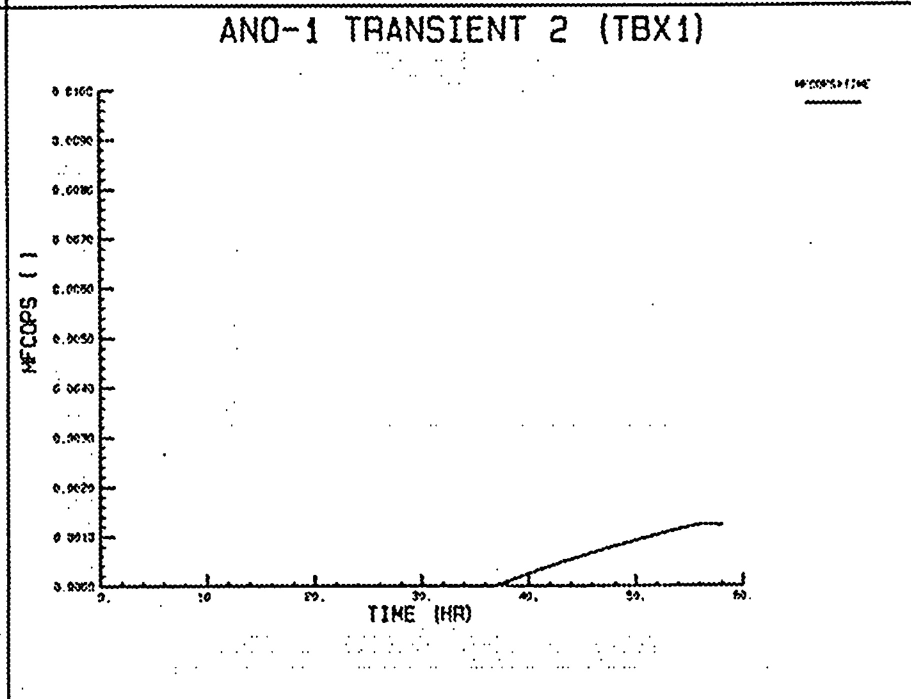
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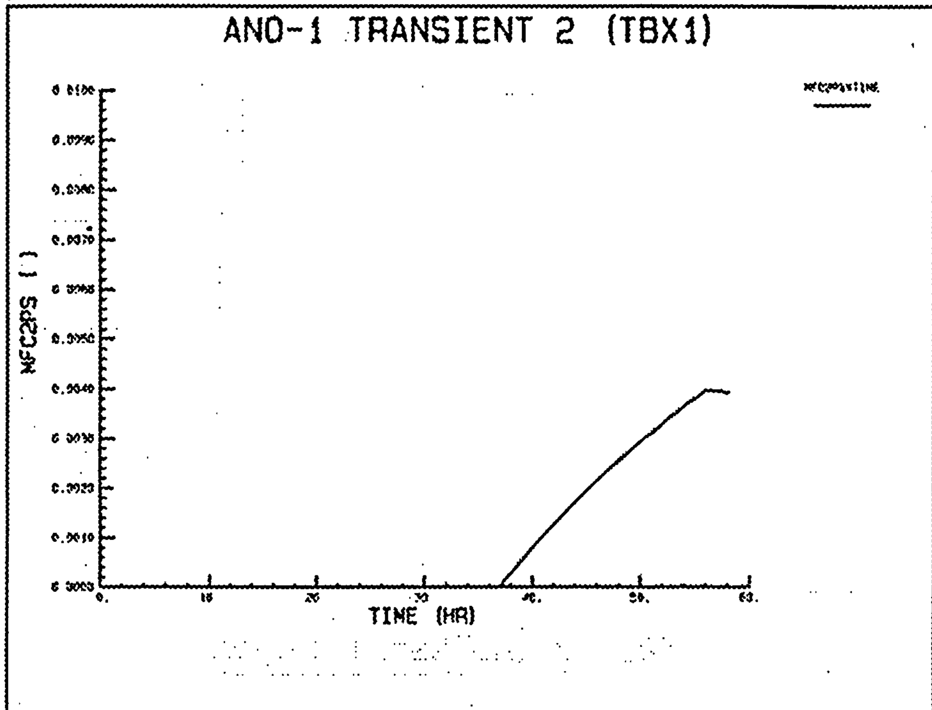
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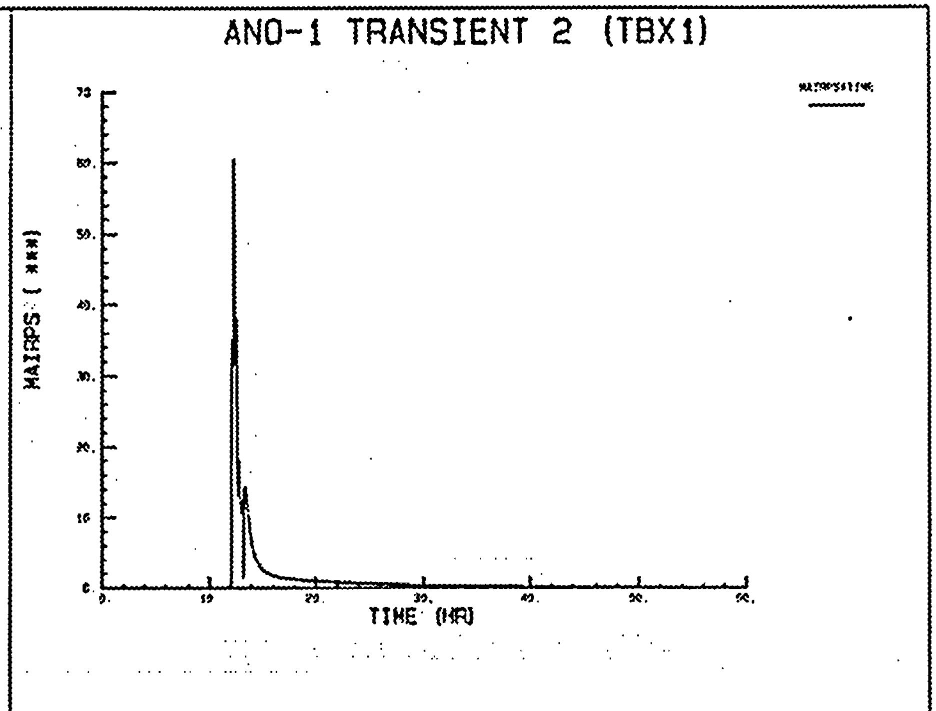
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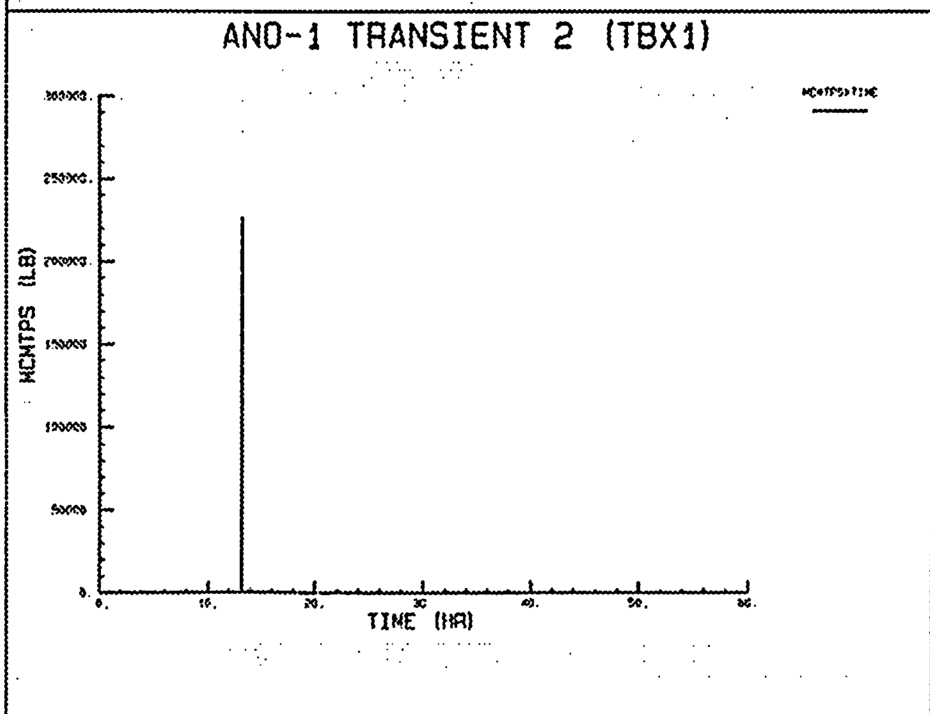
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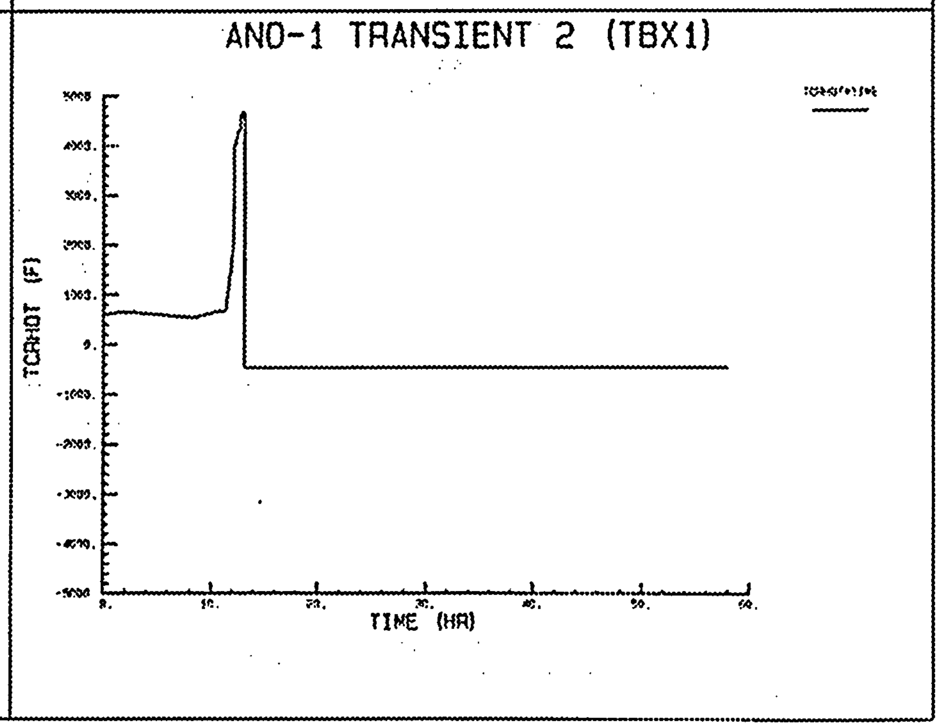
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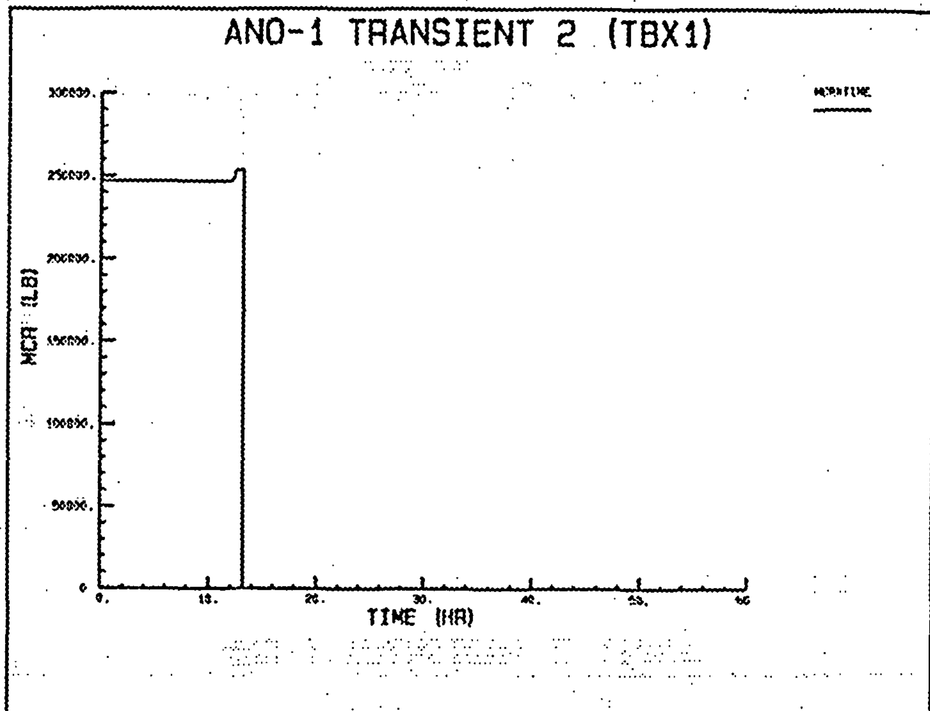
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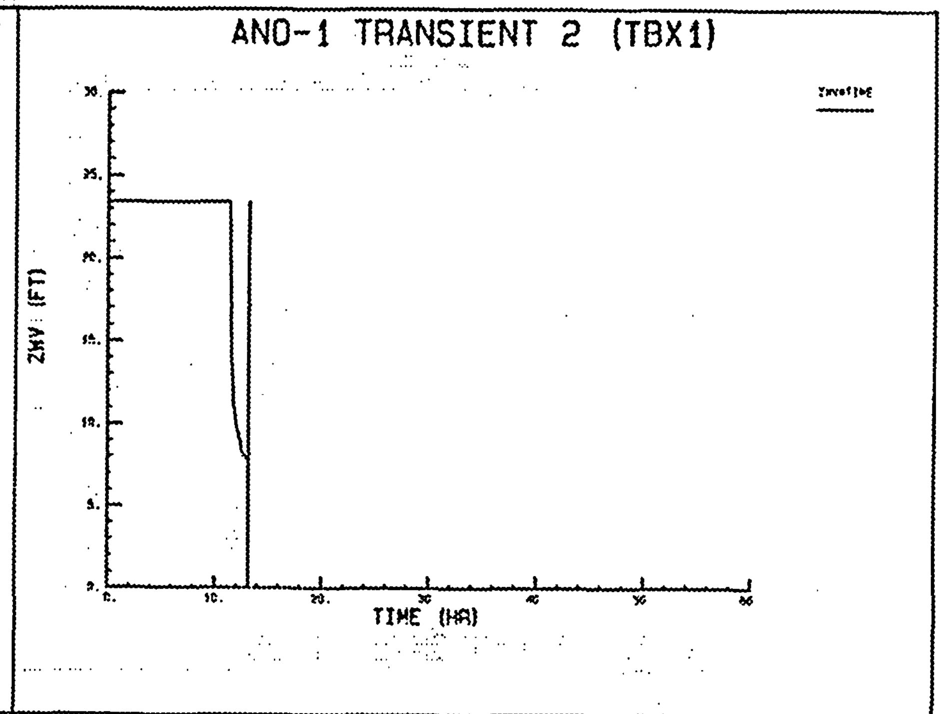
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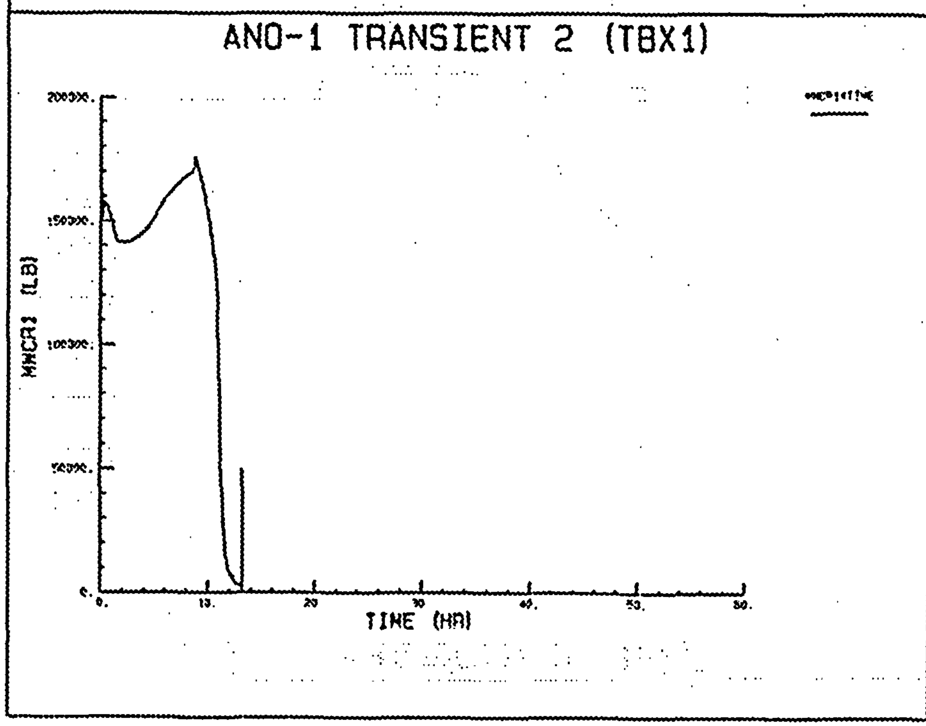
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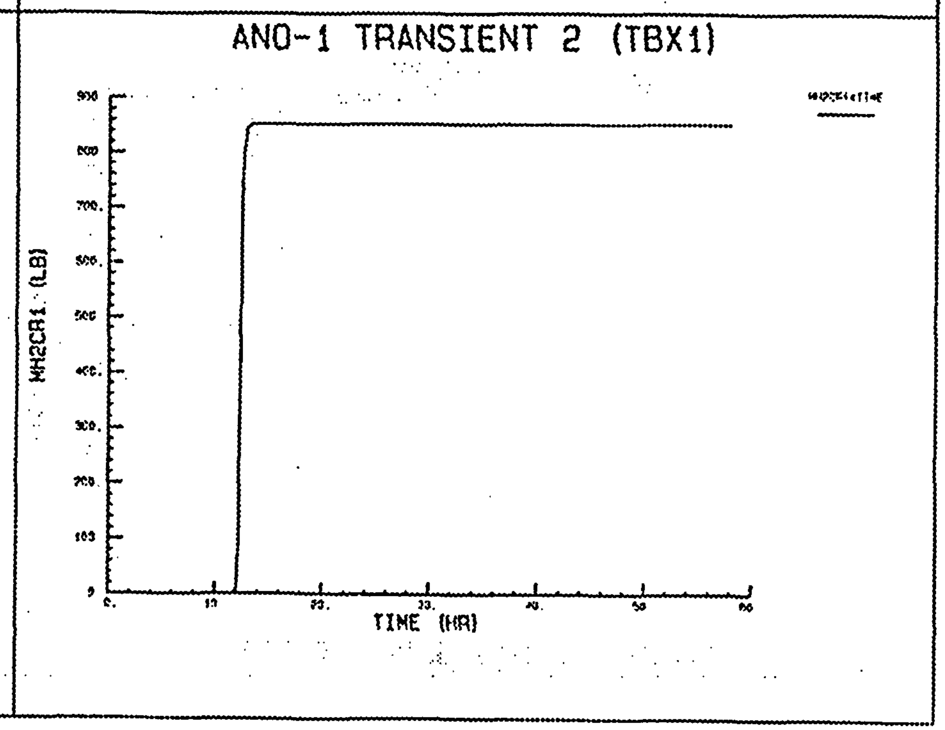
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TIME (HR)

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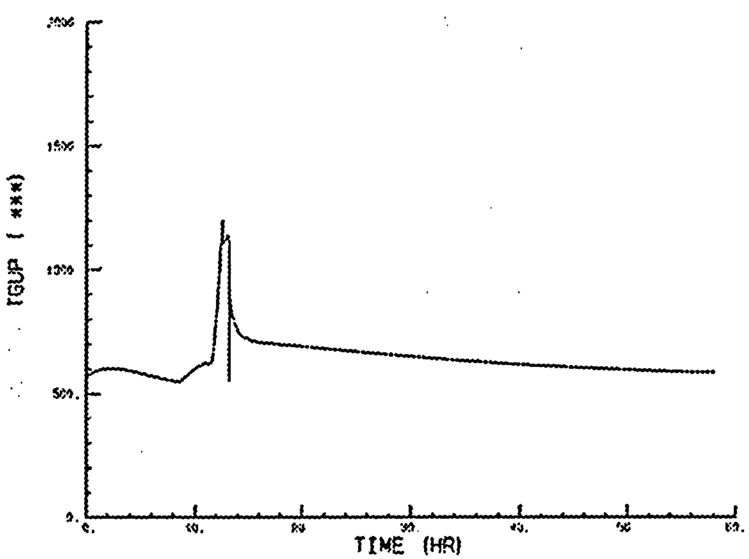

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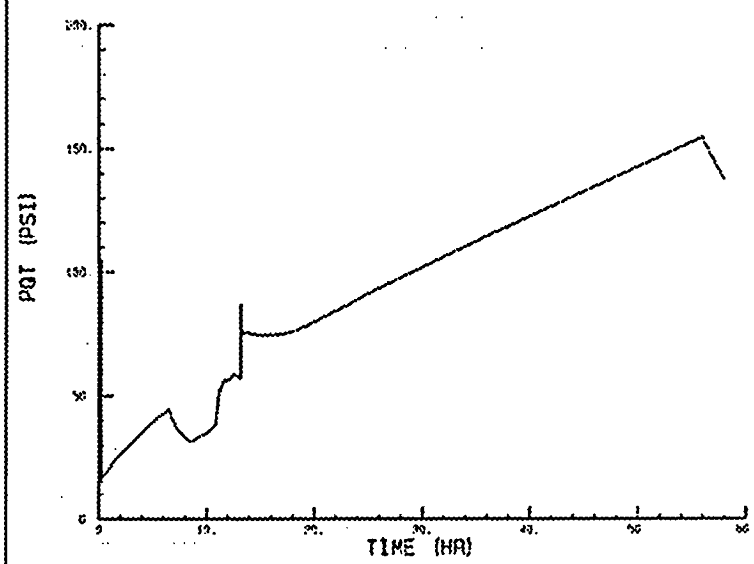

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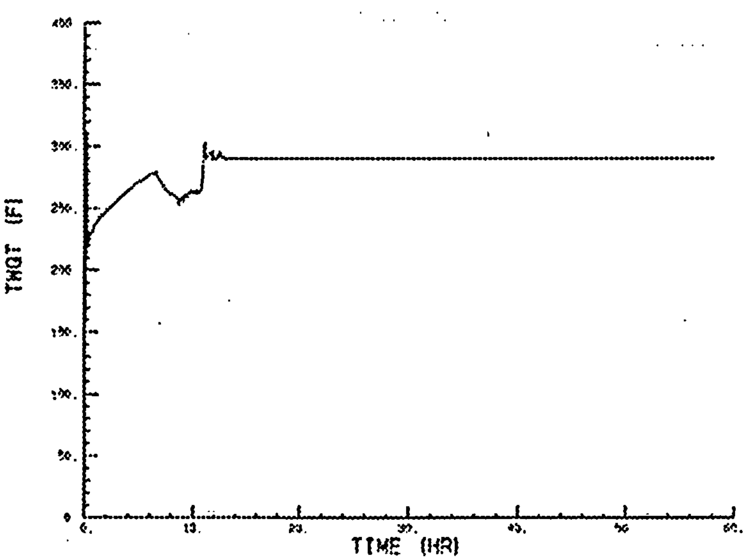

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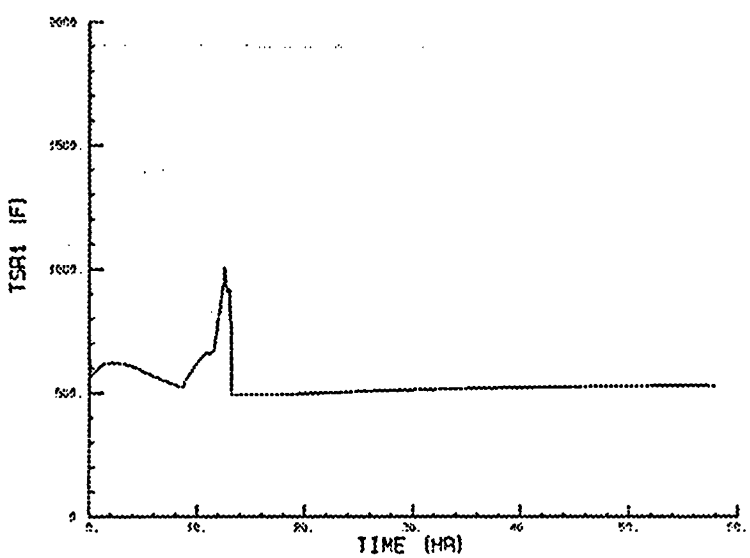

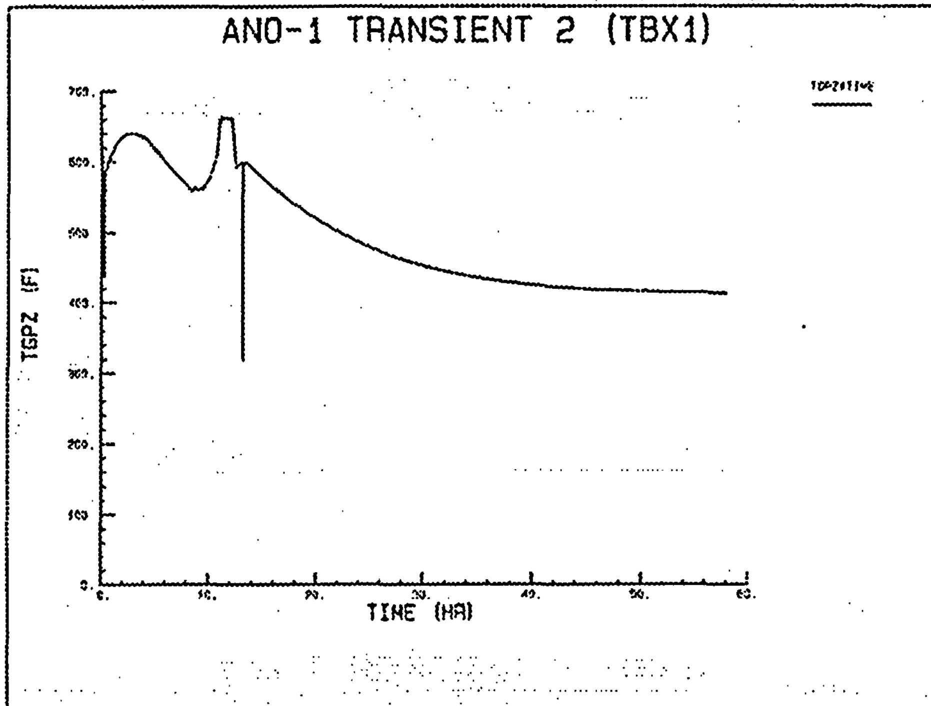
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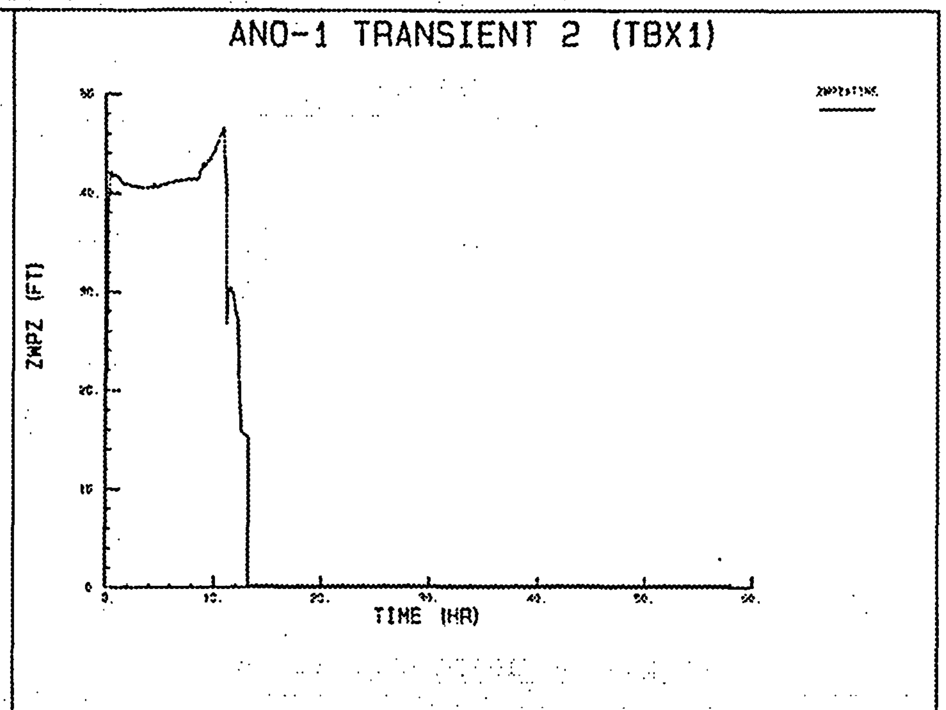
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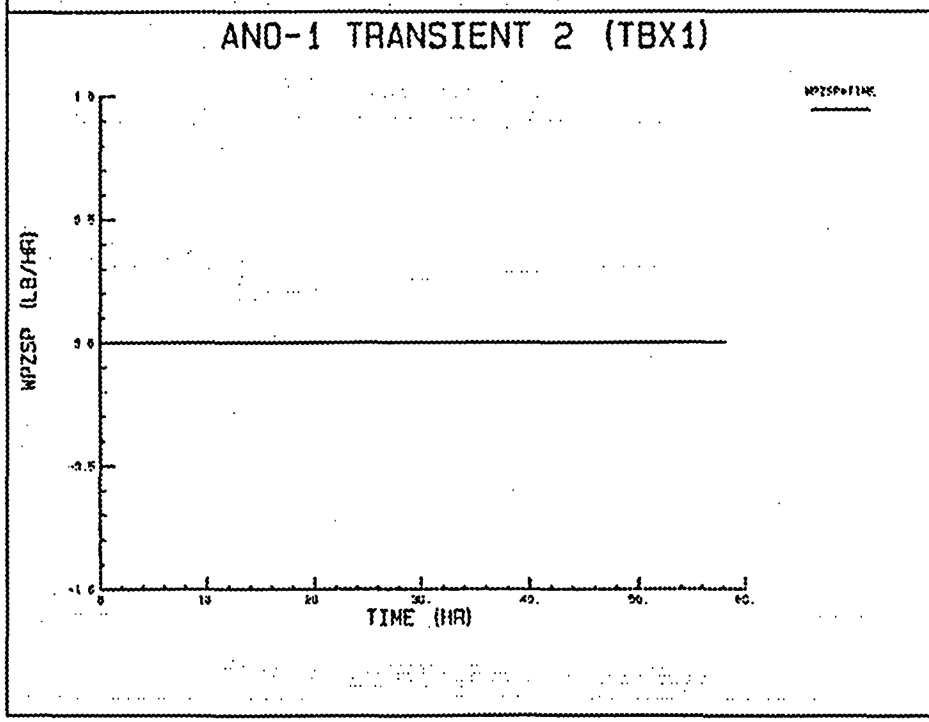
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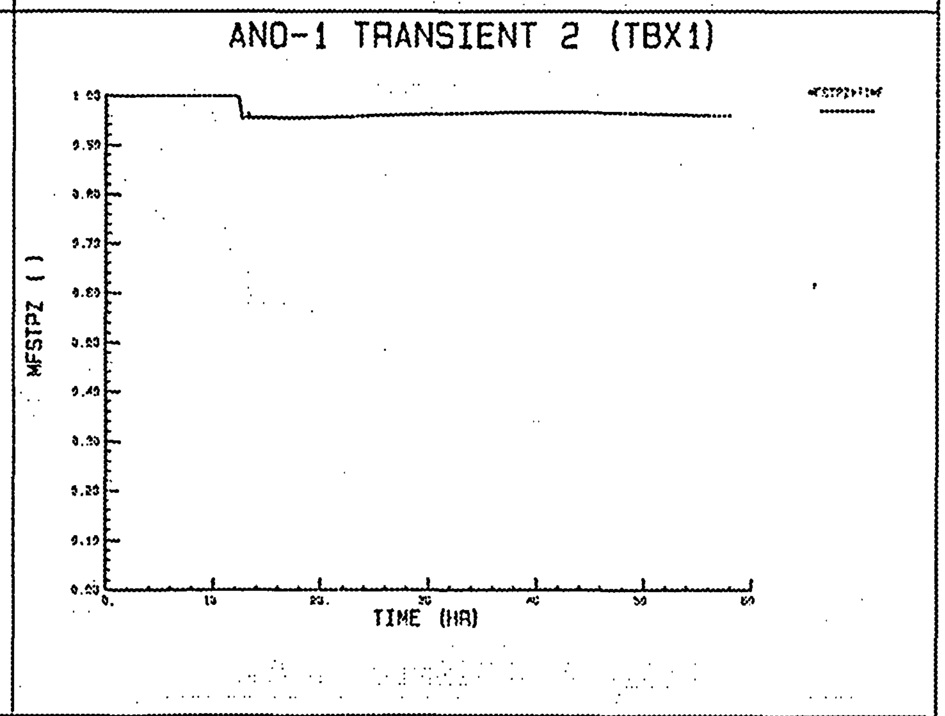
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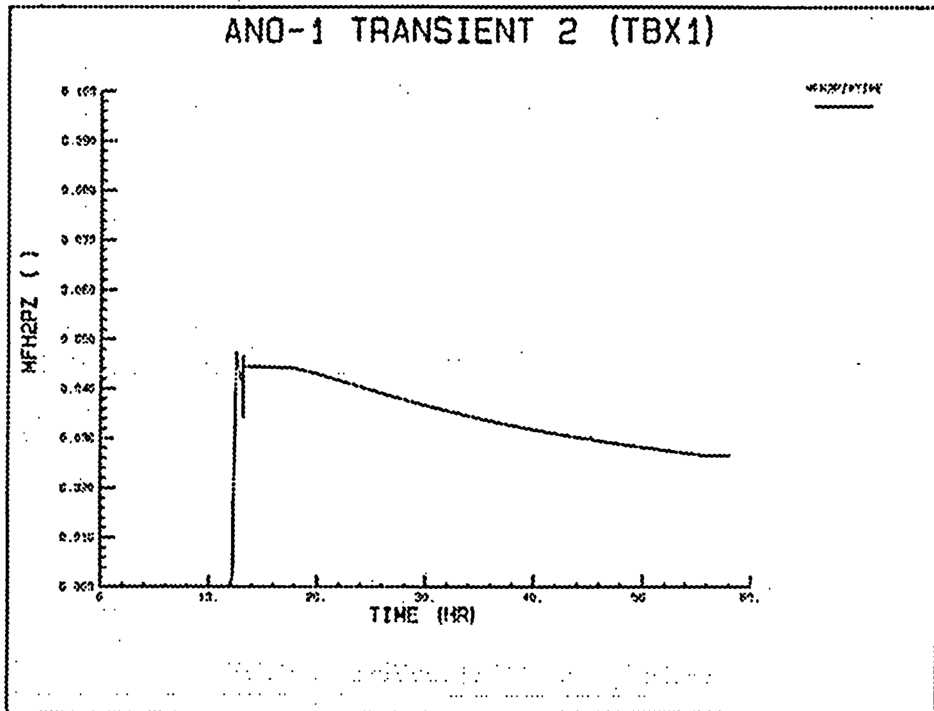
TIME (HR)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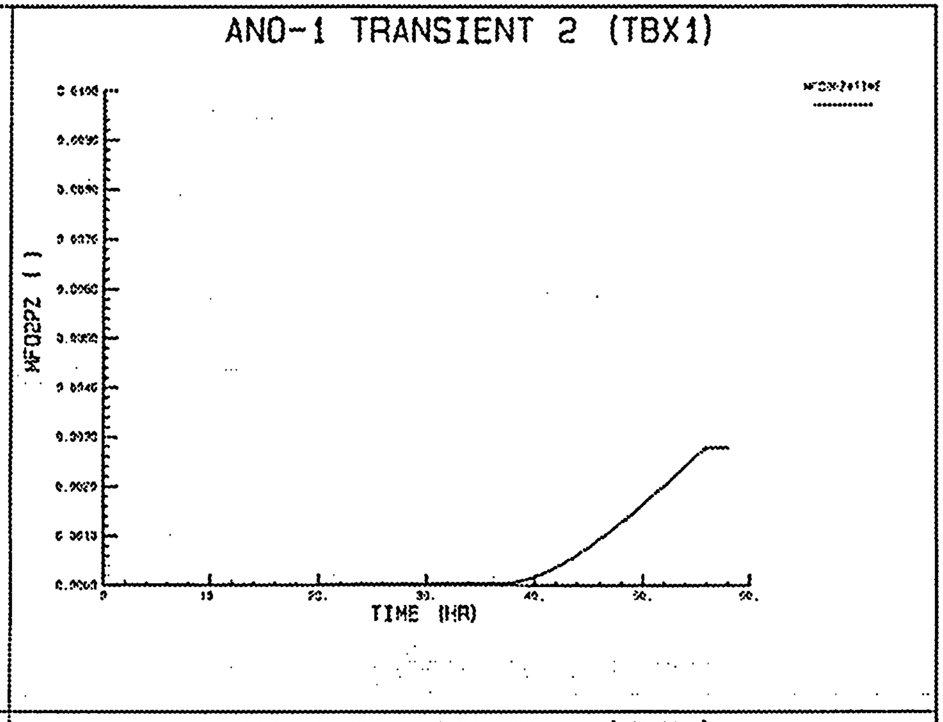
MFH2PZ ( )
TIME (HR)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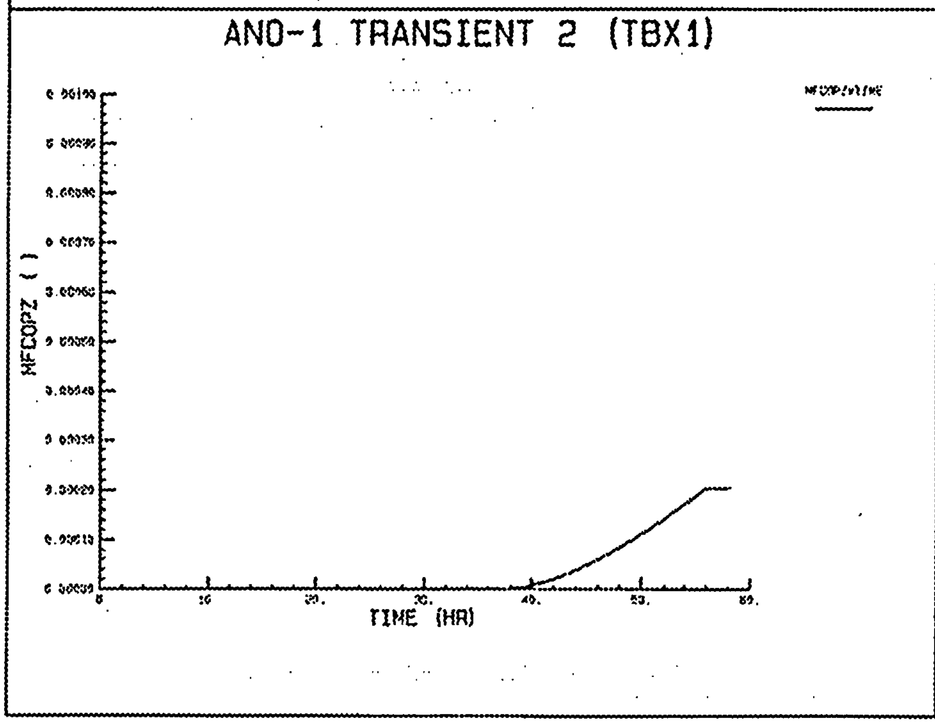
MFO2PZ ( )
TIME (HR)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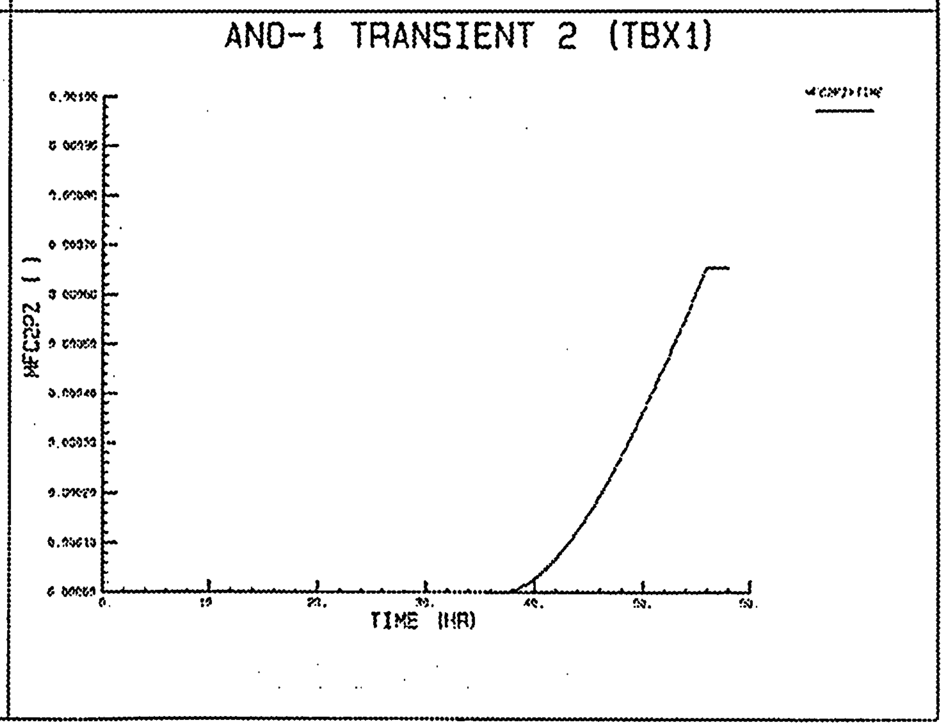
MFCOPZ ( )
TIME (HR)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MFC2PZ ( )
TIME (HR)

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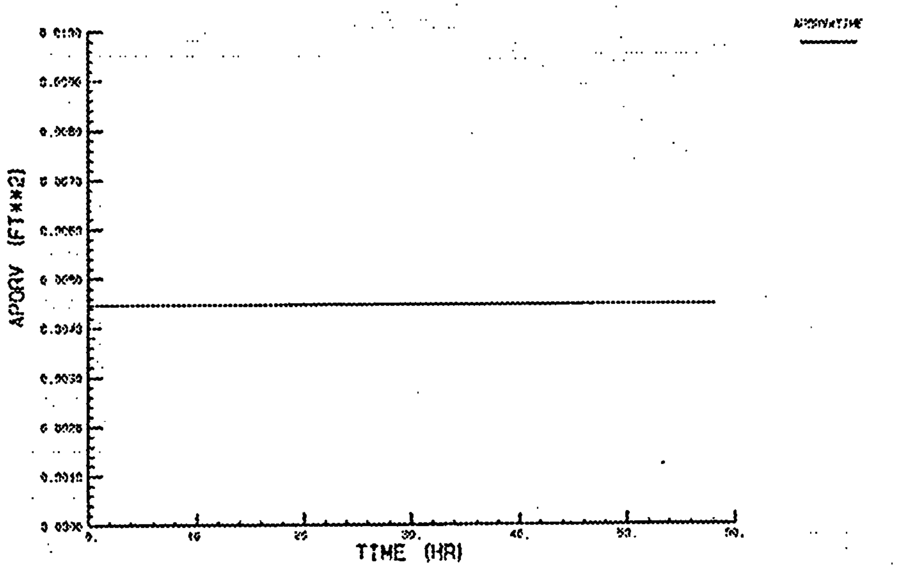

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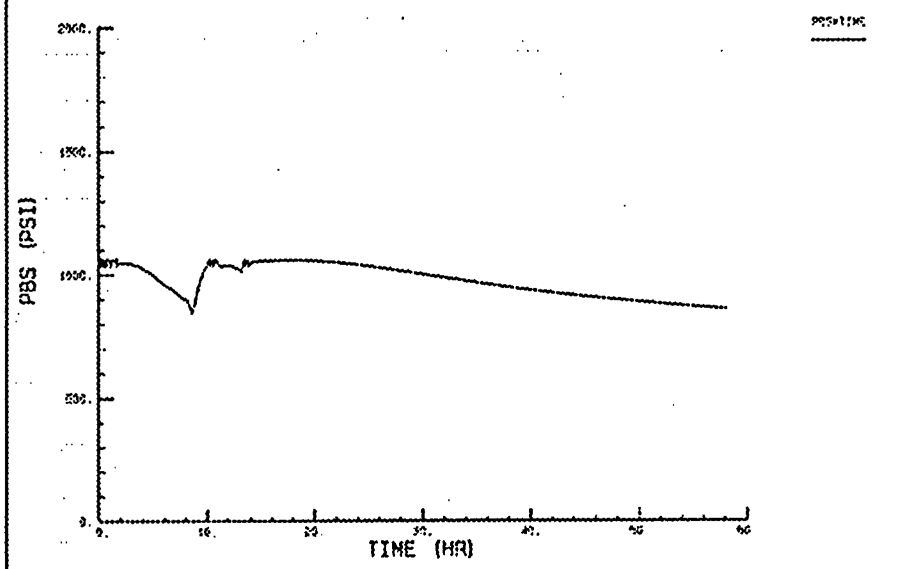

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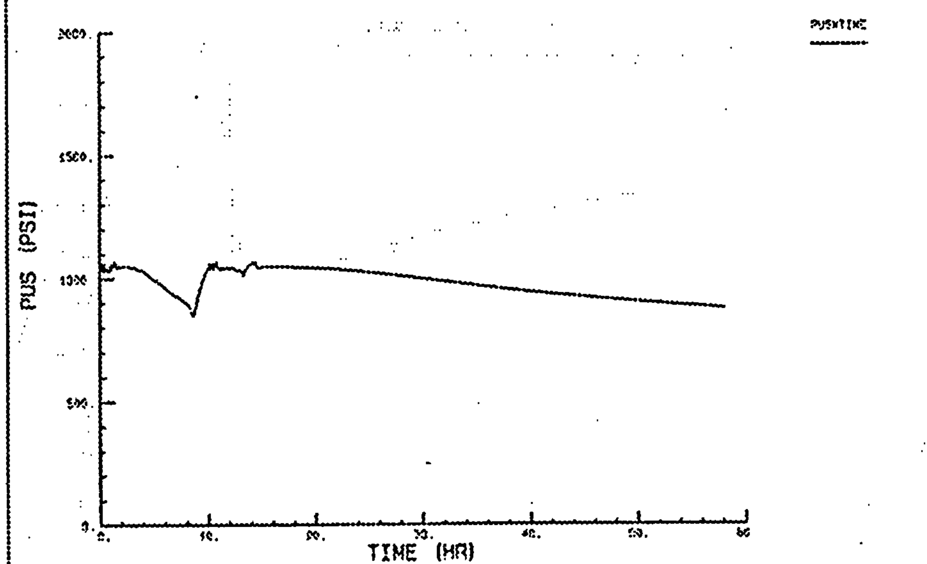

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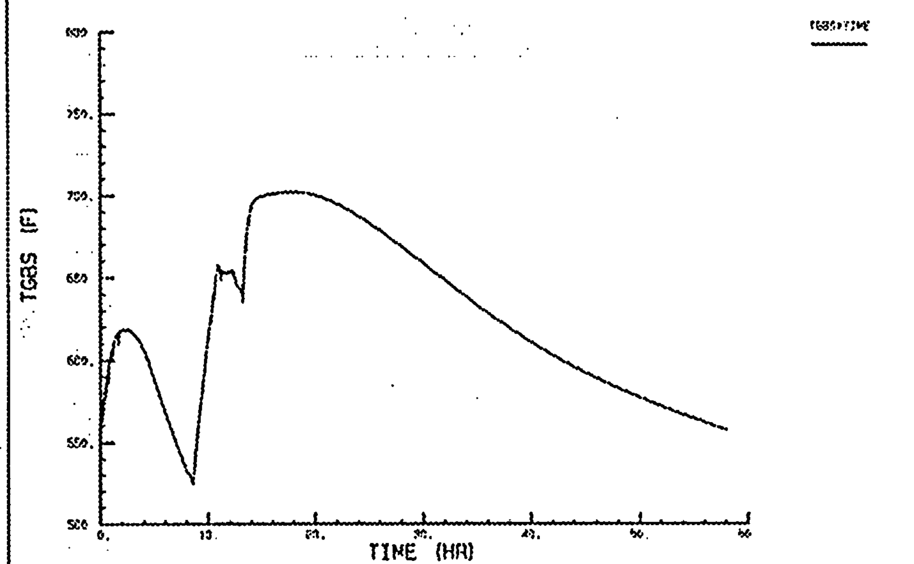

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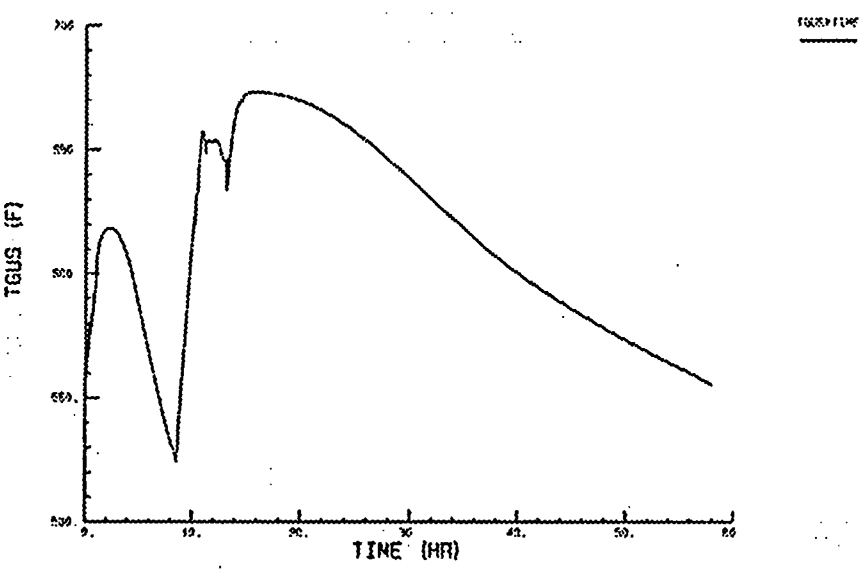

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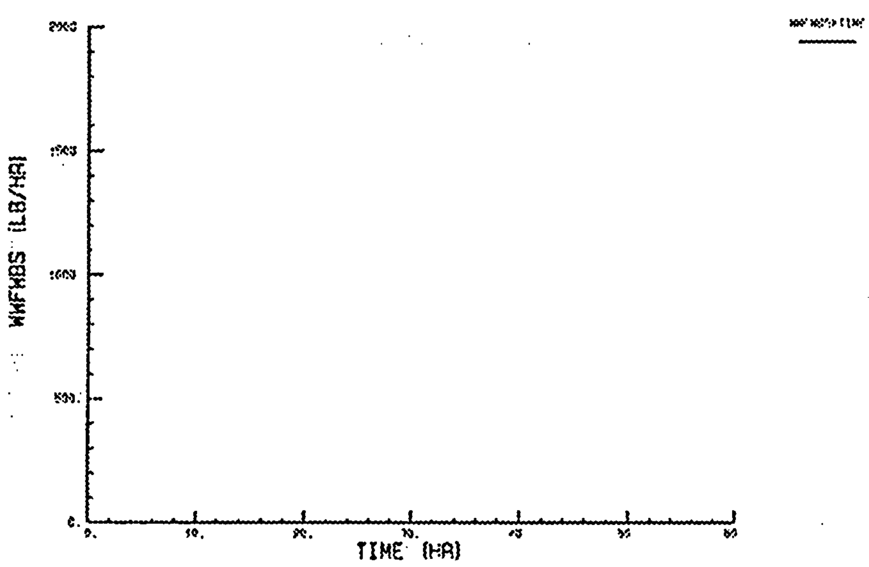

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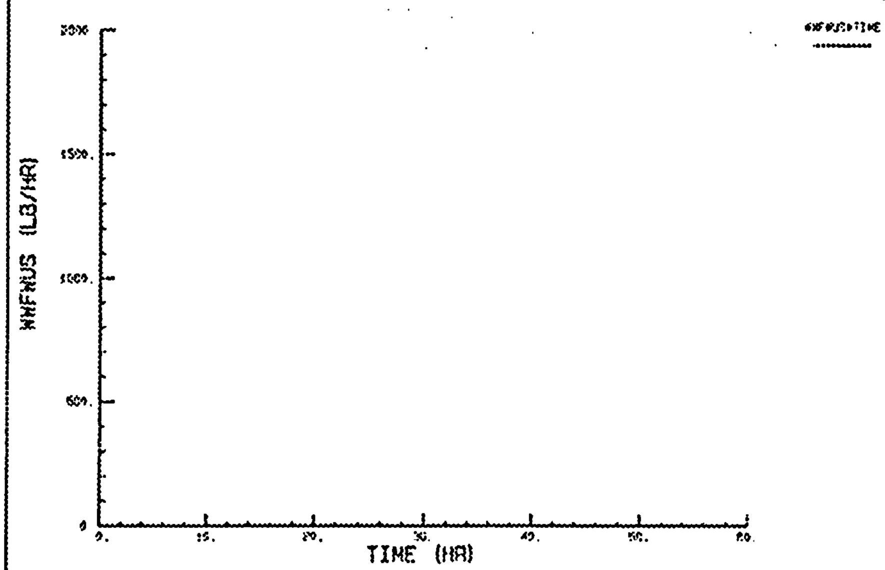

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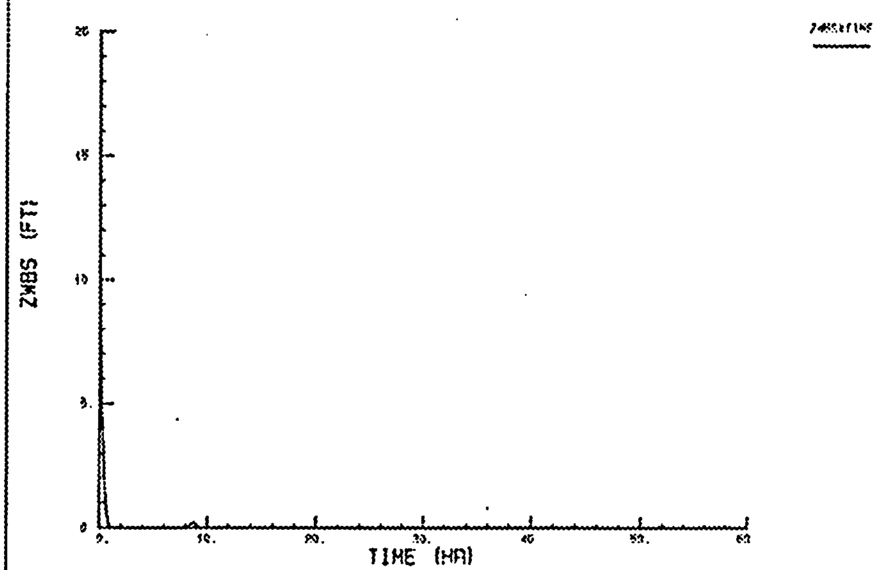

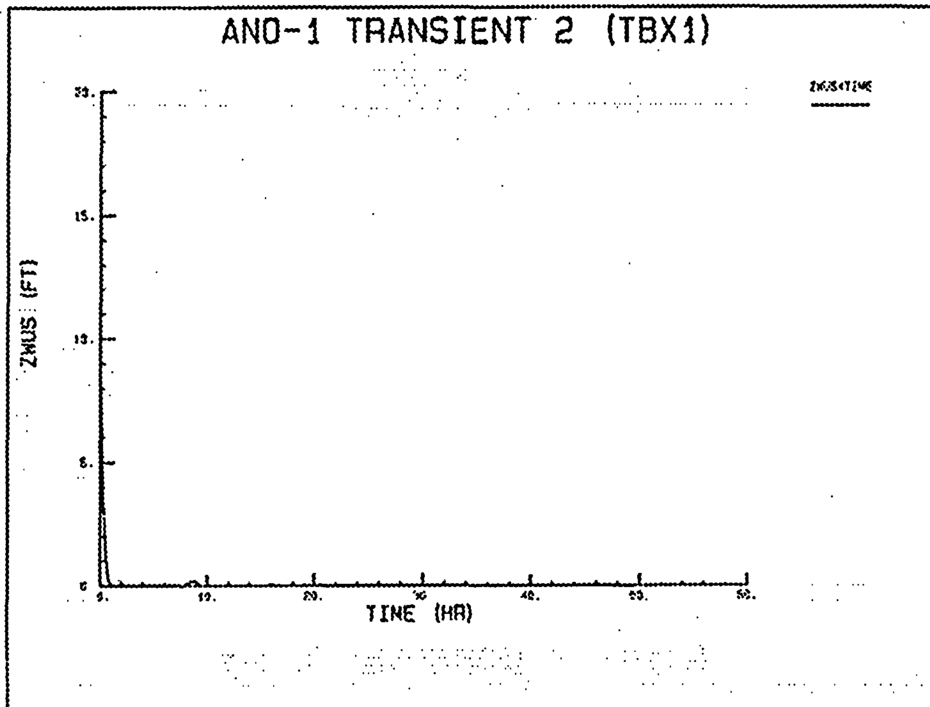
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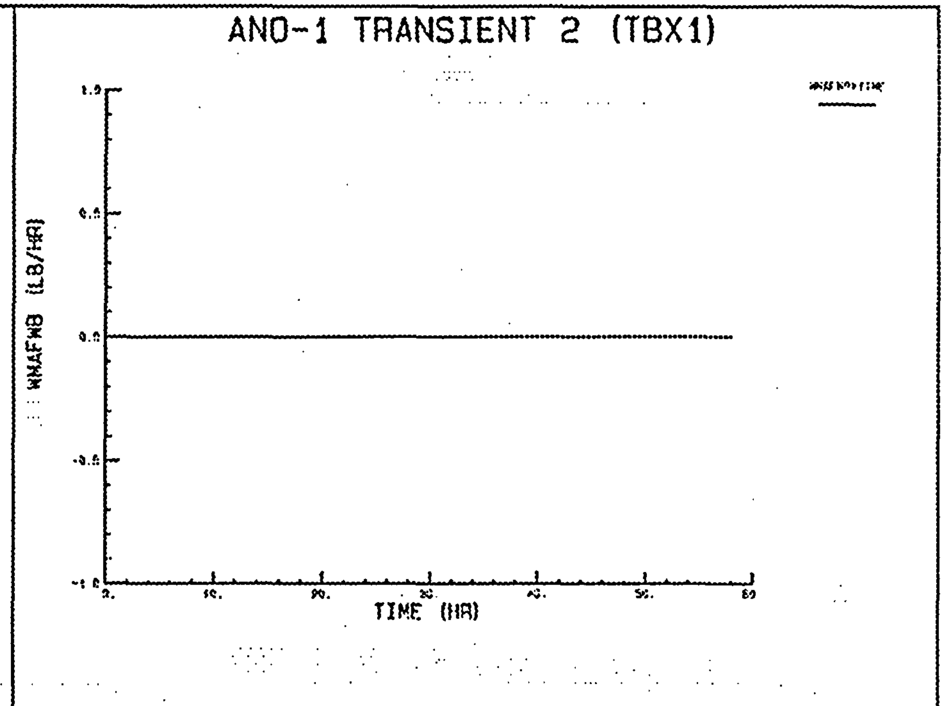
ZWUS (FT)
TIME (HR)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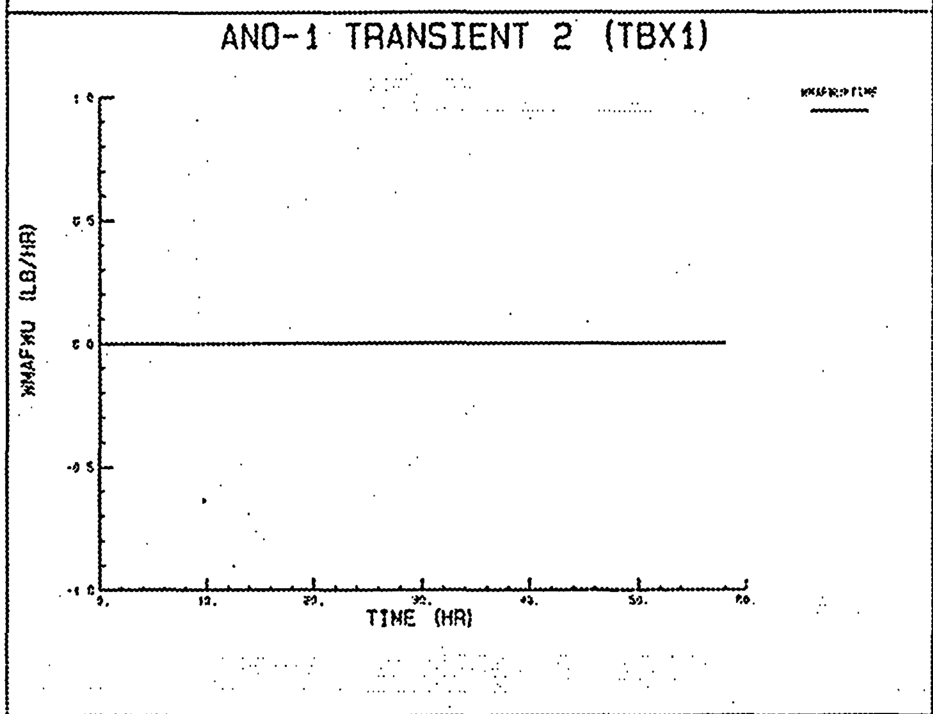
TIME (HR)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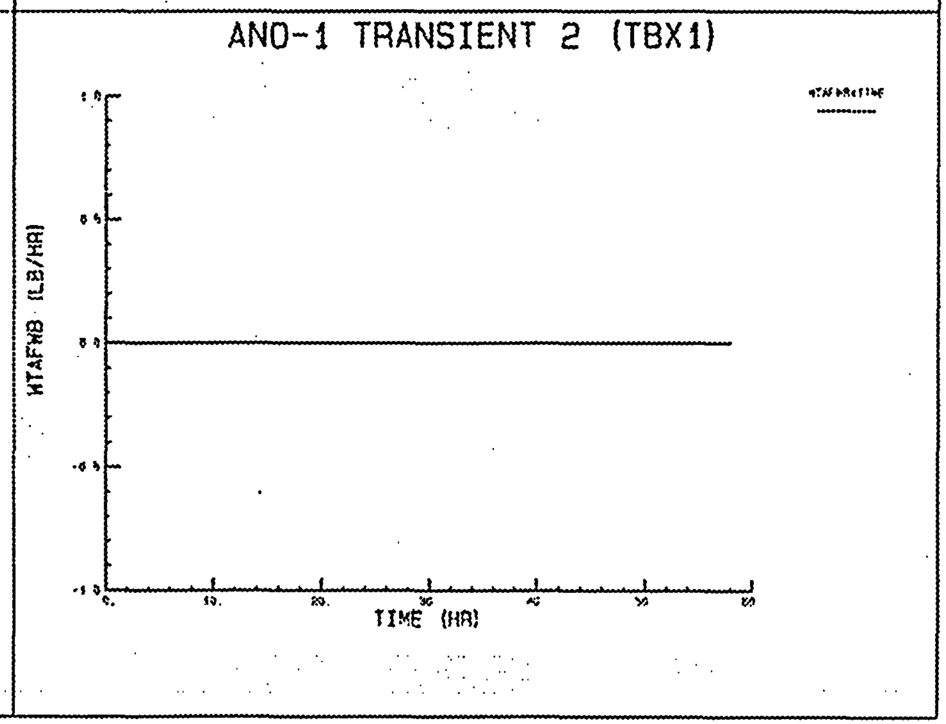
TIME (HR)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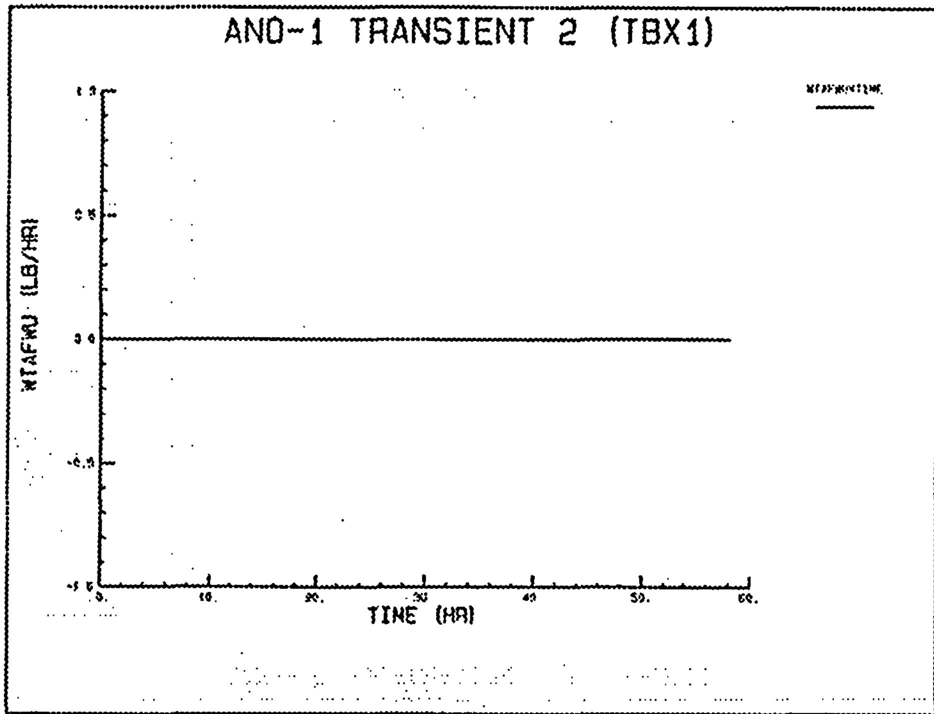
TIME (HR)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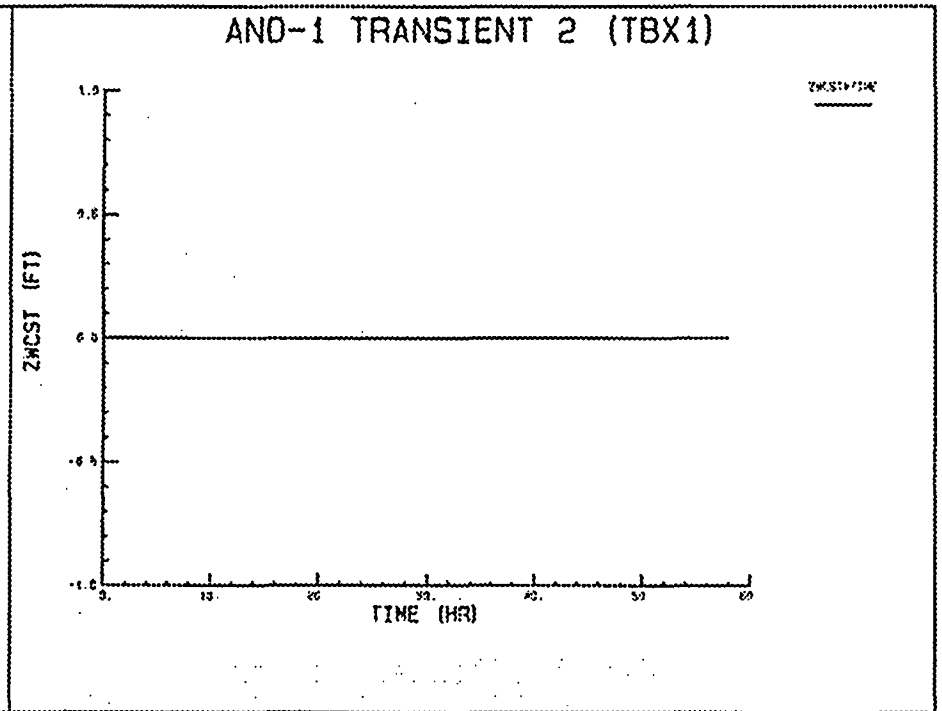
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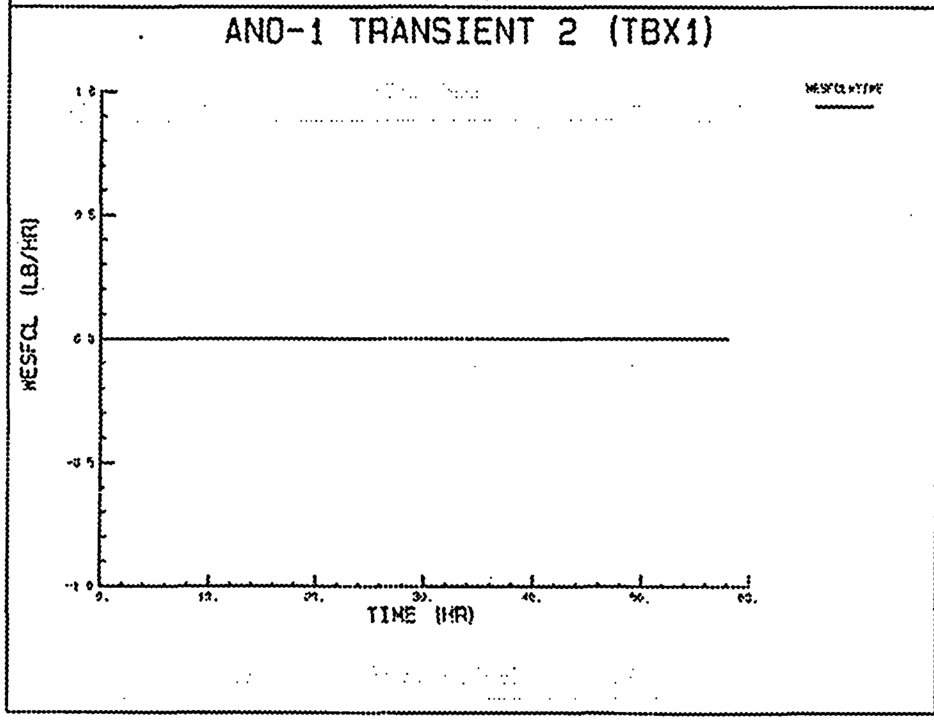
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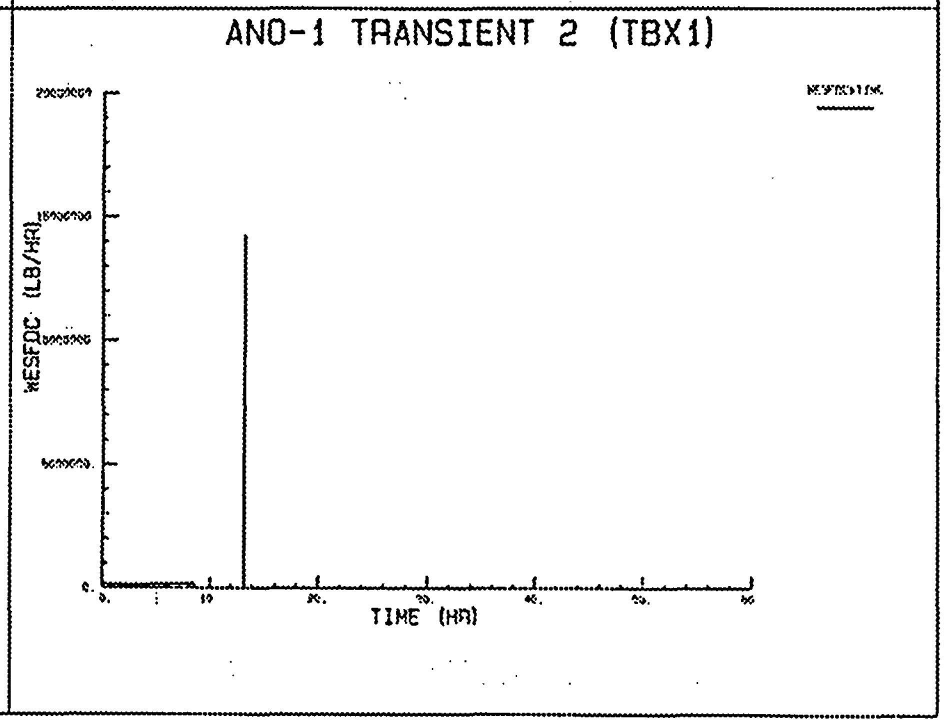
TIME (HR)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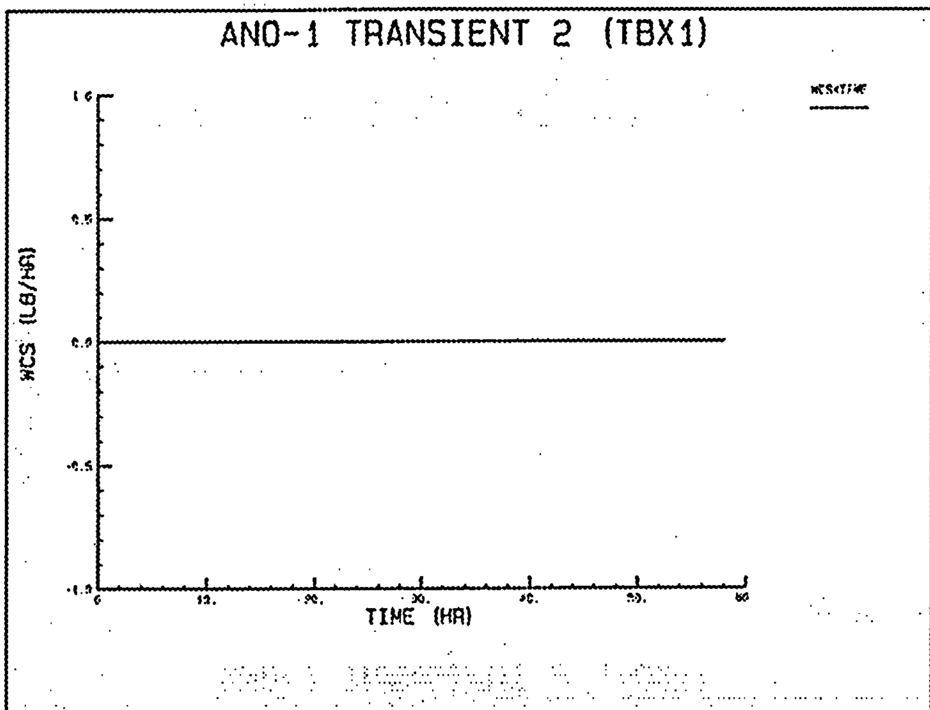
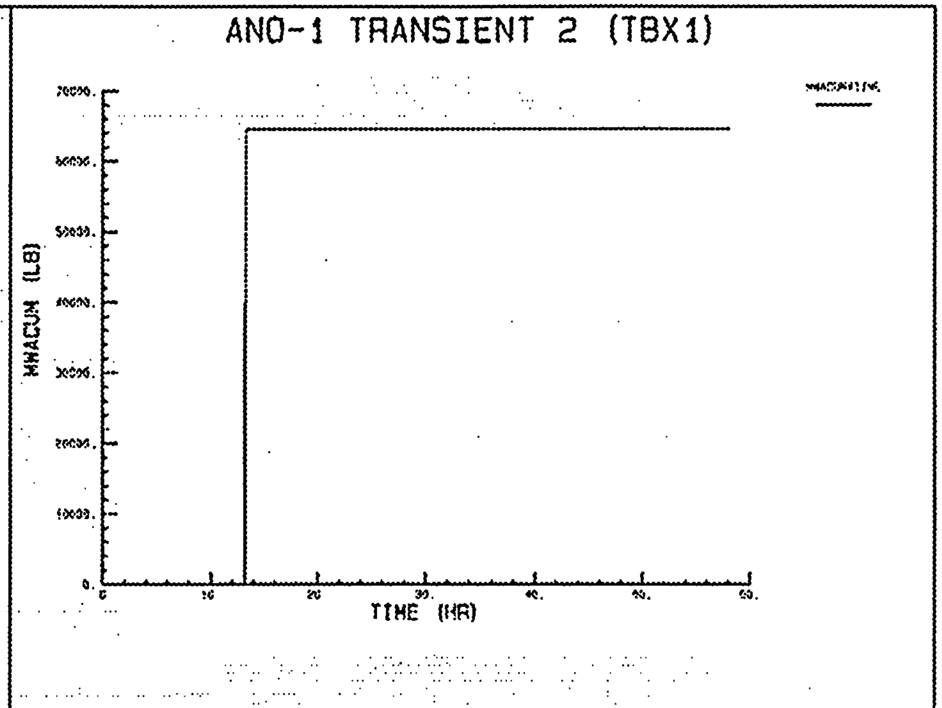
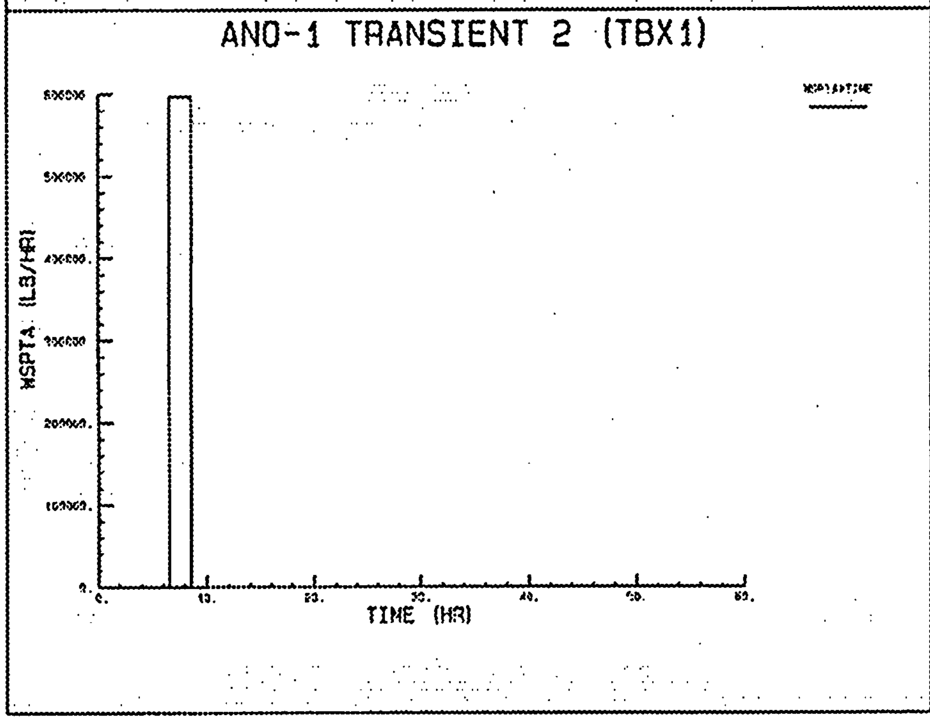
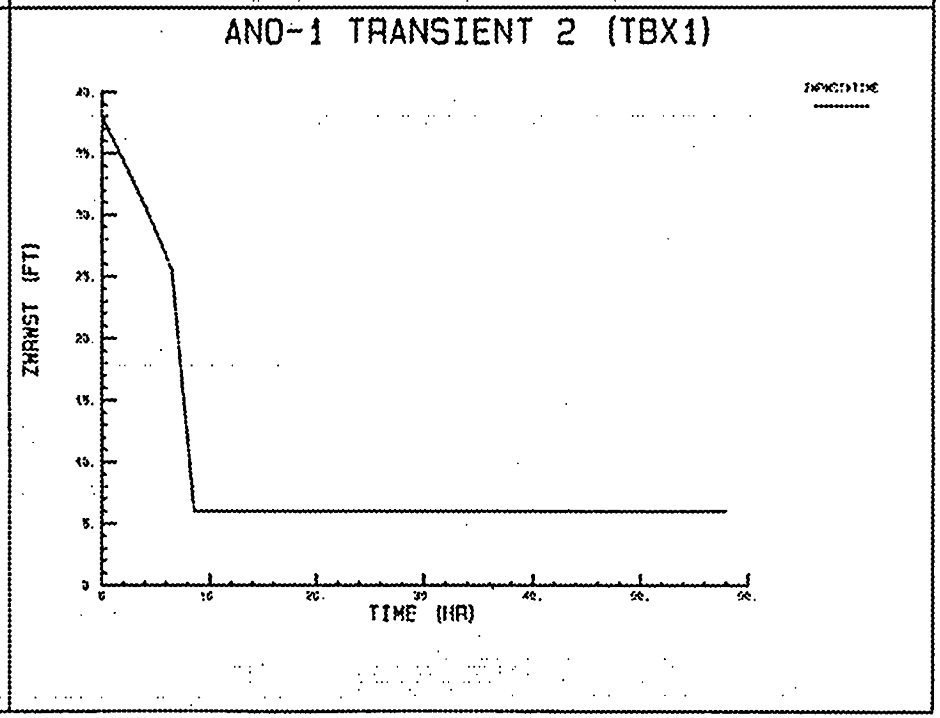
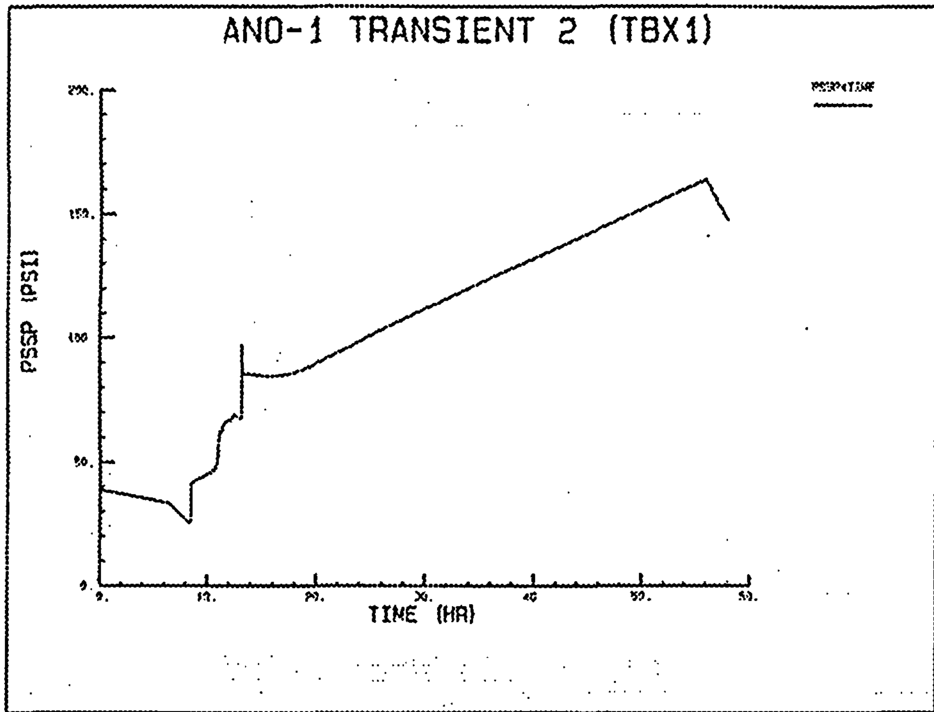
WESFDC (LB/HR)
TIME (HR)

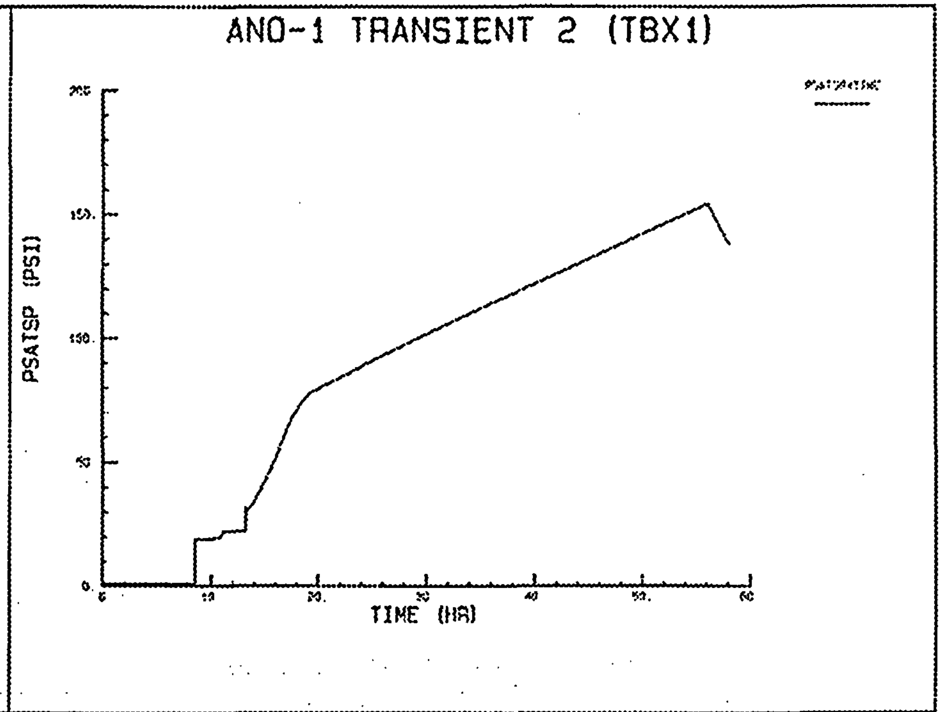

ANO-1 TRANSIENT 2 (TBX1)
WCS (LB/HR)
1.0
0.5
0.0
-0.5
-1.0
0
10.
20.
30.
40.
50.
60
TIME (HR)


ANO-1 TRANSIENT 2 (TBX1)
MWACUM (LB)
70000.
60000.
50000.
40000.
30000.
20000.
10000.
0.
0
10
20
30.
40.
50.
60.
TIME (HR)


ANO-1 TRANSIENT 2 (TBX1)
WSPTA (LB/HR)
600000
500000
400000.
300000
200000.
100000.
0.
0.
10.
20.
30.
40.
50.
60.
TIME (HR)


ANO-1 TRANSIENT 2 (TBX1)
ZHRWST (FT)
40.
35.
30.
25.
20.
15.
10.
5.
0
0
10
20.
30
40.
50.
60.
TIME (HR)


ANO-1 TRANSIENT 2 (TBX1)
PSSP (PSI)
TIME (HR)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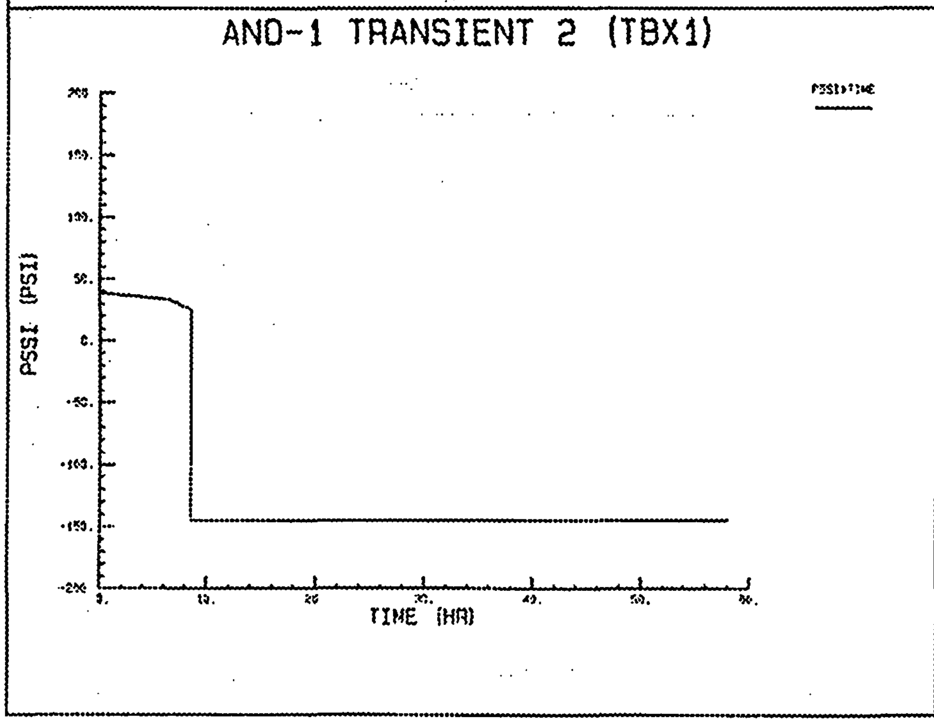
TIME (HR)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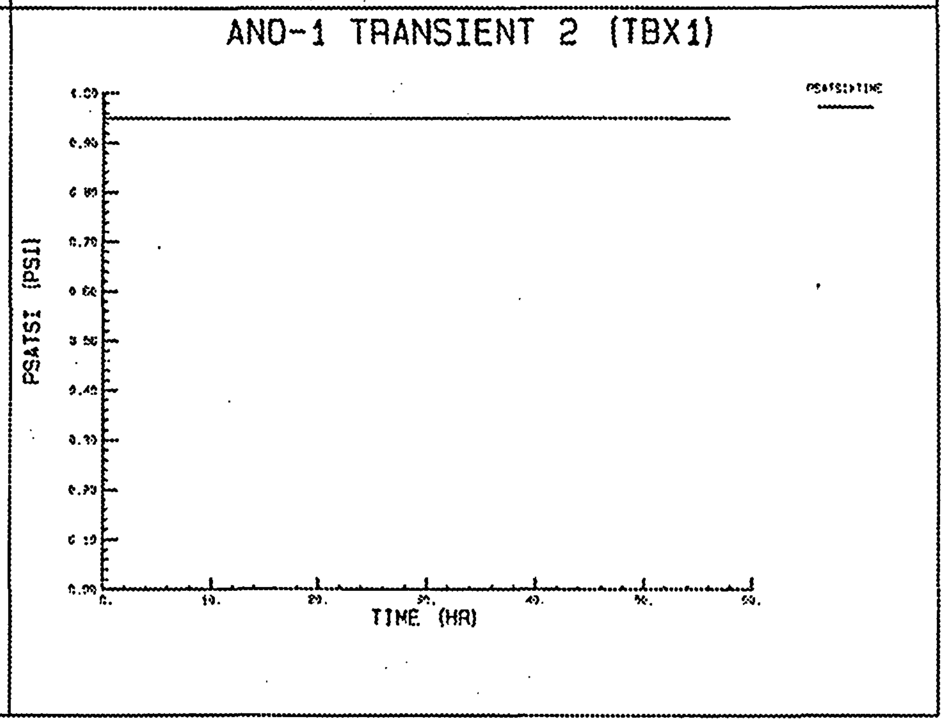
TIME (HR)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TIME (HR)

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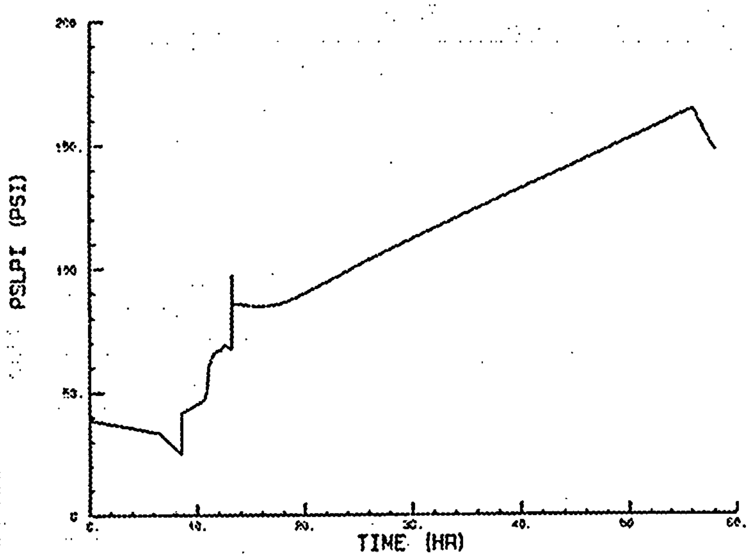

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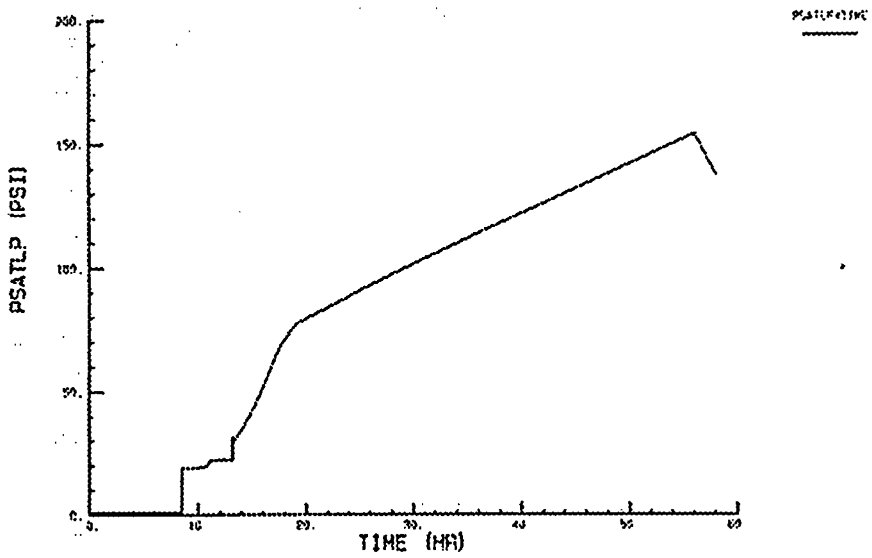

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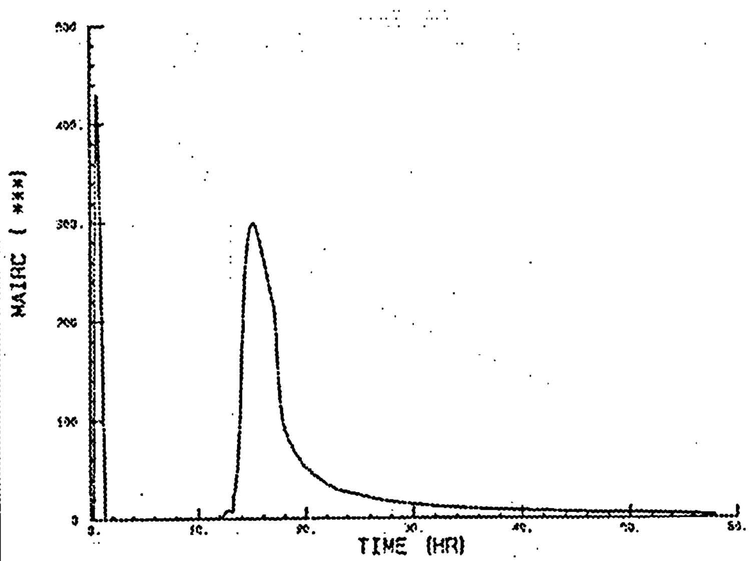

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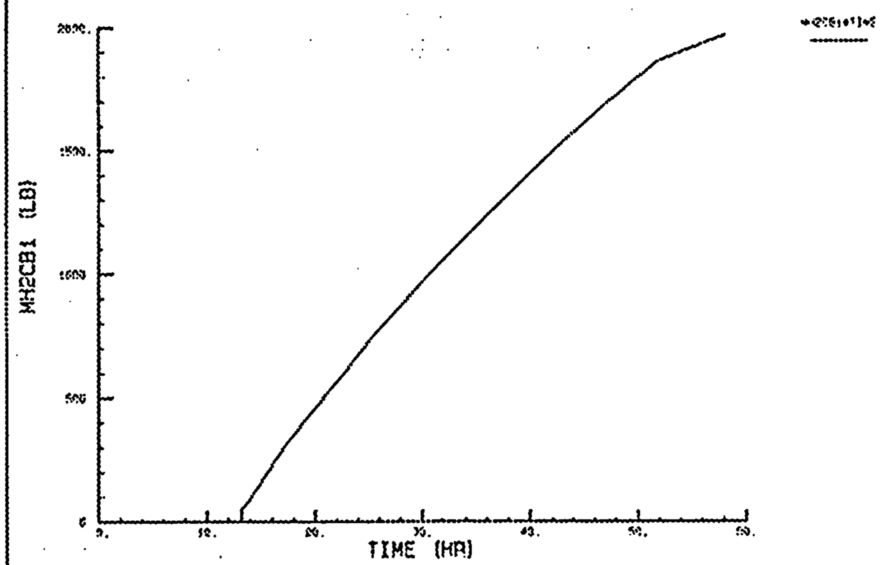

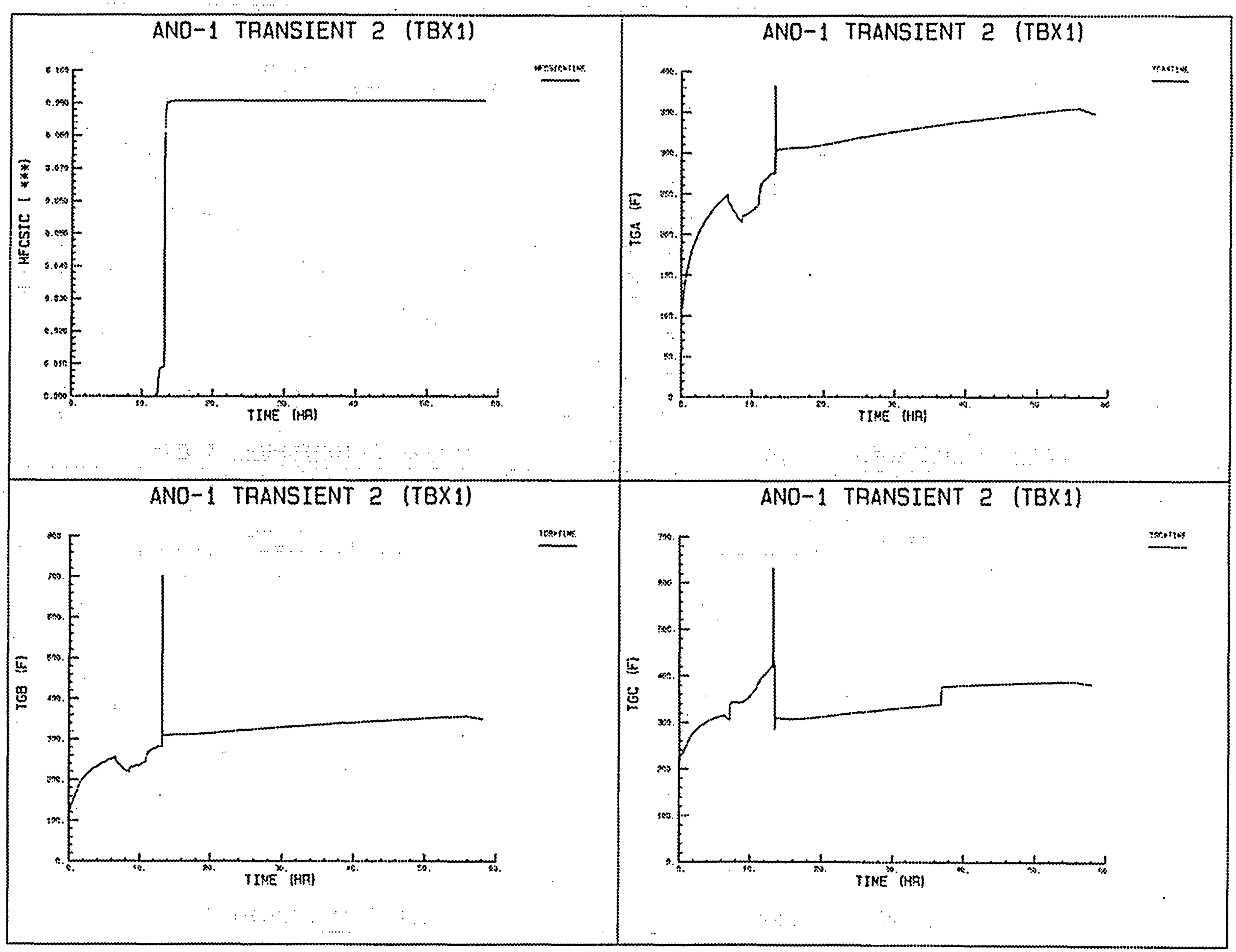
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MFCSIC
TIME (HR)
ANO-1 TRANSIENT 2 (TBX1)
TGA (F)
TIME (HR)
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TGB (F)
TIME (HR)
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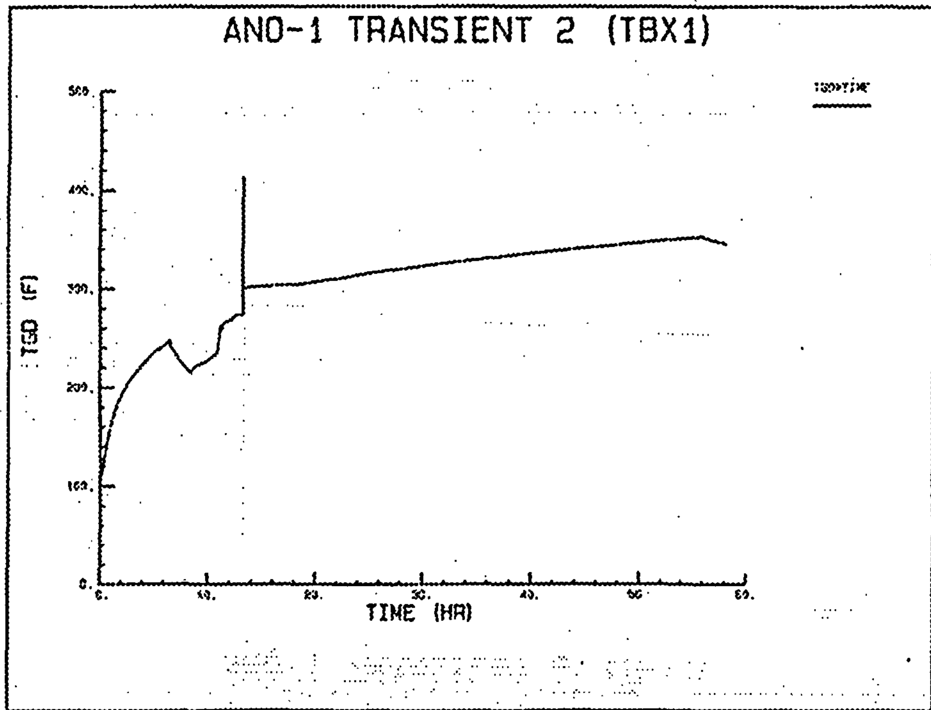
TGC (F)
TIME (HR)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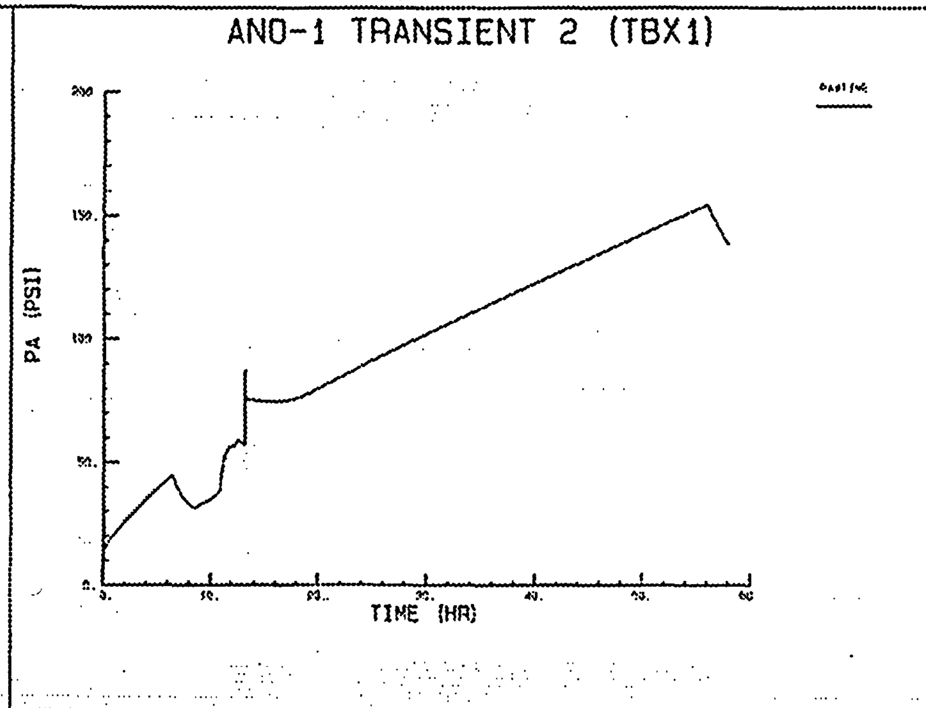
TIME (HR)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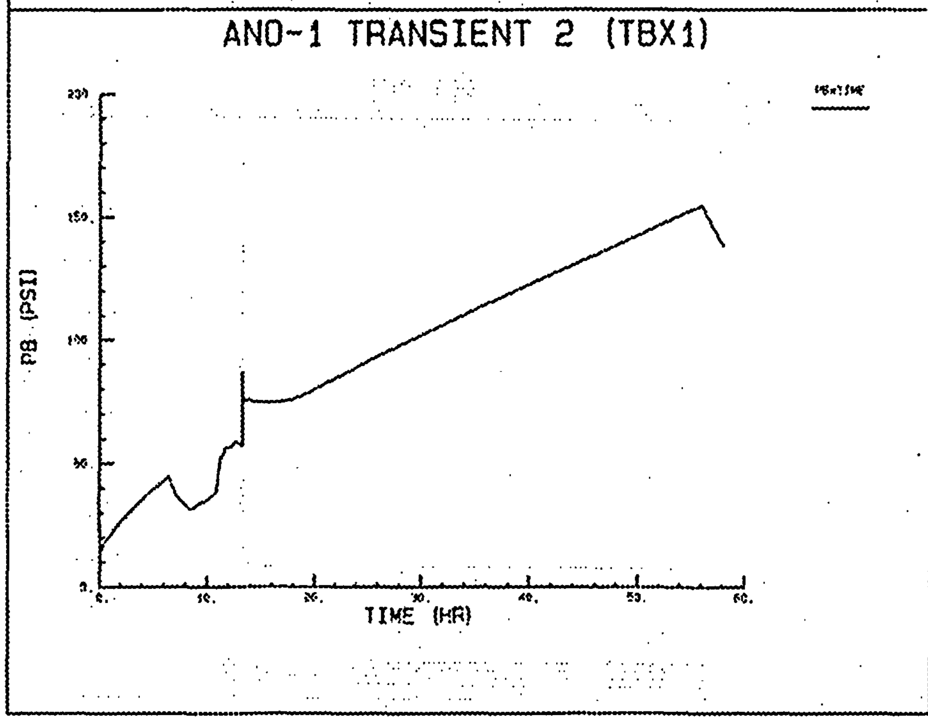
TIME (HR)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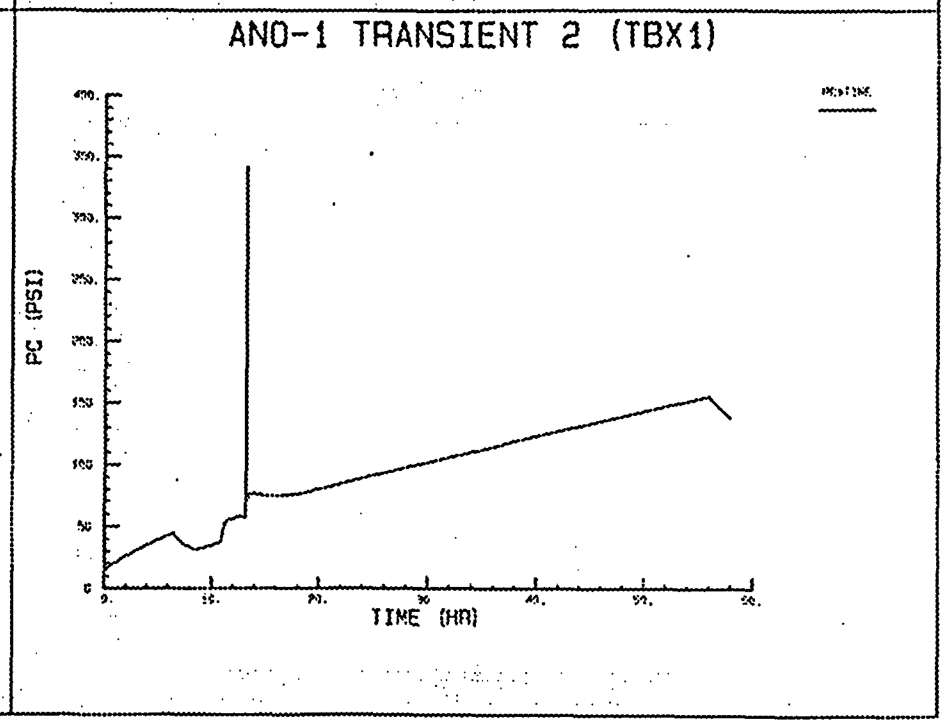
TIME (HR)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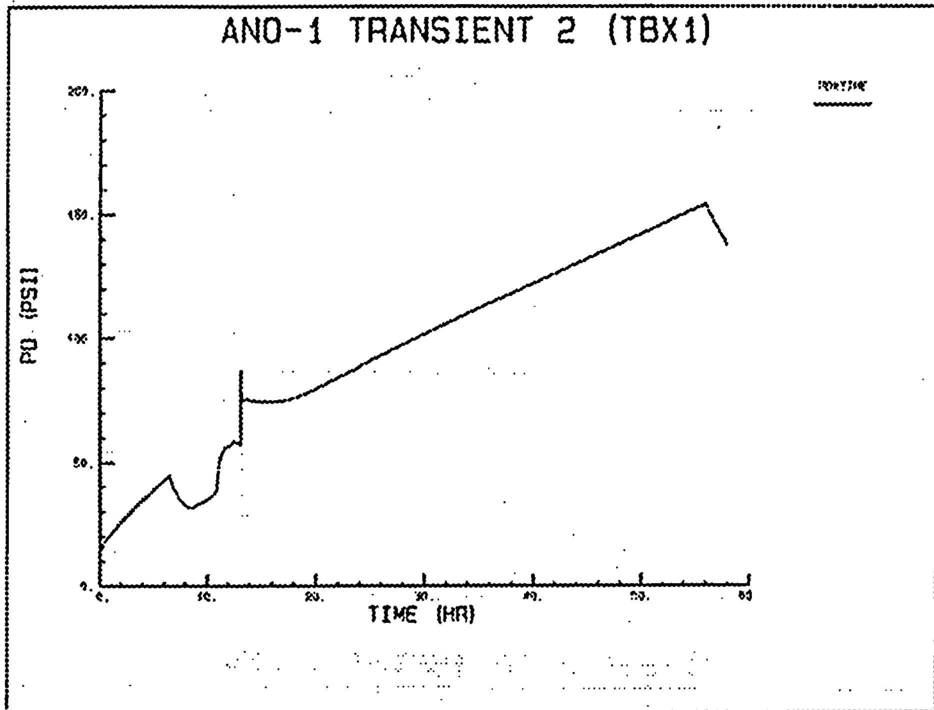
TIME (HR)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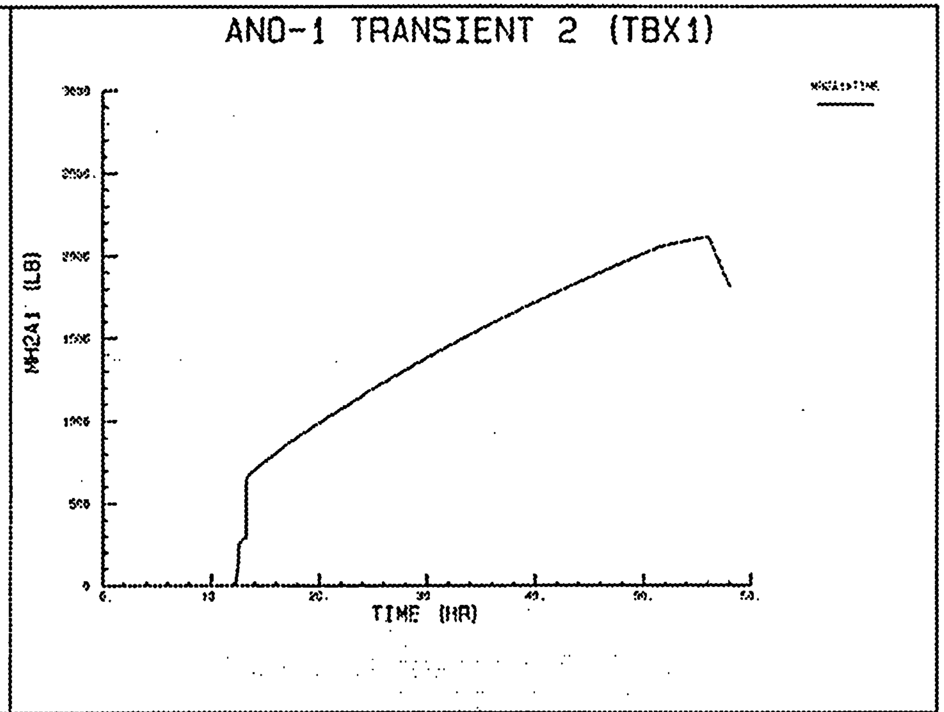
TIME (HR)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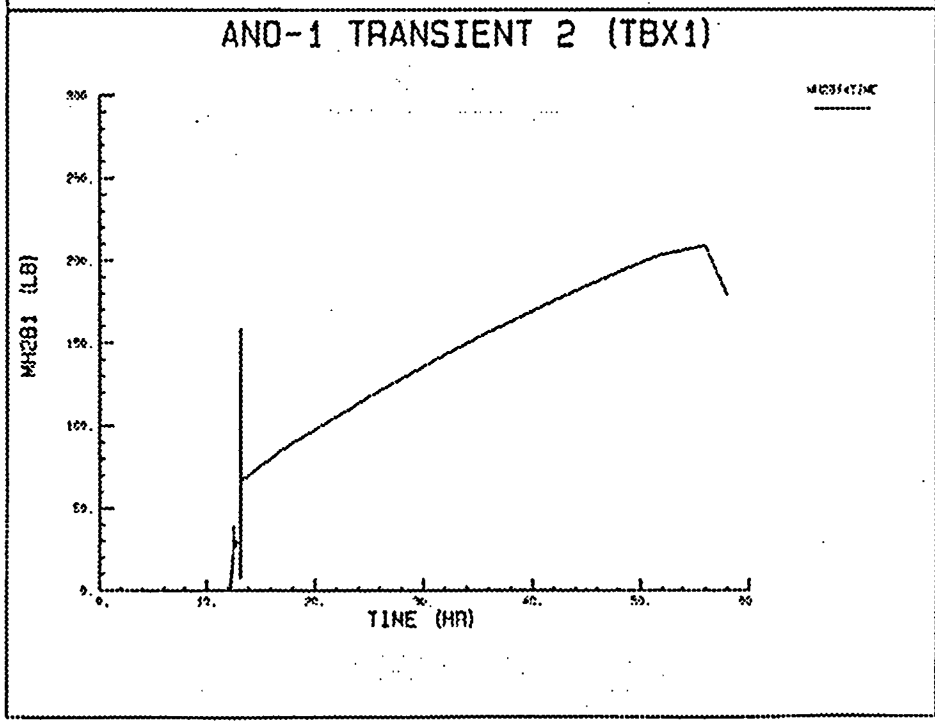
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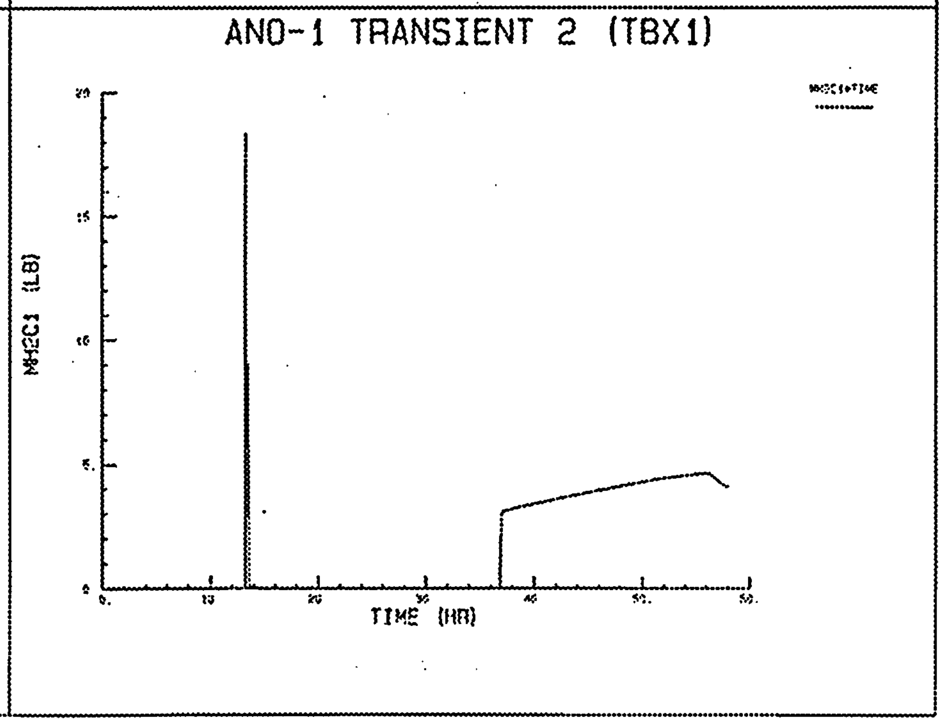
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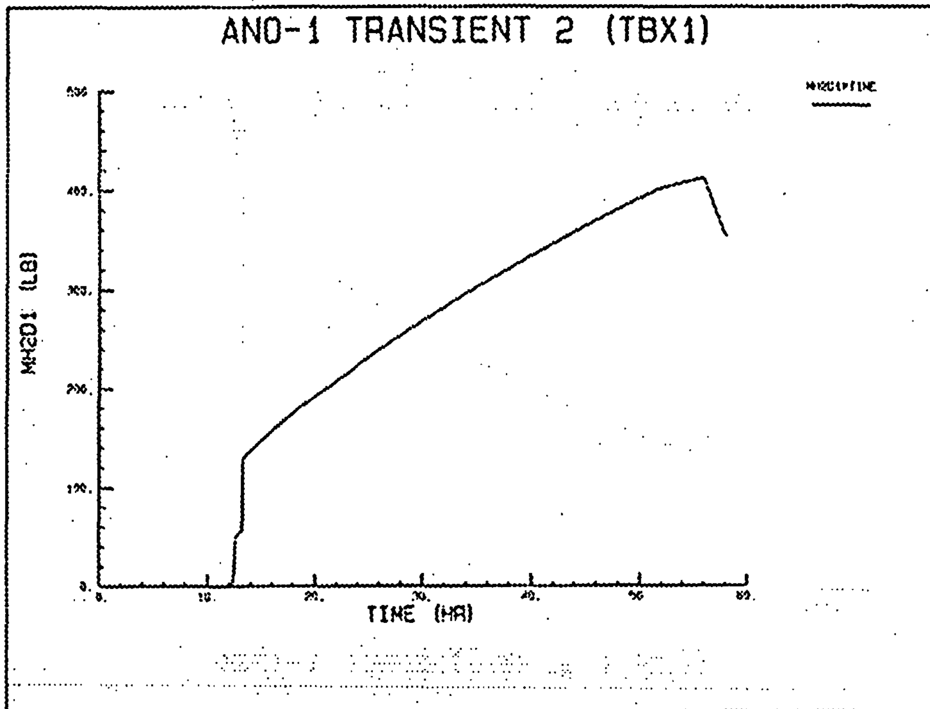
TIME (HR)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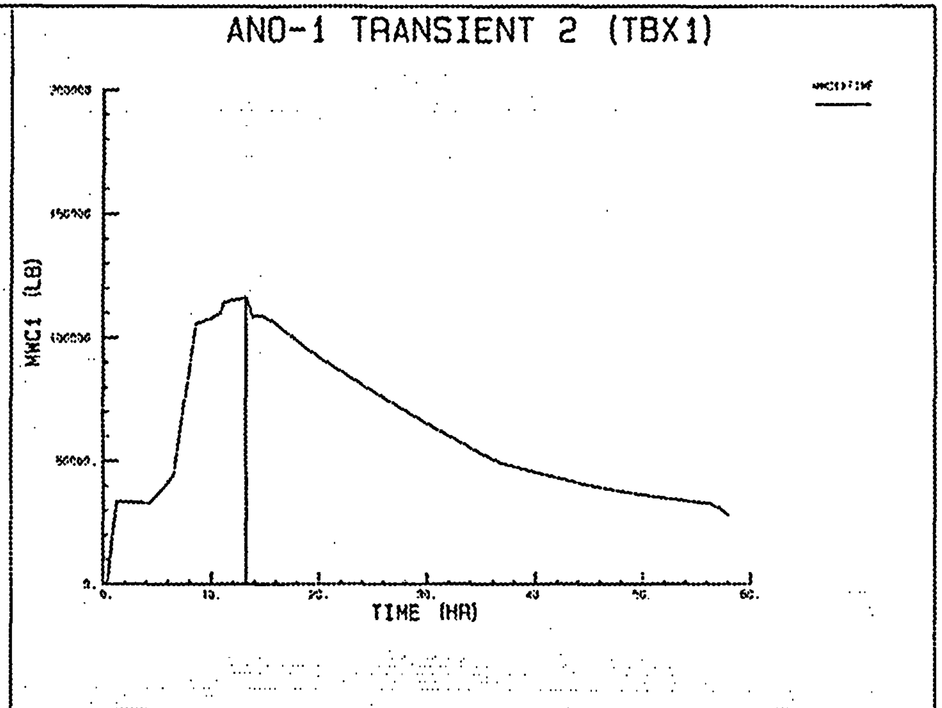
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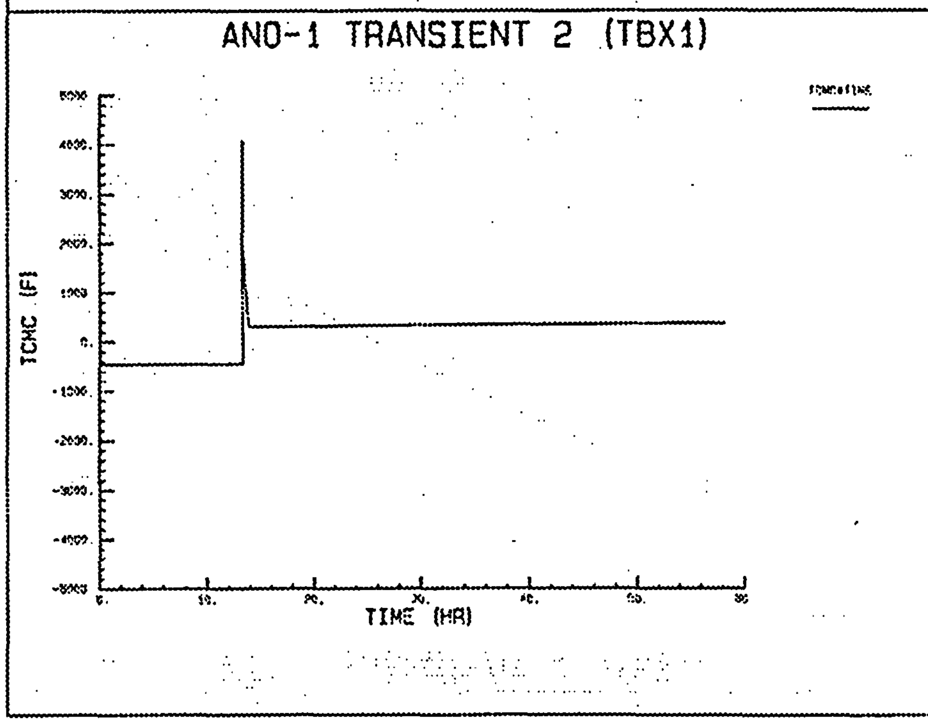
TIME (HR)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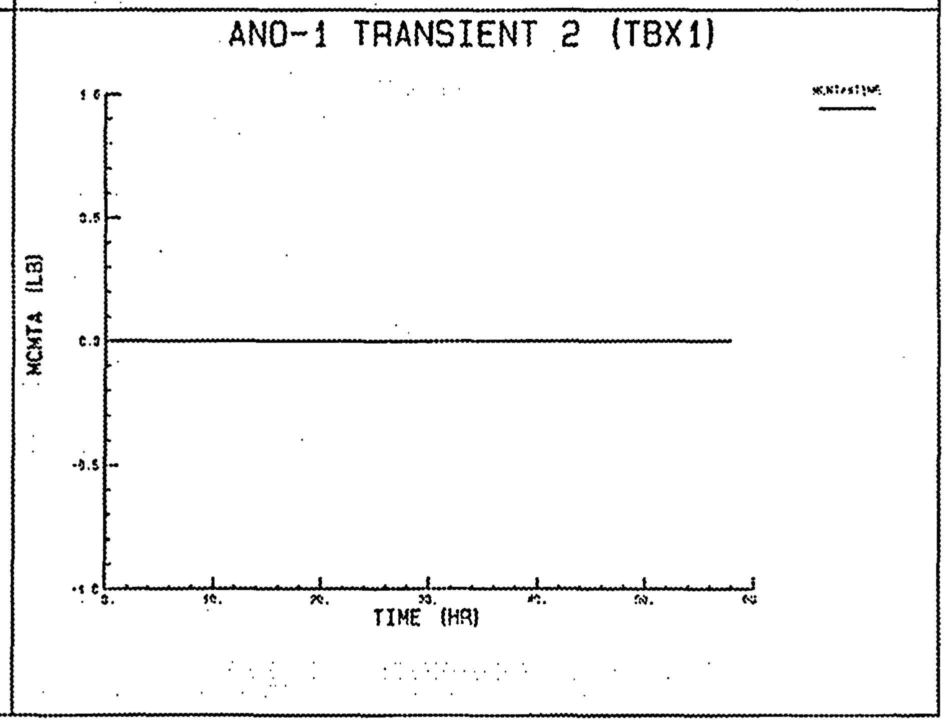
TCMC (F)
TIME (HR)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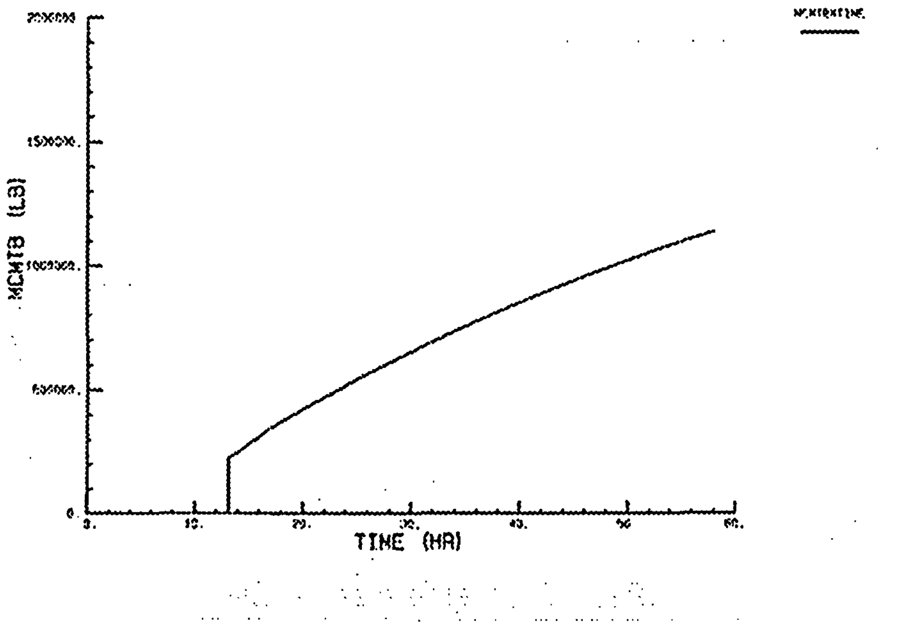

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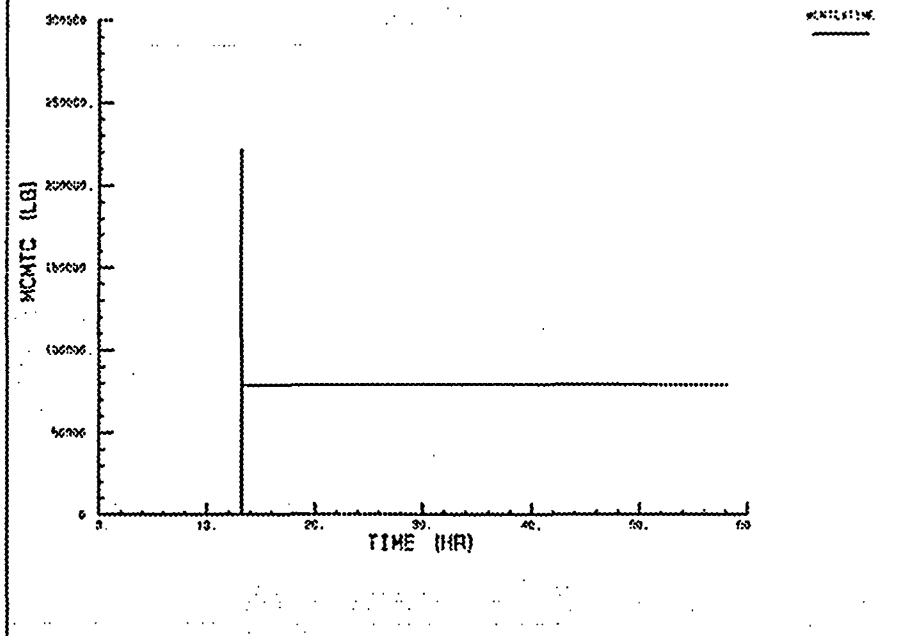

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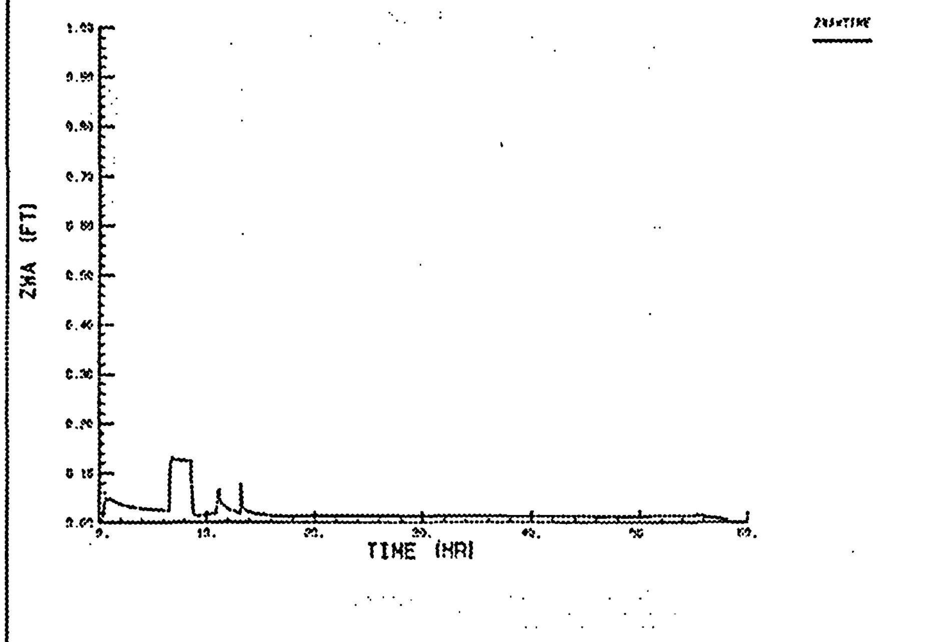

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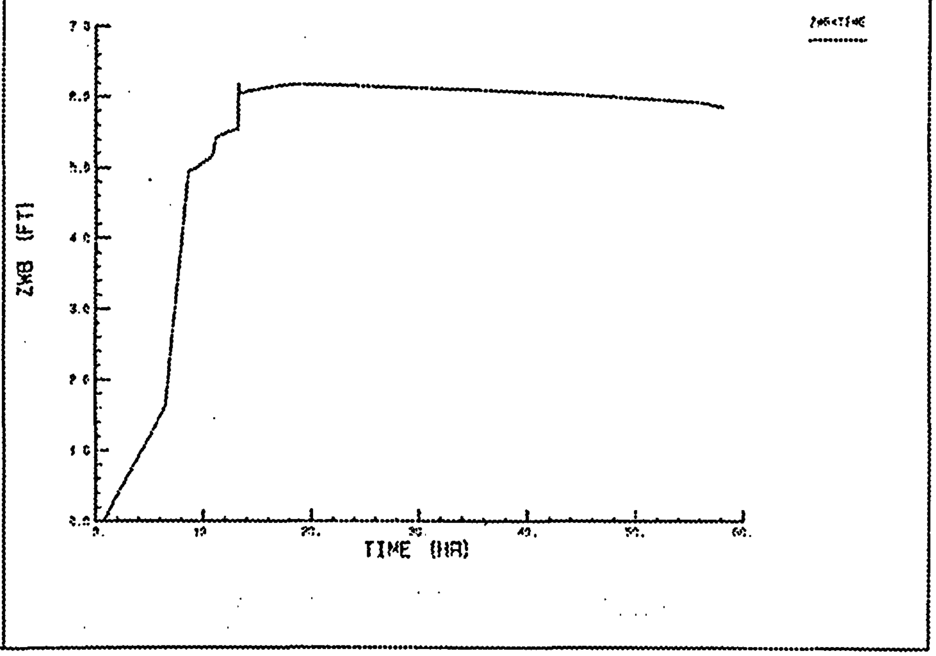

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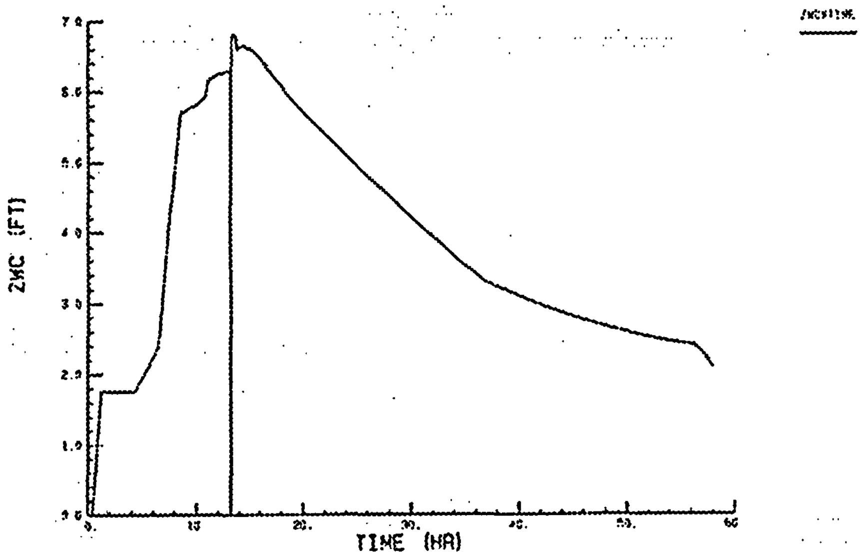

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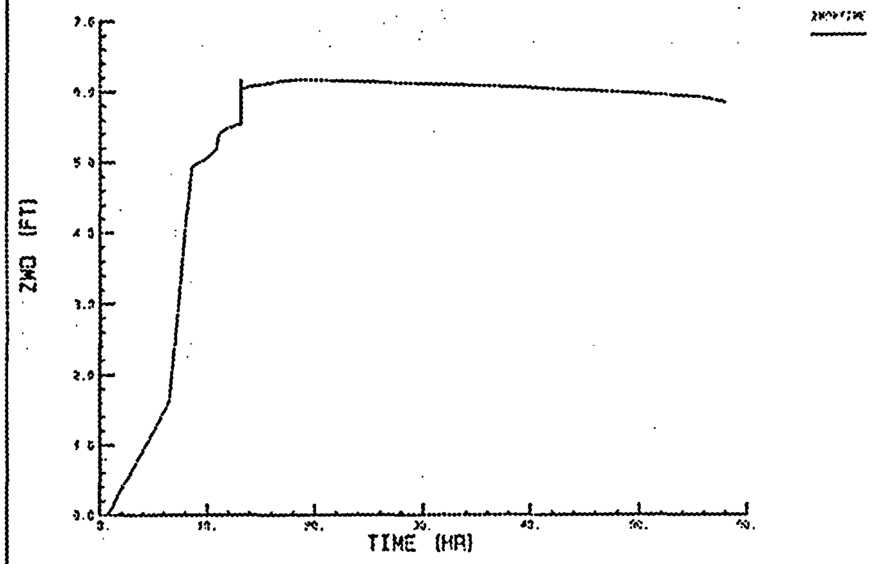

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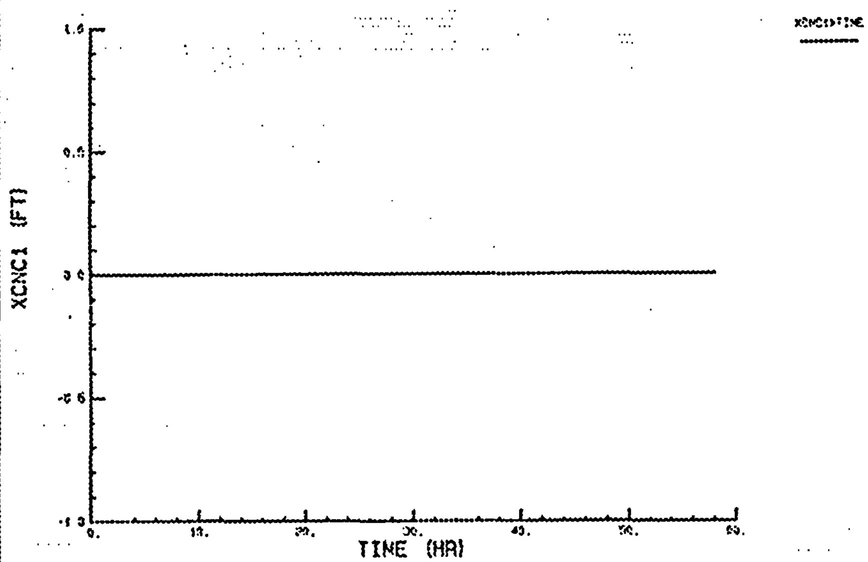

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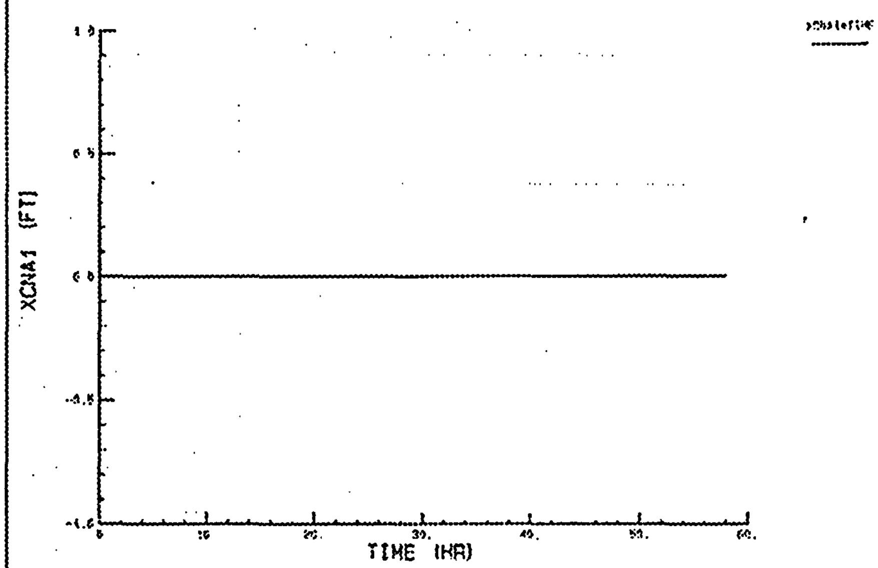

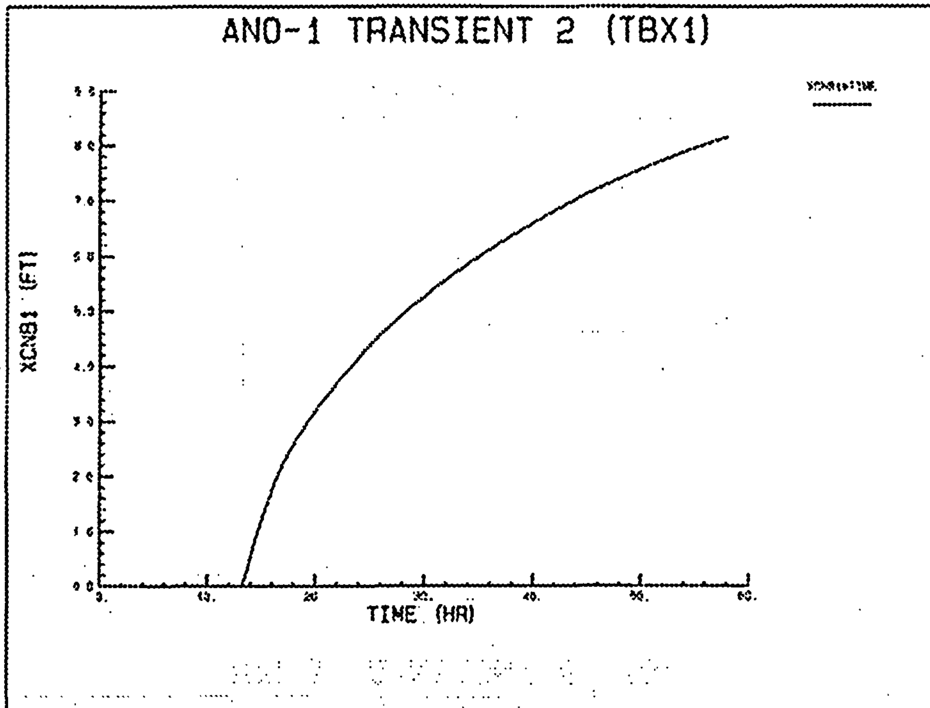
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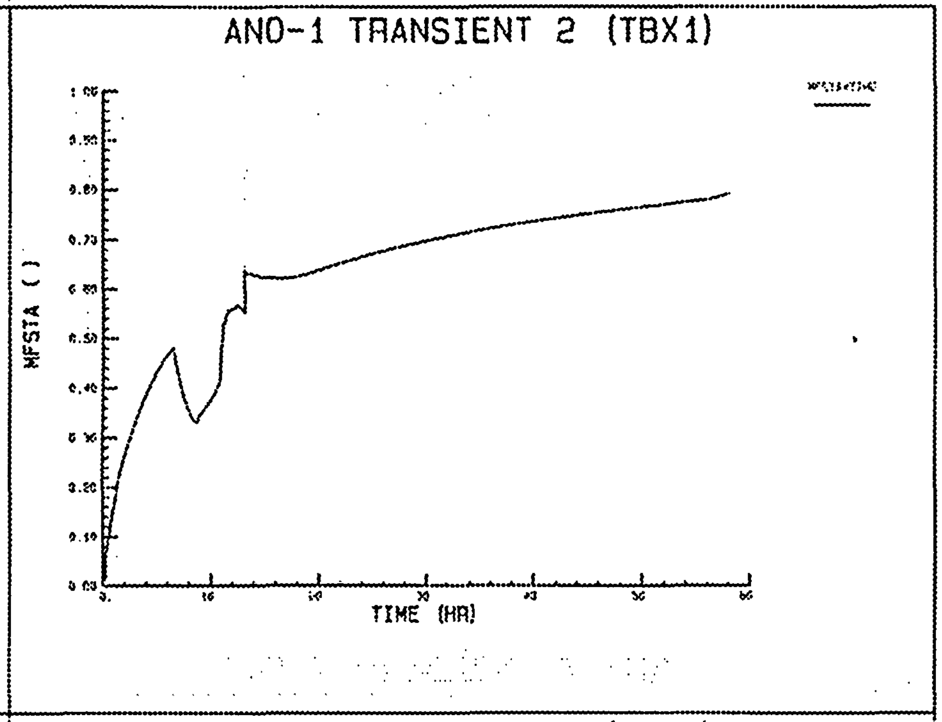
XCNB1 (FT)
TIME (HR)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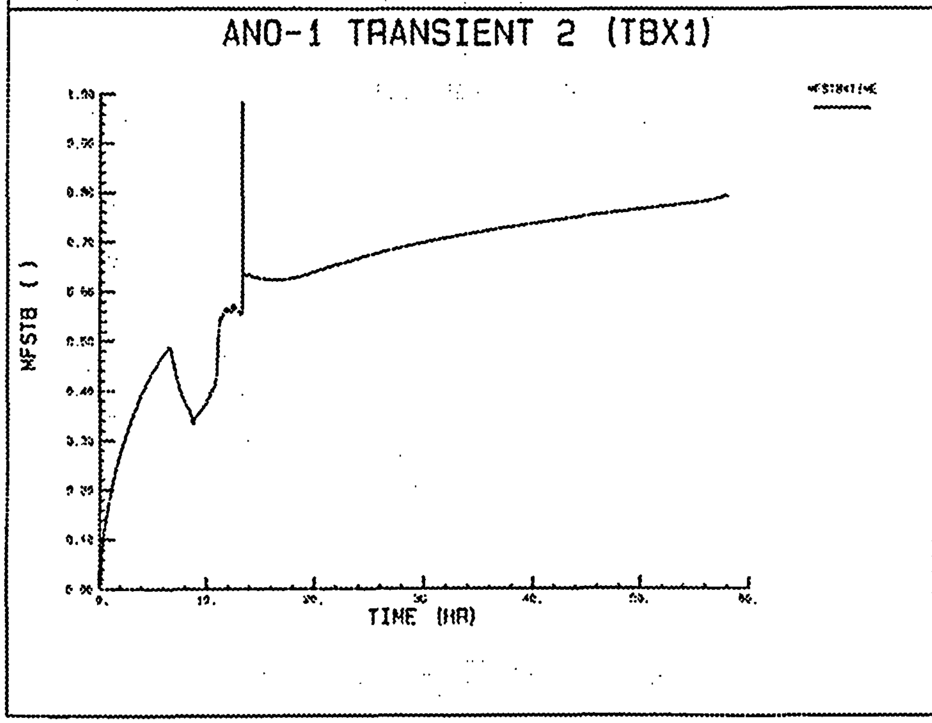
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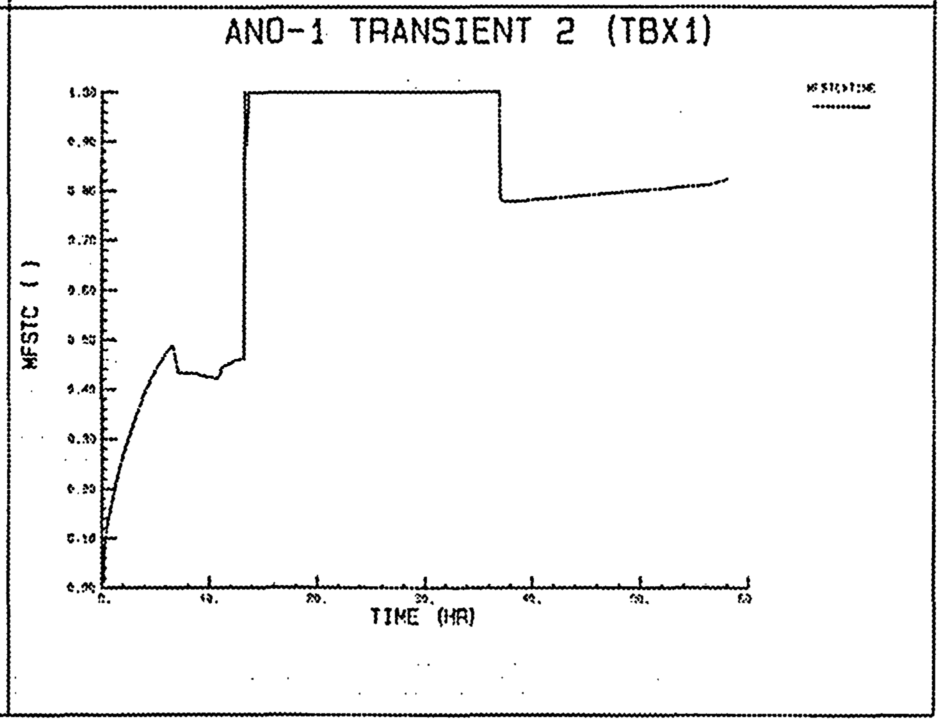
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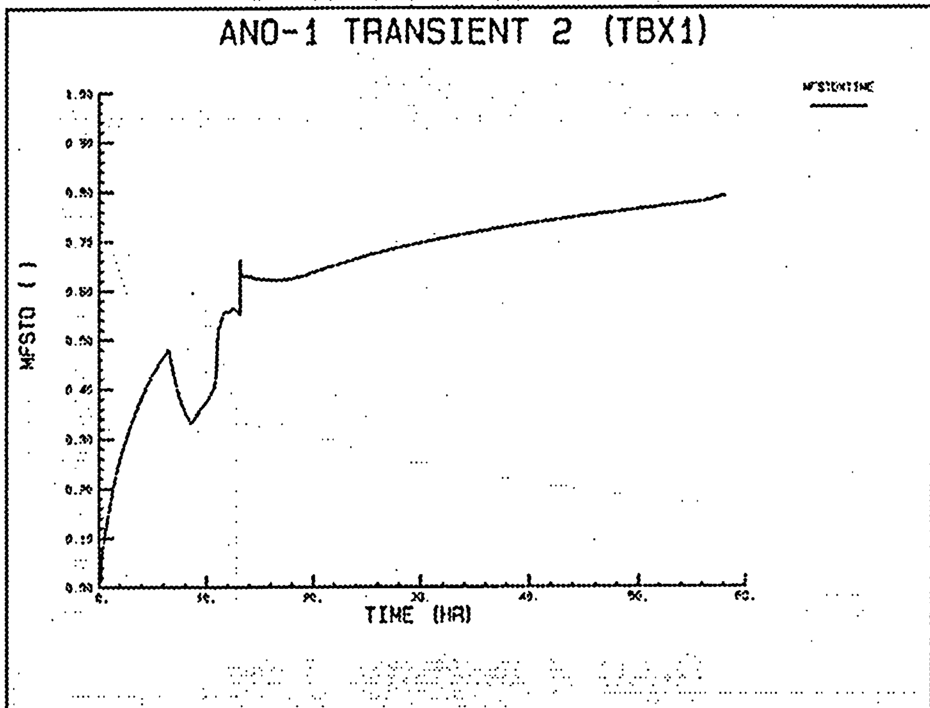
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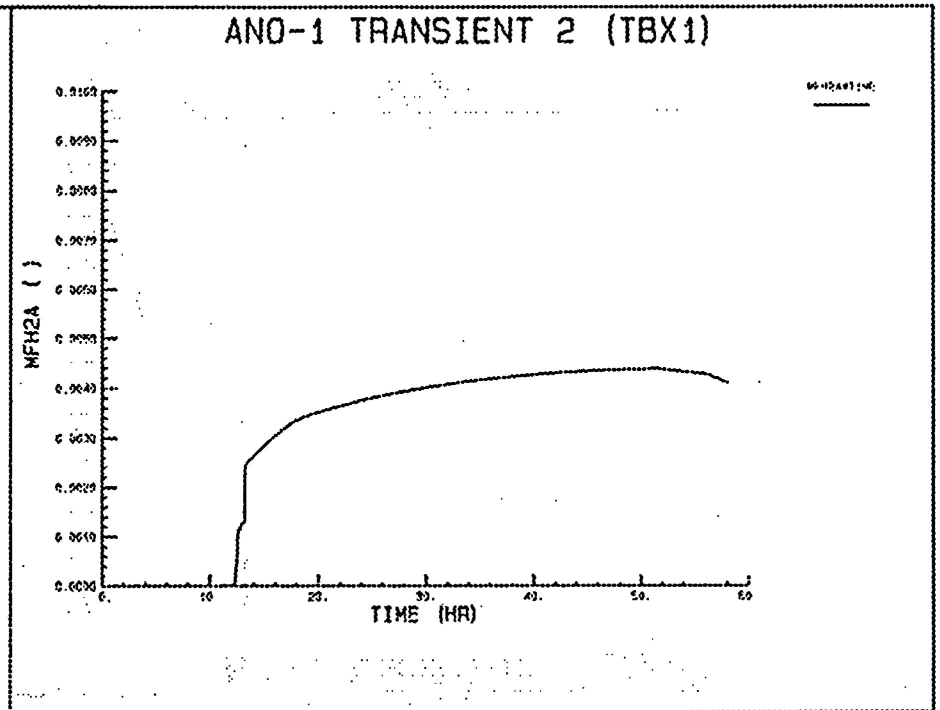
TIME (HR)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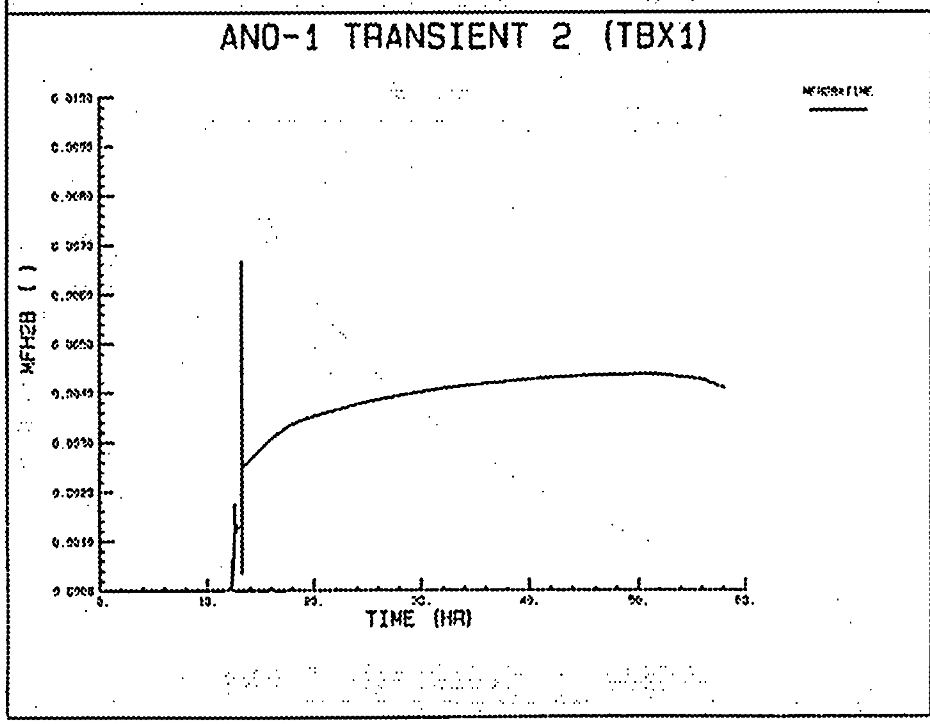
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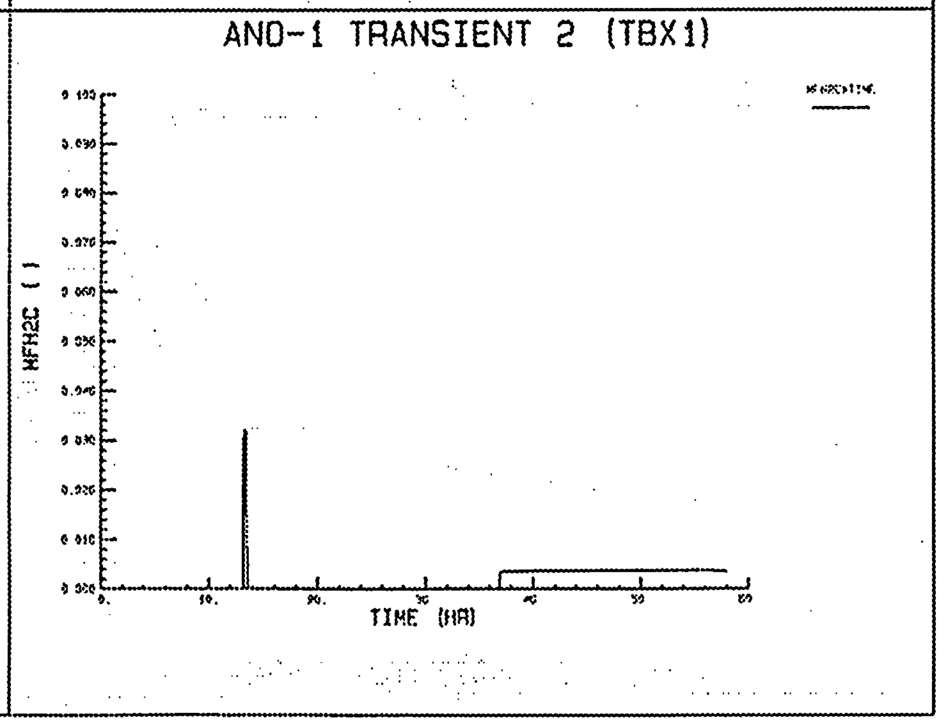
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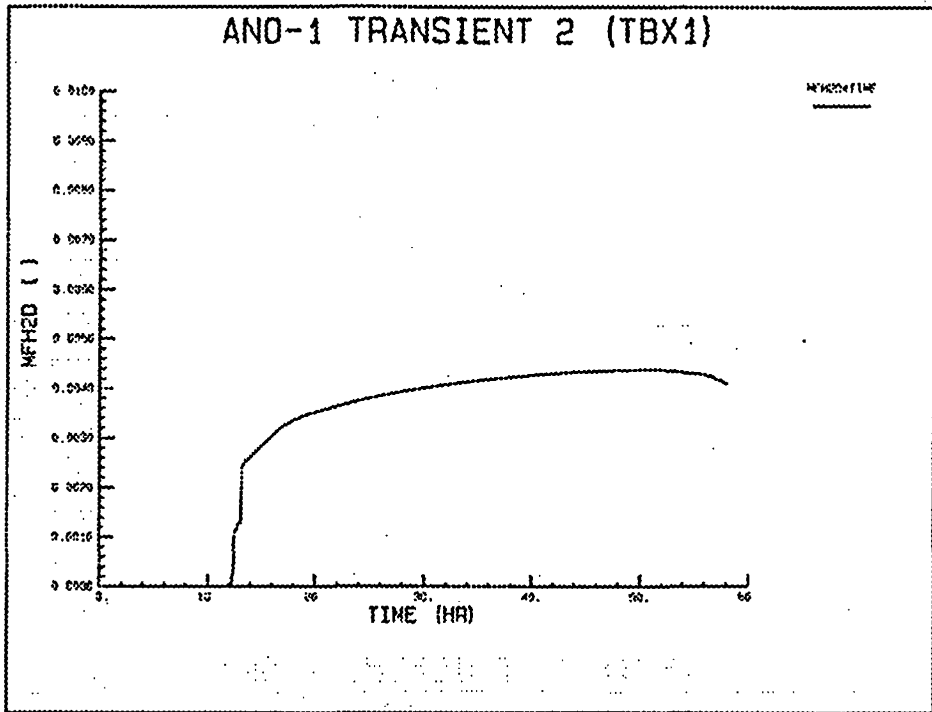
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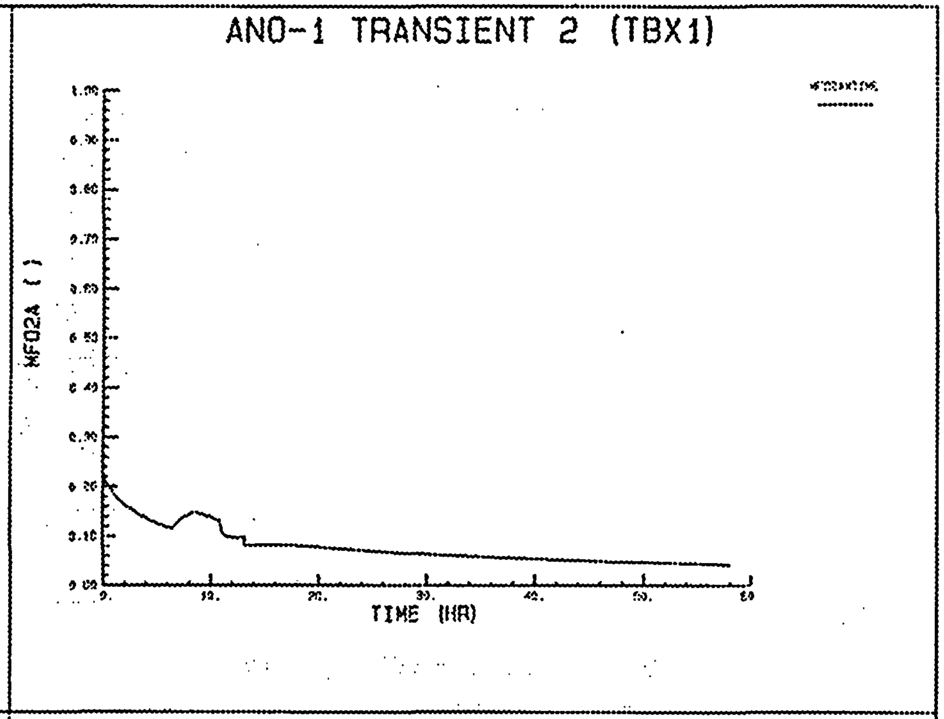
MFH2D ( )
TIME (HR)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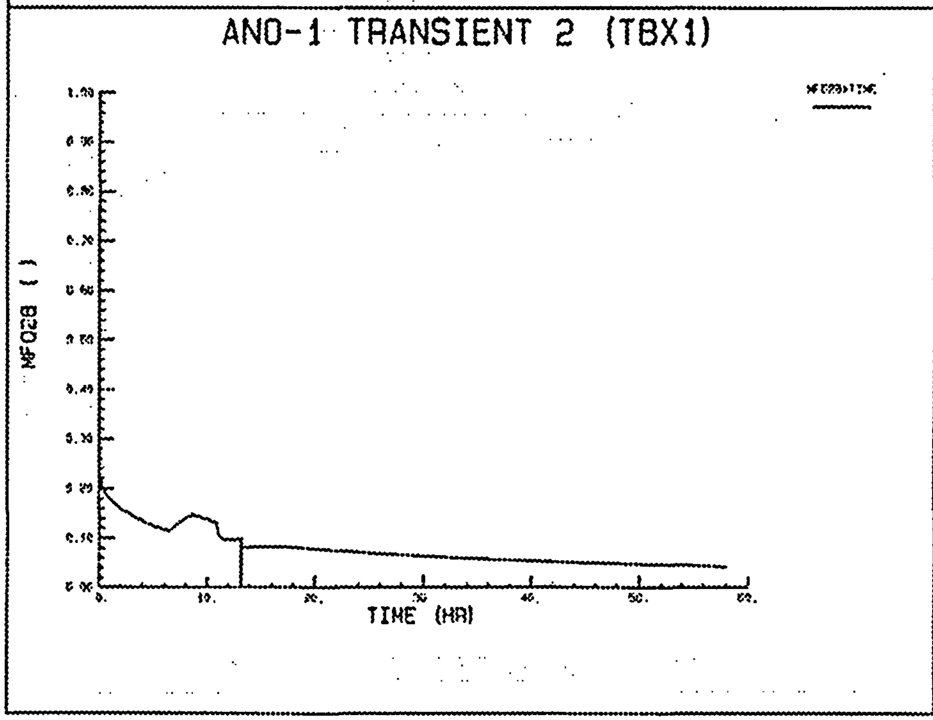
MFO2A ( )
TIME (HR)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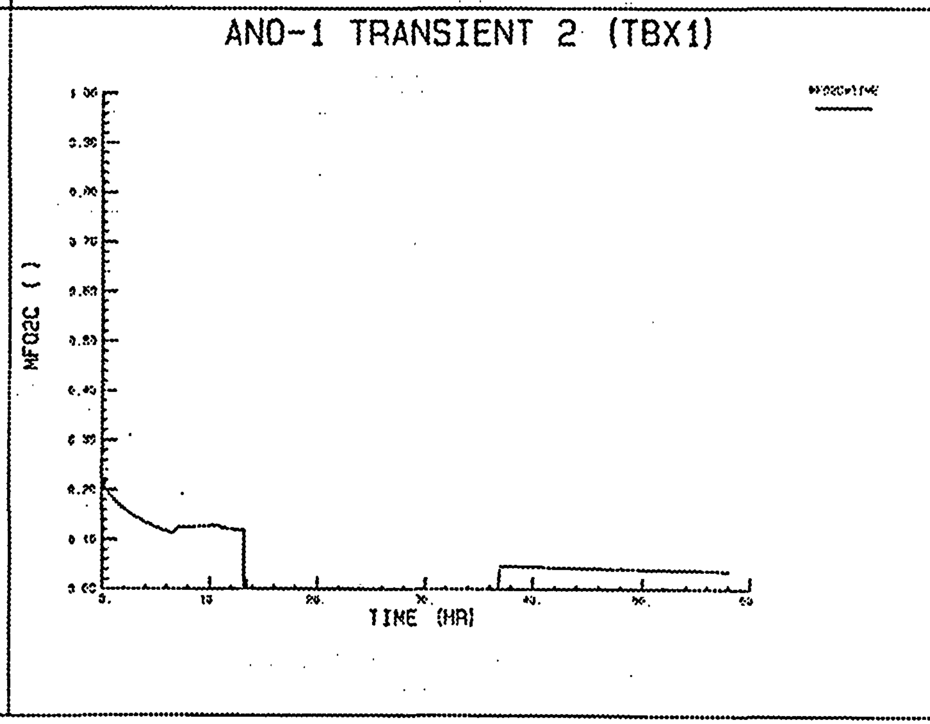
MFO2B ( )
TIME (HR)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MFO2C ( )
TIME (HR)

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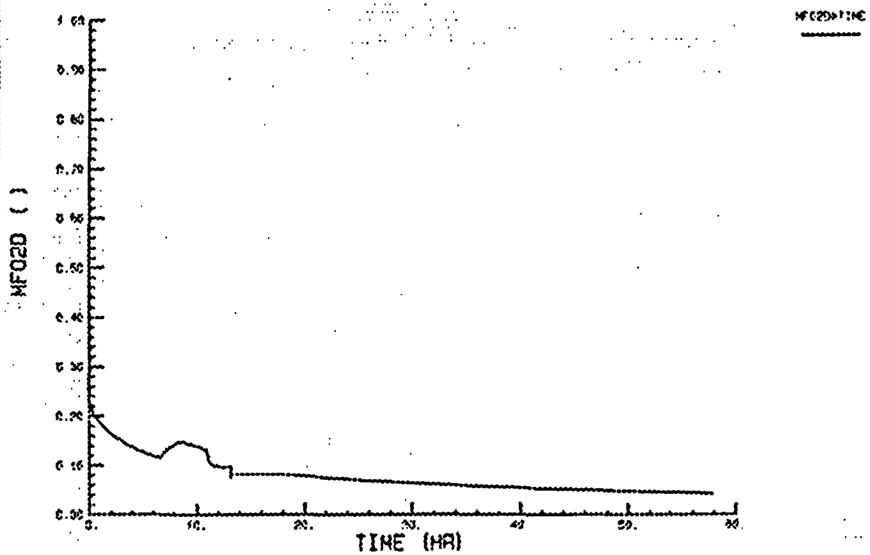

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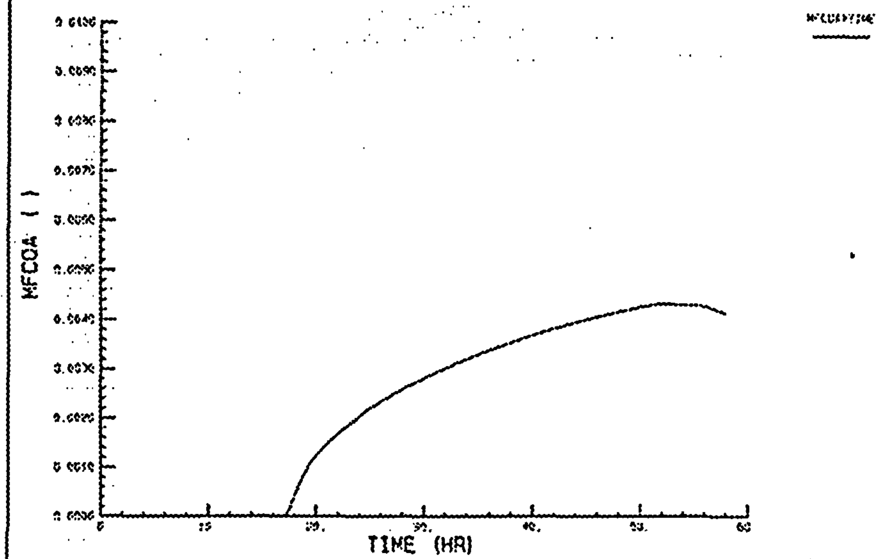

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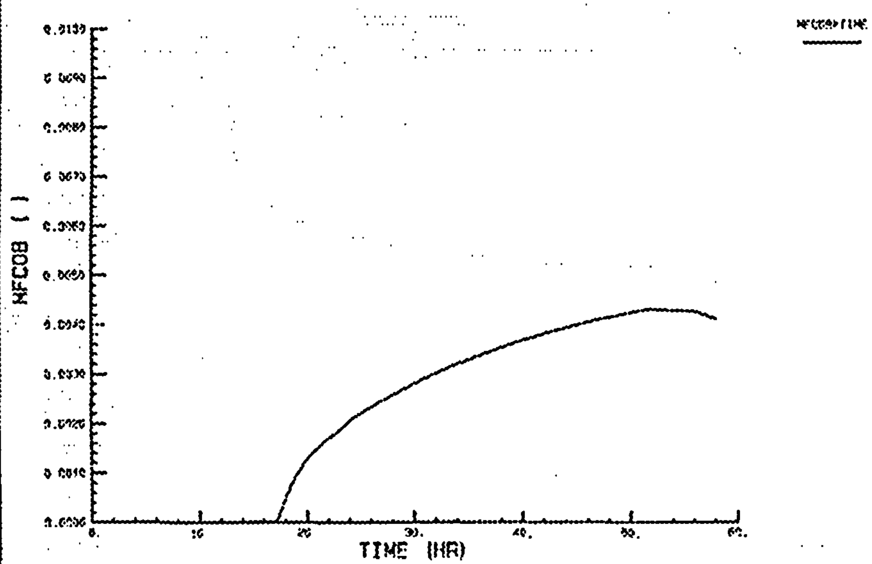

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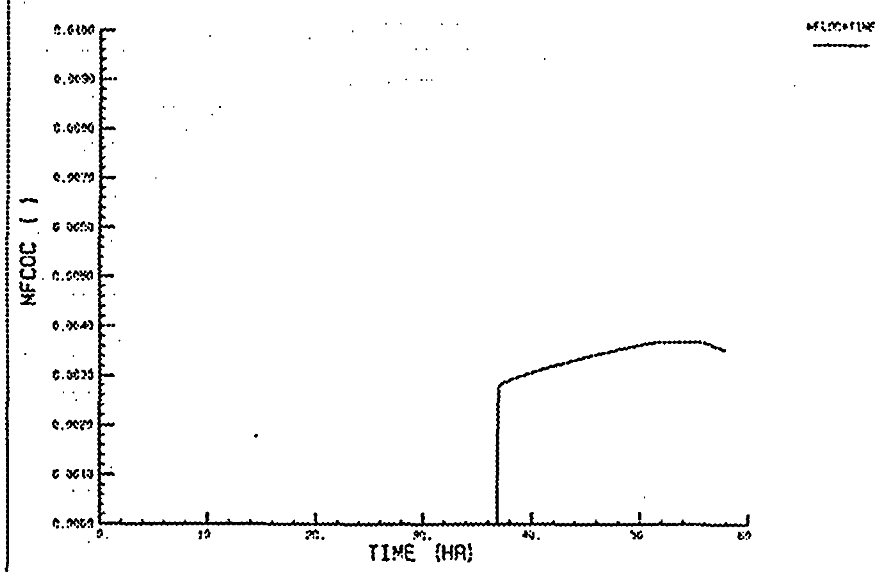

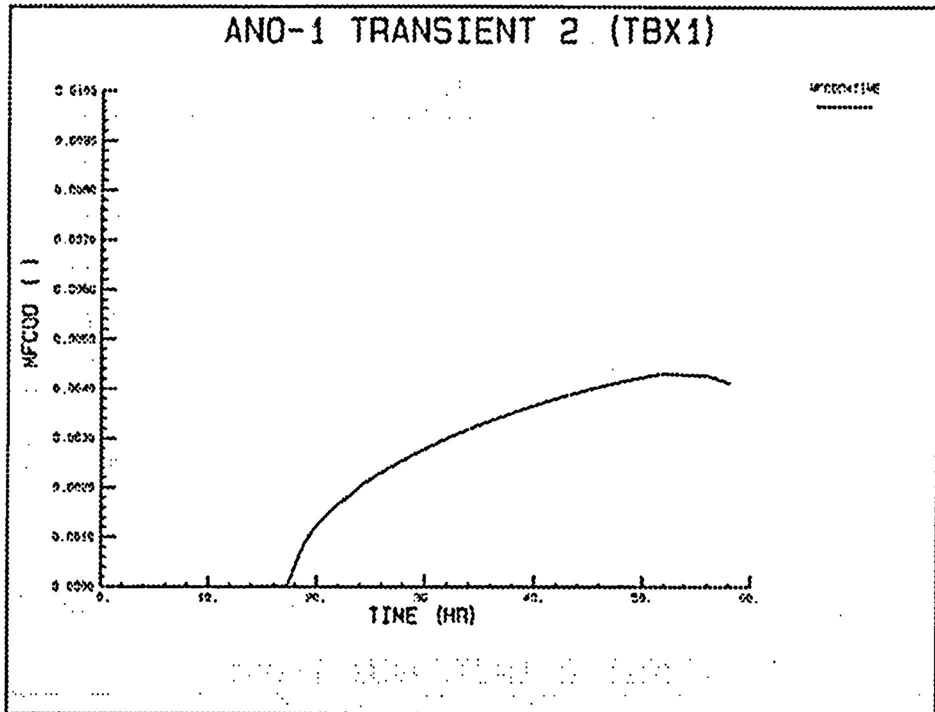
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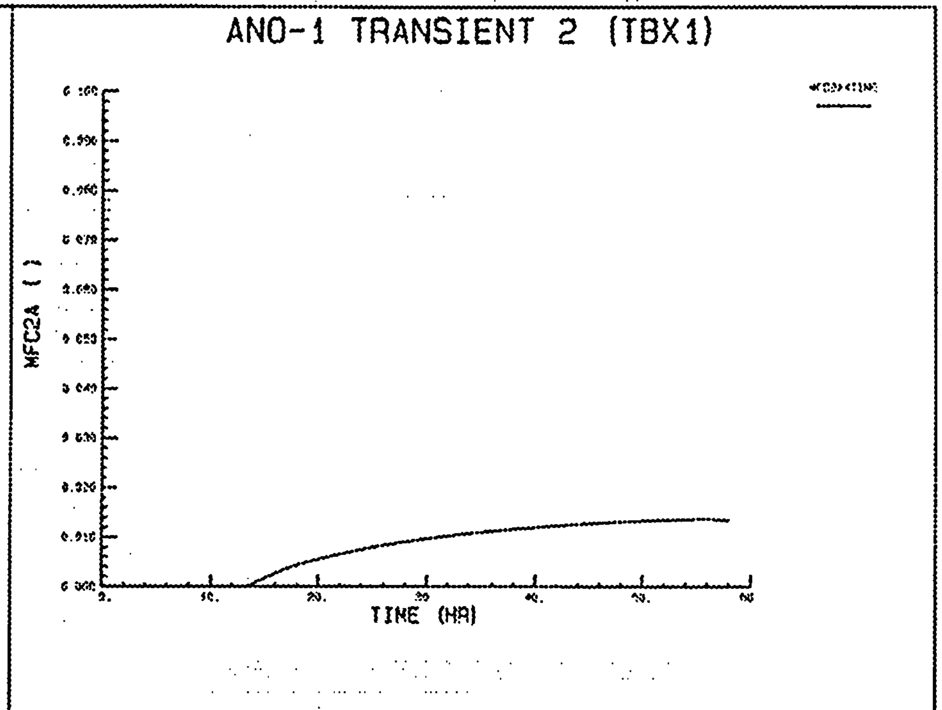
MFC3D ( )
TIME (HR)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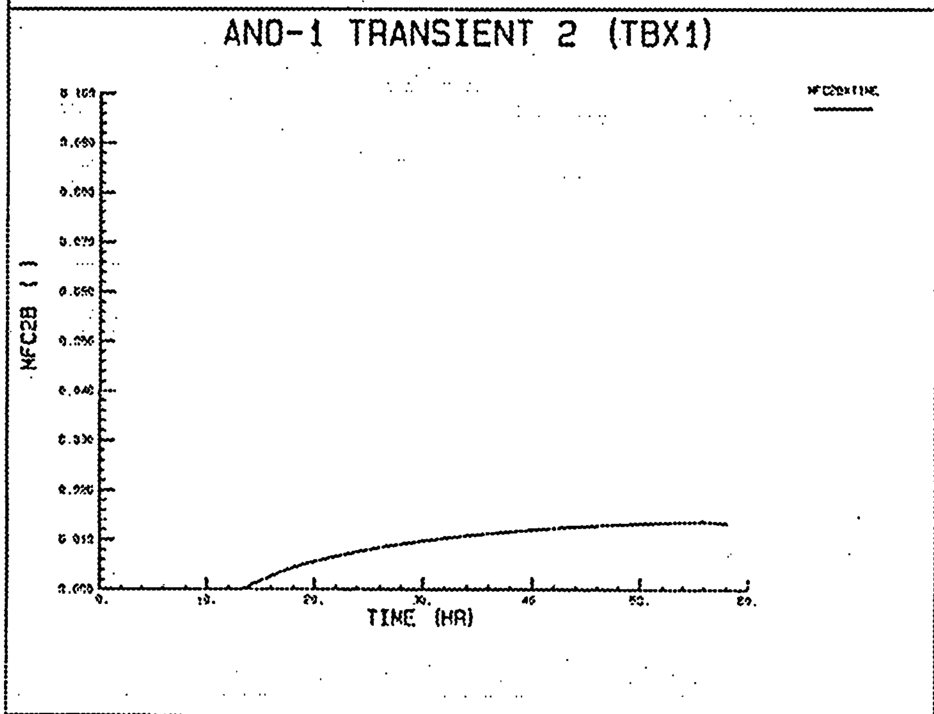
MFC2A ( )
TIME (HR)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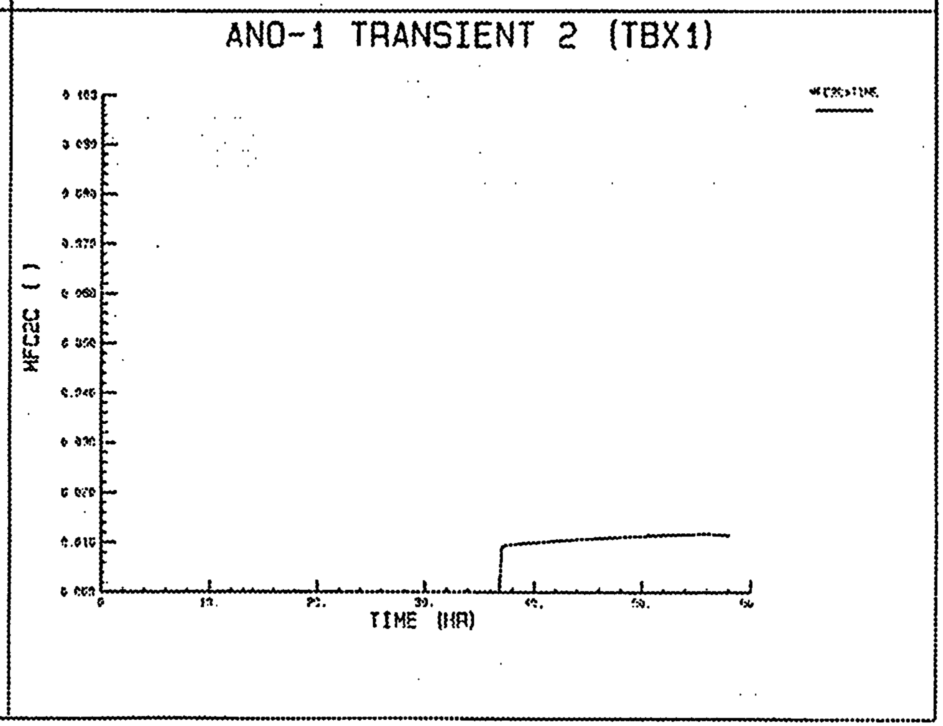
TIME (HR)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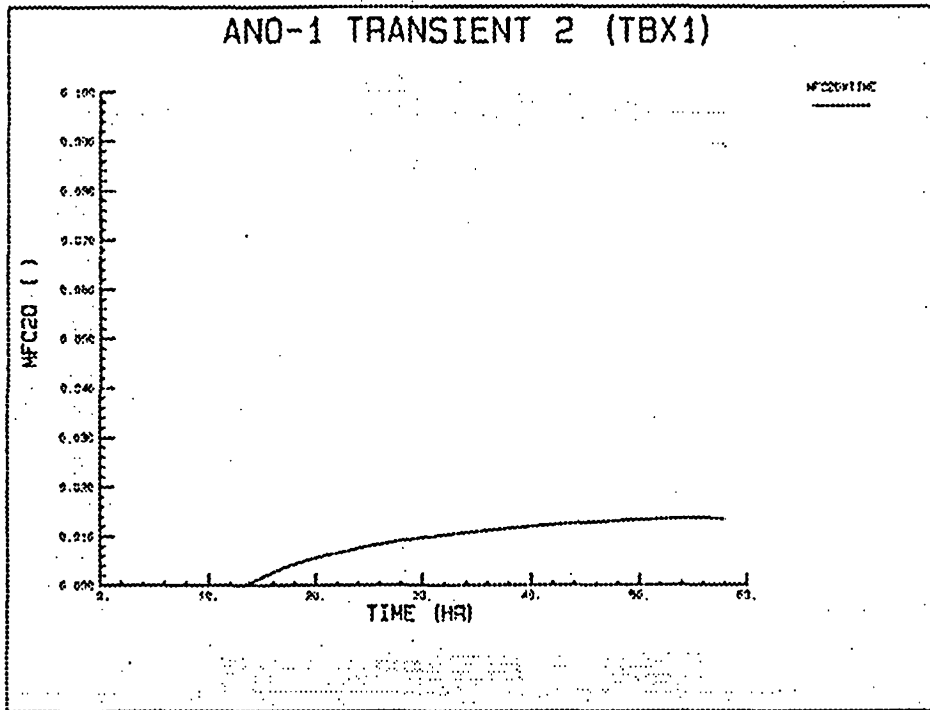
TIME (HR)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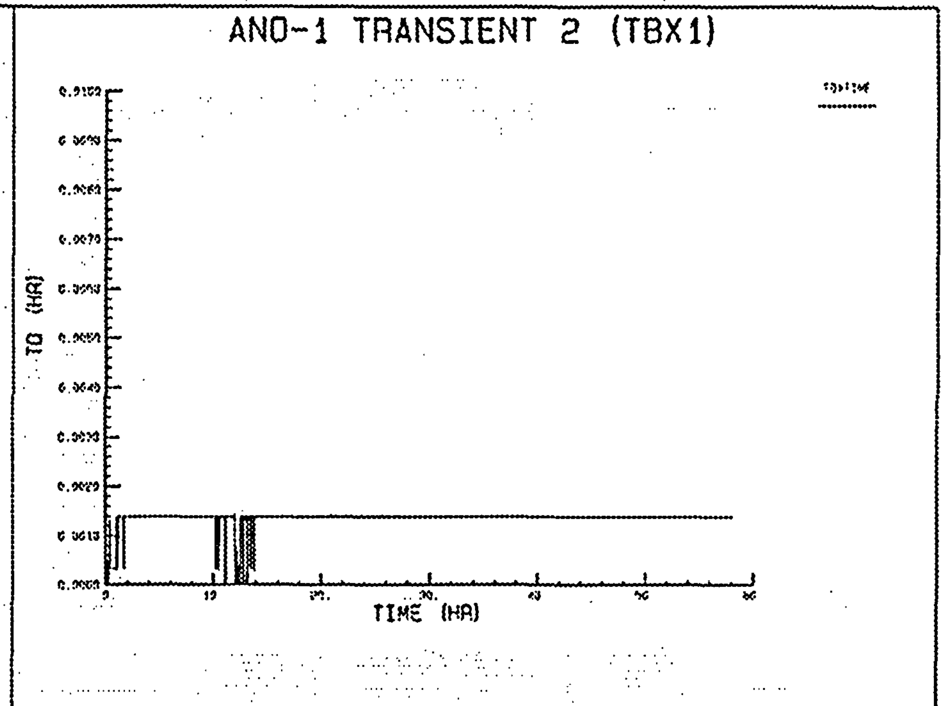
TIME (HR)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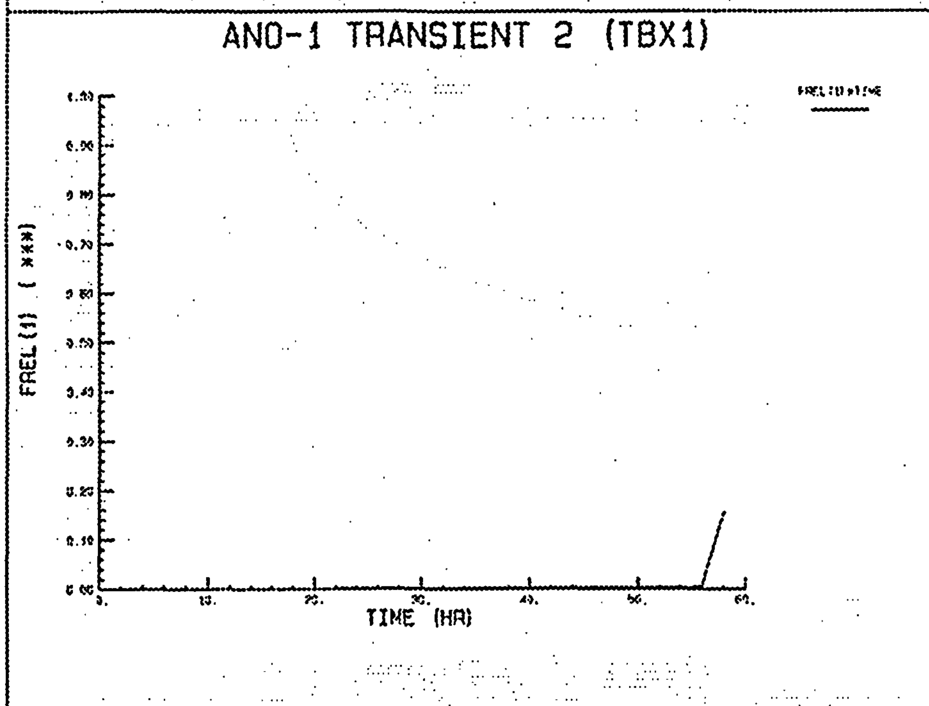
TD (HR)
TIME (HR)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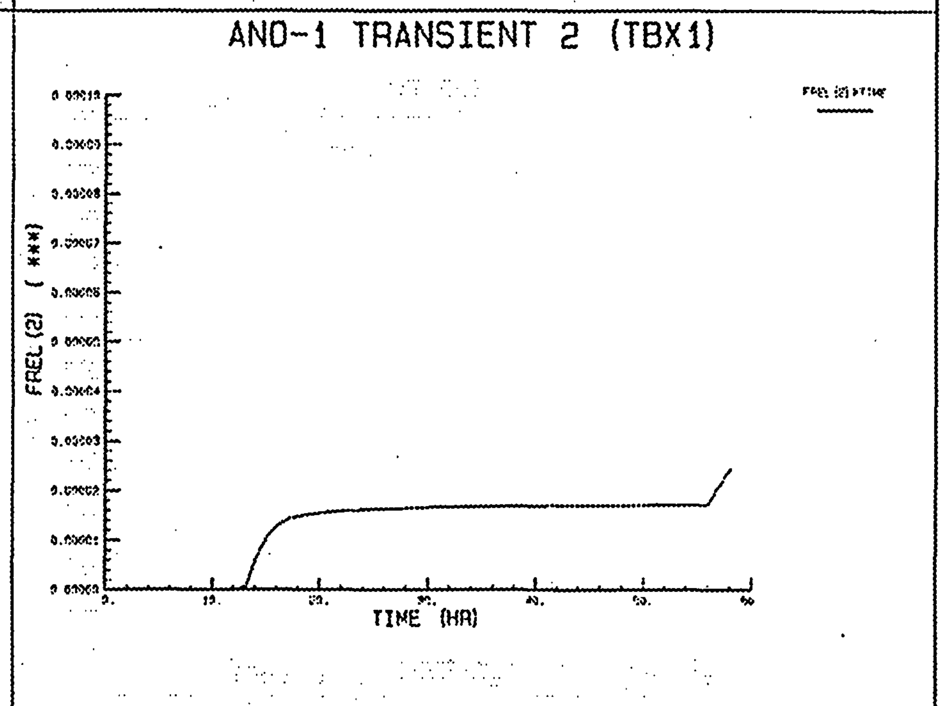
FREL(1) (***)
TIME (HR)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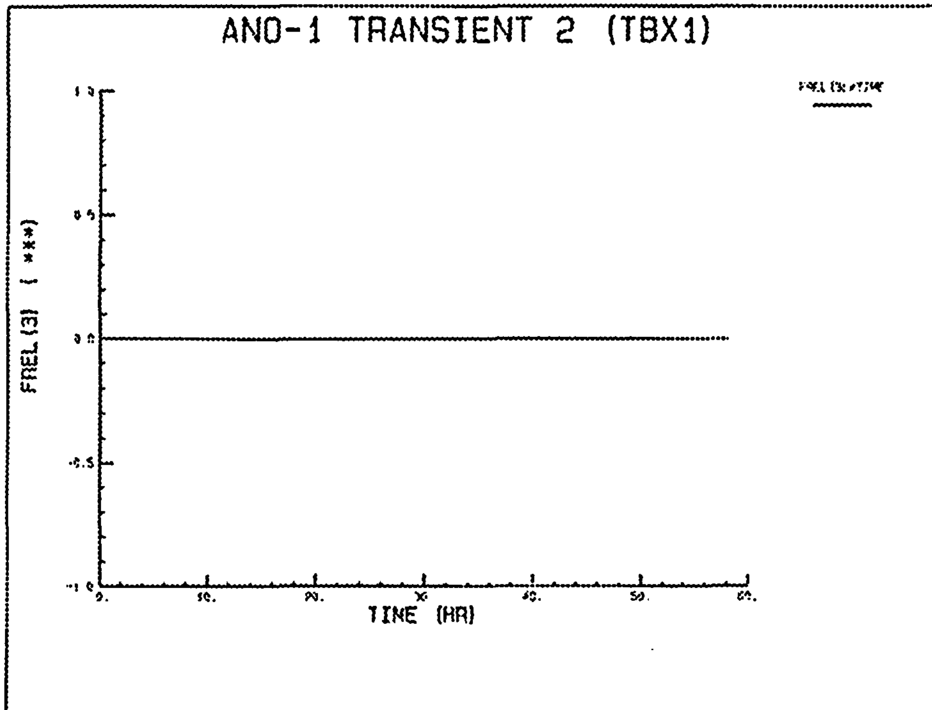

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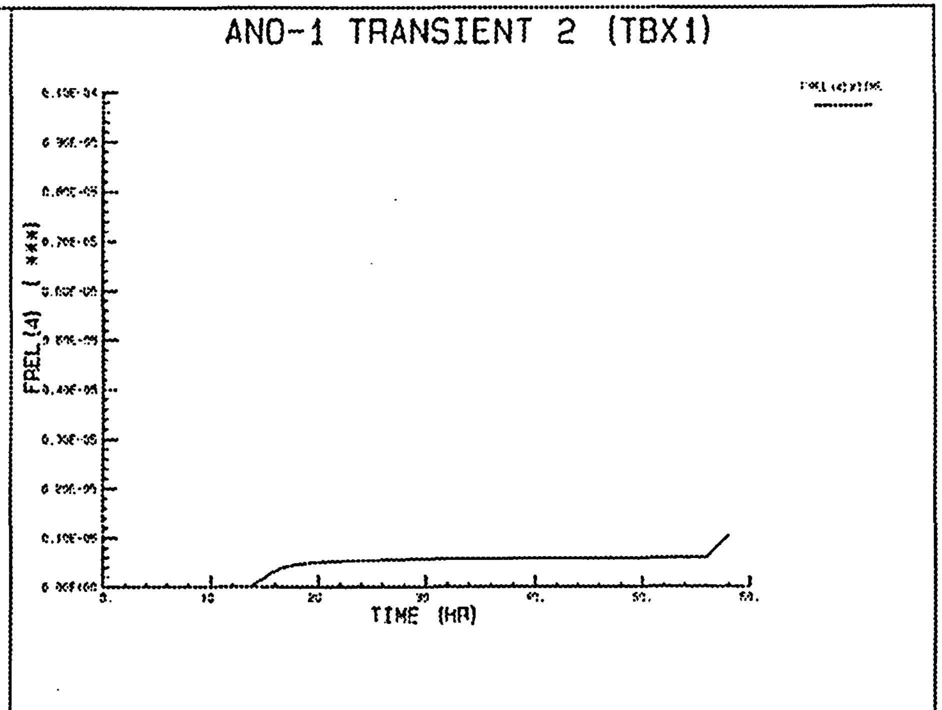
FREL(3) (***)
TIME (HR)



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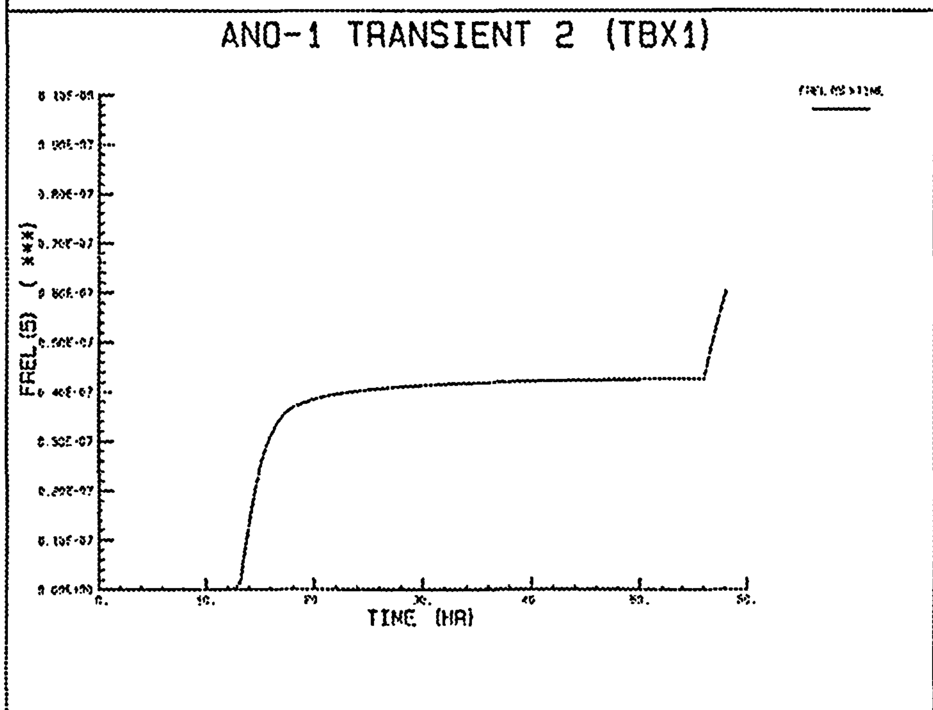
FREL(4) (***)
TIME (HR)



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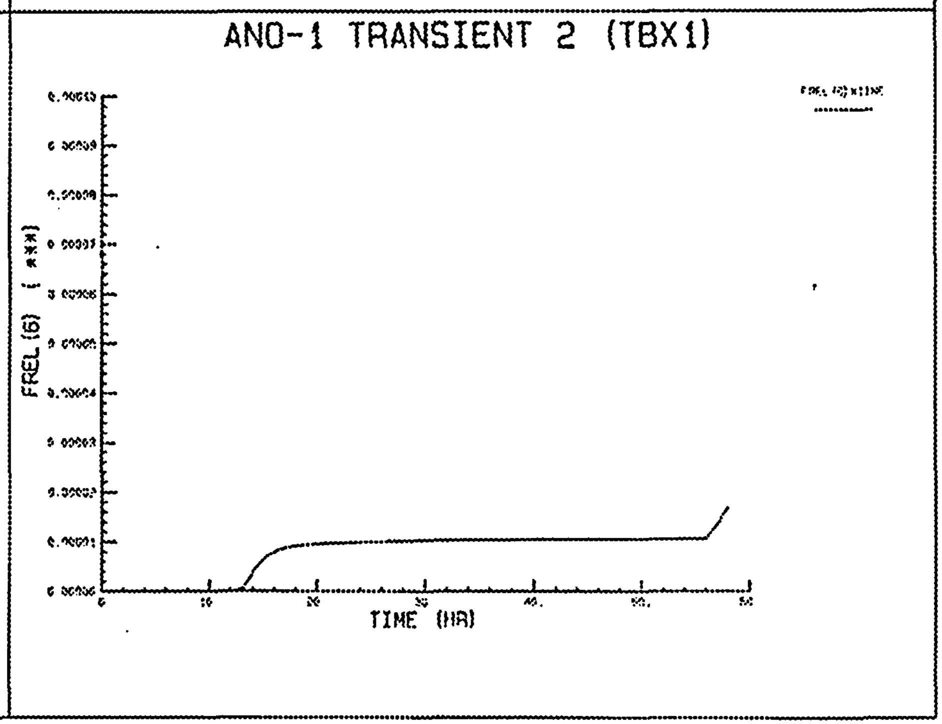
FREL(5) (***)
TIME (HR)



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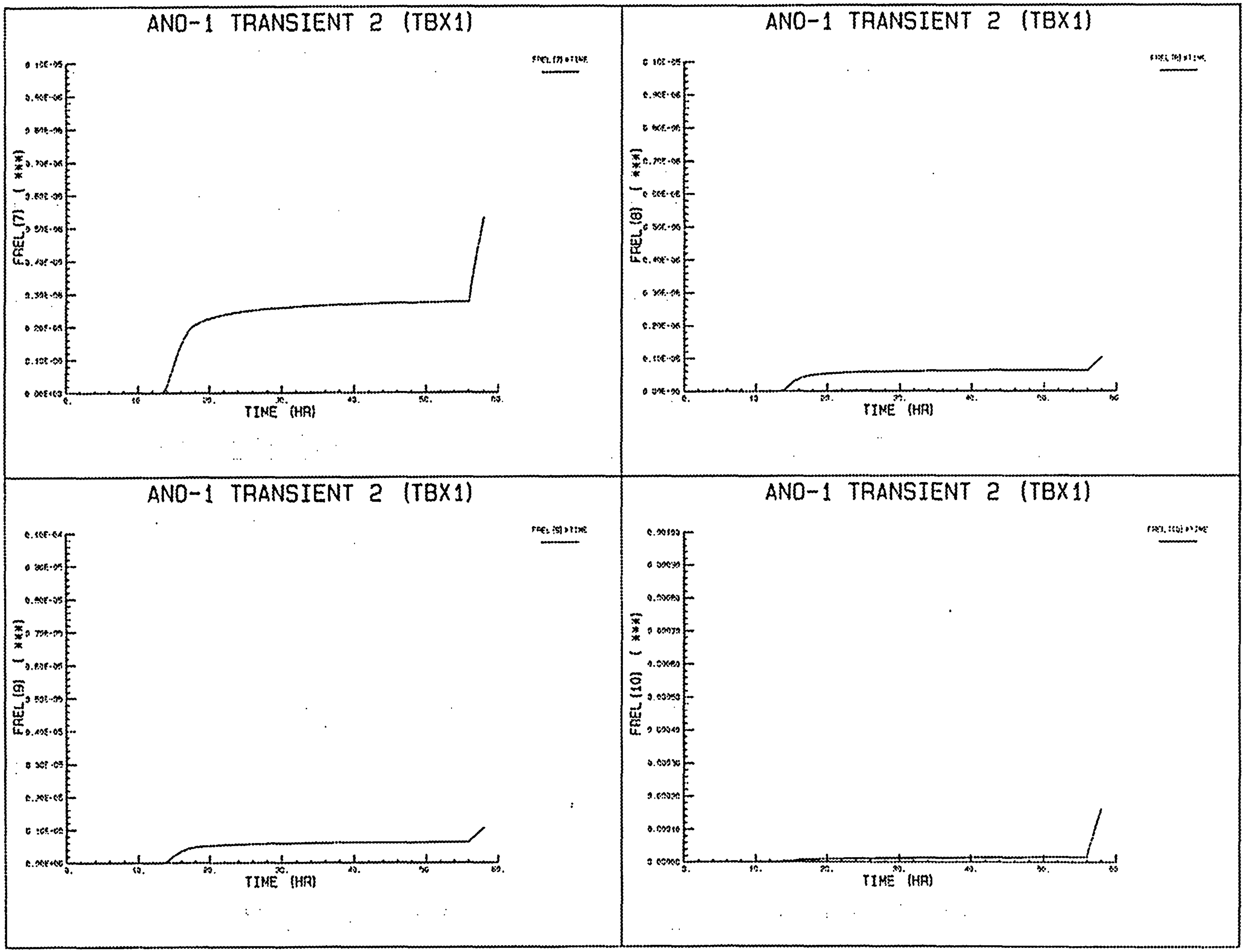
FREL(6) (***)
TIME (HR)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FREL(7) (***)
TIME (HR)
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FREL(8) (***)
TIME (HR)
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FREL(9) (***)
TIME (HR)
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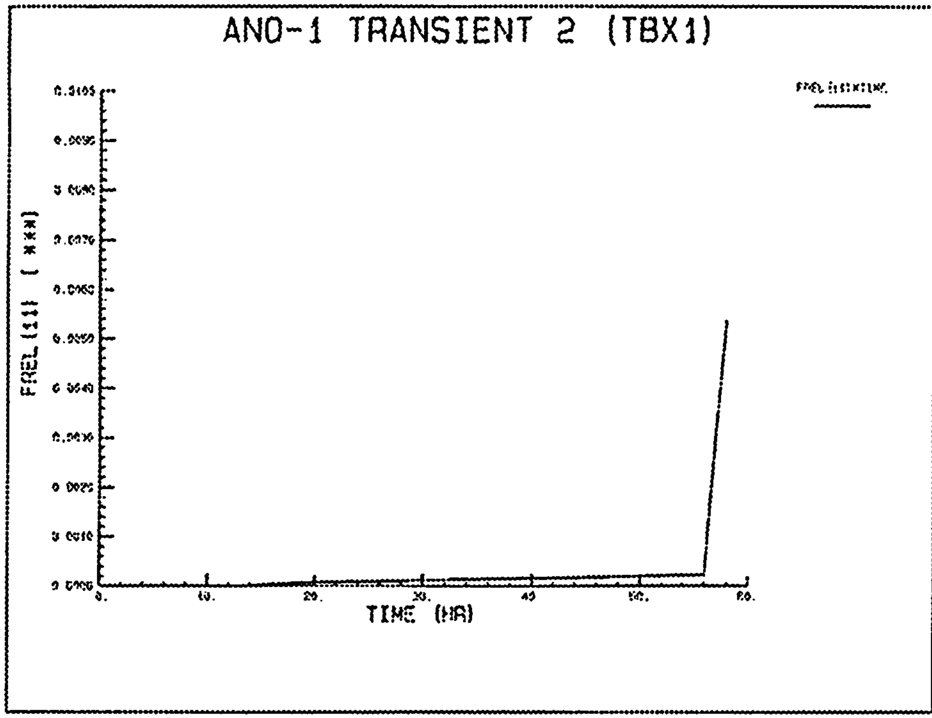
FREL(10) (***)
TIME (HR)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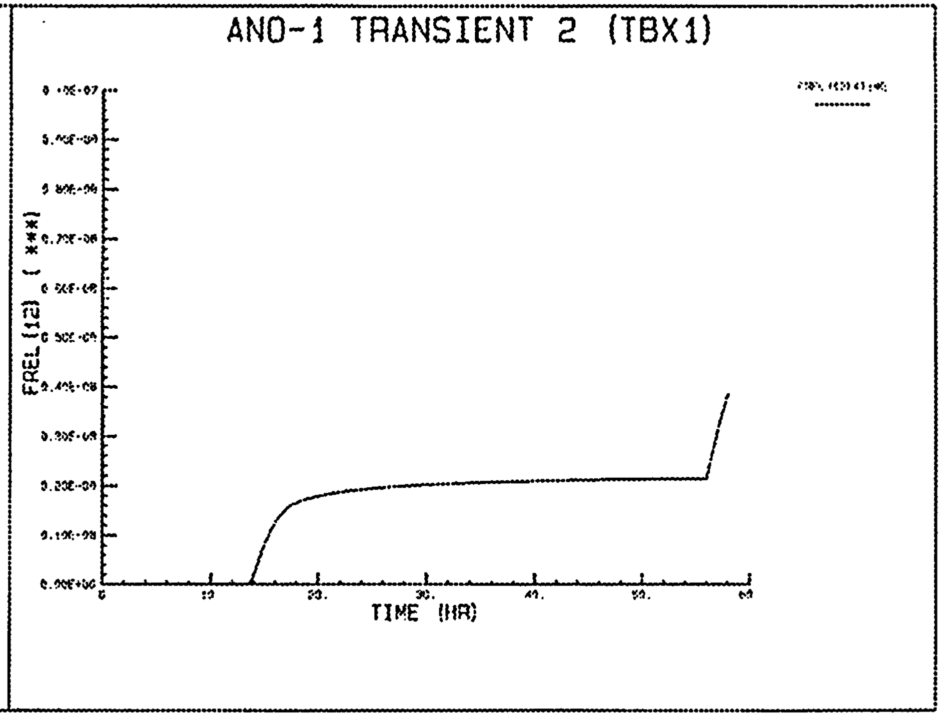
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FREL (12) (***)
TIME (HR)

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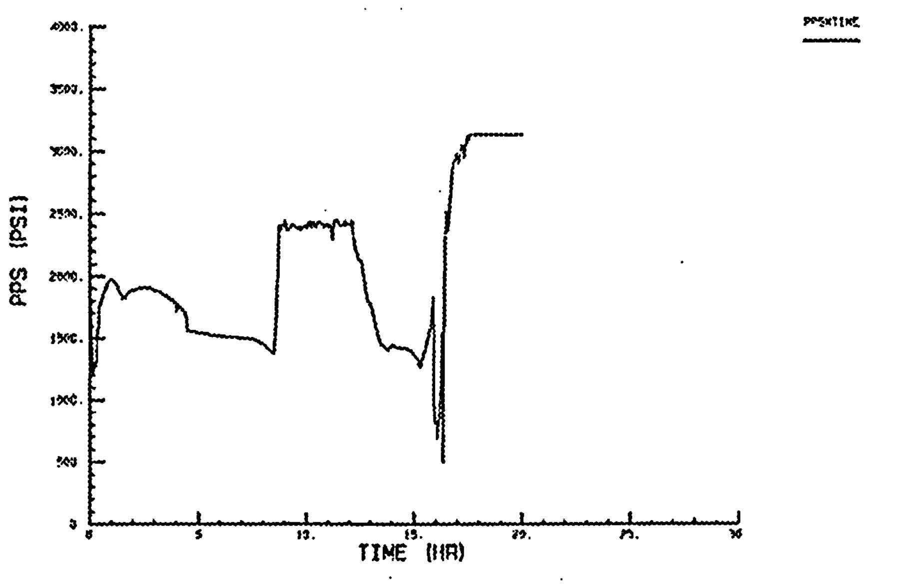

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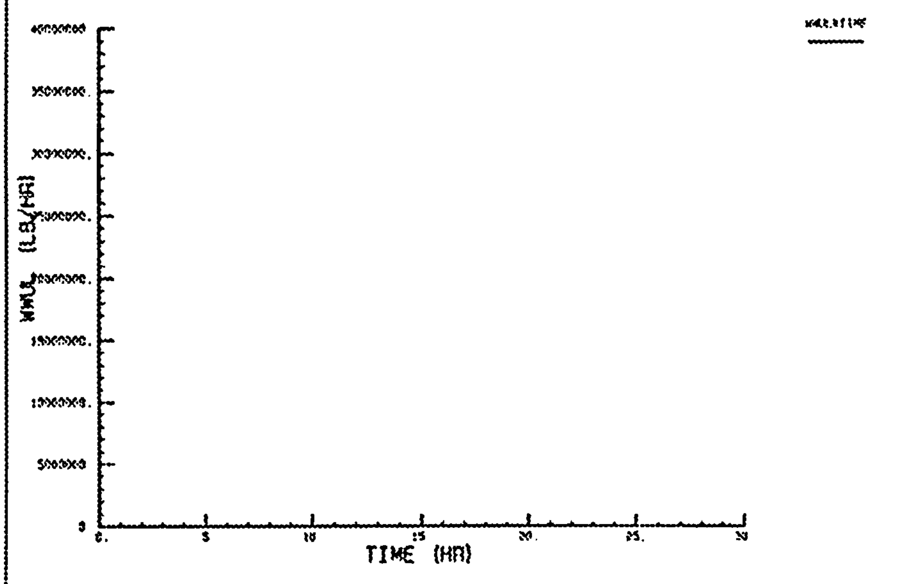

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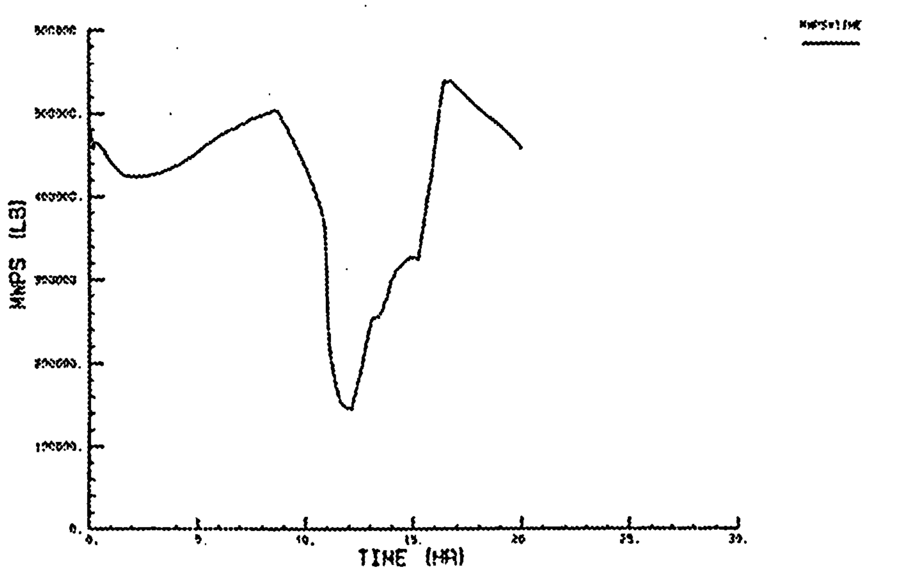

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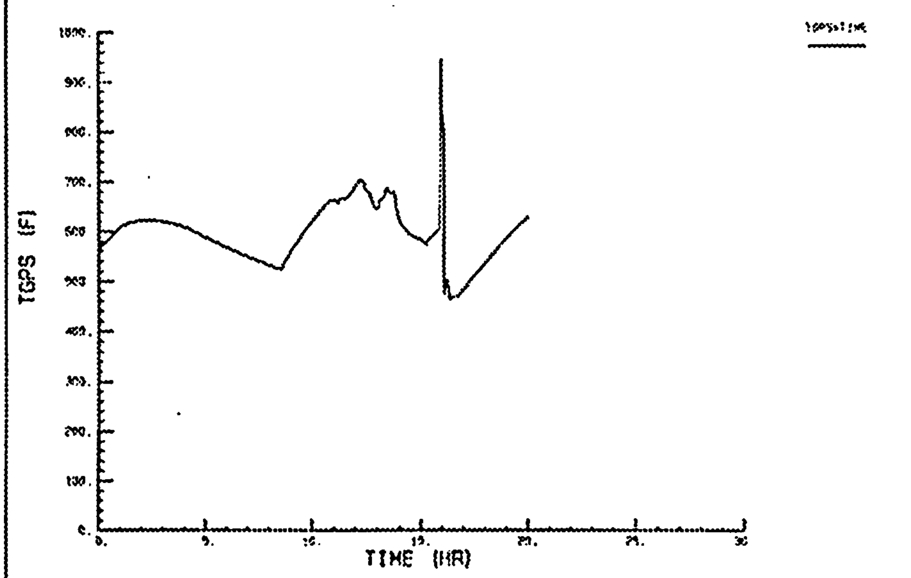

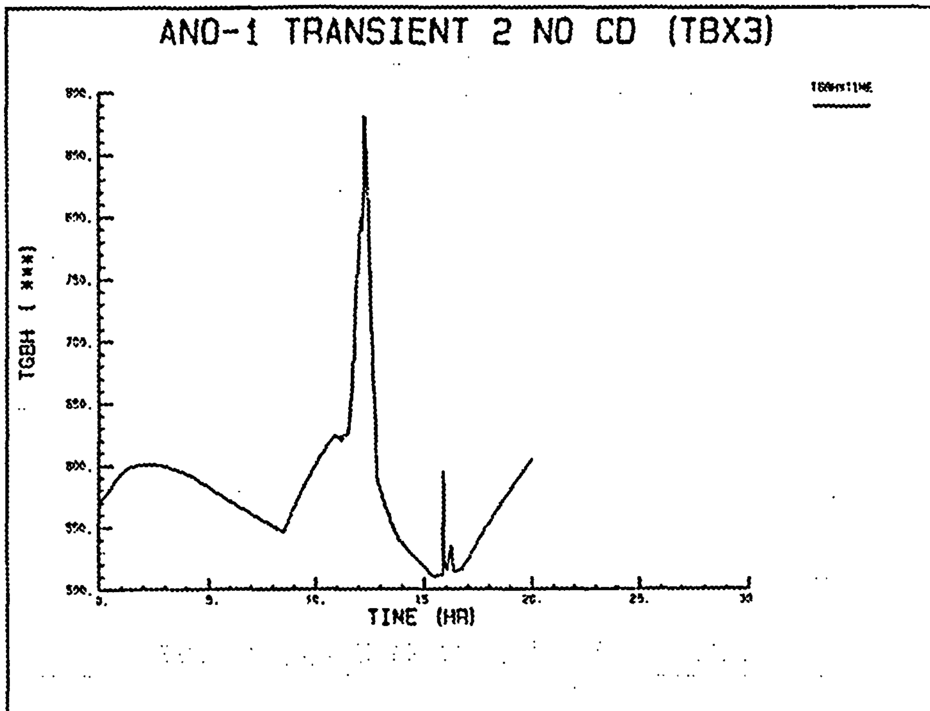
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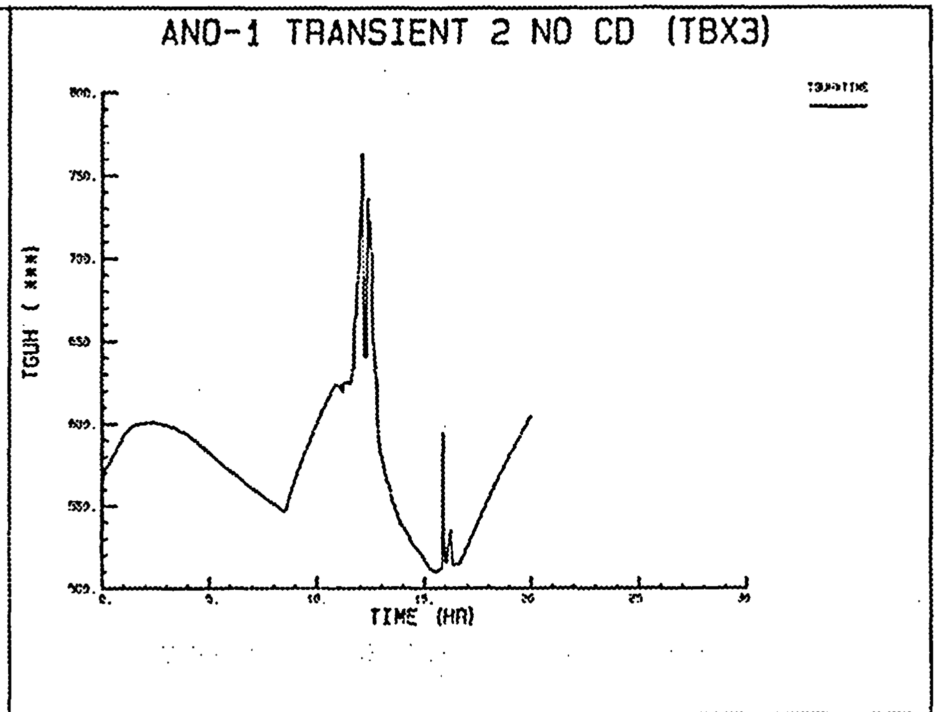
TIME (HR)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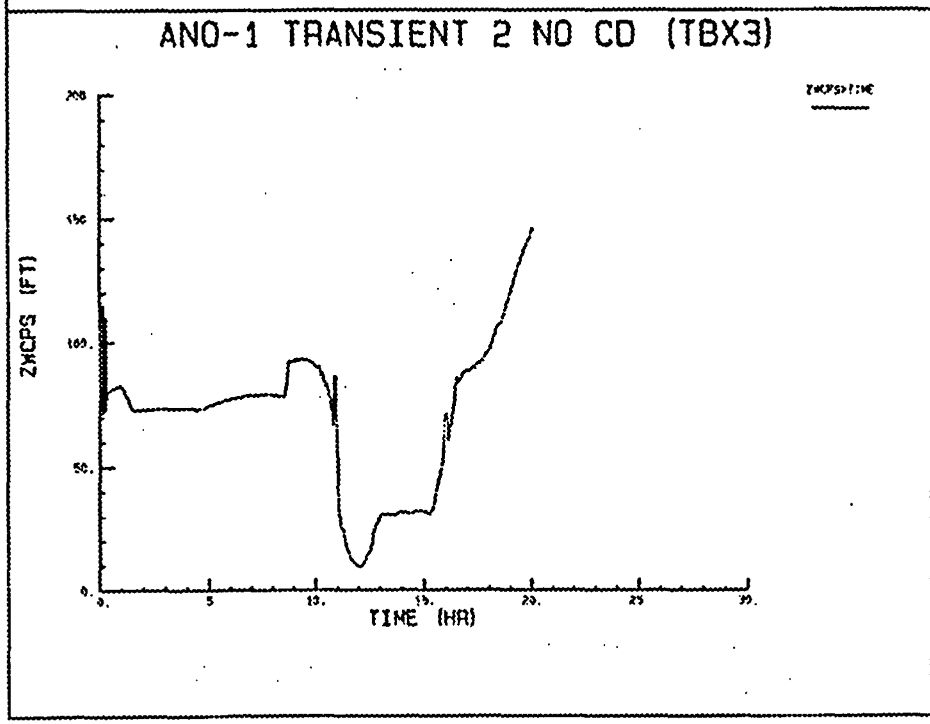
TGUH (***)
TIME (HR)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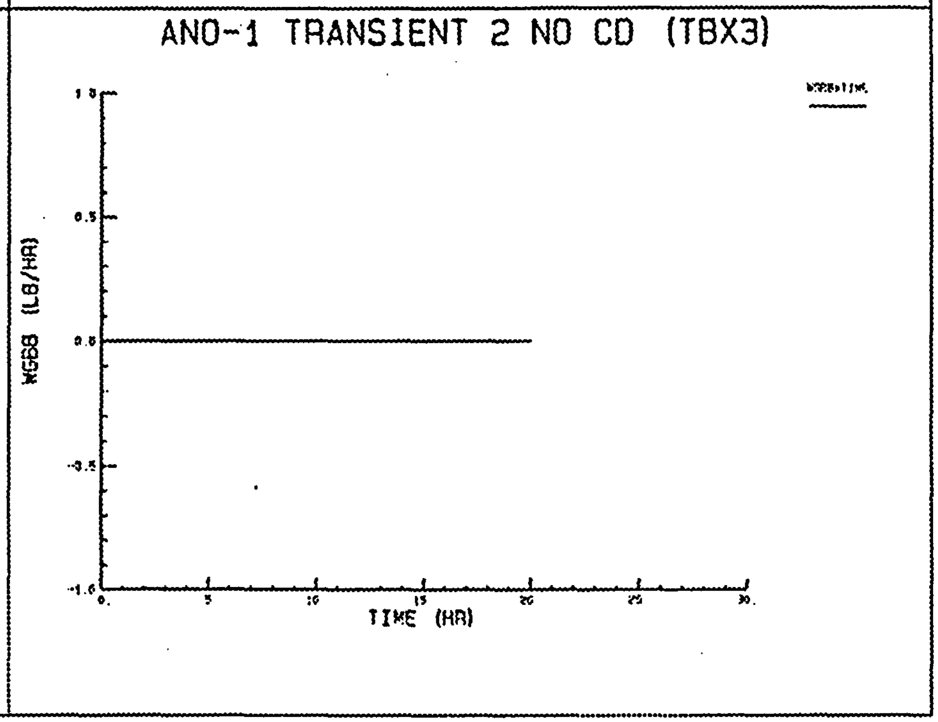
ZWCPS (FT)
TIME (HR)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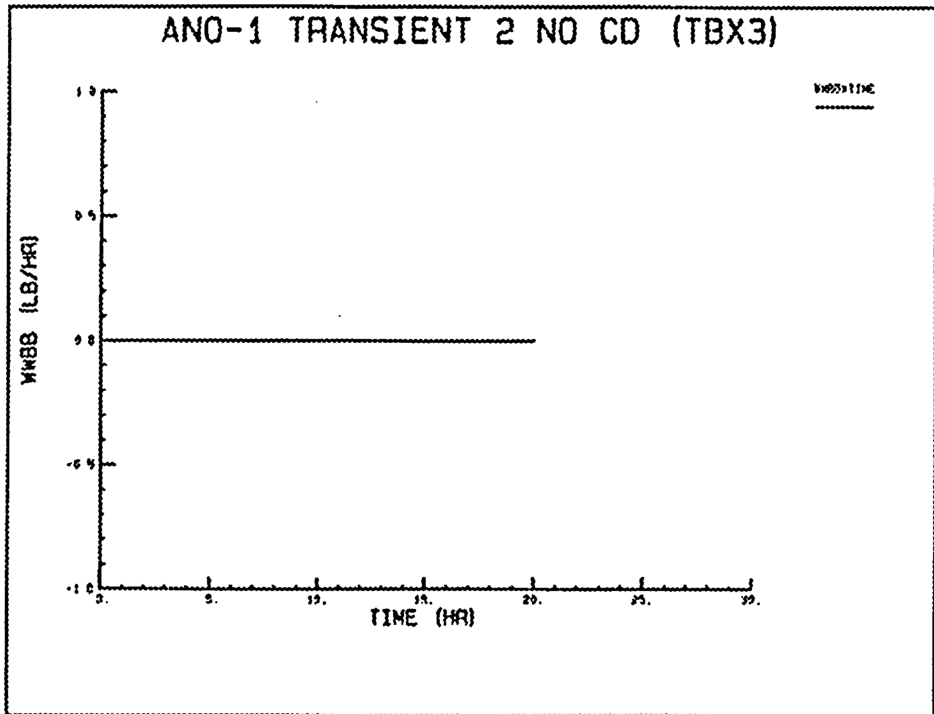
TIME (HR)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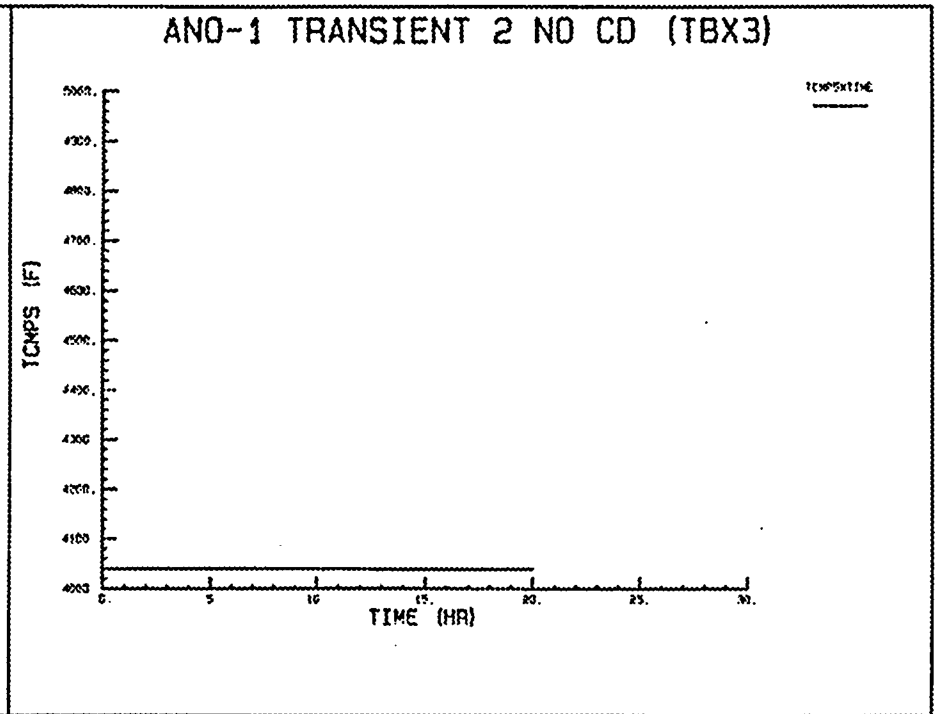
TIME (HR)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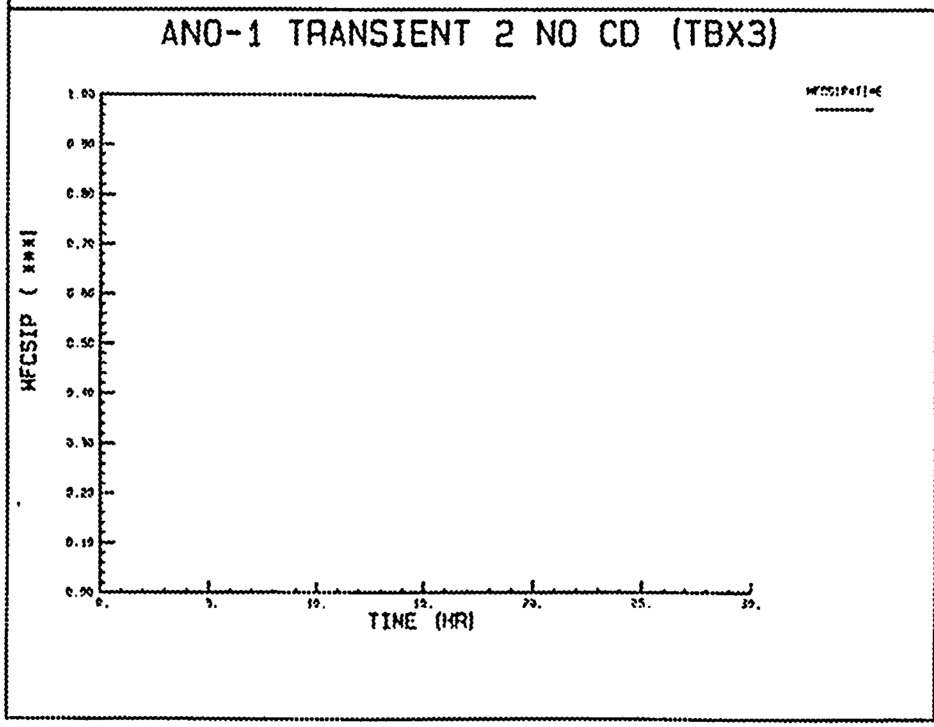
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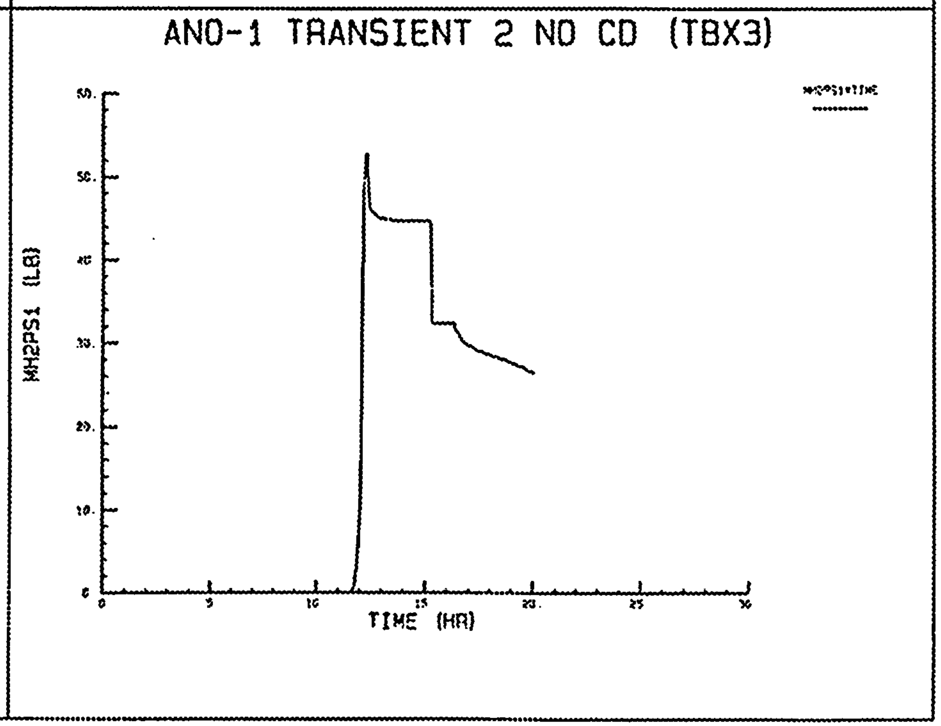
TIME (HR)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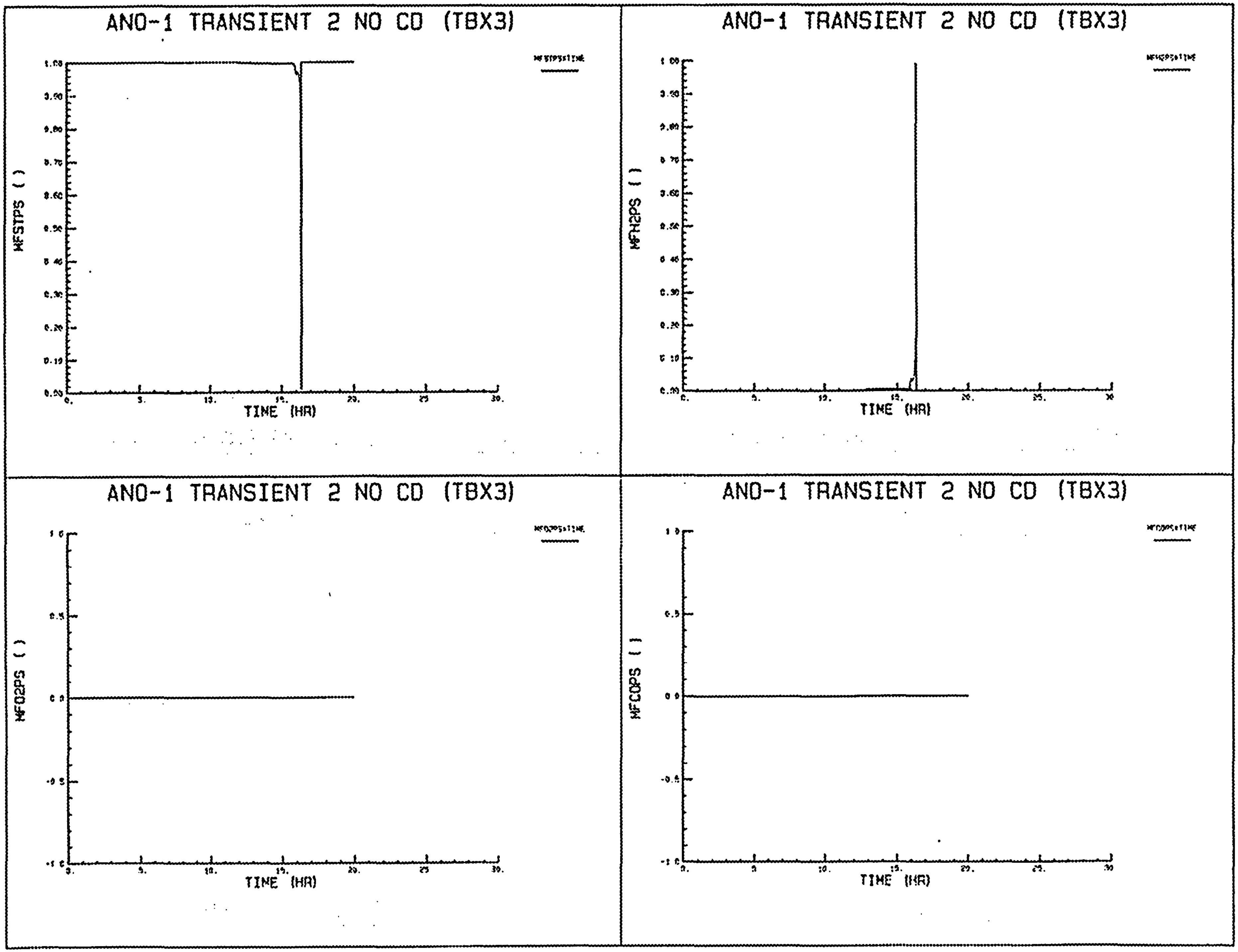
MH2PS1 (LB)
TIME (HR)



ANO-1 TRANSIENT 2 NO CD (TBX3)
MFSTPS ( )
TIME (HR)
ANO-1 TRANSIENT 2 NO CD (TBX3)
MFH2PS ( )
TIME (HR)
ANO-1 TRANSIENT 2 NO CD (TBX3)
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TIME (HR)
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TIME (HR)

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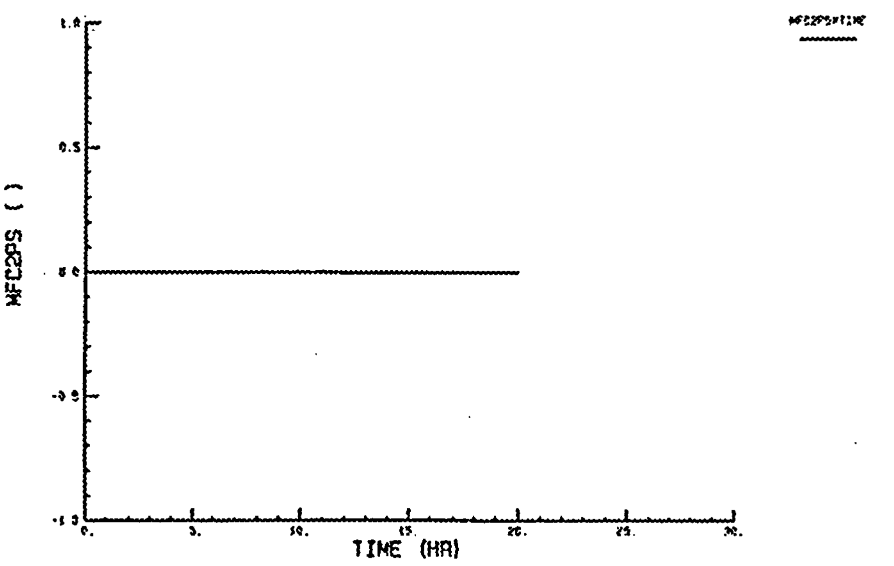

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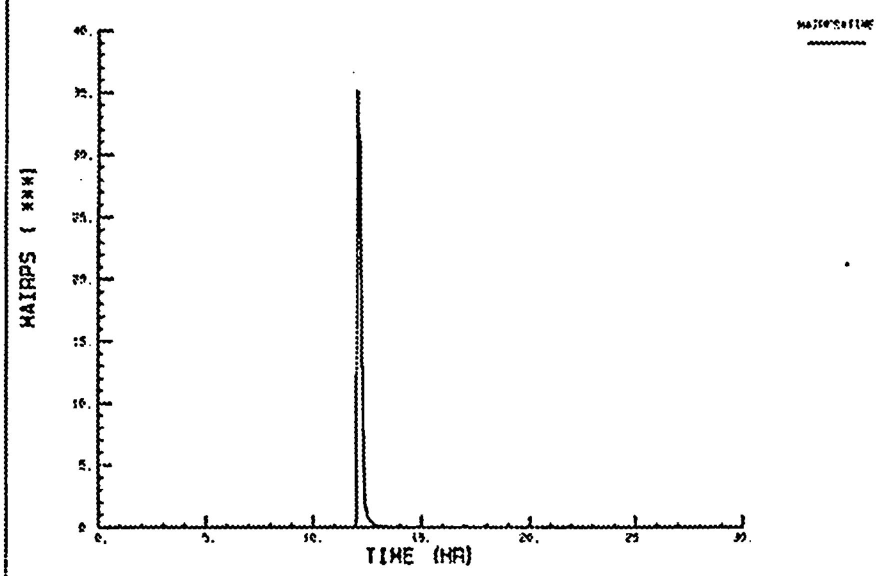

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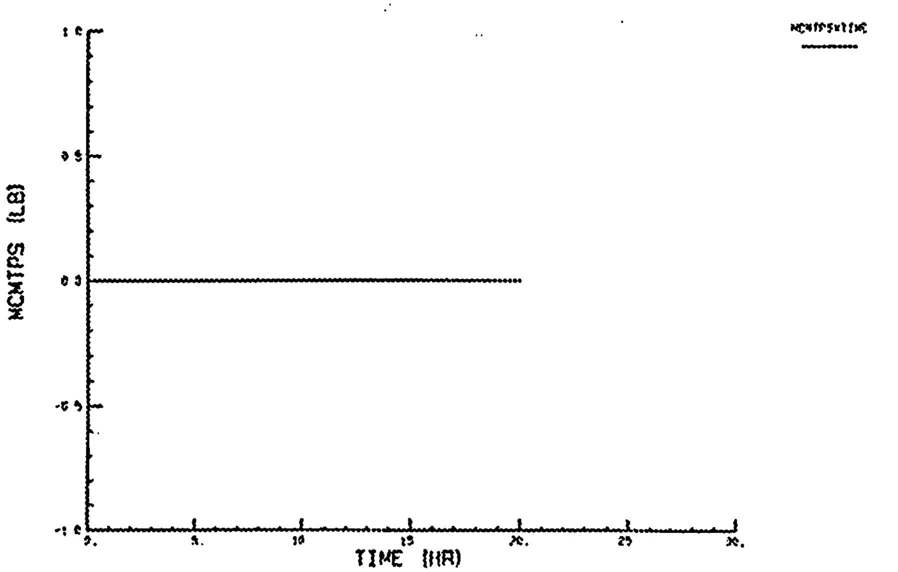

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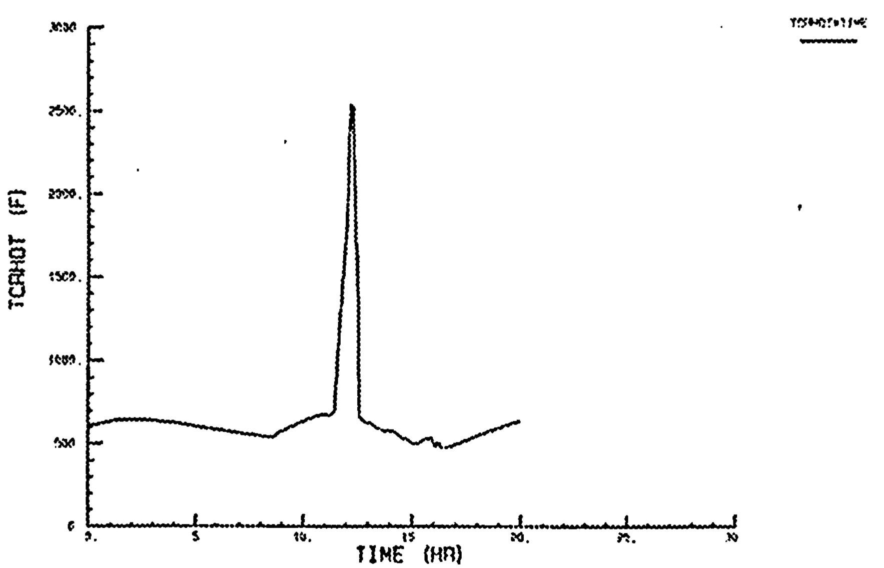

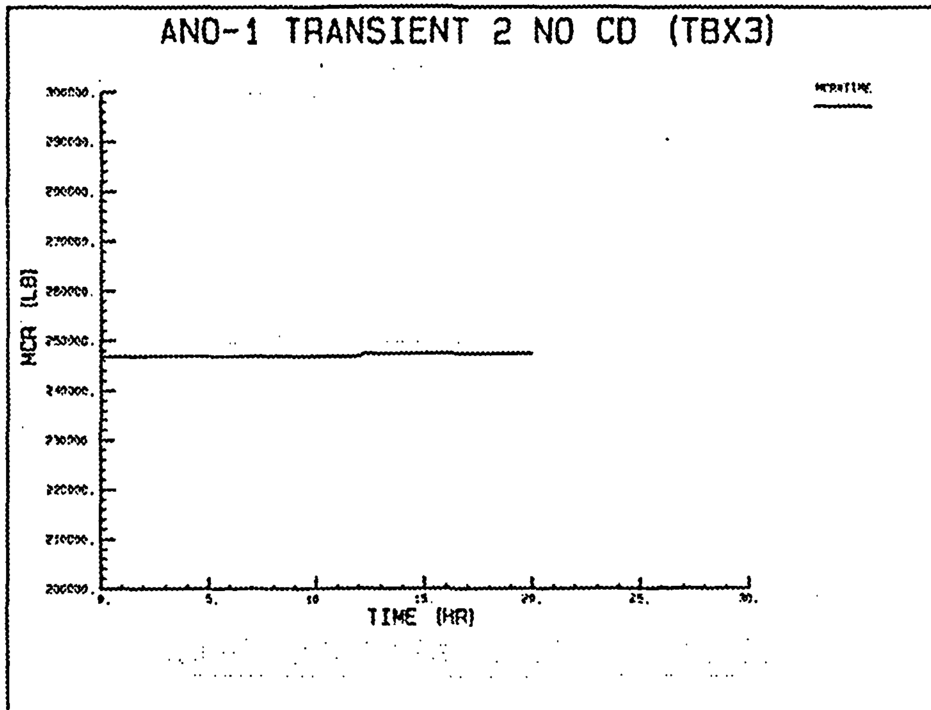
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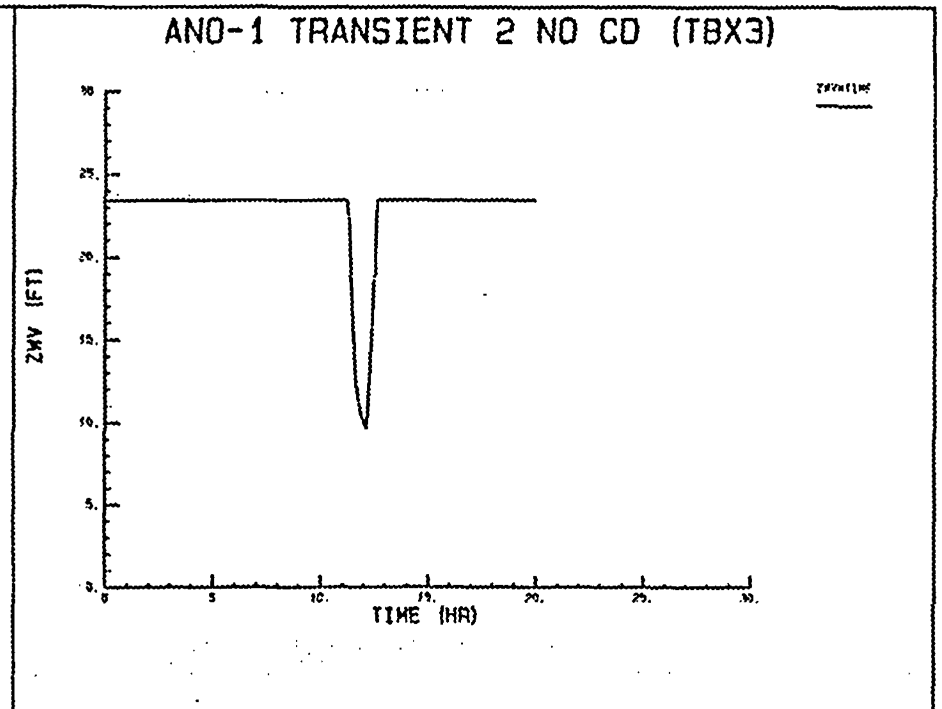
TIME (HR)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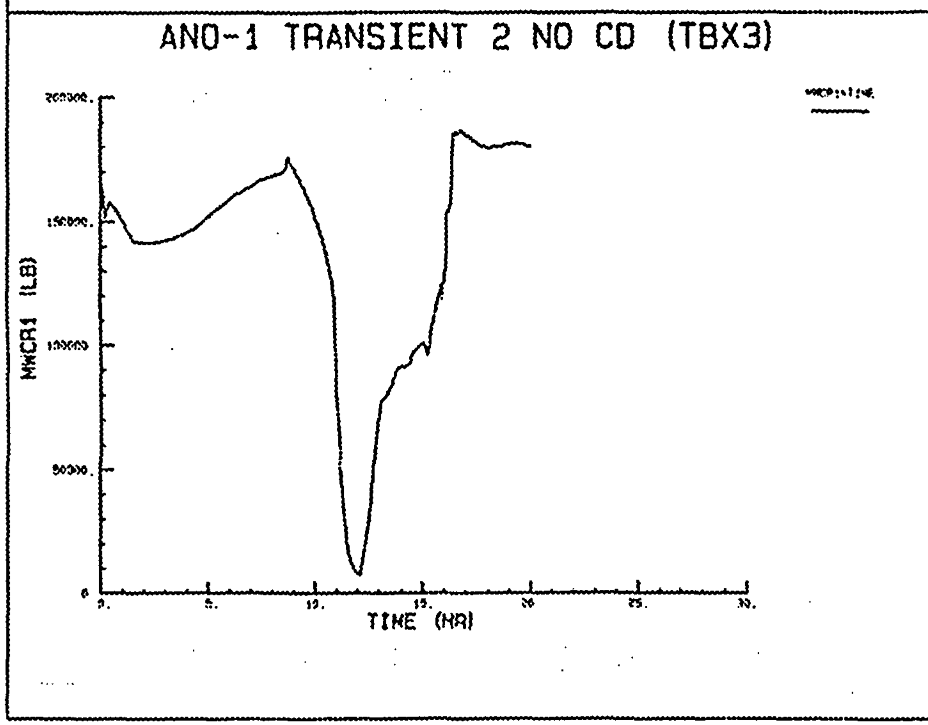
ZWV (FT)
TIME (HR)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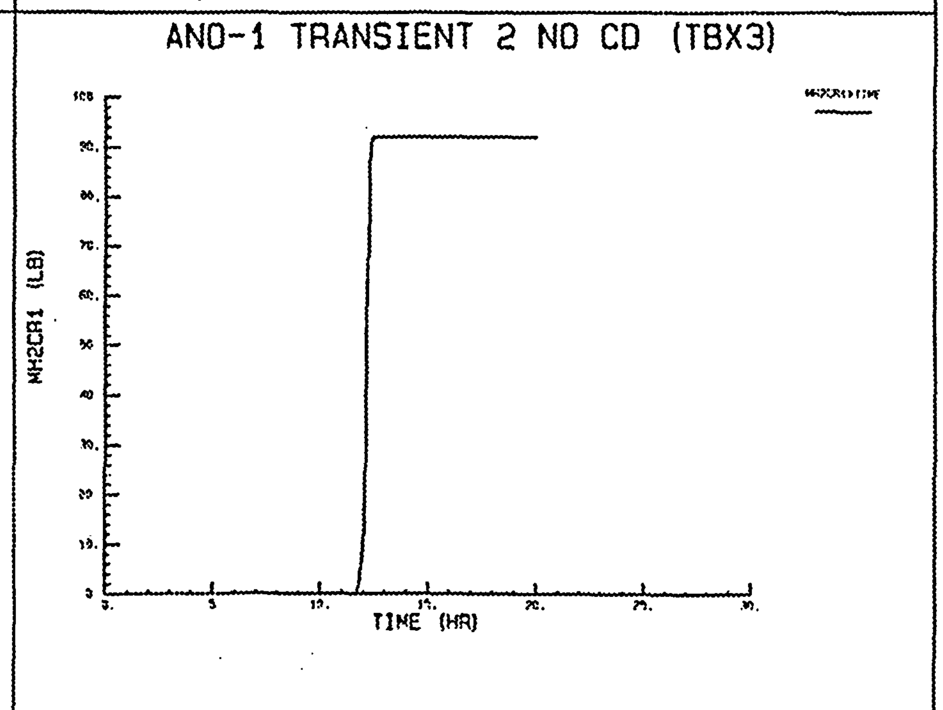
TIME (HR)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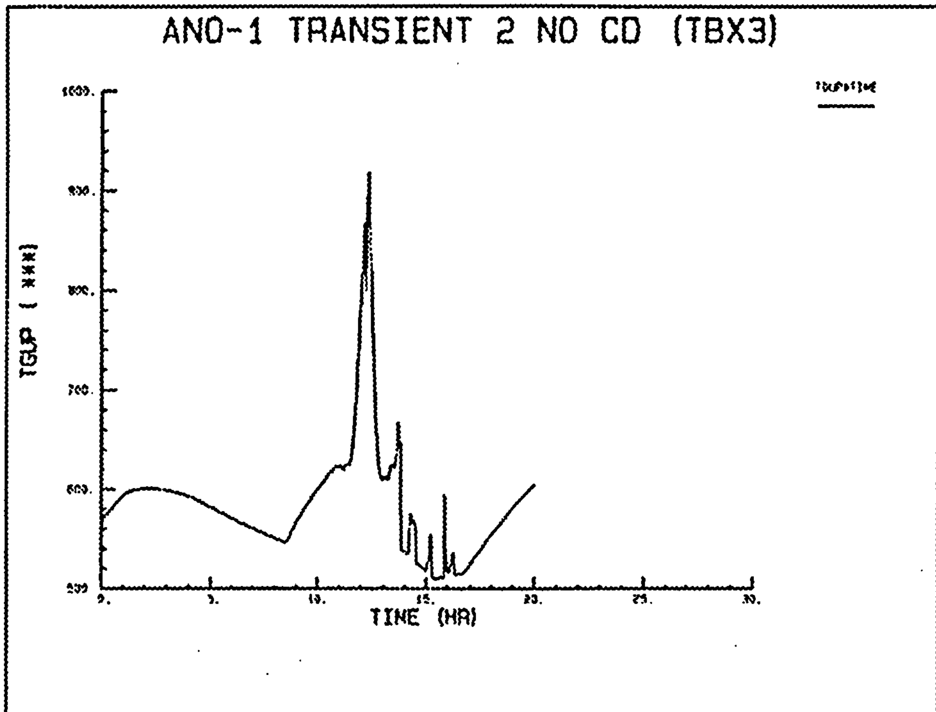
TIME (HR)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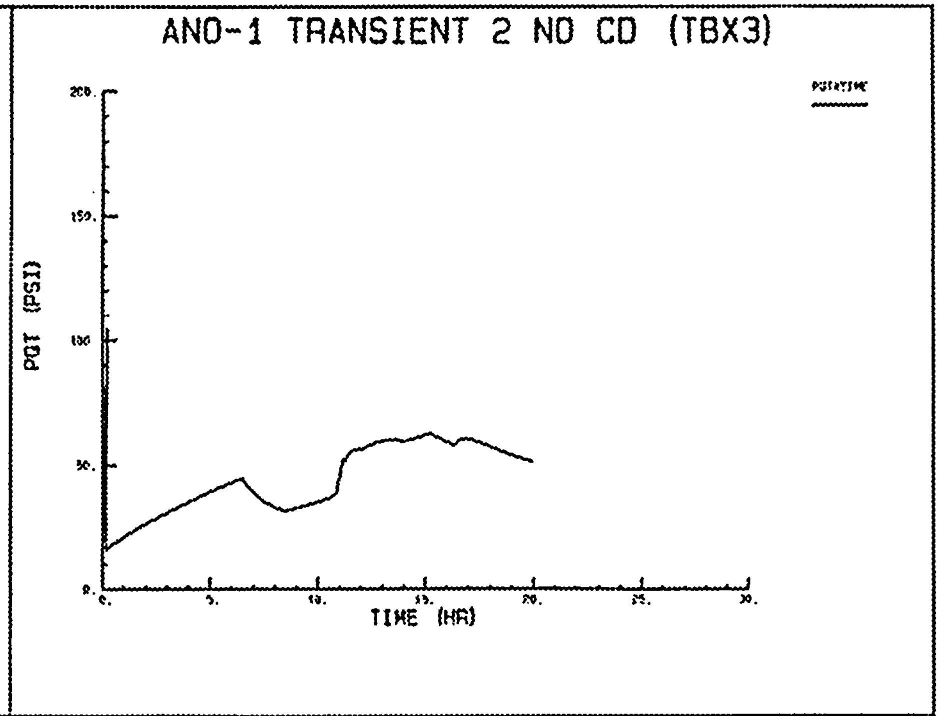
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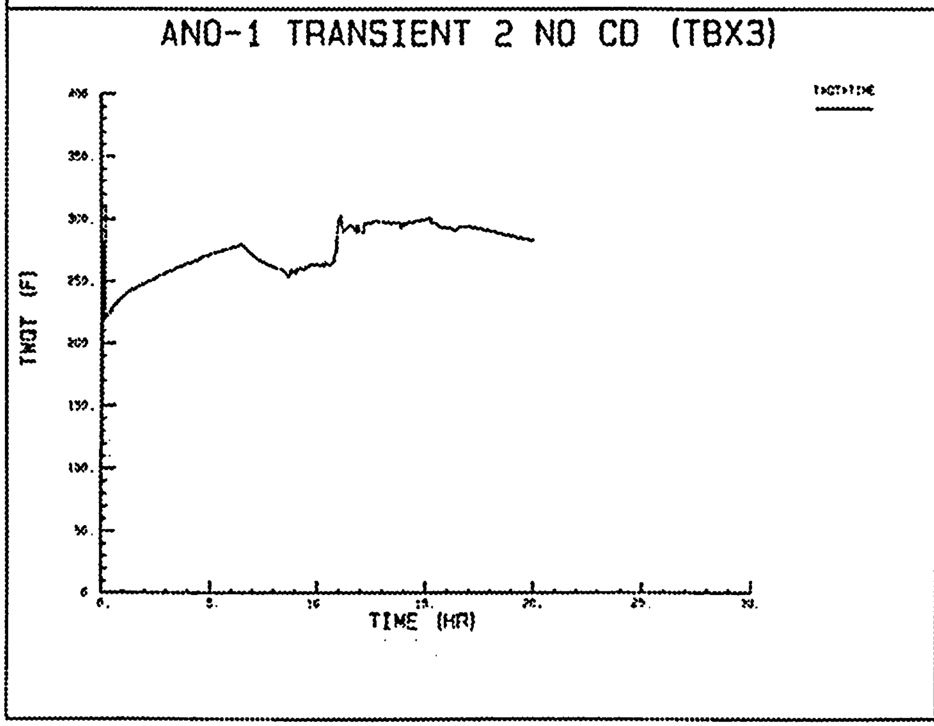
PQT (PSI)
TIME (HR)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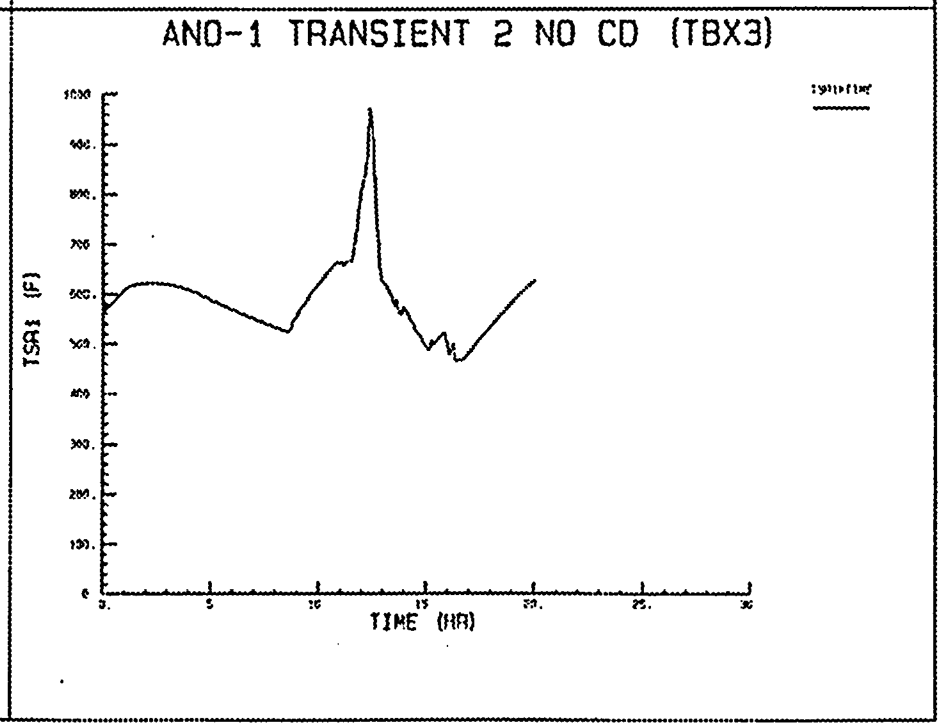
TIME (HR)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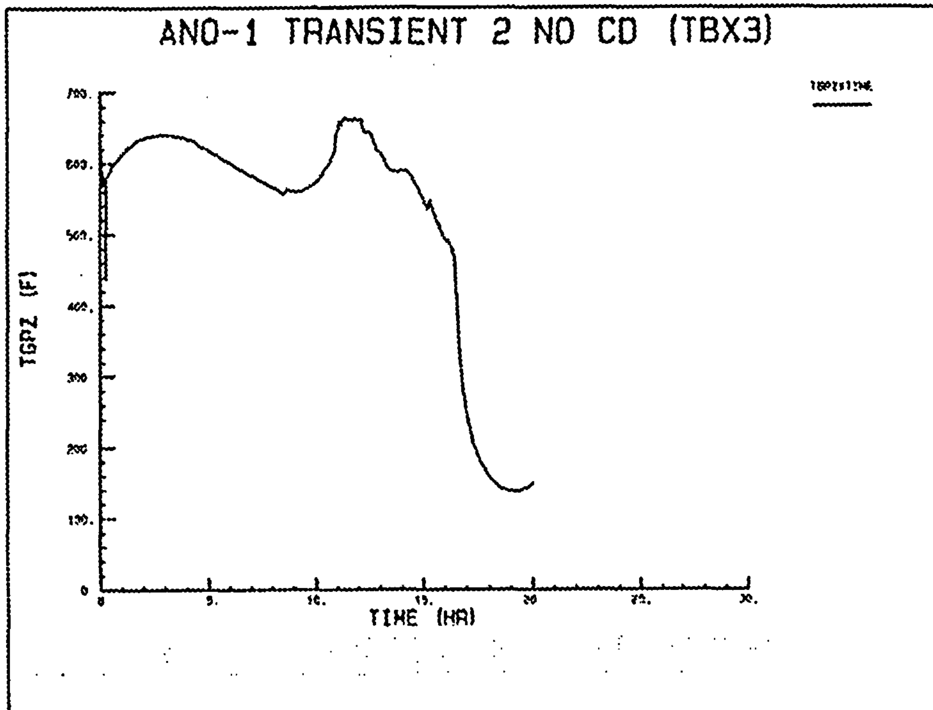
TIME (HR)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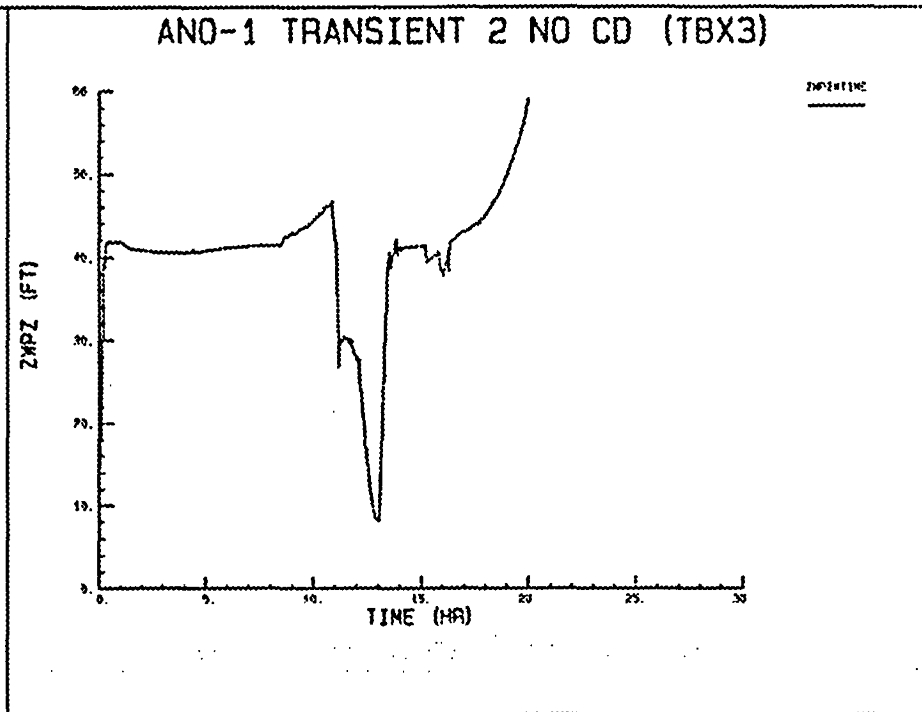
TIME (HR)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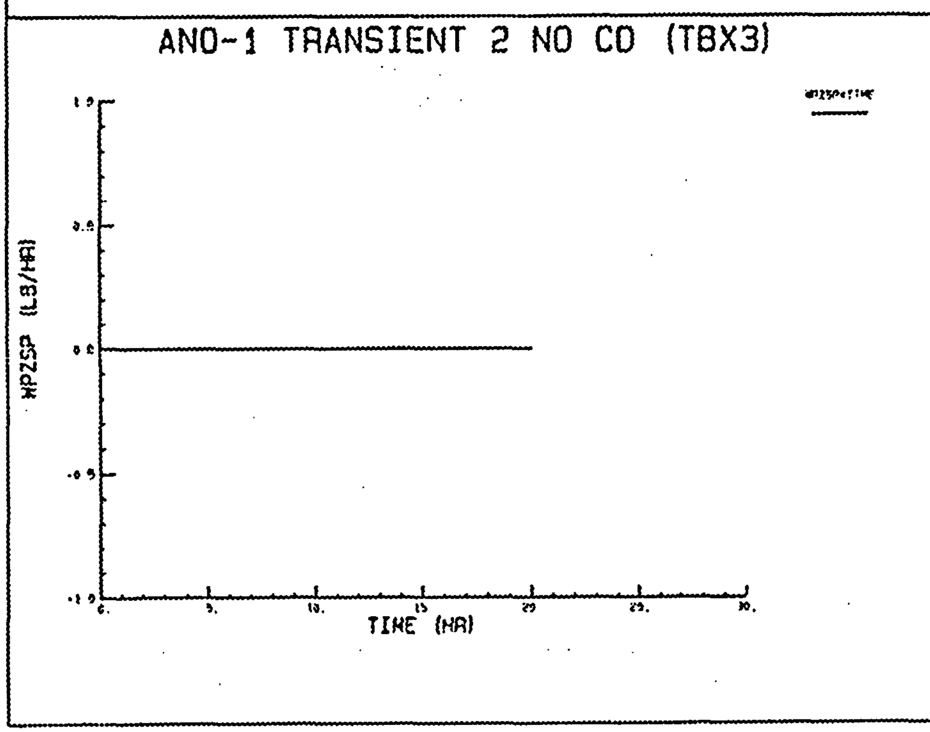
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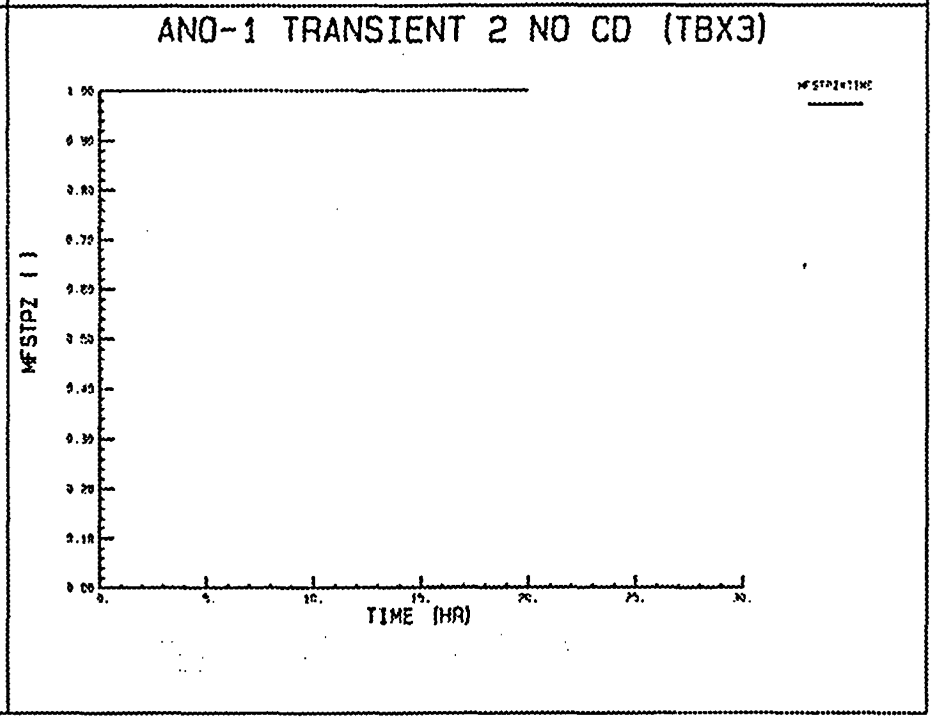
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MFSTPZ ( )
TIME (HR)

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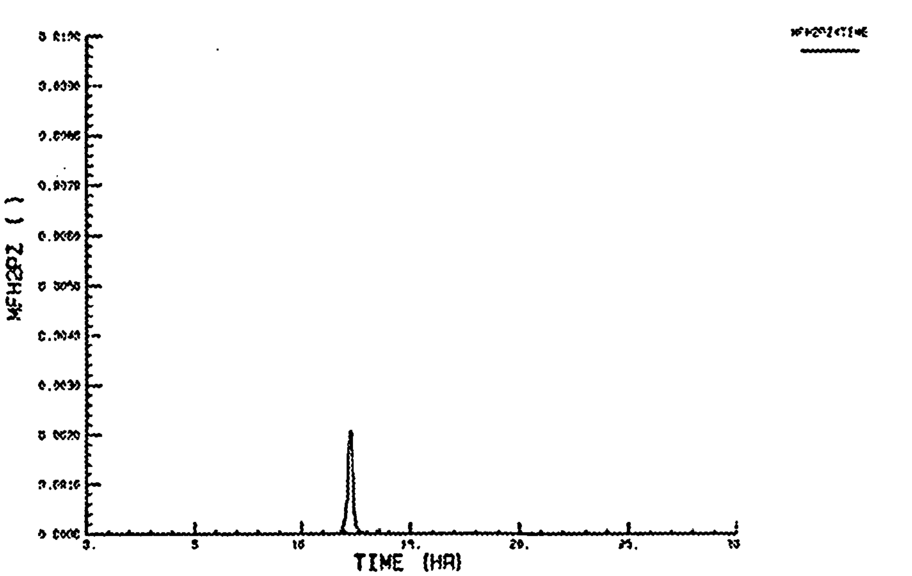

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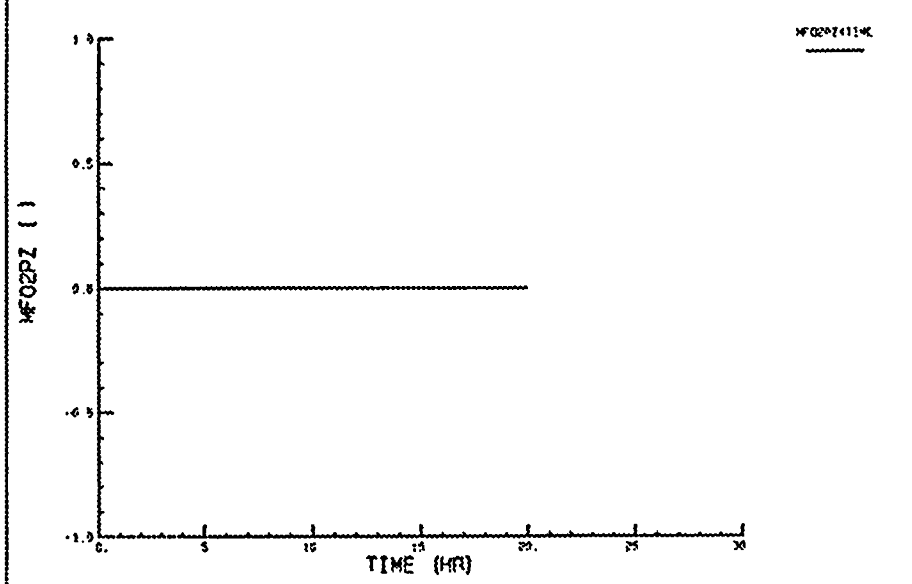

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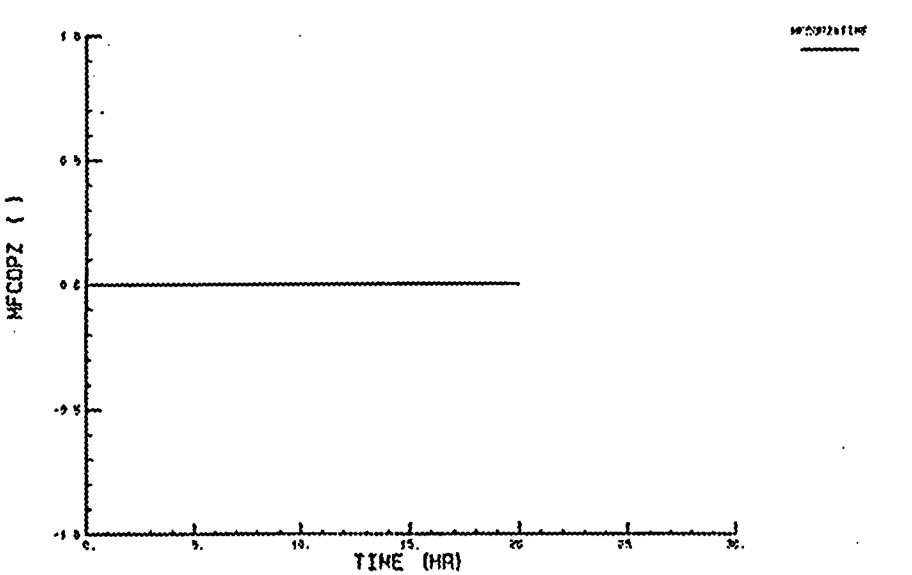

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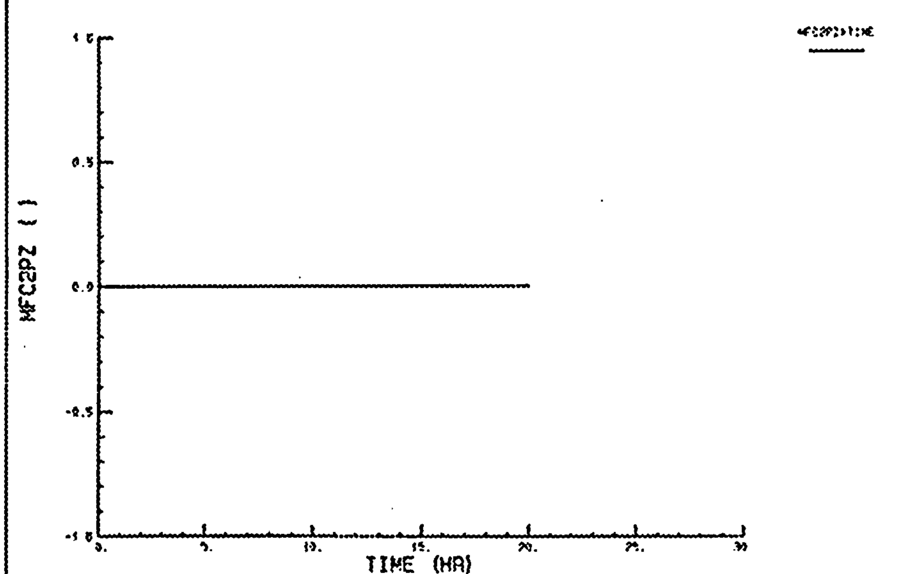

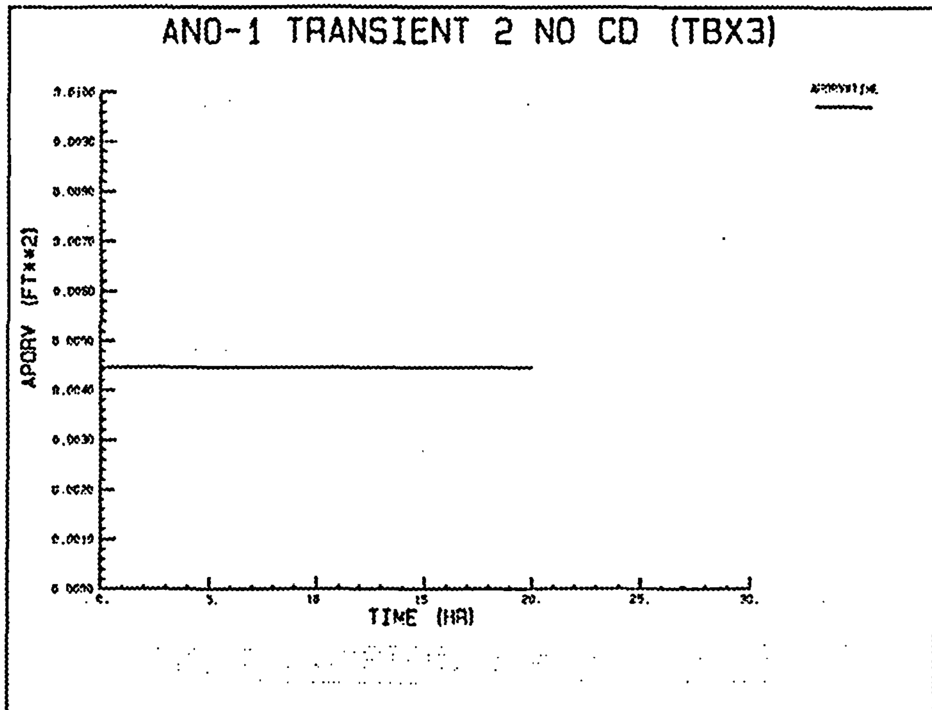
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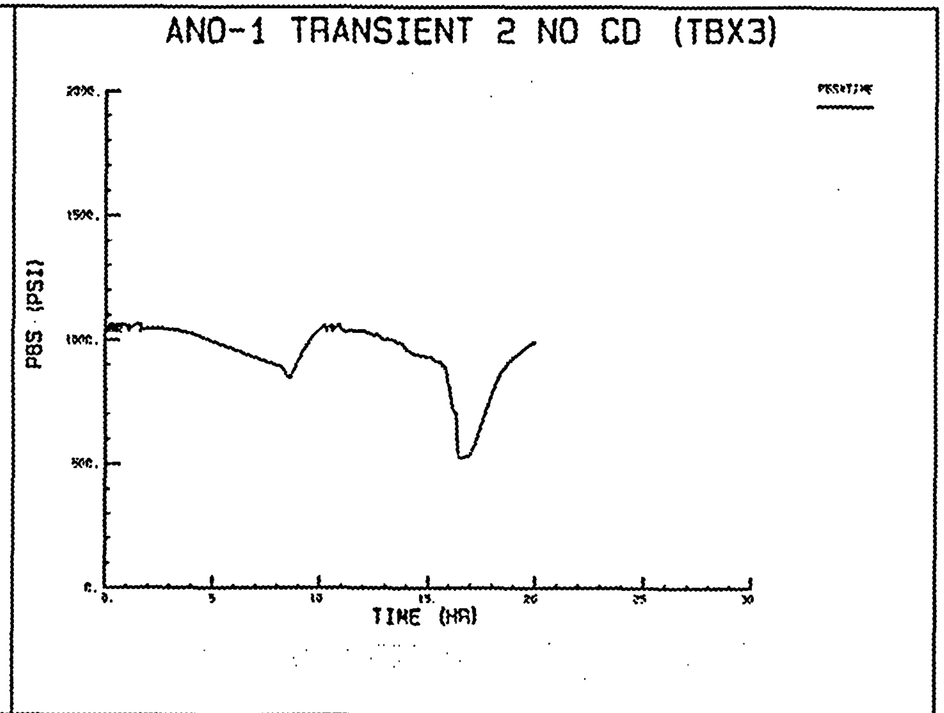
TIME (HR)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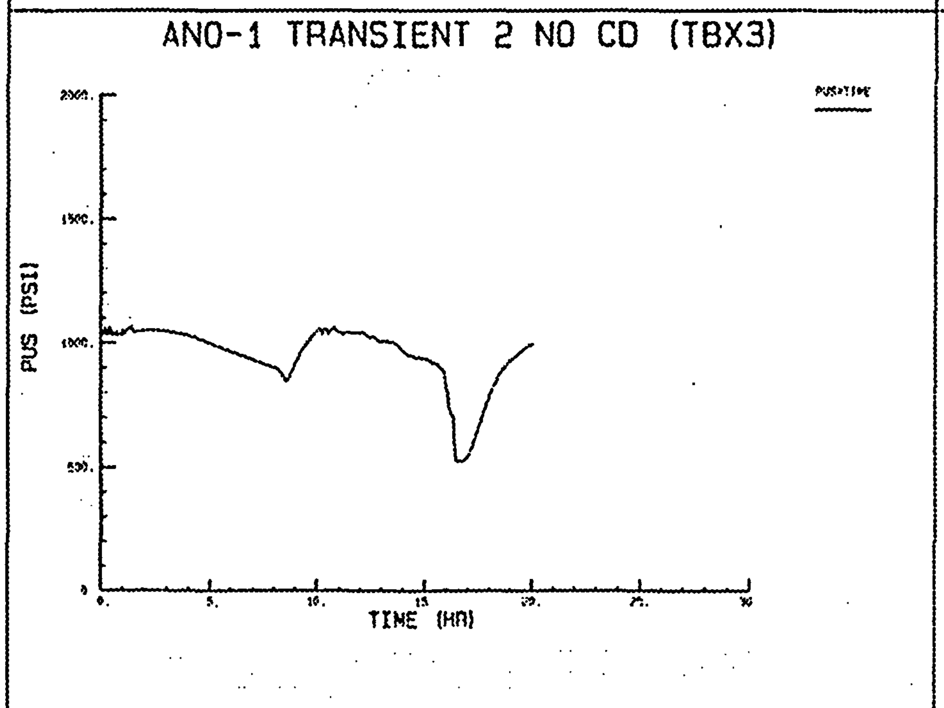
PBS (PSI)
TIME (HR)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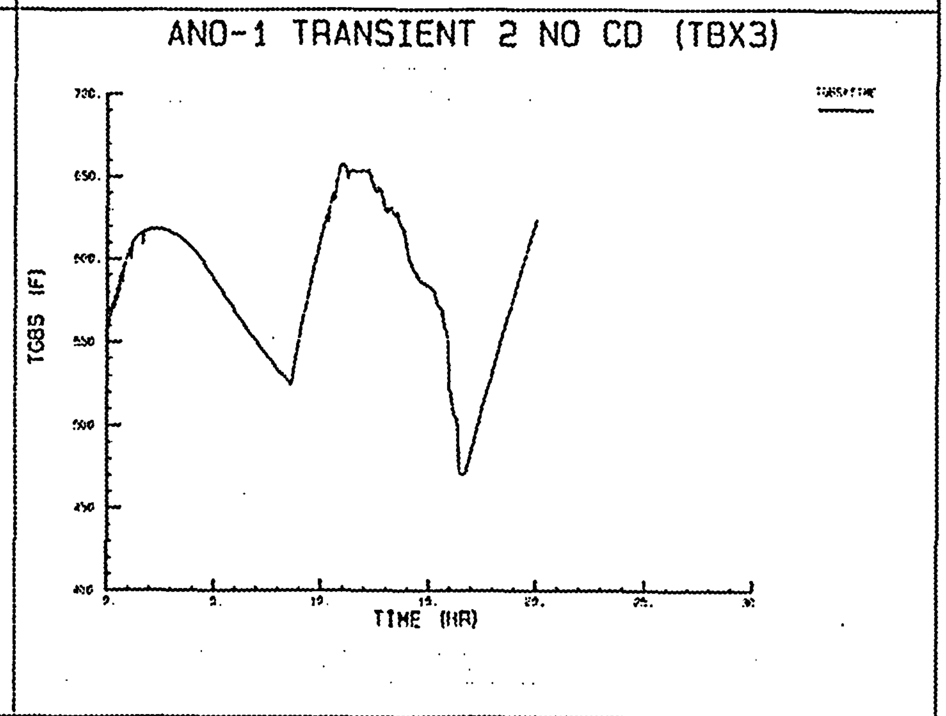
TIME (HR)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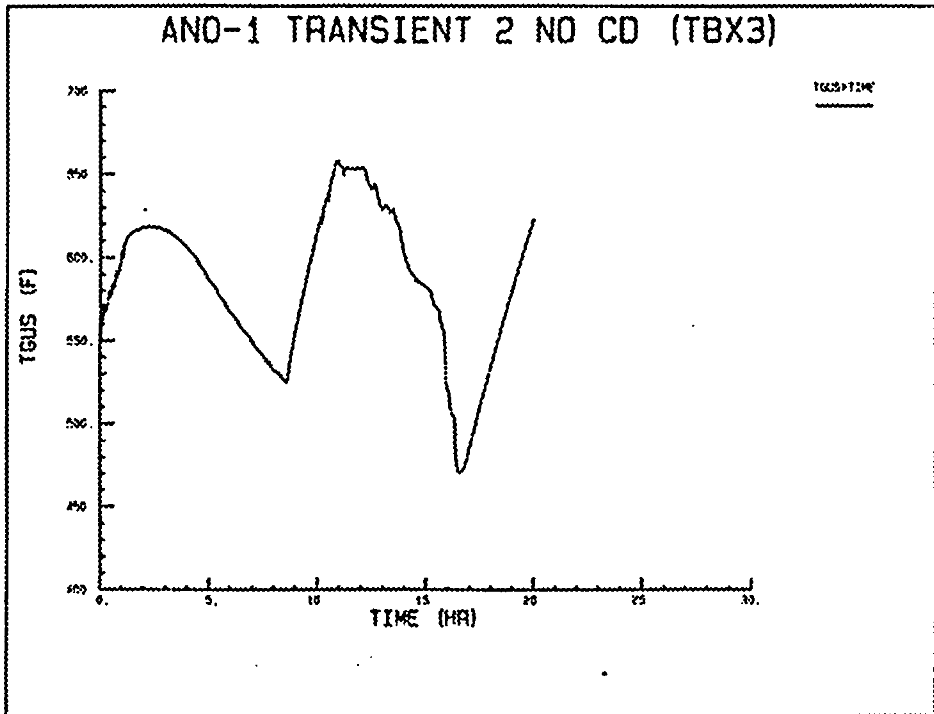
TIME (HR)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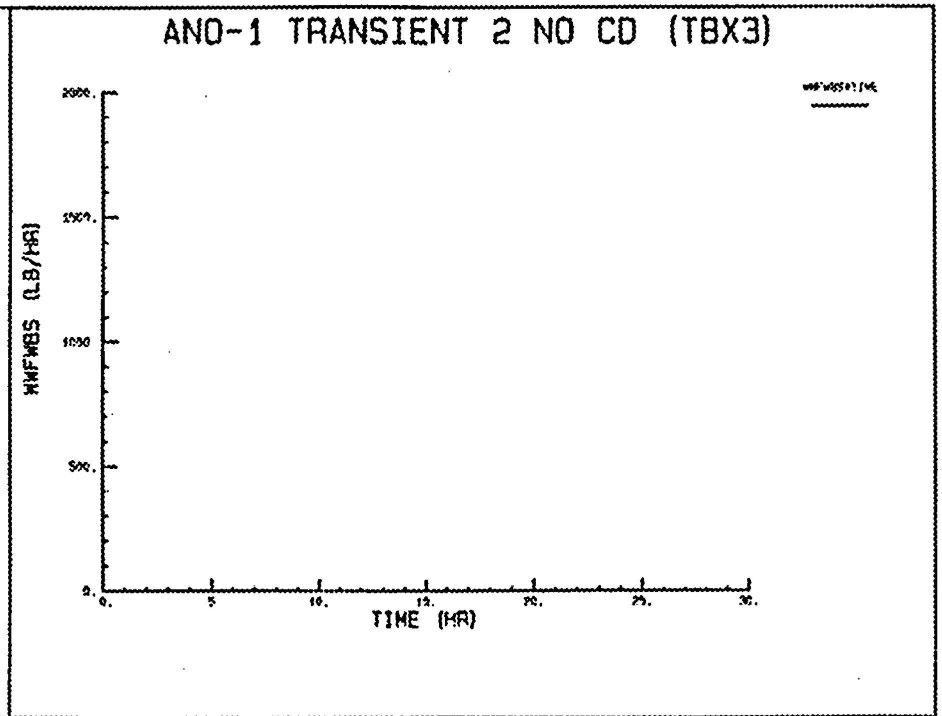
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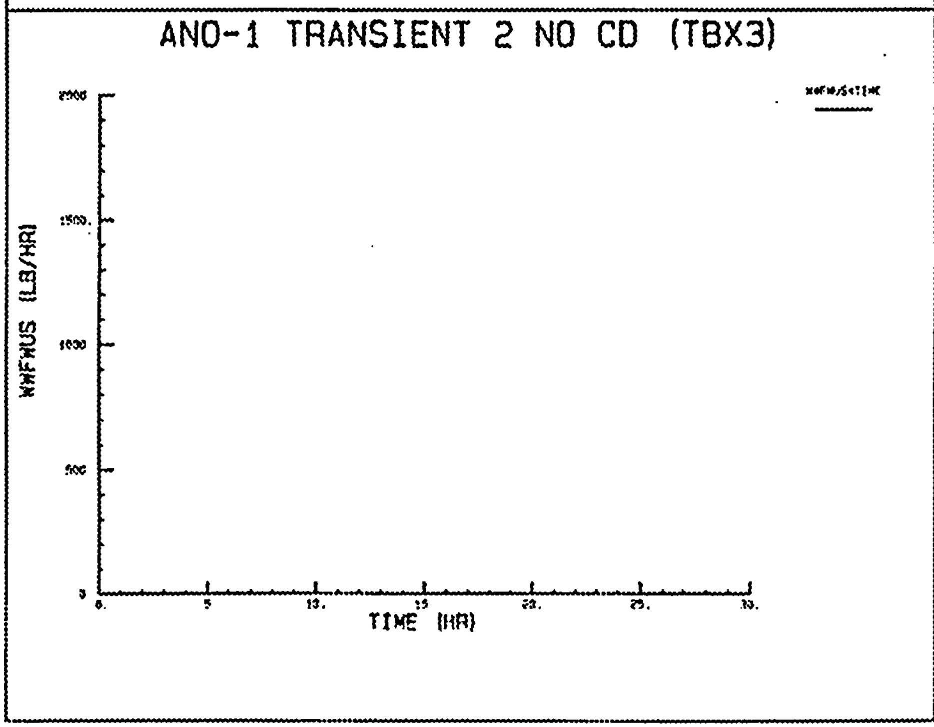
TIME (HR)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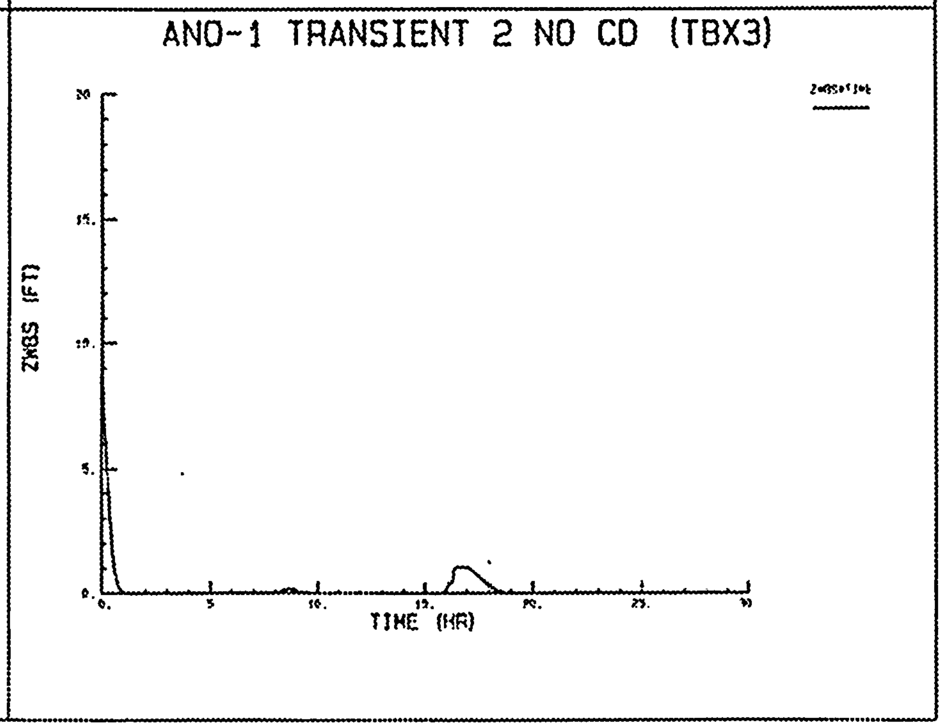
TIME (HR)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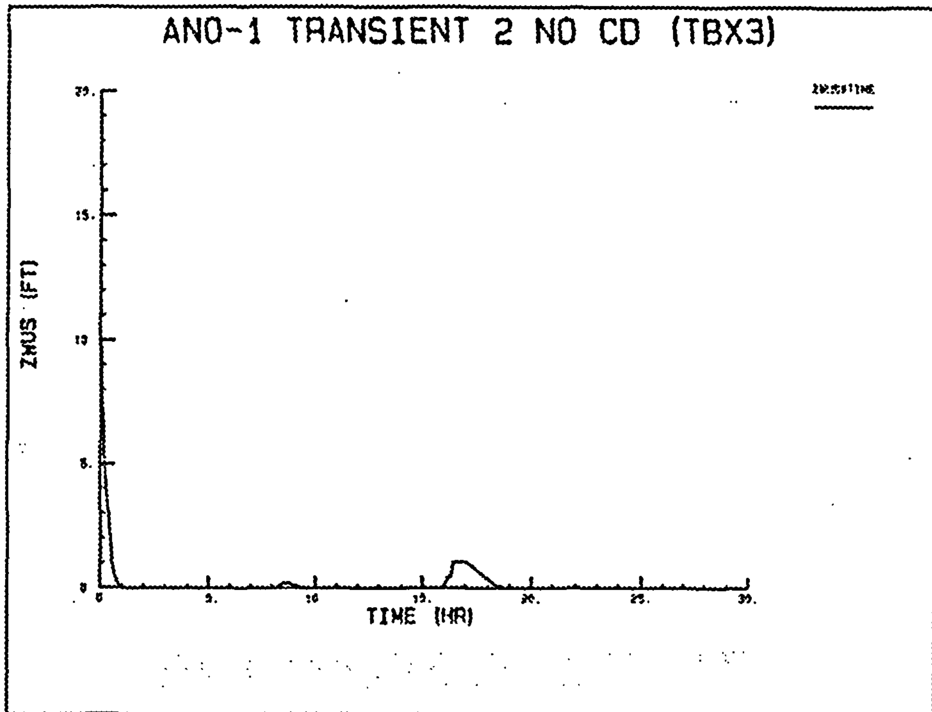
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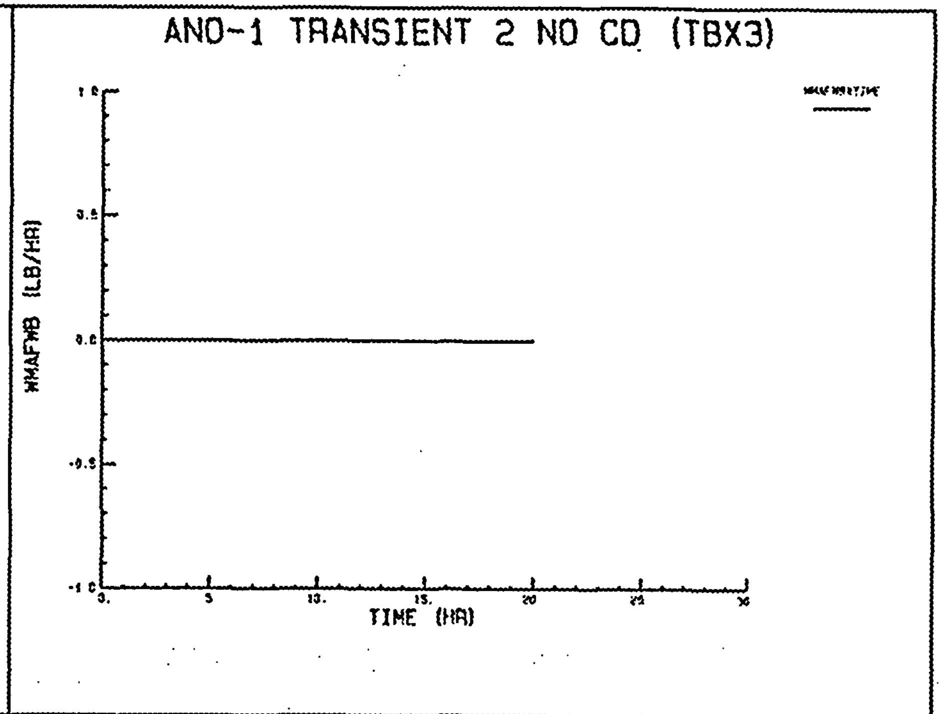
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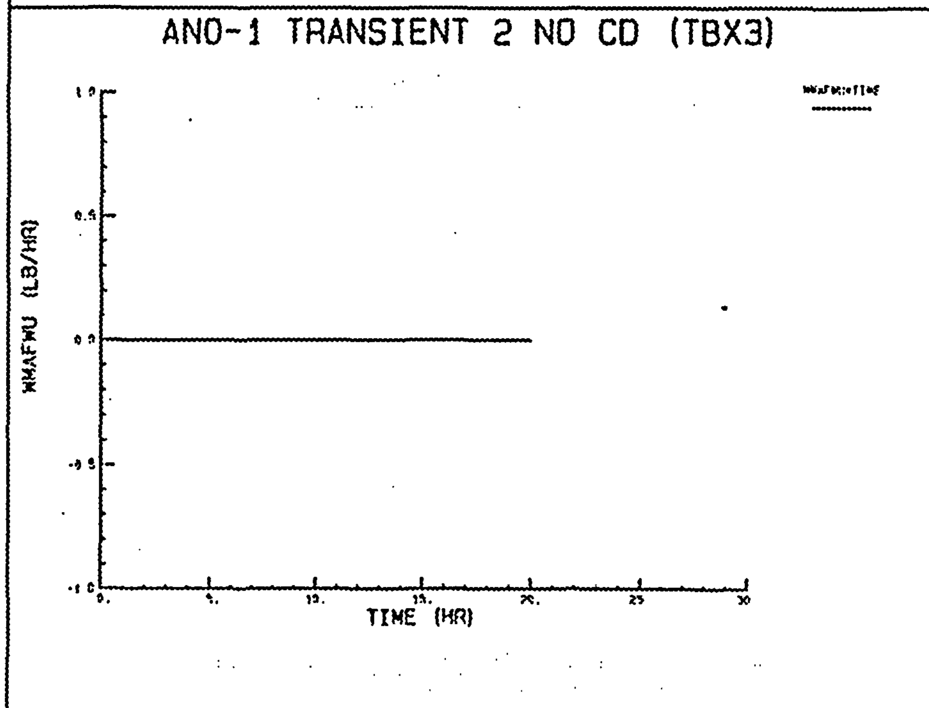
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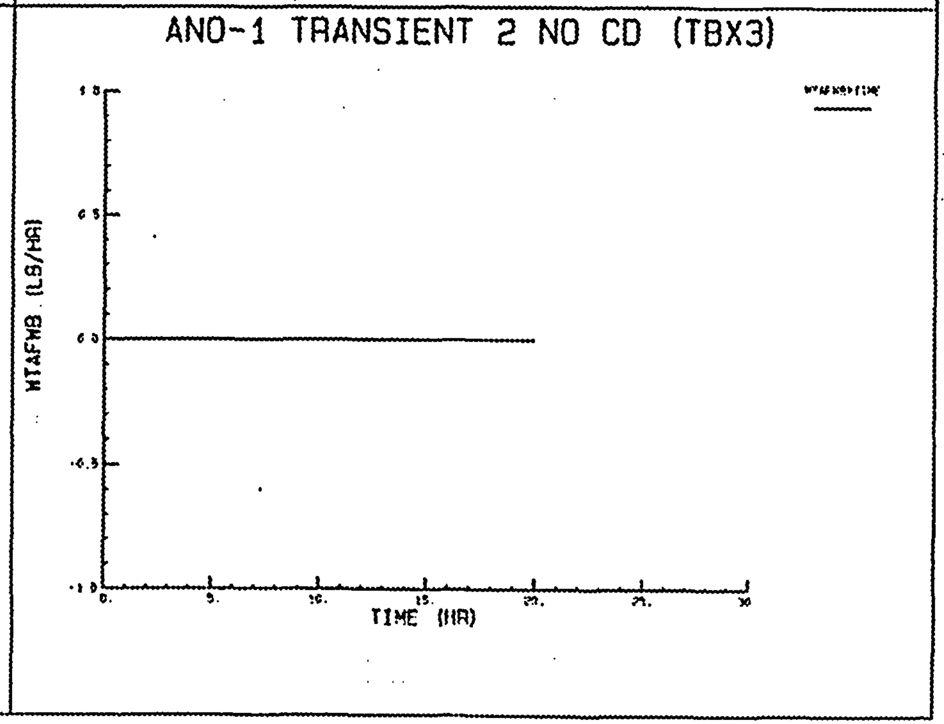
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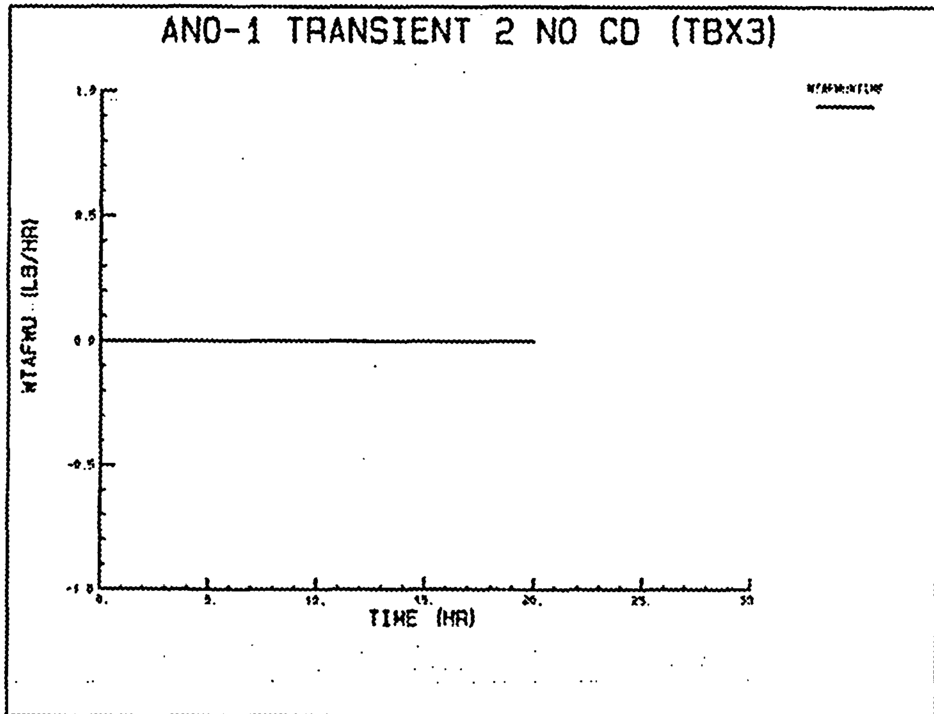

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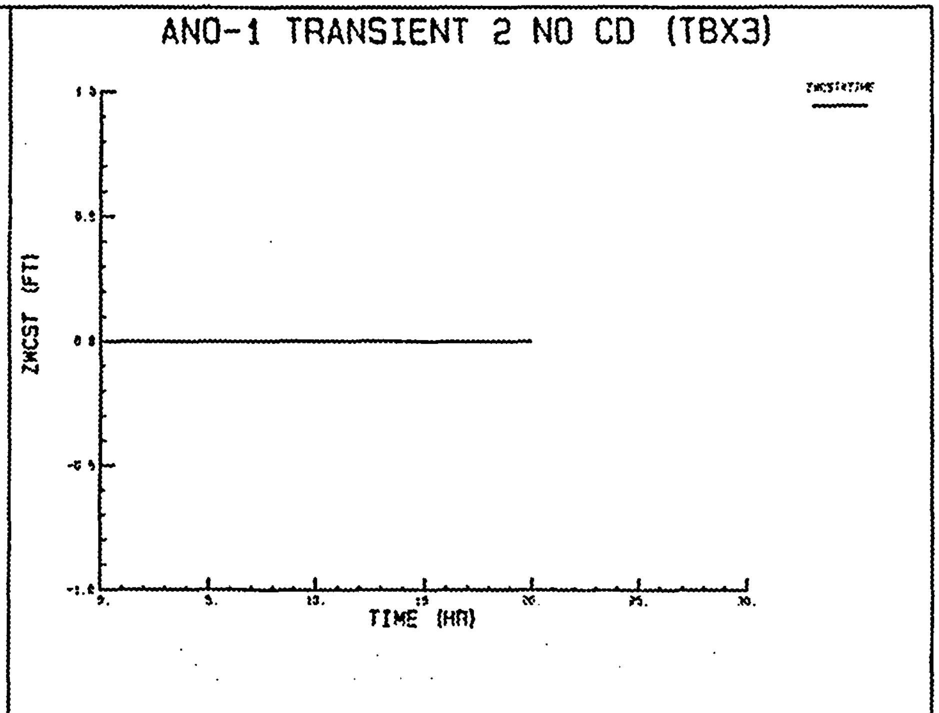

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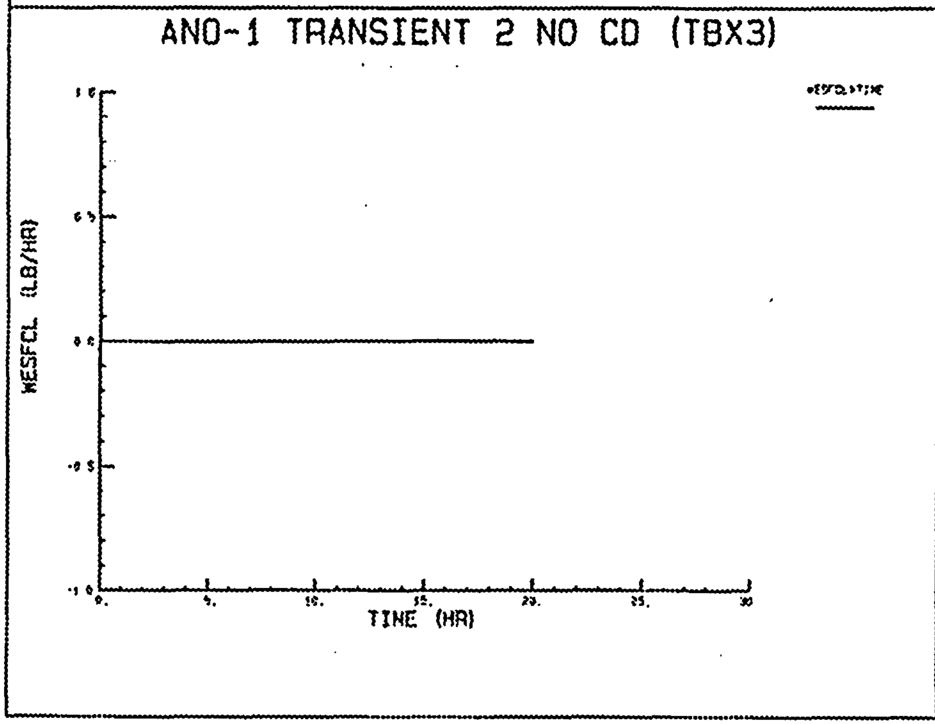

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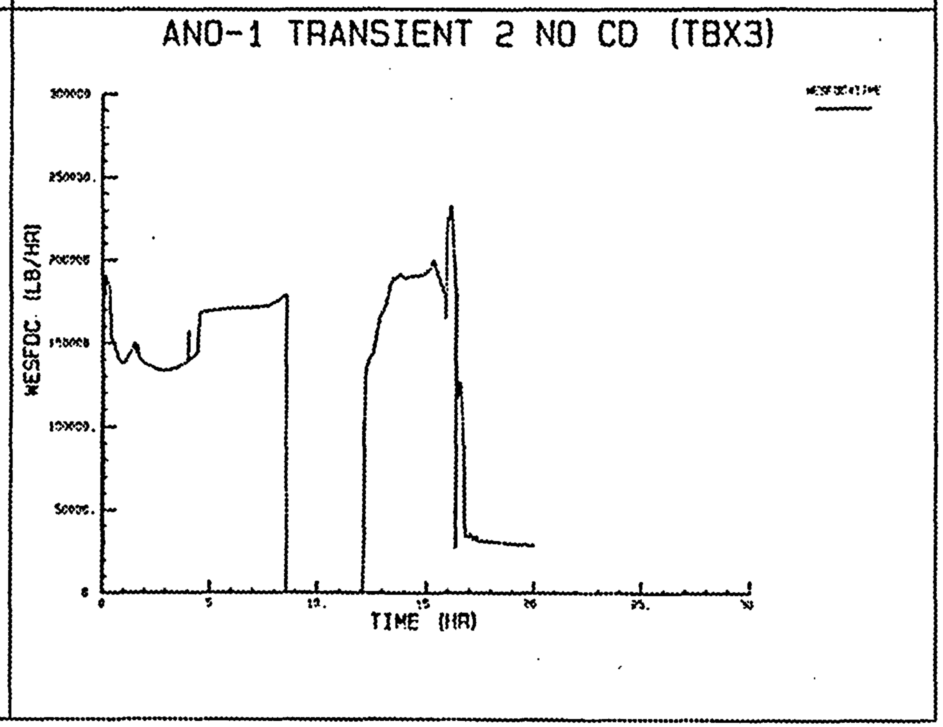

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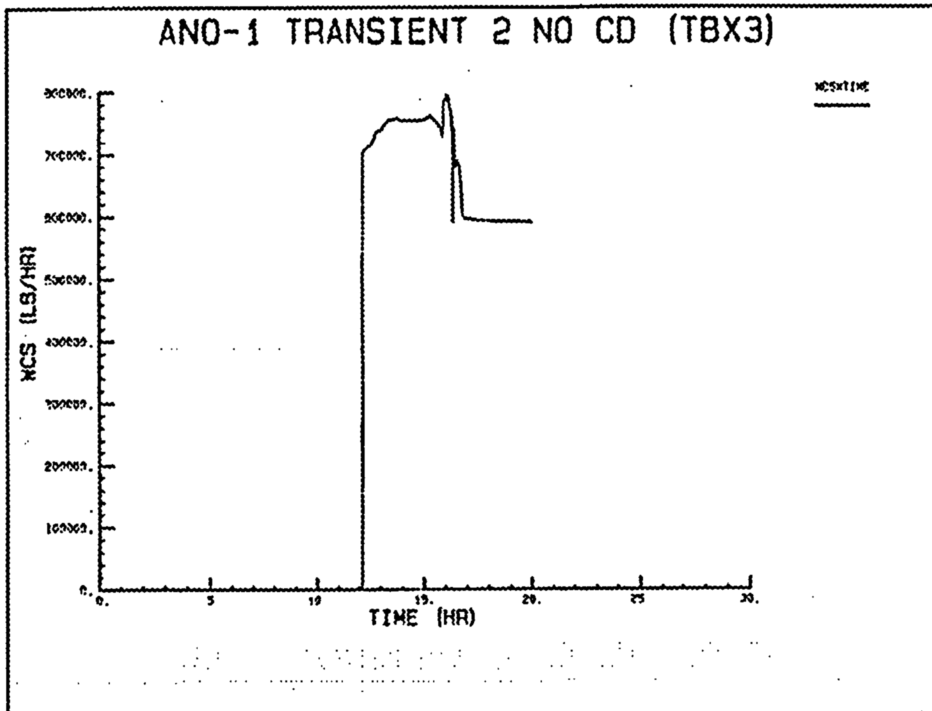
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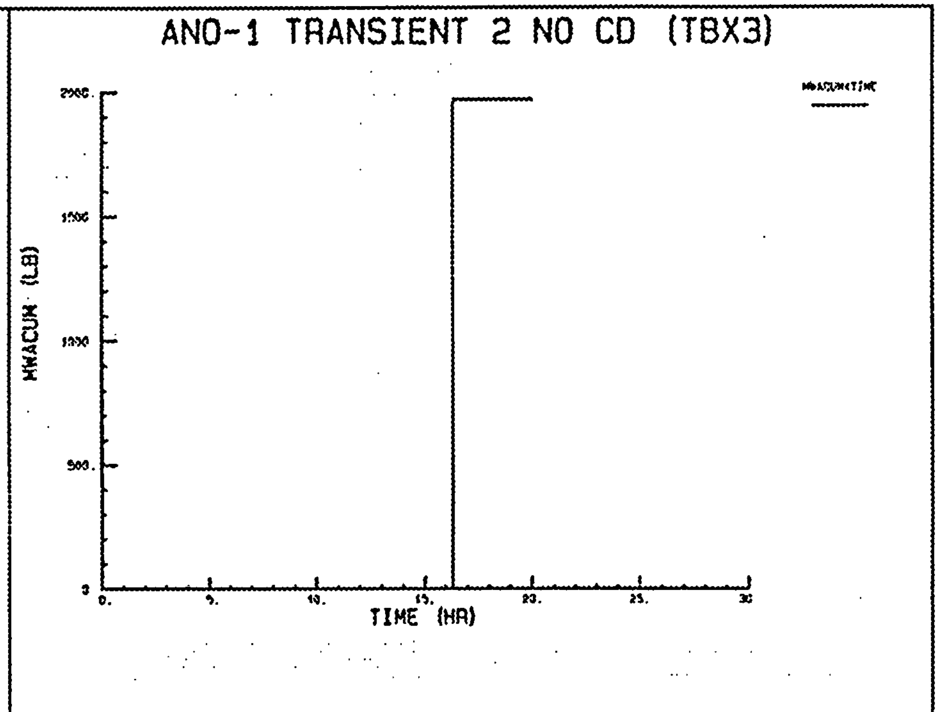
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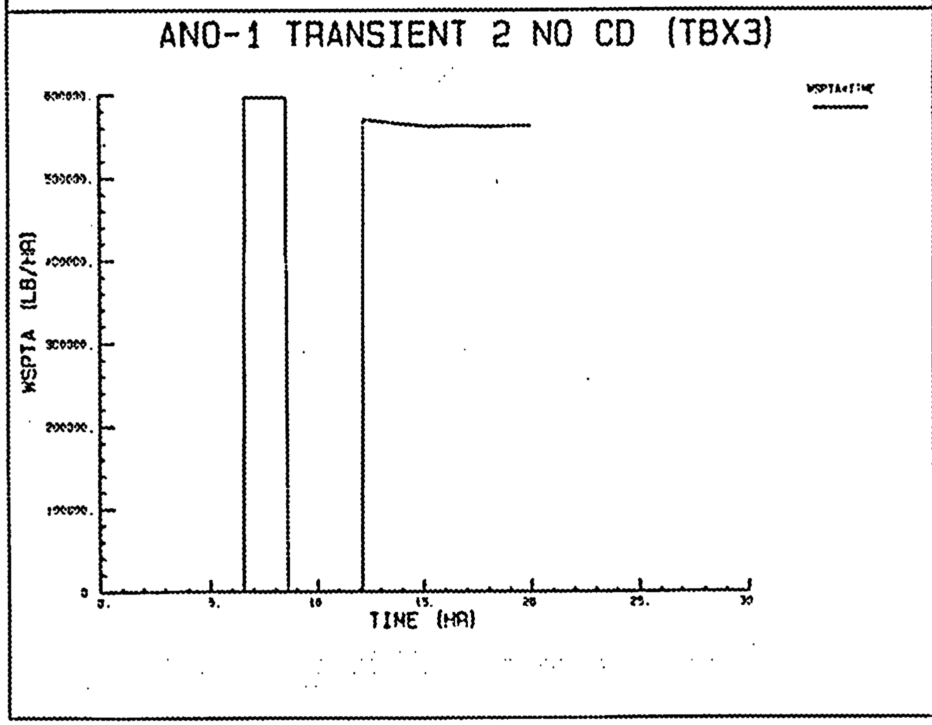
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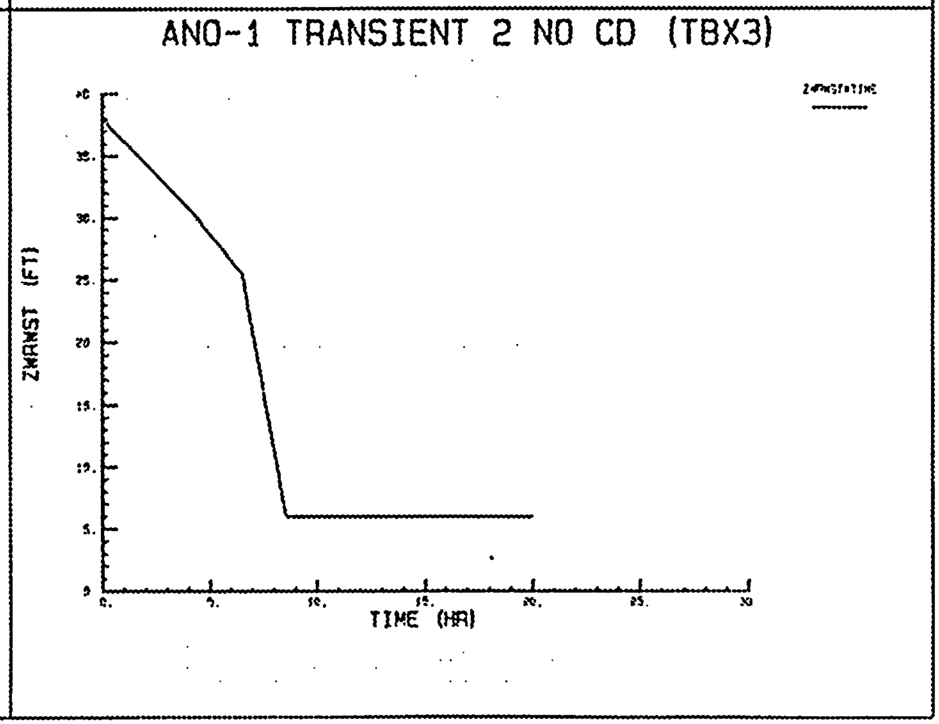
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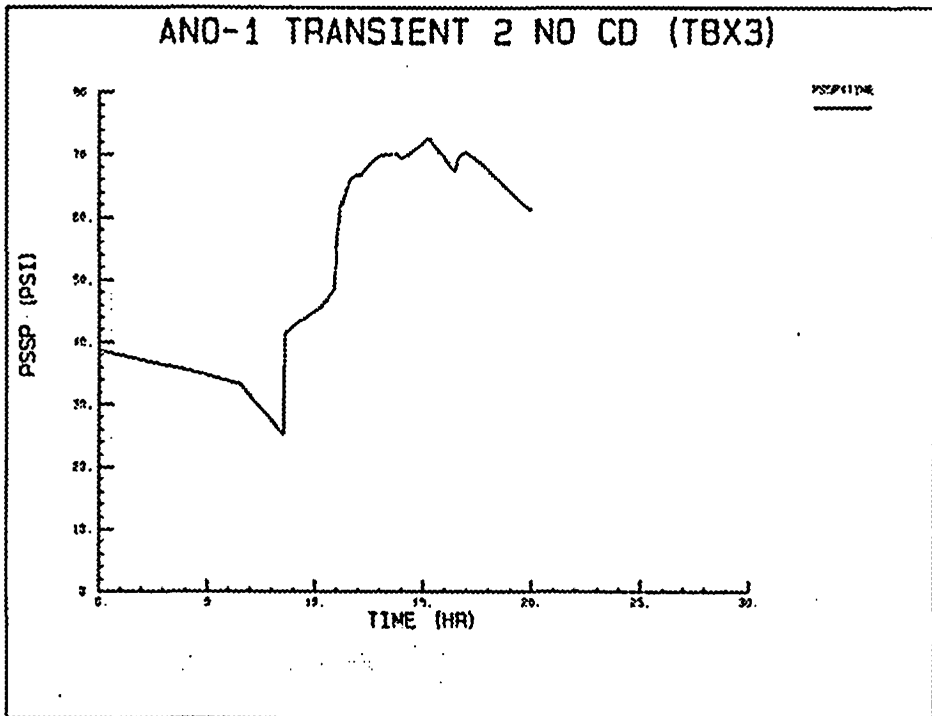
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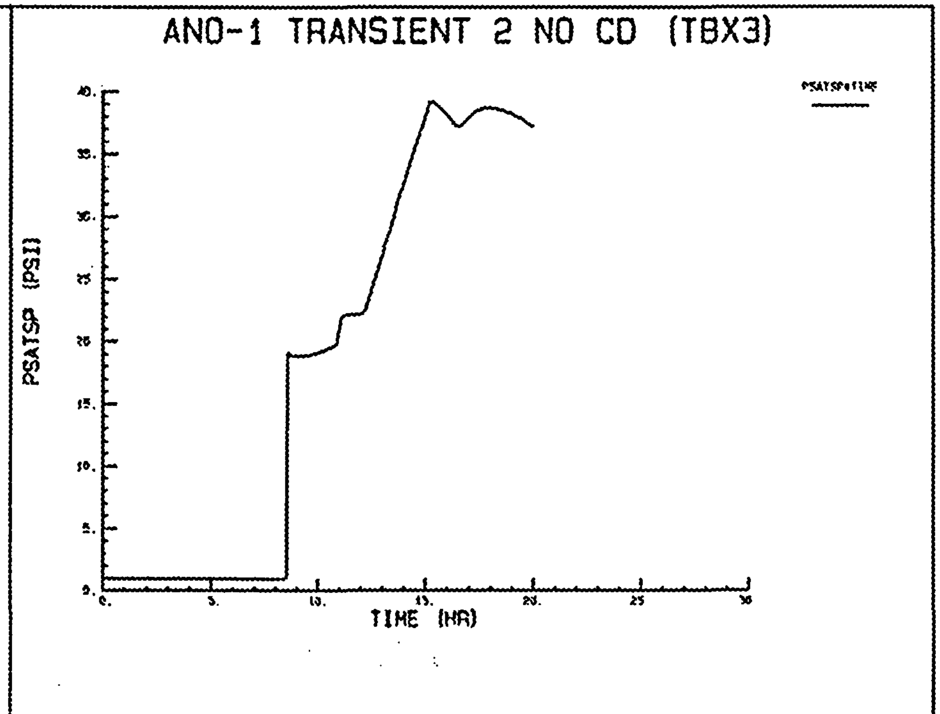
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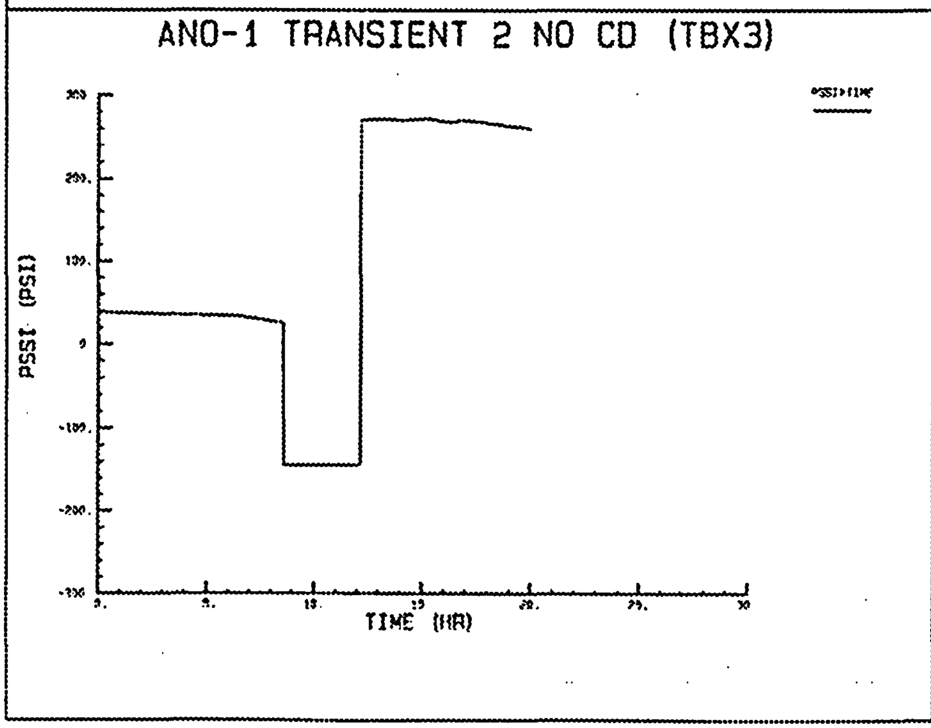
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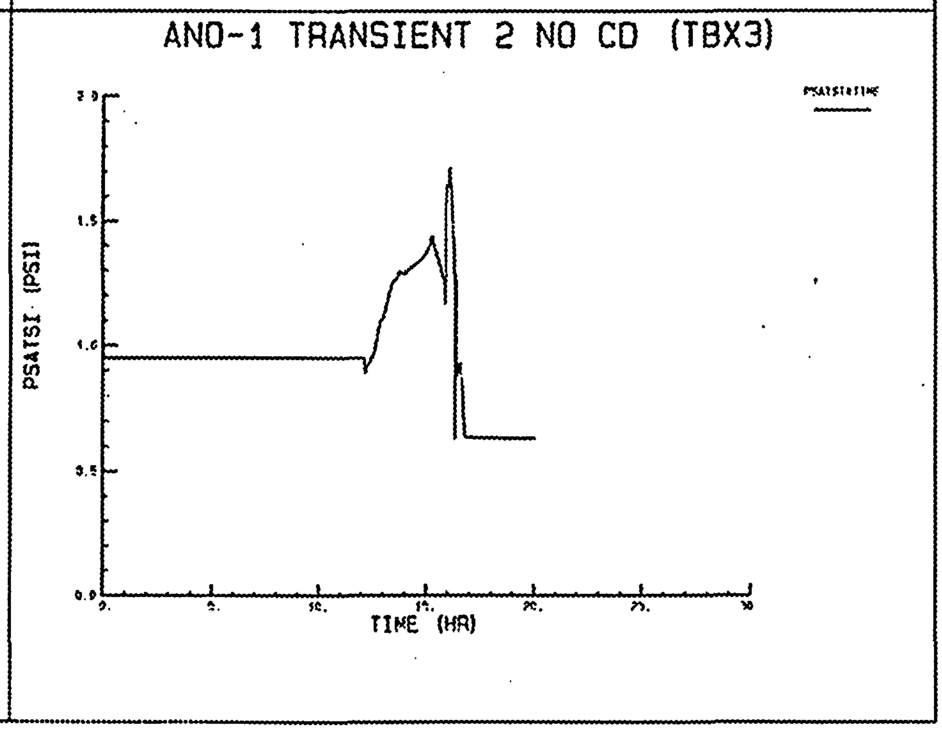
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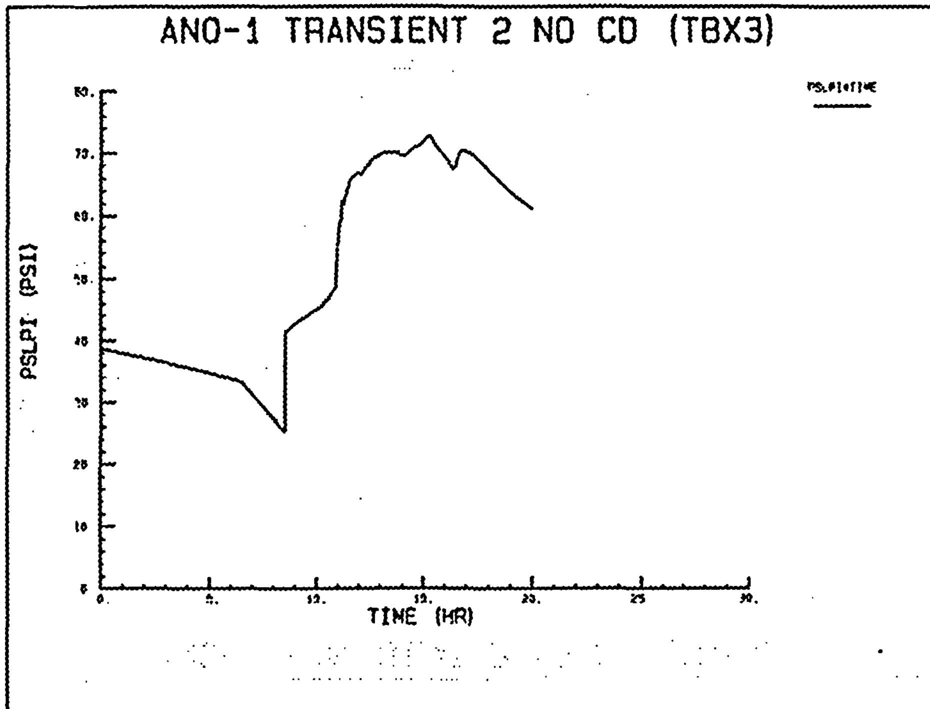
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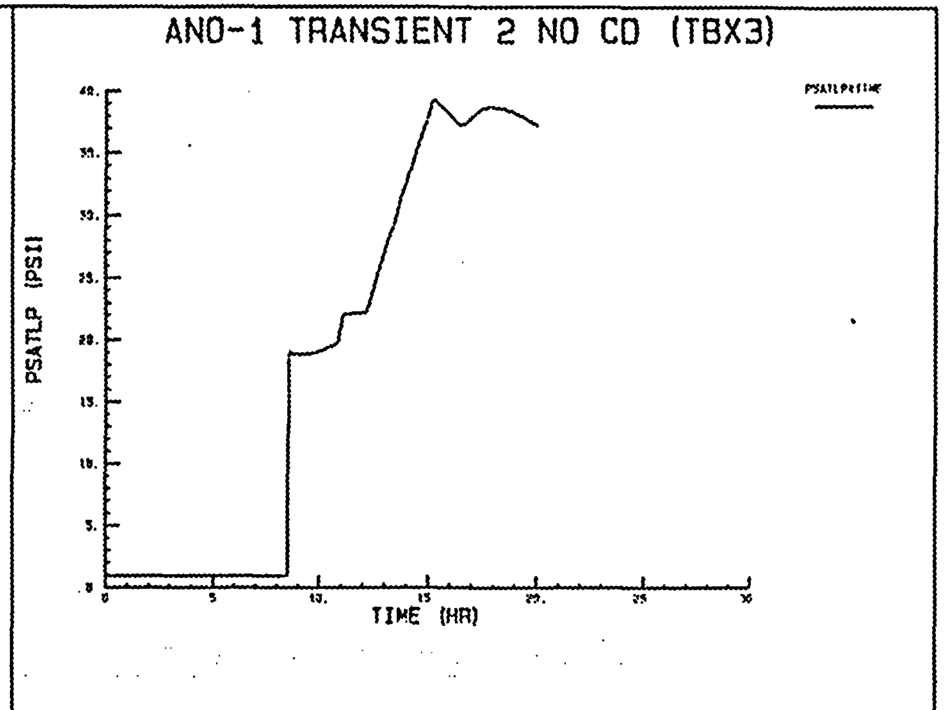
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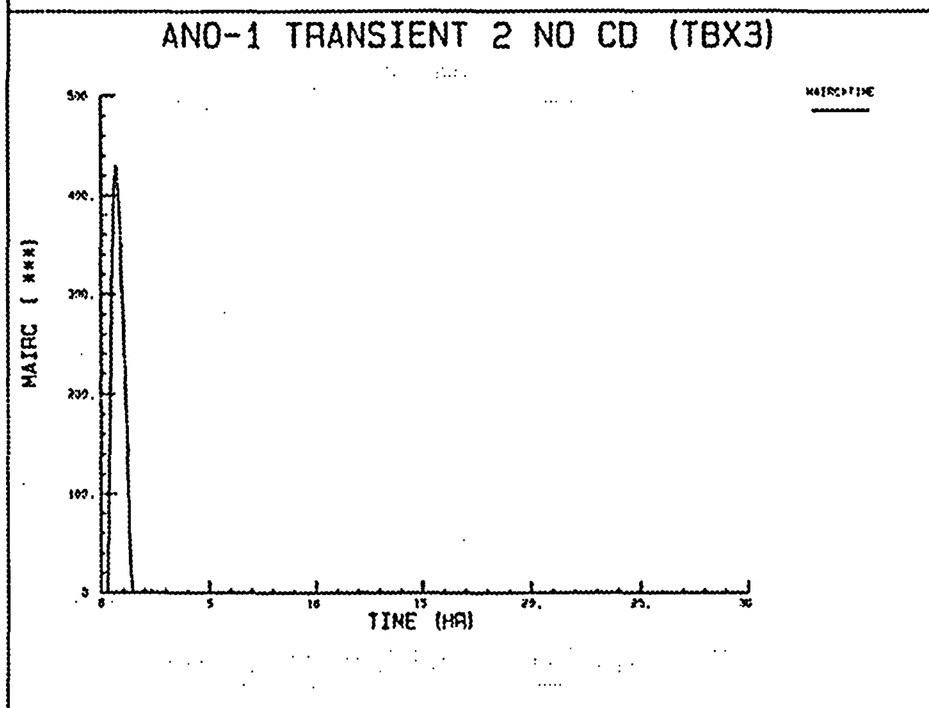
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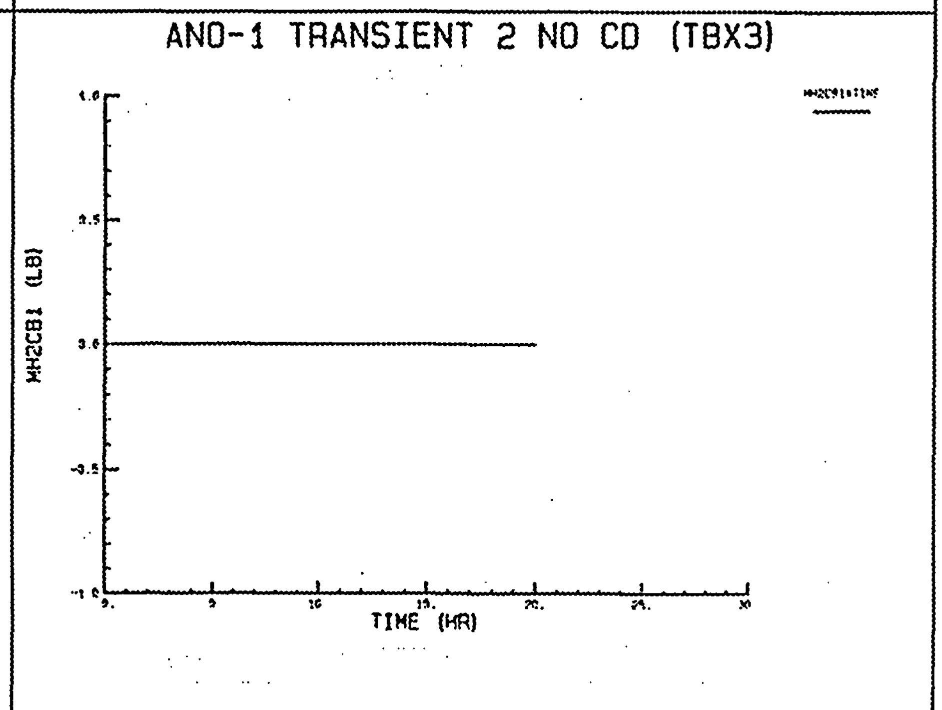
MAIRC (***)
TIME (HR)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TIME (HR)

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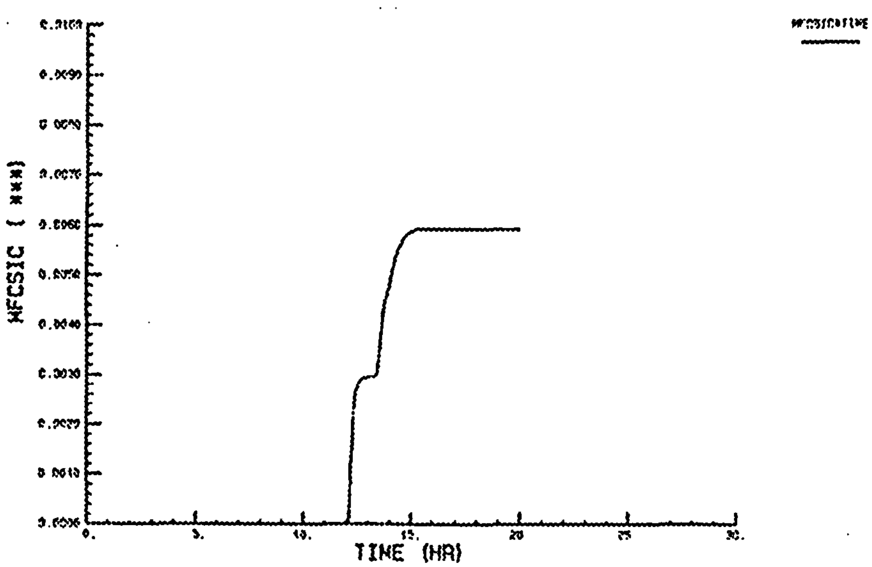

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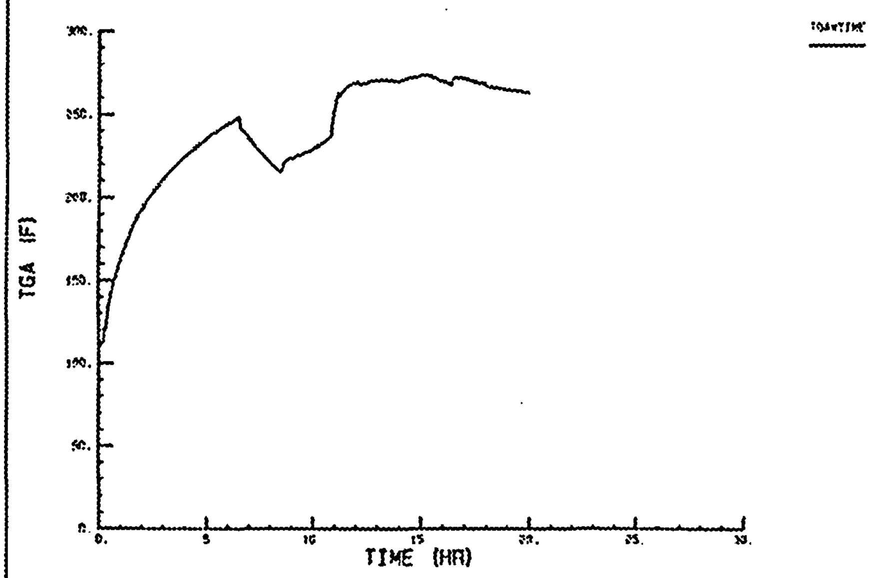

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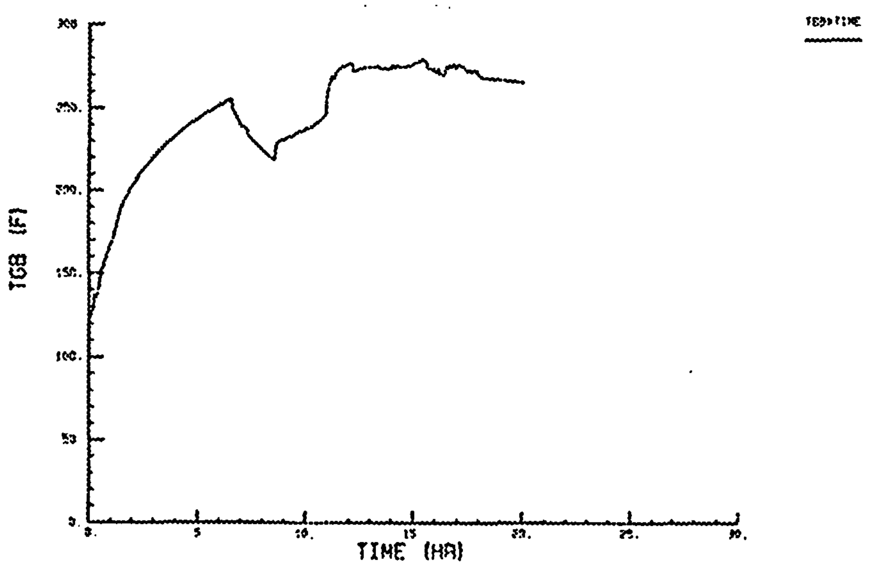

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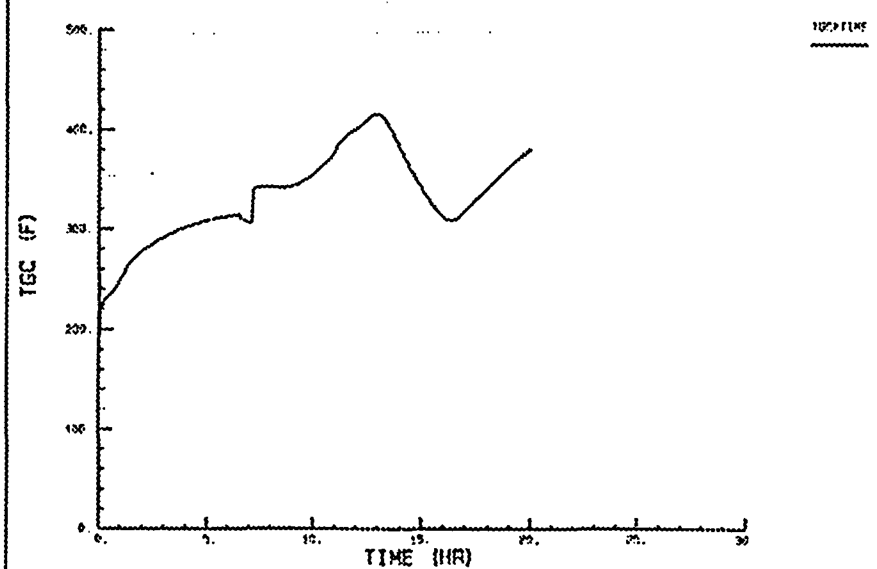

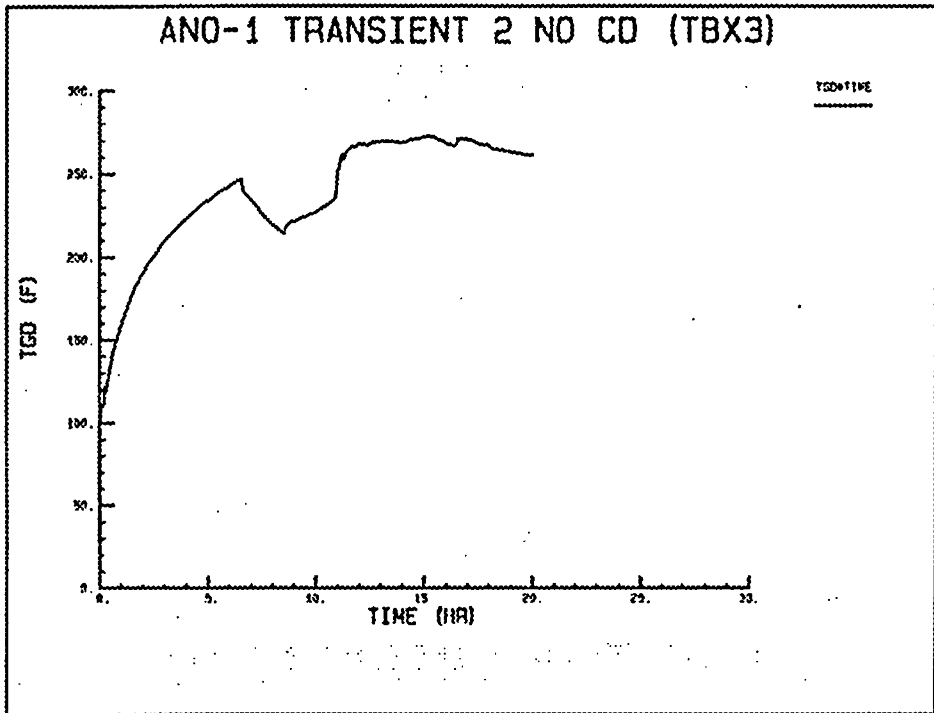
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TGD (F)
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150.
200.
250.
300.
TIME (HR)
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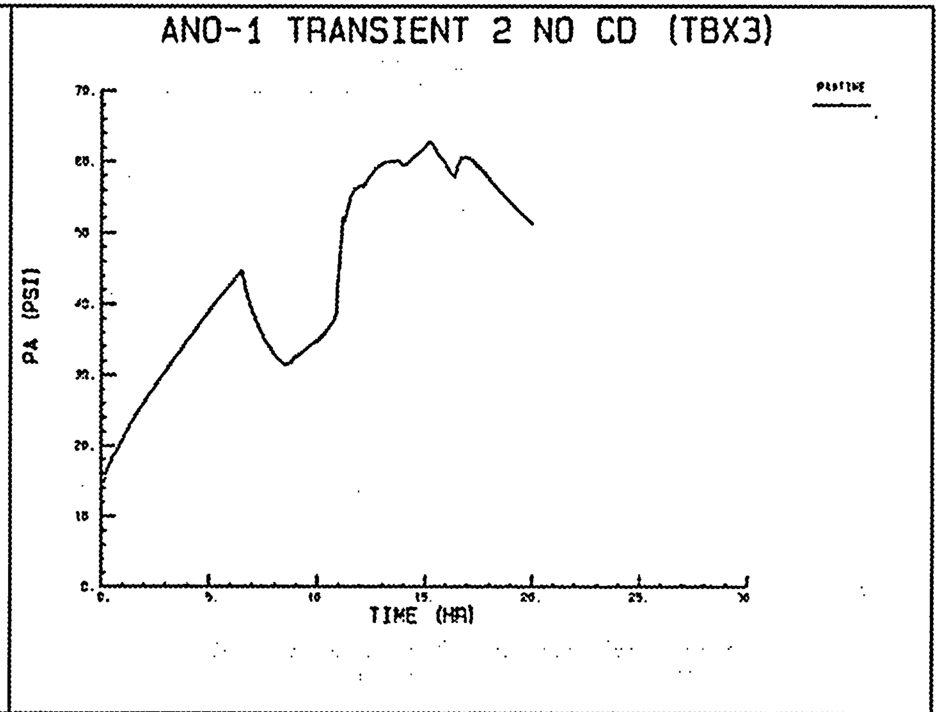
5.
10.
15.
20.
25.
30.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PA (PSI)
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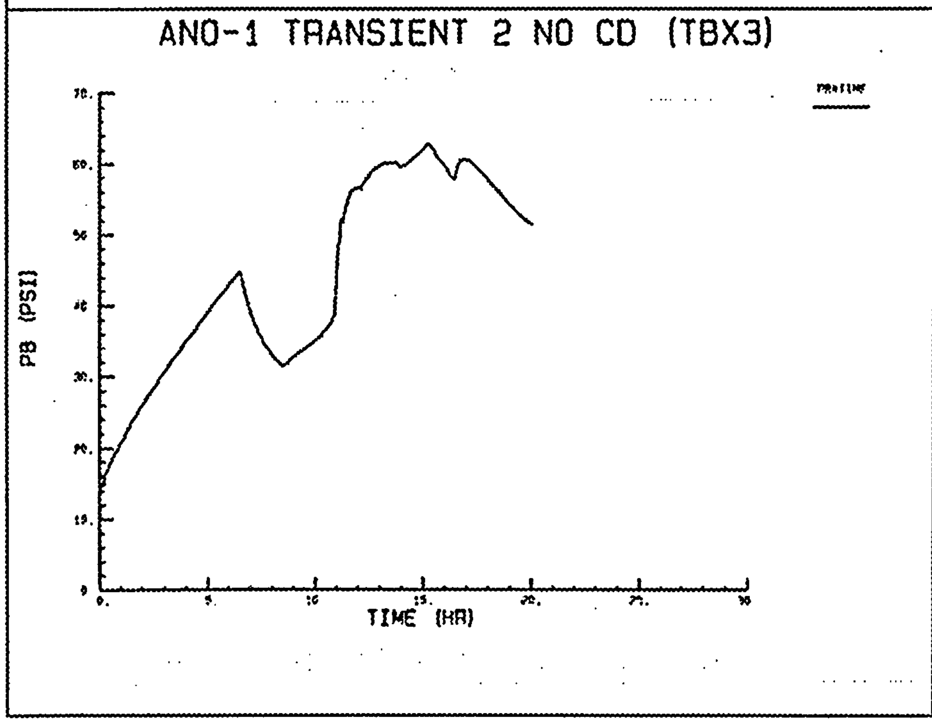
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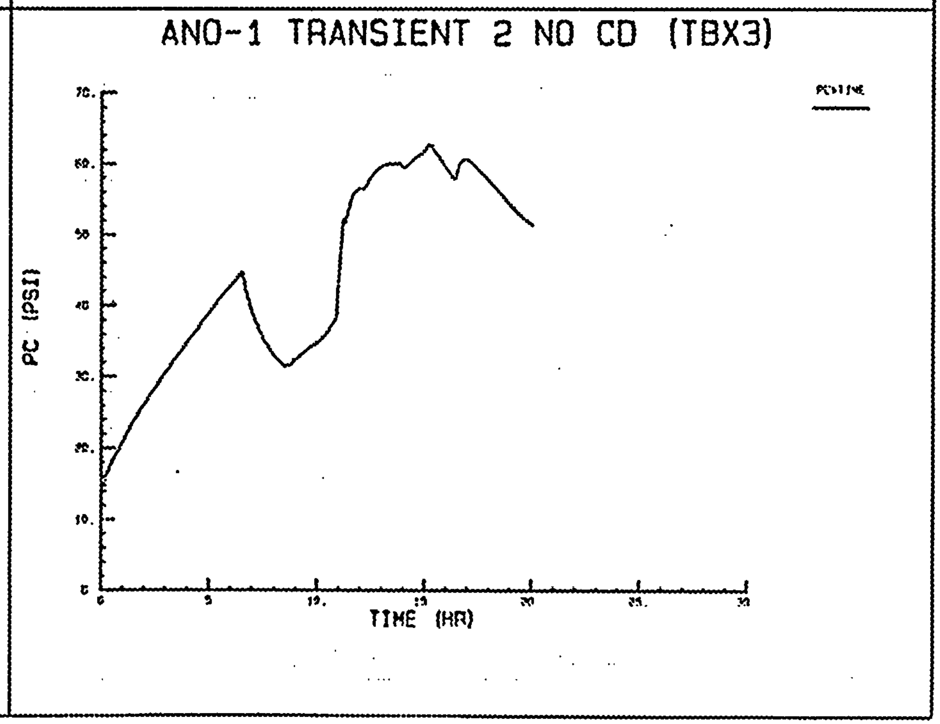
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PC (PSI)
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0
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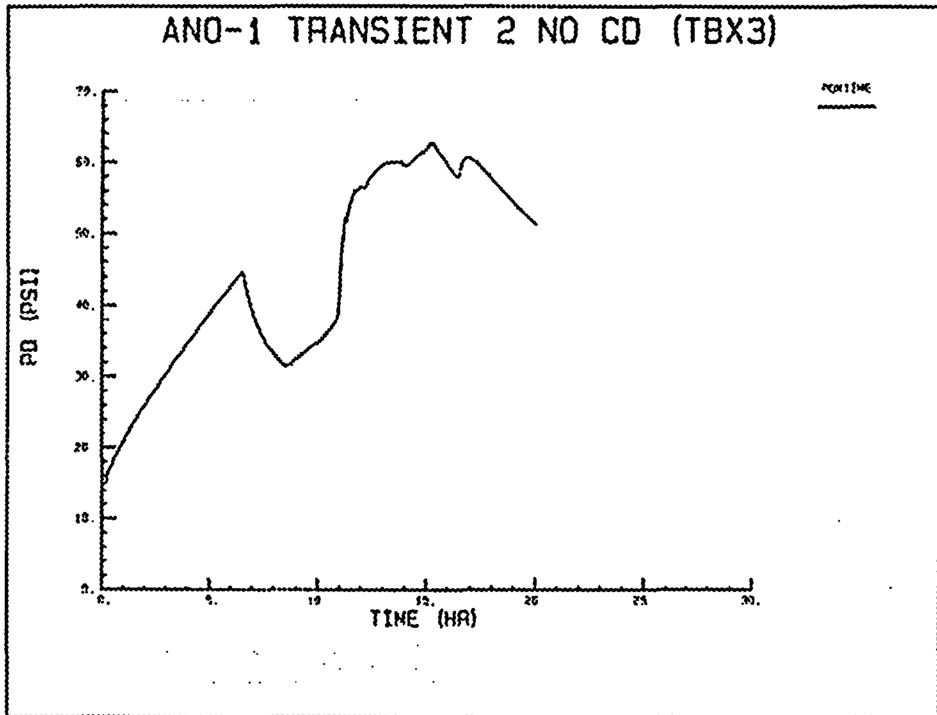
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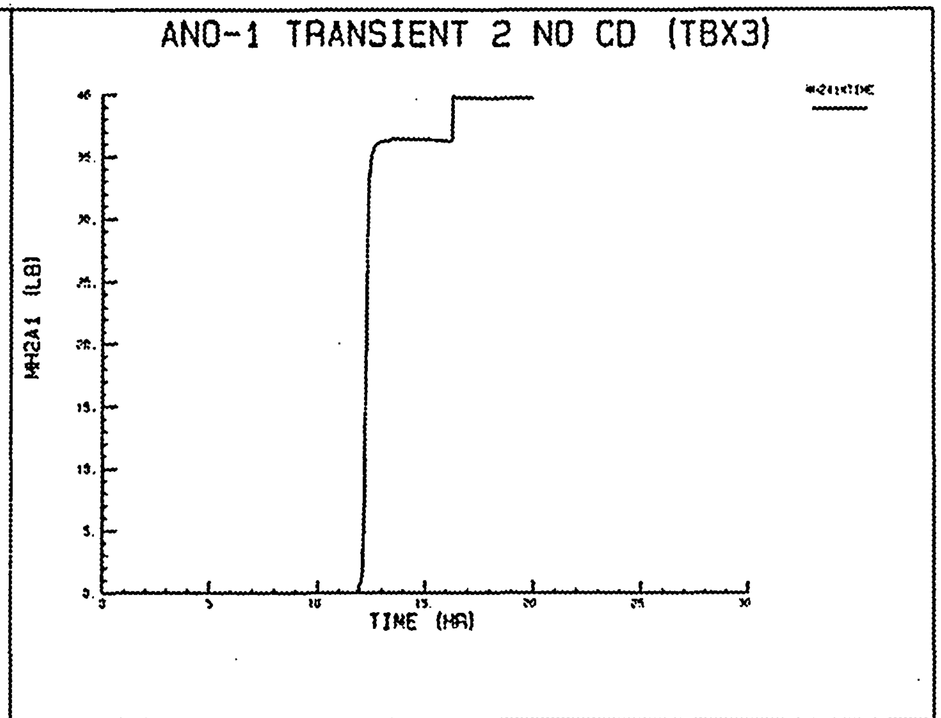
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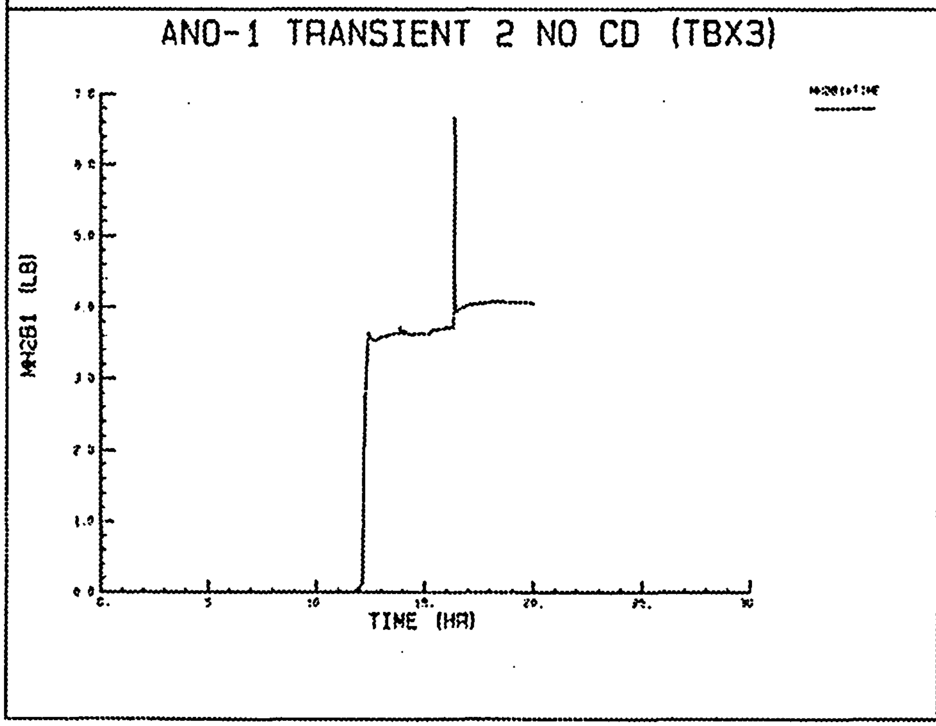
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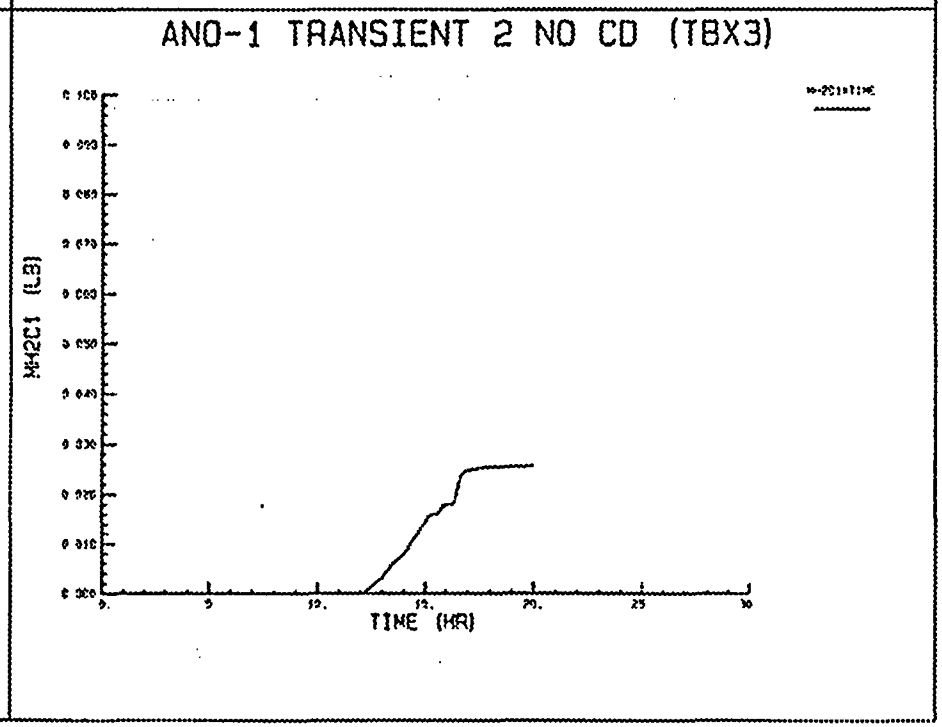
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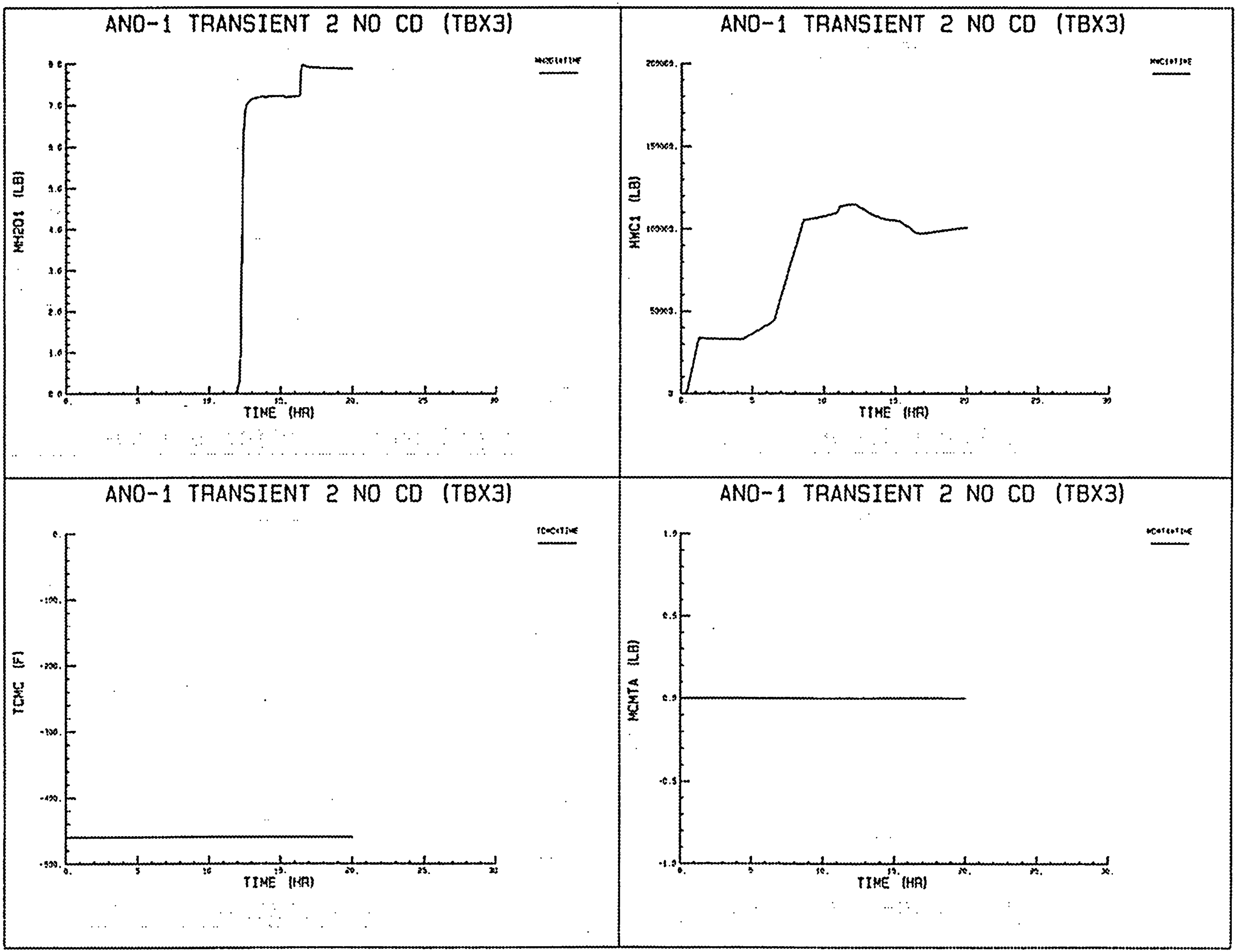
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TIME (HR)
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MHC1 (LB)
TIME (HR)
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TCMC (F)
TIME (HR)
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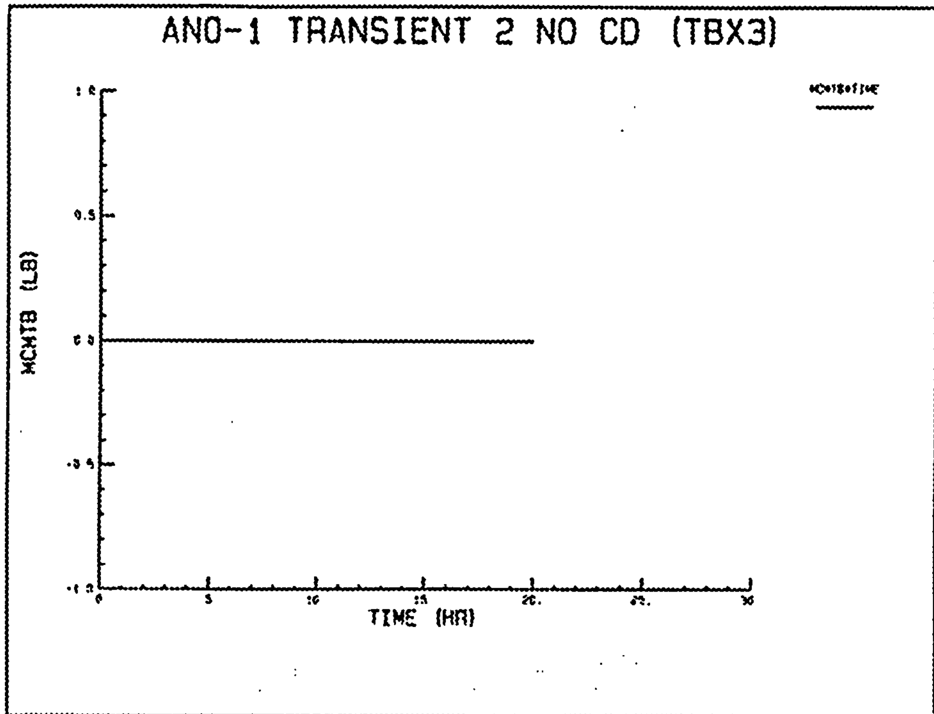
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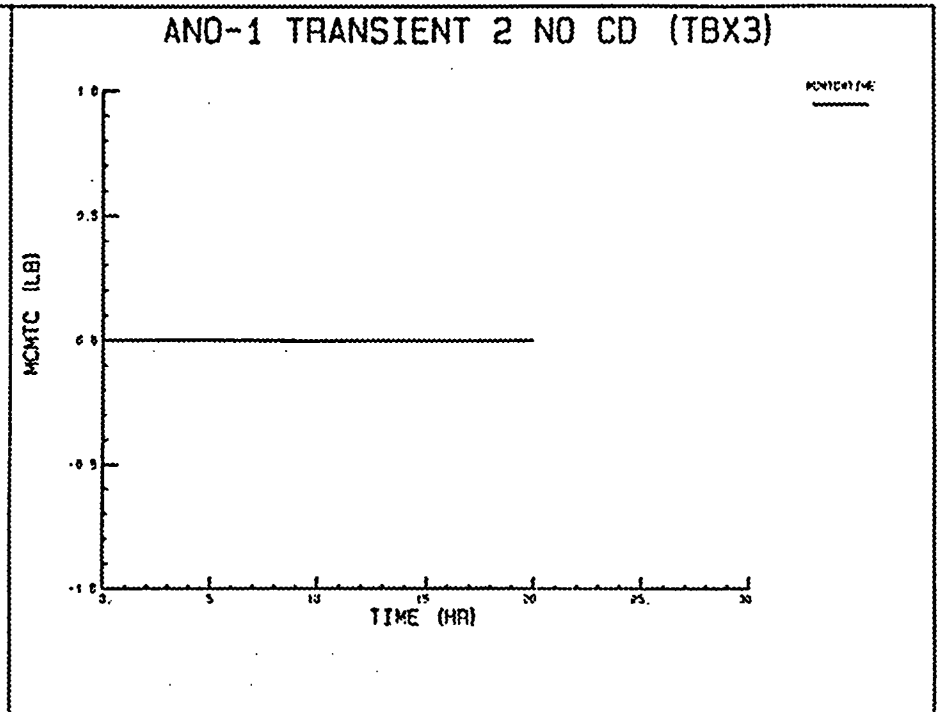
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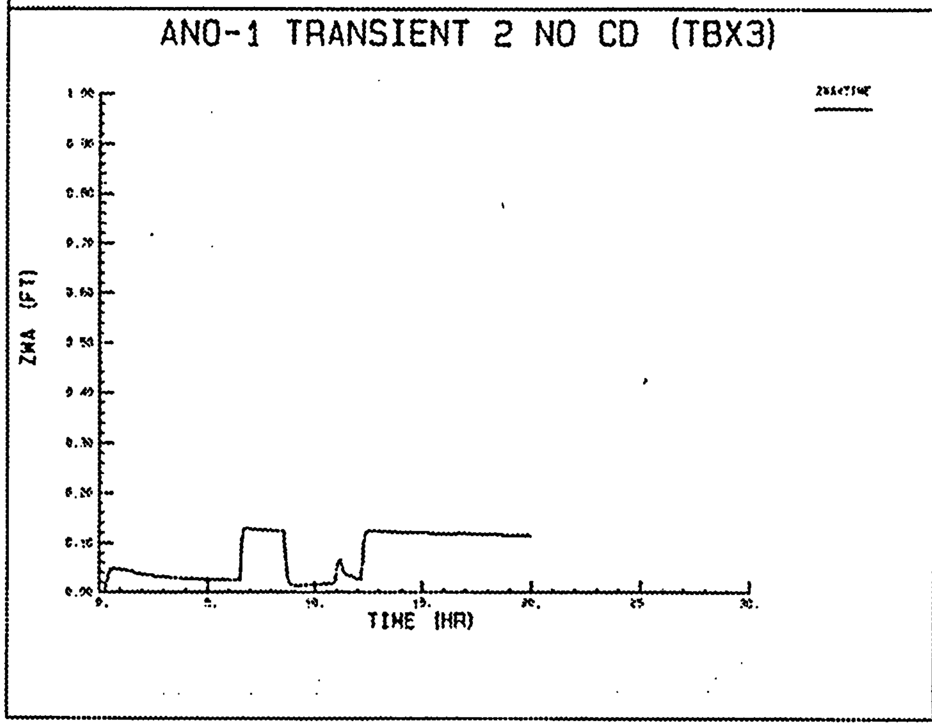
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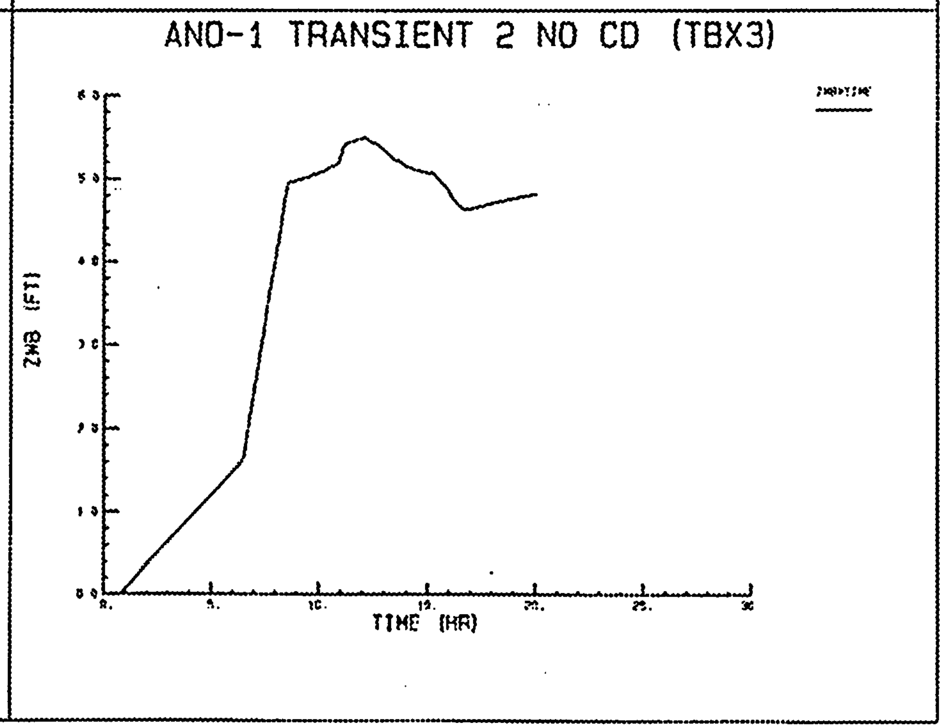
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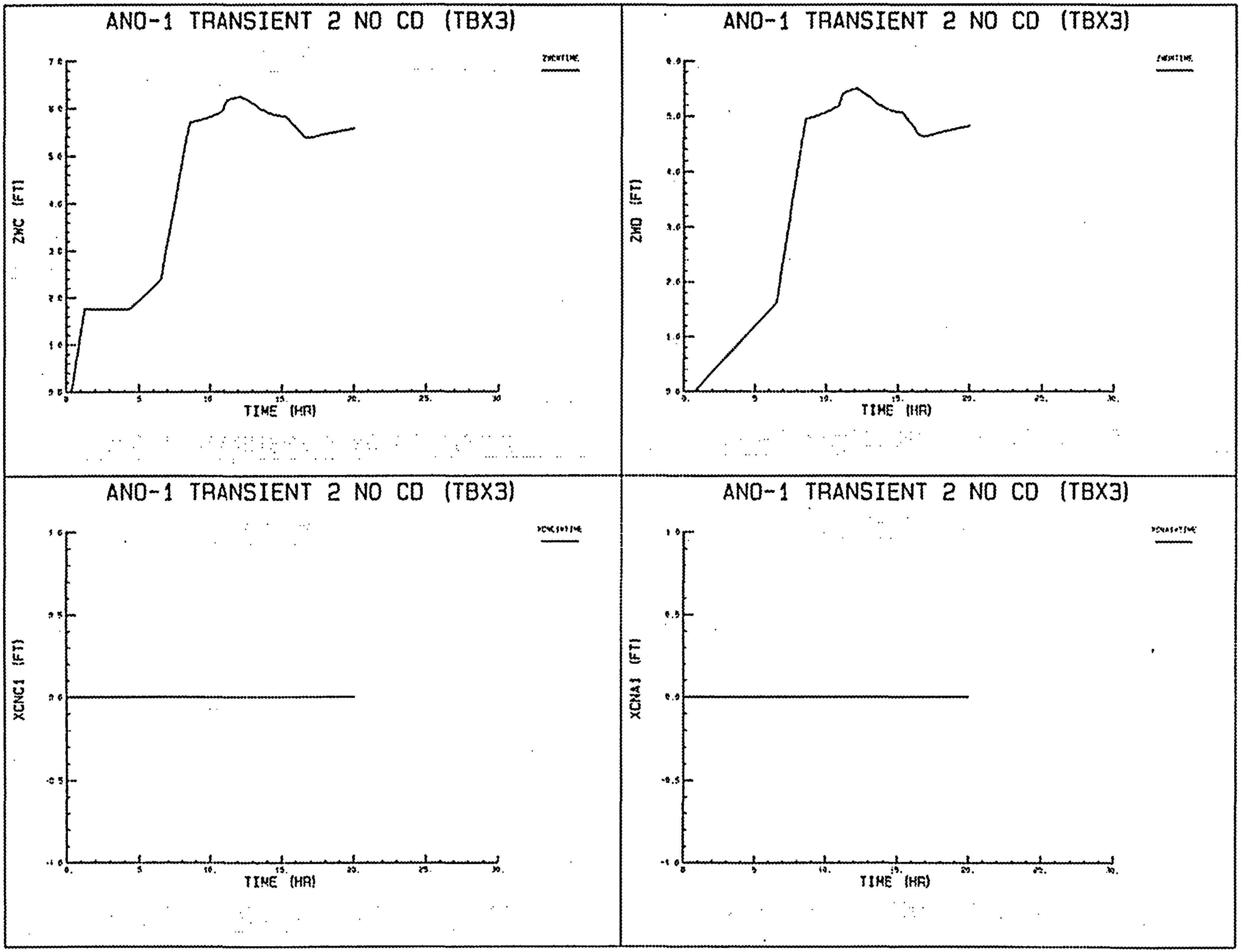
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TIME (HR)
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TIME (HR)
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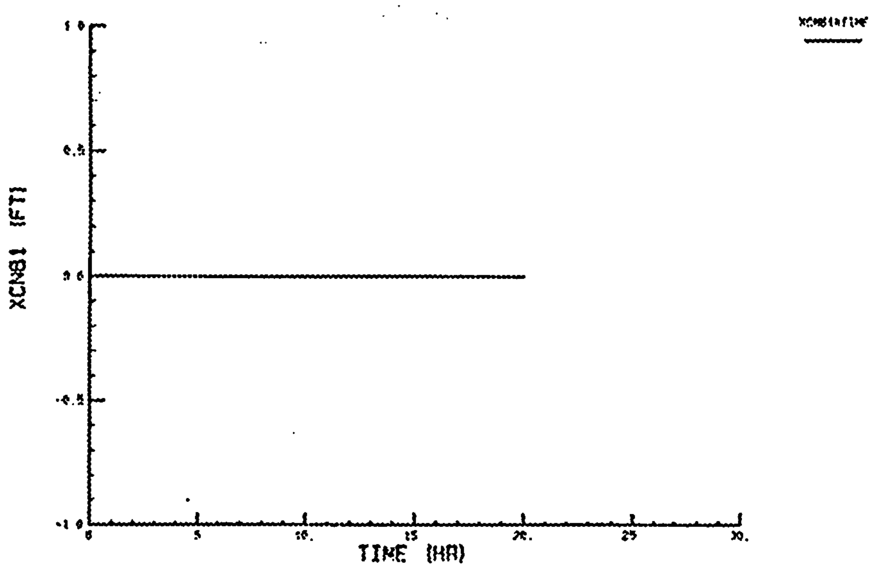

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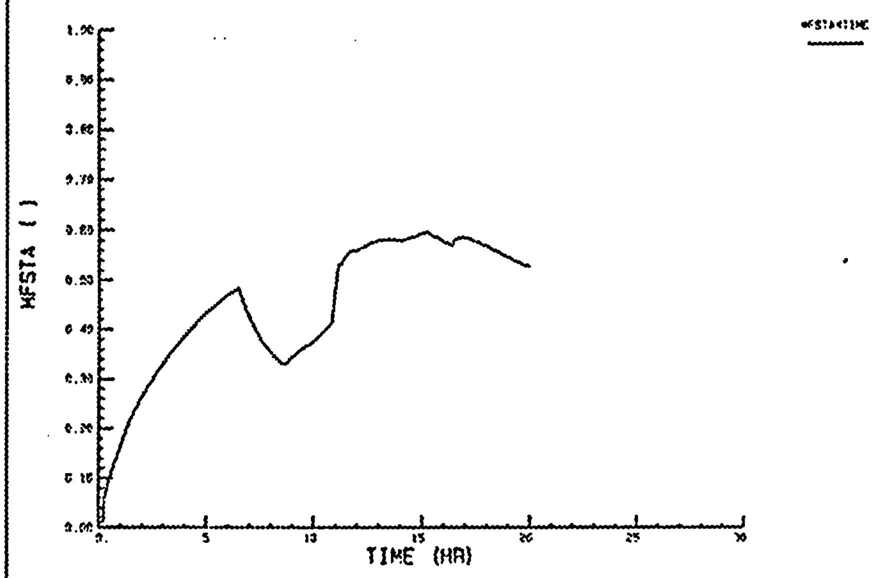

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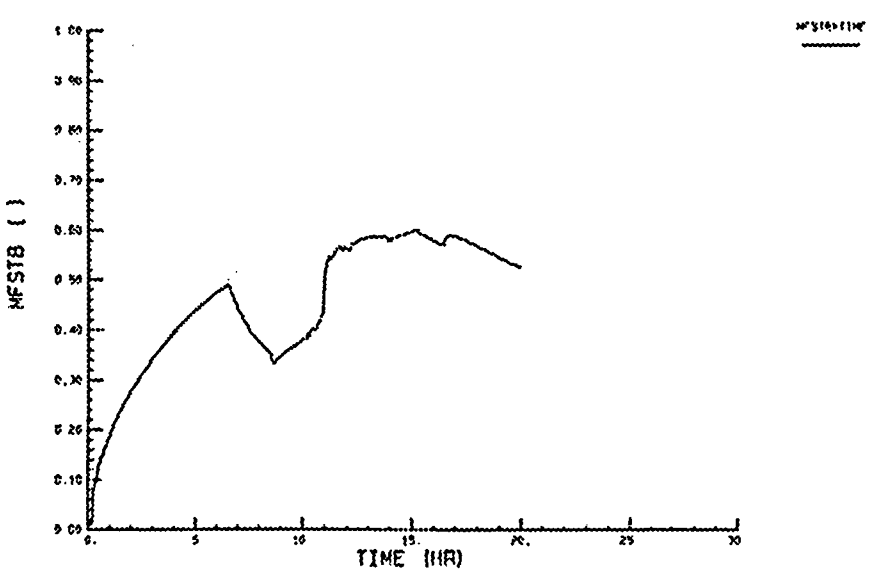

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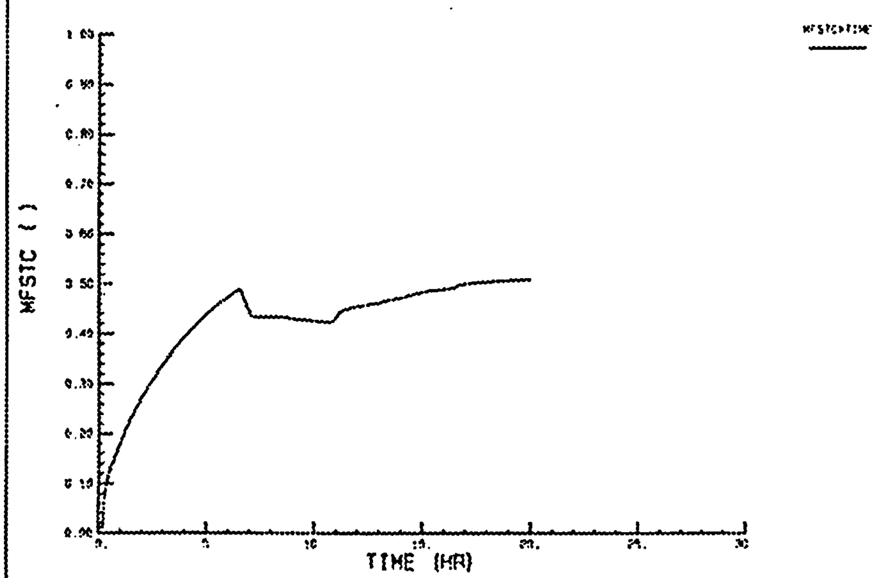

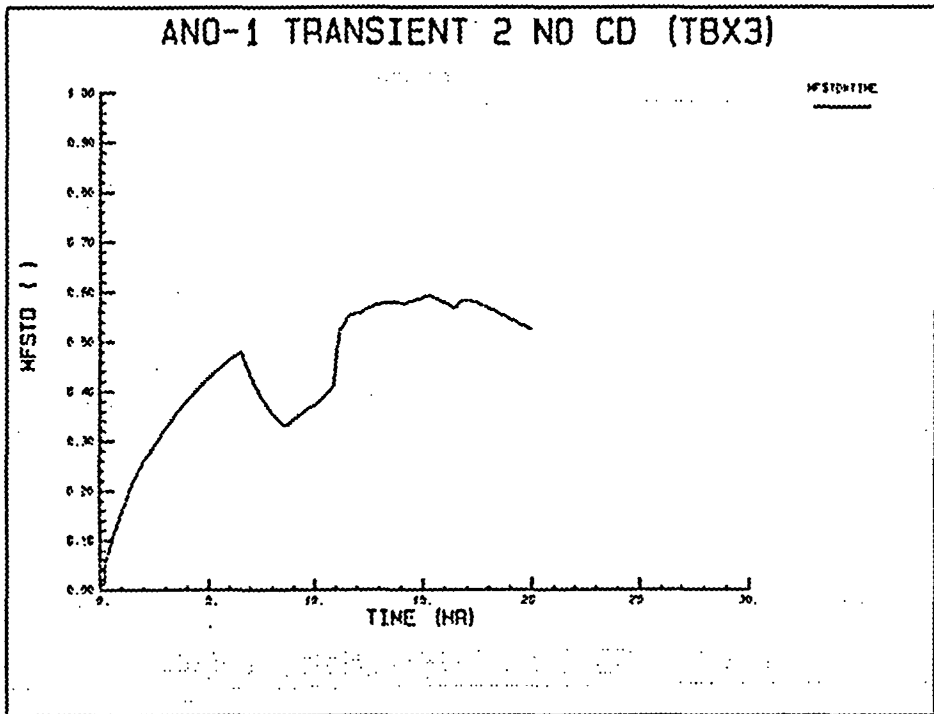
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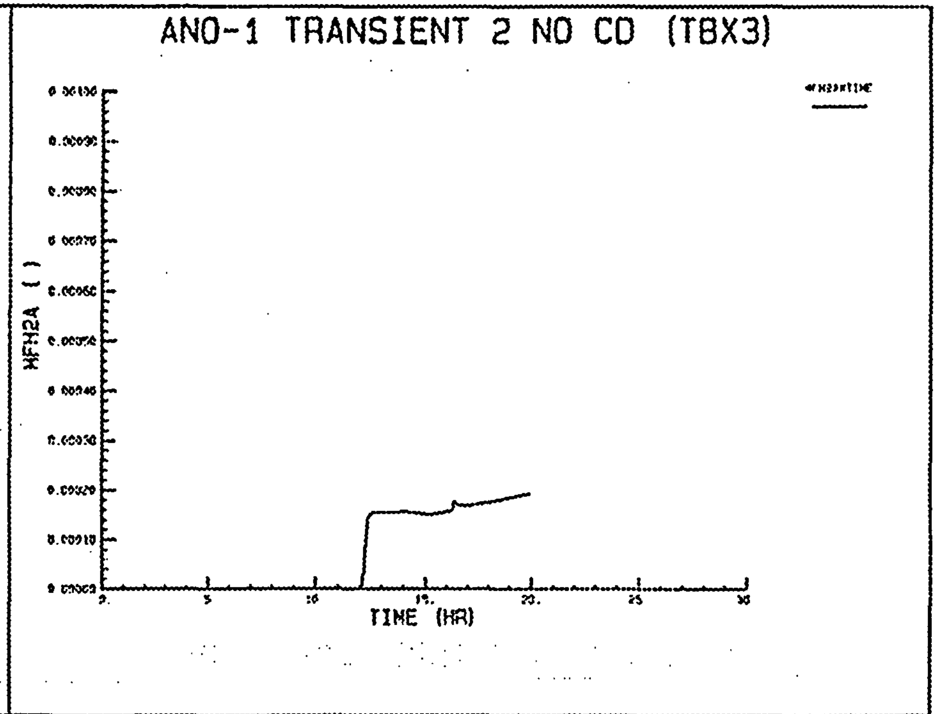
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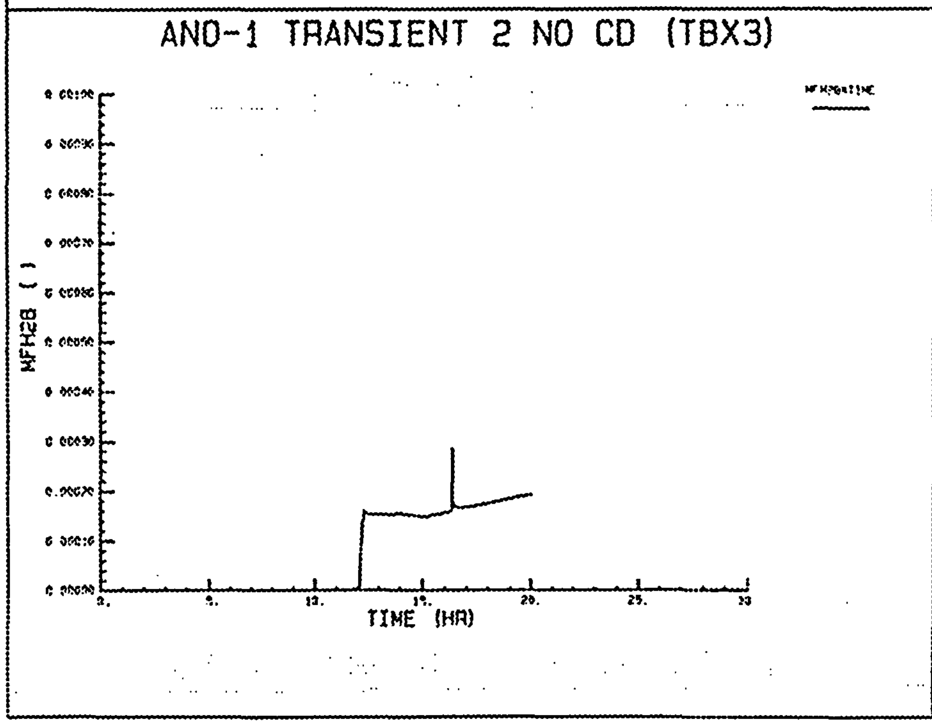
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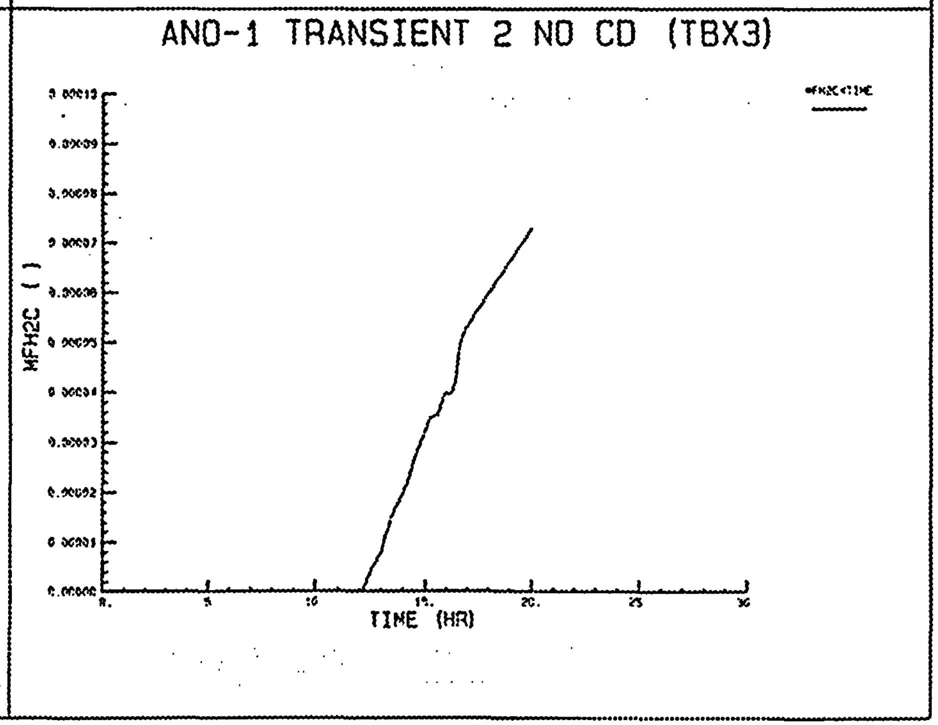
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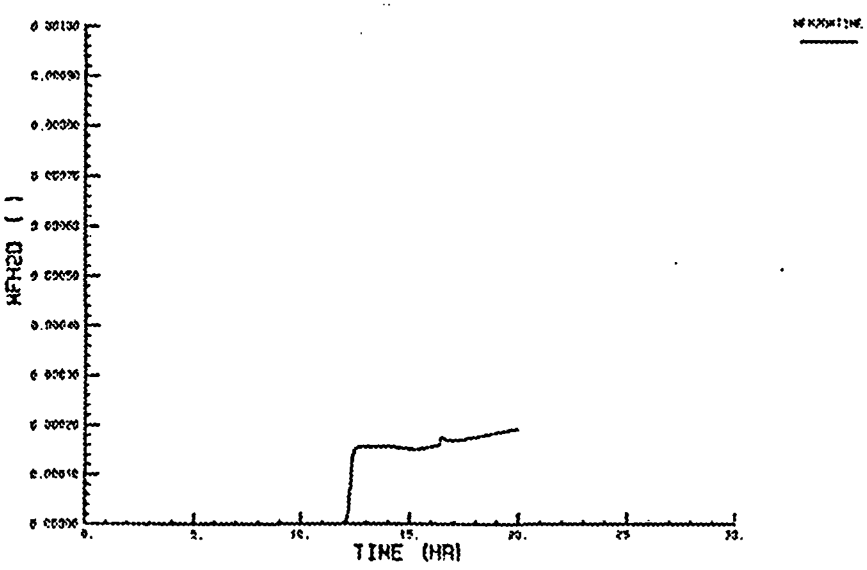

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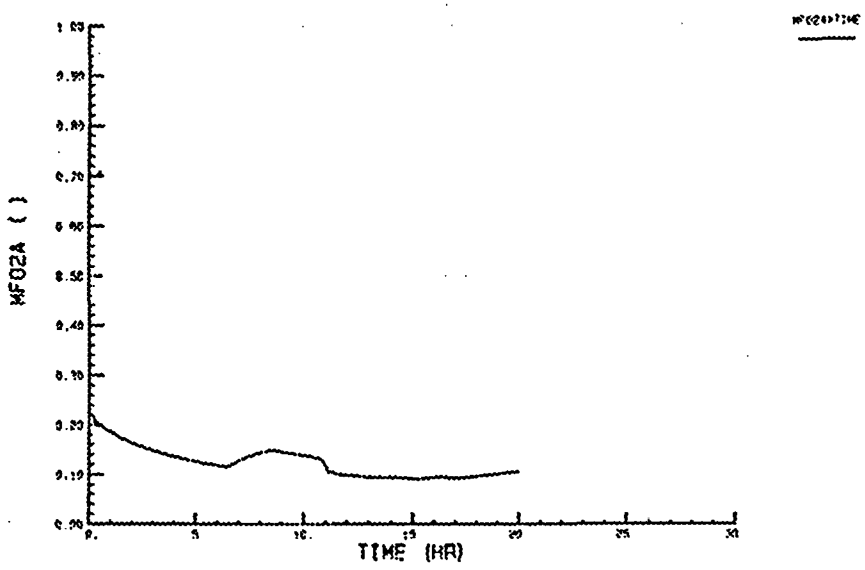

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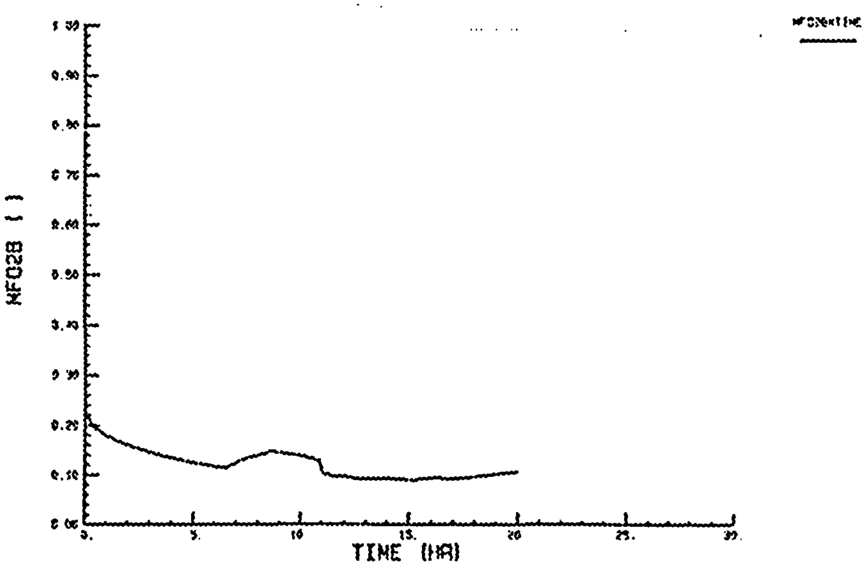

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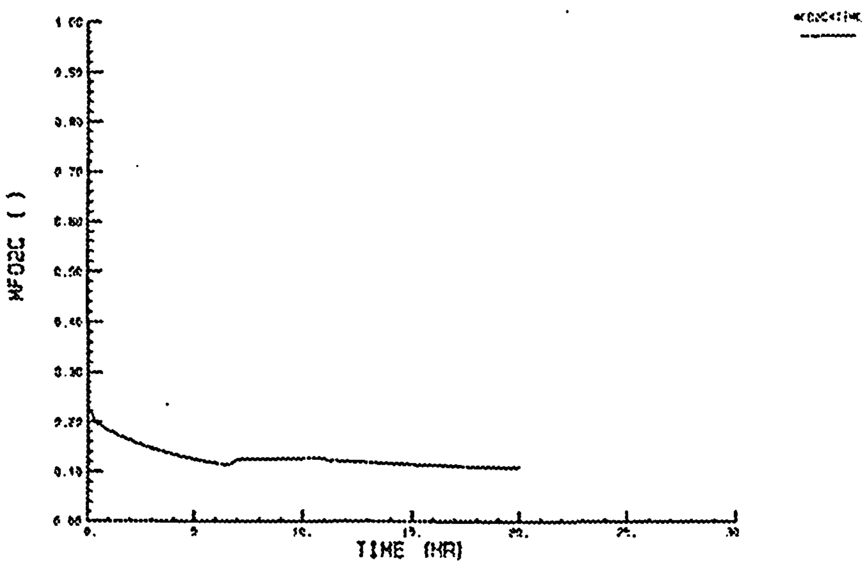

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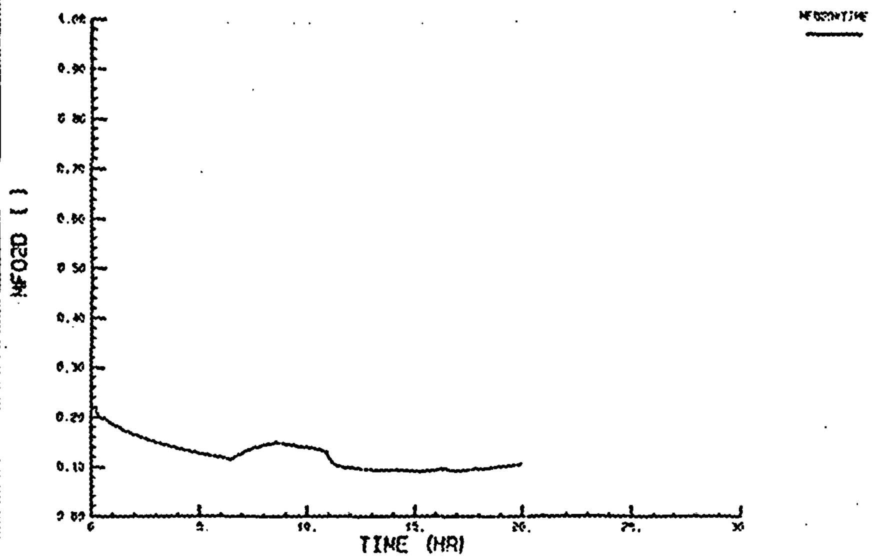

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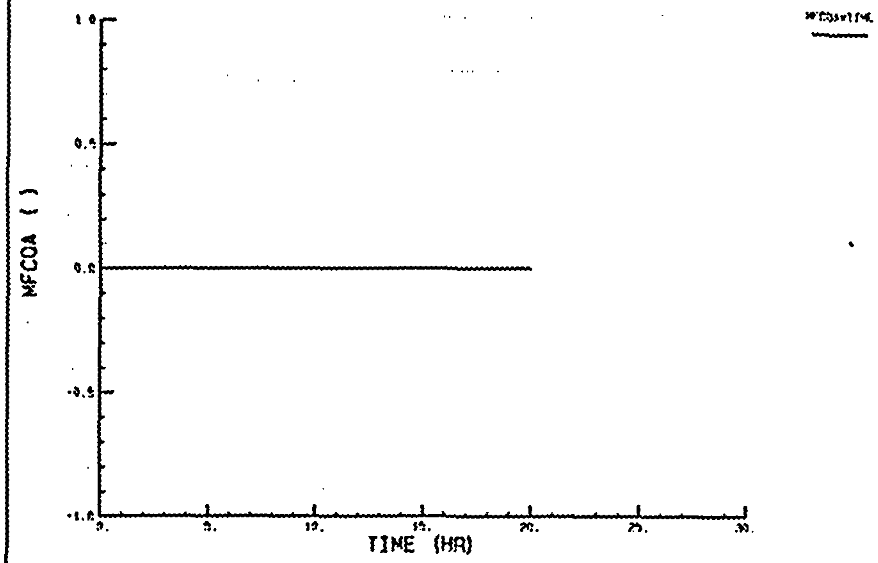

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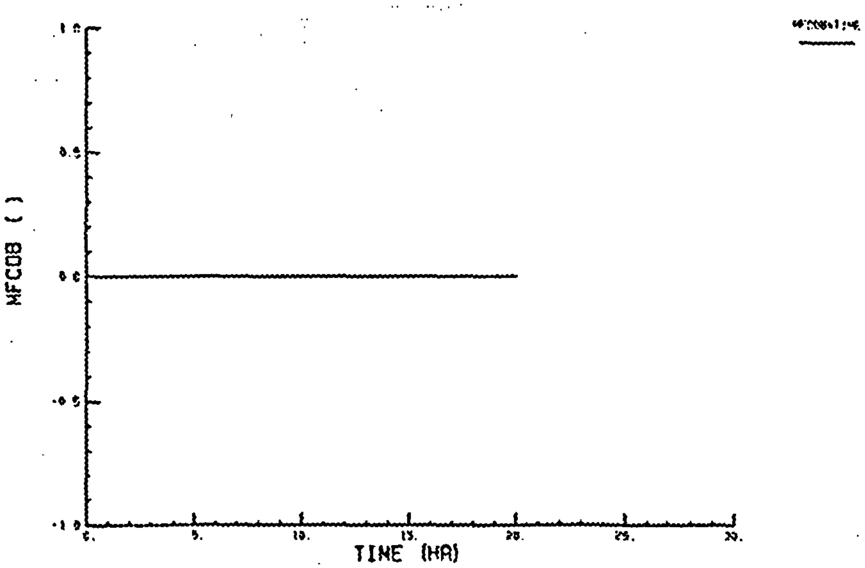

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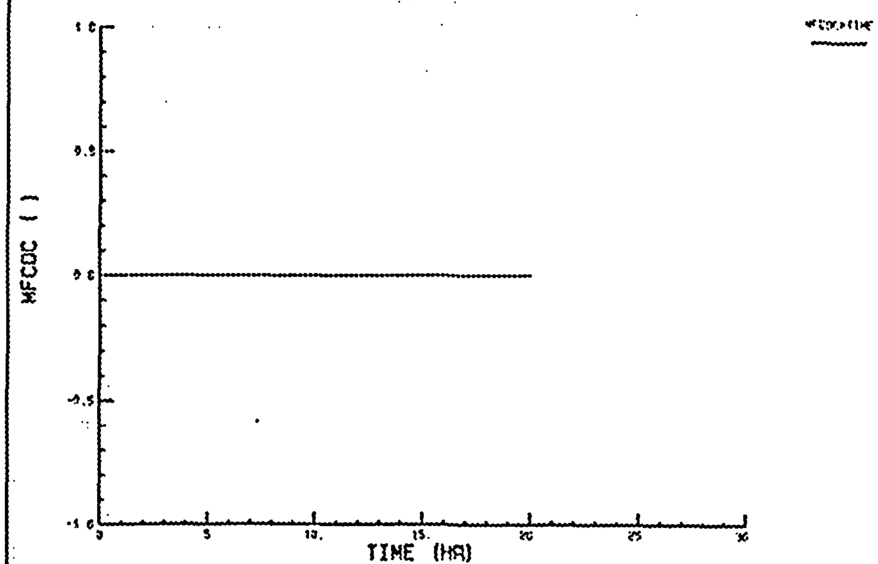

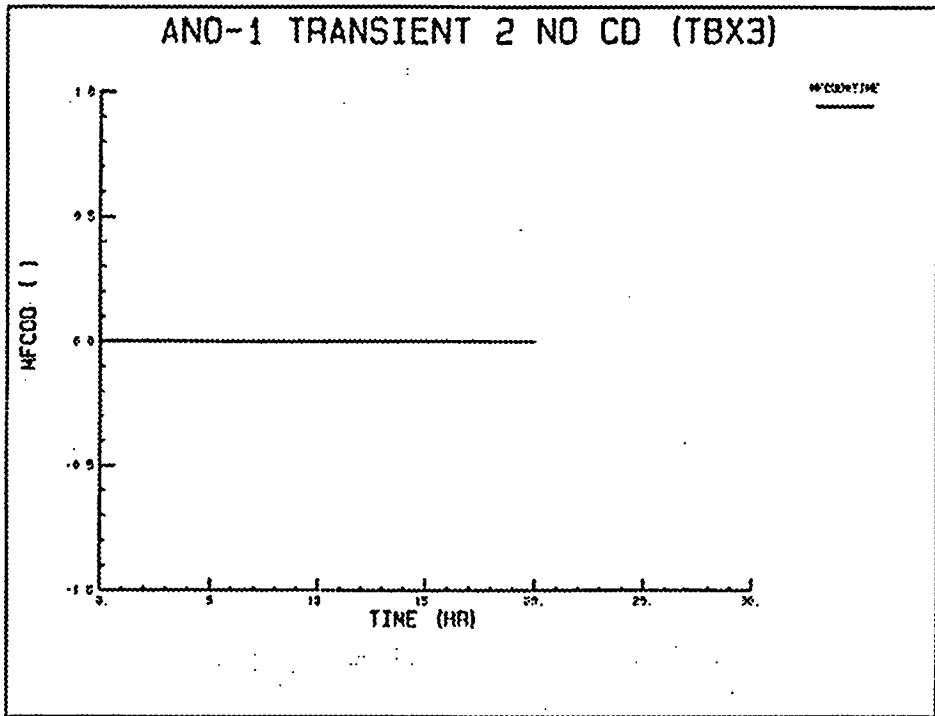
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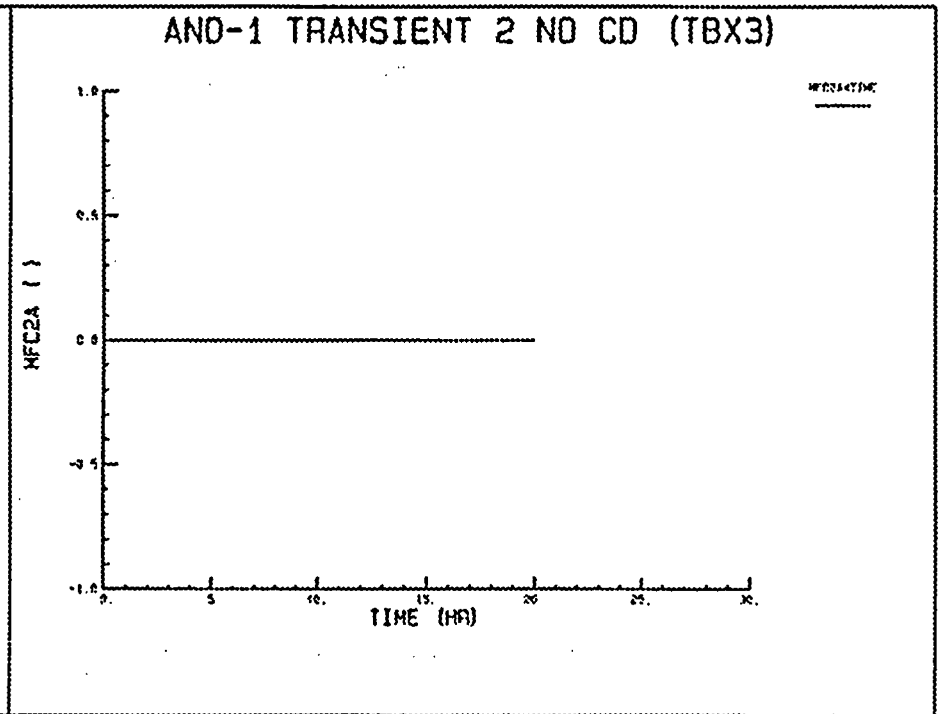
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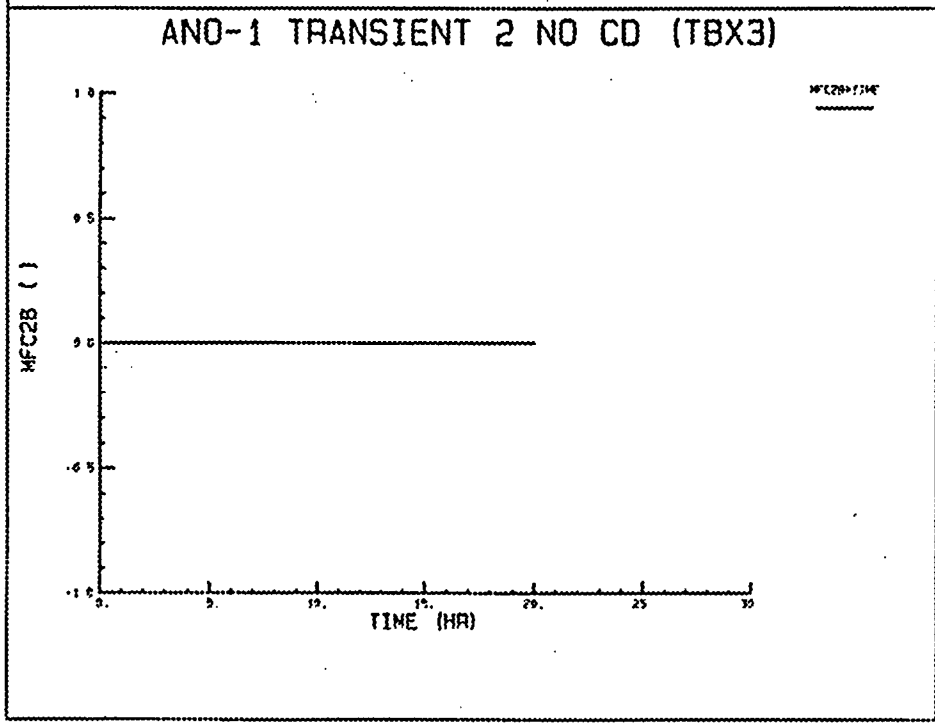
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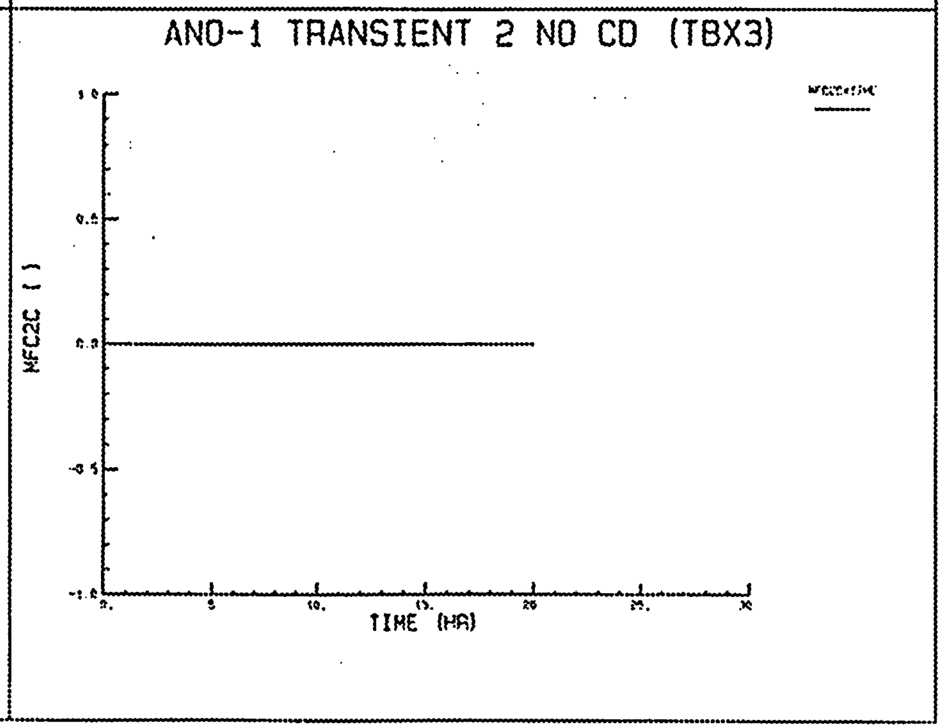
TIME (HR)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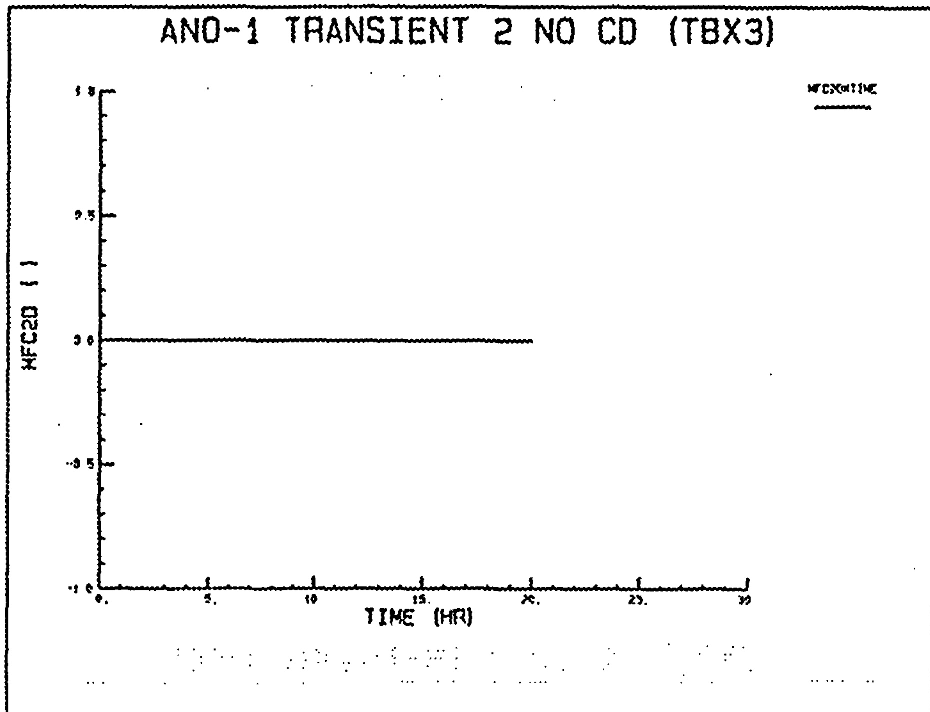
MFC2C ( )
TIME (HR)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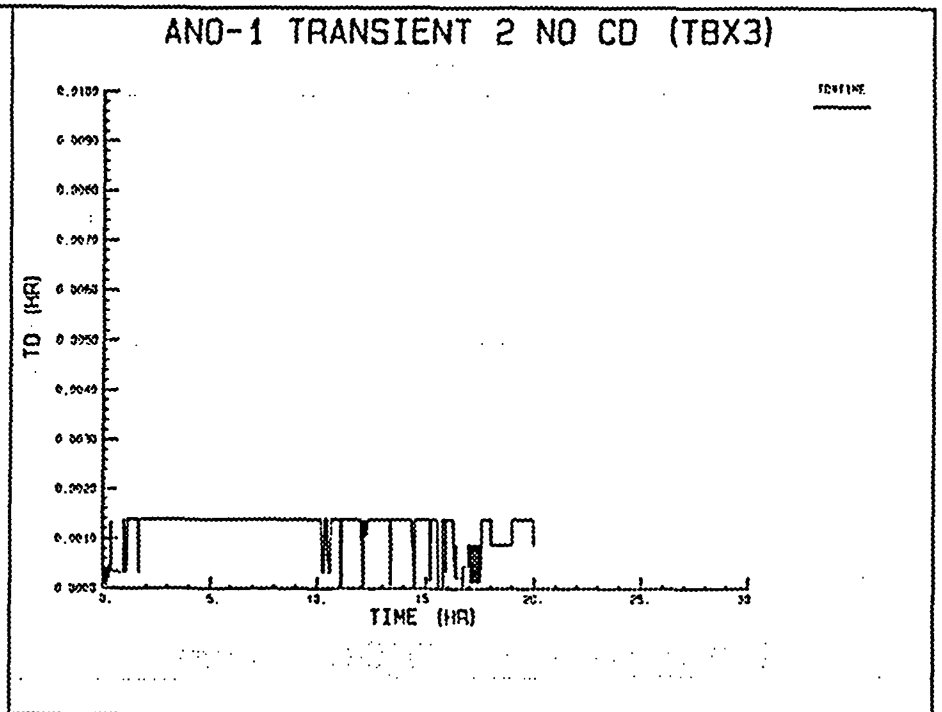
TIME (HR)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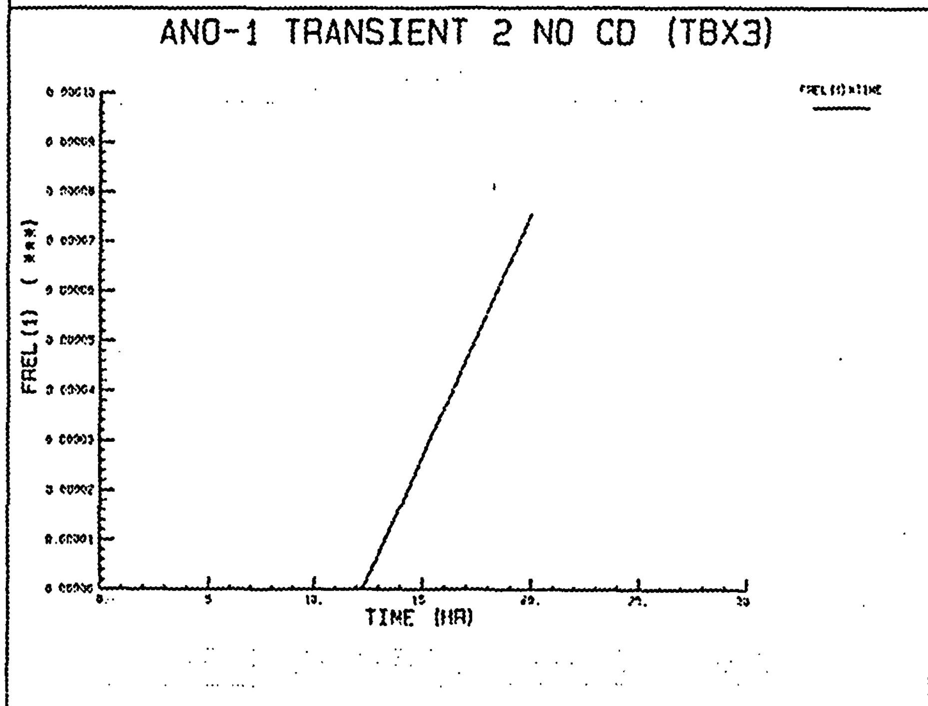
TIME (HR)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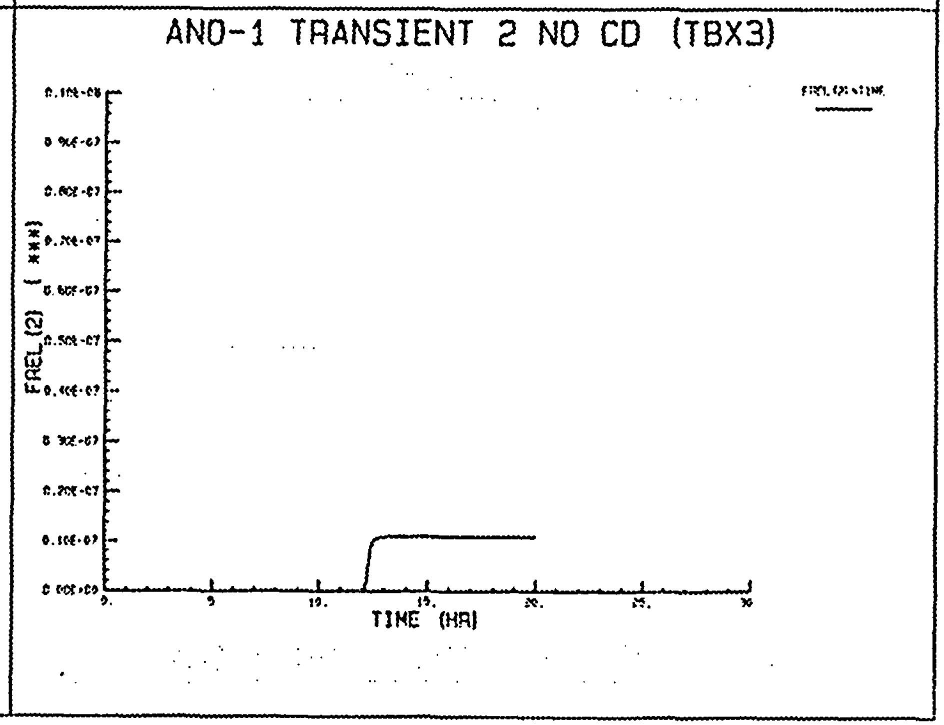
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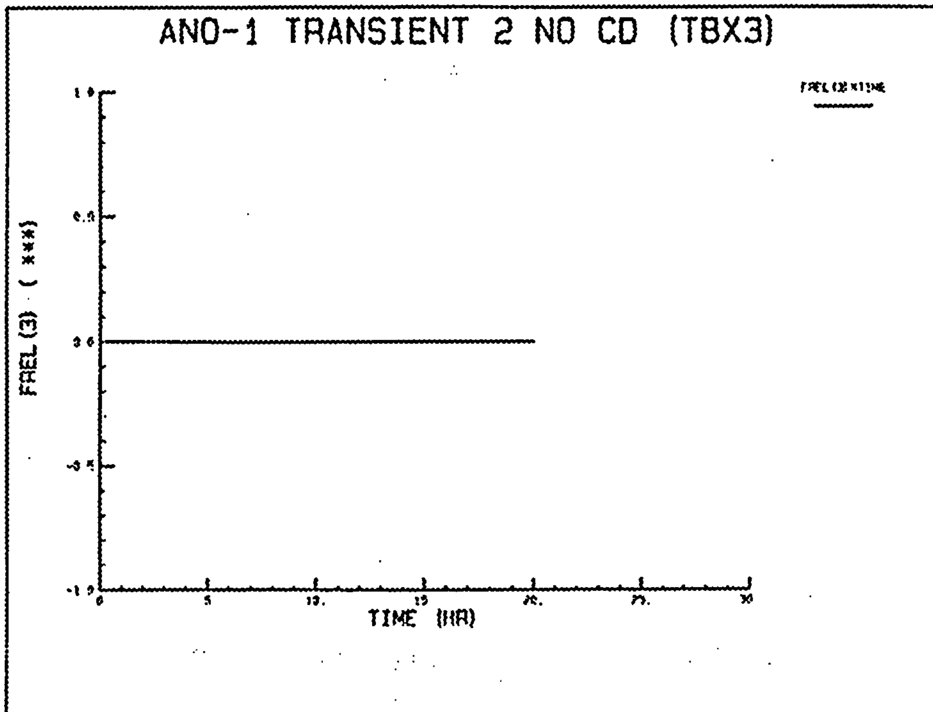

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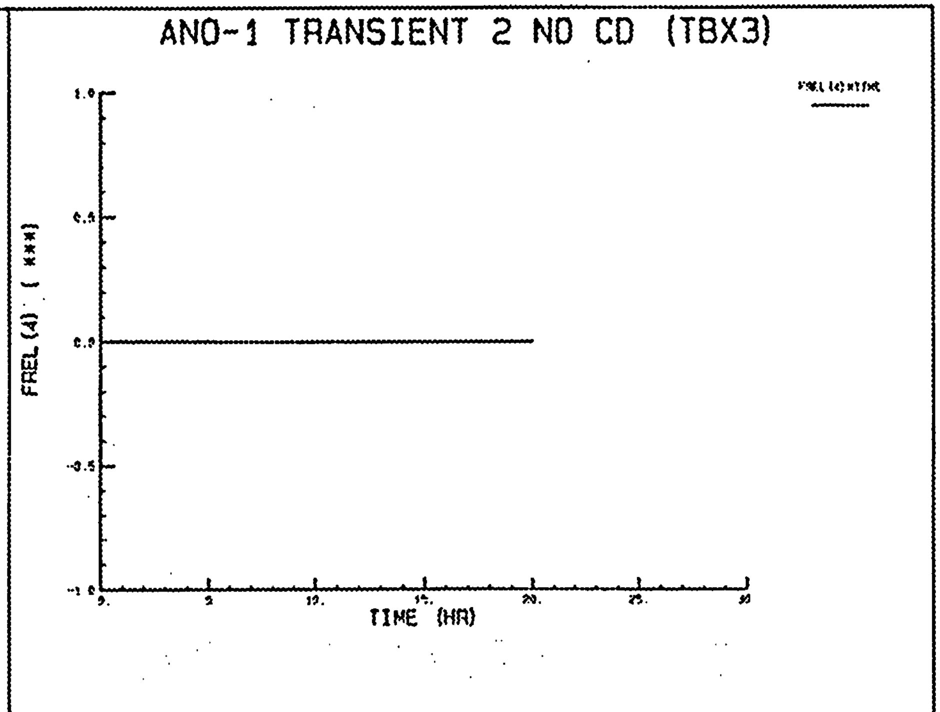

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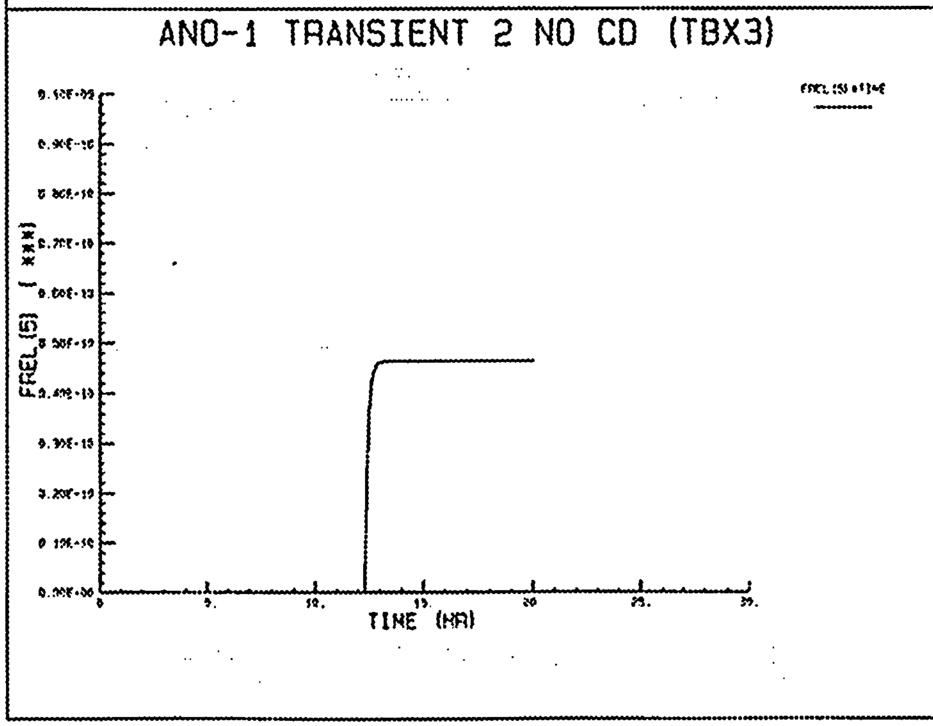
TIME (HR)



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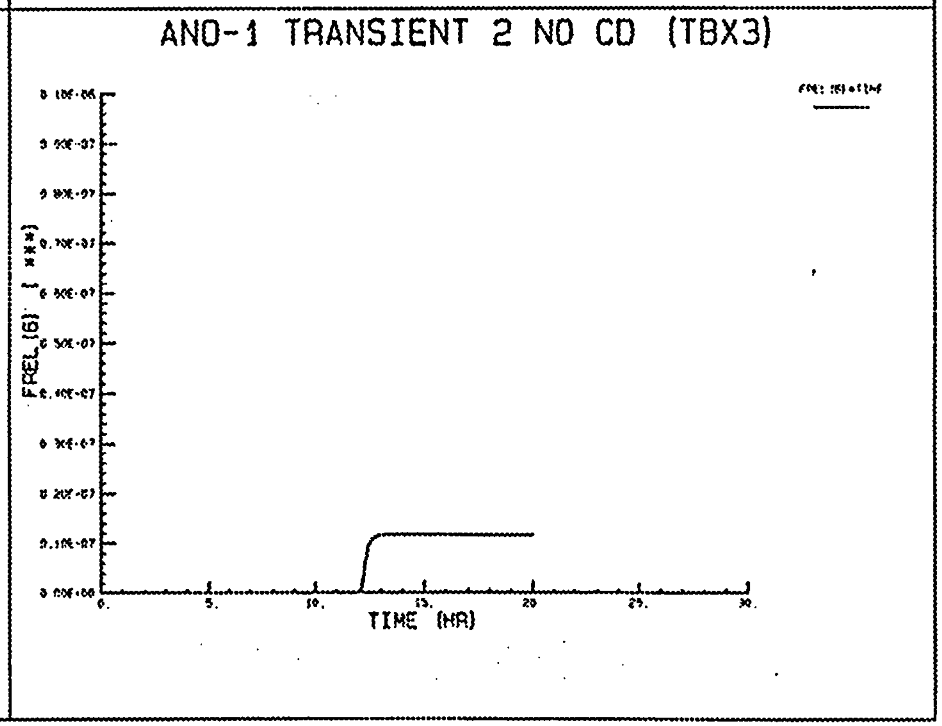
FREL(5) (***)
TIME (HR)



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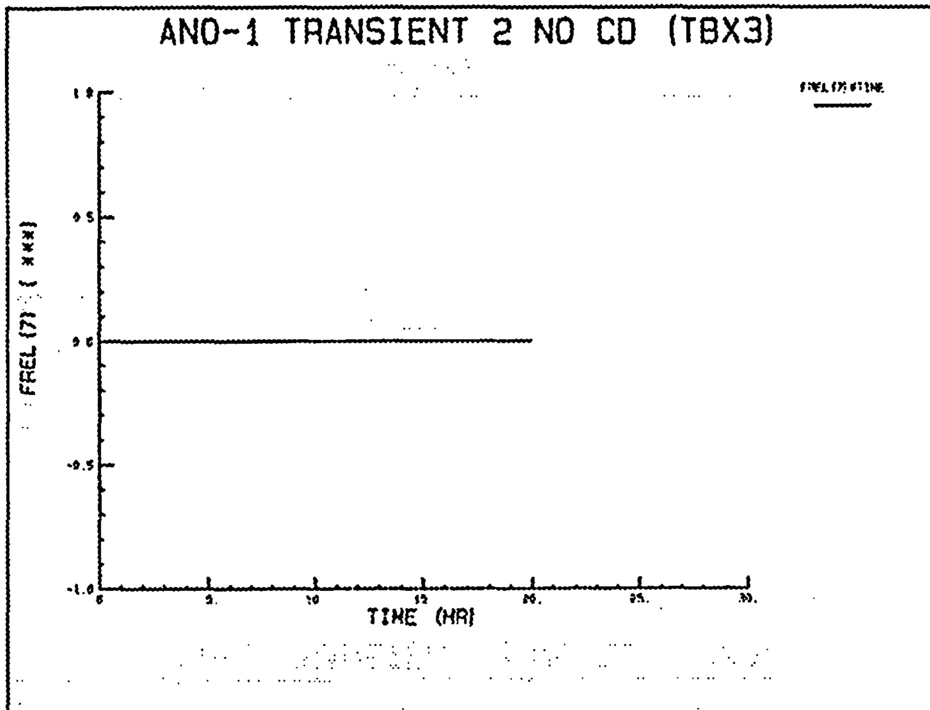
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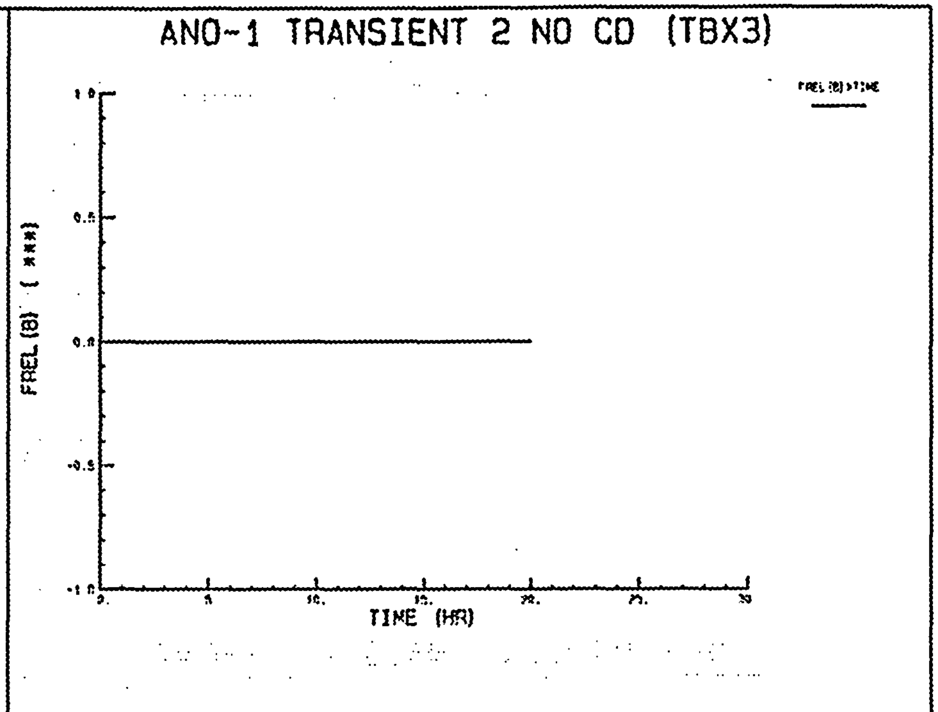
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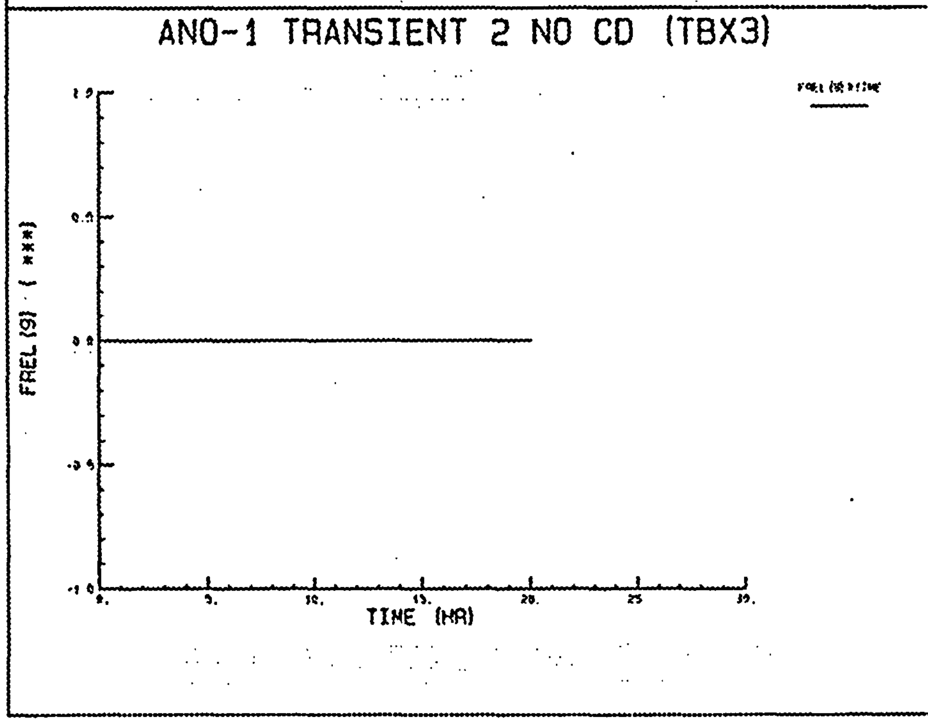
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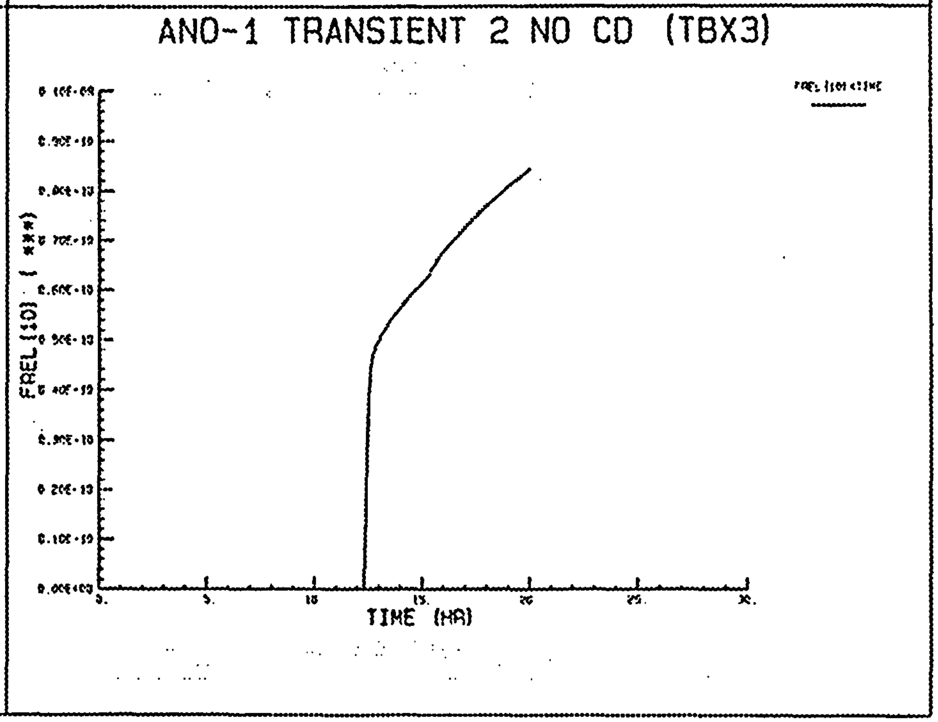
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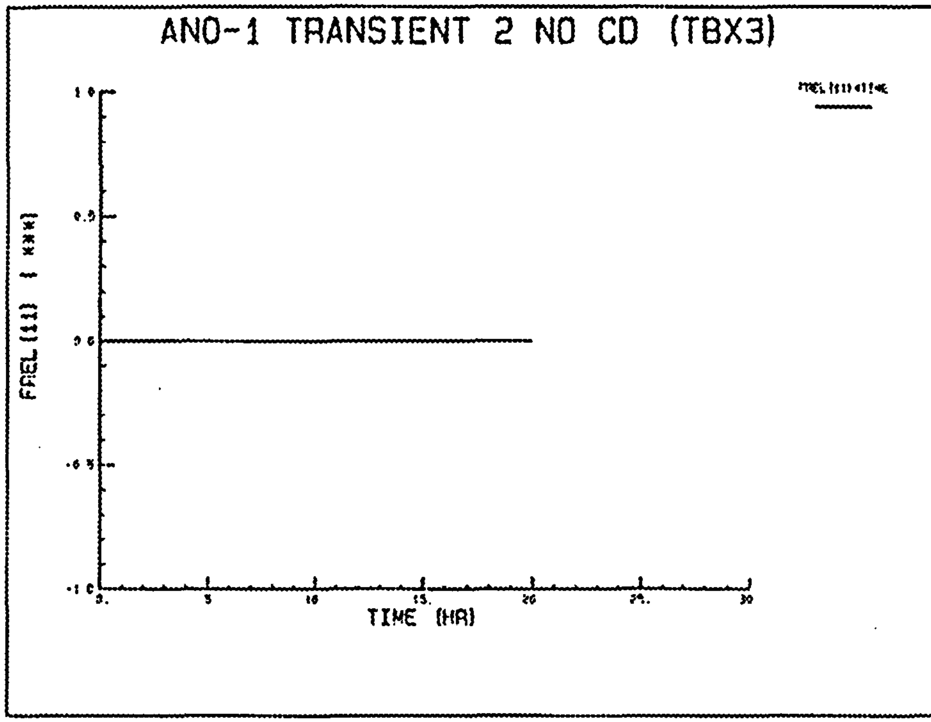
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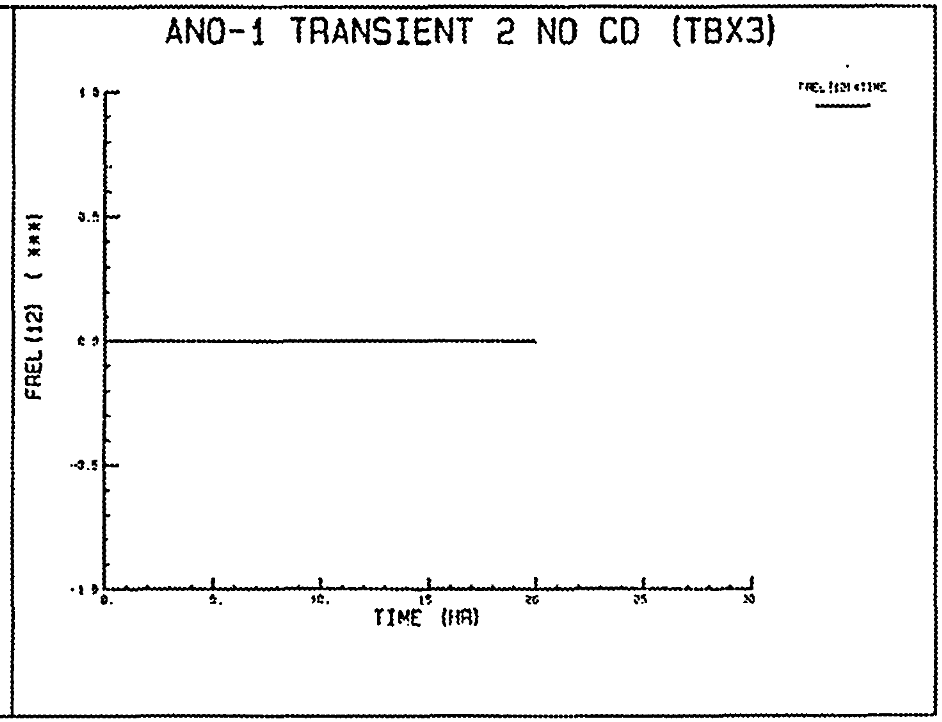
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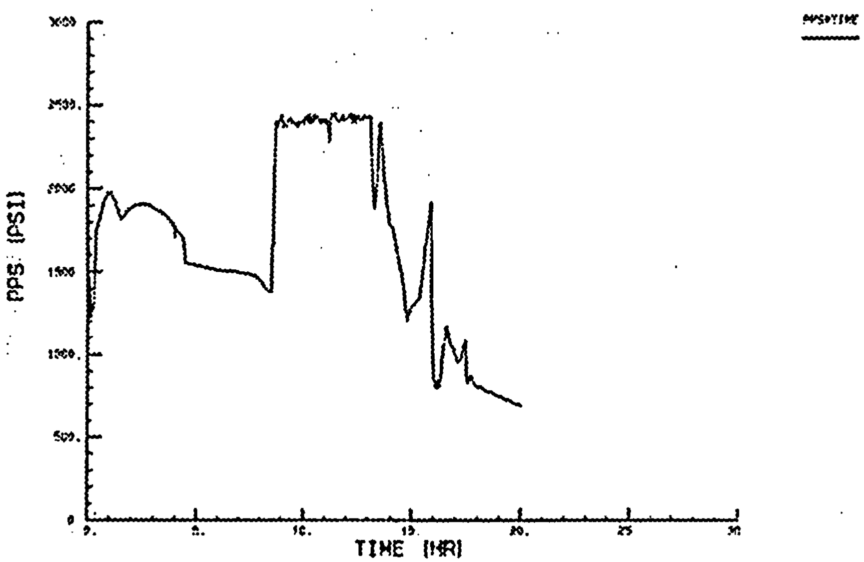
FREL(12) (***)
TIME (HR)

ANO-1 TRANSIENT 2 NO VF (TBX7)



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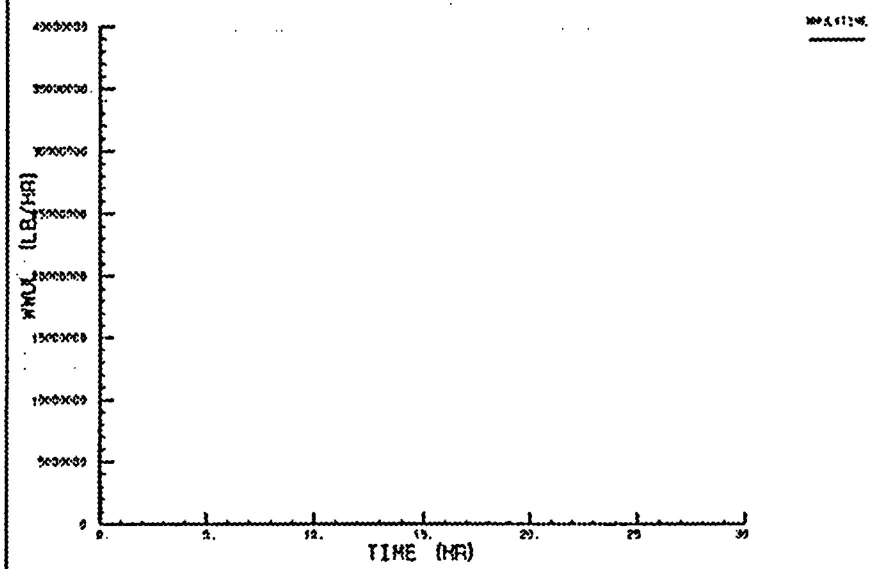

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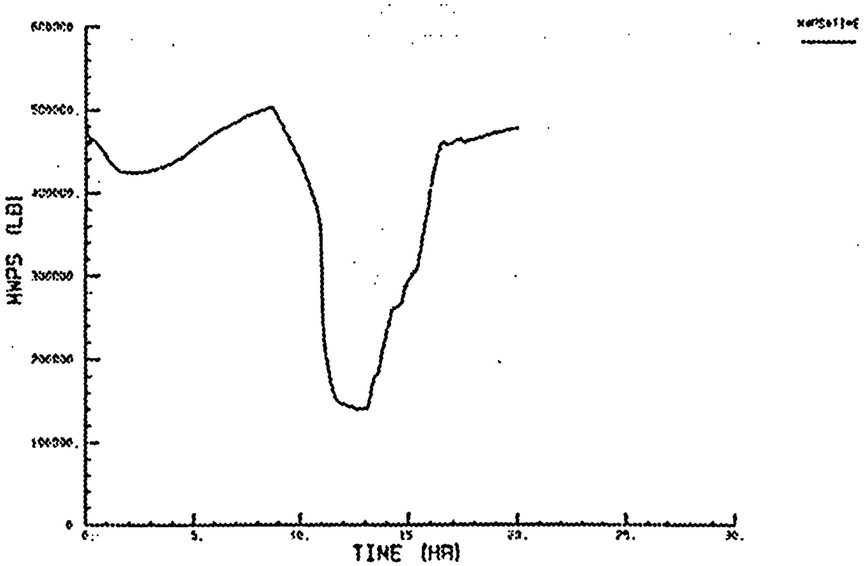

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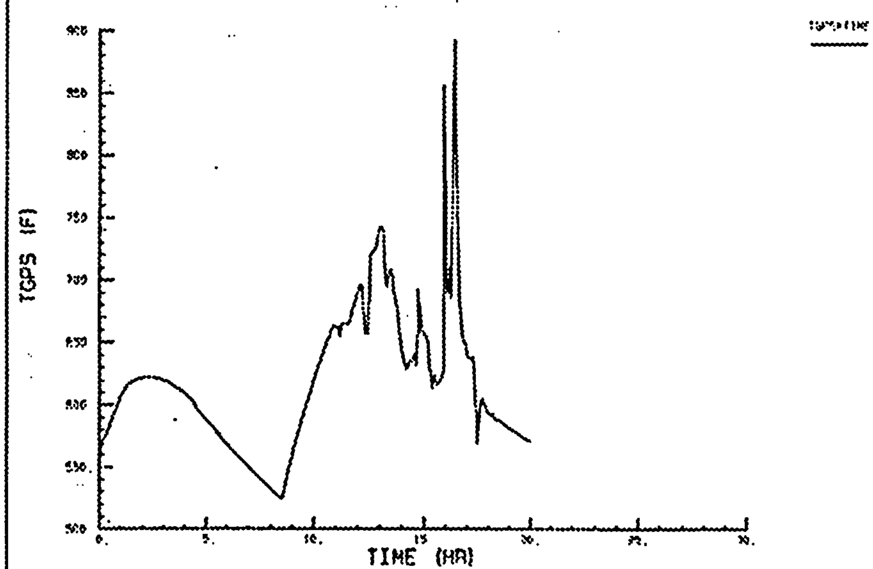

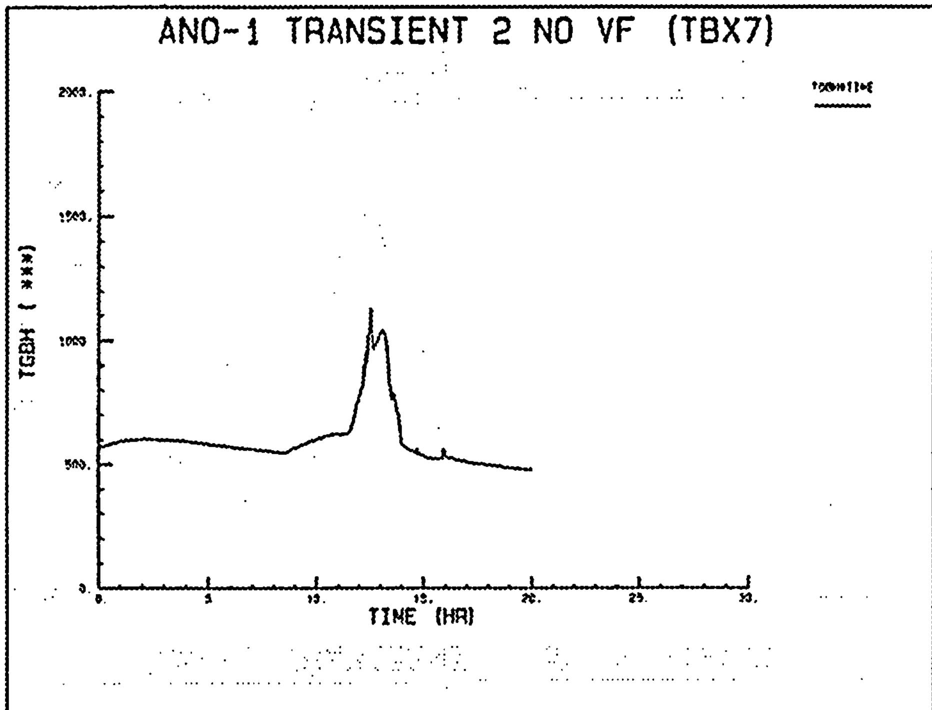
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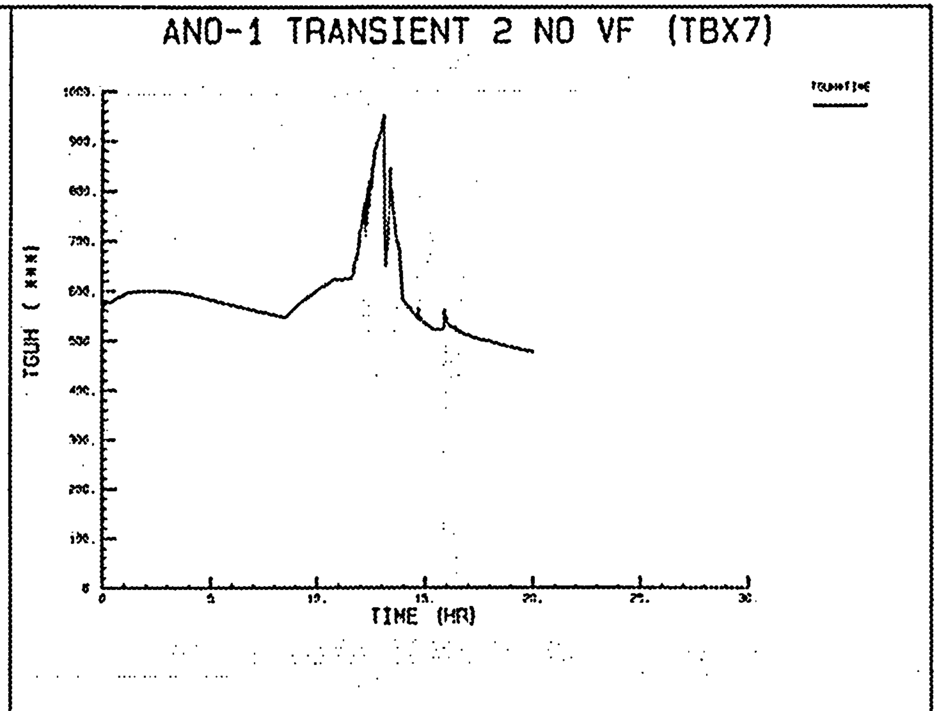
TGBH (***)
TIME (HR)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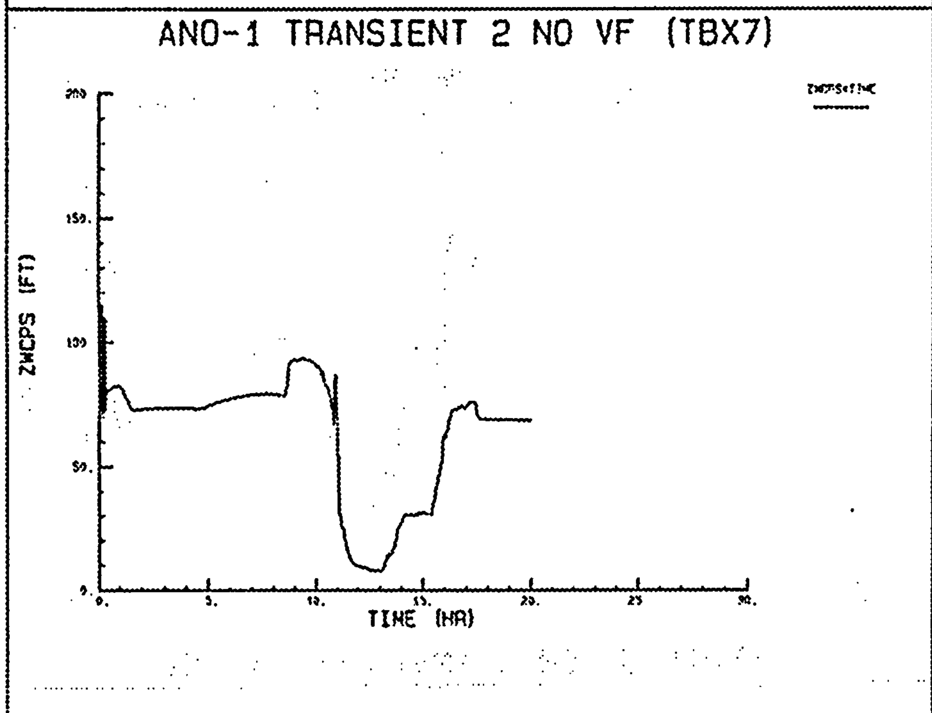
TGUH (***)
TIME (HR)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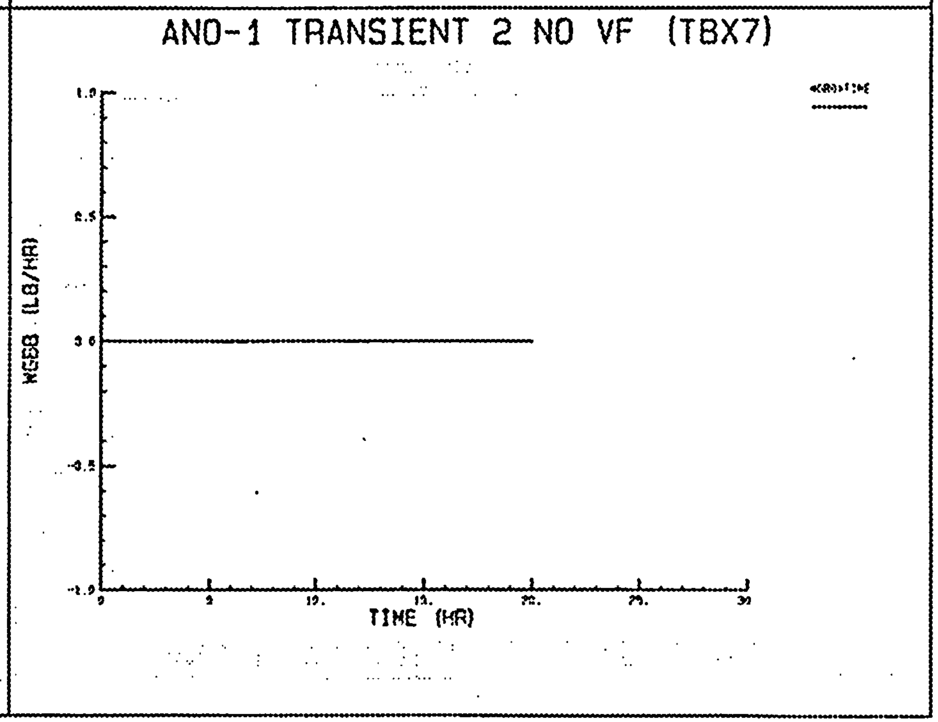
ZWCPS (FT)
TIME (HR)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WGSB (LB/HR)
TIME (HR)

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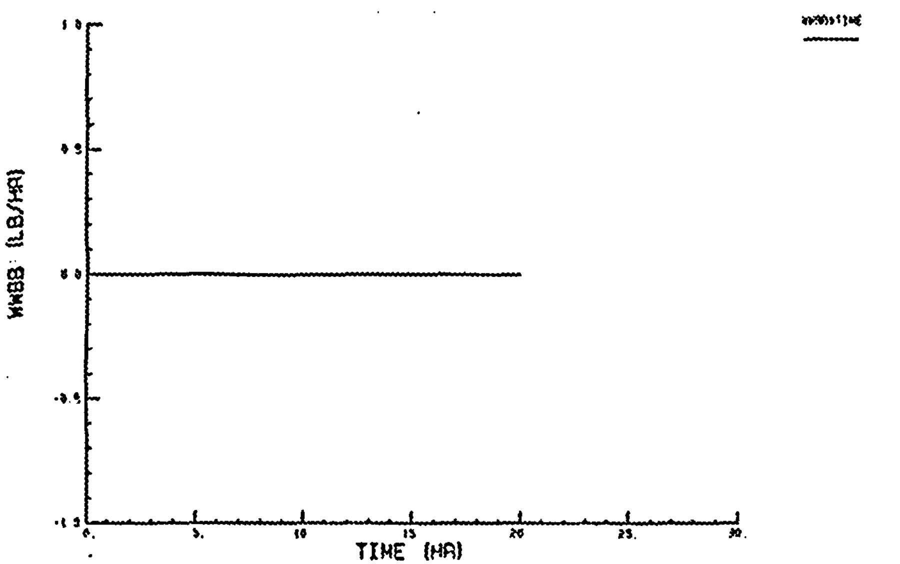

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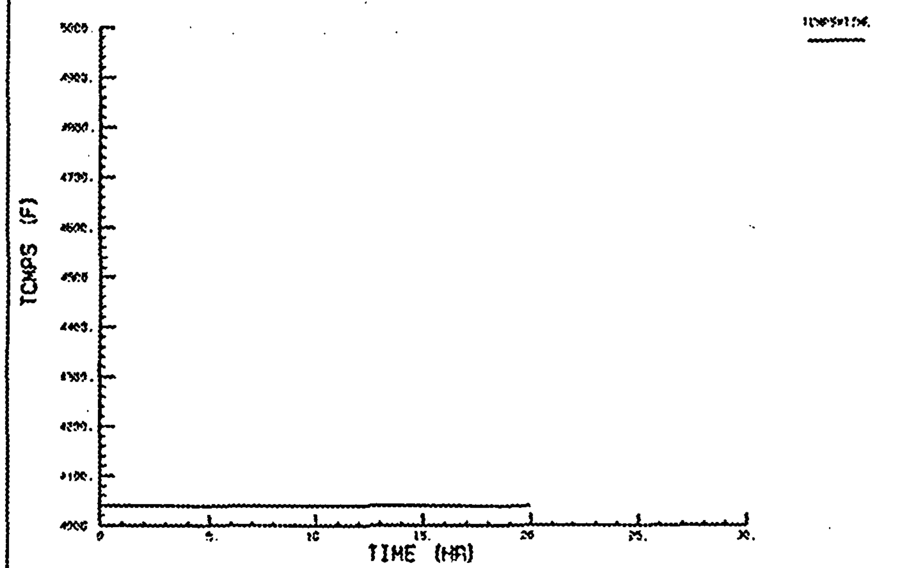

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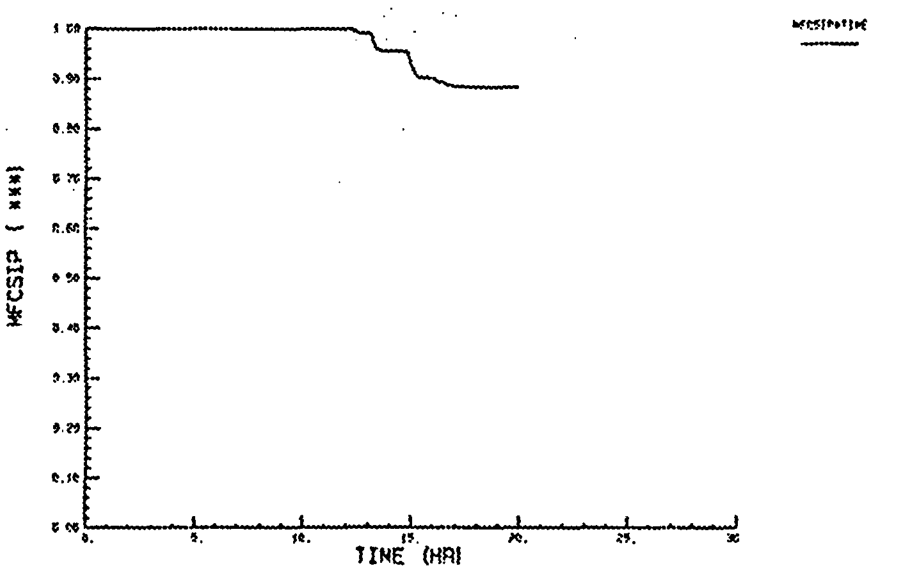

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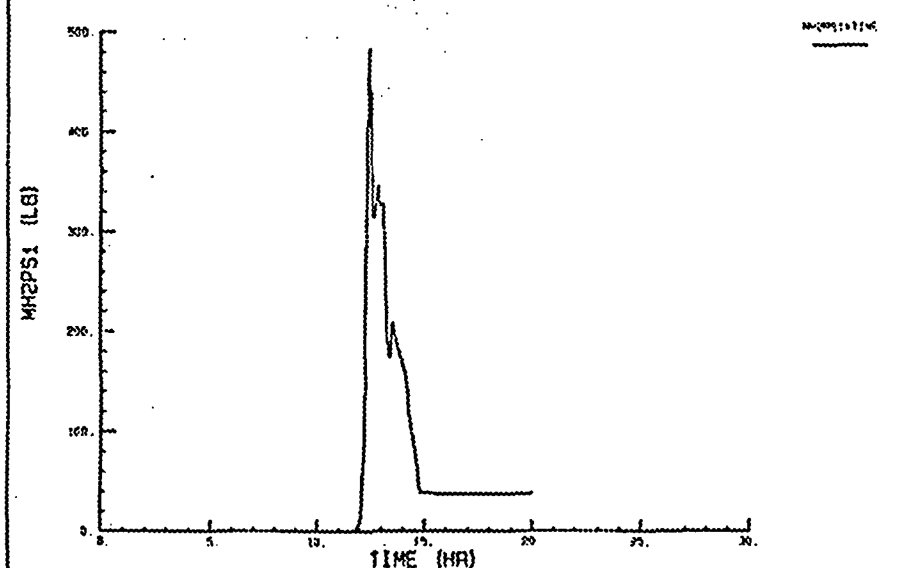

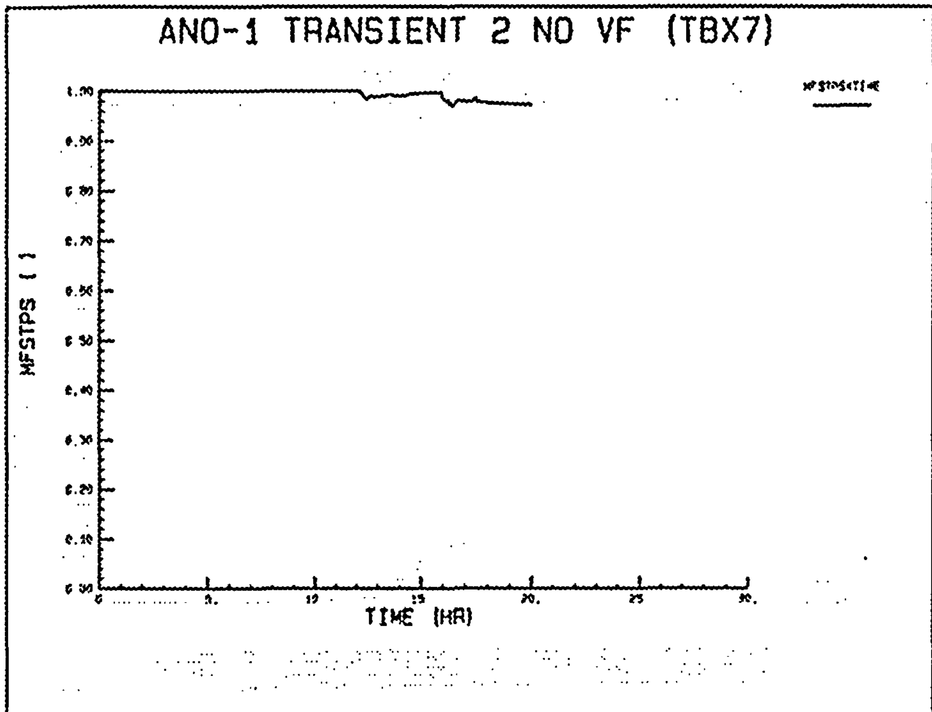
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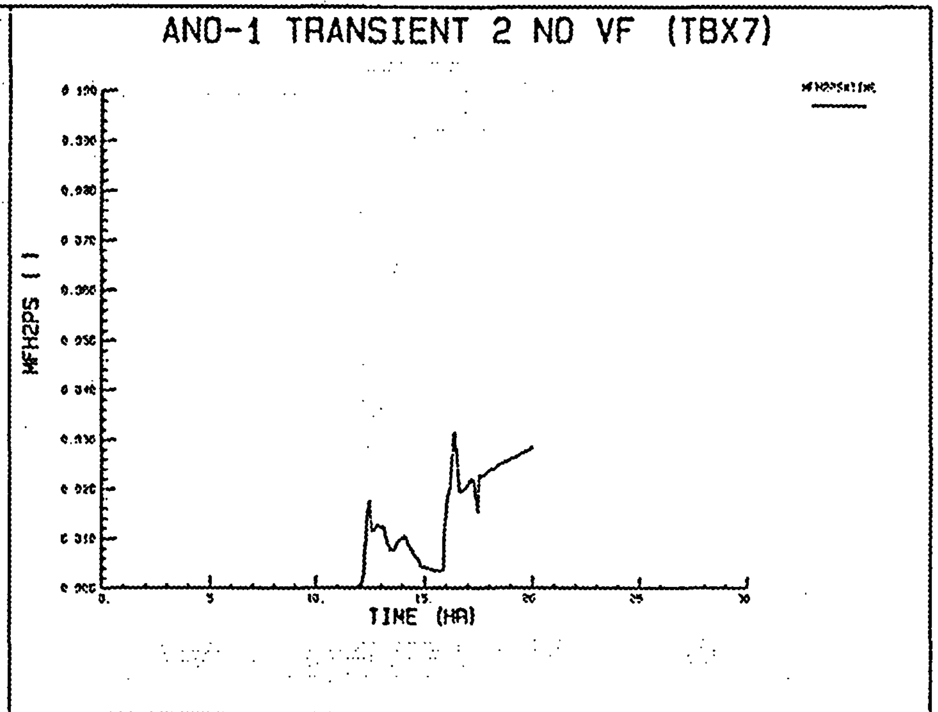
MFSTPS ( )
TIME (HR)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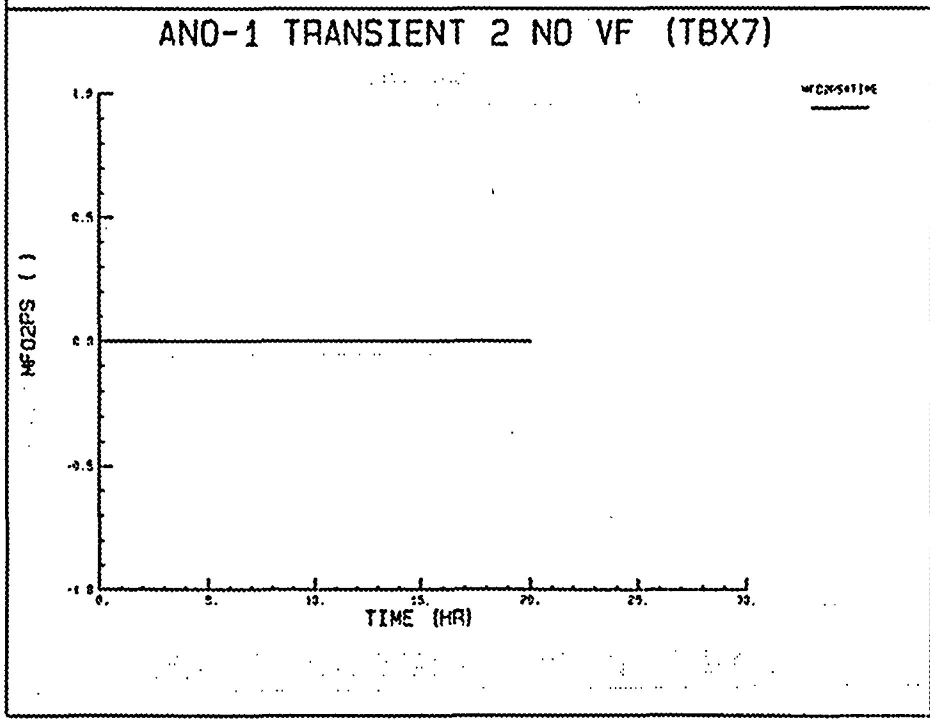
TIME (HR)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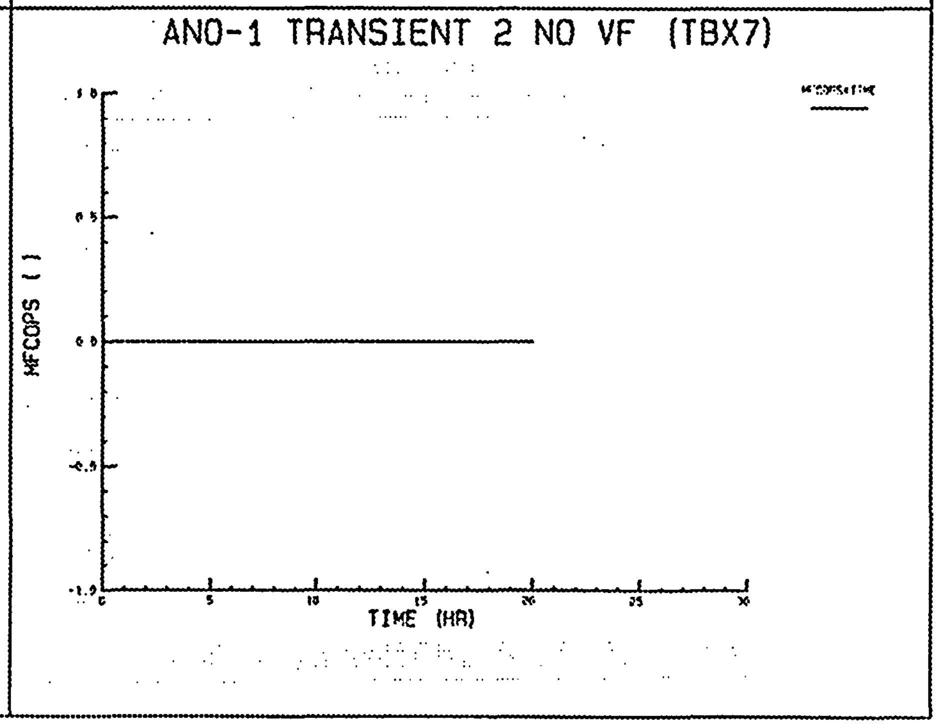
TIME (HR)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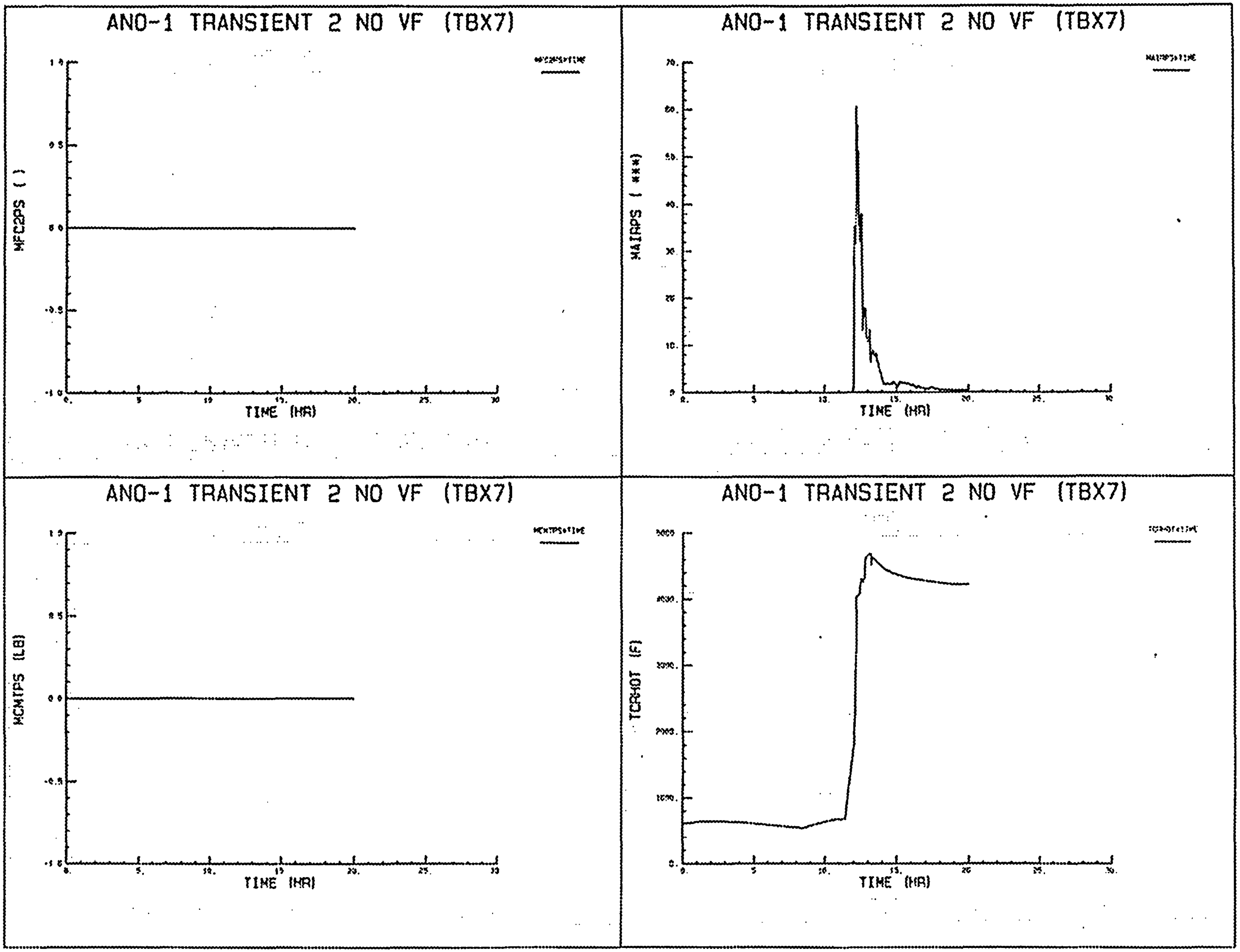
TIME (HR)


ANO-1 TRANSIENT 2 NO VF (TBX7)
MFC2PS ( )
TIME (HR)
ANO-1 TRANSIENT 2 NO VF (TBX7)
MAIRPS (***)
TIME (HR)
ANO-1 TRANSIENT 2 NO VF (TBX7)
MCMIPS (LB)
TIME (HR)
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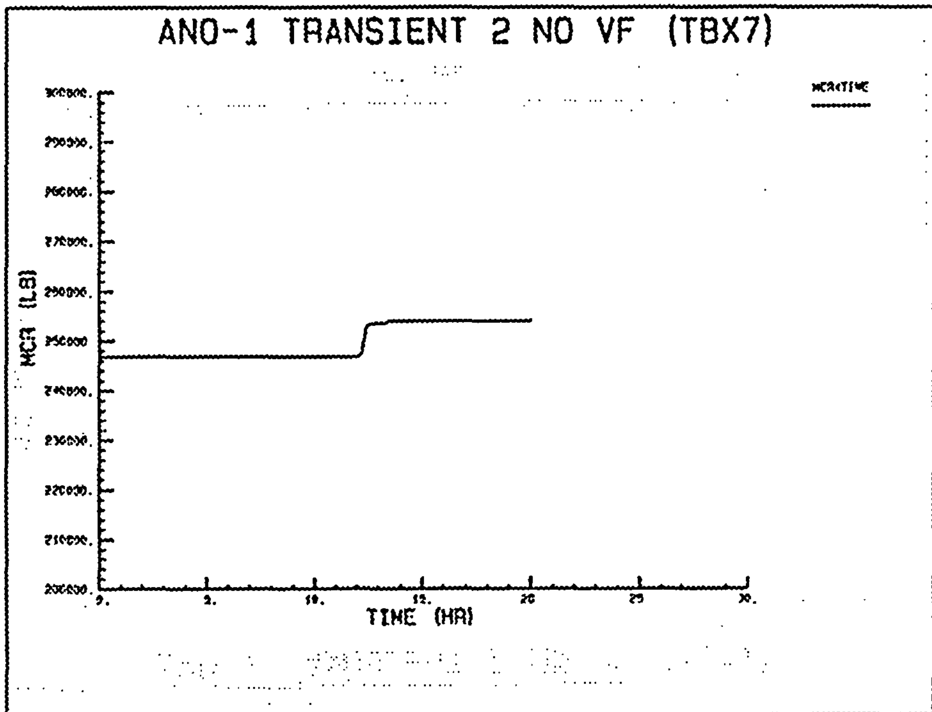
TCRHOT (F)
TIME (HR)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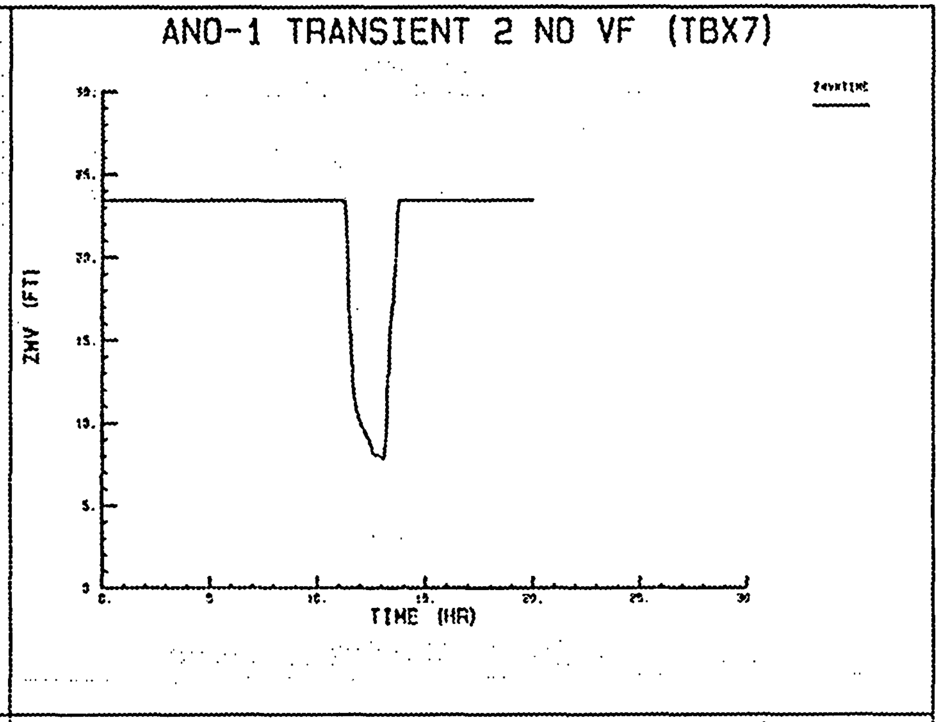
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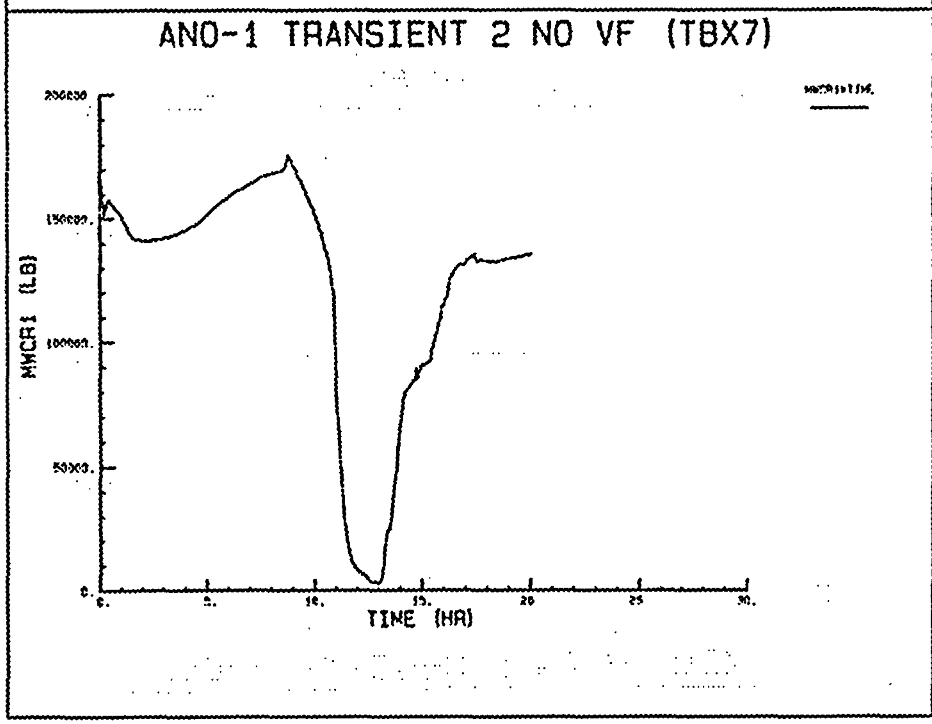
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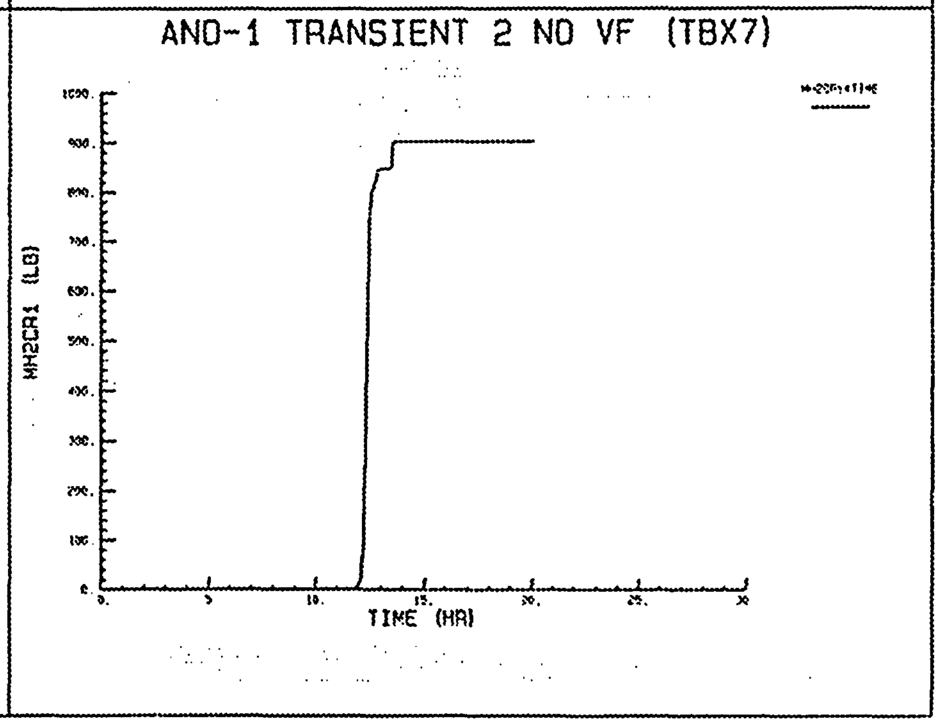
TIME (HR)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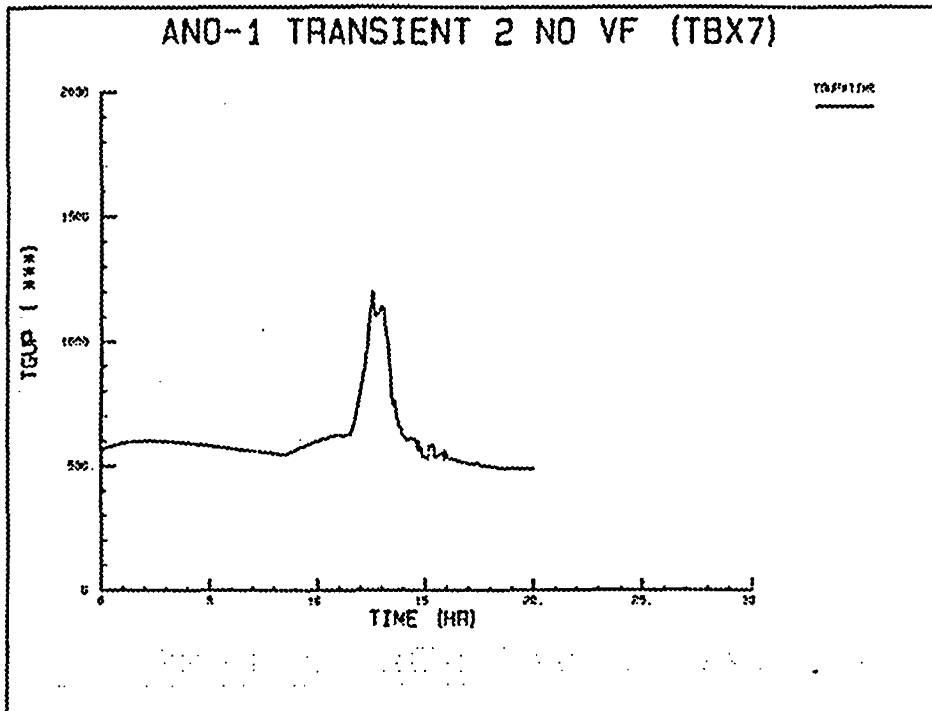
TIME (HR)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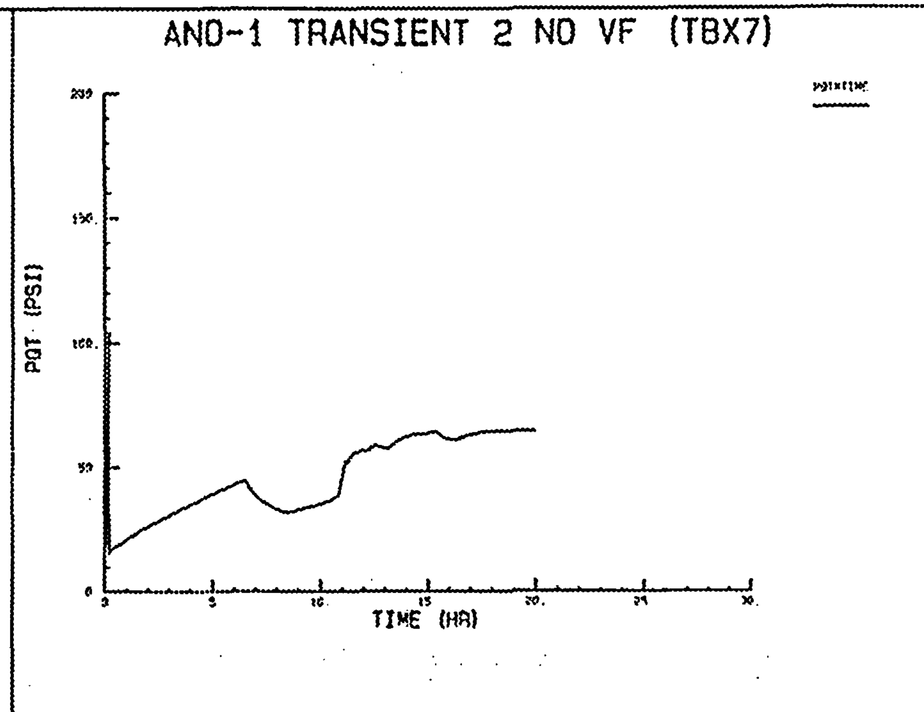
TGUP (***)
TIME (HR)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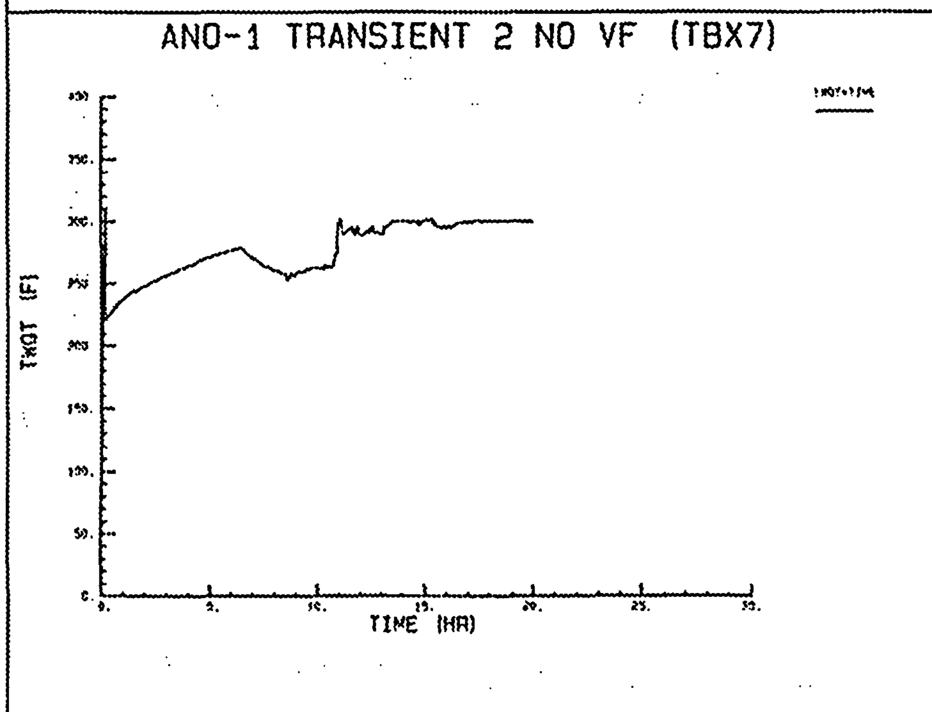
TIME (HR)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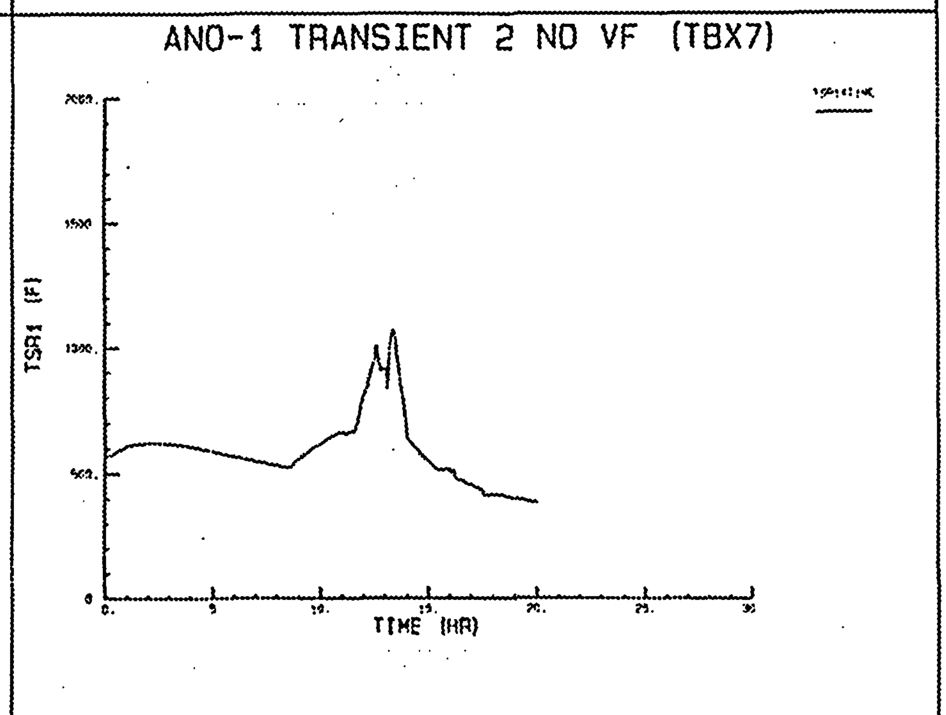
TKOT (F)
TIME (HR)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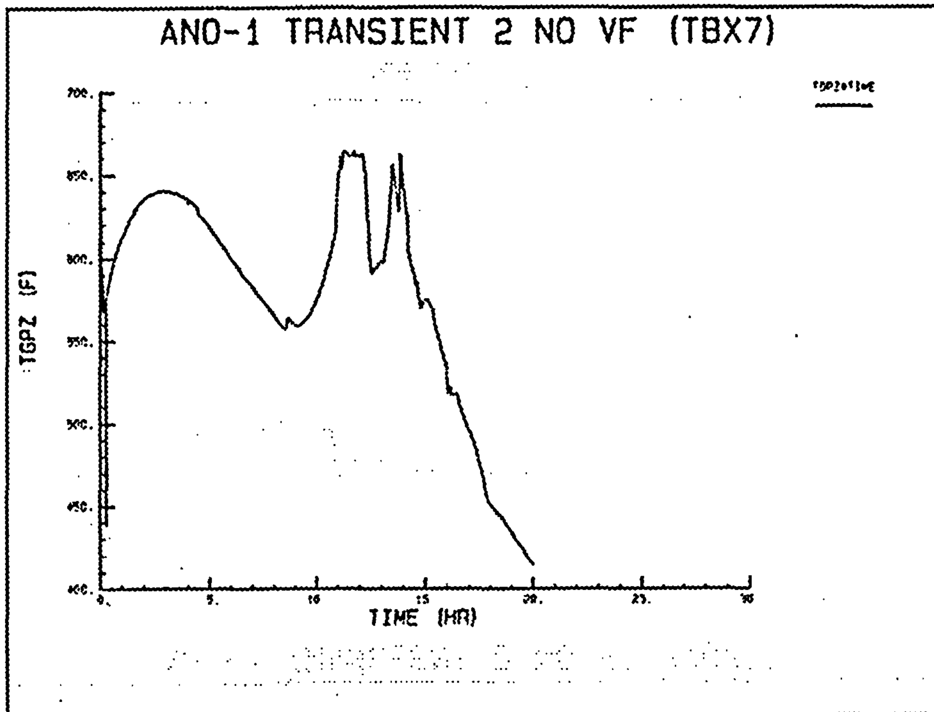
TIME (HR)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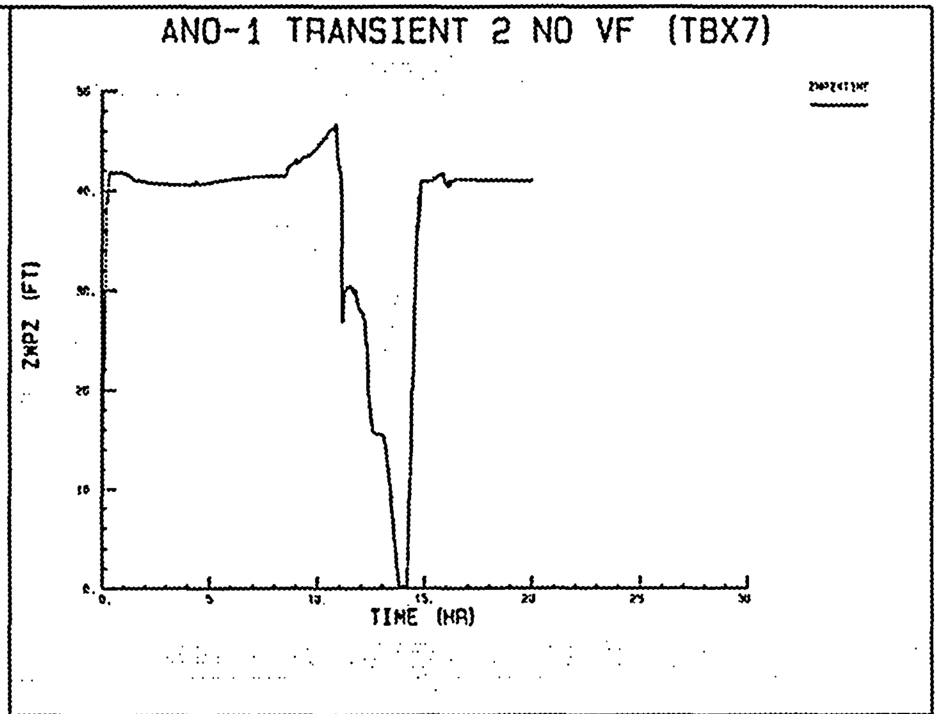
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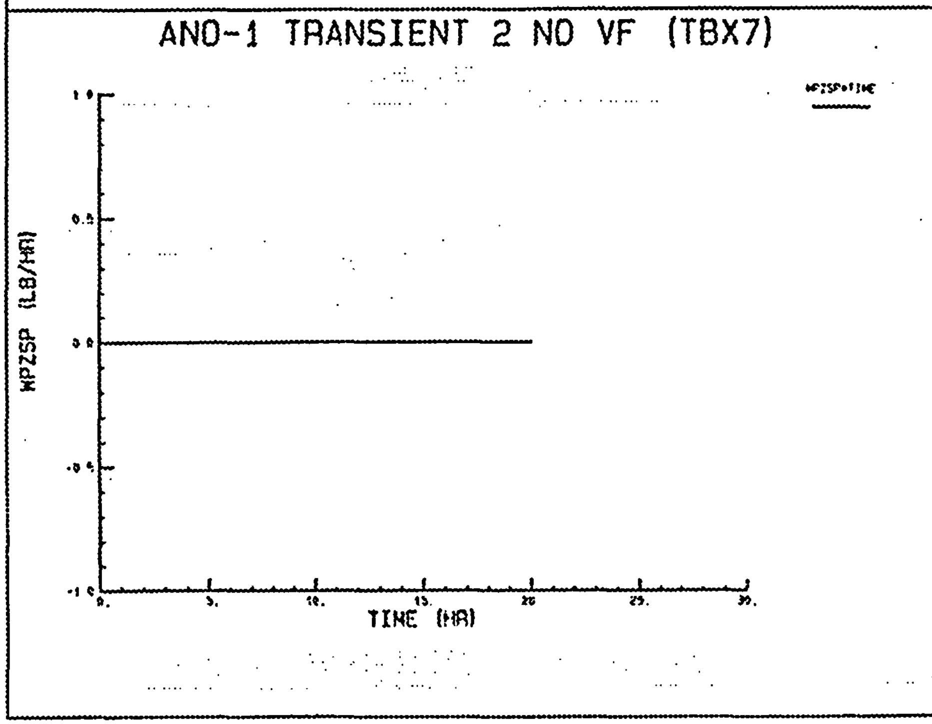
TIME (HR)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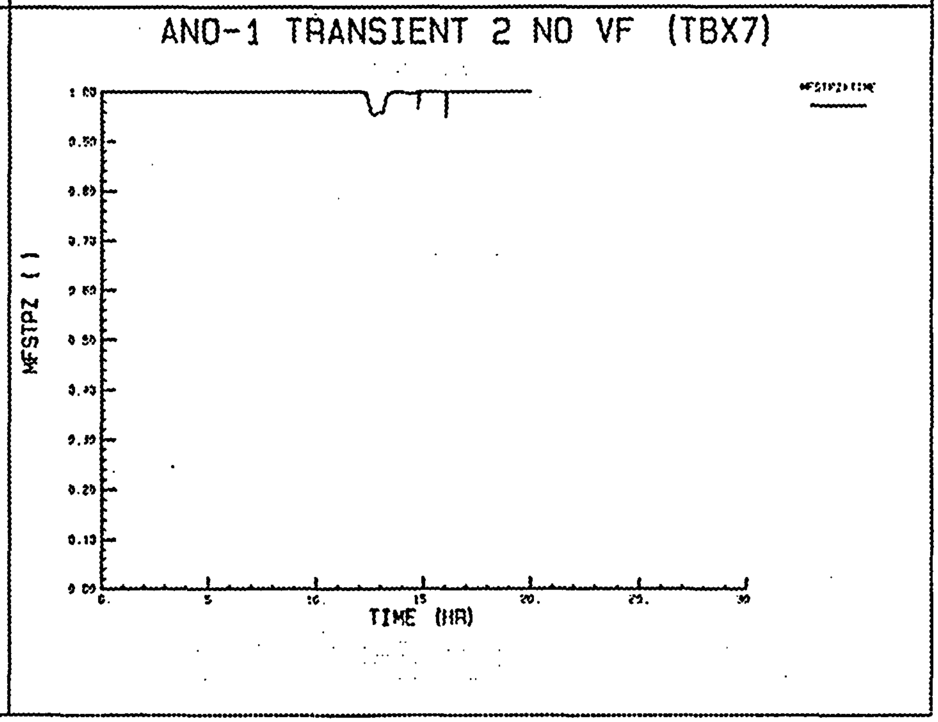
TIME (HR)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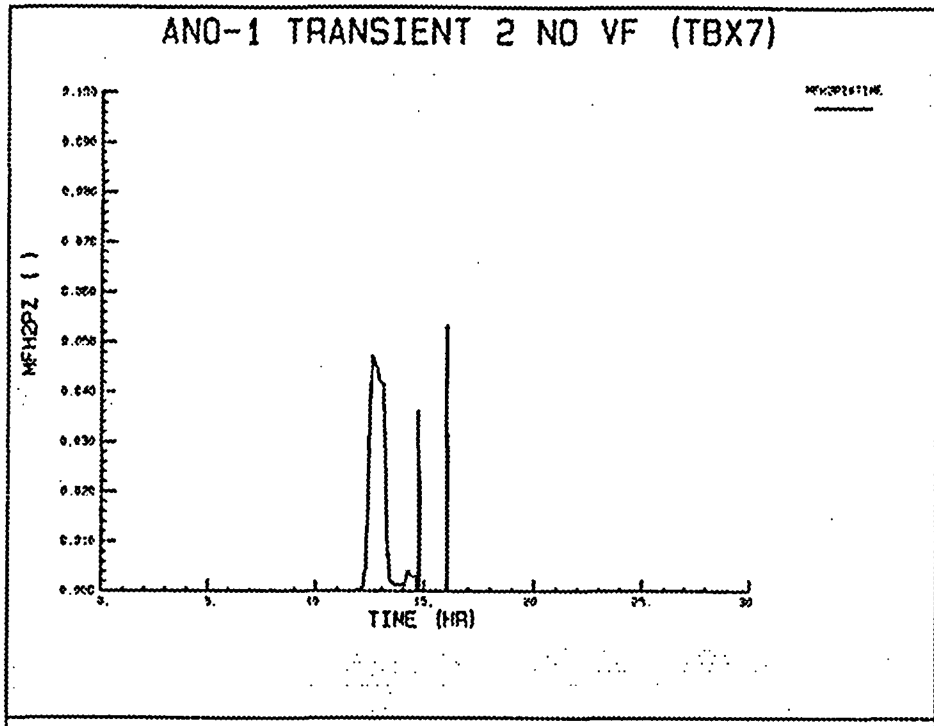
TIME (HR)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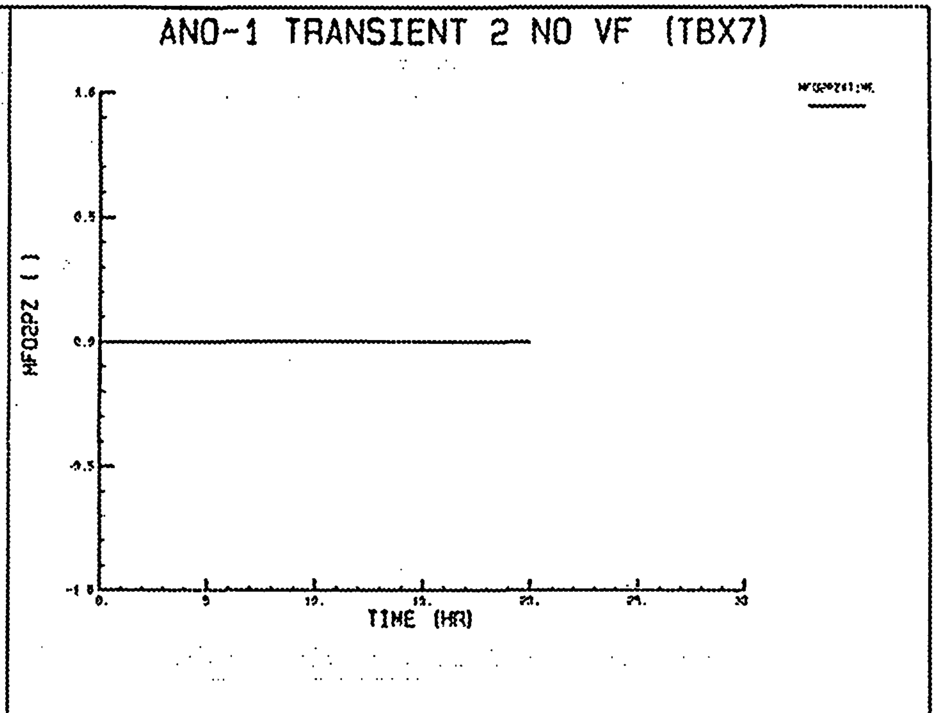
TIME (HR)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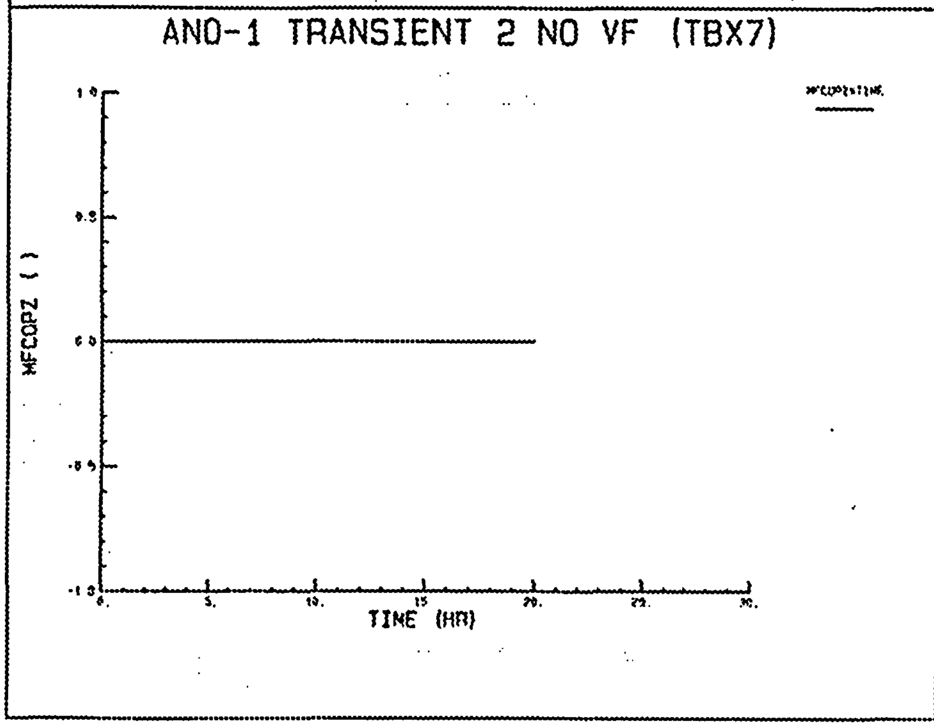
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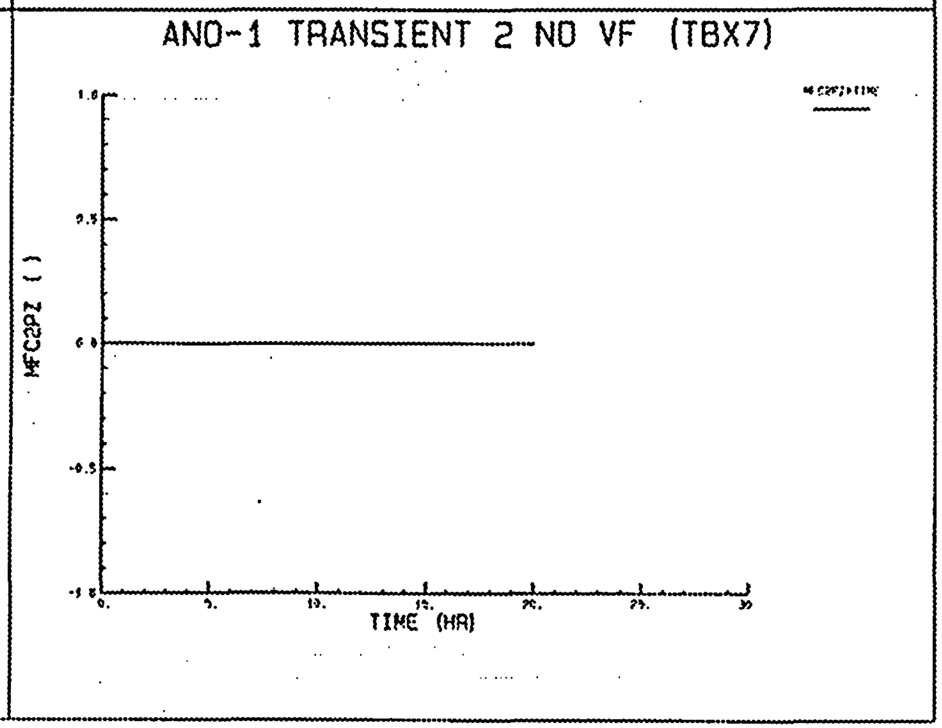
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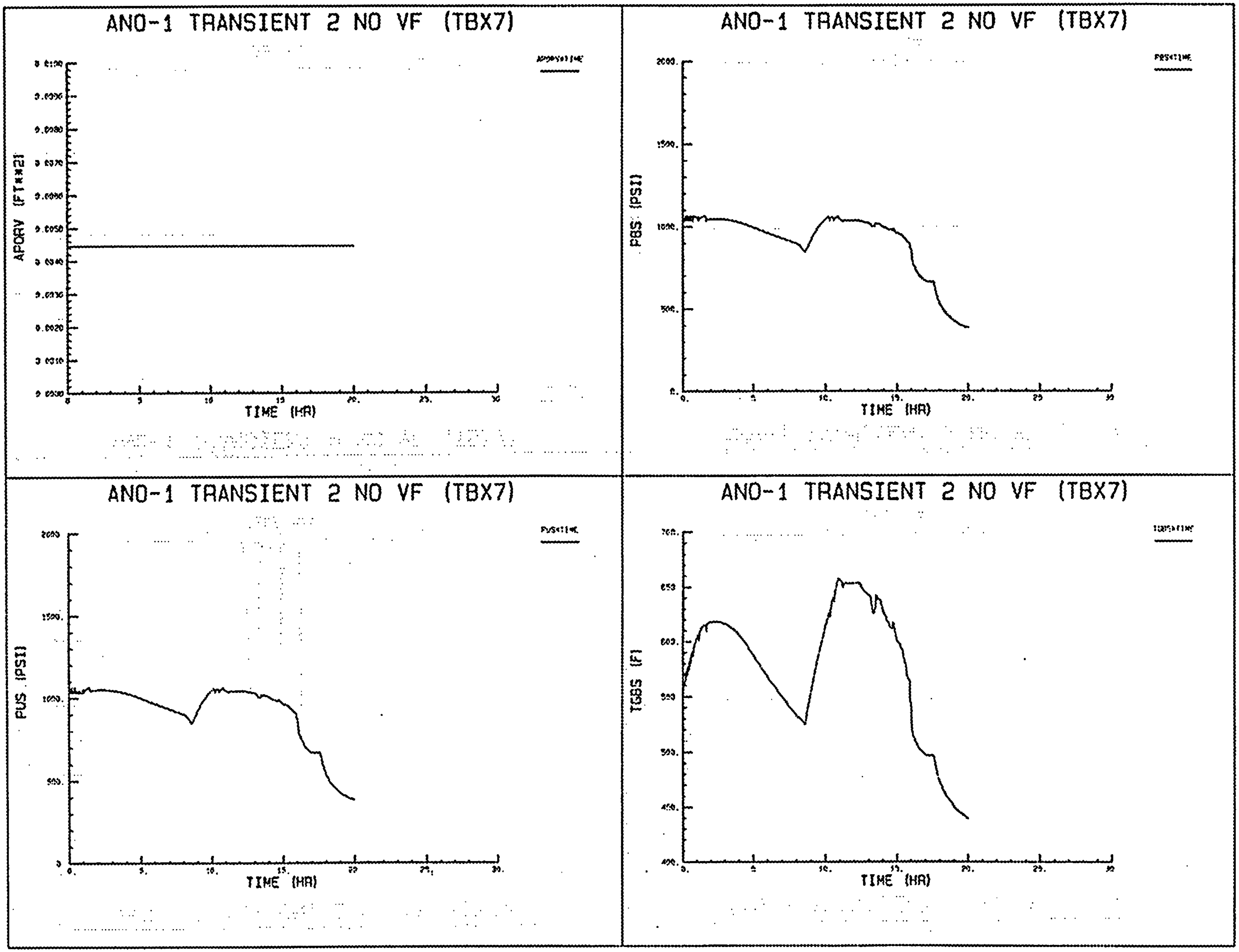
TIME (HR)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TIME (HR)
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TIME (HR)
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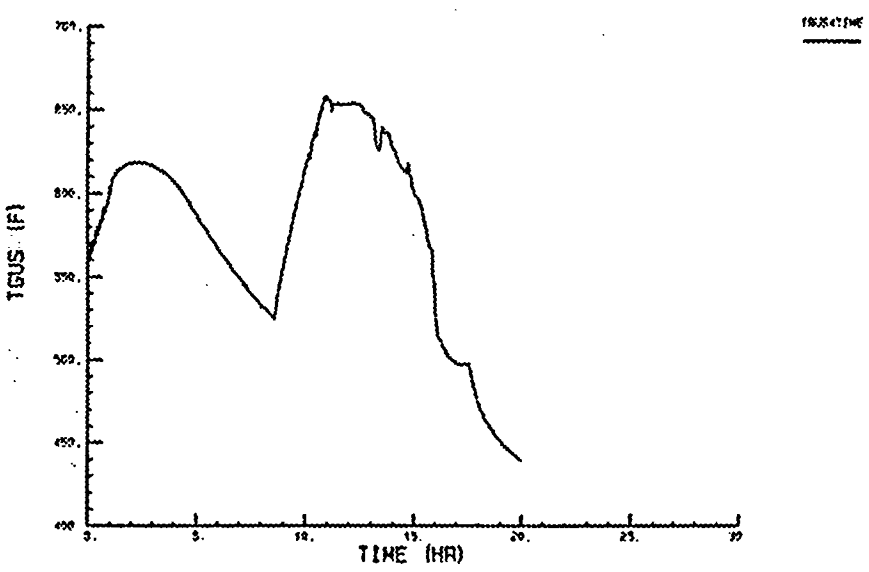

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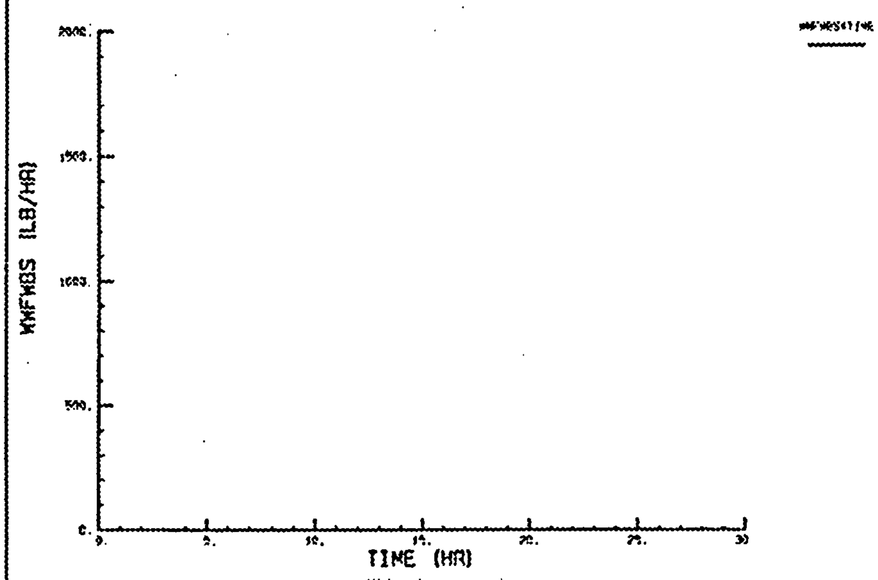

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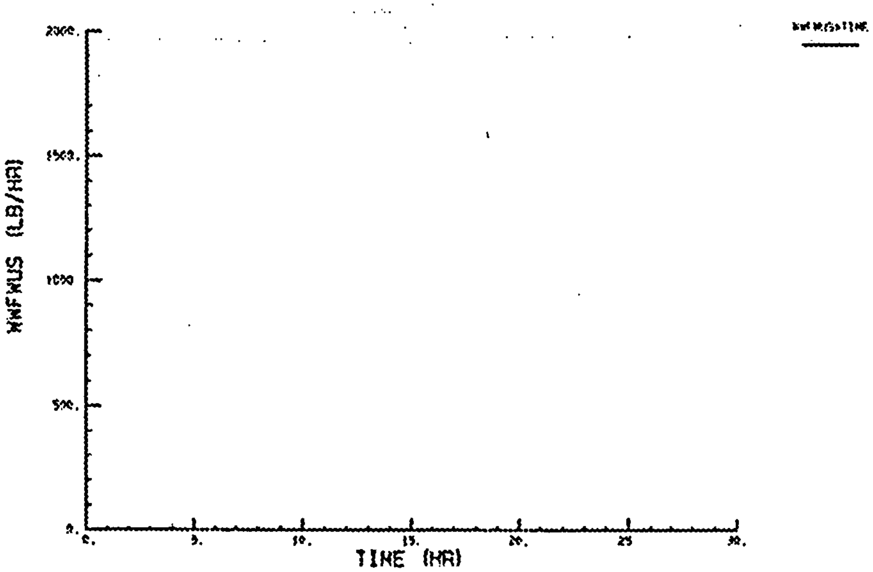

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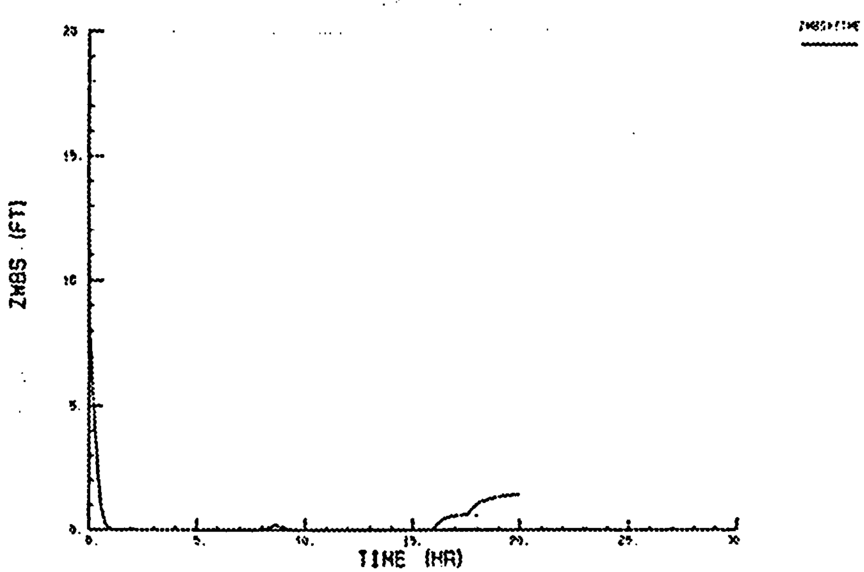

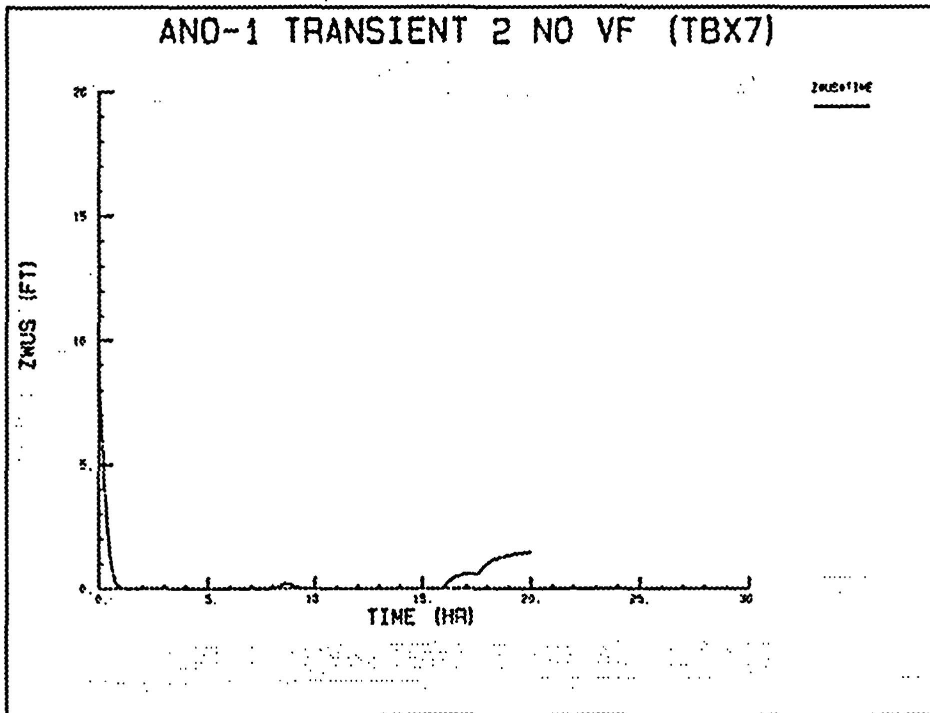
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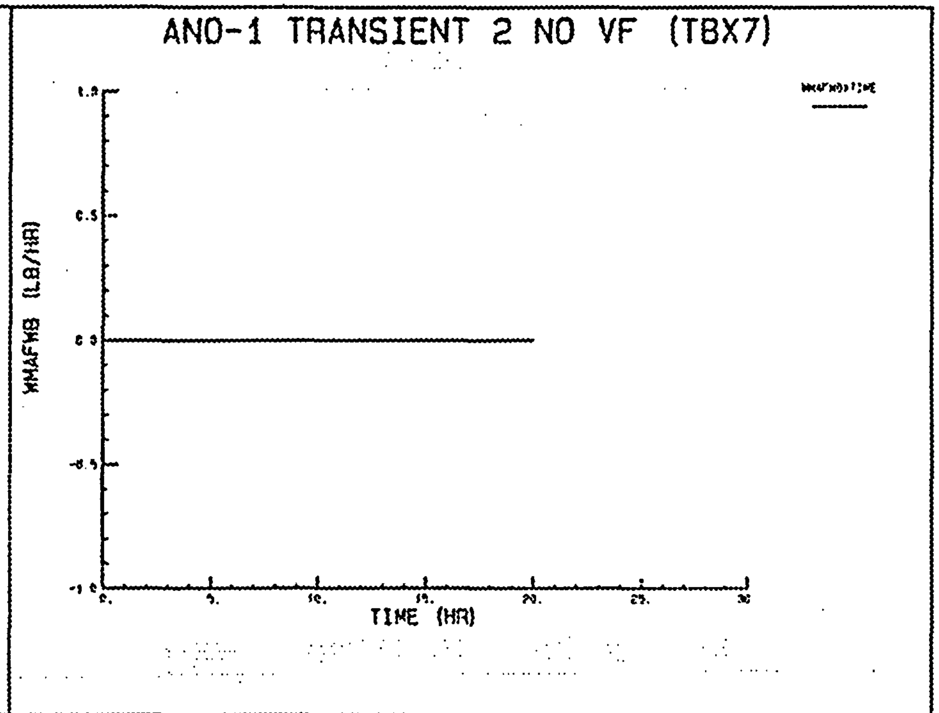
ZWUS (FT)
TIME (HR)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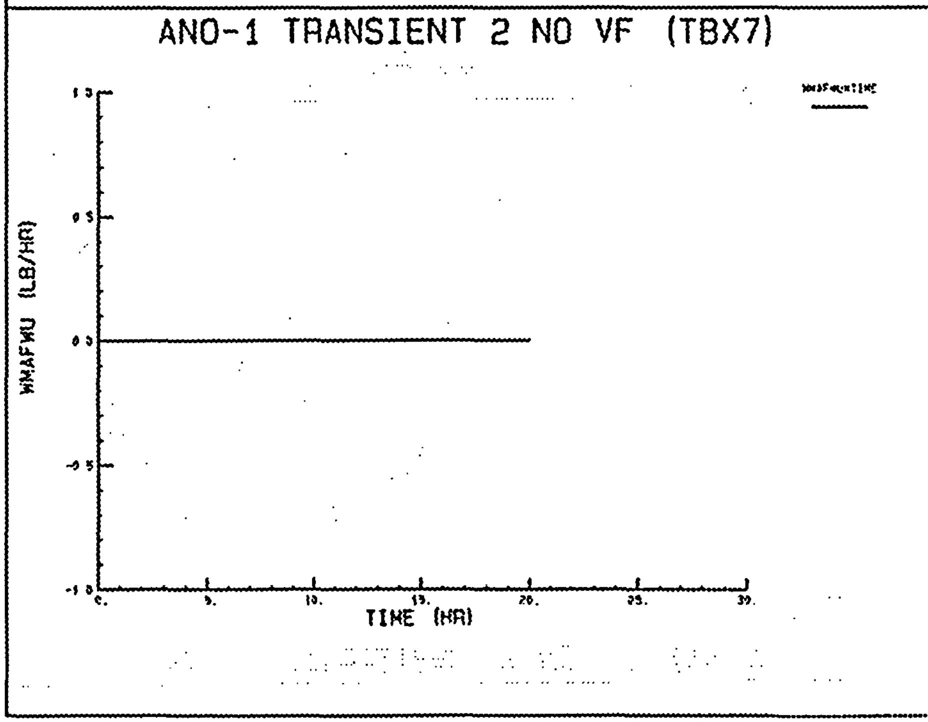
WMAFWB (LB/HR)
TIME (HR)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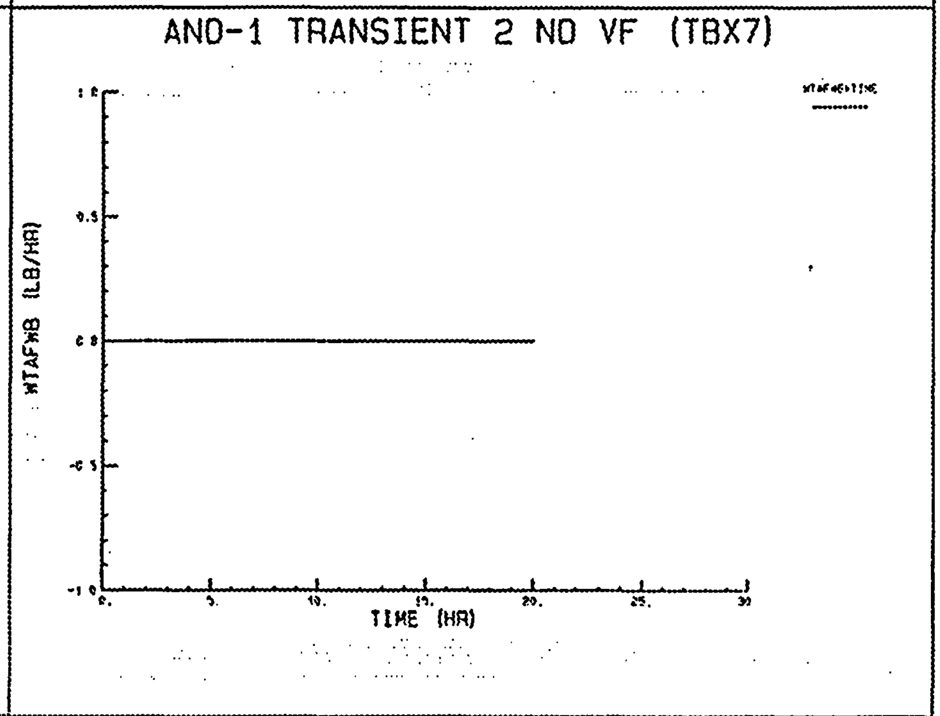
TIME (HR)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WTAFWB (LB/HR)
TIME (HR)

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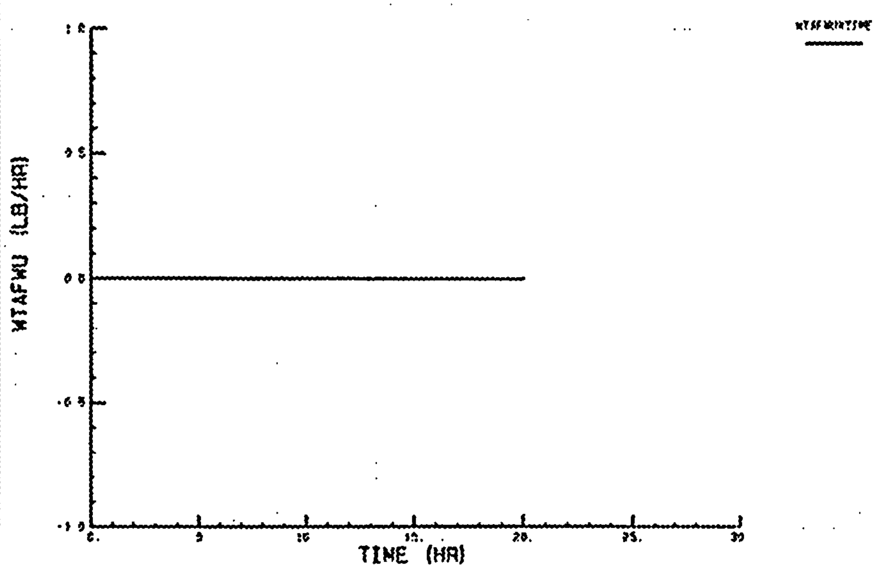

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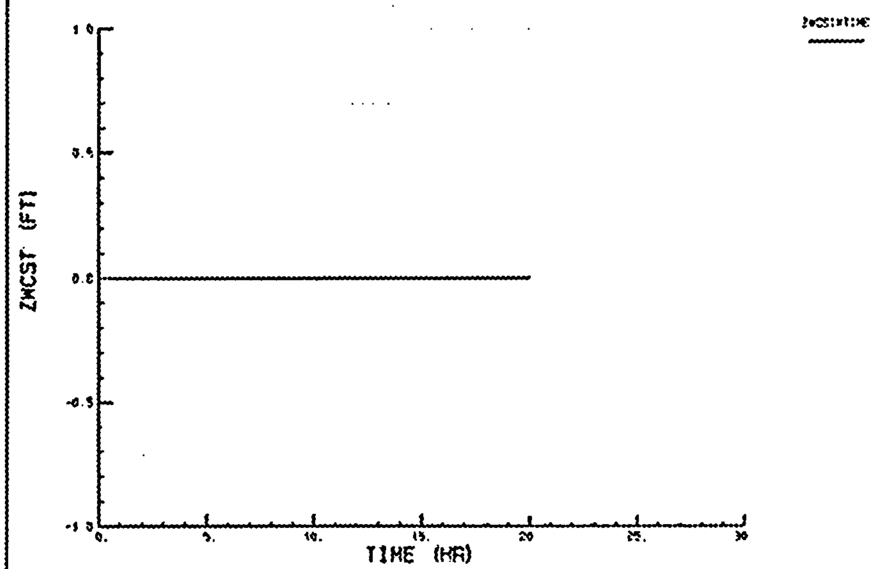

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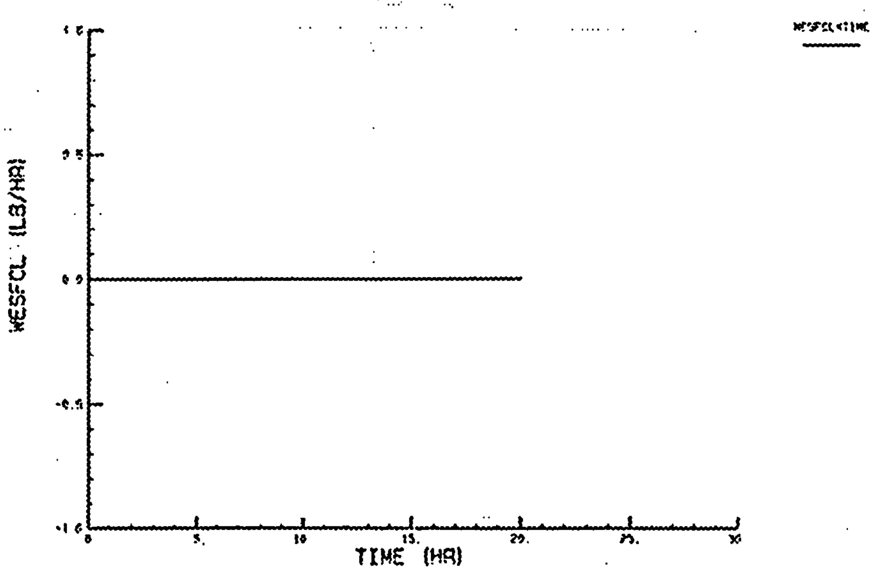

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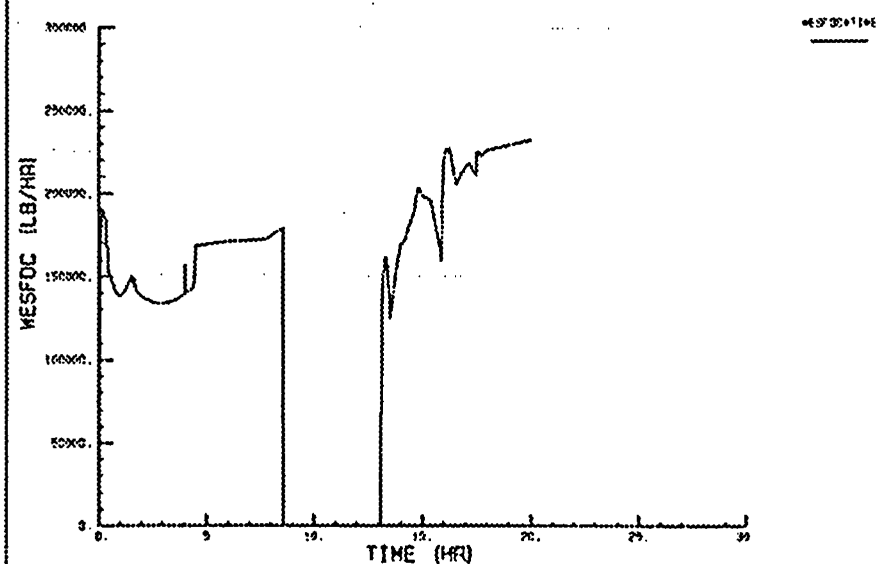

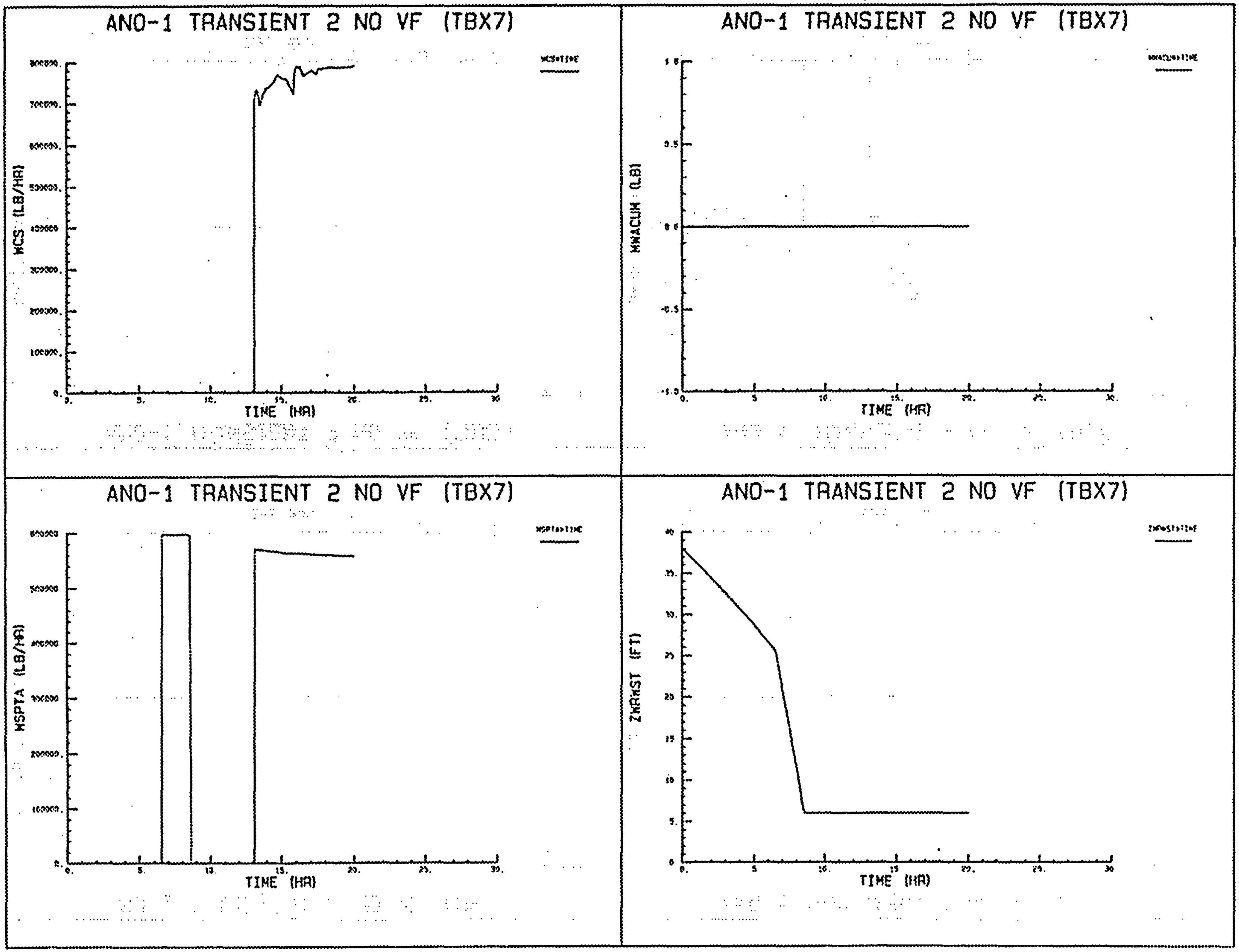
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TIME (HR)
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MWACUM (LB)
TIME (HR)
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TIME (HR)
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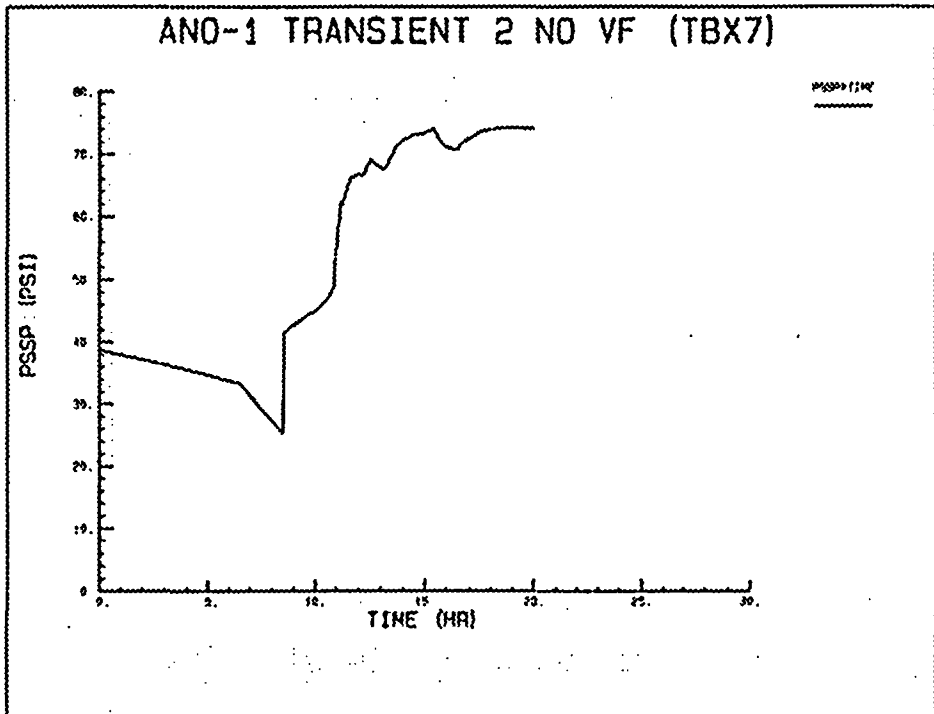
ZWRKST (FT)
TIME (HR)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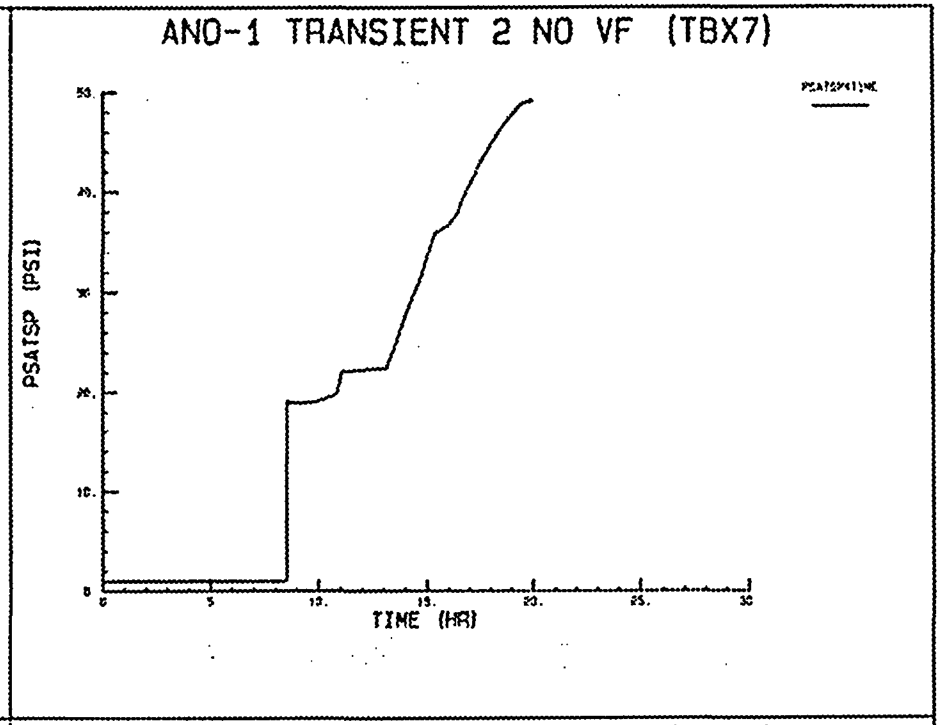
TIME (HR)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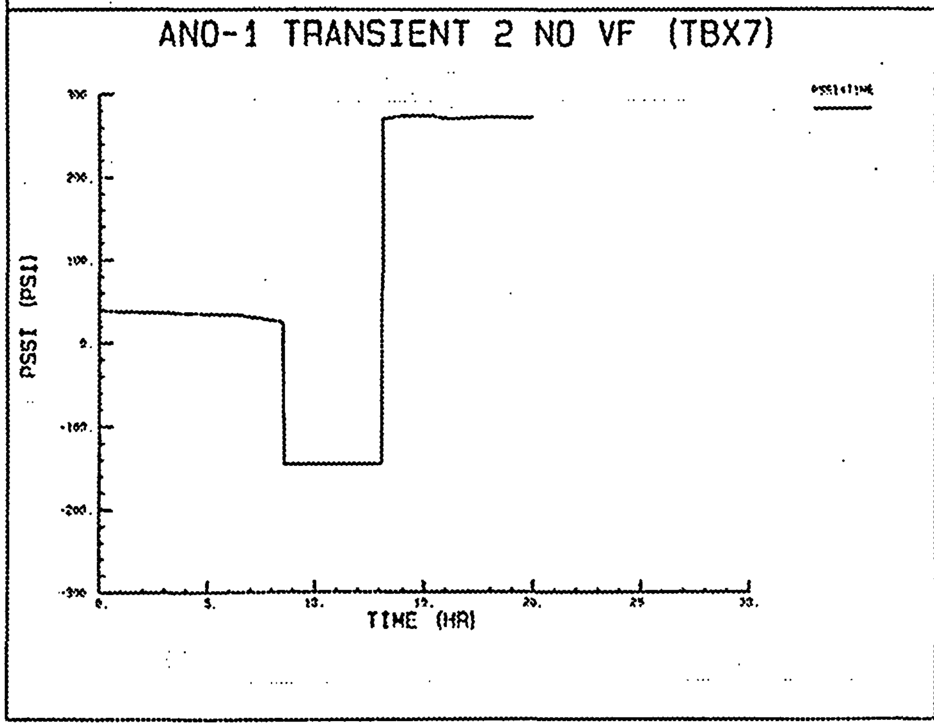
TIME (HR)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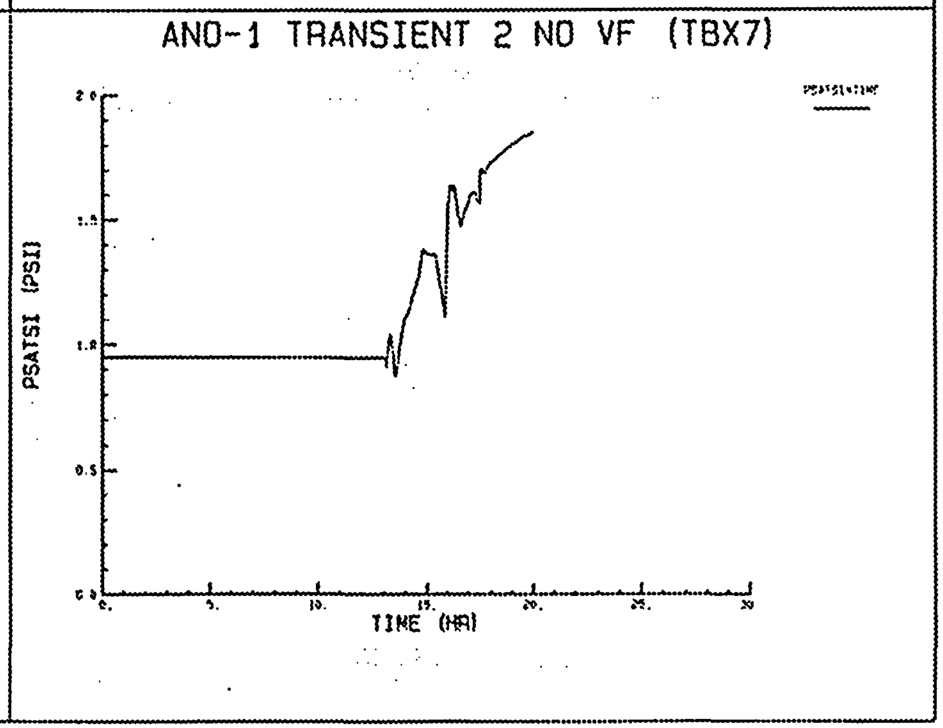
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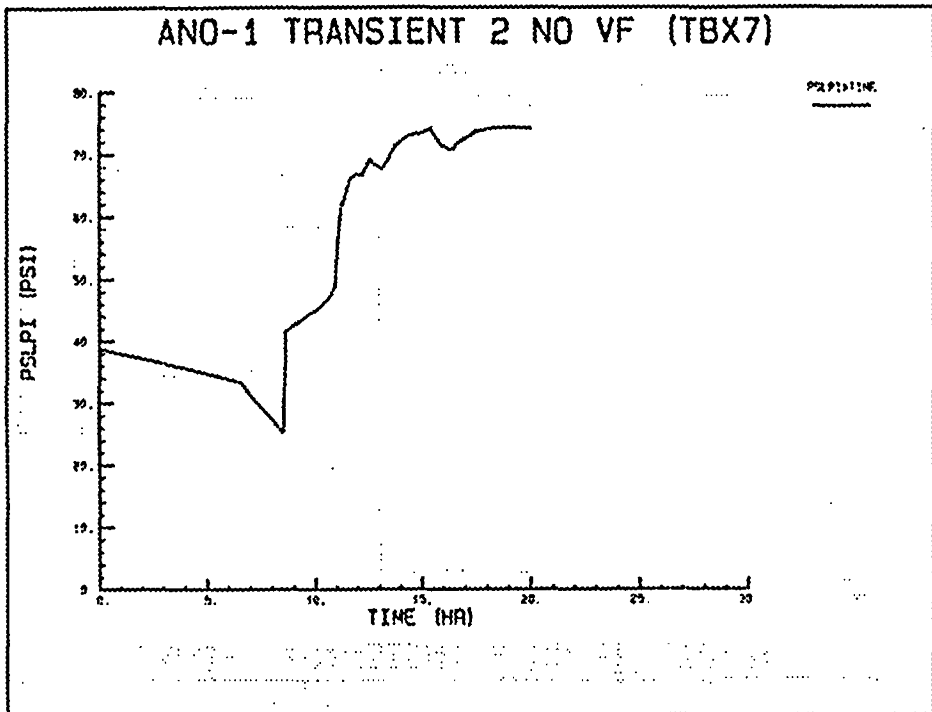
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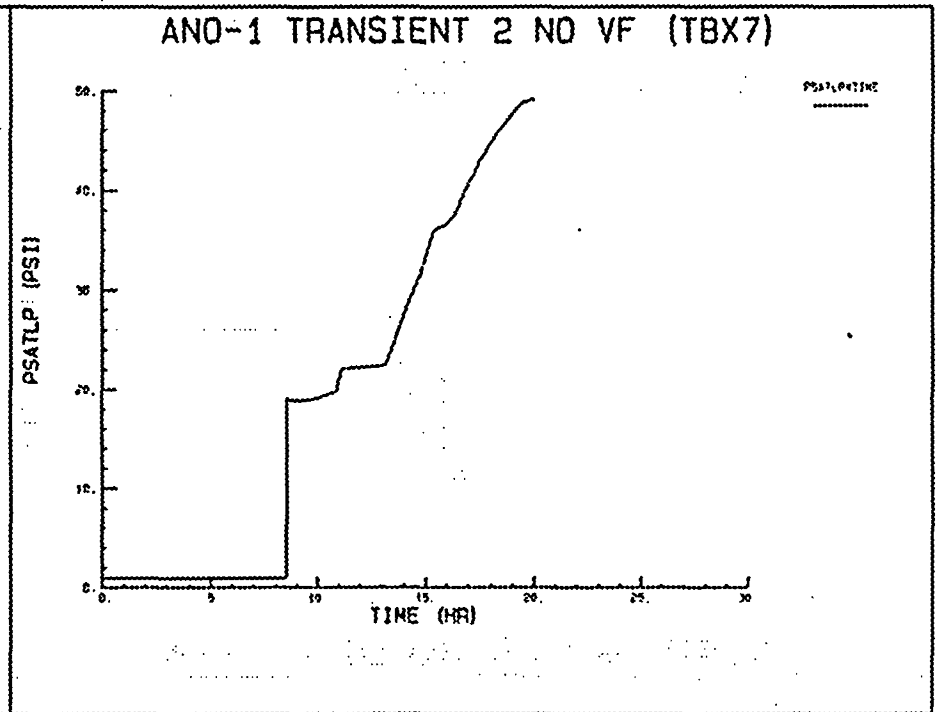
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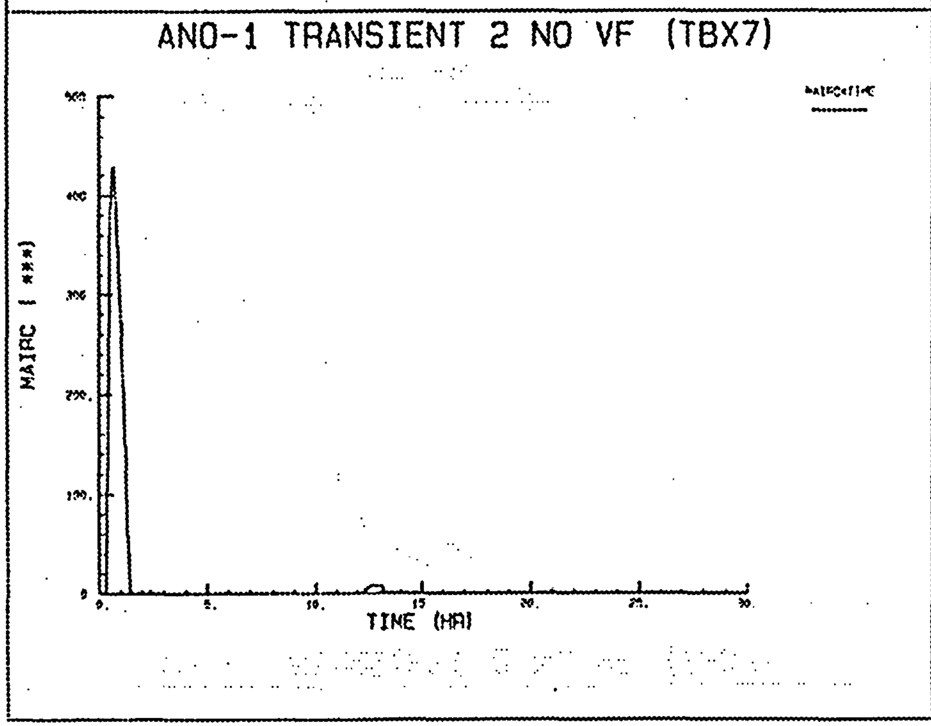
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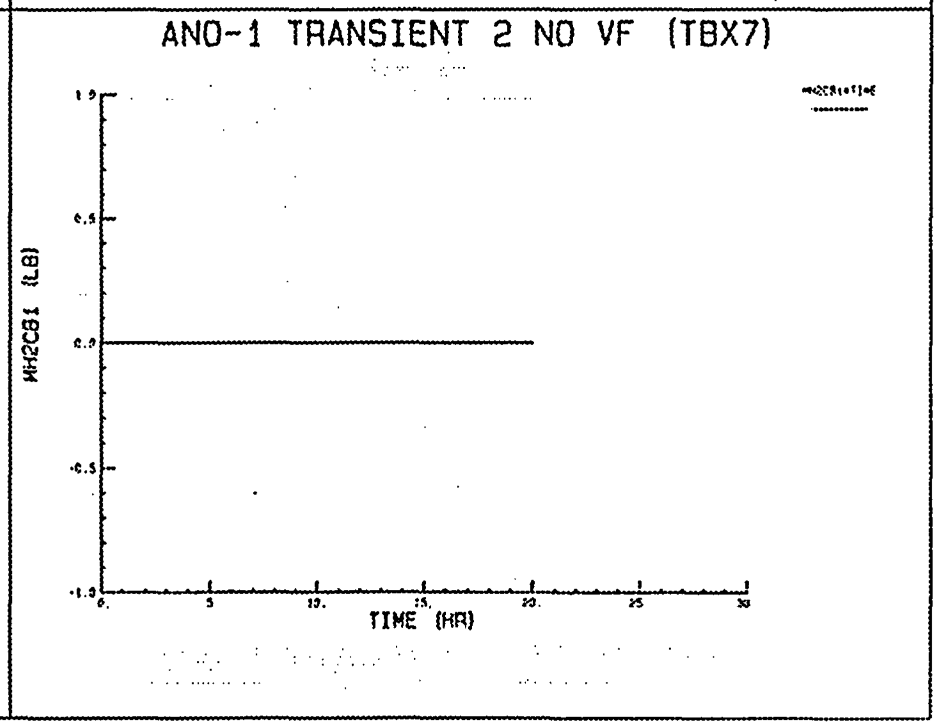
MAIRC (***)
TIME (HR)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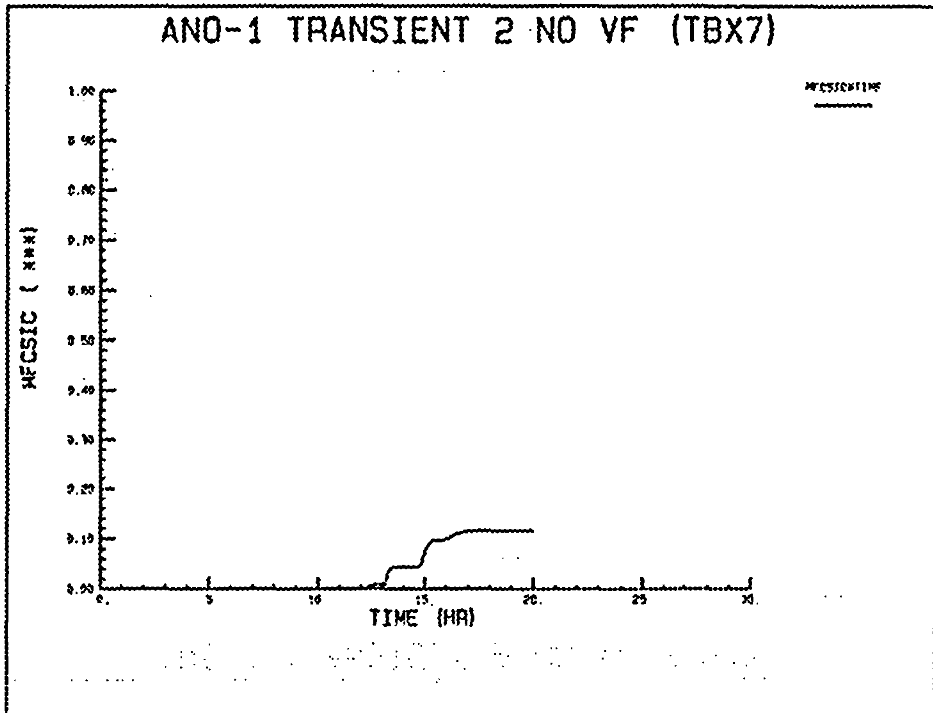
TIME (HR)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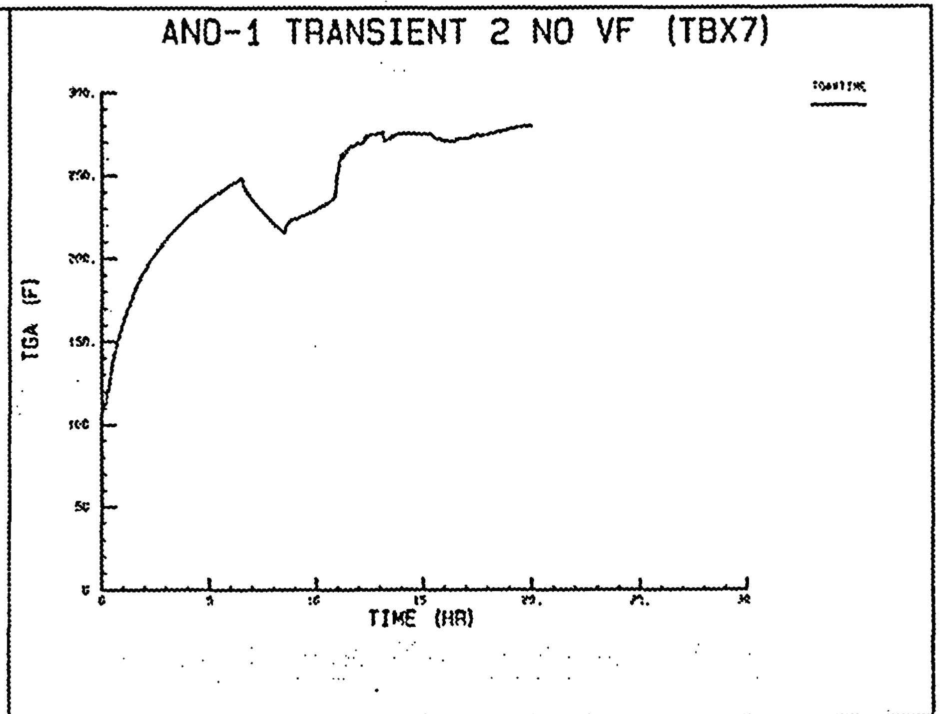
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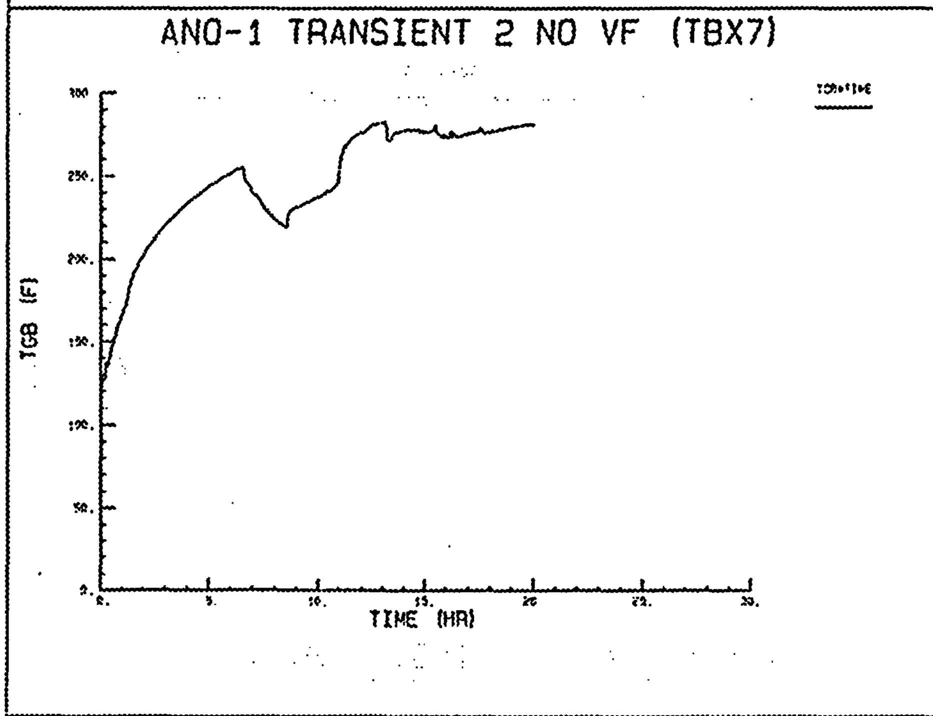
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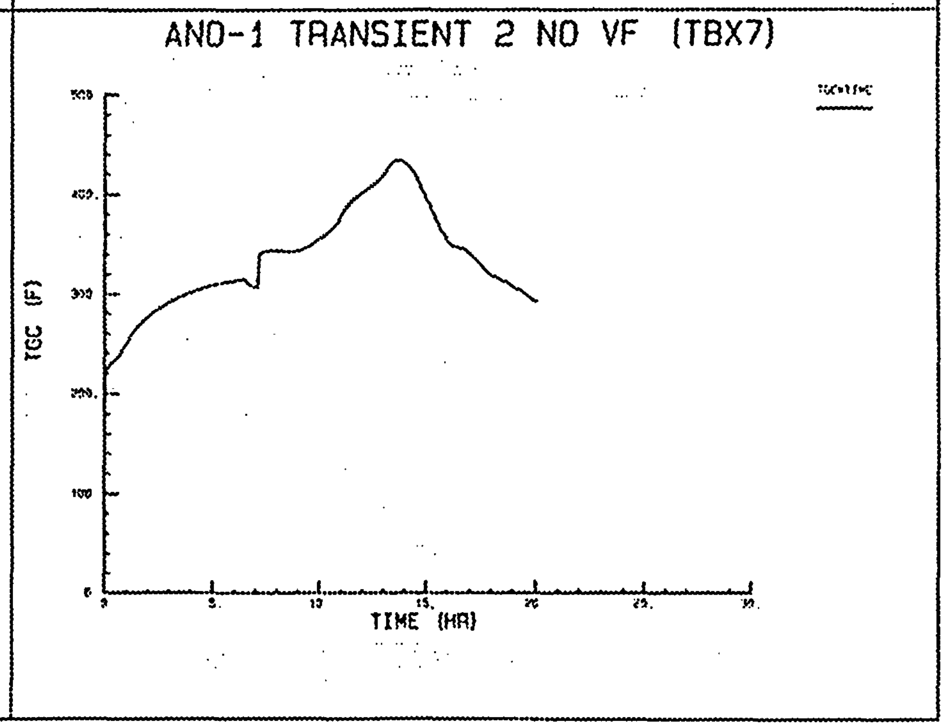
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TGC (F)
TIME (HR)

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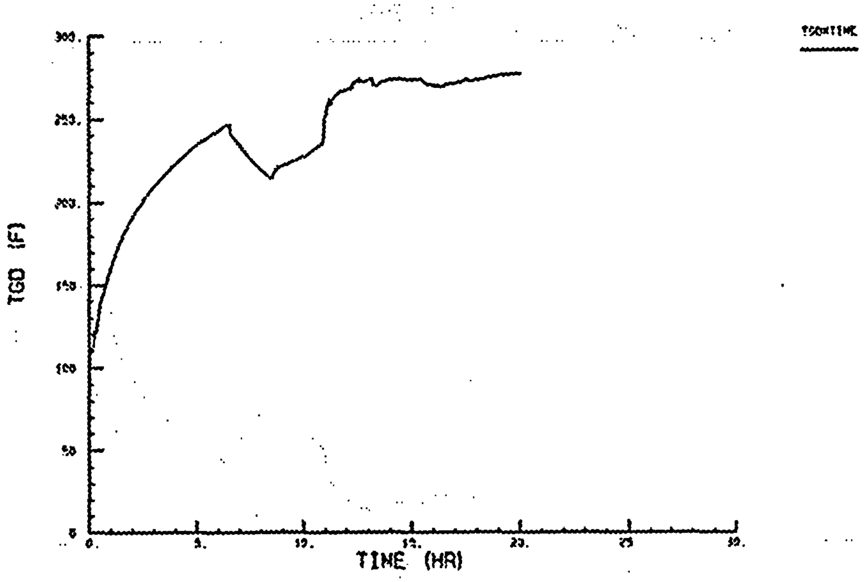

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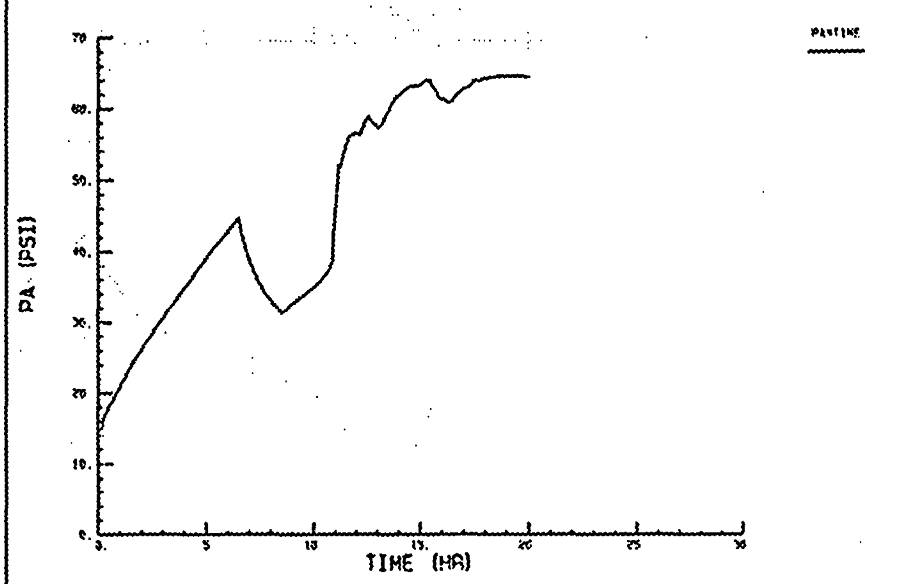

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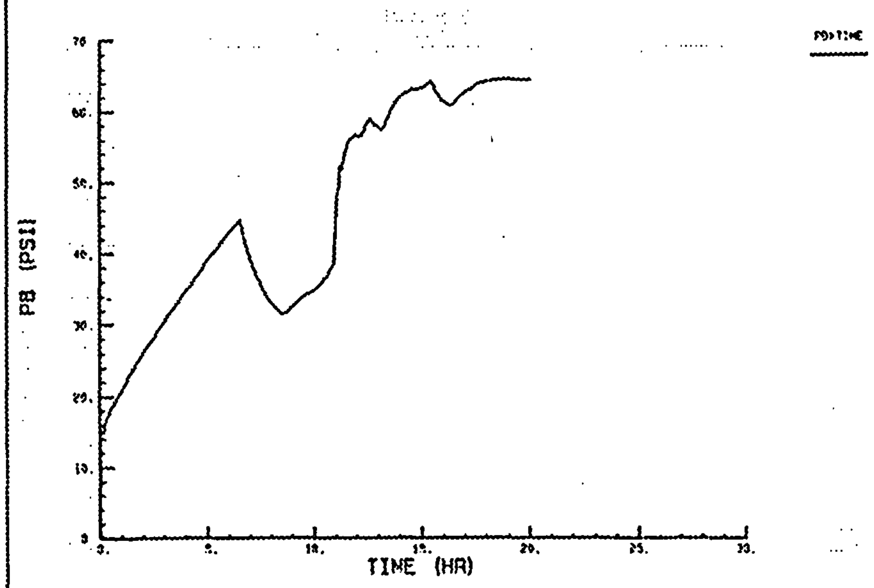

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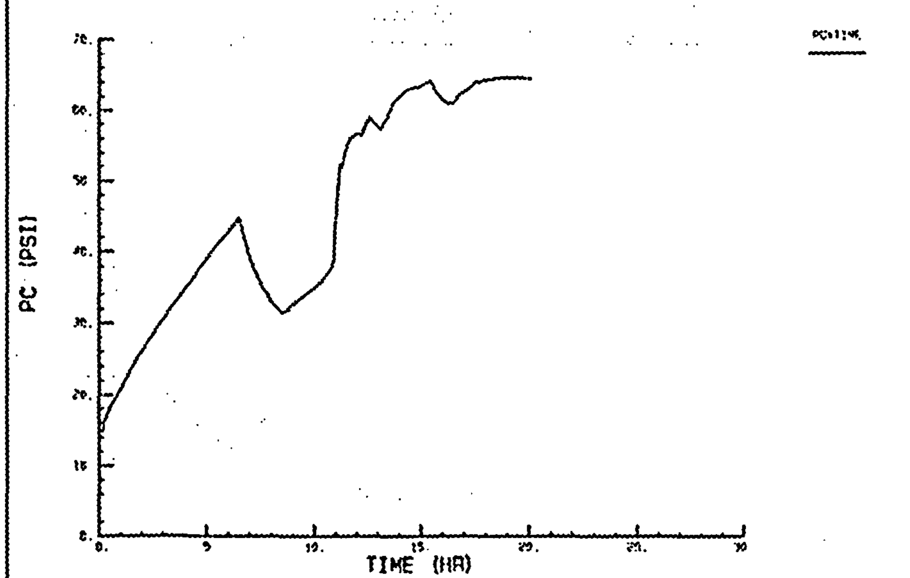

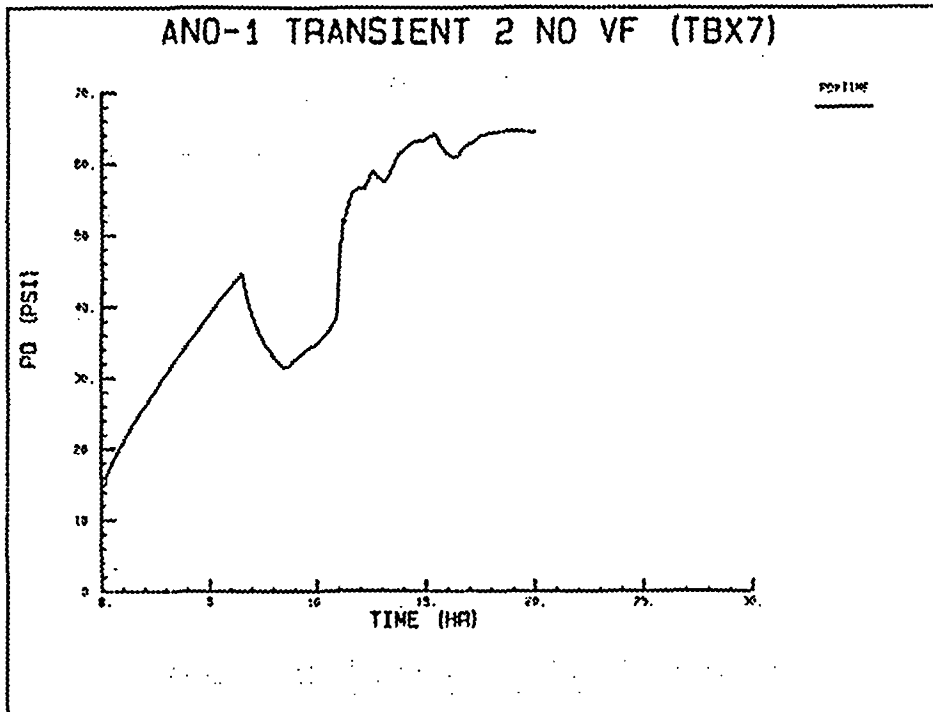
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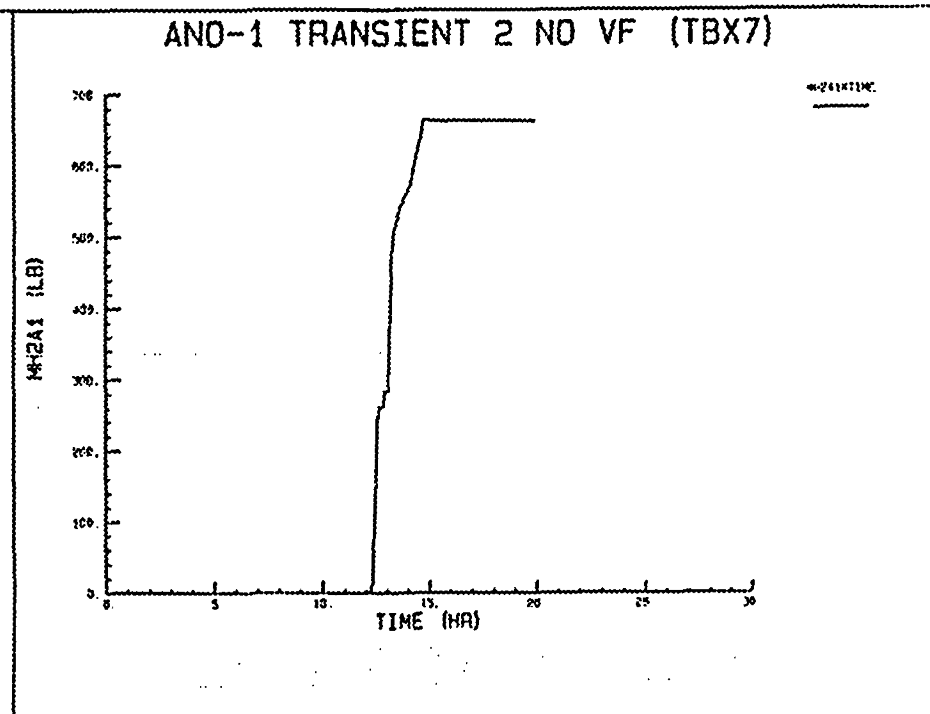
PO (PSI)
TIME (HR)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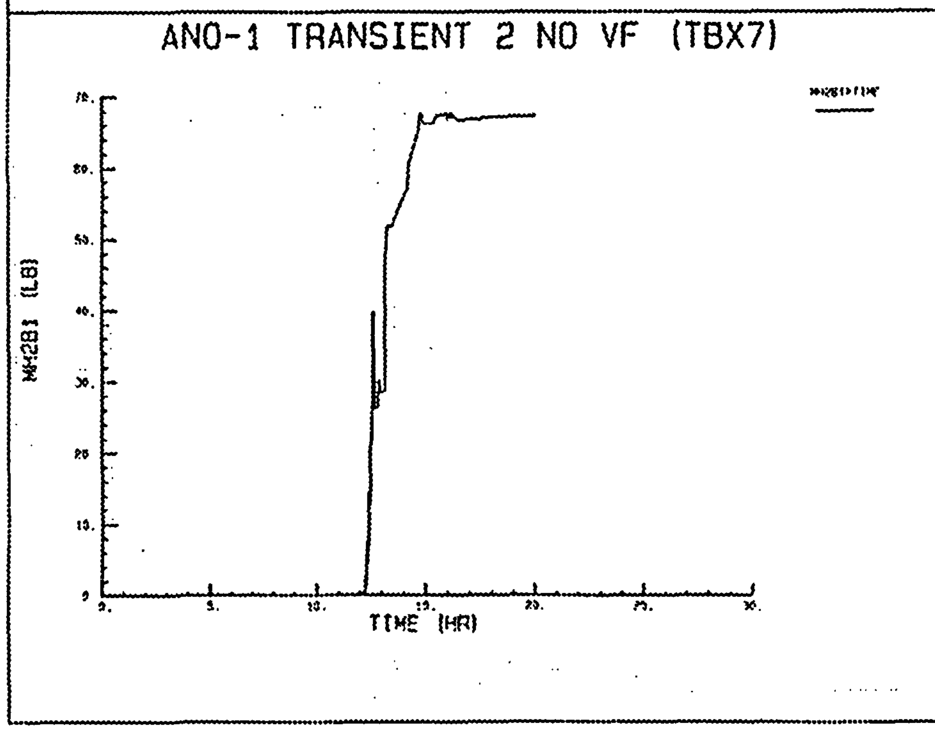
TIME (HR)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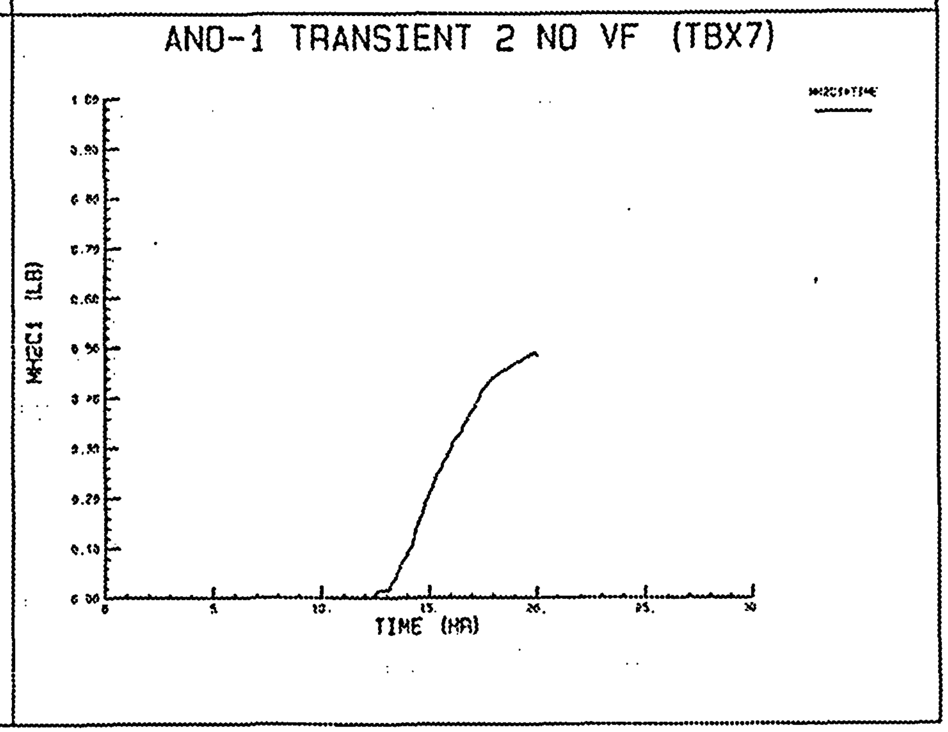
TIME (HR)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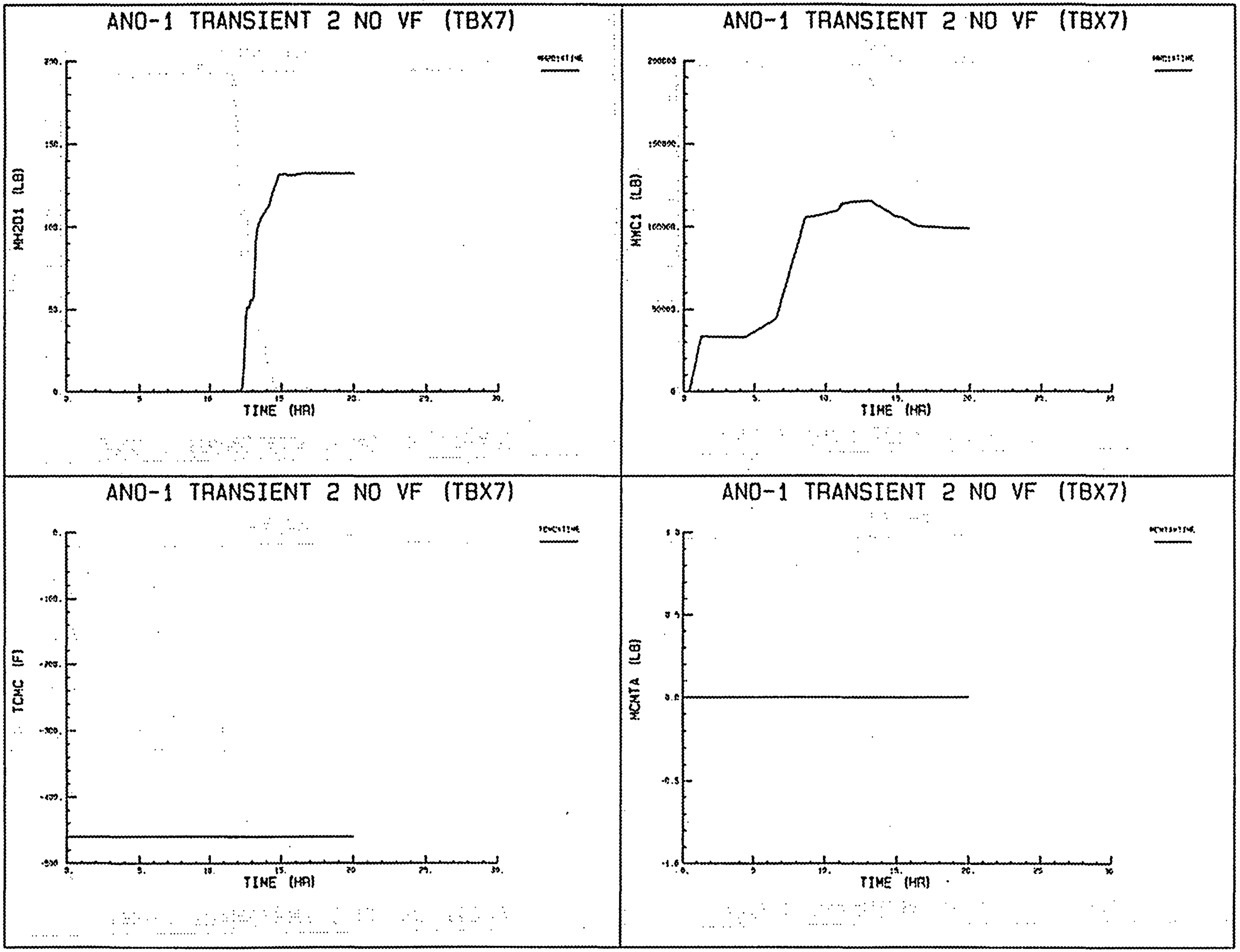
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TIME (HR)
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MMC1 (LB)
TIME (HR)
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TCMC (F)
TIME (HR)
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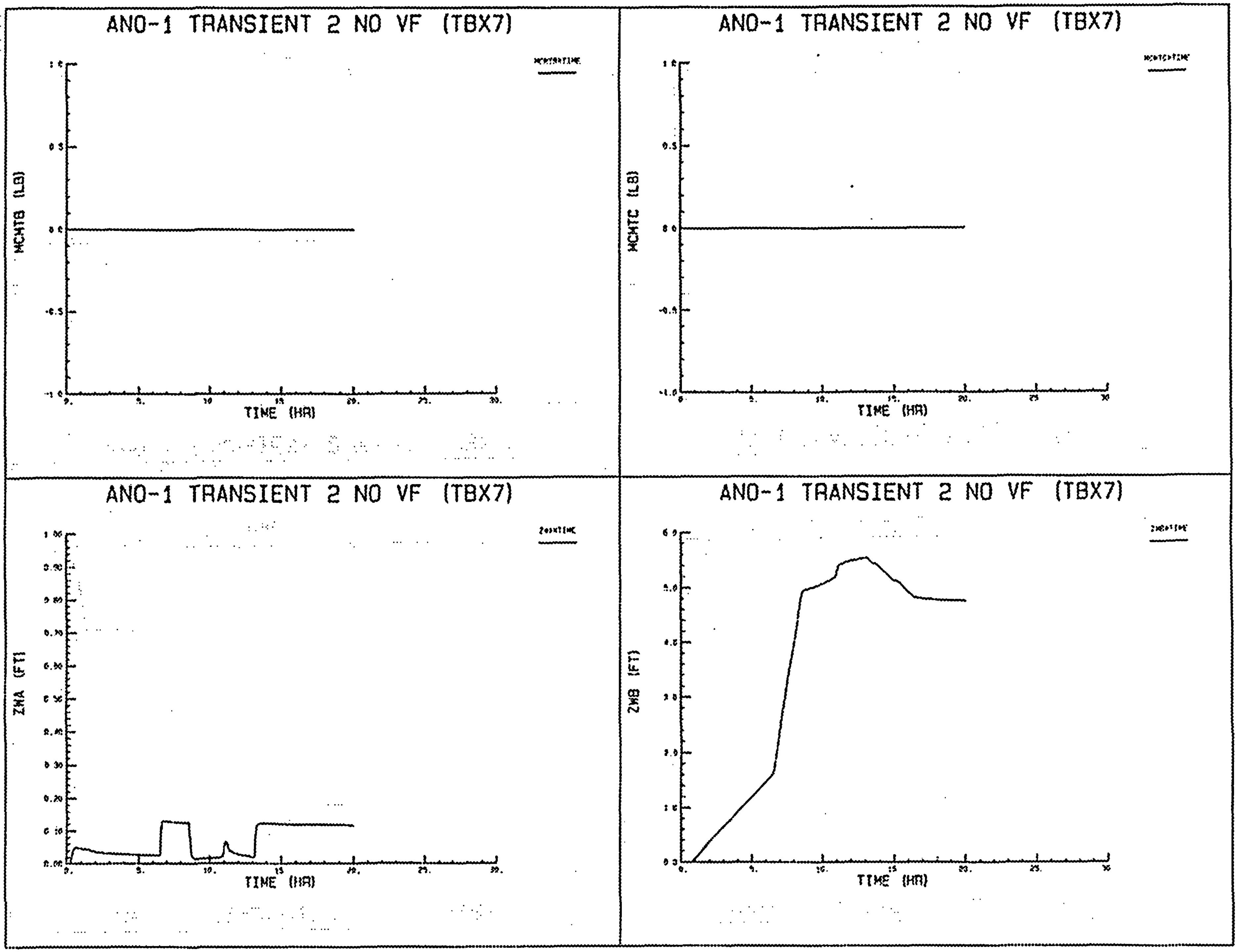
MCNTA (LB)
TIME (HR)



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MCMTB (LB)
TIME (HR)
ANO-1 TRANSIENT 2 NO VF (TBX7)
MCMTC (LB)
TIME (HR)
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ZWA (FT)
TIME (HR)
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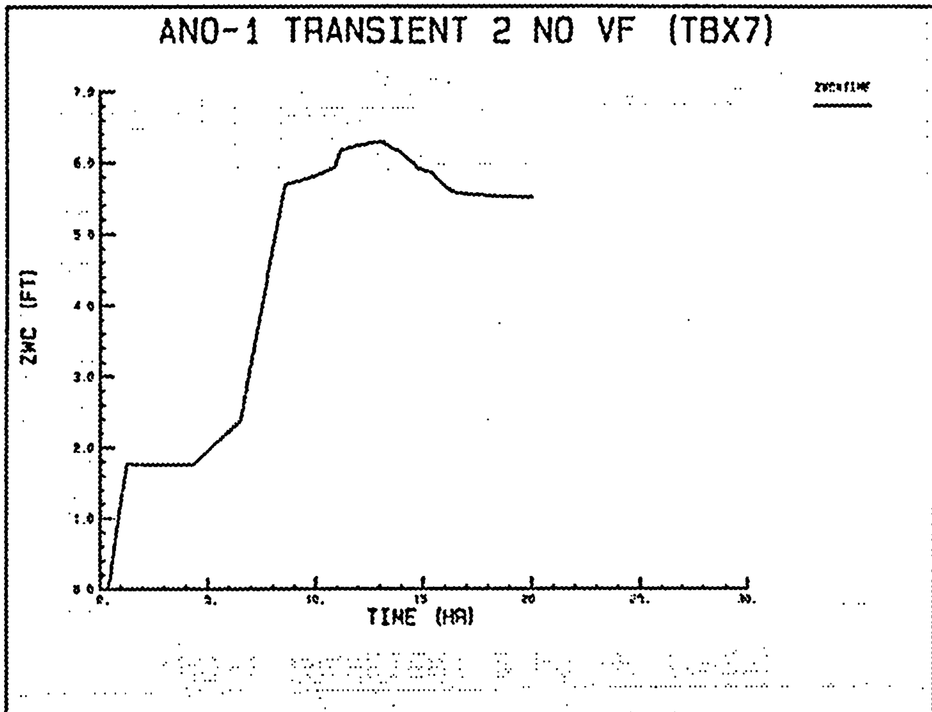
TIME (HR)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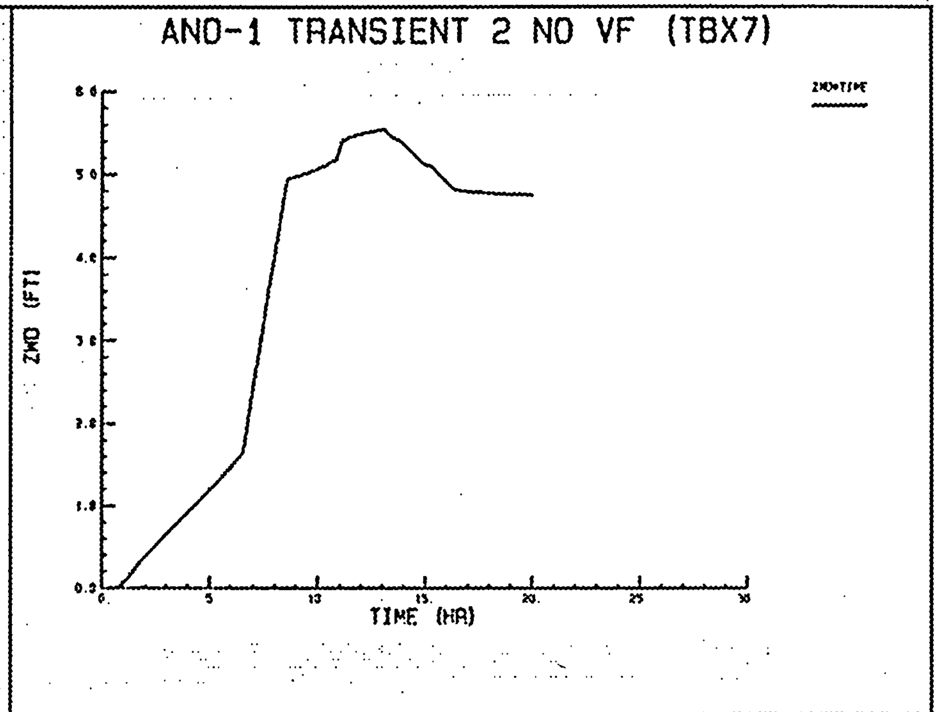
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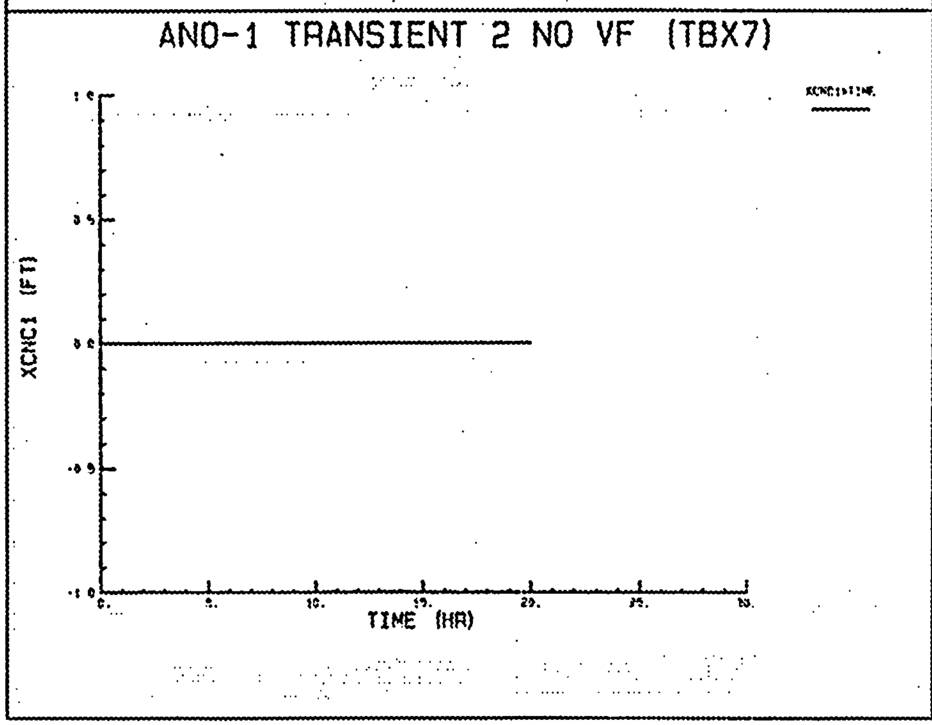
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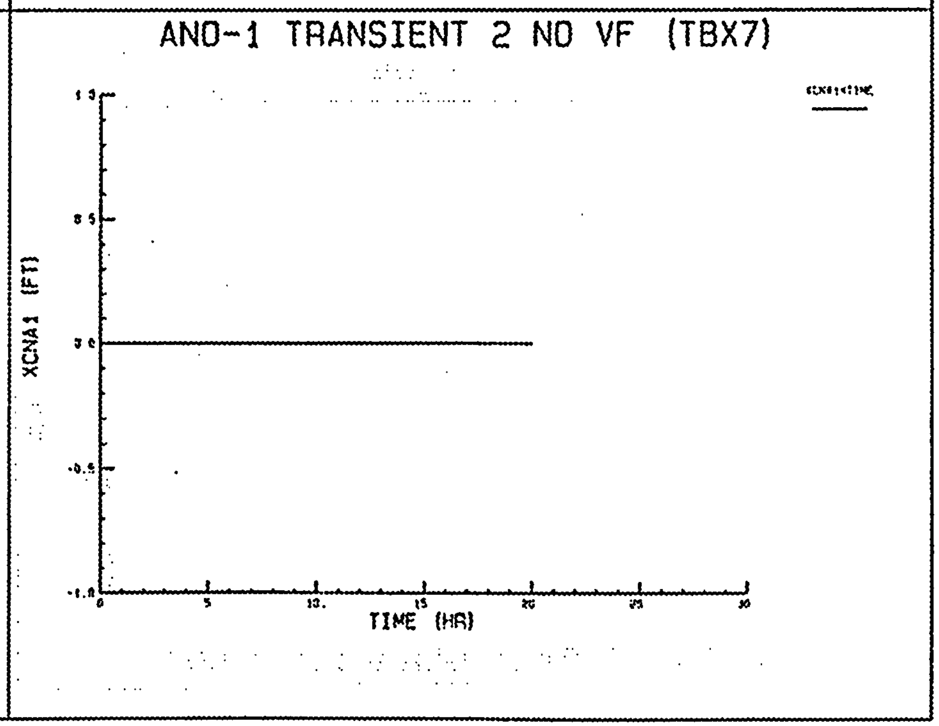
TIME (HR)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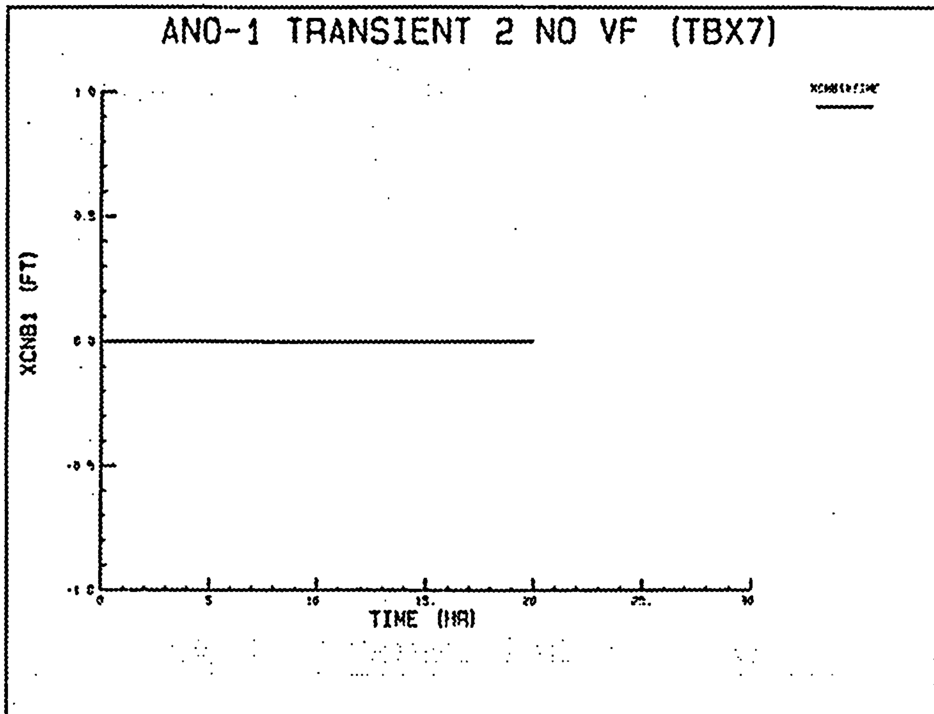
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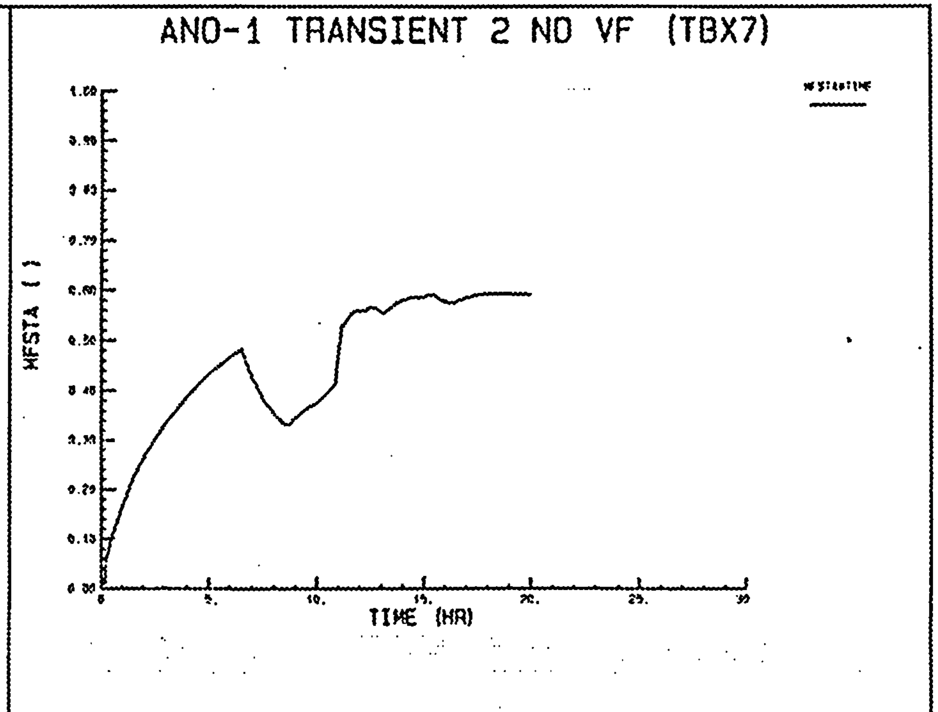
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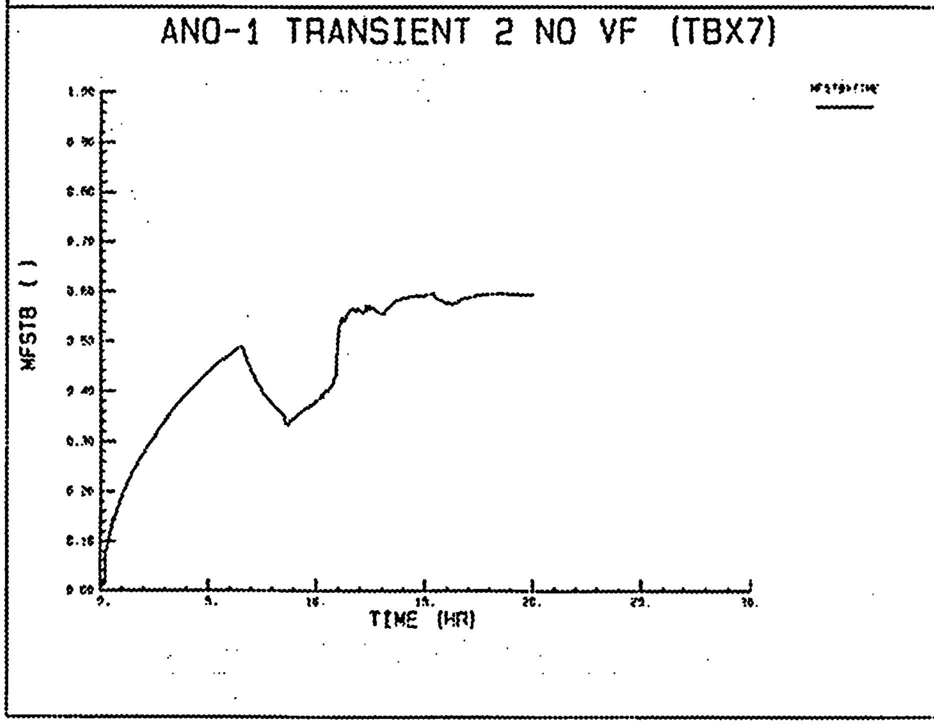
TIME (HR)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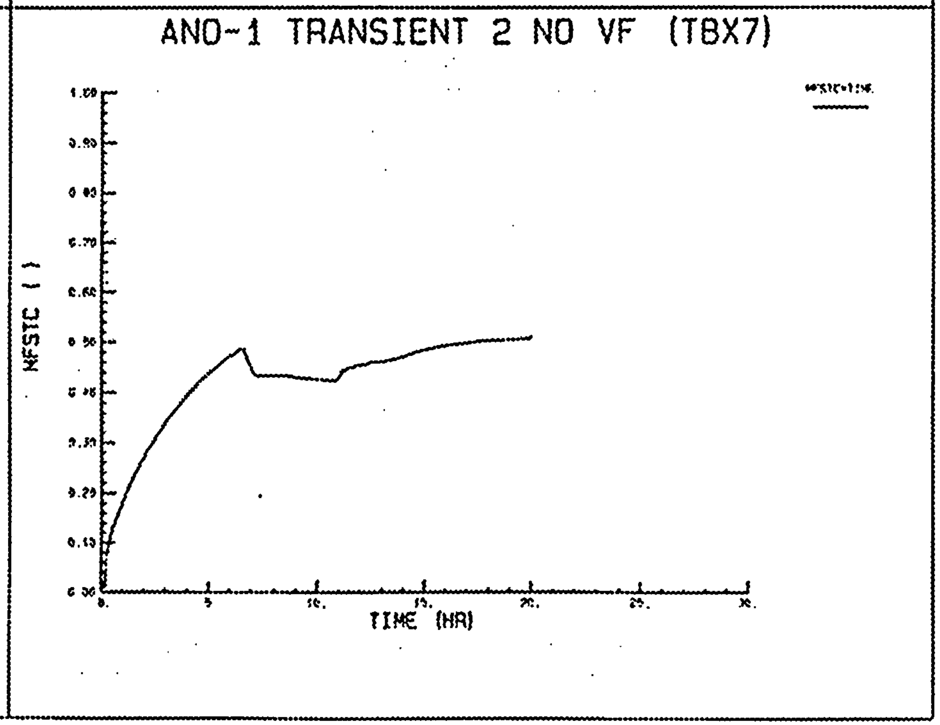
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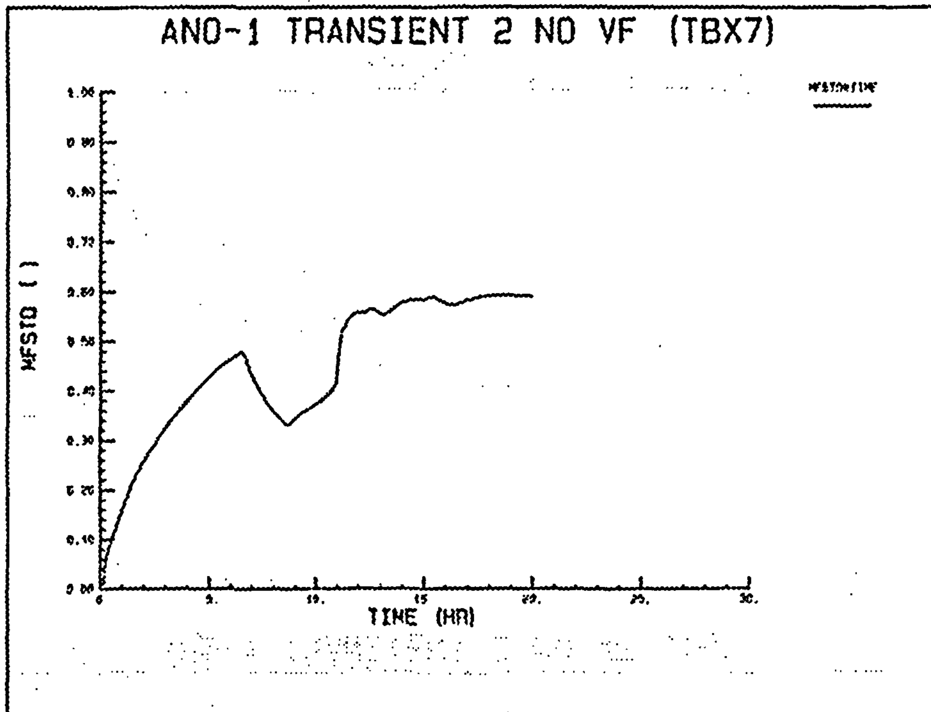
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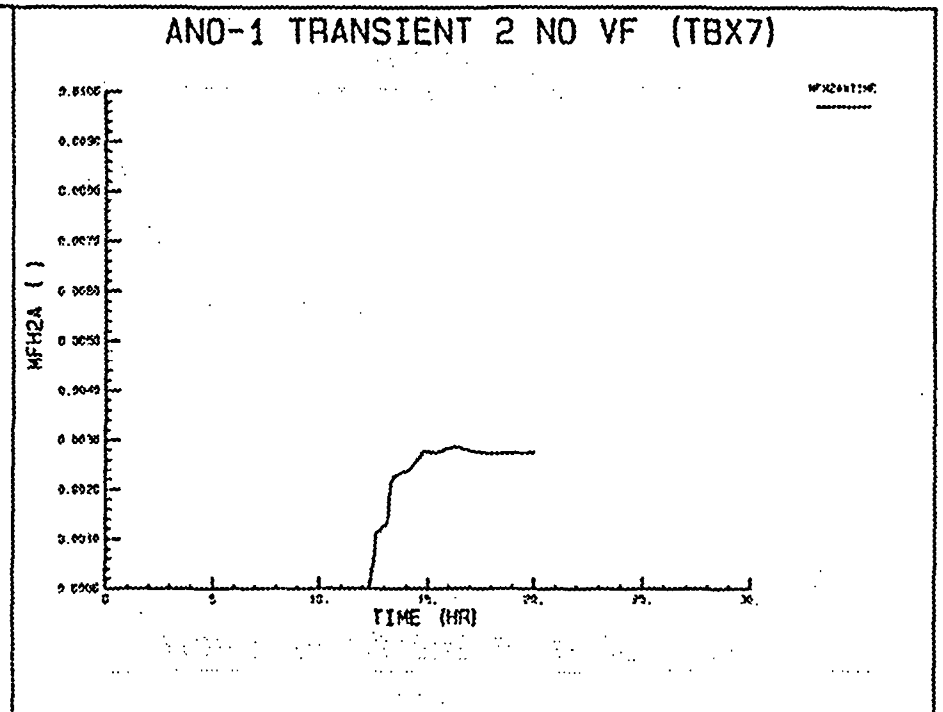
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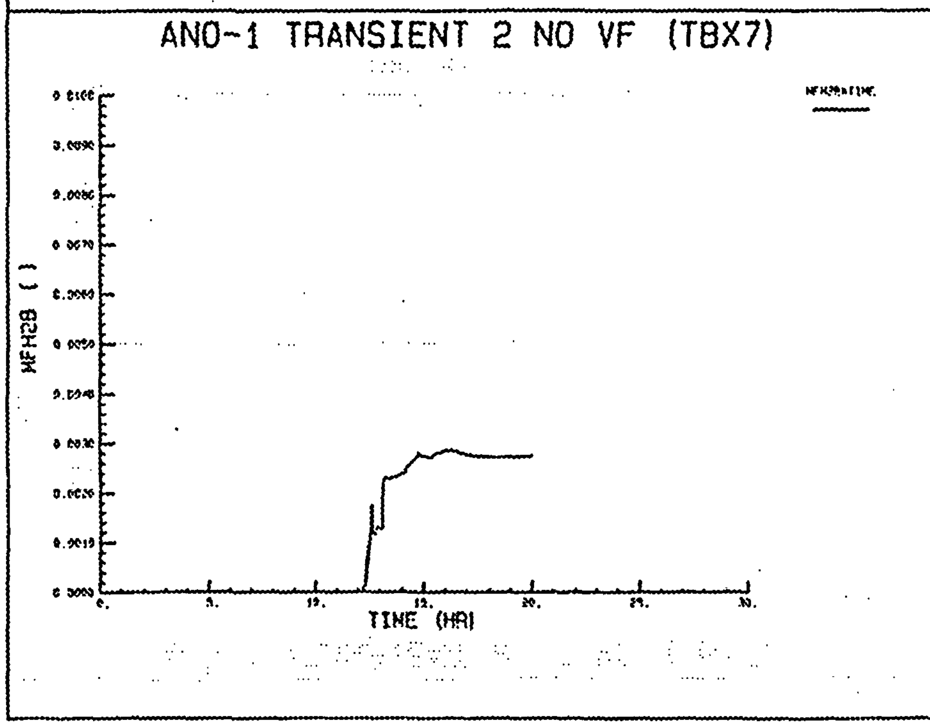
TIME (HR)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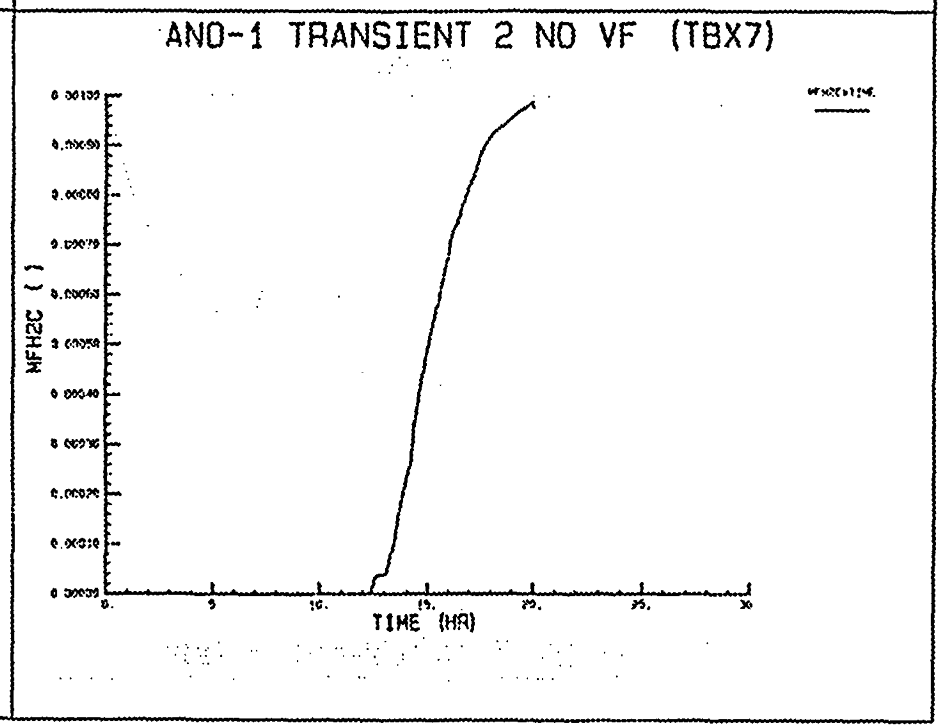
TIME (HR)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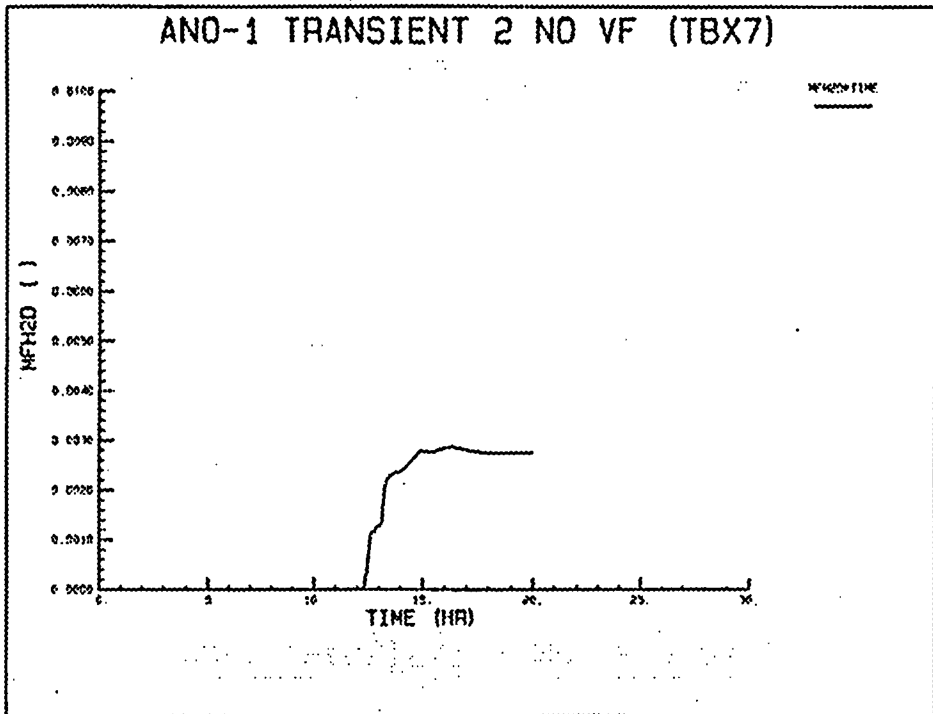
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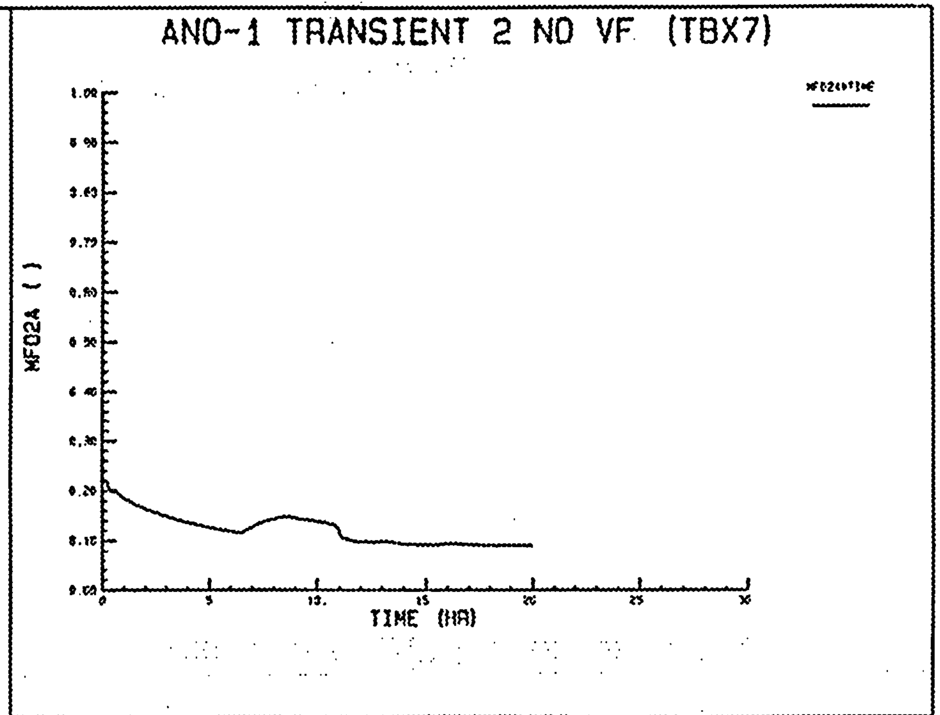
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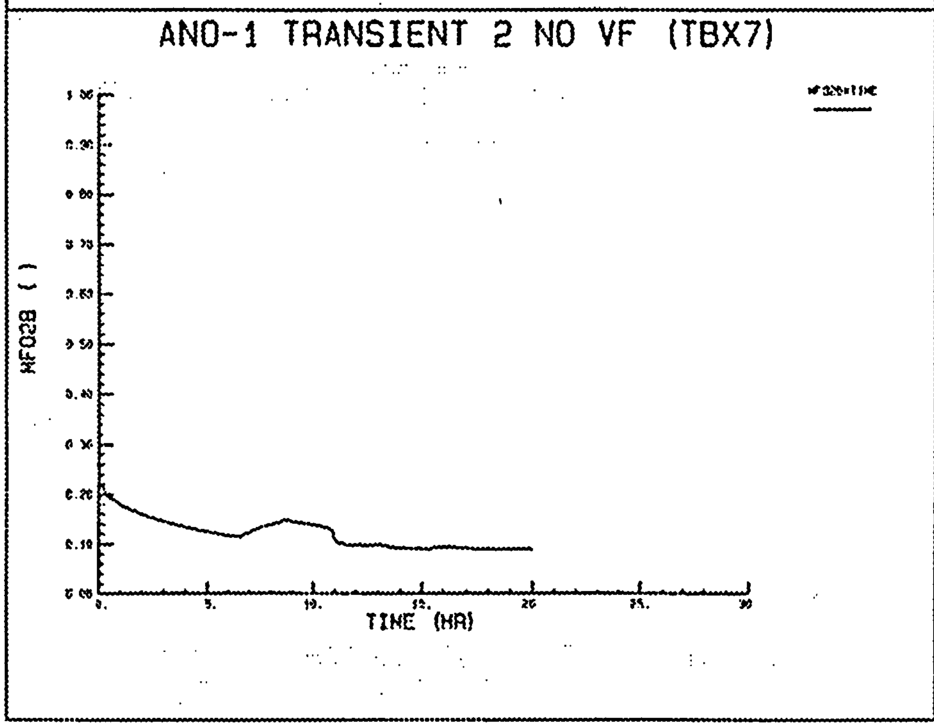
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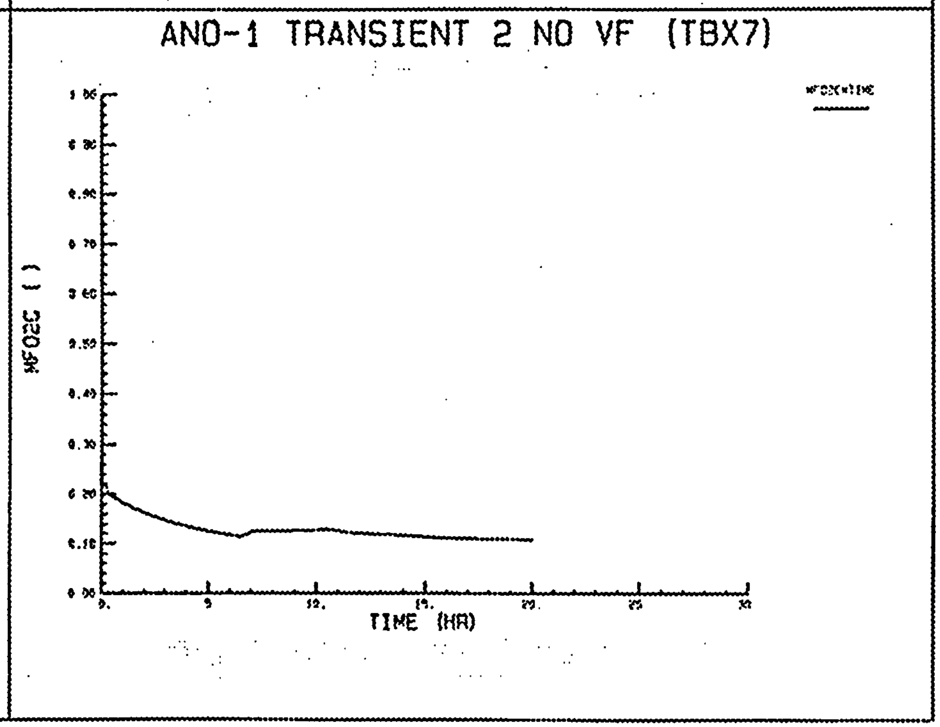
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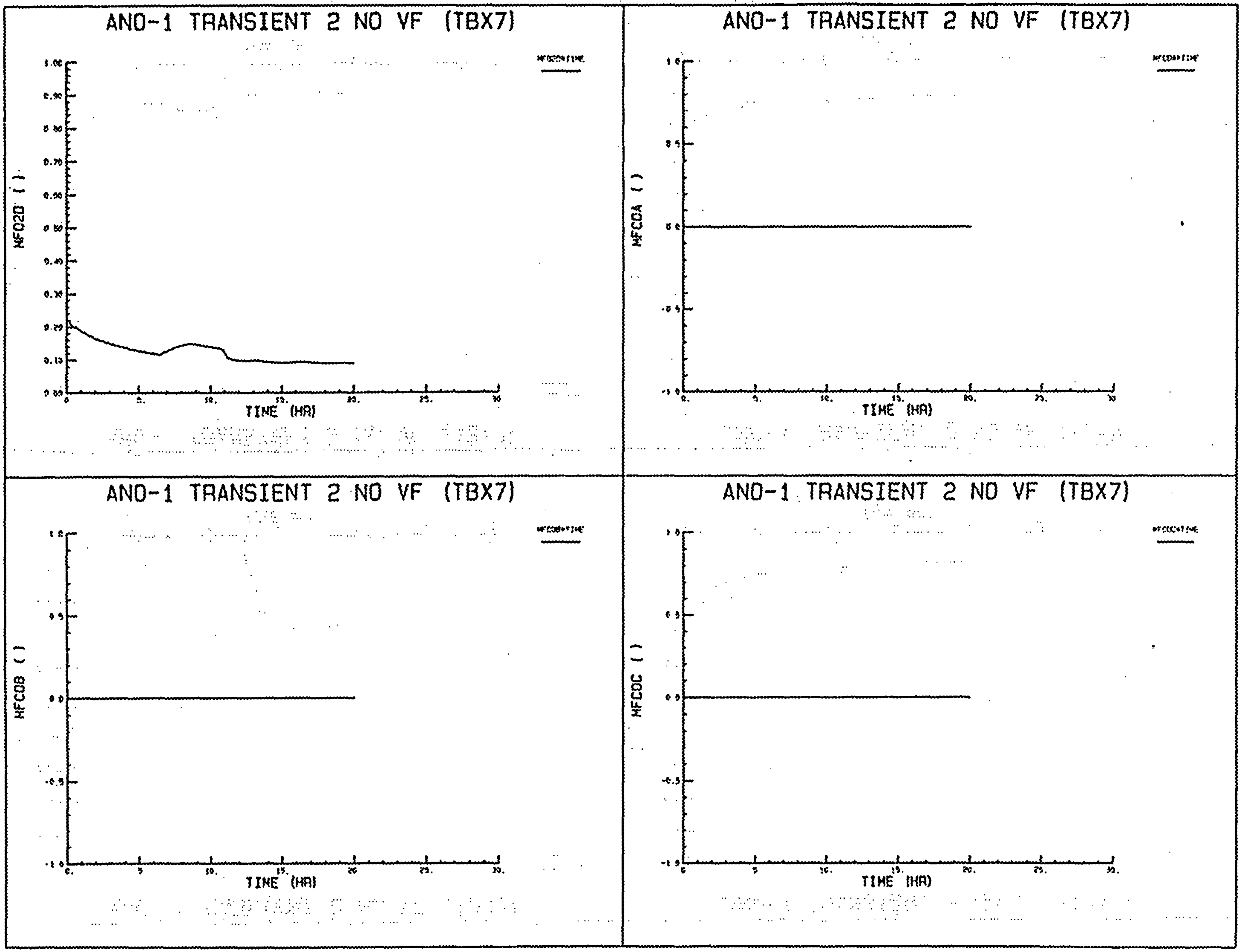
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TIME (HR)
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TIME (HR)
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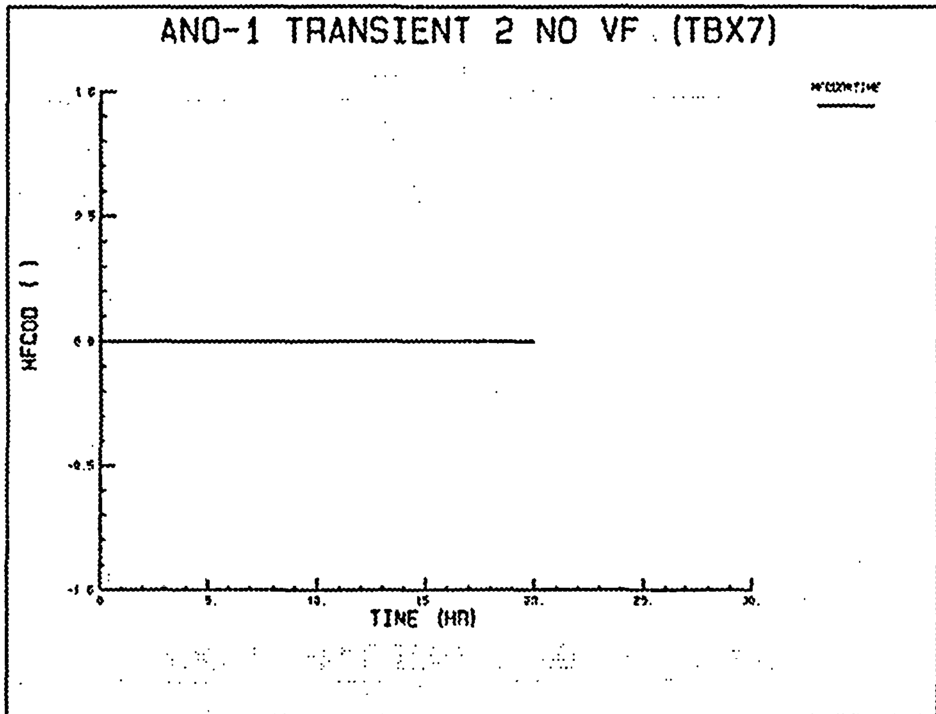
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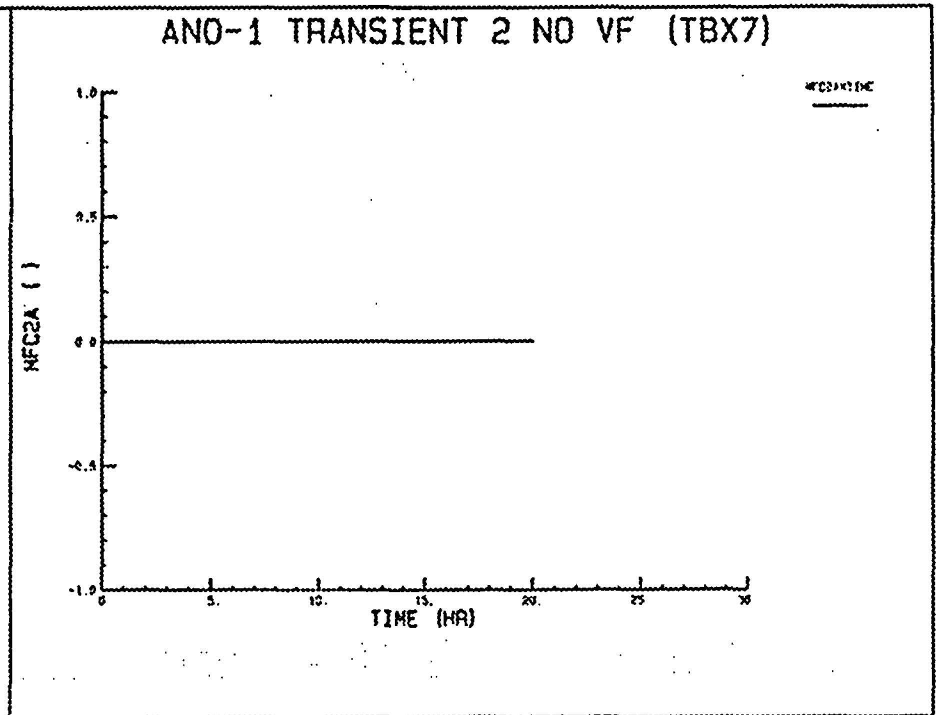
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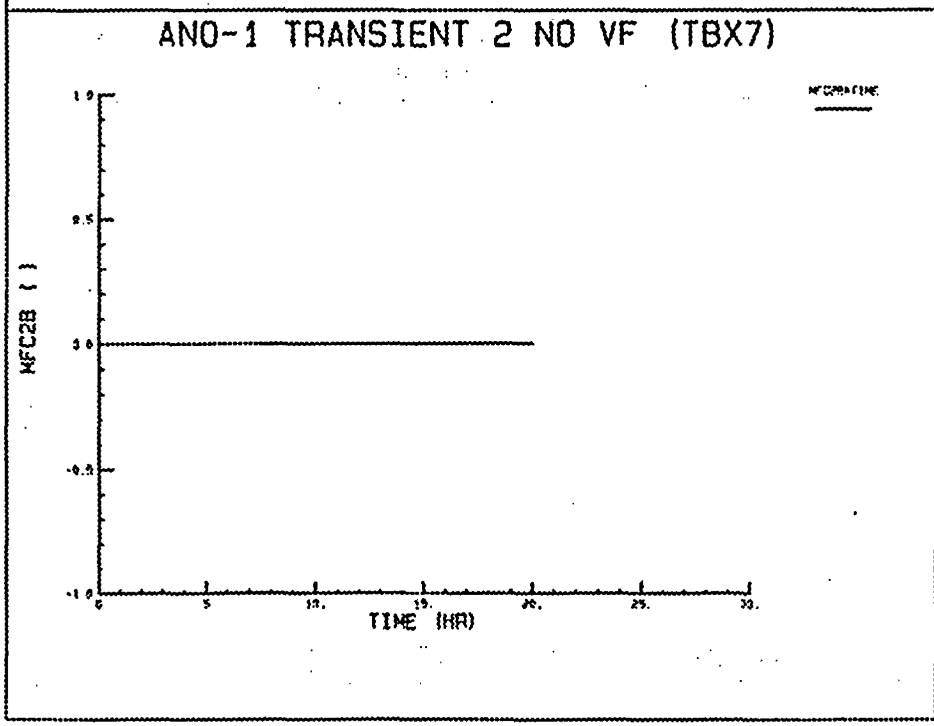
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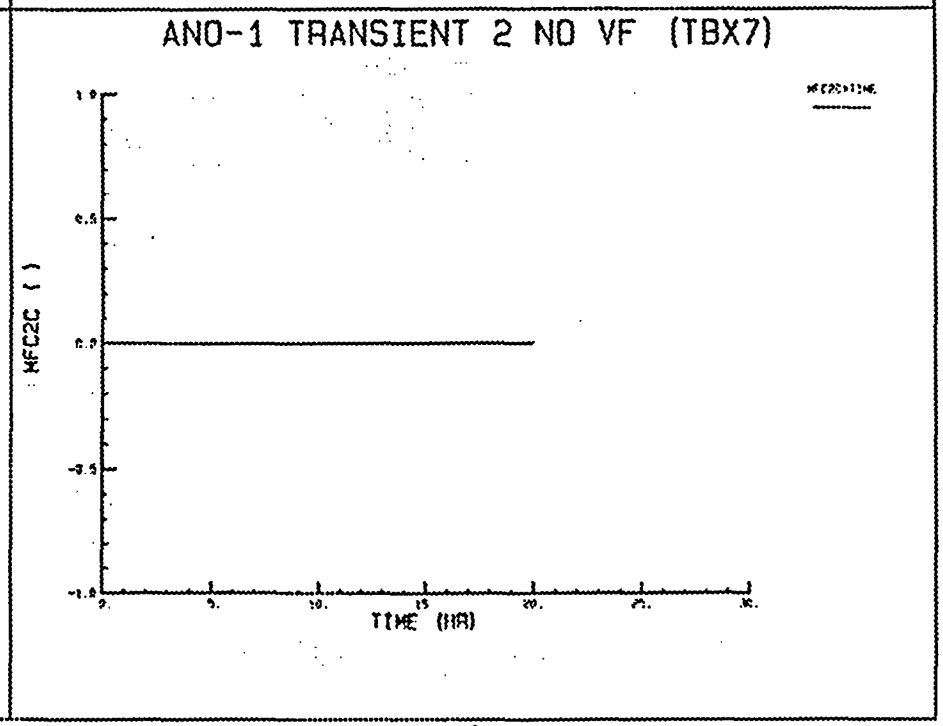
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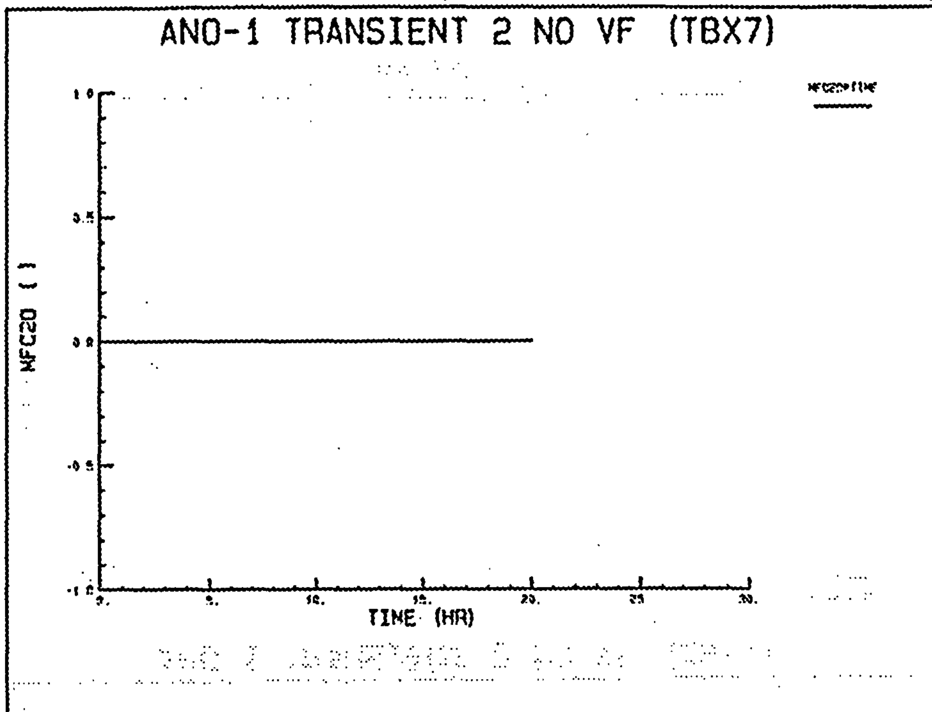
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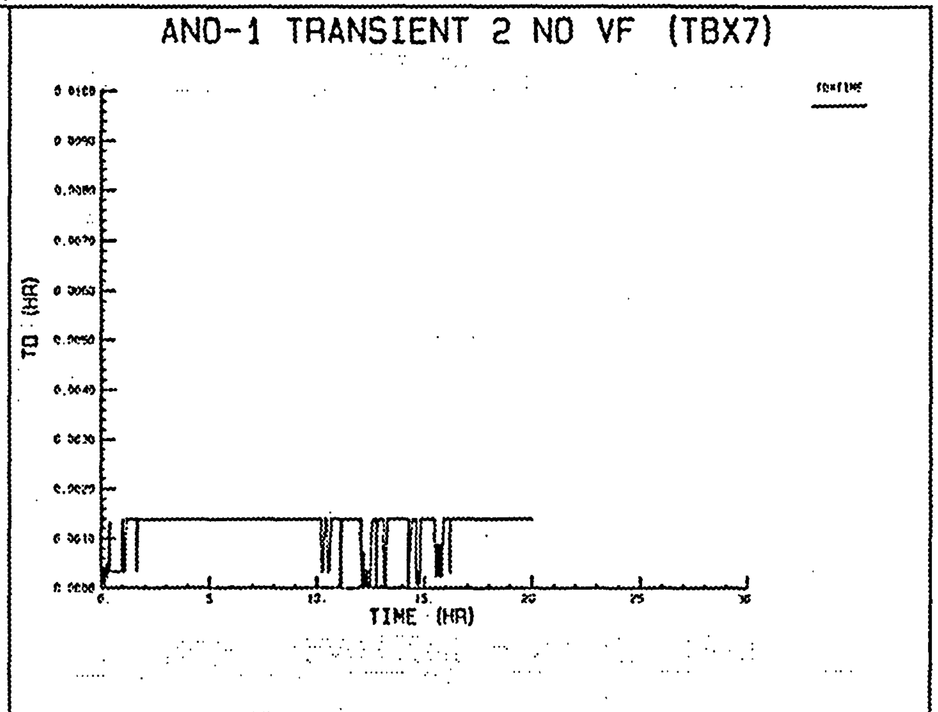
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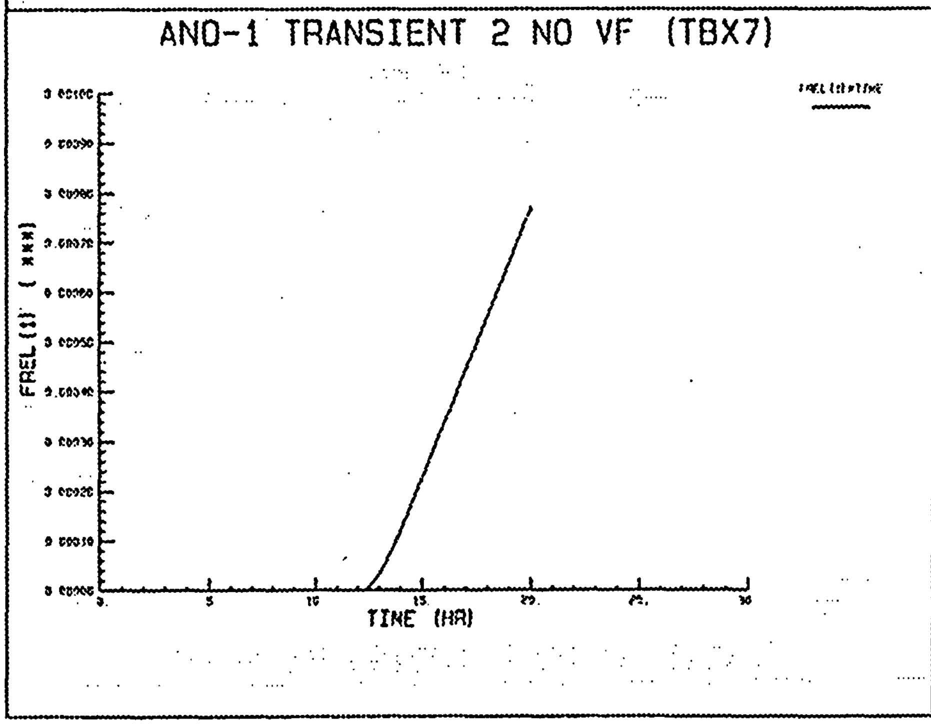
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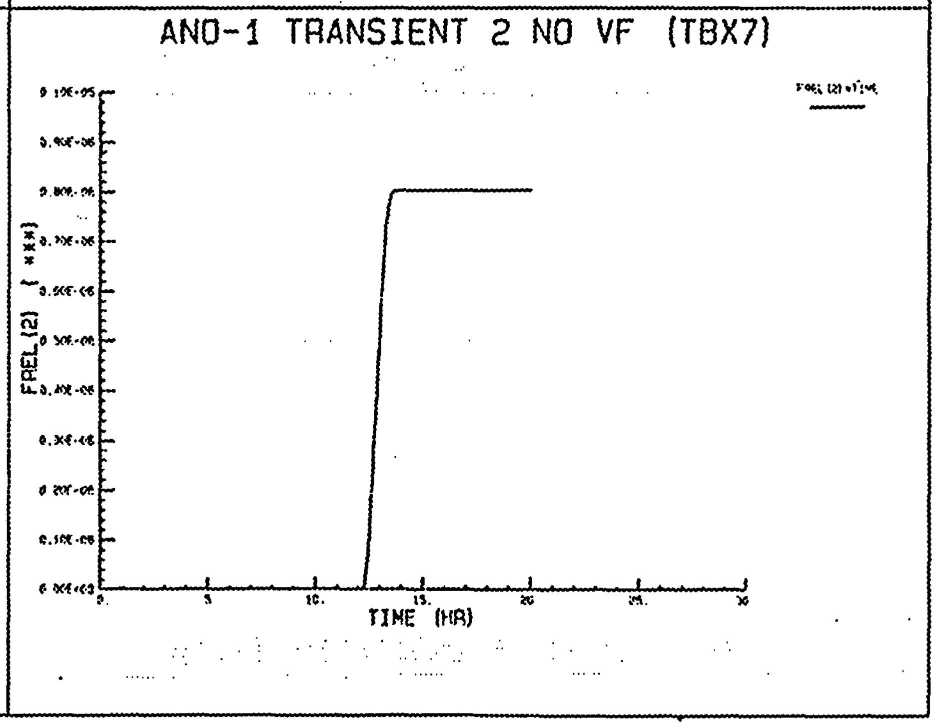
TIME (HR)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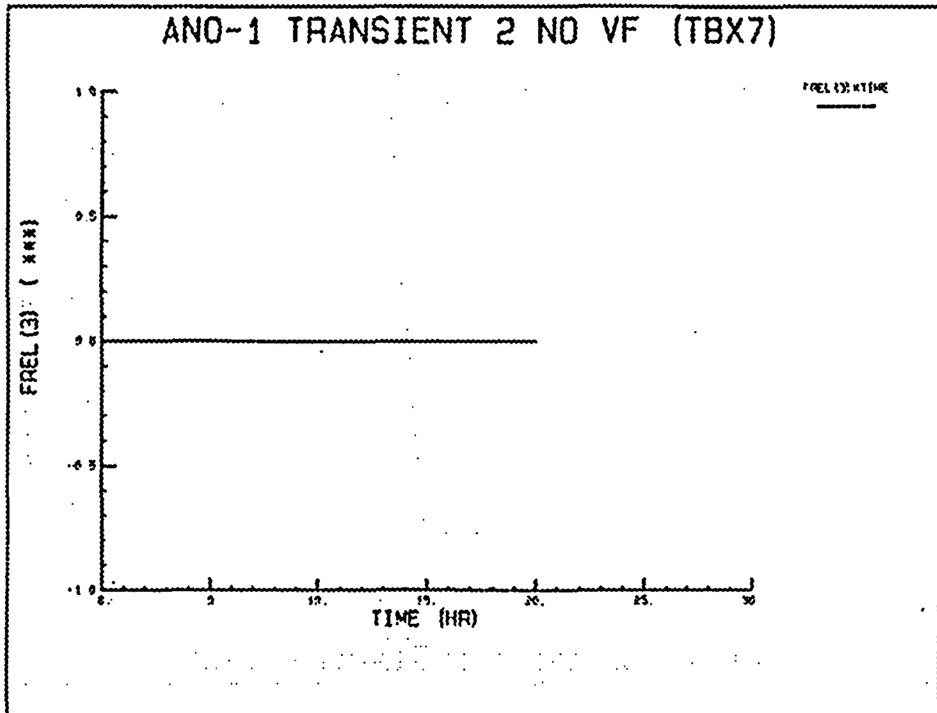
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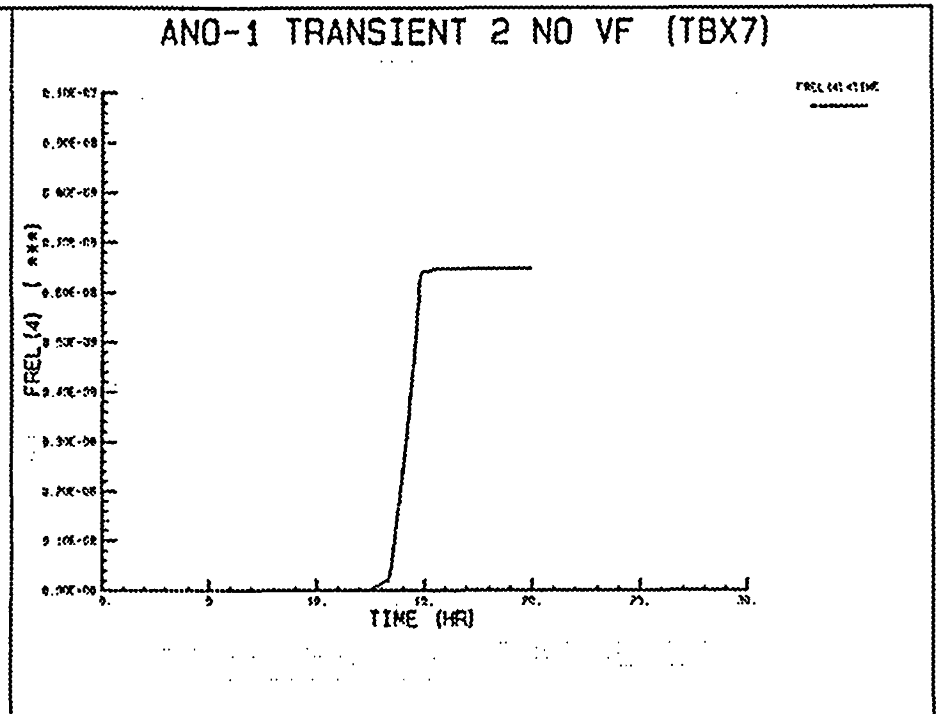
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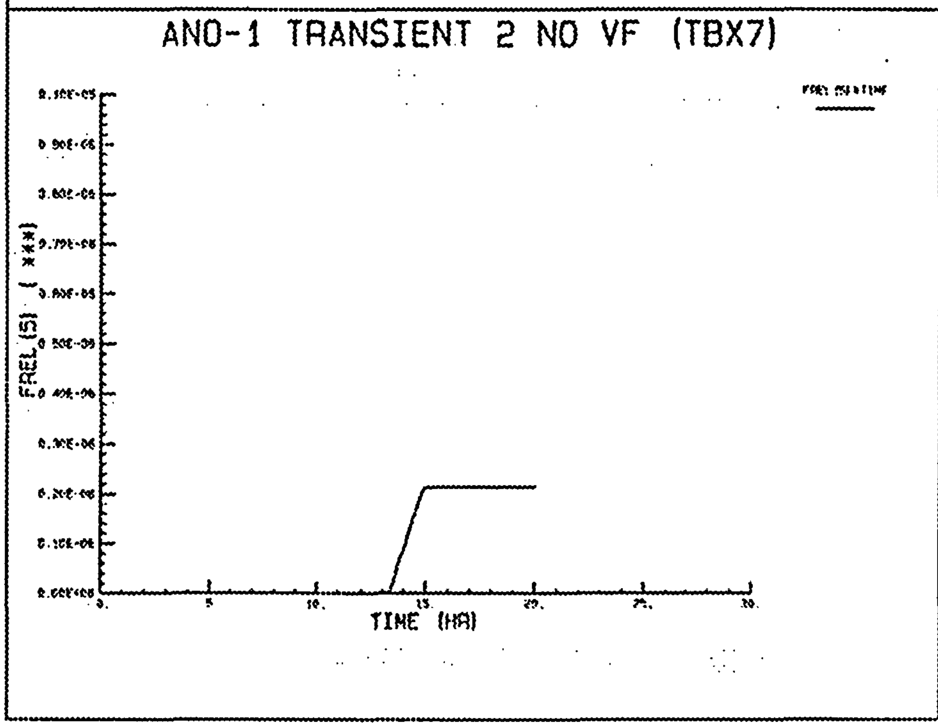
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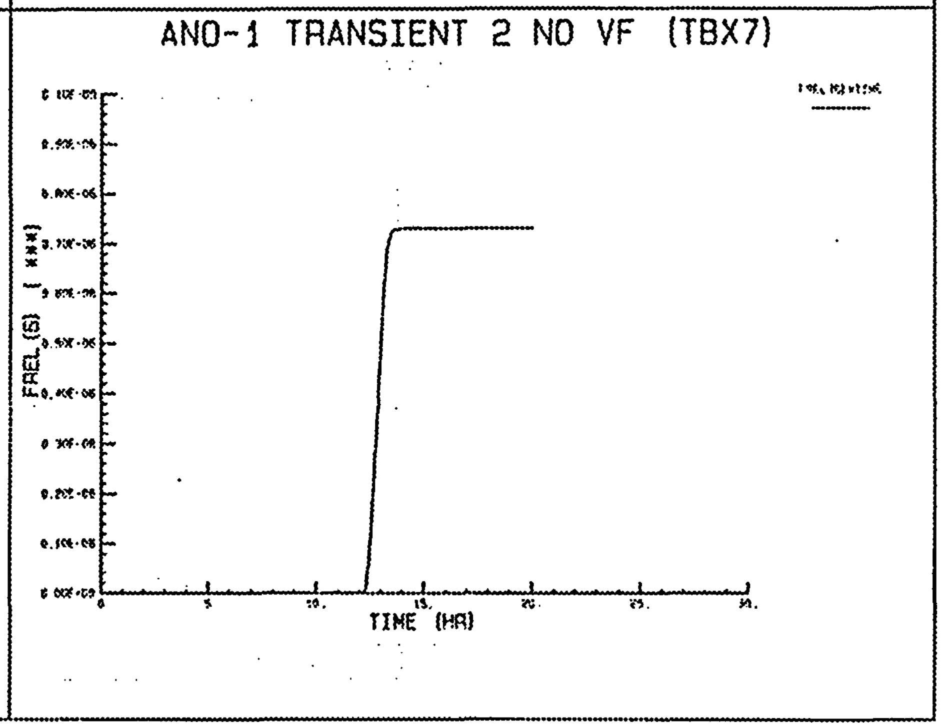
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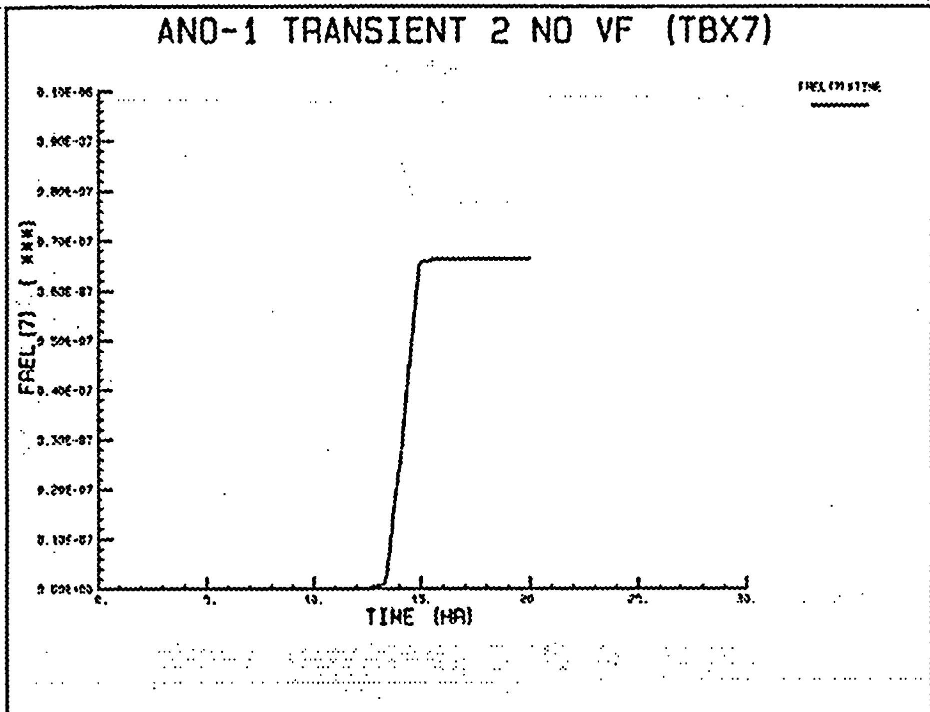
TIME (HR)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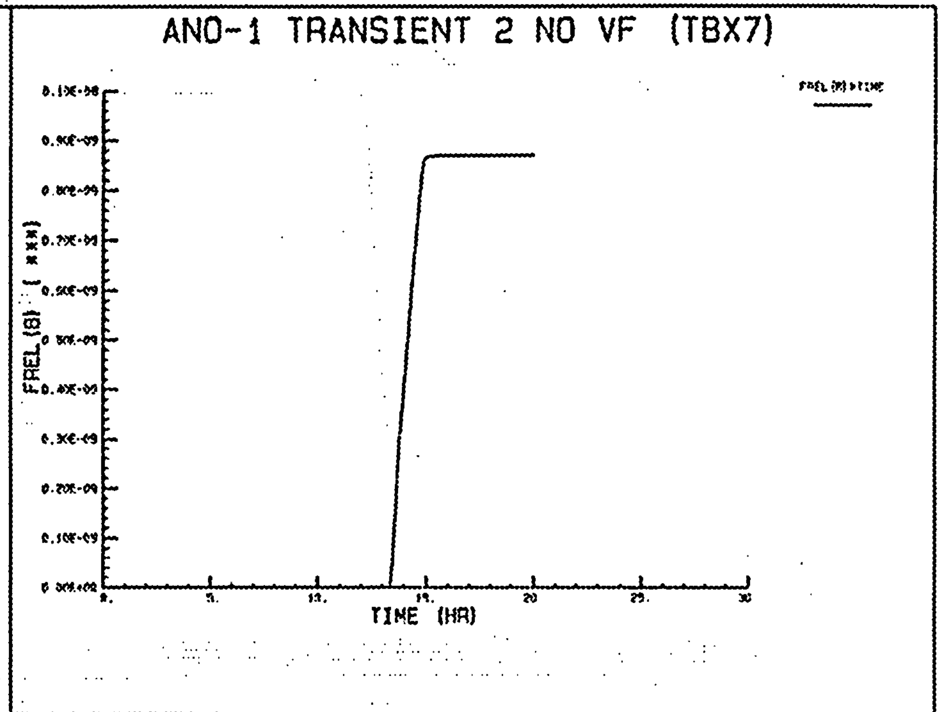
FREL(7) (***)
TIME (HR)
0.
5.
10.
15.
20
25.
30.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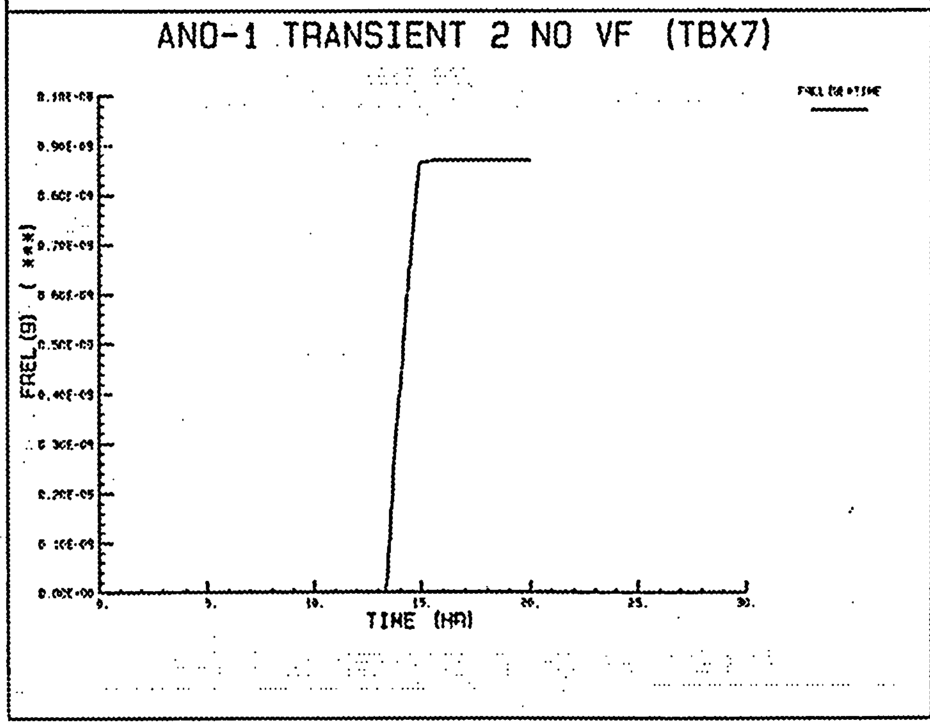
FREL(8) (***)
TIME (HR)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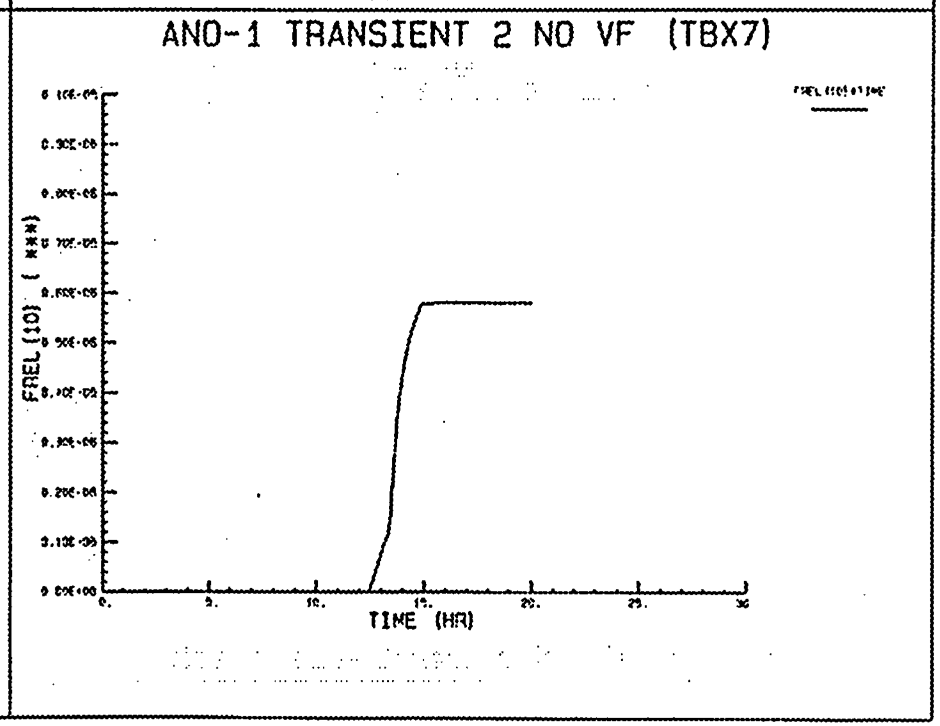
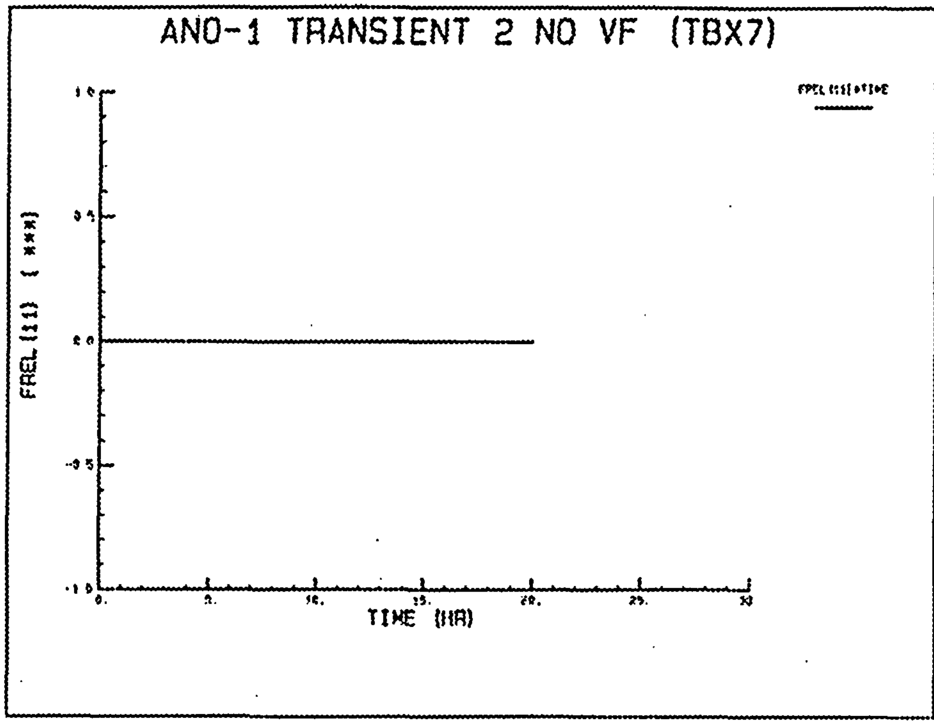
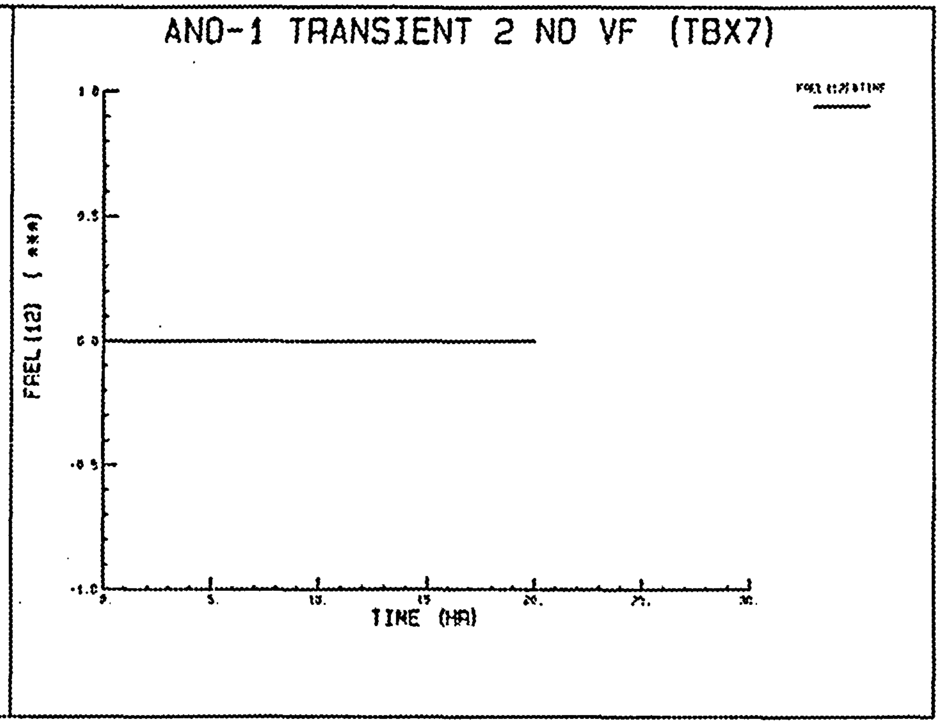
FREL(9) (***)
TIME (HR)
0.
5.
10.
15.
20.
25.
30.


ANO-1 TRANSIENT 2 NO VF (TBX7)
FREL(10) (***)
TIME (HR)


ANO-1 TRANSIENT 2 NO VF (TBX7)
FREL (11) (***)
1.0
0.5
0.0
-0.5
-1.0
0.
5.
10.
15.
20.
25.
30
TIME (HR)


ANO-1 TRANSIENT 2 NO VF (TBX7)
FREL (12) (***)
1.0
0.5
0.0
-0.5
-1.0
0.
5.
10.
15
20.
25.
30.
TIME (HR)