308 --- Q200311210004

Scientific Notebook # 025: Crevice Corrosion Experiments of Alloy 825 (12/01/1993 through 02/14/1997)

21

REC.

CNWRA
CONTROLLED
COPY 025

Pages 1 through 304 of this Scientific Notebook were reviewed for compliance with QAP-001 in response to Corrective Action Request 94-02. Corrections and clarifications were made as appropriate. In some cases, the date of a change will reflect the date of this review rather than the date of the original Scientific Notebook entry.

Randy Folck
SwRI - QA
11/28/94

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EQUIPMENT

ELECTRODES -

1) ORION MODEL 94-17 Chloride electrode
2) ORION MODEL 95-02 CO_2 electrode
3) ORION MODEL ROSS pH Comb. electrode

1) ORION electrode meter model 720A	003368
2) ESC 440 multichannel potentiostat	9029127
3) AUSTIN 386SX	
4) WORK BENCH SOFTWARE - Strawberry tree INC.	

(See equipment list on page 829)

N. Sridhar
12/1/93

12/6/93

EQUIPMENT 10/92 - 7/93

PH METERS

ORION EA 920 SN 5001A

ORION EA 940 DD ~~SN 230~~ SN 2330

ORION 720A SN 005885

FISNER ACCUMET 950 SN 3340

ELECTRODES - ISE / pH / SCE / Ag/AgCl /

FISNER 13-620-96 pH ELECTRODE SN 02602250

FISNER 13-620-~~RDD~~ 16 ATC PROBE

ORION 94-17B Cl^- ION SELECTIVE ELECTRODE

ORION 90-02-00 REFERENCE ELECTRODE

FISNER SCE 13-620-51 SN's 9214083, 8211163, 0165415, 0169033, 3106337, 2134032, 3106340, 3106321, 0165403

FISHER Ag/AgCl REFERENCE 13-620-53 SN 8118182

MICROELECTRODES INC.

MI506 FLEXABLE pH ELECTRODES SERIAL #'S 44817, 45147, 43715, 44060, 4944S

MI200 Cl^- ION SELECTIVE ELECTRODES SERIAL #'S 44199, 44447, 47226, 47239, 47233, 47228, 44176

MI402 / MI403 Ag/AgCl REFERENCE ELECTRODES SERIAL #'s 49467, 46024, 43647, 43636, 44671, 45860, 44628, 44629, 41432, 41436, 45867, 46104

MERCURY THERMOMETERS FISNER SCIENTIFIC

SERIAL #'S ASSIGNED BY CALIBRATION LABORATORY AT INITIAL CALIBRATION SERIAL #'S

1238001, 1238002, 1238004, 183305, 183301, 183303, 183302, 183304, 183306, ~~183~~ DD 0323002, 0323003, 0323004 0323005, 0323007, 0323008

COMPUTERS

COMPUADD 333E

COMPAQ 386/20

COMPUADD 212

12/6/93

EQUIPMENT 10/92 - 7/93

POTENTIOSTATS

ESC 440 #1 SN 9029127

ESC 440 #2 ~~SN 9138~~ DD SN 9209138

ESC 410 POWER SUPPLY / POTENTIOSTAT 9105504 / 9105556

ESC 410 POWER SUPPLY / POTENTIOSTAT 9029495 / 9105557

ESC 410 POWER SUPPLY / POTENTIOSTAT 9105503 / 9029548

ELECTRONIC BALANCE SARTORIUS MC1 RESEARCH RC 210 P SN 10704379

METERS / ELECTROMETERS

KEITHLEY 614 SN 555368

KEITHLEY 614 SN 467374

KEITHLEY 617 SN 537418

KEITHLEY 485 SN 509163

FLUKE 8050A SN 5005078

FLUKE 8050A SN 5005110

CONDUCTIVITY METER YSI MODEL 35 SN 90D014379

DIPCELLS $K = 0.1\ cm^{-1}$ FISNER 3992

$K = 1.0\ cm^{-1}$ FISNER 4062

STRIP CHART RECORDERS ABB (ASEA BROWN BOVERI)

SE120 SN 0515265

SE120 SN 0049616

THERMOCOUPLE METER OMEGA MODEL HH22 SN T 94140

OVENS: FISHER ISOTEMP MODEL 838F SN 00300001

BLUE-M STABIL-THERM MODEL-OV-510A-3 SN OV-5697

LINDBERG MODEL 51828 SN 909027

SHARING WATER BATH FISHER VERSABATH MODEL 236 SN 90100023

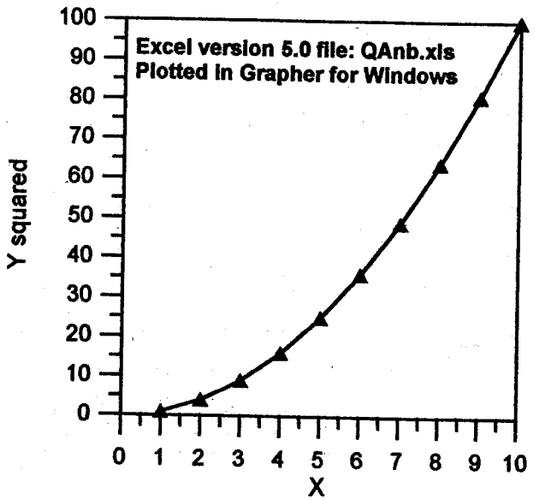
WORKBENCH PC SOFTWARE V 2.0.4 1990

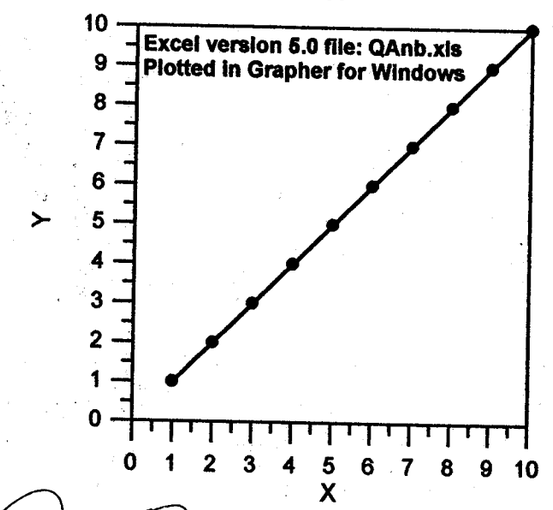
QUATTRO PRO V 3.01 DA246H0021600

REACTION KETTLES: 2, 1-PIECE, 2-LITER REACTION KETTLES W/GROUND GLASS JOINTS AND 4, 2-PIECE, 1-LITER REACTION KETTLES WITH GROUND GLASS JOINTS

12/6/93

INSTALLATION TEST DOCUMENTATION FOR MICROSOFT EXCEL VERSION 5.0 AND GRAPHER FOR WINDOWS VERSION 1.23





4/1/97

X	Y	Ysquared
1	1	1
2	2	4
3	3	9
4	4	16
5	5	25
6	6	36
7	7	49
8	8	64
9	9	81
10	10	100

4/1/97

4/1/97

INTERFERENCE

Purpose: The purpose of this experiment is to determine whether several species can interfere with the CO_2 or Cl^- electrodes.

several sample matrices were generated for different levels of HCO_3^-, Cl^-, SO_4^-, F^-, NO_3^-

	HCO_3^-	Cl^-	SO_4^{2-}	NO_3^-	F^-	LABEL	(PPM)
*	88	6	20	10	2	I 1 A-C	
	88	10,000	20	10	2	I 2	
	88	6	10,000	10	2	I 3	
	88	6	20	10,000	2	I 4	
	88	6	20	10	200	I 5	
*	8800	6	20	10	2	II 1 A-C	
	8800	10,000	20	10	2	II 2	
	8800	6	10,000	10	2	II 3	
	8800	6	20	10,000	2	II 4	
	8800	6	20	10	200	II 5	

* 3 solutions A, B, C

These solutions were prepared using stock solutions and dry chemicals (HCO_3^- & high conc)

F^-	1000 ppm	SN CNWRA	013-107	7/1/90	7/1/91
NO_3^-	1000 ppm	SN CNWRA	019-63	3/21/91	3/21/92
SO_4^-	1000 ppm	SN CNWRA	019-97	4/10/91	4/10/92
Cl^-	600 ppm	SN CNWRA	013-10	7/1/90	7/1/91
$NaHCO_3$	dry	Lot no	897789		
$NaNO_3$	dry	Lot no	897674		
Na_2SO_4	dry	Lot no	901213		

The pH, ppm CO_2, ppm Cl^- were measured using electrode procedures.

The pH was measured using an Orion combination pH electrode.
CO_2 ppm was measured using ASTM D513-88 test method A and an Orion combination carbon dioxide electrode model 95-02
Cl^- ppm was measuring using an Orion model 94-17B Chloride electrode.

	CO_2 ppm	Cl^- ppm	pH
I1-A	67.3	10.6	8.168
-B	67.8	9.3	8.345
-C	68.7	10.1	8.410
I2	74.1	(1:100) 110	8.157
I3	73.8	17.5 *	8.091
I4	72.3	8.5	8.510
I5	78.0	7.4	8.132
	1:20 dil	~~7.40~~ TCP	
II1-A	298	7.48	8.209
-B	322	8.56	8.290
-C	338	8.60	8.275
II2	334	(1:100) 125	8.050
II3	327	7.80	8.129
II4	339	8.10	8.144
II5	365	8.31	8.245

* Recheck I3 - new solution

I3	73	8.6	8.177

	HCO_3^- (ppm)	Cl^- ppm	pH
I..	99.4 ± 5.5	9.12 ± 1.11	8.259 ± 0.161
II.	9200 ± 560	8.14 ± .44	8.192 ± 0.088

4/28/24

6/14/91

ASTM 661 - Multichannel Potentiometer w/WORKBENCH™

Purpose: The purpose of this experiment was to test work Bench software and multichannel potentiometer. 902-9127.

(Trial Run not verification)

ASTM TEST 661 procedures were done using work bench software and program ASTM661. The measured potential and current density were logged using the same program into file 661DAT.DAT. WORKSHEET ASTM661 and data file 661DAT.DAT are stored on work bench - disk 1 (F) (3½" disk.)

A 386 SX ~~ASTF~~ TCP AUSTIN PC with DAC and math coprocessor were used to run the software.

JCP 6/14/91

~~6/19/91~~ JCP

LTPT - Long-term Pitting Test - Initial Entry

Experimenters: Thomas Page, Narasi Sridhar, Walter Machowski

Procedure: The following series of tests follow TOP-008. Specific stepping progression and testing procedures follow Memorandum included below

MEMORANDUM

To: Tom Page/Walt Machowski

From: N. Sridhar

Date: June 26, 1991

Subject: Long-term Pitting Tests on 304L stainless Steel

Please conduct the following tests using the Multi-channel potentiostat and Workbench PC:

1. **Prepare two liters of solution per TOP-010:**

   1000 ppm Cl, 10 ppm NO_3, 20 ppm SO_4, 2 ppm F, 85 ppm HCO_3 all as sodium salts

2. **All tests at 95°C.**

3. **Prepare samples by polishing in 600 grit paper, washing in distilled water and acetone and drying.**

4. **Deaerate solution by bubbling nitrogen for 1 hour before test and throughout the test at a slower rate (say about a bubble every 2 seconds)**

Test 1

5. **Introduce sample after solution reaches 95°C. Maintain at open-circuit for 1 hour. Monitor potential and record.**

6. **Polarize sample to ~~+0~~ −50 mV SCE for 30 minutes. Record potential and current density (30 sec. interval).**

7. **Increase the potential to +200 mV vs. SCE, record current density and potential for 1 hour.** (30 sec)

8. **Decrease potential in steps of 20 mV, while monitoring current density at each potential. If the current starts increasing with time, decrease the potential to the next step. When the current starts decreasing with time, stop stepping potential down and maintain potential and record current and potential for 48 hours.**

More

Test 2:

1. **Use another 304L sample. Repeat steps 5 and 6.**
2. **increase potential to 200 mV vs. SCE and hold for 4 hours.**
3. **Repeat step 8.**

After test, rinse sample and store with appropriate designation.

The concentration of Cl^-, NO_3^-, SO_4^{2-}, F^-, HCO_3^- will be varied from trial to trial

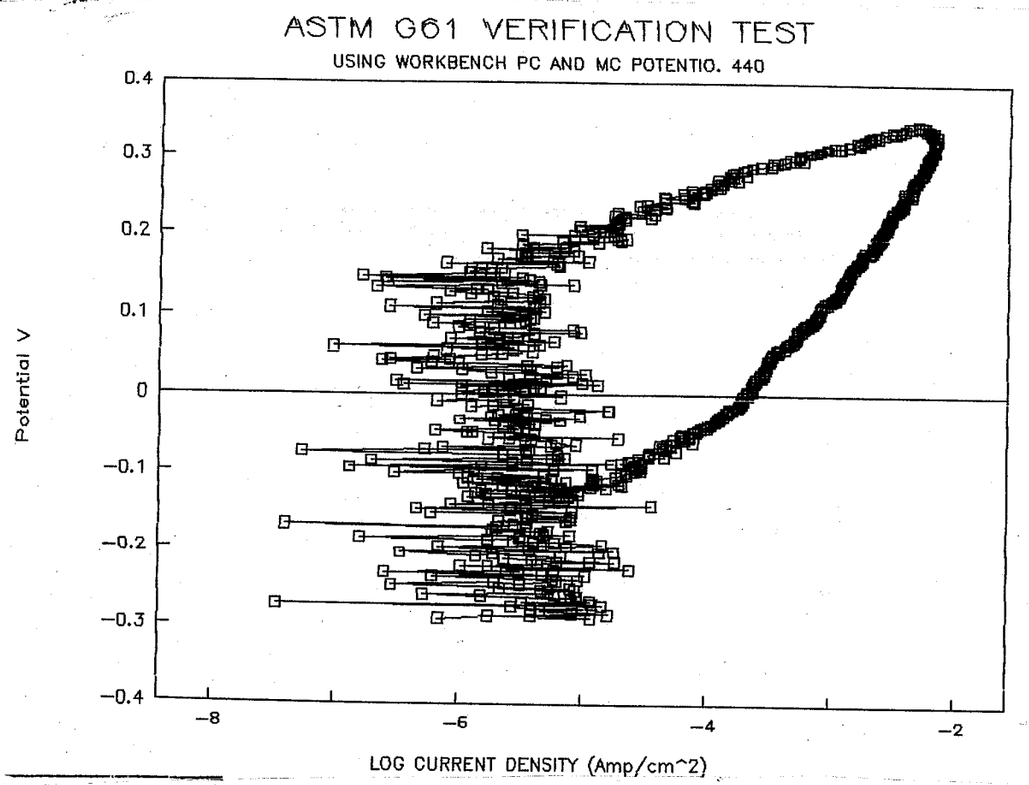
Equipment:

Workbench PC software on 386 SX PC
ESC 440 multichannel Potentiostat SW# 9029127
CalB: 1/16/91 → 7/16/91
Standard Calomel Electrode - check before use TOP-008-5.5
Platinum Counter Electrode TOP-008-5.4 TCP
Standard Test Cell TOP-008-5.1
Mettler AE 240 electronic balance S/N 101237
CALIB: 5/16/91 → 11/91
Micrometer: Calib: 4/19/91 → 10/19/91 SW 20-M-1
Orion Ph meter - calib before use
Specific Program for each test
Keithley 614 electrometer 12/31/90 → 7/1/91 SW 23B97
Samples: Prepared as described in TOP-003-001

JCP
6/28/91

Tests terminated due to necessary changes in equipment. Data will not be used.
N. S. 8/21/91

N. Sridhar
4/28/94



ten point average through low-current region.

LTPT - Verification G61

Purpose: To verify operation of equipment, software, and procedures for running cyclic potentiodynamic tests. The test serves as a check for the initiation of LTPT tests using ESC 440 multichannel potentiostat and workbench PC software.

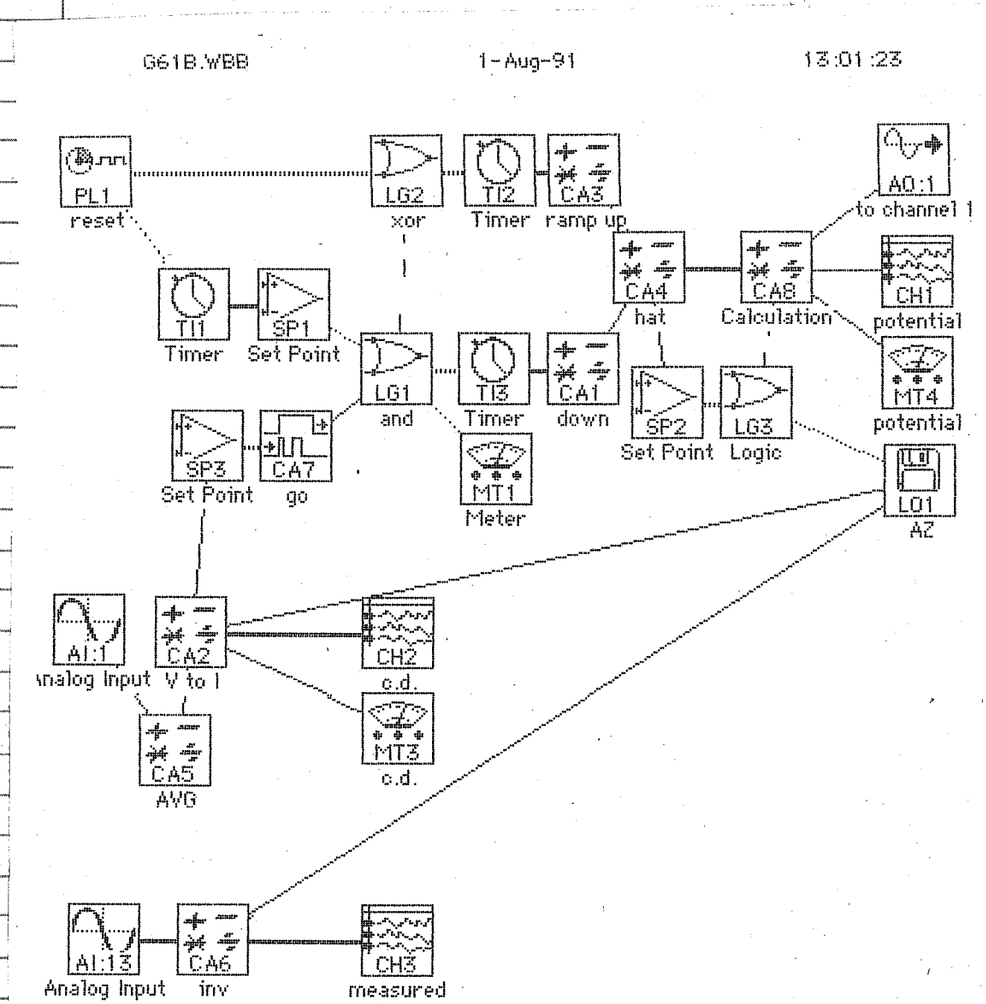
The test was in accordance with TOP-008-6.1 and ASTM G-61. A cylindrical 304 LSS specimine from heat # T0954 was used. The NaCl solution was prepared from Fisher NaCl lot no. 885407. Argon (99.999%) was used for de-aeration.

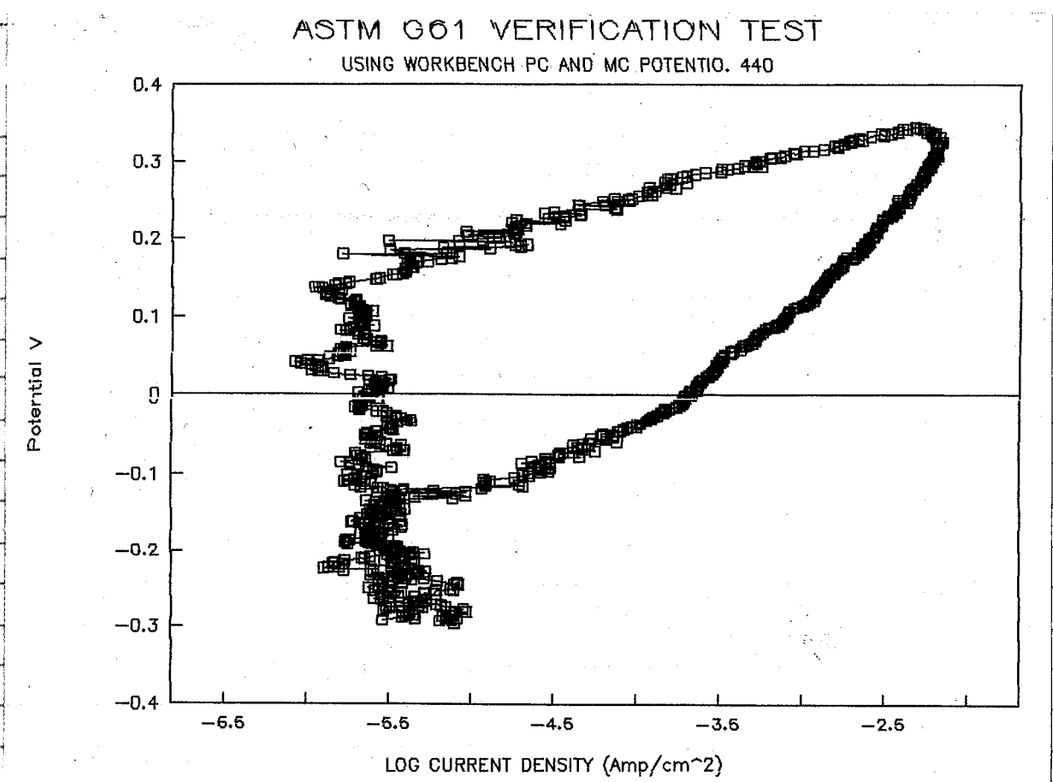
Spec. Dim: ϕ 0.634 cm l = 1.909 cm A: 4.118 cm^2

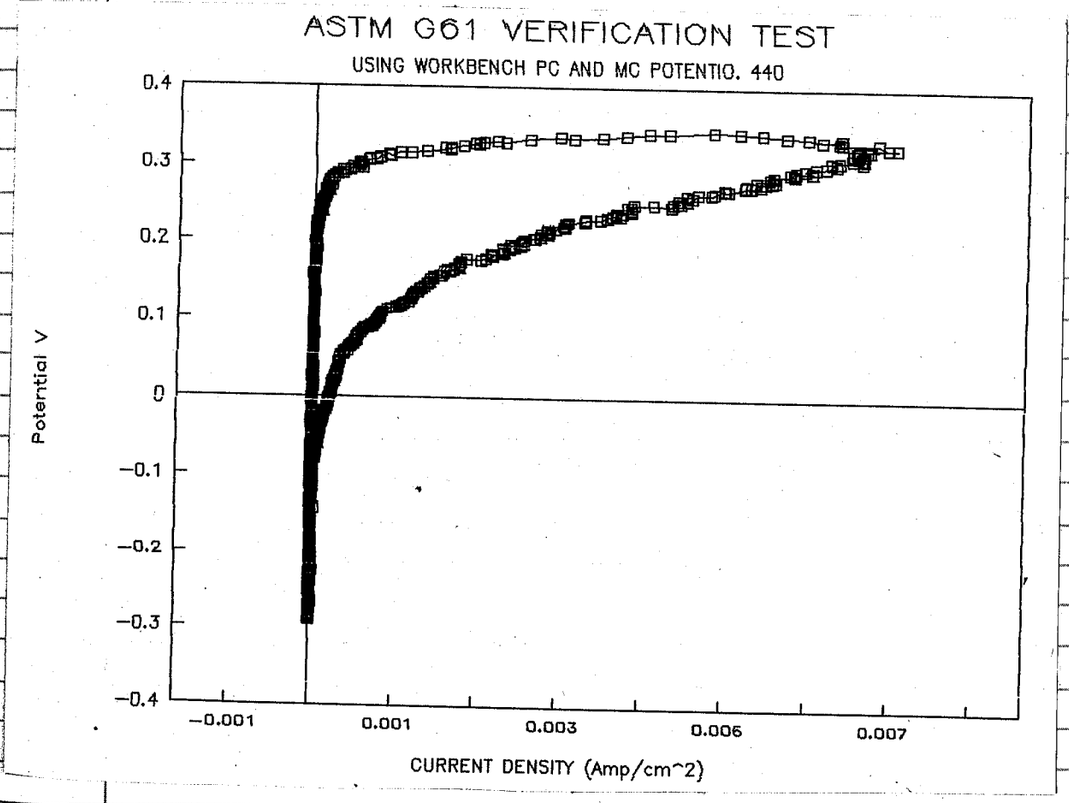
Pt potential 10 min before start + 134 mV vs SCE
E_{corr} at start -300 mV vs SCE

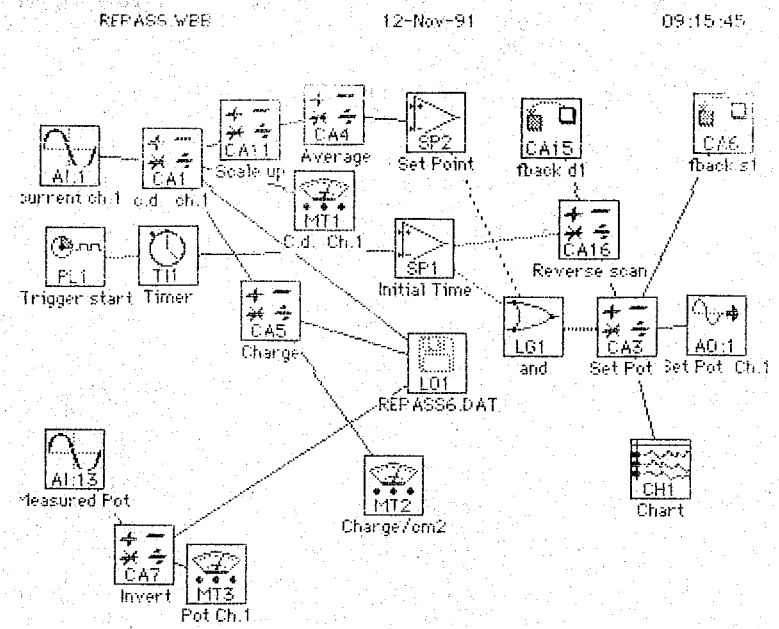
SCE was checked vs SCE - difference < 1.0 mV
Data saved on Disk - Workbench - Disk 1 (E)
in file ASTMG61.DAT
Test program is saved in ASTMG61B.WBB on same disk.

Thomas C Page
6/20/91


G61B.WBB
1-Aug-91
13:01:23
PL1
reset
LG2
xor
TI2
Timer
CA3
ramp up
AO:1
to channel 1
TI1
Timer
SP1
Set Point
CA4
hat
CA8
Calculation
CH1
potential
LG1
and
TI3
Timer
CA1
down
MT4
potential
SP2
Set Point
LG3
Logic
SP3
Set Point
CA7
go
MT1
Meter
LO1
AZ
AI:1
Analog Input
CA2
V to I
CH2
c.d.
MT3
c.d.
CA5
AVG
AI:13
Analog Input
CA6
inv
CH3
measured


ASTM G61 VERIFICATION TEST
USING WORKBENCH PC AND MC POTENTIO. 440
Potential V
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−6.5
−5.5
−4.5
−3.5
−2.5
LOG CURRENT DENSITY (Amp/cm^2)


ASTM G61 VERIFICATION TEST
USING WORKBENCH PC AND MC POTENTIO. 440
Potential V
0.4
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
−0.4
−0.001
0.001
0.003
0.006
0.007
CURRENT DENSITY (Amp/cm^2)


REPASS.WBB
12-Nov-91
09:15:45
Page 1
AI:1
current ch.1
CA1
c.d. ch.1
CA11
Scale up
CA4
Average
SP2
Set Point
CA15
fback d1
CA6
fback s1
MT1
c.d. Ch.1
CA16
Reverse scan
PL1
Trigger start
TI1
Timer
SP1
Initial Time
CA5
Charge
LG1
and
CA3
Set Pot
AO:1
Set Pot Ch.1
LO1
REPASS6.DAT
AI:13
Measured Pot
MT2
Charge/cm2
CH1
Chart
CA7
Invert
MT3
Pot Ch.1

Worksheet Name: REPASS.WBB
Hardware list:

Name	AIs	AOs	DIOs	CTs	DIs	DOs
STI ACPC-16	16	0	16	0	0	0
STI ACAO-12	0	6	8	0	0	0

Maximum icons: 464
Grid size: 16
Snap to grid: < disabled >
Report Unsynch: < disabled >
Fast Mode: < disabled >
Fast Mode Samples: 1000
Fast Mode Rate: 1.0 Kilohertz
Com ports: 2

Port: COM 1
Comment: Mouse connected

Port: COM 2
Baud rate: 9600
Data bits: 8
Stop bits: 1
Duplex: Half
Parity: None
XonXoff: < disabled >
Echo wait: < disabled >
Line delay: < disabled >

IEEE: < disabled >

Type: Analog Input

Name: AI:1 current ch.1
Card Type: STI ACPC-16
Channel Number: 1
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA1 c.d. ch.1

Name: AI:13 Measured Pot
Card Type: STI ACPC-16
Channel Number: 13
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA7 Invert

Type: Timer

Name: TI1 Timer
Inputs:
PL1 Trigger start
Outputs:
SP1 Initial Time

Type: Pulse

Name:	PL1 Trigger start
High Duration:	24.0 Hours
Low Duration:	0.1 Seconds
Start Value:	Low
Reset on exit	enabled
Inputs:	
< None >	
Outputs:	
TI1 Timer	

Type: Calculation

Name:	CA1 c.d. ch.1		
Function:	aX / bY		
X input:	AI:1 current ch.1		
Y input:	4.1		
"a" constant:	-1.0		
"b" constant:	10.0		
"c" constant:	0.0		
Inputs:			
AI:1 current ch.1			
Outputs:			
MT1 C.d. Ch.1	CA5 Charge	CA11 Scale up	
LO1 REPASS6.DAT			

Name:	CA3 Set Pot		
Function:	aX + bY + c		
X input:	LG1 and		
Y input:	CA16 Reverse scan		
"a" constant:	-0.02		
"b" constant:	1.0		
"c" constant:	0.6		
Inputs:			
LG1 and	CA16 Reverse scan		
Outputs:			
AO:1 Set Pot Ch.1	CH1 Chart	CA6 fback s1	

Name:	CA4 Average		
Function:	Ave(X) for last (a) seconds		
X input:	CA11 Scale up		
Y input:	0.0		
"a" constant:	2.0		
"b" constant:	0.0		
"c" constant:	0.0		
Inputs:			
CA11 Scale up			
Outputs:			
SP2 Set Point			

Name:	CA5 Charge		
Function:	Integral X dt		
X input:	CA1 c.d. ch.1		
Y input:	0.0		
"a" constant:	0.0		
"b" constant:	0.0		
"c" constant:	0.0		
Inputs:			
CA1 c.d. ch.1			
Outputs:			
MT2 Charge/cm2	LO1 REPASS6.DAT		

Name:	CA6 fback s1
Function:	Global Feedback(a:address)

```
X input:                    CA3   Set Pot
Y input:                    0.0
"a" constant:               1.0
"b" constant:               0.0
"c" constant:               0.0
Inputs:
    CA3   Set Pot
Outputs:
    < None >

Name:                       CA7   Invert
Function:                   aX + bY
X input:                    AI:13 Measured Pot
Y input:                    0.0
"a" constant:               -1.0
"b" constant:               0.0
"c" constant:               0.0
Inputs:
    AI:13 Measured Pot
Outputs:
    MT3   Pot Ch.1          LO1   REPASS6.DAT

Name:                       CA11  Scale up
Function:                   aX + bY
X input:                    CA1   c.d.  ch.1
Y input:                    0.0
"a" constant:               10000.0
"b" constant:               0.0
"c" constant:               0.0
Inputs:
    CA1   c.d.  ch.1
Outputs:
    CA4   Average

Name:                       CA15  fback d1
Function:                   Global Feedback(a:address)
X input:                    0.0
Y input:                    0.0
"a" constant:               1.0
"b" constant:               0.0
"c" constant:               0.0
Inputs:
    < None >
Outputs:
    CA16  Reverse scan

Name:                       CA16  Reverse scan
Function:                   c (X + a)(Y + b)
X input:                    CA15  fback d1
Y input:                    SP1   Initial Time
"a" constant:               -0.6
"b" constant:               0.0
"c" constant:               1.0
Inputs:
    CA15  fback d1          SP1   Initial Time
Outputs:
    CA3   Set Pot

Type: Set Point_____________________________________________________

Name:                       SP1   Initial Time
Function:                   X > Y
X input:                    TI1   Timer
Y input:                    120.0
Dead Band:                  0.0
Inputs:
```

TI1 Timer
Outputs:
LG1 and CA16 Reverse scan

Name: SP2 Set Point
Function: X > Y
X input: CA4 Average
Y input: 0.5
Dead Band: 0.05
Inputs:
CA4 Average
Outputs:
LG1 and

Type: Logic

Name: LG1 and
Function: X AND Y
X input: SP1 Initial Time
Y input: SP2 Set Point
Inputs:
SP1 Initial Time SP2 Set Point
Outputs:
CA3 Set Pot

Type: Log

Name: LO1 REPASS6.DAT
Log Status: < disabled >
Sample Rate: 30.0 Seconds
Gate: < None >
Data Format:
Heading: Repassivation Pot, Ch.1
File Path: C:\WB
File Name: REPASS6.DAT
Date Stamp: enabled
Time Stamp: enabled
Inputs:
CA7 Invert CA1 c.d. ch.1 CA5 Charge
Outputs:
< None >

Type: Meter

Name: MT1 C.d. Ch.1
Output Type: Exponential
Units: A/cm2
Integer: 8
Decimal: 1
Inputs:
CA1 c.d. ch.1
Outputs:
< None >

Name: MT2 Charge/cm2
Output Type: Exponential
Units: Coul/cm2
Integer: 8
Decimal: 1
Inputs:
CA5 Charge
Outputs:
< None >

Name: MT3 Pot Ch.1
Output Type: Fixed Point

Integer:	6
Decimal:	3
Inputs:	
CA7 Invert	
Outputs:	
< None >	

Type: Chart

Name:	CH1 Chart
Chart Color:	White
X Axis Label:	Minutes
X Axis Min:	0.0
X Axis Max:	10.0
Y Axis Label:	< None >
Y Axis Min:	-10.0
Y Axis Max:	10.0
Inputs:	
CA3 Set Pot	
Outputs:	
< None >	

Type: Analog Output

Name:	AO:1 Set Pot Ch.1
Card Type:	STI ACAO-12
Channel Number:	1
Range:	+¦- 5 Volts
Resolution:	0.024%
Inputs:	
CA3 Set Pot	
Outputs:	
< None >	

Pitting Protection Potential Tests

Description: The pitting protection potential tests are run in accordance with the Workbench PC software using a program called REPASS.WBB. This program is documented on p. 22. The ESC 440 multichannel potentiostat and an Austin 386 SX computer are used to run the program and to control the potentials.

The program works in the following manner. A selected potential is applied to the specimen for an initial time period. If after the initial time period the current density is above a selected maximum value, the applied potential will decrement by a selected amount. If the current threshold is still exceeded, it will decrement another step, until the current threshold remains below the selected threshold value. This potential at which the current no longer continues to increase above the selected threshold, is the pitting protection potential.

Set-Up: The cells are 1-L reaction flasks w/covers that allow penetrations for a platinum counter electrode, a specimen holder, a reference salt bridge (~~short LC type~~ modified LC type with), a gas sparging tube.

The reference electrode is kept cooled w/a small condenser, an Allihn condenser refluxes the entire test cell, and a water trap is used in the gas exit line to prevent back streaming of oxygen. The cell is heated in a heating mantle using a rheostat controller and reading internal temperature w/a thermometer in a thermowell in the cover.

W. J. Mackerras
9/11/91

Pitting Protection Potential Test on 316L SS (Lot # P80746)

P3TSS001.DAT

Purpose: To determine the pitting protection potential as it may vary with propagation time and initial applied potential

Spec. Prep: A long cylindrical (10 cm² area) specimen was wet polished w/320 followed by 600 grit paper. It was then cleaned in an ultrasonic bath for 5 minutes, rinsed w/DI water, rinsed w/acetone and dried under a hot air gun.

Solution Prep: To 500 ml of 17 MΩ water in a 2-L volumetric add 0.2452 g of $NaHCO_3$ (Fisher lot # 897789) and 3.2922 g of NaCl (Fisher lot # 885407). Pipet 40.0 ml of SO_4 stock, 20.0 ml of NO_3 stock, and 4.0 ml of F stock solutions (#019-137, #019-199, and #019-191). Dilute to the mark.

Set-Up: The cell described on p. 23 was used. 900 ml of test solution was used, the salt bridge was filled w/test solution. The specimen was immersed approximately with 60-70% of the length immersed to leave the crevice out of the solution. Ref SCE #1 was used + checked vs another SCE, difference was less than 1.0 mV. Nitrogen (hi-purity) used for sparging.

① Wt initial 11.3503 g Wt final not taken ⑧
② de-aeration for one hour before spec immersion
③ Held at open circuit one hour after immersion
④ E corr before applying potential −516 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 3600 secs. (1 hr) +600 mV w Mackowski 9/11/91
⑦ Applied initial potential ~~+300 mV~~ vs SCE
⑧ Initial pH 8.38 @25°C Final pH 9.23 @25°C
⑨ ~~Init. area~~ Immersed area ≅ not taken ⑧
⑩ Final E −987 mV vs SCE

Data stored on disk PPPT #1

⑧ specimen misplaced

Walter J. Mackowski
9/11/91

Pitting Protection Potential on 316L SS (P80746)

P3TSS002.DAT

Purpose: Same as P3TSS001

Sample Prep: Same as p.25

Solution Prep: Same solution used as prepared for P3TSS001 (p.25).

Set-Up: Identical to P3TSS001 (p.25), except ref SCE #4 was used.

① Initial Wt 11.3682 g Final Wt: not taken*
② de-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min −725 mV vs SCE
⑤ Test temp 95°C
⑥ Initial Time 7200 secs (2 hrs) +600 mV vs SCE 9/11/91
⑦ Applied initial potential ~~+300 mV~~ vs SCE
⑧ Initial pH 8.38 @ 25°C Final pH 9.32 @ 25°C
⑨ Immersed area = not taken*
⑩ Final E −1106 mV vs SCE

Data stored on disk PPPT #1

⑪ specimen misplaced

Walter J. Mackerle
9/11/91

Pitting Protection Potential Test on 316L SS (Ht # P80746)

P3TSS003.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described in p.25 from same lot # chemicals + solutions. Actual salt wts. used were 0.2451 g $NaHCO_3$ and 3.2930 g NaCl.

Set-Up are as described on p.25. Ref SCE #1 was used.

① Initial wt 11.3880 g Final wt. 11.3444 g
② de-Aerate for one hour before immersion.
③ Hold at open circuit for one hour after immersion.
④ E corr after 60 min −560 mV/vs SCE
⑤ Test temp 95°C wjmachwski 9/12/91
⑥ ~~Initial time 14,400 secs (4 hrs)~~ 3600 secs
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.38 @25°C Final pH 9.21 @25°C
⑨ Immersed area ≅ 7.22 cm^2 l = 3.462 cm ϕ = 0.635 cm
⑩ Final E −165 mV vs SCE

Stored on disk PPPT #1

Walter J. Machowski
9/12/91

Pitting Protection Potential Test on 316L SS (Ht # P80746)

P3TSS004.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Same solution used as in P3TSS003.DAT.

Set-Up: As described on p.25. Ref SCE #1 was used.

① Initial wt. 11.4129 g Final wt. 11.3330 g
② de-aerate for one hour before immersion
③ Hold at open-circuit for one hour after immersion.
④ E corr after 60 min. −753 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 7200 secs (2 hrs) +300 mV wjmachwski 9/12/91
⑦ Applied initial potential ~~+100 mV~~ vs SCE
⑧ Initial pH 8.38 @25°C Final pH 9.33 @25°C
⑨ Immersed area ≅ 6.23 cm^2 l = 2.965 cm ϕ = 0.635
⑩ Final E −548 mV vs SCE

Stored on disk PPPT #2

Walter J Machowski
9/12/91

Pitting Protection Potential Test on 316L SS (Lot# P80746)

P3TSS005.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.25 from same lot # Chemicals + solutions. Actual salt wts. were 0.2447 g $NaHCO_3$ and 3.2916 g NaCl.

Set-Up: As described on p.25. Ref SCE #1 used.

① Initial Wt. 11.4265 g Final Wt. 11.2915 g.
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ $\bar{E}$ corr after 60 min -717 mV vs SCE
⑤ Test Temp 95°C
⑥ Initial time 14,400 secs (4 hrs)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.41 @ 25°C Final pH 9.27 @ 25°C
⑨ Immersed area ≅ 2.17 cm^2 ℓ=3.441 cm ϕ=0.6354 cm
⑩ Final $\bar{E}$ -153 mV vs SCE

Stored on disk PPDT #1

Walter J. Mochowski
9/13/91

Pitting Protection Potential Test on 316L SS (Lot# P80746)

P3TSS006.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: ~~Two liters~~ aqua chemki 9/13/91 Same solution as on p.30 was used.

Set-Up: As described on p.25. Ref SCE #4 was used.

① Initial Wt. 11.3968 g Final Wt. 11.3818 g.
② De-aerate for one hour before immersion.
③ Hold at open circuit after immersion.
④ $\bar{E}$ corr after 60 min. -483 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 7200 secs (2 hrs)
⑦ Applied initial potential +100 mV vs SCE
⑧ Initial pH 8.41 @ 25°C Final pH 9.56 @ 25°C
⑨ Immersed area ≅ 6.64 cm^2 ℓ=3.168 cm ϕ=0.635
⑩ Final $\bar{E}$ -1169 mV vs SCE

Stored on disk PPDT #1

Walter J. Mochowski
9/13/91

Pitting Protection Potential Test on 316L SS (Ht# P80746)

P3TSS007.DAT

Purpose: Same as P3TSS001.DAT.

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.25 from the same lot # chemicals + solutions. Actual salt wts. were 0.2448 g $NaHCO_3$ and 3.2931 g NaCl.

Set-Up: As described on p.25. Ref SCE #1 was used.

① Initial wt 11.3656 g Final wt. 11.3683 g
② de-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min. not recorded
⑤ Test temp 95°C
⑥ Initial time 14,400 secs (4 hrs)
⑦ Applied initial voltage +100 mV vs SCE
⑧ Initial pH 8.38 @ 25°C Final pH 9.27 @ 25°C
⑨ Immersed area ≅ 5.78 cm^2 ℓ = 3.739 cm ϕ = 0.635 cm
⑩ Final E +96 mV vs SCE

Stored on disk PIPT #1

No Pitting

Walter J. Machowski
9/16/91

Pitting Protection Potential Test on 316L SS (Ht# P80746)

P3TSS008.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Used same solution as P3TSS007.DAT.

Set-Up: As described on p.25. Ref SCE #4 was used.

① Initial wt. 11.3803 g Final wt. 11.3798 g
② de-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min. not recorded
⑤ Test temp 70°F (room temp)
⑥ Initial time 14,400 secs (4 hrs)
⑦ Applied initial potential +400 mV vs SCE
⑧ Initial pH 8.38 @ 25°C Final pH 9.29 @ 25°C
⑨ Immersed area ≅ 8.23 cm^2 ℓ = 3.971 cm ϕ = 0.634 cm
⑩ Final E +401 mV vs SCE

Stored on disk PIPT #2

No Pitting

Walter J. Machowski
9/16/91

Pitting Protection Potential Tests on INC 825 (Lot # HH4371FC)

P3TIN009.DAT

Purpose Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.25 from the same lot # chemicals and solutions. Actual salt wts were 0.2480 g $NaHCO_3$ and 3.2864 g NaCl.

Set-Up: As described on p.25. Ref SCE #1 was used.

① Initial Wt. 11.7427 g Final Wt. 11.7368 g
② De-aerate for one hour before immersion.
③ Hold at open-circuit for one hour after immersion.
④ E corr after 60 min. −581 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 3600 secs (1 hr)
⑦ Applied initial potential +600 mV vs SCE
⑧ Initial pH 8.45 @ 25°C Final pH 9.38 @ 25°C
⑨ Immersed area ≅ 8.23 cm^2 ℓ = 3.972 cm ϕ = 0.634 cm
⑩ Final E +16 mV vs SCE

Stored on disk PPPT #7

Walter J. Mackowski
9/17/91

Pitting Protection Potential of INC 825 (Lot # HH4371FC)

P3TIN010.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Used same solution as P3TIN009

Set-Up: As described on p.25. Ref SCE #4 was used.

① Initial wt. 11.6526 g Final wt. 11.5820 g
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min −382 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 7200 secs (2 hrs)
⑦ Applied initial potential +600 mV vs SCE
⑧ Initial pH 8.45 @ 25°C Final pH 9.22 @ 25°C
⑨ Immersed area ≅ 7.19 cm^2 ℓ = 3.448 cm ϕ = 0.635 cm
⑩ Final E −63 mV vs SCE

Stored on disk PPPT #7

Walter J. Mackowski
9/17/91

Pitting Protection Potential on INC 825
(Lot # HH437JFC)

P3TIN011.DAT
Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p. 25

Solution Prep: Two liters were prepared as described on p. 25 from the same lot # chemicals & solutions. Actual salt wts were 0.2451 g $NaHCO_3$ and 3.2898 g NaCl.

Set-Up: As described on p. 25. Ref SCE #1 was used.

① Initial Wt. 11.6215 g Final Wt. 11.6090 g
② De-aerate for one hour before immersion.
③ Hold at open circuit for one hour ~~before~~ after immersion
C Machowski 9/24/91
④ E corr after 60 min. -531 mV vs SCE
⑤ Test Temp 95°C
⑥ Initial time 14,400 secs (4 hrs)
⑦ Applied initial potential +600 mV vs SCE
⑧ Initial pH 8.35 @25°C Final pH 9.36 @25°C
⑨ Immersed area ≅ 7.64 cm² ℓ=3.671 cm ϕ=0.655 cm
⑩ Final E -13 mV

Forgot to Start Logs; log started after ≈ 4 hrs.
One step drop was observed to ~~-7.3~~ -13 mV vs SCE

Stored on disk PPPT #1

Walter J. Machowski
9/23/91

Pitting Protection Potential on INC 825
(Lot # HH437JFC)

P3TIN012.DAT
Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p. 25

Solution Prep: Used same solution as P3TIN011.DAT.

Set-Up: As described on p. 25. Ref SCE #4 was used.

① Initial wt. 11.7252 g Final Wt. 11.7369 g
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min. -546 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 7200 secs (2 hrs)
⑦ Applied initial potential +400 mV vs SCE
⑧ Initial pH 8.65 @25°C Final pH 9.54 @25°C
⑨ Immersed area ≅ 7.55 cm² ℓ=3.628 cm ϕ=0.655 cm
⑩ Final E +147 mV vs SCE

Forgot to Start Logs; log started after ≈ 4 hrs. Two step drops were observed; 1st down to +207 mV and then a second down to +147 mV.

Stored on disk PPPT #1

Walter J Machowski
9/23/91

Pitting Protection Potential Tests on INC 825
(Lot# HH4371FC)

P3TIN013.DAT

Purpose: Re-run of P3TIN011.DAT due to log error

Sample prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.25 from the same lot # chemicals & solutions. Actual salt wts were 0.2432 g $NaHCO_3$ and 3.2930 g NaCl.

Set-Up: As described on p.25. Ref SCE #1 was used.

① Initial Wt. 11.6649 g Final Wt. 11.6532 g
② De-aerate for one hour before ~~start~~ immersion (a/m Mackowski 9/20/91)
③ Hold at open circuit for one hour after immersion
④ $\bar{E}$ corr at 60 min −529 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 14,400 secs (4 hrs)
⑦ Applied initial potential +600 mV vs SCE
⑧ Initial pH 8.42 @ 25°C Final pH 8.86 @25°C
⑨ Immersed area ≅ 7.58 cm² ℓ=3.645cm ϕ=0.634cm
⑩ Final E −53 mV vs SCE

Stored on disk PPPT #1.

Note:
Initial time was 3 hours as shown in log,
not 4 hours as recorded in step 6.

N. Sridhar
3/27/92

Walter J. Mackowski
9/26/91

Pitting Protection Potential Tests on INC 825
(Lot# HH4371FC)

P3TIN014.DAT

Purpose: Re-run of P3TIN012.DAT due to log error.

Sample Prep: Same as p.25

Solution Prep: Used same solution as P3TIN013.DAT

Set-Up: As described on p.25. Ref SCE #4 was used.

① Initial Wt. 11.5702 g Final Wt. 11.5274 g
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ $\bar{E}$ corr after 60 min. −497 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 7200 secs (2 hrs)
⑦ Applied initial potential +400 mV vs SCE
⑧ Initial pH 8.42 @25°C Final pH 9.74 @25°C
⑨ Immersed area ≅ 6.30 cm² ℓ=3.001cm ϕ=0.635cm
⑩ Final E +399 mV vs SCE

Stored on disk PPPT #1.

Walter J. Mackowski
9/26/91

Pitting Protection Potential Tests on Line 825
(Lot # HH4371FC)

P3TIN015.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.25 using the same Lot # Chemicals & solutions. Actual salt wts. used were 0.2445 g $NaHCO_3$ + 3.3930 g NaCl.

Set-Up: As described on p.25. SCE #1 was used.

① Initial Wt 11.7285 g Final Wt. 11.7116 g
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min. −548 mV vs SCE
⑤ Test temp 95°C
⑥ Initial Time 14,400 secs (4 hrs)
⑦ Applied initial potential +400 mV vs SCE
⑧ Initial pH 8.12 @ 25°C Final pH 9.71 @ 25°C
⑨ Immersed area ≅ 6.45 Cm^2 ℓ = 3.072 cm ϕ = 0.635 cm
⑩ Final E −1697 mV vs SCE

Solution dropped overnight to a level below that of the salt bridge tip. Potential drop is probably due to this. D.I. Water was added & experiment continued for about 4 more hours.

Stored on disk PPPT #1

Ignore Test.

N-Smith Kalz
3/20/92

Walter J. Mackowski
10/1/91

Pitting Protection Potential Tests on Line 825
(Lot # HH4371FC)

P3TIN016.DAT

Purpose: Same as P3TSS001.DAT

Sample Prep: Same as p.25

Solution Prep: Used same solution as P3TIN015

Set-Up: As described on p.25. SCE #4 was used.

① Initial Wt 11.6747 g Final Wt. 11.6644 g
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min −352 mV vs SCE
⑤ Test temp: room temp (70°F)
⑥ Initial time 14,400 secs (4 hrs)
⑦ Applied initial potential +600 mV vs SCE
⑧ Initial pH 8.12 @ 25°C Final pH 8.98 @ 25°C
⑨ Immersed area ≅ 7.5 Cm^2 (no mark for measurement)
⑩ Final E +607 mV vs SCE

Stored on disk PPPT #1.

Walter J. Mackowski
10/1/91

Pitting Protection Potential Tests on 316L SS
(Lot # P80746)

P3TSS017.DAT

Purpose: Re-run of ...003 to check reproducibility

Sample Prep: Same as p.25.

Solution Prep: Two liters were prepared as described on p.25 from the same lot # Chemicals + solutions. Actual salt wts. 0.2461 g $NaHCO_3$ and 3.2928 g NaCl.

Set-Up: As described on p.25. Ref SCE #1 was used.

① Initial Wt. 11.4048 g Final Wt. 11.3962 g
② [redacted]-aerate one hour before immersion
③ Hold at open circuit for one hour after immersion.
④ $\bar{E}$ corr after 60 min -665 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 3600 secs (1 hr)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.15 @ 25°C Final pH 9.39 @ 25°C
⑨ Immersed area ≅ 7.97 cm^2 ℓ = 3.857 cm ϕ = 0.655 cm
⑩ Final $\bar{E}$ -42 mV vs SCE

Stored on disk PPPT #1

Walter J Mackowski
~~9/7/91~~ wjm
10/7/91

Pitting Protection Potential Tests on 316L SS
(Lot # P80746)

P3TSS018.DAT

Purpose: re-run of ...004 to check reproducibility

Sample Prep: Same as p.25.

Solution Prep: Used same solution as P3TSS017.DAT.

Set-Up: As described on p.25. Ref SCE #4 was used.

① Initial Wt 11.3943 g Final Wt. 11.3655 g
② De-aerate one hour before immersion
③ Hold at open circuit for one hour after immersion
④ $\bar{E}$ corr after 60 min. -756 mV vs [redacted]
⑤ Test temp 95°C
⑥ Initial time 7200 secs (2 hrs)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.15 @ 25°C Final pH 9.36 @ 25°C
⑨ Immersed area ≅ 8.34 cm^2 ℓ = 4.023 cm ϕ = 0.655 cm
⑩ Final $\bar{E}$ -163 mV vs SCE

Stored on disk PPPT #1

Walter J Mackowski
10/7/91

Pitting Protection Potential Tests on 316L SS
(Lot # P80346)

P3TSS019.DAT

Purpose: Same as P3TSS001.DAT Except this test was run manually. See below.

Method: Initial potential applied and after the initial time the potential was lowered by 100 mV. The current density was monitored + if it was greater than 50 μA for 5 minutes, the potential was lowered 100 mV again. Again CD monitored and potential lowered 100 mV. The next decrement was to be 50 mV if CD > 50 μA for 5 minutes. The experiment was never allowed to go past this point because CD was too low after the 3rd decrement.

Solution Prep: Two liters were prepared as on p. 25 using same lot # chemicals and solutions. Actual salts were 0.2444 g $NaNO_3$ and 3.2934 g NaCl.

Set-Up: As described on p. 25. Ref SCE #1 used

Specimen Prep: Same as p. 25

① Initial Wt. 11.4269 g Final Wt. 11.4012 g
② De-aerate one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min -446 mV vs SCE
⑤ Test temp 95°C
⑥ Initial time 3600 secs (1 hr)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.12 @ 25°C Final pH 9.34 @ 25°C
⑨ Immersed area ≅ 7.62 cm^2 ℓ = 3.668 ϕ = 0.634
⑩ Final E -3 mV vs SCE

Once set to 0 mV, the CD was greater than 50 μA for about 60-75 seconds, slowly decaying to low values (10^{-7} A).

Stored on disk PPPT #1

Walter J Mackerwich
10/8/91

Pitting Protection Potential Tests on 316L SS
(Lot # P80346)

P3TSS020.DAT

Purpose: Same as P3TSS019.DAT

Method: Same as on p. 44.

Solution Prep: Same solution used as P3TSS019.DAT.

Set-Up: As described on p. 25. Ref SCE #4 used.

Specimen Prep: Same as p. 25.

① Initial Wt. 11.3851 g Final Wt. 11.2524 g
② De-aerate for one hour before immersion
③ Hold at open circuit for one hour after immersion
④ E corr after 60 min -513 mV vs SCE
⑤ Test temp ~~95°C~~ 95°C WJM 11/6/91
⑥ Initial time 10,800 secs (3 hrs)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.15 @ 25°C Final pH 9.68 @ 25°C
⑨ Immersed area ≅ 7.96 cm^2 ℓ = 3.824 ϕ = 0.635
⑩ Final E ?

Once set to 0 mV, the CD was greater than 50 μA for about 3-4 minutes, slowly decaying to low values.

Stored on disk PPPT #1

Walter J Mackerwich
10/8/91

Pitting Protection Potential Tests on 316L SS (Lot # P80346)

P3TSS021.DAT

Purpose: This test is a re-run of P3TSS003. The program was modified to slow down the "decrementation". This is to compare results of the old program w/the new. This program - REPASS1.WBB is documented on p. 50.

Sample Prep: Same as on p. 25.

Solution Prep: Two liters were prepared as described on p. 25 using the same chemical lot #'s and solutions. Actual salt weights were 0.3451 g $NaHCO_3$ and 3.2929 g NaCl.

Set Up: As described on p. 25. Ref SCE #1 was used.

① Initial Weight 11.3532 g Final Weight N/A*
② de-Aerate one hour before immersion.
③ Hold at open circuit for one hour after immersion
④ $\bar{E}$ corr after 60 min -742 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 3600 secs (1 hr)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.14 @ 25°C Final pH 9.08 @ 25°C
⑨ Immersed area *
⑩ Final $\bar{E}$ -372 mV vs SCE

* Test aborted to excessive evaporation of test solution which left reference probe out of liquid as well as effectively exposing test specimen above liquid level.

Data after 15105 seconds after start of polarization appears iffy due to the solution evaporation.

— M

Walter J. Mlechowski
11/8/91

Pitting Protection Potential Tests on 316L SS (Lot # P80346)

P3TSS032.DAT

Purpose: Same as p. 46. This is re-run of P3TSS004.

Sample Prep: Same as on p. 25.

Solution: Used same solution as on p. 46 w/ make-up

Set-Up: As described on p. 25. Ref SCE #4 was used. Run w/ REPASS1.WBB program.

① Initial Wt. 11.4111 Final Wt. Did not Measure
② de-aerate for one hour before starting immersion
③ Hold at open circuit for one hour after immersion
④ $\bar{E}$ corr after 60 min. -768 mV vs SCE
⑤ Test Temp 95°C
⑥ Initial Time 7200 secs (2 hrs)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.14 @ 25°C Final pH 9.12 @ 25°C
⑨ Immersed area ≈ 8.35 cm^2 ℓ = 4.036 cm ϕ = 0.634 cm
⑩ Final $\bar{E}$ -1 mV vs SCE

Stored on disk P80T #7

C.d. did not drop below 3×10^{-5} A/cm^2.

Specimen sent for metallographic examination

M

Walter J Mlechowski
11/8/91

Pitting Protection Potential Tests on 316L SS (Lot # P80746)

P3TSS023.DAT

Purpose: Same as p.46.

Sample Prep: Same as p.35.

Solution Prep: Two liters were prepared as described on p.35 from the same lot # Chemicals & solutions, except the SO$_4$ stock was #019-231. Salt wts were 0.249 g NaHCO$_3$ and 3.2968 g NaCl.

Set-Up: As described on p.35, Ref. SCE #1 was used. Run w/REPASS1.WBB program

① Initial Wt. 11.3996 g Final Wt. 11.3726 g
② De-aerate one hour before immersion.
③ Hold @ open circuit for one hour before start, after immersion
④ E corr after 60 min. -761 mV vs SCE
⑤ Test Temp 95°C
⑥ Initial Time 3600 secs (1 hr)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.08 @ 25°C Final pH 9.53 @ 25°C
⑨ Immersed area ≈ 8.32 cm^2 ℓ = 4.012 cm ϕ = 0.635 cm
⑩ Final E -13 mV

Stored on disk PPPT #2

Walter J Macbowski
11/13/91

Pitting Protection Potential Tests on 316L SS (Lot # P80746)

P3TSS024.DAT

Purpose: Same as p.46.

Sample Prep: Same as p.35.

Solution: Same solution used as on p. 48

Set-Up: As described on p.35 Ref SCE #4 was used. Run w/REPASS2.WBB program

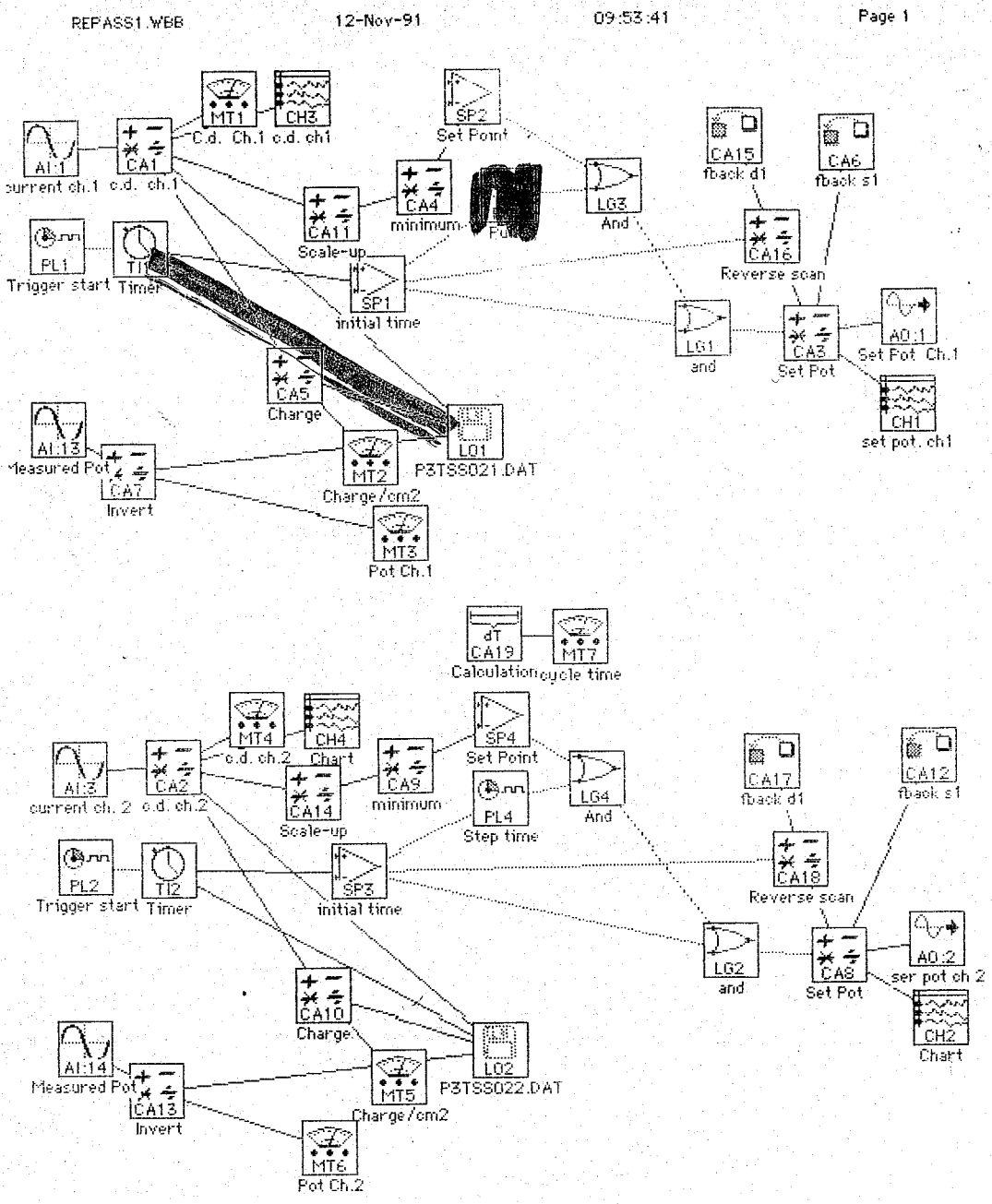
① Initial Wt. 11.4075 g Final Wt. 11.4445 g
② De-aerate one hour before immersion
③ Hold @ open circuit for one hour before immersion
④ E corr after 60 min. -743 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 14,400 secs (4 hrs)
⑦ Applied initial potential +100 mV vs SCE
⑧ Initial pH 8.08 @ 25°C Final pH 9.51 @ 25°C
⑨ Immersed area ≈ 8.09 cm^2 ℓ = 3.936 cm ϕ = 0.634
⑩ Final E +98 mV

Stored on disk PPPT #2

Total Time at +100 mV SCE was 76036 seconds. No change in c.d. = 2×10^{-6} A/cm^2.

N.S.

Walter J Macbowski
11/13/91


REPASS1.WBB
12-Nov-91
09:53:41
Page 1
AI:1
current ch.1
CA1
c.d. ch.1
MT1
C.d. Ch.1
CH3
c.d. ch1
SP2
Set Point
CA15
fback d1
CA6
fback s1
CA4
minimum
LG3
And
CA11
Scale-up
CA16
Reverse scan
PL1
Trigger start
TI1
Timer
SP1
initial time
LG1
and
CA3
Set Pot
AO:1
Set Pot Ch.1
CA5
Charge
CH1
set pot. ch1
AI:13
Measured Pot
CA7
Invert
MT2
Charge/cm2
LG1
P3TSS021.DAT
MT3
Pot Ch.1
dT
CA19
Calculation
MT7
cycle time
MT4
c.d. ch.2
CH4
Chart
SP4
Set Point
AI:3
current ch. 2
CA2
c.d. ch.2
CA14
Scale-up
CA9
minimum
PL4
Step time
LG4
And
CA17
fback d1
CA12
fback s1
PL2
Trigger start
TI2
Timer
SP3
initial time
CA18
Reverse scan
LG2
and
CA8
Set Pot
AO:2
ser pot ch 2
CA10
Charge
CH2
Chart
AI:14
Measured Pot
CA13
Invert
MT5
Charge/cm2
LG2
P3TSS022.DAT
MT6
Pot Ch.2

Worksheet Name: REPASS1.WBB
Hardware list:

Name	AIs	AOs	DIOs	CTs	DIs	DOs
STI ACPC-16	16	0	16	0	0	0
STI ACAO-12	0	6	8	0	0	0

Maximum icons: 448
Grid size: 16
Snap to grid: < disabled >
Report Unsynch: < disabled >
Fast Mode: enabled
Fast Mode Samples: 1000
Fast Mode Rate: 1.0 Kilohertz
Com ports: 2

Port: COM 1
Comment: Mouse connected

Port: COM 2
Baud rate: 9600
Data bits: 8
Stop bits: 1
Duplex: Half
Parity: None
XonXoff: < disabled >
Echo wait: < disabled >
Line delay: < disabled >

IEEE: < disabled >

Type: Analog Input

Name: AI:1 current ch.1
Card Type: STI ACPC-16
Channel Number: 1
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA1 c.d. ch.1

Name: AI:3 current ch. 2
Card Type: STI ACPC-16
Channel Number: 3
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA2 c.d. ch.2

Name: AI:13 Measured Pot
Card Type: STI ACPC-16
Channel Number: 13
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz

```
Fast Mode:                      < disabled >
Inputs:
    < None >
Outputs:
    CA7   Invert

Name:                           AI:14 Measured Pot
Card Type:                      STI ACPC-16
Channel Number:                 14
Range:                          +|-Auto V
Resolution:                     Lo Noise (17ms)
Output Type:                    Voltage
Sample rate:                    10.0   Hertz
Fast Mode:                      < disabled >
Inputs:
    < None >
Outputs:
    CA13  Invert

Type: Timer_____________________________________________________________

Name:                           TI1   Timer
Inputs:
    PL1   Trigger start
Outputs:
    SP1   initial time          LO1   P3TSS021.DAT

Name:                           TI2   Timer
Inputs:
    PL2   Trigger start
Outputs:
    SP3   initial time          LO2   P3TSS022.DAT

Type: Pulse_____________________________________________________________

Name:                           PL1   Trigger start
High Duration:                  50.0   Hours
Low Duration:                   0.1   Minutes
Start Value:                    Low
Reset on exit                   enabled
Inputs:
    < None >
Outputs:
    TI1   Timer

Name:                           PL2   Trigger start
High Duration:                  50.0   Hours
Low Duration:                   0.1   Seconds
Start Value:                    Low
Reset on exit                   enabled
Inputs:
    < None >
Outputs:
    TI2   Timer

Name:                           PL3   Pulse
High Duration:                  1.0   Seconds
Low Duration:                   180.0   Seconds
Start Value:                    Low
Reset on exit                   enabled
Inputs:
    SP1   initial time
Outputs:
    LG3   And

Name:                           PL4   Step time
```

High Duration:	0.1 Seconds
Low Duration:	180.0 Seconds
Start Value:	Low
Reset on exit	enabled
Inputs:	
SP3 initial time	
Outputs:	
LG4 And	

Type: Calculation

Name:	CA1 c.d. ch.1		
Function:	aX / bY		
X input:	AI:1 current ch.1		
Y input:	7.5		
"a" constant:	-1.0		
"b" constant:	10.0		
"c" constant:	0.0		
Inputs:			
AI:1 current ch.1			
Outputs:			
MT1 C.d. Ch.1	CH3 c.d. ch1	CA5	Charge
CA11 Scale-up	LO1 P3TSS021.DAT		

Name:	CA2 c.d. ch.2		
Function:	aX / bY		
X input:	AI:3 current ch. 2		
Y input:	7.2		
"a" constant:	-1.0		
"b" constant:	10.0		
"c" constant:	0.0		
Inputs:			
AI:3 current ch. 2			
Outputs:			
CH4 Chart	MT4 c.d. ch.2	CA10	Charge
CA14 Scale-up	LO2 P3TSS022.DAT		

Name:	CA3 Set Pot		
Function:	aX + bY + c		
X input:	LG1 and		
Y input:	CA16 Reverse scan		
"a" constant:	-0.01		
"b" constant:	1.0		
"c" constant:	0.3		
Inputs:			
LG1 and	CA16 Reverse scan		
Outputs:			
AO:1 Set Pot Ch.1	CH1 set pot. ch1	CA6	fback s1

Name:	CA4 minimum		
Function:	Min(X) for last (a) seconds		
X input:	CA11 Scale-up		
Y input:	0.0		
"a" constant:	180.0		
"b" constant:	0.0		
"c" constant:	0.0		
Inputs:			
CA11 Scale-up			
Outputs:			
SP2 Set Point			

Name:	CA5 Charge		
Function:	Integral X dt		
X input:	CA1 c.d. ch.1		
Y input:	0.0		
"a" constant:	0.0		

"b" constant: 0.0
"c" constant: 0.0
Inputs:
CA1 c.d. ch.1
Outputs:
MT2 Charge/cm2 LO1 P3TSS021.DAT

Name: CA6 fback s1
Function: Global Feedback(a:address)
X input: CA3 Set Pot
Y input: 0.0
"a" constant: 1.0
"b" constant: 0.0
"c" constant: 0.0
Inputs:
CA3 Set Pot
Outputs:
< None >

Name: CA7 Invert
Function: aX + bY
X input: AI:13 Measured Pot
Y input: 0.0
"a" constant: -1.0
"b" constant: 0.0
"c" constant: 0.0
Inputs:
AI:13 Measured Pot
Outputs:
MT3 Pot Ch.1 LO1 P3TSS021.DAT

Name: CA8 Set Pot
Function: aX + bY + c
X input: LG2 and
Y input: CA18 Reverse scan
"a" constant: -0.01
"b" constant: 1.0
"c" constant: 0.3
Inputs:
LG2 and CA18 Reverse scan
Outputs:
AO:2 ser pot ch 2 CH2 Chart CA12 fback s1

Name: CA9 minimum
Function: Min(X) for last (a) seconds
X input: CA14 Scale-up
Y input: 0.0
"a" constant: 180.0
"b" constant: 0.0
"c" constant: 0.0
Inputs:
CA14 Scale-up
Outputs:
SP4 Set Point

Name: CA10 Charge
Function: Integral X dt
X input: CA2 c.d. ch.2
Y input: 0.0
"a" constant: 0.0
"b" constant: 0.0
"c" constant: 0.0
Inputs:
CA2 c.d. ch.2
Outputs:
MT5 Charge/cm2 LO2 P3TSS022.DAT

Name:	CA11 Scale-up
Function:	aX + bY
X input:	CA1 c.d. ch.1
Y input:	0.0
"a" constant:	10000.0
"b" constant:	0.0
"c" constant:	0.0
Inputs:	
CA1 c.d. ch.1	
Outputs:	
CA4 minimum	

Name:	CA12 fback s1
Function:	Global Feedback(a:address)
X input:	CA8 Set Pot
Y input:	0.0
"a" constant:	2.0
"b" constant:	0.0
"c" constant:	0.0
Inputs:	
CA8 Set Pot	
Outputs:	
< None >	

Name:	CA13 Invert
Function:	aX + bY
X input:	AI:14 Measured Pot
Y input:	0.0
"a" constant:	-1.0
"b" constant:	0.0
"c" constant:	0.0
Inputs:	
AI:14 Measured Pot	
Outputs:	
MT6 Pot Ch.2	LO2 P3TSS022.DAT

Name:	CA14 Scale-up
Function:	aX + bY
X input:	CA2 c.d. ch.2
Y input:	0.0
"a" constant:	10000.0
"b" constant:	0.0
"c" constant:	0.0
Inputs:	
CA2 c.d. ch.2	
Outputs:	
CA9 minimum	

Name:	CA15 fback d1
Function:	Global Feedback(a:address)
X input:	0.0
Y input:	0.0
"a" constant:	1.0
"b" constant:	0.0
"c" constant:	0.0
Inputs:	
< None >	
Outputs:	
CA16 Reverse scan	

Name:	CA16 Reverse scan
Function:	c (X + a)(Y + b)
X input:	CA15 fback d1
Y input:	SP1 initial time
"a" constant:	-0.3

"b" constant: 0.0
"c" constant: 1.0
Inputs:
CA15 fback d1 SP1 initial time
Outputs:
CA5 Set Pot

Name: CA17 fback d1
Function: Global Feedback(a:address)
X input: 0.0
Y input: 0.0
"a" constant: 2.0
"b" constant: 0.0
"c" constant: 0.0
Inputs:
< None >
Outputs:
CA18 Reverse scan

Name: CA18 Reverse scan
Function: c (X + a)(Y + b)
X input: CA17 fback d1
Y input: SP3 initial time
"a" constant: -0.3
"b" constant: 0.0
"c" constant: 1.0
Inputs:
CA17 fback d1 SP3 initial time
Outputs:
CA8 Set Pot

Name: CA19 Calculation
Function: WB cycle time(msecs)
X input: 0.0
Y input: 0.0
"a" constant: 0.0
"b" constant: 0.0
"c" constant: 0.0
Inputs:
< None >
Outputs:
MT7 cycle time

Type: Set Point

Name: SP1 initial time
Function: X > Y
X input: TI1 Timer
Y input: 3600.0
Dead Band: 0.0
Inputs:
TI1 Timer
Outputs:
LG1 and PL3 Pulse CA16 Reverse scan

Name: SP2 Set Point
Function: X > Y
X input: CA4 minimum
Y input: 0.5
Dead Band: 0.0
Inputs:
CA4 minimum
Outputs:
LG3 And

Name: SP3 initial time

Function: X > Y
X input: TI2 Timer
Y input: 7200.0
Dead Band: 0.0
Inputs:
TI2 Timer
Outputs:
LG2 and PL4 Step time CA18 Reverse scan

Name: SP4 Set Point
Function: X > Y
X input: CA9 minimum
Y input: 0.5
Dead Band: 0.01
Inputs:
CA9 minimum
Outputs:
LG4 And

Type: Logic

Name: LG1 and
Function: X AND Y
X input: SP1 initial time
Y input: LG3 And
Inputs:
SP1 initial time LG3 And
Outputs:
CA3 Set Pot

Name: LG2 and
Function: X AND Y
X input: SP3 initial time
Y input: LG4 And
Inputs:
SP3 initial time LG4 And
Outputs:
CA8 Set Pot

Name: LG3 And
Function: X AND Y
X input: PL3 Pulse
Y input: SP2 Set Point
Inputs:
PL3 Pulse SP2 Set Point
Outputs:
LG1 and

Name: LG4 And
Function: X AND Y
X input: PL4 Step time
Y input: SP4 Set Point
Inputs:
PL4 Step time SP4 Set Point
Outputs:
LG2 and

Type: Log

Name: LO1 P3TSS021.DAT
Log Status: < disabled >
Sample Rate: 2.0 Minutes
Gate: < None >
Data Format:
Heading: pitting protection potential; ch 1
File Path: C:\WB

```
File Name:                      P3TSS021.DAT
Date Stamp:                     enabled
Time Stamp:                     enabled
Inputs:
    TI1   Timer                 CA7   Invert              CA1   c.d.  ch.1
    CA5   Charge
Outputs:
    < None >

Name:                           LO2   P3TSS022.DAT
Log Status:                     < disabled >
Sample Rate:                    2.0   Minutes
Gate:                           < None >
Data Format:
Heading:                        pitting protection potential; ch 1
File Path:                      C:\WB
File Name:                      P3TSS022.DAT
Date Stamp:                     enabled
Time Stamp:                     enabled
Inputs:
    TI2   Timer                 CA13  Invert              CA2   c.d. ch.2
    CA10  Charge
Outputs:
    < None >

Type: Meter_____________________________________________________________

Name:                           MT1   C.d.  Ch.1
Output Type:                    Exponential
Units:                          A/cm2
Integer:                        8
Decimal:                        1
Inputs:
    CA1   c.d.  ch.1
Outputs:
    < None >

Name:                           MT2   Charge/cm2
Output Type:                    Exponential
Units:                          Coul/cm2
Integer:                        8
Decimal:                        1
Inputs:
    CA5   Charge
Outputs:
    < None >

Name:                           MT3   Pot Ch.1
Output Type:                    Fixed Point
Units:                          Volt
Integer:                        6
Decimal:                        3
Inputs:
    CA7   Invert
Outputs:
    < None >

Name:                           MT4   c.d. ch.2
Output Type:                    Exponential
Units:                          A/cm2
Integer:                        8
Decimal:                        1
Inputs:
    CA2   c.d. ch.2
Outputs:
    < None >
```

Name: MT5 Charge/cm2
Output Type: Exponential
Units: Coul/cm2
Integer: 8
Decimal: 1
Inputs:
CA10 Charge
Outputs:
< None >

Name: MT6 Pot Ch.2
Output Type: Fixed Point
Units: Volt
Integer: 6
Decimal: 3
Inputs:
CA13 Invert
Outputs:
< None >

Name: MT7 cycle time
Output Type: Fixed Point
Units: msecs
Integer: 6
Decimal: 3
Inputs:
CA19 Calculation
Outputs:
< None >

Type: Chart

Name: CH1 set pot. ch1
Chart Color: White
X Axis Label: Hours
X Axis Min: 0.0
X Axis Max: 10.0
Y Axis Label: < None >
Y Axis Min: -0.6
Y Axis Max: 0.4
Inputs:
CA3 Set Pot
Outputs:
< None >

Name: CH2 Chart
Chart Color: White
X Axis Label: Minutes
X Axis Min: 0.0
X Axis Max: 10.0
Y Axis Label: < None >
Y Axis Min: -0.6
Y Axis Max: 0.4
Inputs:
CA8 Set Pot
Outputs:
< None >

Name: CH3 c.d. ch1
Chart Color: White
X Axis Label: Hours
X Axis Min: 0.0
X Axis Max: 10.0
Y Axis Label: < None >
Y Axis Min: 1.0e-07

Y Axis Max: 0.001
Inputs:
CA1 c.d. ch.1
Outputs:
< None >

Name: CH4 Chart
Chart Color: White
X Axis Label: Minutes
X Axis Min: 0.0
X Axis Max: 5.0
Y Axis Label: < None >
Y Axis Min: -0.001
Y Axis Max: 0.05
Inputs:
CA2 c.d. ch.2
Outputs:
< None >

Type: Analog Output

Name: AO:1 Set Pot Ch.1
Card Type: STI ACAO-12
Channel Number: 1
Range: +|- 5 Volts
Resolution: 0.024%
Inputs:
CA3 Set Pot
Outputs:
< None >

Name: AO:2 ser pot ch 2
Card Type: STI ACAO-12
Channel Number: 2
Range: +|- 5 Volts
Resolution: 0.024%
Inputs:
CA8 Set Pot
Outputs:
< None >

Potting Protective Potential Tests on INC 825 (A# HH4371FC)

P3TIN025.DAT

Purpose: Same as p.46. Run w/ REPASS1.WBB program.

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.25 from same chemical and solution lot #'s, except SO_4 stock solution was #019-231. Actual salt weights were 0.2441 g $NaHCO_3$ and 3.2932 g NaCl.

Set-up: As described on p.25. Ref SCE #4 was used.

① Initial wt. 11.6973 g Final wt. 11.6829 g
② de-aerate one hour before immersion
③ hold @ open circuit for one hour before immersion
④ E corr after 60 min -677 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 3600 secs (1 hr)
⑦ Applied Initial Potential +600 mV vs SCE
⑧ Initial ~~Potential~~ pH 8.07 @25°C Final pH 9.53 @25°C
upon launch
⑨ Immersed area ≅ 8.06 cm^2 $\ell = 3.889$ cm $\phi = 0.654$ cm

~~Steedan disk PPPT #2~~ File lost.

WJ
3/20/92

Walter J. Mecherski
11/13/91

Pitting Protection Potential Tests on INC 825
(Ht # HH4371 FC)

P3TIN026.DAT

Purpose: Same as p.46. Run w/ REPASS1.WBB program.

Sample Rep: Same as p.25

Solution: Used same solution as p.51.

Set-Up: As described on p.25. Ref SCE #4 was used.

① Initial Wt. 11.6833 g Final Wt. 11.1166 g
② De-aerate one hour before immersion
③ Hold @ open circuit for one hour after immersion
④ E corr after 60 min. -683 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 14,400 secs (4 hrs)
⑦ Applied Initial Potential +600 mV vs SCE
⑧ Initial pH 6.07 @ 25°C Final pH 9.14 @ 25°C
⑨ Immersed area ≈ 7.73 cm² l = 3.724 cm ϕ = 0.634 cm

Stored on disk PPT #7

Can not find file on This disk or other companion disk. The file is considered to be lost.

N. Sridhar

Walter J. Mackowski
11/13/91

Pitting Protection Potential Tests on INC 825
(Ht # HH4371 FC)

P3TIN027.DAT

Purpose: Same as p.46 Run w/ REPASS1.WBB program.

Sample Rep: Same as on p.25

Solution Prep: To 500 ml of 17 MΩ water in a 1-L volumetric flask add 0.1238 g of $NaHCO_3$ and 1.6468 g of NaCl (Fisher lot #'s 897789 + 885407 resp.). Pipet 20.0 ml of SO_4, 10.0 ml of NO_3, and 2.0 ml of F stock solutions (# 019-231, 019-199, + 019-191 resp.). Dilute to the mark.

Set-Up: As described on p.25. Ref SCE #2 was used.

① Initial Wt. 11.6941 g Final Wt.
② De-aerate one hour before immersion
③ Hold @ open circuit for one hour after immersion
④ E corr after 60 min
⑤ Test Temp 95°C
⑥ Initial Time 7200 secs (2 hrs)
⑦ Applied Initial Potential +600 mV vs SCE
⑧ Initial pH 6.05 @ 25°C Final pH 9.39 @ 25°C

Data lost - not written to disk or logged for unknown reasons.

Walter J. Mackowski
11/14/91

Pitting Protection Potential Tests on 316L SS (Lot # P80746)

P3TSS028.DAT

Purpose: To re-run selected conditions to assess repeatibility of PPPT experiments. Used REPP952.WB3

Sample Prep: Same as p.25.

Solution: Two liters were prepared as described on p.25. All lot #'s and solution #'s were the same, except SO_4 stock which was 019-231. Actual salt weights were 0.249 g $NaHCO_3$ and 3.2928 g NaCl

Set Up: As described on p. 25. Ref SCE #3 was used.

① Initial Wt. 11.3018 g Final Wt. 11.1155 g
② de-aerate one hour before immersion
③ Hold @ open circuit for one hour after immersion.
④ $\bar{E}$ corr after 60 min. -673 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 14,400 secs (4 hrs)
⑦ Applied initial potential +300 mV vs SCE
⑧ Initial pH 8.12 @ 25°C Final pH 9.18 @ 25°C
⑨ Immersed area $\cong$ 6.95 cm^2 $\ell = 3.3165$ $\phi = 0.623$ cm
⑩ Final $\bar{E}$ +7 mV vs SCE (1½ days)

Stored on disk PPPT #2.

Walter J. Mackowski
12/4/91

P3TSS029.DAT

Purpose: Same as p.54.

Sample Prep: Same as p.25.

Solution: Used same solution as on p. 54.

Set-Up: As described on p. 25. Ref SCE #1 was used.

① Initial Wt. 11.3015 g Final Wt. 11.0947 g
② de-aerate one hour before immersion
③ Held @ open circuit for one hour after immersion
④ $\bar{E}$ corr after 60 min -721 mV vs SCE
⑤ Test Temp. 95°C
⑥ Initial Time 14,400 secs (4 hrs)
⑦ Applied initial potential +400 mV vs SCE
⑧ Initial pH 8.12 @ 25°C Final pH 9.20 @ 25°C
⑨ Immersed area $\cong$ 8.28 cm^2 $\ell = 4.042$ cm, $\phi = 0.628$ cm
⑩ Final $\bar{E}$ -21 mV vs SCE (2 days)

Stored on disk PPPT #2

Potential stayed at +18 for upto 80,222 seconds (22.3 hrs.) & then had a brief increase in c.d. which prompted a decrease in potential. The potential remained at -21 mv for upto 179,420 seconds.

N. Sridhar
3/19/92

Walter J. Mackowski
12/4/91

Pitting Protection Potential Tests on 316L SS (Lot # P80746)

P3TSS030.DAT

Purpose: Same as p.54.

Sample Prep: Same as p.25.

Solution Prep: To 500 ml of 17 MΩ water in a 1-L volumetric add 0.1231 g $NaHCO_3$ and 1.6463 g NaCl. Pipet 20.0 ml of SO_4, 10.0 ml of SO_3, and 20 ml of F stock solutions. Chemical + solution lot #'s the same as on p.53

Set Up: As described on p. 25. Ref SCE # 3 was used.

① Initial Wt. 11.2933 g Final Wt. 11.2065 g
② De-aerate one hour before immersion
③ Hold @ open circuit for one hour after immersion.
④ E corr after 60 min. -640 mV vs SCE
⑤ Test Temp. 95°C +300 mV/min 12/4/91
⑥ Applied initial potential +400 mV vs SCE
⑦ Initial Time 14,400 secs (4 hrs).
⑧ Initial pH 8.18 @ 25°C Final pH 9.12 @ 25°C
⑨ Immersed area ≅ 7.55 cm^2 ℓ = 3.671 cm ϕ = 0.628 cm
⑩ Final E -3 mV vs SCE (after 2 days)

Stored on disk PPPT #7

Walter J. Mackerle
12/6/91

Pitting Protection Potential Tests on INC 825 (HH4371FC)

P3TIN031.DAT

Purpose: Same as p.54.

Sample Prep: Same as p.25

Solution Prep: Two liters were prepared as described on p.54. Actual salt weights were 0.2451 g $NaHCO_3$ and 3.2927 g NaCl.

Set-Up: As described on p.25. Ref SCE # 1 was used.

① Initial Wt. 11.7058 g Final Wt. 11.6832
② De-aerate one hour before immersion.
③ Hold @ open circuit for one hour after immersion
④ E corr after 60 min. -535 mV vs SCE
⑤ Test Temp 95°C
⑥ Applied Initial Potential +600 mV vs SCE
⑦ Initial Time 14,400 secs (4 hrs) 3/20/92
⑧ Initial pH 8.42 Final pH 9.25
⑨ Immersed area ≅ 6.942 cm^2 ℓ = 3.409 cm ϕ = 0.620 cm
⑩ Final E +135 mV vs SCE (after ~6 days)
(stable for 142.7 hours)
3/20/92

Stored in PPPT #1

Initial Time: 3600 seconds as shown in log not 14,400 sec. as in step 7
- N. Sridhar
3/20/92

N. Sridhar
1/19/92

Pitting Protection Potential Tests on Duc 825 (HH4371FC)

P3TIN032.DAT

Purpose: Same as p.54

Sample Prep: Same as p.25.

Solution Prep: Used same solution as P3TIN031.

Set-Up: As described on p.25. Ref SCE# 3 was used.

① Initial Wt. 11.6871 g Final Wt. 11.5917 g
② De-aerate one hour before immersion.
③ Hold @ open circuit for one hour after immersion
④ E corr after 60 min. -592 mV vs SCE
⑤ Test Temp. 95°C
⑥ Applied initial Potential +600 mV vs SCE
~~⑦ Initial Time 7200 secs (2 hrs)~~ 3/20/92
⑧ Initial pH 8.42 Final pH 9.20
⑨ Immersed area ≈ 7.621 cm² ℓ = 3.738 cm ϕ = .623 cm
⑩ Final E +98 mV vs SCE (after ~6 days)

Stored in PPPT #1

DIRECT TIMER LOG IS MISSING.

Potential varied between 604 and ~~585~~ 475 mV during initial period. Actual Initial Time logged was 11160 seconds (~~4~~ 3 hrs + 6 min)

N. Sridhar
1/19/92

N. Sridhar
3/20/92

Pitting Protection Potential Tests on Duc 825 (HH4371FC)

P3TIN033.DAT p.25

Purpose: Same as ~~p.54~~. Use REPASS2.WBB - see page 61. D. J. Macdonald 1/22/92

Sample Prep: Same as on p.25

Solution Prep: To 1-liter of 17MR water in a 2-L volumetric add 3.2968 g NaCl and 0.2448 g $NaHCO_3$. Pipet 20.0 ml of SO_4, 10.0 ml of NO_3 and 2.0 ml of F stock solutions. Chemical + solution lot #'s are the same as on p.53.

Set-up: Same as on p.25. Potentials and currents were verified using the Keithley 602 Electrometer and Keithley 485 Picoammeter respectively.

① Initial Wt. 11.5750 g Final Wt. 11.5664 g
② De-aerate one hour before immersion.
③ Hold @ open circuit for one hour after immersion.
④ E corr after 60 min wt recorded
⑤ Test Temp 95°C
⑥ Applied initial potential +600 mV vs SCE
⑦ Initial Time 60 secs
⑧ Initial pH ~~8.00~~ 8.13 Final pH 9.32
wjmacdonald 1/27/92
⑨ Immersed area ~~7.334~~ cm ϕ = .634 A = 6.956 cm²
⑩ Final E -572 mV 3.3341
(after ~5 days) wjmacdonald 1/27/92

Stored in PPPT #1

Due to problems w/ hardware & software, this data is not valid.

Walter J Macdonald
1/24/92

Pitting Protection Potential Tests on Inc 825 (HH4371FG)

P3TIN034.DAT

Purpose: Same as p.35. Use Repass2.WBB.

Sample Prep: Same as p.25.

Solution: Used same solution as P3TIN033.

Set-Up: Same as p.25. Potentiostat & accurate verified as described on p. 59.

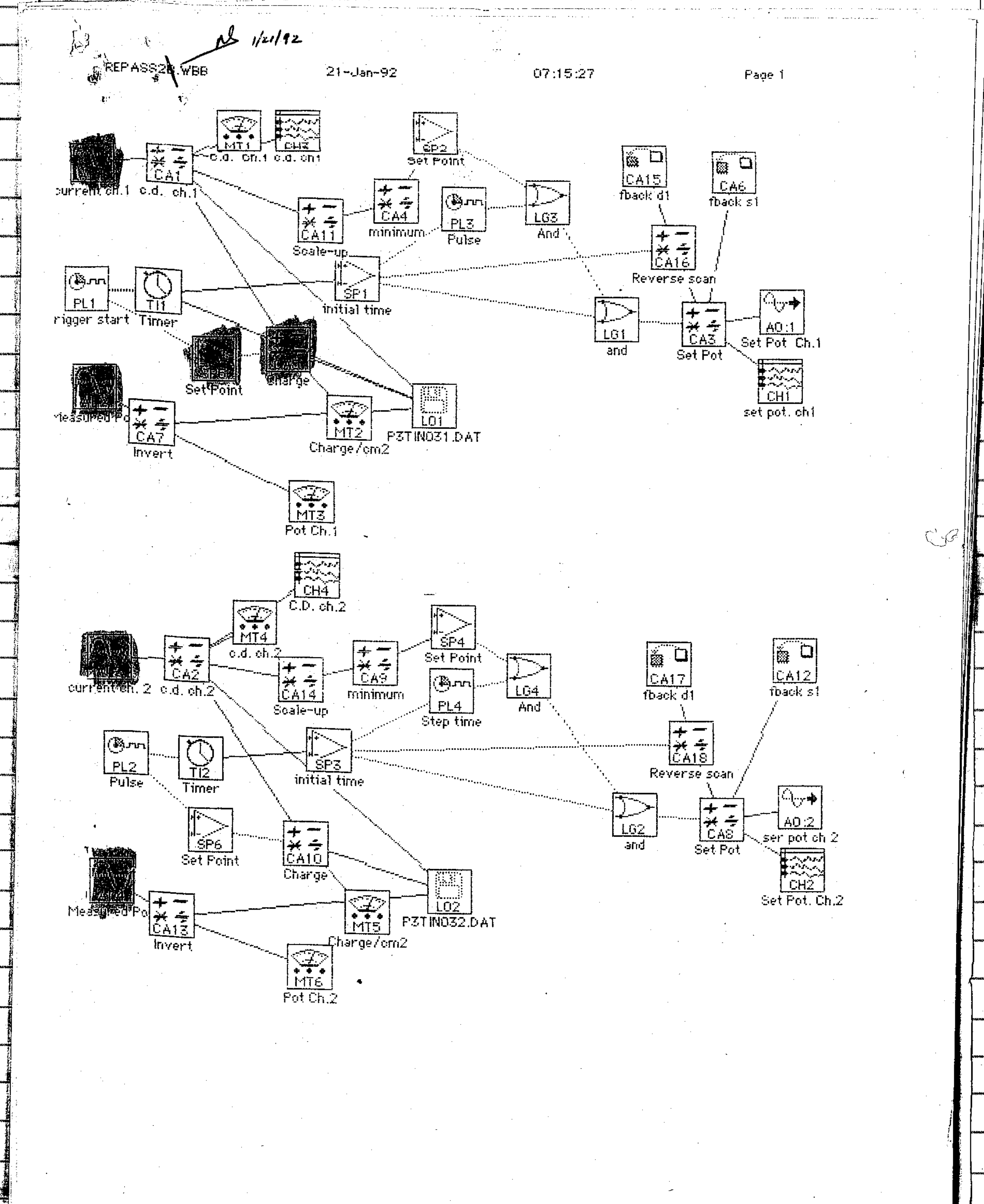
1. Initial Wt. 11.5757 g   Final Wt. 11.5718
2. de-aerate one hour before immersion.
3. Hold at open circuit one hour after immersion
4. E corr after 60 min. -285 mV vs SCE
5. Test temp 95°C
6. Applied initial E +600 mV vs SCE
7. Initial Time 600 secs.
8. Initial pH 8.13   Final pH 9.16
9. Immersed area ≅ ~~1.308 cm~~ D=.638 cm A=6.394 cm²
10. Final E +207 mV (after ~4 days) 3.084 [illegible] 1/27/92

Stored in PPPT #1

Walter J Machowski
1/24/92

Repass2.WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.



N. [illegible]
1/25/92

Repass 2.WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

1/21/92

Worksheet Name: REPASS2B.WBB

Hardware list:

Name	AIs	AOs	DIOs	CTs	DIs	DOs
STI ACPC-16	16	0	16	0	0	0
STI ACAO-12	0	6	8	0	0	0

Maximum icons: 464
Grid size: 16
Snap to grid: < disabled >
Report Unsynch: < disabled >
Fast Mode: enabled
Fast Mode Samples: 1000
Fast Mode Rate: 1.0 Kilohertz
Com ports: 2

Port: COM 1
Comment: Mouse connected

Port: COM 2
Baud rate: 9600
Data bits: 8
Stop bits: 1
Duplex: Half
Parity: None
XonXoff: < disabled >
Echo wait: < disabled >
Line delay: < disabled >

IEEE: < disabled >

Type: Analog Input

Name: AI:1 current ch.1
Card Type: STI ACPC-16
Channel Number: 1
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA1 c.d. ch.1

Name: AI:2 Measured Pot
Card Type: STI ACPC-16
Channel Number: 2
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA7 Invert

Name: AI:3 current ch. 2
Card Type: STI ACPC-16
Channel Number: 3
Range: +¦-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz

N. Swidzinski
1/23/92

Repass 2. WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA2 c.d. ch.2

Name: AI:4 Measured Pot
Card Type: STI ACPC-16
Channel Number: 4
Range: +|-Auto V
Resolution: Lo Noise (17ms)
Output Type: Voltage
Sample rate: 10.0 Hertz
Fast Mode: < disabled >
Inputs:
< None >
Outputs:
CA13 Invert

Type: Timer

Name: TI1 Timer
Inputs:
PL1 Trigger start
Outputs:
SP1 initial time LO1 P3TIN031.DAT

Name: TI2 Timer
Inputs:
PL2 Pulse
Outputs:
SP3 initial time

Type: Pulse

Name: PL1 Trigger start
High Duration: 496.0 Hours
Low Duration: 0.1 Minutes
Start Value: Low
Reset on exit < disabled >
Inputs:
< None >
Outputs:
TI1 Timer SP5 Set Point

Name: PL2 Pulse
High Duration: 496.0 Hours
Low Duration: 0.1 Seconds
Start Value: Low
Reset on exit enabled
Inputs:
< None >
Outputs:
TI2 Timer SP6 Set Point

Name: PL3 Pulse
High Duration: 0.1 ~~1.0~~ Seconds
Low Duration: 180.0 Seconds
Start Value: Low
Reset on exit enabled
Inputs:
SP1 initial time
Outputs:
LG3 And

Name: PL4 Step time

N 1/29/92

N. Swidler
1/29/92

Repass 2 · WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

```
High Duration:              0.1   Seconds
Low Duration:               180.0   Seconds
Start Value:                Low
Reset on exit               enabled
Inputs:
    SP3   initial time
Outputs:
    LG4   And

Type: Calculation_____________________________________________

Name:                       CA1   c.d.  ch.1
Function:                   aX / bY
X input:                    AI:1  current ch.1
Y input:                    7.5
"a" constant:               -1.0
"b" constant:               10.0
"c" constant:               0.0
Inputs:
    AI:1  current ch.1
Outputs:
    MT1   C.d.  Ch.1        CH3   c.d. ch1          CA5   Charge
    CA11  Scale-up          LO1   P3TIN031.DAT

Name:                       CA2   c.d. ch.2
Function:                   aX / bY
X input:                    AI:3  current ch. 2
Y input:                    7.2
"a" constant:               -1.0
"b" constant:               10.0
"c" constant:               0.0
Inputs:
    AI:3  current ch. 2
Outputs:
    MT4   c.d. ch.2         CH4   C.D. ch.2          CA10  Charge
    CA14  Scale-up          LO2   P3TIN032.DAT

Name:                       CA3   Set Pot
Function:                   aX + bY + c
X input:                    LG1   and
Y input:                    CA16  Reverse scan
"a" constant:               -0.01
"b" constant:               1.0
"c" constant:               0.6
Inputs:
    LG1   and               CA16  Reverse scan
Outputs:
    CH1   set pot. ch1      AO:1  Set Pot  Ch.1       CA6   fback s1

Name:                       CA4   minimum
Function:                   Min(X) for last (a) seconds
X input:                    CA11  Scale-up
Y input:                    0.0
"a" constant:               180.0
"b" constant:               0.0
"c" constant:               0.0
Inputs:
    CA11  Scale-up
Outputs:
    SP2   Set Point

Name:                       CA5   Charge
Function:                   Integral X dt
X input:                    CA1   c.d.  ch.1
Y input:                    SP5   Set Point
"a" constant:               0.0
```

N. Friedkar
1/25/92

Repass 2. WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

```
"b" constant:                0.0
"c" constant:                0.0
Inputs:
    CA1   c.d.  ch.1         SP5   Set Point
Outputs:
    MT2   Charge/cm2         LO1   P3TIN031.DAT

Name:                        CA6   fback s1
Function:                    Global Feedback(a:address)
X input:                     CA3   Set Pot
Y input:                     0.0
"a" constant:                1.0
"b" constant:                0.0
"c" constant:                0.0
Inputs:
    CA3   Set Pot
Outputs:
    < None >

Name:                        CA7   Invert
Function:                    aX + bY
X input:                     AI:2  Measured Pot
Y input:                     0.0
"a" constant:                -1.0
"b" constant:                0.0
"c" constant:                0.0
Inputs:
    AI:2  Measured Pot
Outputs:
    MT3   Pot Ch.1           LO1   P3TIN031.DAT

Name:                        CA8   Set Pot
Function:                    aX + bY + c
X input:                     LG2   and
Y input:                     CA18  Reverse scan
"a" constant:                -0.01
"b" constant:                1.0
"c" constant:                0.6
Inputs:
    LG2   and                CA18  Reverse scan
Outputs:
    CH2   Set Pot. Ch.2      AO:2  ser pot ch 2        CA12  fback s1

Name:                        CA9   minimum
Function:                    Min(X) for last (a) seconds
X input:                     CA14  Scale-up
Y input:                     0.0
"a" constant:                180.0
"b" constant:                0.0
"c" constant:                0.0
Inputs:
    CA14  Scale-up
Outputs:
    SP4   Set Point

Name:                        CA10  Charge
Function:                    Integral X dt
X input:                     CA2   c.d. ch.2
Y input:                     SP6   Set Point
"a" constant:                0.0
"b" constant:                0.0
"c" constant:                0.0
Inputs:
    CA2   c.d. ch.2          SP6   Set Point
Outputs:
    MT5   Charge/cm2         LO2   P3TIN032.DAT
```

1/25/92

Repass 2 · WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

```
Name:                   CA11  Scale-up
Function:               aX + bY
X input:                CA1   c.d.  ch.1
Y input:                0.0
"a" constant:           10000.0
"b" constant:           0.0
"c" constant:           0.0
Inputs:
    CA1   c.d.  ch.1
Outputs:
    CA4   minimum

Name:                   CA12  fback s1
Function:               Global Feedback(a:address)
X input:                CA8   Set Pot
Y input:                0.0
"a" constant:           2.0
"b" constant:           0.0
"c" constant:           0.0
Inputs:
    CA8   Set Pot
Outputs:
    < None >

Name:                   CA13  Invert
Function:               aX + bY
X input:                AI:4  Measured Pot
Y input:                0.0
"a" constant:           -1.0
"b" constant:           0.0
"c" constant:           0.0
Inputs:
    AI:4  Measured Pot
Outputs:
    MT6   Pot Ch.2          LO2   P3TIN032.DAT

Name:                   CA14  Scale-up
Function:               aX + bY
X input:                CA2   c.d. ch.2
Y input:                0.0
"a" constant:           10000.0
"b" constant:           0.0
"c" constant:           0.0
Inputs:
    CA2   c.d. ch.2
Outputs:
    CA9   minimum

Name:                   CA15  fback d1
Function:               Global Feedback(a:address)
X input:                0.0
Y input:                0.0
"a" constant:           1.0
"b" constant:           0.0
"c" constant:           0.0
Inputs:
    < None >
Outputs:
    CA16  Reverse scan

Name:                   CA16  Reverse scan
Function:               c (X + a)(Y + b)
X input:                CA15  fback d1
Y input:                SP1   initial time
"a" constant:           -0.6
```

1/25/92

Repos 2. WBB Documentation

Purpose: Modification of Potentiostat Esc 440 & data acquisition system to release some channels.

```
"b" constant:                0.0
"a" constant:                1.0
Inputs:
    CA15  fback d1           SP1   initial time
Outputs:
    CA3   Set Pot

Name:                        CA17  fback d1
Function:                    Global Feedback(a:address)
X input:                     0.0
Y input:                     0.0
"a" constant:                2.0
"b" constant:                0.0
"c" constant:                0.0
Inputs:
    < None >
Outputs:
    CA18  Reverse scan

Name:                        CA18  Reverse scan
Function:                    c (X + a)(Y + b)
X input:                     CA17  fback d1
Y input:                     SP3   initial time
"a" constant:                -0.6
"b" constant:                0.0
"c" constant:                1.0
Inputs:
    CA17  fback d1           SP3   initial time
Outputs:
    CA8   Set Pot

Type: Set Point_____________________________________________________

Name:                        SP1   initial time
Function:                    X > Y
X input:                     TI1   Timer
Y input:                     14400.0
Dead Band:                   0.0
Inputs:
    TI1   Timer
Outputs:
    LG1   and                PL3   Pulse              CA16  Reverse scan

Name:                        SP2   Set Point
Function:                    X > Y
X input:                     CA4   minimum
Y input:                     0.5
Dead Band:                   0.0
Inputs:
    CA4   minimum
Outputs:
    LG3   And

Name:                        SP3   initial time
Function:                    X > Y
X input:                     TI2   Timer
Y input:                     7200.0
Dead Band:                   0.0
Inputs:
    TI2   Timer
Outputs:
    LG2   and                PL4   Step time          CA18  Reverse scan

Name:                        SP4   Set Point
Function:                    X > Y
X input:                     CA9   minimum
```

1/25/92

Repass 2. WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

Y input: 0.5
Dead Band: 0.01
Inputs:
CA9 minimum
Outputs:
LG4 And

Name: SP5 Set Point
Function: X < Y
X input: PL1 Trigger start
Y input: 0.0
Dead Band: 0.0
Inputs:
PL1 Trigger start
Outputs:
CA5 Charge

Name: SP6 Set Point
Function: X < Y
X input: PL2 Pulse
Y input: 0.0
Dead Band: 0.0
Inputs:
PL2 Pulse
Outputs:
CA10 Charge

Type: Logic

Name: LG1 and
Function: X AND Y
X input: SP1 initial time
Y input: LG3 And
Inputs:
SP1 initial time LG3 And
Outputs:
CA3 Set Pot

Name: LG2 and
Function: X AND Y
X input: SP3 initial time
Y input: LG4 And
Inputs:
SP3 initial time LG4 And
Outputs:
CA8 Set Pot

Name: LG3 And
Function: X AND Y
X input: PL3 Pulse
Y input: SP2 Set Point
Inputs:
PL3 Pulse SP2 Set Point
Outputs:
LG1 and

Name: LG4 And
Function: X AND Y
X input: PL4 Step time
Y input: SP4 Set Point
Inputs:
PL4 Step time SP4 Set Point
Outputs:
LG2 and

Type: Log

1/25/92

Repass 2 · WBB documentation

Purpose: modification of Potentiostat ESC 440 + data acquisition system to release some channels.

Name: LO1 P3TIN031.DAT
Log Status: < disabled >
Sample Rate: 15.0 Minutes
Gate: < None >
Data Format:
Heading: pitting protection potential; ch 1
File Path: C:\WB
File Name: P3TIN031.DAT
Date Stamp: enabled
Time Stamp: enabled
Inputs:
TI1 Timer CA7 Invert CA1 c.d. ch.1
CA5 Charge
Outputs:
< None >

Name: LO2 P3TIN032.DAT
Log Status: < disabled >
Sample Rate: 15.0 Minutes
Gate: < None >
Data Format:
Heading: pitting protection potential; ch 1
File Path: C:\WB
File Name: P3TIN032.DAT
Date Stamp: enabled
Time Stamp: enabled
Inputs:
CA13 Invert CA2 c.d. ch.2 CA10 Charge
Outputs:
< None >

Type: Meter

Name: MT1 C.d. Ch.1
Output Type: Exponential
Units: A/cm2
Integer: 8
Decimal: 1
Inputs:
CA1 c.d. ch.1
Outputs:
< None >

Name: MT2 Charge/cm2
Output Type: Exponential
Units: Coul/cm2
Integer: 8
Decimal: 1
Inputs:
CA5 Charge
Outputs:
< None >

Name: MT3 Pot Ch.1
Output Type: Fixed Point
Units: Volt
Integer: 6
Decimal: 3
Inputs:
CA7 Invert
Outputs:
< None >

Name: MT4 c.d. ch.2
Output Type: Exponential

1/25/92

Repass 2. WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

Units: A/cm2
Integer: 8
Decimal: 1
Inputs:
CA2 c.d. ch.2
Outputs:
< None >

Name: MT5 Charge/cm2
Output Type: Exponential
Units: Coul/cm2
Integer: 8
Decimal: 1
Inputs:
CA10 Charge
Outputs:
< None >

Name: MT6 Pot Ch.2
Output Type: Fixed Point
Units: Volt
Integer: 6
Decimal: 3
Inputs:
CA13 Invert
Outputs:
< None >

Type: Chart

Name: CH1 set pot. ch1
Chart Color: White
X Axis Label: Hours
X Axis Min: 0.0
X Axis Max: 24.0
Y Axis Label: < None >
Y Axis Min: -0.8
Y Axis Max: 0.7
Inputs:
CA3 Set Pot
Outputs:
< None >

Name: CH2 Set Pot. Ch.2
Chart Color: White
X Axis Label: Hours
X Axis Min: 0.0
X Axis Max: 10.0
Y Axis Label: < None >
Y Axis Min: -1.2
Y Axis Max: 0.8
Inputs:
CA8 Set Pot
Outputs:
< None >

Name: CH3 c.d. ch1
Chart Color: White
X Axis Label: Hours
X Axis Min: 0.0
X Axis Max: 10.0
Y Axis Label: < None >
Y Axis Min: 1.0e-07
Y Axis Max: 0.001
Inputs:
CA1 c.d. ch.1

1/25/92

Repass 2. WBB Documentation

Purpose: Modification of Potentiostat ESC 440 & data acquisition system to release some channels.

Outputs:
< None >

Name:	CH4 C.D. ch.2
Chart Color:	White
X Axis Label:	Minutes
X Axis Min:	0.0
X Axis Max:	5.0
Y Axis Label:	< None >
Y Axis Min:	-0.001
Y Axis Max:	0.05

Inputs:
CA2 c.d. ch.2
Outputs:
< None >

Type: Analog Output

Name:	AO:1 Set Pot Ch.1
Card Type:	STI ACAO-12
Channel Number:	1
Range:	+¦- 5 Volts
Resolution:	0.024%

Inputs:
CA3 Set Pot
Outputs:
< None >

Name:	AO:2 ser pot ch 2
Card Type:	STI ACAO-12
Channel Number:	2
Range:	+¦- 5 Volts
Resolution:	0.024%

Inputs:
CA8 Set Pot
Outputs:
< None >

N. Swidler
1/25/92

Pitting Protection Potential Test on Inc 825 (HH4371FC)

P3TIN035.DAT

Purpose: Re-run of P3TIN033.DAT.

Sample Prep: Same as p.25.

Solution Prep: Same as p.59. Actual salt wts. were 3.2960 g NaCl and 0.2436 g $NaHCO_3$.

Set-Up: Same as p.25. Currents and potentials verified as described on p.59. Used REPASS2.WBB (p.61)

① Initial Wt. 11.5996 g — Final Wt. 11.4849 g
② de-aerate one hour before immersion
③ Hold at open-circuit for one hour after immersion
④ E corr after 60 min. −680 mV vs SCE
⑤ Test temp 95°C
⑥ Applied initial potential +600 mV vs SCE
⑦ Initial Time 60 secs
⑧ Initial pH 8.00 Final pH 9.09
⑨ Immersed area ≅ undetermined ℓ = ϕ =
⑩ Final E not meaningful

After running a few hours, re-set PL3 to 1 sec and 180 sec and re-started test (re-initiated pulse). The next day, changed specimen (called P3TINR35.DAT) and re-initiated using same solution. Anomalous behavior caused these changes to be made.

Specimen P3TIN035 was repolished in an attempt to reuse

Walter J. Mackowski
1/29/92

Pitting Protection Potential Test on Inc 825 (HH4371FC)

P3TIN036.DAT

Purpose: Same as p.35.

Sample Prep: Same as p.25.

Solution Prep: Used same solution as P3TIN035.

Set-Up: Same as p.25. Currents + potentials verified as on p.59. Use REPASS2.WBB(61)

① Initial Wt. 11.5893 g Final Wt. 11.5476 g
② de-aerate one hour before immersion
③ Hold at open-circuit for one hour before immersion
④ E corr after 60 min. −511 mV
⑤ Test temp 95°C
⑥ Applied initial potential +600 mV vs SCE
⑦ Initial time 3600 secs
⑧ Initial pH 8.00 Final pH 9.09
⑨ Immersed area ≅ 6.951 cm^2 ℓ = 3.378 cm ϕ = .626 cm
⑩ Final E −203 mV (after ~ 2 days)

Data stored in PPPT #1 Diskette

The potential remained at +108 mV SCE with a c.d. of 5×10^{-7} to 4×10^{-7} A/cm for 29 hours. Then current suddenly increased prompting a decrease in potential. c.d. was high (10^{-4} A/cm^2) even at −700 mV. This is most probably due to bubble in the salt bridge. 108 mV was assumed to be the repassivation potential.

Walter J. Mackowski
1/31/92

N. Sridhar
3/20/92

Pitting Potential Test on 316L

P3TSS037.DAT

Purpose: To re-run a conduction to try to analyze the anomalous behavior of REPASS2.WBB

Test was aborted to flaws in the test WB program.

stored in PPPT #1

Walter J. Mackowski
2/4/92

Pitting Repassivation Potential Test on 316L S-S.

P3TSS038.DAT

2/4/92

Purpose: Determine repassivation potential of 316L stainless as a function of initial pit growth.

Sample Prep: Same as p. 25

Solution: Same solution composition as P3TIN035.DAT

Set up: Used REPASS2.WBB Program, See p. 61. Used the WORKBENCH Ver 2.0.4 updated software (Has Password Protection)

at $t=0$, $E_{corr} = -818$ mV SCE (Using Keithley 614 electrometer INST. # 11152)

Note: the E_{corr} was highly variable at first and also relatively high. A brief cathodic pulse of -1.5 V was given & then turned off. The specimen was allowed to stay at E_{corr} for 5 minutes.

Initial pH 8.02 @ 25°C Final pH 9.01 @ 25°C

Stored in PPPT #1

N. Sridhar
2/4/92

Preparation of NO_3 Stock Solution 10000 ppm

Purpose: Solution to be used for preparation of test solutions.

Prep: To 500 ml of 17 MΩ water in a 1-L volumetric add 1.3793 g of $NaNO_3$ (Fisher lot # 897183). Dilute to the mark. Label as SN CAVWRA 025-66.

Walter J. Machowski
2/5/92

Pitting Repassivation Potential of 316L SS

P3TSS039.DAT

Purpose: Same as p. 65. ~~This is a re-run of~~ W Machowski 2/5/92

Sample Prep: Same as p. 35.

Set-Up: Same as p. 35. Currents and potentials verified as described on p. 59. Use REPASS2.WB3 (p. 61)

Solution Prep: Same as p. 59, except NO_3 stock solution was SN CAVWRA 025-66. Actual salt weights were 3.2965 g NaCl and 0.2446 g $NaNO_3$

① Initial Wt. 11.3492 g Final Wt. 11.3122 g
② de-aerate one hour before immersion.
③ Hold at open circuit one hour after immersion
④ E corr after 60 min. -448 mV vs SCE
⑤ Test Temp. 95°C
⑥ Applied initial potential +300 mV vs SCE
⑦ Initial Time 3600 secs
⑧ Initial pH 8.02 @ 25°C Final pH 9.09 @ 25°C
⑨ Immersed area ≅ 6.91 cm² l = 3.365 ϕ = .625
⑩ Final E -41 mV vs SCE

Timer log missing

N. Fyfhat
2/19/92

Stored in PPT #1

N. Fyfhat
2/13/92

Note for Experiments P3T XX033-038

Due to problems with the experimental hardware and software, data from these experiments are not valid

Walter J. Mackowski
2/13/92

Pitting Protection Potential of 316L SS (Lot# P80746)

P3TSS040.DAT

Purpose: To determine repassivation potential of 316L SS as a function of pit growth (initial).

Set-Up: Used REPASS2.WBB (p.61) Used Workbench version 2.0.4 updated software. Hardware, i.e. test cells, etc were as described on p.23

Solution Prep: To one liter of 17MΩ water in a 2L-volumetric add 3.2964 g of NaCl and 0.2447 g of $NaHCO_3$ (Fisher lot #'s 885707 and 897789 resp.). Pipet 20.0ml of NO_3 stock, 40.0ml of SO_4 stock and 4.0ml of F stock solutions. (lot #'s 025-66, 019-231, and 019-191 resp.). Dilute to the mark.

① Initial Wt. 11.3052 g Final Wt. 11.2480 g
② de-aerate w/ N_2 for one hour before immersion
③ Hold at OCV for one hour after immersion.
④ E corr after 60 min −471 mV vs SCE
⑤ Initial pH 7.91 @ 25°C Final pH 9.04 @ 25°C

Potential Measurement By

ESC 440	Keithley 614	Data Acquisition System
±0.035 V SCE	±0.0356 V SCE	±0.036 V SCE

⑥ Initial applied potential +300 mV vs SCE
⑦ Initial T in 60 secs
⑧ Test Temp 95°C
⑨ Immersed area ≅ 7.15 cm² l = 3.489 in ϕ = .625
⑩ Final E 0.036 upto 75297 seconds. Decreased beyond. Probably related to bubble formation in probe.

Stored on PPT #1

Walter J. Mackowski
2/16/92

Pitting Protection Potential of 316LSS (P80746)

P3TSS041.DAT

Purpose: Same as P3TSS040

Set-Up: Same as P3TSS040

Solution: Used same solution as P3TSS040

① Initial Wt. 11.3248 g Final Wt. 11.2865 g
② De-aerate w/ N_2 for one hour before immersion
③ Held at OCV for one hour after immersion.
④ E corr after 60 min. −755 mV vs SCE
⑤ Initial pH 8.03 @ 25°C Final pH 9.08 @ 25°C

Potential Measurement		Data Acquisition System
ESC 440	Keithley 619	
+0.017 V SCE	+0.0178 V SCE	+0.018 V SCE

Final E_{corr} = −0.093 V SCE.

⑥ Initial applied E +300 mV vs SCE
⑦ Initial Time 600 sec
⑧ Test Temp 95 °C
⑨ Immersed area ≅ 7.63 cm^2 ℓ = 3.725 cm ϕ = .656 cm
⑩ Final E −93 mV vs SCE (For 120 hours)

Stored on PPT #2

Timer not ~~sec~~ logged.
The potential stayed at 18 mV for 96 hours. Then c.d. increased beyond threshold (but was never above 10^{-4} A/cm²), potential dropped in steps to −93 mV. (final E) charge at 96 hours was 8.7 C/cm². Final charge: 27 C/cm².

N. Sridhar
3/19/92

Preparation of SO_4 Stock Solution 1000 ppm
Purpose: Solution to be used for preparation of test solutions.

Prep: To 500 ml of 17 MΩ water in a 1-L volumetric add 1.4786 g of Na_2SO_4 (Fisher Lot # 901213). Dilute to the mark. Label as SW CWRA 025-71.

Walter J. Mackowski
2/18/92

Pitting Protection Potential of 316L SS (PP80746)

P3TSS042.DAT
Purpose: Same as P3TSS040

Set-Up: Same as P3TSS040

Solution: To 1-Lite of 17 MΩ water in a 2-L volumetric add 3.2962g NaCl and 0.2451g $NaHCO_3$ (Fisher lot #'s 885407 + 897789 resp.). Pipet 20.0ml of NO_3 stock, 40.0ml of SO_4 stock, and 4.0ml of F stock solutions (#'s 025-66, 025-71 and 019-191 resp.),

① Initial Wt. 11.2982g Final Wt. 11.2625g

ESC 440	K. 614	DAC
+297mV	+299mV	+297mV

② de-aerate w/N_2 for one hour before immersion
③ Hold at open circuit for one hour
④ E corr after 60 min -455mV vs SCE
⑤ Test Temp 95°C
⑥ Applied initial potential +300mV vs SCE
⑦ Initial time 3600 secs.
⑧ Initial pH 8.04 Final pH 9.11
⑨ Immersed area ≅ 8.39cm² ℓ = 4.034cm ϕ = .637cm
⑩ Final E − 2mV vs SCE

Stored on PPPT #2.

Potential remained at −2mV for 800,109 sec. (222 hrs) then decreased due to small increase in c.d. beyond threshold.

Pitting Protection Potential of 316L SS (080746)

P3TSS043.DAT
Purpose: Same as P3TSS040

Set-Up: Same as P3TSS040

Solution: Used same solution as P3TSS042 (p.72)

ESC 440	K. 614	DAC
+197mV	+200mV	+198mV

① Initial wt. (wt taken) Final Wt. 11.2783
② de-aerate w/N_2 for one hour before immersion
③ Hold at OCV for one hour
④ E corr after 60 min: −562mV vs SCE
⑤ Test Temp 95°C
⑥ Applied initial potential +200mV vs SCE
⑦ Initial Time 3600 secs.
⑧ Initial pH 8.04 Final pH 9.48 @ 25°C
⑨ Immersed area ≅ 4.5733cm² ℓ = 2.1736cm ϕ = .625cm
⑩ Final E = +8mV vs SCE

Test terminated due to excess evaporation; it appeared to have reached a stable E value prior to this.

Stored on PPPT #2

INITIAL part of i vs Current, potential data not logged in.

Walter J. Machowski
2/27/92

Pitting Protection Potential of 316LSS (P80746)

P3TS5044.DAT

Purpose: Same as P3TS5040

Set-up: Same as P3TS5040

Solution: To 1-liter of 17MΩ water in a 2-L volumetric add 3.2962 g NaCl and 0.2451 g of $NaHCO_3$ (same lot #s as p.72). Pipet 20.0 ml of NO_3 stock, 40.0 ml of SO_4 stock and 4.0 ml of F stock solutions (same lot #s as p.72). Dilute to the mark.

① Initial Wt. 11.2992 g 11.5442 g.
② de-aerate w/N_2 for one hour before immersion
③ Hold at OCV for one hour.

Pot. Check:	Keithley 614	ESC 440	DAC
	-541 mV	-542 mV	-547 mV
	+97 "	+97 "	+98 "

④ E corr at 60 min -541 mV vs SCE
⑤ Temp 95°C
⑥ Applied potential (initial) +100 mV vs SCE
⑦ Initial Time 3600 secs.
⑧ Initial pH 7.98 @ 25°C Final pH not taken
⑨ Immersed area ≥ 8.42 cm^2 ℓ = 4.042 cm ϕ = .638 cm
⑩

Bubbles in Luggin probe caused problems w/ the current control. Test will be re-run.

Stored on PPPT #2

Walter J. Mackowski
3/2/92

Pitting Protection Potential of 316LSS (P80746)

P3TS5045.DAT

Purpose: Same as P3TS5040. This is a re-run of P3TS5044.

Set-up: Same as P3TS5040

Solution: To 1 liter of 17MΩ water in a 2-L volumetric add 3.2970 g of NaCl and 0.2437 g $NaHCO_3$ (same lot #'s as p.72). Pipet 20.0 ml of NO_3 stock, 40.0 ml of SO_4 stock and 4.0 ml of F stock solutions (same lot #s as p.72). Dilute to the mark.

① Initial wt. 11.2883 g Final wt. 11.2956 g
② deaerate one hour before immersion (N_2).
③ Hold at OCV for one hour. 3/13/92

	Keithley	ESC 440	DAC
	-365 mV	-366 mV	-365 mV → there are wrong channel w/readouts in
	-673 mV	-676 mV	-671 mV

④ E corr at 60 min. -731 mV vs SCE
⑤ Test Temp 95°C
⑥ Applied initial potential +100 mV vs SCE
⑦ Initial Time 3600 secs
⑧ Initial pH 8.01 Final pH 9.28
⑨ Immersed area ≥ 7.00 cm^2 ℓ = 3.368 ϕ = .632 cm
⑩ Final E +59 mV vs SCE

Stored on PPPT #2

The current remained low at an applied potential of 100 mV for 54.15 hours. Then a sudden increase in current resulted in potential drop to 59 mV.

Walter J. Mackowski
3/13/92

Pitting Protection Potential of Inc 825 (HH4371FC)

P3TIN046.DAT

Purpose: Same as P3TSS040, except on INC 825.

Set-Up: Same as P3TSS040.

Solution: Used same solution as P3TSS045.

① Initial Wt: 11.6352 g Final wt. 11.5997 g
② Deaerate one hour before immersion (N_2).
③ Hold at OCV for one hour.

Keithley	ESC 440	DMC
-364 mV	-365 mV	-363 mV

④ E corr at 60 min. -416 mV vs SCE

Bubble in Luggin probe caused I to go cathodic. Bubble was removed + test restarted.
New Bubble formed — spec changed due to pit growth. New Wt; = 11.6060
⑪ New OCV w/new spec. -445 mV
⑫ Test Temp 95°C
⑥ Applied initial Potential +500 mV vs SCE
⑦ Initial Time 3600 secs
⑧ Initial pH 8.01 Final pH 9.17
⑨ Immersed area ≅ 7.75 cm^2 ℓ = 3.933 cm, ϕ = .63 Hex
⑩ Final E ⇒ stayed at +500 mV then dropped rapidly to -1.6 V due to either bubble in probe or low electrolyte level in reference electrode. Test was terminated.

Stored on PPT #2

Potential stayed at 490-500 mV for 127.5 hours with c.d. of 1×10^{-7} A/cm^2 approx. Then small increases in c.d. pushed potential down to very cathodic values.

— N. Laycock 3/20/92

Walter J. Mackerle
3/13/92

Pitting Potential of Inc 825 (HH4371FC)

P3TIN047

Purpose: Same as P3TIN046.DAT

Set-Up: Same as P3TSS040.

Solution: To 1-liter of 17 MΩ water in a 2-L volumetric add 3.2932 g of NaCl and 0.3429 g Na_2HPO_4 (same lot #'s as p. 72). Pipet 20.0 ml of Na_2 stock, 40.0 ml of SO_4 stock and 4.0 ml of F stock solution (same lot #'s as p. 72) dilute to the mark.

① Initial Wt. 11.5683 g Final Wt. 11.5476 g
② deaerate w/N_2 for one hour before immersion.
③ Hold at OCV for one hour.
④ E corr at 60 min -662 mV vs SCE
⑤ Test Temp 95°C
⑥ Applied initial E +700 mV vs SCE
⑦ Initial Time 600 secs
⑧ Initial pH 8.05 Final pH 8.98 w/mechanical 3/12/92
⑨ Immersed area ≅ 8.102 cm^2 ℓ = 4.5417 ϕ = .633 cm 3.916 cm
⑩ Final E = -20 Volts

Test propably not valid due to bubbles in probe and erratic current control.

Stored on PPT # 2

Potential stayed at 0.145 V for 47.8 hours with c.d. of about 10^{-7} A/cm^2. Then c.d. increased forcing potential decrease.

N. Laycock
3/20/92

Walter J. Mackerle
3/17/92

Pitting Potential of Inc 825 (HH 4371 PC)

P3TIN048

Purpose: Same as P3TIN046.DAT.

Set-up: Same as P3TIN047

Solution: Used same solution as P3TIN047.

① Initial Wt. 11.6051 g Final Wt. 11.6650
② Deaerate w/N_2 for one hour before immersion.
③ Hold at OCV for one hour.
④ $\bar{E}$ corr at 60 min −125 mV vs SCE
⑤ Test temp 95°C
⑥ Applied initial E +600 mV vs SCE
⑦ Initial Time 3600 secs.
⑧ Initial pH 8.05 Final pH
⑨ Immersed area = 9.301 cm^2 ℓ = 4.518 cm ϕ = .635
⑩ Final E ~~+1.0 Volts~~ +358 mV vs SCE
at Pmaclaughlin 3/16/92

Stored on PPPT #2

Walter J. Mochnacki
3/17/92

Pitting Potential of Inc 825 (HH 4371FC)

P3TIN049

Purpose: Re-run of P3TIN047

Set-up: Same as P3TIN047

Solution: Prepared 2-liter as on p. 77 using same lot # chemicals and solutions. Actual salt weights were 3.2936 g NaCl and 0.2446 g $NaHCl_2$

① Initial Wt. not taken
② Deaerate w/N_2 for one hour
③ Hold at OCV for one hour
④ $\bar{E}$ corr at 60 min. −533 mV vs SCE

Keithley	ESC440	DAC
−483 mV	−484	−483

⑤ Test temp 95°C
⑥ Applied initial E +700 mV vs SCE
⑦ Initial Time 600 secs.
⑧ Initial pH 8.03 Final pH not taken

Test terminated early due to excessive fluid loss.

Stored in PPPT #2

Walter J Mochnacki
3/19/92

Pitting Potential of Inc 825 (HH 4371FC)

P3TIN050

Purpose: Re-run of P3TIN048

Set-up: Same as P3TIN047

Solution: Used same solution as P3TIN049

① Initial WT. not taken
② Deaerate w/N_2 for one hour
③ Hold at OCV for one hour
④ $\bar{E}$ corr at 60 min -445 mV vs SCE

Keithley	ESC440	DAC
-444mV	-446	-441

⑤ Test temp 95°C
⑥ Applied initial $\bar{E}$ +600mV vs SCE
⑦ Initial time 3600 secs.
⑧ Initial pH 8.03 Final pH not taken

Test terminated early due to excessive fluid loss.

Stored in PPPT # 2

Walter J. Mackowski

Pitting Potential of Inc 825 (HH 4371FC)

P3TIN051

Purpose: Re-run of P3TIN047

Set-up: Same as P3TIN047

Solution: Prepared 2-liters as on p.77 using same lot # chemicals and solutions. Actual salt weights were 3.2406g NaCl and 0.2450g $NaHCO_3$.

① Initial WT. 11.6115g Final WT. 11.5837g
② Deaerate w/N_2 for one hour.
③ Hold at OCV for one hour.
④ $\bar{E}$ corr at 60 min -467mV vs SCE

Keithley	ESC440	DAC
-464mV	-467	-464

⑤ Test Temp 95°C
⑥ Applied initial $\bar{E}$ +700mV
⑦ Initial time 600 secs
⑧ Initial pH 8.07 Final pH 9.18
⑨ Immersed area = 8.06 cm^2 ℓ=3.889 ϕ=1.634cm

Test stopped early due to excessive noise in potential sensing circuit.

Stored on disk PPPT # 2.

Walter J. Mackowski
3/23/95

Pitting Potential of Inc 825 (HH4371FC)

P3TIN052

Purpose: Rerun of P3TIN048

Set-Up: Same as P3TIN047

Solution: Used same solution as P3TIN051.

① Initial Wt. 11.6093 g Final Wt. 11.6045 g
② Deaerate w/N_2 for one hour
③ Hold at OCV for one hour.
④ $\bar{E}$ corr at 60 min -608 mV vs SCE

Keithley	ESC440	DAC
-608mV	-608	-605

⑤ Test Temp 95°C
⑥ Applied initial $\bar{E}$ +600 mV vs SCE
⑦ Initial time 3600 hrs.
⑧ Initial pH 8.07 Final pH 9.26
⑨ Immersed area ≅ 7.166 cm^2 $\ell = 7.455$ cm $\phi = .633$ cm
3.696 cm adjusted 3/25/92

Test stopped overnight due to excessive fluid loss.

Stored on disk PDOT #2

Walter J. Mackowski
3/23/92

Pitting Potential of Inc 825 (HH4371FC)

P3TIN053 w2 machined 3/24/92

Purpose: Rerun of ~~P3TIN044~~ P3TIN047

Set-Up: Same as P3TIN047

Solution: To 500 ml of 17 MΩ water in a 1-liter volumetric add 1.6449 g NaCl and 0.1233 g of $NaNO_3$. Pipet 2.0 ml of F stock, 10.0 ml of NO_3 stock and 20.0 ml of SO4 stock solutions (chemicals + solutions are same lot #'s as p.72), dilute to the mark.

① Initial Wt. 11.6115 g Final Wt. 11.5713 g
② Deaerate w/N_2 for one hour.
③ Hold at OCV for one hour
④ $\bar{E}$ corr at 60 min

Keithley	ESC440	DAC
+697	+695	+704

⑤ Test temp 95°C
⑥ Initial applied $\bar{E}$ +700 mV vs SCE
⑦ Initial time 600 secs
⑧ Initial pH 8.00 Final pH 9.21
⑨ Immersed area ≅ 7.94 cm^2 $\ell = 3.848$ $\phi = .631$ cm

Test was re-initiated on same specimen w/out removing or repolishing. Specimen had probably repassivated by the time restart occurred.

Stored on disk PDOT #2

Walter J. Mackowski
3/30/92

Pitting Potential of Inc 825 (HH4371FC)

P3TIN054

Purpose: Rerun of P3TIN047

Set-up: Same as P3TIN047

Solution: Prepared as on p. 72 from same stock # chemicals + solutions. Actual salt weights were 1.6468 g NaCl and 0.1225 g $NaHCO_3$.

① Initial wt. 11.5889 g Final wt. 11.5516 g
② Deaerate w/N_2 for one hour.
③ Hold at OCV for one hour.
④ E corr at 60 min.

Keithley	ESC	DAC
-168mV	-170	-175

⑤ Test temp 95°C
⑥ Initial applied E +700mV vs SCE
⑦ Initial time 600 secs
⑧ Initial pH 8.00 Final pH 9.28
⑨ Immersed area ≅ 8.32 cm^2 ℓ = 4.037 cm, ϕ = .631 cm

Stored on disk IIIT #3

Walter J. Mackowiak
3/30/92

Repassivation Potential on Crevice 316LSS (P80746)

CRREP01

Purpose: To gather data on repassivation potential on a crevice specimen.

Set-up: Crevice specimen were machined at SwRI. Crevices were obtained by mounting slotted discs against the flat surfaces of the specimen using C-276 nuts + bolts torqued to 50 in-lbs in -lb w/ Torque wrench Type Proto P-60; ser # A-90689, cal'd 2-14-92 due 8-14-92. The tightening bolt was electrically insulated from the specimen w/ polypropylene sleeve and TFE tape wrapping. The flat surfaces on which the crevices were made were wet polished w/ 600 grit paper. Used program CREVICE.WBB which is the same program as REPASS2.WBB.

Solution: Prepared as on p. 77 (as marked 3/24/92) from same lot # chemicals and solutions. Actual salt wts were 3.2930 g NaCl and 0.2444 g $NaHCO_3$.

① Initial wt. 35.0513 g Final wt. 35.0373 g
② deaerate w/N_2 for one hour
③ Hold at O.C. for one hour E corr @ 60 min -358mV

Keithley	ESC	DAC
-346mV	-347	-338

④ Test temp 95°C
⑤ Initial applied E +100 mV vs SCE
⑥ Initial time 3600 secs.
⑦ Initial pH 8.01 Final pH 6.67
⑧ Final E +97mV

Stored on disc "crevice #1"

Bulk of specimen not attacked. 21 "sectors" showed localized attack. Most of it shallow and spread out. In about 5 sectors deeper pits were forming. Mounted area free of attack.

Walter J. Mackowiak
4/17/92

Repassivation Potential on Crevices 316L SS (P80746).

CRREP02
Purpose: Same as CRREP01

Set-Up: Same as on p. 85.

Solution: Used same solution as CRREP01.

① Initial Wt. 35.1634 g Final Wt. 35.1585 g
② Deaerate w/N_2 for one hour
③ Hold at O.C. for one hour $\bar{E}$ corr @ 60 min -316 mV

Kirkby	ESC	DAC
-339	-340	-357

④ Test temp 95°C
⑤ Initial applied E +200 mV vs SCE
⑥ Initial time 3600 secs
⑦ Initial pH 8.01 Final pH 3.18
⑧ Final E +78 mV

Stored on Crevice #1

Faces of specimen were reddish-brown, but segments where ceramic formed crevices was still metallic. One sector had shallow, broad local attack. One other sector had a small but deeper pit. Mounted area free of attack.

Walter J. Mackowski
4/17/92

Repassivation Potential on Crevices 316L SS (P80746)

CRREP03
Purpose: Same as CRREP01

Set-Up: Same as p. 85. One difference is all faces of specimen polished to 600 grit and all non-crevice faces passivated w/nitric acid.

Solution: Prepared as on p. 27 from same batch chemicals and solutions. Actual salt wts. 3.2922 g NaCl + 0.2424 g $NaHCO_3$.

① Initial Wt. 34.8896 g Final Wt. 34.8816 g
② Deaerate w/N_2 for one hour
③ Hold at O.C for 1 hour $\bar{E}$ corr at 60 min -321 mV vs SCE

Kirk	ESC	DAC
-593	-594	-590

④ Test temp 95°C
⑤ Initial applied E +200 mV vs SCE
⑥ Initial time 7200 secs
⑦ Initial pH 8.03
⑧ Final E +58 mV

Stored on Crevice #1

Some mottled reddish-brown stains on surfaces. Some shallow, broad, localized attack in 17 sectors, most of it nearer the edges. Some areas of similar local attack (shallow) and some pits evident on non-creviced faces of specimen. Mounted area free of attack.

Walter J. Mackowski
4/23/92

Repassivation Potential on Crevices Inc 825 (Ht HH4371FC)

CRREP04

Purpose: Same as CRREP01

Set-Up: Same as p. 85.

Solution: Used same solution as CRREP03

① Initial Wt. 35.0820g Final Wt. 35.0602g
② Deaerate w/N_2 for one hour.
③ Hold at O.C. for one hour $\bar{E}$ corr @ 60min -5mV

Keithley	ESC	DAC
-211mV	-209	-210

④ Test Temp. 95°C 500 mV 10/15/92
⑤ Initial applied E +450mV vs SCE
⑥ Initial time ~~7200~~ 3600 secs. 10/15/92
⑦ Initial pH 8.01 Final pH 9.23
⑧ Final E +158mV

Stored on Crevice #1

Some brown-red stain around crevices areas and at mounting hole. 14 sectors show broad, shallow attack filling most of the sector area. Some crevice attack with one rather deep spot around mounting hole. Rest of specimen free of localized attack.

Walter J. Mecklowski
4/23/93

Repassivation Potential on Crevices Inc 825 (Ht HH4371FC)

CRREP05

Purpose: Same as CRREP01.

Set-Up: Same as p. 85. Also, the nut holding the specimen against the specimen holding rod was tightened to a controlled torque, which was 40oz-in.

Solution: Prepared 2-liters as on p. 77 from same lot # chemicals and solutions. Actual salt weights were 3.2958g NaCl and 0.2432g $NaHCO_3$.

① Initial Wt. 35.2385g Final wt. 35.19734g
② Deaerate w/N_2 for one hour $\bar{E}$ corr at 60min -513mV
③ Hold at O.C. for one hour

Keithley	ESC	DAC
-503mV	-504	-506

④ Test temp 95°C
⑤ Initial applied E +500mV vs SCE
⑥ Initial time 7200 secs
⑦ Initial pH 8.00 Final pH 9.22
⑧ Final E +46mV

Stored on Crevice #1

Some reddish-brown stain around crevices areas and at mounting hole. 19 sectors show broad, shallow attack, in most cases filling the entire affected sector. Crevice attack around mount, one fairly large and deep spot. A few minor pits forming at other places on non-crevices surfaces.

Walter J. Mecklowski
4/23/93

Repassivation Potential on Crevices Inc 825 (Lot # HH4371FC)

CRREP06

Purpose: Same as CRREP01.

Set-Up: As described on p. 89.

Solution: Used same solution as CRREP05.

① Initial Wt. 35.4833 g Final Wt. 35.4706 g
② Deaerate w/ N_2 for one hour
③ Hold at O.C. one hour E_{corr} @ 60 min -597 mV
④

Kethley	ESC	DAC
-579 mV	-581	-582

⑤ Test Temp 95°C
⑥ Initial applied E +450 mV vs SCE
⑦ Initial time 3600 secs
⑧ Initial pH 8.00 Final pH 9.27
⑨ Final E +217 mV

Stored on Crevice #1

Reddish-brown staining around crevice sectors. 14 sectors have broad, shallow attack filling the entire sector (in most cases). No attack around mount. Rest of specimen free from attack.

Walter J. Mackowski
4/23/92

Repassivation Potential on Crevices Inc 825 (Lot # HH4371FC)

CRREP07

Purpose: Same as CRREP01.

Set-Up: As described on p. 89.

Solution: Prepared 2-liters as on p. 77 from same lot # chemicals and solutions. Actual salt weights were 3.2957 g NaCl and 0.2460 g $NaHCO_3$.

① Initial Wt. 35.3263 g Final Wt. 35.1974 g
② Deaerate w/ N_2 for one hour
③ Hold at O.C. for one hour E_{corr} @ 60 min -555 mV

Kethley	ESC	DAC
-469 mV	-470	-469

④ Test Temp 95°C
⑤ Initial applied E +500 mV vs SCE
⑥ Initial time 600 secs
⑦ Initial pH 8.02 Final pH 8.98
⑧ Final E +36 mV

(Potential stayed at 106 mV for a while for dipped possibly due to noise spike.)

Stored on Crevice #1

Very little reddish-brown staining, most of it around the mounting hole. 21 sectors had broad, shallow attack. In most cases it filled all or most of the sector area. Moderate crevice attack around the mount. Rest of specimen free from attack.

Walter J. Mackowski
4/27/92

Repassivation Potential on Creviced Inc 825 (HH4371FC)

CRREP08

Purpose: Same as CRREP01.

Set-Up: As described on p. 89.

Solution: Used same solution as CRREP07.

① Initial Wt. 35.1839 g Final Wt. 35.1412 g
② deaerate w/N_2 for one hour
③ Hold at O.C. one hour $\bar{E}$ corr @ 60 min -511 mV

Keithley	ESC	DAC
-560 mV	-561	-560

④ Test Temp 95°C
⑤ Initial applied E +450 mV vs SCE
⑥ Initial time 14,400 secs
⑦ Initial pH 8.02 Final pH 9.28
⑧ Final E +59 mV

Stored on Crevice #1

Small amount of reddish-brown stain around crevice sectors. 15 sectors had broad, shallow attack usually filling most of the sector area. No crevice attack on any attach at mounting hole. No attach on other specimen surfaces.

Walter J. Mochowski
4/27/92

Repassivation Potential on Creviced Inc 825 (HH4371FC)

CRREP09

Purpose: Same as CRREP01.

Set-Up: As described on p. 89.

Solution: Prepared 1-liter as described on p. 83 from same chemical + solution lot #'s. Actual salt weights were 1.6464 g NaCl and 0.1215 g $NaHCO_3$.

① Initial Wt. 35.3318 g Final Wt. 35.3312 g
② deaerate w/N_2 for one hour.
③ Hold at O.C. one hour $\bar{E}$ corr @ 60 min -294 mV

Keithley	ESC	DAC
-488 mV	-490	-489

④ Test Temp. 95°C
⑤ Initial applied E +350 mV vs SCE
⑥ Initial time 3600 secs
⑦ Initial pH 7.99 Final pH 8.99
⑧ Final E +189 mV

Stored on Crevice #1
Cell had excessive ~~ev~~ evaporation.
agm 4/27/92

Small amount of reddish-brown stain around crevice sectors. 3 sectors show broad, shallow attach. One sector full, other 2 sector spotty. No attach at mounting hole. No attach on other surfaces.

Walter J. Mochowski
4/27/92

Repassivation Potential on Crevices 316L SS (Lot. P80746)

CRREP10

Purpose: Same as CRREP01

Set-Up: As described on p. 89.

Solution: Prepared 2-liters as on p. 77 from same lot # chemicals + solutions. Actual salt weights were 3.2930g NaCl and 0.2439g $NaHCO_3$.

① Initial wt. 34.7115g Final wt. 34.7047g 11/28/92 a/m.
② Deaerate w/N_2 for one hour −531mV
③ Hold at O.C. one hour E corr @ 60 min. −696mV

Keithley	ESC	DAC
−602mV	−603	−602

④ Temp 95°C
⑤ Initial applied E +150mV vs SCE
⑥ Initial time 600 secs.
⑦ Initial pH 8.00 Final pH 9.00
⑧ Final E −33mV

Stored on Crevice #1

Some Blueish-brown staining. Small and shallow local attack in 10 sectors. Moderately deep crevice attack at mounting hole.

Current was quite low at +0.036V.

Walter J. Mackowski
5/1/93

Repassivation Potential on Crevices 316L SS (Lot. P80746)

CRREP11

Purpose: Same as CRREP01.

Set-Up: As described on p. 89.

Solution: Used same solution as CRREP10.

① Initial wt. 34.8324g Final wt. 34.8279g
② Deaerate w/N_2 for one hour
③ Hold at O.C. one hour E corr @ 60 min. −696mV

Keithley	ESC	DAC
−607mV	−608	−607

④ Temp 95°C
⑤ Initial applied E +150mV vs SCE
⑥ Initial time 14,400 secs.
⑦ Initial pH 8.00 Final pH 9.20
⑧ Final E +18mV dropped to −51mV probably due to evaps.

Stored on Crevice #1

Some Blueish-brown staining. Very small + shallow attack in 7 sectors. Moderately deep attack around the mounting hole.

Walter J. Mackowski
5/1/93

Repassivation Potential on Crevices 316L SS (Lot P80746)

CRREP 12

Purpose: Same as CRREP01

Set-Up: As described on p. 89.

Solution: Prepare 2 liters as on p. 77 from same lot # chemicals and solutions. Actual Salt weights were 3.2929 g NaCl and 0.2451 g $NaHCO_3$.

① Initial Wt. 34.7615 g Final Wt. 34.7501 g
② Deaerate one hour w/ N_2 E corr @ 60 min -732 mV
③ Hold at O.C. one hour

Keithly	ESC	DAC
-665 mV	-666	-664

④ Temp 95°C
⑤ Initial applied E +150 mV vs SCE
⑥ Initial time 3600 secs
⑦ Initial pH 2.92 Final pH 9.18

Stored on crevice #1.

Same staining of bluish-brown colors. Very small spots of local attack in 7 sectors. Moderately deep attack around the mounting hole.

Walter J. Mackowski
5/15/92

Repassivation Potential on Crevices 316L SS (Lot P80746)

CRREP 13

Purpose: Same as CRREP01.

Set-Up: As described on p. 89.

Solution: Used same solution as CRREP12.

① Initial Wt. 34.9296 g Final Wt. 34.9249 g
② Deaerate one hour w/ N_2 E corr @ 60 min -516 mV
③ Hold at O.C. one hour

Keithly	ESC	DAC
-353 mV	-355	-347

④ Temp 95°C
⑤ Initial applied E +150 mV vs SCE
⑥ Initial time 7200 secs.
⑦ Initial pH 7.92 Final pH 9.24

Stored on Crevice #1

Very little staining. Very small spots of localized attack in 7 sectors. Some attack around mounting hole, but much less than previously seen, only about 30% of circumference is affected.

Walter J. Mackowski
5/15/92

Preparation of SO_4 Stock Solution

Purpose: Solution to be used for preparation of test solutions.

Prep: To 500 ml of 17 MΩ water in a 1-L volumetric flask add 1.4786 g of Na_2SO_4 (Fisher lot # 901213). Dilute to the mark.

Label as SV CWARA 025-98

Walter J. Mlechoorski
5/4/95

CRREP 14

Purpose: Same as CRREP01, but using a Teflon crevice washer instead to see if crevice growth intensifies.

Set-Up: As described on p. 89, except that Teflon crevice washers were used and torqued to 11 inch-pounds.

Solution: One liter was prepared by adding 1.6463 g NaCl and 0.1236 g $NaHCO_3$ (Fisher lot #'s 885407 and 897789 resp.) Pipet 2.0 ml of F stock, 10.0 ml of NO_3 stock, and 20.0 ml of SO_4 stock solutions (Lot #'s 019-191, 025-66 and 025-98). These were added to 500 ml of 17 MΩ water in a 1-L volumetric and diluted to volume.

① Initial Wt. 34.8608 g Final Wt. 34.8629 g ?
② Deaerate w/ N_2 for one hour E corr @ 60 min
③ Hold at O.C. for one hour

Kinetics	ESC	DAC
-485 mV	-487	-483

④ Temp 95°C
⑤ Initial applied E +150 mV vs SCE
⑥ Initial time 3600 secs
⑦ Initial pH 7.96 Final pH 9.13

Stored on Crevice #1

Brown staining around circumference (outer) of TFE washer. Localized attack in 13 sectors, in many cases filling the entire sector area. 3 spots of shallow attack at mounting hole, again not affecting entire circumference + less severe than previously recorded.

Walter J. Mlechoorski
5/15/95

Pitting Protection Potential Test on IAC 825 (H#4371FC)

P3TIN055.DAT

Purpose: To assess growth rate of pits by initiation above pitting potential for a short time, and then holding at a secondary potential at which pits would grow but not initiate for a set time, and then allowing potential to decrease until the repassivation potential is passed.

Set-Up: All hardware was set-up as described on p. 35. The ~~PASS2.WBQ~~ program (p. 61) was used, although manual input of the potential parameters was used to apply the initial and secondary potentials.

Solution: Prepared 2 liters as on p. 77, but using lot #s listed on p. 99. Actual salt weights were 3.2932 g NaCl and 0.3440 g $NaHCO_3$.

① Initial Wt. 11.7164 g Final Wt. 11.7105 g
② Deaerate w/ N_2 for one hour E corr @ 60 min -389 mV
③ Hold at O.C. for one hour

Kelly	ETC	DAC
-392	-392	-389

④ Temp. 95°C
⑤ Initial E +600 mV vs SCE for 5 minutes
Secondary E +400 " " for ~~two~~ hours after machine 5/22/92

⑥ Initial pH 8.02 Final pH 9.39

Stored on PPDT #2.

Walter J. Mackowski
5/21/92

Pitting Protection Potential on Inc 825 (H#4371FC)

P3TIN056.DAT

Purpose: Same as P3TIN055

Set-Up: Same as p. 100

Solution: Prepare 2 liters. To 1-liter on 17 MΩ water in a 2-L volumetric add 3.2279 g NaCl and 0.3446 g $NaHCO_3$ and 2.9578 g Na_2SO_4 (Fisher lot #'s 685407, 897389 + 901213 resp.). Pipet 4.0 ml of Estock, 20.0 ml of NO_3 stock solution (lot #'s on p. 99). Dilute to the mark.

① Initial Wt. 11.7142 g Final Wt. 11.7019 g
② Deaerate w/ N_2 for one hour
③ Hold at O.C. for one hour E corr @ 60 min -491 mV

Kelly	ETC	DAC
-494	-493	-491

④ Temp. 95°C
⑤ Initial E +800 mV for ~~two~~ 7 minutes
Secondary E +400 mV for ~~one~~ two hours
w/ machine 5/22/92

⑥ Initial pH 8.05 Final pH 9.27

Stored on PPDT #2.

Walter J. Mackowski
5/21/92

Pitting Protection Potential Test on Inc 825 (HH437IFC)

P3TIN057.DAT

Purpose: Same as P3TIN055

Set-Up: Same as p.100

Solution: Used same solution as P3TIN055

① Initial Wt. 11.6817 g Final Wt. 11.6665 g
② Deaerate w/Ar for one hour
③ Hold at O.C. for one hour E corr @ 60min -590mV

Keithley	E3C	DAC
-594	-594	-598

④ Temp 95°C
⑤ Initial E +600mV for 5 min
Secondary E +400 mV for 6 hours

⑥ Initial pH 8.00 Final pH 9.62

Stored on PPPT #2

Walter J. Machorski
5/22/92

Pitting Protection Potential Test on Inc 825 (HH437IFC)

P3TIN058.DAT

Purpose: Same as P3TIN055

Set-Up: Same as p.100

Solution: Used same solution as P3TIN056.

① Initial Wt. 11.6832 g Final Wt. 11.6518 g
② Deaerate w/Ar for one hour
③ Hold at O.C. for one hour E corr @ -532mV

Keithley	E3C	DAC
-534	-534	-532

④ Temp 95°C
⑤ Initial E +800 mV for 5 minute
Secondary E +400 mV for 6 hours

⑥ Initial pH 8.06 Final pH 9.27

Stored on PPPT #2

Walter J. Machorski
5/22/92

Pitting Protection Potential Test on 316L SS (Lot #80746)

P3TSS059.DAT

Purpose: Same as P3TIN065.

Set-Up: Same as p. 100

Solution: Prepared 2 liter by adding 3.3941 g NaCl and 0.2447 g $NaHCO_3$ (same lot #'s as p. 99) to 1 liter of 17 MΩ water in a 2-L volumetric. Pipet 4.0 ml of F stock, 40.0 ml of SO_4 stock, and 20.0 ml of NO_3 stock solutions (same lot #'s as p. 99). Dilute to the mark.

① Initial Wt. 11.3159 g Final Wt. 11.2966 g
② Deaerate w/N_2 for one hour
③ Hold at O.C. for one hour E_{corr} @ 60 min −624 mV

Keithley	ESC	DAC
−20 mV	−22	−21

④ Temp 95°C +300 mV 6/18/92 Machowski
⑤ Initial E ~~+300 mV~~ vs SCE for 5 minutes
Secondary E ~~+200 mV~~ 100 mV for 1 hour
⑥ Initial pH 8.02 Final pH 9.08

Stored on ~~POPT #2~~. Disc ran out of space - data did not transfer
Stored on Repass. Pot. Data Disk #3

After 5 min at 300 mV, potential was dropped to 100 mV. c.d. remained at ≈ 1×10^{-6} A/cm². Even a brief increase to 200 mV did not cause renewed pitting. Then potential was dropped to 100 mV + no c.d. increase was observed for 63.9 hours.

Walter J. Machowski
6/8/92

Pitting Protection Potential Test on 316L SS (Lot #80746)

P3TSS060.DAT

Purpose: Same as P3TIN055.

Set-Up: Same as p. 100.

Solution: To 1 liter of 17 MΩ water in a 2-L volumetric add 3.3948 g NaCl, 2.4560 g Na_2SO_4 and 0.2448 g $NaHCO_3$ (same lot #'s as p. 101). Pipet 4.0 ml of F stock and 20.0 ml of NO_3 stock solution (lot #'s on p. 99). Dilute to the mark.

① Initial wt. 11.3066 g Final Wt. 11.2956 g
② Deaerate w/N_2 for one hour.
③ Hold at O.C. for one hour E_{corr} @ 60 min −671 mV

Keithley	ESC	DAC
−226 mV	−226	−226

④ Temp 95°C
⑤ Initial E +300 mV for 5 minutes
Secondary E +100 mV " 1 hour
⑥ Initial pH 8.01 Final pH 8.61

Stored on ~~POPT #2~~. Disc ran out of space - data did not transfer.
Stored on Repass. Pot. Data Disk #3

After 5 min at 300 mV, potential decreased to +100 mV. c.d. remained low at ≈ 1×10^{-6} A/cm² for 2.57 hours. Then potential increased to +150 mV for 1 hour. The potential was then decreased in 30 min steps. The new repassivation potential was 69 mV for ~~the threshold c.d. was set~~ 18.53 hours. Then, for some reason, c.d. increased beyond threshold & the potential was decreased again to −1 mV for 5.5 hours, then decreased in steps to −74 mV. It stayed here for 39 hours.

Walter J. Machowski
6/8/92

Pitting Protection Potential Tests on 316L SS (Lot # P80746)

P3TSS061.DAT
Purpose: Same as P3TIN055

Set-Up: Same as p.100.

Solution: Used same solution as P3TSS059.

① Initial Wt. 11.2793 g Final Wt. 11.2534 g
② Deaerate w/N_2 for one hour
③ Hold at O.C. for one hour E corr @ 60 min -747 mV

Keithley	ESC	DAC
-727 mV	-725	-725

④ Temp 95°C
⑤ Initial E +300 mV for 5 minutes
Secondary E +200 mV for 6 hours

⑥ Initial pH 8.03 Final pH 9.08

Stored on ~~P3PT#2~~. Disc ran out of space - data did not transfer.
Stored on Repass. Pot. Data Disk #3

C.d. stayed low at +36 mV for 64.3 hours. At this time, a small increase in current (this must have been for less than 3 mS since it did not log in) resulted in reduction of potential to +26 mV at which it stayed for 15.6 hours.

Walter J. Mackowski
6/8/93

Pitting Protection Potential Tests on 316LSS (Lot # P80746)

P3TSS062.DAT
Purpose: Same as P3TIN055.

Set-Up: Same as p.100.

Solution: Used same solution as p3TIN060.

① Initial Wt. 11.3318 g Final Wt. 11.2807 g
② Deaerate w/N_2 for one hour
③ Hold at O.C. for one hour E corr @ 60 min -700 mV

Keithley	ESC	DAC
-681 mV	-679	-678

④ Temp 95°C
⑤ Initial E +300 mV for 5 minutes
Secondary E +100 mV for 6 hours

⑥ Initial pH 8.04 Final pH 9.19

Stored on Repass. Pot. Data Disk #3.

At 100 mV, the c.d. decreased over a period of time to very low & then to cathodic value. Time at 100 mV was Total of 22.5 hours. c.d. decreased below 1×10^{-6} A/cm² after 1.33 hours.

Walter J. Mackowski
6/8/93

Pitting Protection Potential Test on Heat C-22

P3T22063.DAT

Purpose: Same as P3TIN055.

Set-Up: Same as p.100

Solution: To 500ml of 17MΩ water in a 1-L volumetric add 16.4610 g of NaCl (Fisher Lot # 685407). Dilute to the mark.

① Initial Wt. 12.2655 g Final Wt. 12.1283 g
② Deaerate w/N₂ for one hour.
③ Hold @ O.C. for one hour E corr @ 60 min -414 mV

Keithley	SCE	DSC
-449 mV	-450	-447

④ Temp 95°C

⑤ Initial E +700 mV (see note)

⑥ Initial pH 5.72 Final pH 5.39

Note: Upon applying the initial potential of +700 mV, it was noted that the C.D. kept slowly decreasing. It was decided to let it stay at +700 mV for a few days and not go thru a potential decrementation since no localized attack was being initiated. The specimen was turning a golden yellow for the first day or two, which had become a very dark, almost black by the end of the experiment.

Stored on Repass. Pot. Lab. Rack #3.

Walter J. Mackowski
6/16/95

Pitting Protection Potential Test on 316LSS (Lot. P80746)

P3TSS064.DAT

Purpose: Re-run of P3TSS059.

Set up: Same as p. 100.

Solution: Prepared 1-liter. To 500ml of 17MΩ water in a 1-L volumetric add 1.6460 g NaCl and 0.1226 g Na_2WO_4 (same lot #'s as p 99). Pipet 2.0 ml of F stock, 200 ml of Cl stock and 10.0 ml of NO_3 stock solution. (same lot #'s as p. 99). Dilute to the mark.

① Initial Wt. 11.3967 g Final Wt. 11.2603 g
② Deaerate w/N_2 for one hour
③ Hold at O.C. for one hour E corr @ 60 min

Keithley	SSC	DSC
-765 mV	-765	-764

④ Temp 95°C
⑤ Initial E +300 mV (see note)
Secondary E +200 mV for 1 hour
⑥ Initial pH 8.03 Final pH 9.07

Note: Due to selection of improper parameters, the initial potentials may have been at higher than +300 mV (maybe higher than 2.0V) for short periods of time. Also more than 5 minutes at initiating potential was incurred so that the pit initiation was more severe than planned.

Walter J. Mackowski
7/6/95

Repassivation Time experiments

Purpose: To determine the time and total charge taken by alloy 825 and 316LSS to repassivate after pits have been initiated and allowed to grow for a specified length of time. The Program: Reptime.WBB is documented below:

Repassivation Time on 316LSS (Lot P80746)

REPTIME1

Purpose: To determine repassivation time.

Set-Up: As described on p. 35. Reptime.WBB was used.

Solution: 2-liters was prepared by adding 3.3932g of NaCl (Fisher Lot # 913219) and 0.344g Na_2WO_4 (Fisher Lot # 897789) to 1 liter of 17MΩ water in a two liter volumetric. Pipet 40.0 of 5M stock, 20.0 ml of WO_4 stock, and 4.0 ml of F stock solution (#025-98, 025-66 and 019-191 respectively), dilute to volume.
WJW 8/7/92

① Initial Wt. 11.3611g Final Wt. 11.2985g
② Deaerate w/N_2 for one hour.
③ Hold at 0.C. for one hr. Ecorr @ 60min -600mV vs SCE

Ketley	ESC	DAC
-617mV	-618mV	-611mV

④ Temp. 95°C
⑤ Initial E +300mV for 600 secs.
⑥ Secondary E +5mV
⑦ Initial pH 8.03 Final pH 8.65

Stored on disc REPTIME #1

Walter J. Mackowski
8/7/92

Repassivation Time of 316 CSS (Ht #80746)

REPTIME 2

Purpose: Same as REPTIME 1.

Set-Up: Same as p. 25. Used REPTIME.WBB.

Solution: Used same solution as REPTIM 1.

① Initial Wt. 11.3545 g Final Wt. 11.1850 g
② Deaerate w/N_2 for one hr
③ Hold at O.C. for one hour. E corr @ 60 min −585 mV

Keithley	ESC	DMC
−604	−605	−588

④ Temp. 95°C
⑤ Initial E +300 mV for 2,600 secs
⑥ Secondary E −5 mV

⑦ Initial pH 8.03 Final pH 9.22

Stored on REPTIME #1

Walter J. Machrowski
8/7/92

Repassivation Time of INC 825 (HH4371FC)

REPTIM 3

Purpose: Same as REPTIME 1.

Set-Up: Same as p. 25 Used REPTIME.WBB

Solution: To 1 liter of 17 MΩ water in a 1 liter volumetric add 3.2925 g NaCl and 0.345 g Na_2HPO_3 (same lot #'s as p 112) Pipet 40.0 ml of SO_4 stock, 20.0 ml of NO_3 stock and 4.0 ml of F stock solution (same lot #'s as p 112) Dilute to mark.

① Initial wt 11.6687 g Final wt. 11.3884 g
② Deaerate w/N_2 for one hr
③ Hold at O.C for one hr E corr @ 60 min −573 mV

Kettley	ESC	DMC
−541	−542	−534

④ Temp, 95°C
⑤ Initial E +600 mV for 1800 secs. ①
⑥ Secondary E +400 mV

⑦ Initial pH 8.05 Final pH 9.15

① Due to high currents, potentials were stepped down manually according to the following schedule
Initial: +600 mV
Step 1: +400 mV (until 8/8/92)
" 2: +325 " (until 8/9/92, 7:45 AM)
" 3: +250 " (until 8/9/92, 9:30 AM)
" 4: +150 " (until 8/10/92, 7:30 AM)
" 5: 0 mV until finish
Test solution very murky.

Stored on REPTIME #1.

Walt J. Machrowski
8/10/92

Repassivation Time of INC 825 (HH4371FC)

REPTIME 4

Purpose: Same as Reptime 1.

Set-Up: Same as p. 35. Used REPTIME.WBB.

Solution: Used same solution as REPTIME 3.

① Initial WT 11.6744 Final WT. 11.1817 g
② Deaerate w/N2 for one hr.
③ Hold at O.C. for one hr. Ecor @ 60 min -534 mV

Kathley	ESC	DAC
-576 mV	-578	-569

④ Temp. 95°C
⑤ Initial E +600 mV for 21,600 secs ①
⑥ Secondary E +350 mV
⑦ Initial pH 8.05 Final pH 9.02

① Due to high currents, potential was stepped down manually according to the following schedule:
Initial: +600 mV (6 hrs)
Step 1: +350 " (until 8/9/92)
" 2: +200 " (until 8/10/92 7:30 Am)
" 3: 0 " until finish.
Solution very murky w/ much corrosion product on specimen and at bottom of flask.

Stored on REPTIME #1

Walter J. Mackowski
8/10/92

Repassivation Time of INC 825 (HH4371FC)

REPTIME 5

Purpose: Same as REPTIME 1 Used REPTIME.WBB w/mod ②
② Modified to step down twice: First step down to an intermediate E to grow pits that have initiated and then step down again to an E where repassivation should occur. Vary the time of pit growth on first step-down in different experiments.

Set-Up As on p. 35.

Solution: Prepared 2 liter as on p. 111 from same chemical & solution lot #'s.

① Initial WT. 11.5917 g Final WT. 11.5665 g
② Deaerate w/N2 for one hour
③ Hold at O.C. for one hour Ecor @ 60 min -650 mV

Kathley	ESC	DAC
-509 mV	-511	-503

④ Temp. 95°C
⑤ Initial E +600 mV for 1800 secs
Second E +400 mV ~~for 3600 secs~~ ③ 8/24
Third E +100 mV until finish

No polarization done at 400 mV.

⑥ Initial pH 8.10 Final pH 9.25

Solution murky.

Stored on REPTIME #1

Walter J. Mackowski
8/14/92

Repassivation Time of INC 825 (HH4371FC)

REPTIME 6

Purpose: Same as REPTIME 1. Used mod'd REPTIME.WBB.

Set-up: Same as p. 25

Solution: Used same solution as REPTIME 5.

① Initial Wt. 11.5885 g Final Wt. 11.5606 g
② Deaerate w/ N_2 for one hour
③ Hold at O.C. for one hour E corr @ 60 min -443 mV

Ruthenium	ESC	DAC
-600 mV	-601	-592

④ Temp - 95°C
⑤ Initial E +600 mV for 1800 secs
Second E +400 mV for 21,600 secs
Third E +100 mV until finish

⑥ Initial pH 8.10 Final pH 9.35

Solution was murky.

Stored on REPTIME #1

Walter J. Machowski
8/14/92

Repassivation Time of INC 825 (HH4371FC)

REPTIME 7

Purpose: Same as REPTIME 1. Used mod'd REPTIME.WBB.

Set-up: Same as p. 25

Solution: Prepared two liters as on p. 111. Lot # of NaCl: Fisher 932649A. All other lot #'s the same. Actual salt weights 3.2930 g NaCl and 0.2448 g Na_2WO_4.

① Initial Wt. 11.5887 g Final Wt. 11.5312 g
② Deaerate w/ N_2 for one hour
③ Hold at O.C. for one hr. E corr @ 60 min. -456 mV vs SCE

Ruthenium	ESC	DAC
-444 mV	-443	-439

④ Temp 95°C
⑤ Initial E +600 mV for ½ hr.
Second E +400 mV for 12 hrs
Third E +150 mV until end.

⑥ Initial pH 8.03 Final pH 9.43

Solution was murky.

Stored on REPTIME # 2

Walter J. Machowski
8/27/92

Repassivation Time of INC 825 (HHV371FC)

REPTIME 8

Purpose: Same as REPTIME 1. Used mod'd REPTIME.WB1.

Set-up: As on p. 25.

Solution: Used same solution as REPTIME 7.

① Initial Wt. 11.3812 g Final Wt. 11.4820 g
② Deaerate w/ N_2 for one hr.
③ Hold at O.C. for one hr. E corr @ 60 min = -658 mV

Ktech	ESC	DAC
-616 mV	-618	-611

④ Temp 95°C
⑤ Initial E +600 mV for ½ hr.
Second E +400 mV for 18 hr.
Third E +150 mV until end.

⑥ Initial pH 8.03 Final pH 9.32

Solution was murky.

The current was quite high at 150 mV even after a long time (5 hrs). Large amount of corrosion product was present on the specimen. When the potential was reduced to 100 mV, no significant repassivation was seen for ~~24 hours~~ 2000 seconds. A glass rod was used to scrape the corrosion products gently. The current decreased immediately to 1.6×10^{-6} A/cm².

Stored on REPTIME # 2

Walter J. Mackowski
8/27/92

10/1/92

Preparation of stock solutions and Test solutions

Sulfate stock solution:

A 1000 ppm SO_4^{2-} stock solution was prepared by adding 1.4787 g of Na_2SO_4 to make 1 liter of solution in a volumetric flask. Actual weight was 1.4745 g. Lot. No. 901213 (Fisher). Stored in volumetric flask.

Nitrate stock solution

A 1000 ppm NO_3^- stock solution was prepared by adding 1.3763 g of $NaNO_3$, lot No. 897183 (Fisher) to make 1 liter of solution. Stored in volumetric flask.

Fluoride stock solution

A 1000 ppm ~~$FAlO_3$~~ F^- stock solution was prepared by adding 2.2102 g of ~~$NaNO_3$~~ NaF (lot No. 896405) to make 1 l of solution. This was stored in a polyethylene bottle.

Test solutions will be prepared using the above stock solutions.

N. Sridhar
10/1/92

10/1/92 **Preparation of Test Solution of 1000 ppm Cl^-**

0.2459
~~0.12198~~ g of $NaHCO_3$ (lot No. 897789) was added.

3.2958 g of NaCl (lot No. 922649A) was added

The salts were added to beaker, dissolved in nanopure water (17 MΩ), then poured in a 2-l volumetric flask.

Abs pipet 4 ml of F^- stock solution (p. 119)
Abs pipet 20 ml of NO_3^- stock solution (p. 119)
Abs pipet 40 ml of SO_4^{2-} stock solution (p. 119)

Make up total solution volume to 2 l.
Label + date flask.

N. Sridhar
10/1/92

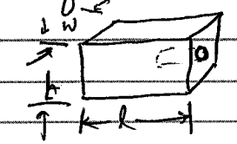
10/2/92 **825 Surf** — **1000 ppm Cl^-, 95°C**

Purpose: To investigate the effect of surface Cr depletion on localized corrosion of alloy 825 using cyclic polarization test technique.

Material: Alloy 825, Heat HH4371FC, 0.5" plate
Solution: Prepared as shown on p. 120.

Test: Same procedure as TOP-008. The verification test (ASTM G-61) was conducted in a previous series by Donald Pile (depassivation Tests). Hence it was not conducted again. The only difference was the surface preparation. Two surfaces were left in the as-mill finished condition. All the other surfaces were polished to 600-grit finish. Specimen was washed, degreased in acetone & dried before placing in cell. PAR 173/276 was used along with M342C software.

Parameters: Surface Area: length: 0.683 in
width: 0.528 in
~~Thickness~~ Thickness: 0.483 in.
Area: 12.2 cm^2 (neglecting hole)

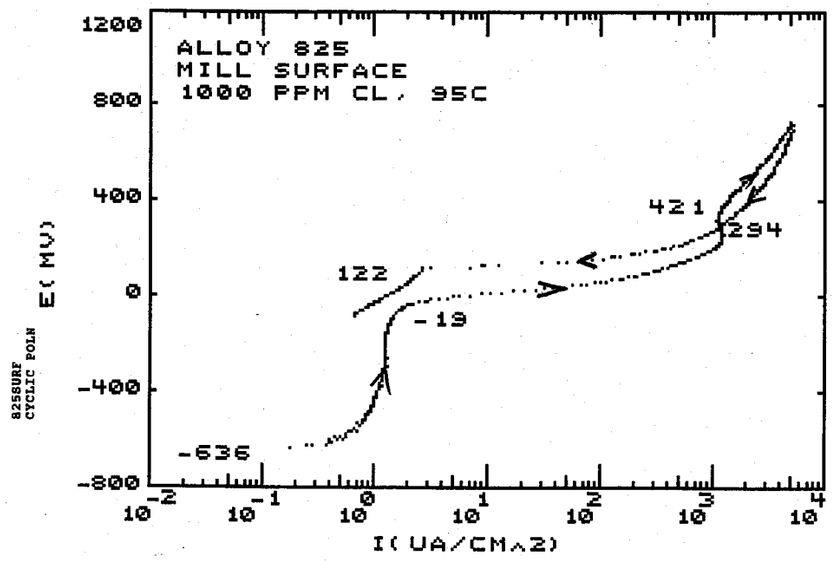


Temp: 93°C (Thermometer: 1238004)
Initial Measurements: Potential of Pt (before connecting to 173): −0.298
(used Keithley 614 electrometer, Ser. No. ~~43~~ 467374) Potential of specimen: −0.589
Ref. Electrode: Sat. Calomel, #1

Initial pH (at 19°C): 8.30
Final pH (at 19°C): 9.92 (after 2 days)

Observation: The specimen showed uniform corrosion on the two mill-finished faces before onset of pitting. Pits were found on all faces. Data stored in Pile 2 (825surf).

N. Sridhar
10/2/92



RUN PARAMETERS

TECHNIQUE	CYCLIC POLN
ORIGINAL NAME	825SURF
INITIAL E(MV)	0 VS E
VERTEX E(MV)	100 VS E
FINAL E(MV)	2 VS E
SCAN RATE(MV/S)	.17
THRESHOLD I(UA/CM^2)	5000
CONDITION E(MV)	PASS
CONDITION T(S)	PASS
INIT DELAY(MV/S OR S)	3600 S

SAMPLE PARAMETERS

AREA(CMS^2)	12.2
EQ WT(GM)	PASS
DENSITY(GM/CM^3)	PASS
CATHODIC TAFEL(MV)	PASS
ANODIC TAFEL(MV)	PASS

DATA SCALE

ECORR	-636
MV/PT	4
DATA MAX	5221.312
DATA MIN	8.442623E-02
ABS MIN	8.442623E-02
ABS MAX	5221.312

RESULTS

E(I=0)(MV)	DEAERATE WITH ARGON
CATHODIC TAFEL(MV)	
ANODIC TAFEL(MV)	
I-CORR(UA/CM^2)	
CORR RATE(MPY)	
E(I=0)(MV)	
POL RES.(K-OHMS CM^2)	
I-CORR(UA/CM^2)	
CORR RATE(MPY)	

LEGEND

ALLOY 825 WITH MILL SURFACE
1000 CL
20 SO4
10 NO3
2 F
85 HCO3
95 C
DONE IN PAR 173/276
SCAN RATE 0.17 MV/SEC

N. Sridhar
10/5/92

10/6/92

Stock solution : 600 ppm Cl^-

0.988 g of NaCl to make 1 liter of solution
used lot No. 922649A (Fisher) of NaCl and Nanopure water.

Test solution (6 ppm Cl^-) :

Add 10 ml of 600 ppm Cl^- stock solution
Add 20 ml of SO_4^{2-} stock solution (p. 119)
Add 10 ml of NO_3^- stock solution (p. 119)
Add 2 ml of F^- stock solution (p. 119)
Add 0.122 g of $NaHCO_3^-$ (Lot No. 897789, Fisher)
Make up solution to 1 l.

N. Sridhar
10/6/92

10/6/92 825 Sur 2

Purpose : To Test the effect of surface cr depletion on cyclic polarization behavior of Inconel alloy 825. in 6 ppm cl solution.

Material : Same as p. 121

Solution : Same as p. 123.

Test : Same as p. 121.

Temperature : 95°C (Temp decreased to 90°C at start of Test but was increased subsequently).

D.C. Potential of Pt : −0.29 V SCE } Keithly 614
D.C. Potential of Specimen : } Sr. No. 467374
D.C. potential of Specimen at end of Test : −0.512 V SCE.

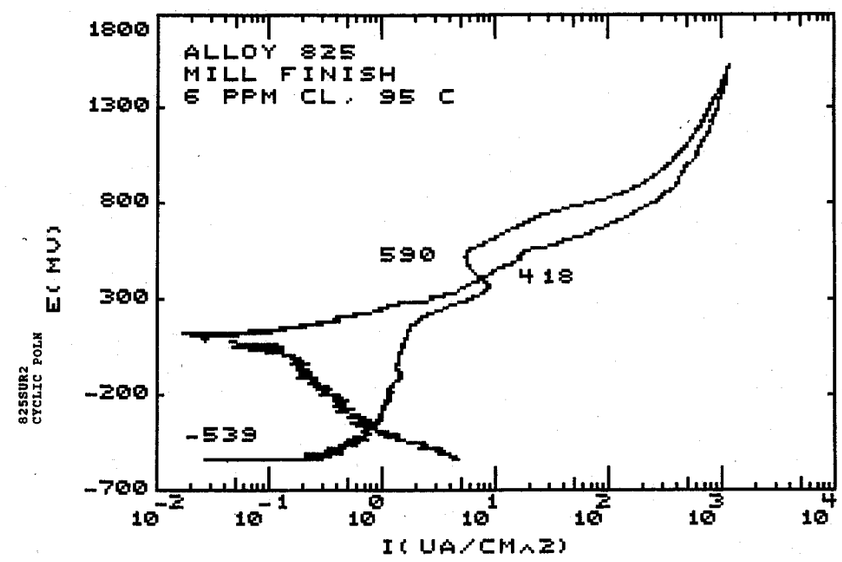
Initial pH : 8.259 (at 19.8°C)
Final pH : 10.195 (at 19.8°C)

Observations : The specimen showed signs of pitting only on the mill-finish surface. Initially small pits were formed on both mill-finish faces after about 590 mV SCE. These then grew laterally & from greenish deposit over a wide area. The solution was slightly yellow. The green deposit washed off easily even with a gentle stream of water.

Data stored in Pile 2 disc.

N. Sridhar
10/6/92

825 Sur 2



RUN PARAMETERS

TECHNIQUE	CYCLIC POLN
ORIGINAL NAME	825SUR2
INITIAL E(MV)	0 VS E
VERTEX E(MV)	100 VS R
FINAL E(MV)	1 VS E
SCAN RATE(MV/S)	.17
THRESHOLD I(UA/CM^2)	5000
CONDITION E(MV)	PASS
CONDITION T(S)	PASS
INIT DELAY(MV/S OR S)	3600 S

SAMPLE PARAMETERS

AREA(CMS^2)	12.2
EQ WT(GM)	PASS
DENSITY(GM/CM^3)	PASS
CATHODIC TAFEL(MV)	PASS
ANODIC TAFEL(MV)	PASS

DATA SCALE

ECORR	-539
MV/PT	4
DATA MAX	1170.492
DATA MIN	-4.770492
ABS MIN	0
ABS MAX	1170.492

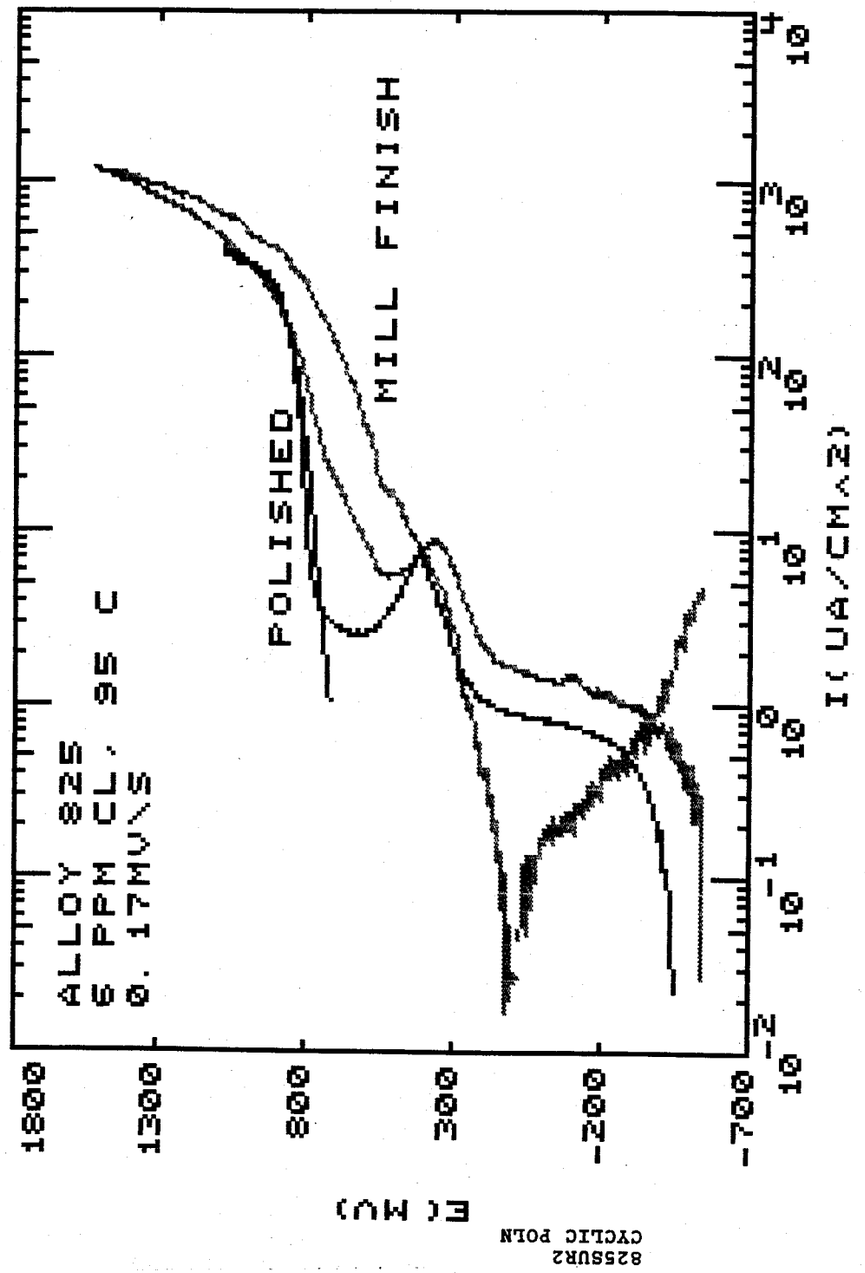
LEGEND

825 SUR2 *
6 PPM CL AT 95 C
MILL FINISH SURFACE
AR DEAERATED
0.17 MV/SEC

N. Sridhar
10/7/92

10/7/92

Polished vs. Mill Finished Alloy 825 in 6 ppm Cl^-, 95°C



~N. Sridhar 10/7/92~

10/15/92

REFER TO PAGE 295 for objectives and Justification 4/28/94

mV vs ppm Cl FOR MI 200/MI 403 ELECTRODES
USING ORION 720A, SN 003368, CAL 10 FEB 92
NaCl LOT # 922649 A QA ACCEPTED 8/11/92

CONC Cl^-	MI 200/MI 403 #1	MI 200/MI 403 #2
1 ppm	285 mV (DRIFTING)	282 mV (DRIFTING)
10 ppm	226 mV (DRIFTING)	244.2 mV (DRIFTING)
100 ppm	163.3 mV	173.8 mV
1000 ppm	111.0 mV	110.5 mV
10000 ~~17725~~ ppm	68.9 mV	63.6 mV
17725 ~~35450~~ ppm	58.9 mV	52.9 mV
35450 ppm	46.2 mV	40.7 mV

QA 7/27/94

MI 200/MI 403 #1 $mV = -49.81 \log(ppm\ Cl^-) + 268.41$

MI 200/MI 403 #2 $mV = -56.87 \log(ppm\ Cl^-) + 292.49$

10/16/92

COMPARE FISNER Ag/AgCl ELECTRODE 13-620-53
SN 8118182 TO MICROELECTRODES INC
MI 402 Ag/AgCl

ELECTRODES CONNECTED TO KEITHLEY 614 ELECTROMETER
MI 402 TO RED (HIGH) AND FISNER 13-620-53
TO BLACK LEAD

CONC Cl^-	MI402 #1 VS FISNER mV	MI402 #2 VS FISNER mV	MI402 #3 VS FISNER mV
10 ppm	0.9 - 4.0	4.0 - 8.0	5.5 - 7.0
100 ppm	1.1 - 3.7	7.0 - 9.0	4.1 - 4.5
1000 ppm	1.9 - 3.2	0.9 - 2.0	0.2 - 1.0
0.5 mCl^-	5.3 - 7.5	3.5 - 6.0	3.0 - 5.0
1.0 mCl^-	4.7 - 8.2	3.7 - 6.0	3.0 - 5.0

10/16/92

10/20/92 MI506/MI402 PN CALIBRATION

	ORION 720A SN 003368 MI506 #1/MI402#1 mV	ORION EA920 SN 5001A MI506#2/MI402#2 mV	FISNER 950 SN 3340 MI506#3/MI402#3 mV
PA			
1.00	339.3	336.4	333.6
4.00	170.4	166.8	162.3
7.00	-2.1	-5.4	-6.9
10.00	-179.6	-183.4	-184.6

MI506 #1 SN # 43717 / MI402 SN# ~~41402~~ 41432 DD 7/27/94
WITH ORION 720A SN 003368
mV = -57.64 (pN) + 399.02

DD 7/27/94
MI506 #2 SN# ~~43717~~ 44060 / MI402 #2 SN# ~~41436~~ 41402
WITH ORION EA920 SN 5001A DD 7/27/94
mV = -57.72 (pN) + 396.06

43717 DD 7/27/94
MI 506 #3 SN# ~~44060~~ / MI402 #3 SN# 41436
WITH FISNER ACCUMET 950 SN 3340
mV = -57.46 (pN) + 392.13

Daniel S. Dunn
10/20/92

10/22/92 ASSEMBLE CREVICE CELL

SAMPLE 304L HEAT # T0954 600 GRIT FINISH

PLACED IN CREVICE CELL. AFTER WASHING IN DI WATER AND ACETONE

ADJUSTED ELECTRODES TO JUST ABOVE LOWER EDGE OF TOP PLATE OF CELL 2 PN ELECTRODES 1 AT CREVICE MOUTH 1 AT CREVICE TIP 1 Cl ELECTRODE AT CENTER OF CELL

10/22/92 ASSEMBLE CREVICE CELL CONT'D

1 PN ELECTRODE PLACED IN BULK SOLUTION
1 Cl ELECTRODE PLACED IN BULK SOLUTION

SOLUTION WAS 1000 ppm ? Cl~~-~~ AS NaCl
LOT 922649A **NO** NCO_3^- SO_4^- NO_3^- OR F^-

Daniel S. Dunn

10/23/92 START CREVICE CORROSION EXPT.

NITROGEN HIGH PURITY GAS BUBBLED INTO SOLN THROUGHOUT ENTIRE TEST.

DATA COLLECTED w/ PC LAB FILE 304L600.ASC
MANUAL LOG ON PAGES 130-131

INITIAL READINGS

	PC LAB	PC LAB PN	METER	READING
PN #1	6.21		ORION 720A	6.253
PN #2	6.82		FISHER 950	6.895
PN #3	6.65		ORION 920	6.78

10/26/92 ENDED EXPERIMENT, DISASSEMBLED CELL CHECKED CALIBRATION OF pH REF AND Cl⁻ ELECTRODES. ON PAGES 132

Daniel S. Dunn 10/26/92

TIME	APPLIED V Ag/AgCl BULK	APPLIED V Ag/AgCl ~~TIP~~ (CREVICE POTENTIAL)	CURRENT	Cl BULK	Cl CENTER	CH 1 PH (720) BULK	CH 2 PH (F 950) MOUTH	CH 3 PH (0920) TIP	COMMENT ①
10/23/92 9:30 AM	-0.1548	-0.1620		89.8 mV	100.8 mV	6.16	6.89	6.69	Type 304L 600 Grit finish (T0954)
10:00 AM	-0.1575	—		89.4	101.0	6.24	7.035	6.88	
10:10 AM	+0.1012	"	24 μA	89.3	112.6 ↓	6.245	6.990	6.82	
10:55 AM	+0.1012		23.44	89.2	102.7	6.397	6.874	6.77	
11:25 AM	+0.1012		23.44 μA	89.2	102.3	6.550	6.846	6.75	
12:40 PM	+0.1012	+0.0952	49.50 μA	89.3	101.5	~~7.533~~ 7.133	6.774	6.70	
1:33 PM	+0.1011	+0.0952	58.3 μA	89.2	101.2	7.921	6.734	6.66	1:38 PM INCREASE APPLIED V TO 200mV
1:40 PM	+0.2009	+0.1975	103.3 μA ↑	89.3	101.6	7.961	6.692	6.67	
2:25 PM	+0.2009	+0.2006	0.2002 mA ↑	88.6	98.5	8.462	6.590	6.66	
3:07 PM	+0.2009	+0.2012	0.2214 mA	88.3	98.2	8.656	6.580	6.63	3:13 PM ADD 1000 ppm Cl⁻ ≈ 100 ml
3:11 PM	+0.2009		0.1978 mA ↑	92.6	99.2	7.687	6.611	6.63	
3:17 PM	+0.3002		0.2612 mA	92.0	99.4	7.673	6.509	6.62	
3:31 PM	+0.3002	+0.2999	0.3122 mA	92.0	97.5	8.064	6.445	6.19	
4:53 PM	+.3002	+0.0877	0.5400 mA	91.9	109.7	8.844	~~7.235~~ 7.127	3.03	T = 20.6°C
6:00 PM	+0.3002	0.0504	0.67 mA	91.8	24.8	8.954	6.114	3.31	
9:00 PM	0.3002	0.0035	0.498 mA	91.5	9.4	9.217	3.625	3.58	T = 19.9°C
10/24/92 8:25 AM	0.3002	-0.0162	0.843 mA	91.5	36.8	9.714	2.715	3.49	T = 19.0°C (Reduced Potential)
8:28 AM	-0.0002	-0.119	0.2460 mA	91.6	70.8	9.722	3.055	3.15	
9:31 AM	-0.0002	—	86.01 μA	91.9	106.0	9.747	3.126	3.15	
10:33 AM	-0.0002	—	54.78 μA	92.0	114.0	9.72	3.110	3.19	

N. Sridhar 10/24/92

Time	Applied V Ag/AgCl Bulk	Applied V Ag/AgCl Tip	Current	Cl⁻ Bulk (720A) (mV)	Cl⁻ Center (EA920) mV	ch.1 (PH) (720A) Bulk	ch.2 PH (F950) Mouth	ch.3 PH (EA920) Tip	Comments ②
10/24 10:47 am	-0.0002	-0.059	47.03 μA	92.1	115.9	9.689	3.120	3.18	Type 304L SS 600 Grit finish.
3:39 pm	-0.0002	-0.0393	24.58 μA	92.1	128.4	9.668	3.132	3.29	
6.25 PM	-0.0002	—	21.59 μA	92.0	124.1	9.672	3.290	3.33	
6.25 PM	-0.0511	-0.086	20.61 μA	92.0	121.2	9.671	3.31	~~3.31~~ 3.30	
10/25 3.05 PM	-0.0511	-0.0773	8.17 μA	91.1	109.0	9.52	3.409	3.56	
10/26 7.05 AM	-0.0511	-0.0785	7.72 μA	89.0	98.4	~~9.749~~ 7.749	3.468	3.75	
7.10 AM	-0.1653	-0.1911	—	89.1	92.7	7.741	3.622	3.63	Disconnected Potentiostat

N. Sridhar 10/26/92

10/26/92 PH CALIBRATION. CHECK

ELECTRODES: MI 506 #1 MI 402 #1
METER: ORION 720A, PC LAB PH #1

BUFFER PH	ORION mV	ORION PH	PCLAB PH
1.00	334.7	2.151	1.17
4.00	171.4	4.51	4.00
7.00	-6.6	6.99	7.05
10.00	-187.6	9.57	10.20

ELECTRODES: MI 506 #2 MI 402 #2
METER FISNER 950 PC LAB PH #2

BUFFER PH	ORION mV	ORION PH	PC LAB PH
1.00	326.6	1.183	4.07
4.00	159.5	4.09	5.48
7.00	-12.8	7.08	6.93
10.00	-189.0	10.135	8.41

ELECTRODES: MI 506 #3 MI 402 #3
METER: ORION EA 920 PC LAB PH #3

BUFFER PH	ORION mV	ORION PH	PC LAB PH
1.00	333.1	1.30	1.07
4.00	165.1	4.19	3.99
7.00	-8.4	7.15	7.00
10.00	-188.9	10.20	10.10

10/26/92 Cl⁻ CALIBRATION CHECK

ELECTRODES: MI 200 #1 / MI 403 #1, MI 200 #2 / MI 403 #2
METERS: ORION EA 920, ORION 720A

PPM Cl⁻	ORION EA 920 MI 200 #1/MI 403 #1 mV	ORION 720A MI 200 #2/MI 403 #2 mV
10	207.1	211.7
100	160.5	150.8
1000	110.7	93.7
17725	54.2	34.2
35450	38.4	16.7

REFERENCE ELECTRODE CALIBRATION CHECK
ELECTRODES: MI 402 #'S 1, 2, 3 VS FISNER 13-620-53, 8118182
METER: ORION EA 920, MI 200 TO REF JACK, FISNER TO BNC

PPM Cl⁻	MI 402 #1 mV	MI 402 #2 mV	MI 402 #3 mV
10	-7.6	-6.8	-10.6
100	-7.8	-6.5	-10.2
1000	-9.5	-8.2	-10.8
17725	-11.5	-11.0	-11.2
35450	-10.9	-10.6	-10.8

Daniel A. Dan
10/26/92

10/29/92

CREVICE EXPT 825-1

SET UP CREVICE CELL AS ON PAGE 129 EXCEPT USING COMPAQ 333T COMPUTER AND WORKBENCH WITH ESC 440-2 POTENTIOSTAT

ALLOY 825 SAMPLE PLACED IN CELL BOLTS TORQUED TO 20 IN OZ SOLUTION INJECTED INTO CELL PRIOR TO TORQUE

2 PH ELECTRODES IN CELL 1 AT MOUTH 1 AT CREVICE TIP 1 PH ELECTRODE IN BULK

2 Cl^- ELECTRODES 1 IN CENTER OF CREVICE 1 IN BULK

1 Ag/AgCl BULK ELECTRODE FISHER 13-620-53 SN 8118182 IN BRIDGE TUBE w/ 0.5M $NaCl$

CELL PLACED IN GLASS VESSEL WITH ≈ 500 ml SOLUTION: @ 6:20 PM

0.5 M $NaCl$ LOT 922649A
85 ppm HCO_3^- AS $NaNCO_3$ LOT 923337
20 ppm $SO_4^=$ AS Na_2SO_4 FROM STOCK SOLN
10 ppm NO_3^- AS $NaNO_3$ FROM STOCK SOLN
2 ppm F^- AS NaF FROM STOCK SOLN

HIGH PURITY N_2 GAS BUBBLED INTO SOLN OVERNIGHT.

Daniel A. Dean
10/29/92

10/30/92

CREVICE EXPT 825-1

CREVICE EXPERIMENT STARTED DATA STORED IN C:\WB\DATA\825-1.DAT ON COMPAQ 333t MANUAL DATA LOG ALSO KEPT

Cl ELECTRODES NOT WORKING DURING TEST

DN 7/27/94

TEST ENDED ~~10/30/92~~ 11/3/92 PH OF CREVICE 9.067 AT LOWEST VALUE CURRENT VERY HIGH 2.6×10^{-3} A AT 200 mV SAMPLE AREA 32.74 cm^2

SAMPLE EXAMINATION REVEALED SMALL PITS IN CREVICE AREA AND LARGE PITS UNDERNEATH MICROSTOP APPLICATION WHERE 825 ROD MEETS FLAT SAMPLE

CROSS CHECK OF PH ELECTRODES INDICATES THEY ARE READING CORRECTLY

DN 7/27/94

DATA LOG ON PAGES ~~133~~ 136-137

Daniel A. Dean
10/30/92

PH AND Cl ISE CALIBRATION DATA STORED IN 8251CAL.DAT ON IWPE-025 DISC

Daniel A. Dean 4/28/94

825-1

Time	Applied External Potential (V)	Potential in the crevice (V)	Bulk pH	Mouth pH	Tip pH	Bulk Cl^-	Center Cl^-	Current ~~density~~	Comments
10/30/92 10:40 AM	0.197		9.341	8.793	8.166			3.04×10^{-4}	Cl ELECTRODES NOT WORKING
11:45 AM	0.00	-0.066 V	9.369	7.264	8.346			-1.3×10^{-4}	
12:45 PM	0.039 V	-0.5550 V	9.369	7.333	8.491				
1:40 PM	0.098 V	0.0874 V	9.369	8.198	8.691			2.3×10^{-5}	
3:15 PM	0.098 V	0.0871	9.378	8.214	8.650			8.0×10^{-5}	
4:00 PM	0.098 V	0.0872	9.381	8.218	8.755			9.0×10^{-5}	
4:43 PM	0.098 V	0.0872	9.391	8.222	8.880			9.5×10^{-5}	
5:02 PM	0.098 V	0.0872	9.393	8.224	9.005			1.015×10^{-4}	
5:20 PM	0.098	0.0872	9.394	8.226	9.030			1.040×10^{-4}	
10/31/92 8:37 PM	0.098	0.0878	9.590	8.302	9.073			3.777×10^{-4}	
11/1/92 9:00 AM	0.098	~~0.0880~~ 0.0880	9.687	8.303	9.094			4.250×10^{-4}	
~~9:50 AM~~ 11/1/92	0.0984	0.0879 ~~9.691~~ 9.241		8.302	9.102			4.21×10^{-4}	slight green color of solution
9:50 PM	0.0984	0.0880	9.774	8.321	9.130			5.06×10^{-4}	
									10/30/92

825-1

0.5 m NaCl

Time	Applied External Potential (V)	Potential in the crevice (V)	Bulk pH	Mouth pH	Tip pH	Bulk Cl^-	Center Cl^-	Current ~~density~~	Comments
11/2/92 7:55 AM	0.0985	0.0880	9.870	8.359	9.210			5.21×10^{-4}	
10:20 AM	0.0985	0.0882	9.860	8.361	9.263			4.63×10^{-4}	
11:30 AM	0.0985	0.0890	9.860	8.354	9.299			4.25×10^{-4}	200mV POTENTIAL
11:35 AM	0.1985	0.1894	9.857	8.855	9.245			7.3×10^{-4}	
12:10 PM	0.1985	0.1895	9.860	8.871	9.234			8.12×10^{-4}	
1:05 PM	0.1985	0.1894	9.872	8.875	9.231			9.92×10^{-4}	
2:40 PM	0.1985	0.1899	9.902	8.901	9.211			1.32×10^{-3}	
4:00 PM	0.1985	0.1900	9.909	8.902	9.204			1.57×10^{-3}	
4:50 PM	0.1985	0.1905	9.920	8.891	9.215			1.59×10^{-3}	
5:30 PM	0.1985	0.1905	9.942	8.905	9.217			1.61×10^{-3}	
11/3/92 8:00 AM	0.1983	0.1905	9.946	8.934	9.067			2.66×10^{-3}	SOLUTION VERY GREEN
8:00 AM	-	-	-	-	-				END OF TEST
									10/30/92

11/11/92

CREVICE CORROSION ALLOY 825 #2
STARTED 11/6/92
ALLOY 825 SAMPLE 600 GRIT FINISH
0.5 m $NaCl$, 85ppm NCO_3^-, 20 ppm $SO_4^=$, 10 PPM NO_3^-
2PPM F^-,

ELECTRICAL CONTACT MADE BY GRINDING
0.091" 825 ROD FLAT AND THEN WELDING
FLAT SIDE OF ROD TO EDGE OF THE SAMPLE
0.032 STAINLESS ROD (WIRE) (304LSS) CONNECTED
TO ALLOY 825 ROD ABOVE SOLUTION LEVEL
NO MICROSTOP USED TO COAT CONTACTS.

SAMPLE PLACED INTO DELRIN CREVICE CELL
SOLUTION INJECTED INTO CELL AND BOLTS
TORQUED TO 20 IN.OZ ELECTRODE PLACEMENT
AS LISTED ON PP. 128-129 ELECTRODE TIPS
SURROUNDED BY GLASS WOOL. pH ELECTRODES
CALIBRATED ON 11/5/92 SLOPE & INTERCEPT
VALUES ENTERED INTO CREVICE.WBB ON WORKBENCH
PROGRAM ON COMPUADD 333T COMPUTER

MI 506 #1 / MI 402 #1
$mV = -57.416\,(pH) + 390.517$
$pH = -17.416\,(V) + 6.802$

MI 506 #2 / MI 402 #2
$mV = -57.253\,(pH) + 383.433$
$pH = -17.467\,(V) + 6.697$

MI 506 #3 / MI 402 #3
$mV = -57.48\,(pH) + 391.44$
$pH = -17.397\,(V) + 6.180$

MI 200#2 / MI 403 #2
$mV = -46.353 * \log(ppm\ Cl^-) + 239.794$

Daniel J. Dun 11/11/92

11/16/92

CREVICE CORROSION ALLOY 825 #2

STARTED 11/6/92 ENDED 11/16/92

DECREASE IN pH AT TIP AND MOUTH
AFTER V_{APP} 0.400 V (11/13/92) Cl^- CENTER
CONCENTRATION VARIED BUT WAS NEVER
ABOVE ≈ 1.0 M

EXAMINATION OF SAMPLE INDICATES THAT
CREVICE CORROSION OCCURED ALONG THE ENTIRE
UNDERNEATH SIDE OF SAMPLE. SOME GREEN
CORROSION PRODUCTS NEAR TIP AND GLASS
WOOL IN TIP WAS DISCOLORED. MUCH
GREEN CORROSION PRODUCT AROUND MOUTH ON
LOWER DELRIN BLOCK. NO CORROSION
VISABLE ON SAMPLE SURFACE OUTSIDE OF
DELRIN CELL. NO CORROSION OBSERVED IN
AREA OF WELD (SAMPLE TO 825 ROD).
SMALL PITS VISABLE ON UPPER SAMPLE SURFACE.
SIMILAR FEATURES WERE OBSERVED PRIOR TO
TEST.

OTHER NOTES BRIEF POWER BLACKOUT ON 11/10/92
CAUSED COMPUTER AND POTENTIOSTAT TO RESET
SAMPLE WAS CATHODIC FOR SHORT PERIOD.
DATA COLLECTED ON 825-2.DAT & 825-2R.DAT.

MANUAL DATA LOG ON PAGES 140 - 143

Daniel J. Dun
11/16/92

PH AND CL ISE DATA STORED AS 8252CAL.DAT
IN IWPE-025 DISK. DATA USED TO CALIBRATE
pH AND Cl^- ISE ELECTRODES Daniel J. Dun 4/28/94

825-2

Time	Applied External Potential (V)	Potential in the crevice (V)	Bulk pH	Mouth pH	Tip pH	Bulk Cl^-	Center Cl^-	Current ~~Density~~	Comments
11/6/92 3:00 PM	~~0.100~~ 0.0984	0.0841	9.012	7.176	8.157	139.0	48.9 T	2.00×10^{-5} A	START OF TEST
3:30 PM	0.0984	0.0842	9.033	7.192	8.171	140.1	47.1	5.5×10^{-6} A	
4:25 PM	0.0984	0.0845	9.066	7.262	8.264	140.4	~~46~~ 47.4	1.9×10^{-6} – 3.0×10^{-6}	
5:12 PM	0.0984	0.0845	9.094	7.298	8.325	142	46.4	2.7×10^{-6} – 3.5×10^{-6}	O-920 ON CN 2.: PA TIP VALUES
11/7/92 10:43 AM	0.0985	0.0842	9.406	7.534	~~9.323~~ 9.312	109.0	48.1	1.0×10^{-6} 1.5×10^{-6}	ARE NOT CORRECT.
1:15 PM	0.0985	0.0842	9.427	7.551	9.259	110.9	46.0	1.0×10^{-6} 2.8×10^{-6}	
11/8/92 10:55 AM	0.0985	0.0870	9.585	7.694	9.404	97.1	42.1	2.4×10^{-6} 3.6×10^{-6}	
11/4/92 12:55 PM	0.0983	0.0853	9.603	7.688	9.45	106.2	42.4	3.2×10^{-6}	Current is noisy
11/9/92 7:57 AM	0.147	0.1333	9.600	7.752	9.473	51.7	39.7	6.4×10^{-6} 7.5×10^{-6}	
10:07 AM	0.147	0.1338	9.569	7.710	9.415	32.9	39.6	6.8×10^{-6} 7.5×10^{-6}	PURGED N_2 FOR 1 h 10-11 AM
11:48 AM	0.147	0.1332	9.418	7.679	9.359	35.1	39.5	6.8×10^{-6} 7.7×10^{-6}	O-920 ON CN 2.: PA
1:08 PM	0.147	0.1334	9.411	7.658	9.315	35.8	39.3	$6.5-7.5\times10^{-6}$	INCORRECT
3:07 PM	0.147	0.1330	9.368	7.634	9.244	31.4	39.2	$6.5-7.5\times10^{-6}$ A	BULK Cl^- REF WAS BUBBLE
									~~10/30/92~~ 11/16/92

825-2

Time	Applied External Potential (V)	Potential in the crevice (V)	Bulk pH	Mouth pH	Tip pH	Bulk Cl^-	Center Cl^-	Current ~~Density~~	Comments
11/9/92 4:30 PM	0.147	0.1329	9.362	7.621	9.190	—	38.9	$6.7-7.8\times10^{-6}$ A	
5:05 PM	0.147	0.1327	9.331	7.616	9.172	—	38.9	$6.2-7.5\times10^{-6}$ A	O-920 ON CN 2.: PA
11:43 PM	0.147	0.1317	9.320	7.608	8.790		38.7	$6.0-7.2\times10^{-6}$ A	INCORRECT.
11/10/92 8:06 AM	0.147	0.1315	9.198	7.623	8.582		37.7	$6.0-7.2\times10^{-6}$ A	
8:45 AM	–	–	–	–	–	–	–	–	POWER OUT COMPUTER REBOOT
10:30 AM			UNLOGGED						
11:30 AM	0.147		–	7.615	8.936		37.3	$3.7-4.6\times10^{-6}$ A	
1:17 PM	0.147		–	7.618	8.897		37.3	$3.5-4.2\times10^{-6}$ A	
11/11 7:46 AM	0.147		8.891	6.869	8.077				
11:14 AM	0.197	~~0.1820~~ 0.1863	8.970	6.870	7.964		37.0	$2.2-3.0\times10^{-6}$ A	
12:05 PM	0.197	0.182	8.943	6.870	7.841		37.0	$1.7-3.0\times10^{-6}$ A	
12:58 PM	0.197	0.1819	8.931	6.871	7.870		36.4-37.4	$1.5-2.4\times10^{-6}$ A	
1:47 PM	0.197		8.924	6.871	7.850		36.2-37.5	$1.4-2.3\times10^{-6}$ A	
									11/16/92

825-2

Time	Applied External Potential (V)	Potential in the crevice (V)	Bulk pH	Mouth pH	Tip pH	Bulk Cl^-	Center Cl^-	Current ~~Density~~	Comments
11/11/92 3:27 PM	0.198		8.879	6.878	7.803		36.3 37.4	1.0×10^{-6}	
5:25 PM	0.198	0.1820	8.905	6.876	7.707		36-37 mV	6.5×10^{-7} 1.2×10^{-6}	
10:25 PM	0.198	0.1817	8.850	6.881	7.550		36-37 mV	10^{-7}	CURRENT 1.0×10^{-7} – 2×10^{-6}
11/12/92 8:50 AM	0.2471 ~~0.198~~	0.2307	8.691	6.901	7.330		35-36 mV	-10^{-7} $+10^{-7}$	
11:23	0.298	0.2821	8.584	6.904	7.286		36-37 mV	-10^{-7} -10^{-6}	
2:07 PM	0.298		8.560	6.924	7.206				
5:10 PM	0.298	0.2819	8.435	6.871	7.090		41-42 mV	-10^{-7} -10^{-6} A	
6:01 PM	0.298	0.2820	8.654	6.927	7.143		36-37 mV	-1.2×10^{-6} A	
11/13 7:20 AM	0.40	0.3830	9.12	6.95	7.03	—	36-37	-1.2×10^{-6} A	Gas purging on all night
11:30 AM	0.398 ~~0.40~~	0.381	9.809	6.03	7.798		25-26	$3-4 \times 10^{-5}$	
1:25 PM	0.3986	0.381	9.909	5.647	7.912		29-30	1.7×10^{-4}	
2:59 PM	0.3985	0.384	9.817	5.350	7.926		36-37	8.6×10^{-4}	
4:35 PM	0.3985	0.3826	10.270	5.378	8.054 ~~8.393~~		−13-14 mV (NEGATIVE)	6.8×10^{-4}	

11/16/92

825-2

Time	Applied External Potential (V)	Potential in the crevice (V)	Bulk pH	Mouth pH	Tip pH	Bulk Cl^-	Center Cl^-	Current ~~Density~~	Comments
11/13/92 5:12 PM	0.3985	0.3826	10.070	5.062	8.094		36-37 mV	6.7×10^{-4}	
11/14/92 9:23 AM	0.3985	0.3793	10.480	3.828	8.813		72-73	8.6×10^{-4}	
6:03 PM	0.3985	0.3739	10.576	3.602	8.580		138.2	6.2×10^{-4}	
11/15/92 11:00 AM	0.3985	0.3160	11.297	3.833	5.070		260.2	7.6×10^{-4}	POTENTIAL INCREASED LOW
4:04 PM	0.3985	0.1707	11.788	4.102	2.001		237-238	9×10^{-4}	
11/16/92 7:53 AM	0.3985	0.1636	12.742	3.629	1.143		253-254	1.1×10^{-3}	SET POTENTIAL AT 0.0 V →
7:54 AM	″	″	″	″	″	″	″	″	[Cl] AT CENTER ↑ 94 mV ↓
9:28 AM	0.0009	−0.0277	9.887	5.021	1.951		88-89	7.1×10^{-5}	

11/16/92

11/11/92

REPASSIVATION EXPT ALLOY 825

EXPT NAME: REPTIM11, 11/11/92 4:15PM

SAMPLE: ALLOY 825 600 GRIT 15% HNO_3 CLEANED RINSED IN DI WATER.

SOLUTION: 1000 PPM Cl^-, 20 PPM $SO_4^=$, 10 PPM NO_3^-, 85 PPM NCO_3^-, 2PPM F^- DEAIRATED W/ 99.999% N_2 AND MAINTAINED AT 95°C USING GLAS-COL TM 512 HEATERS TEMP CHECKED W/ N_2 THERM. # 1238004

POTENTIOSTAT: ESC 440 LABELED 440-1 CHANNEL # 5 BOARD # 3 CALIBRATED 13 JAN 92 DUE 13 JAN 93 POTENTIOSTAT CONTROLLED W/ WORKBENCH REPTIMER.WBB DATA SAVED AS: C:\WB\DATA\REPTIM11.DAT AND: B\ REPTIM11.DAT ON REPTIME #2 3.5" DISK

PIT INITIATION: 600 MV SCE 30 min

PIT GROWTH 400 MV SCE 6 HOURS

PIT REPASSIVATION: 150 MV SCE

SCE ELECTRODE: FISHER 13-620-51 SN 0169033

11/12/92 LOGIC ERROR IN REPTIMER.WBB PROGRAM REPASSIVATION POTENTIAL WAS CATHODIC (-50MV) FOR ≈ 5 min. SAMPLE REPASSIVATED VERY QUICKLY.

Daniel A. Dunn
11/12/92

11/11/92

REPASSIVATION EXPT ALLOY 825

EXPT NAME: REPTIM12, 11/11/92 4:15 PM

SAMPLE: ALLOY 825 600 GRIT 15% HNO_3 CLEANED RINSED IN DI. WATER.

SOLUTION 1000 PPM Cl^-, 85 PPM NCO_3^-, 20 PPM $SO_4^=$, 10 PPM NO_3^-, 2 PPM F^- DEAIRATED W/ 99.999% N_2 AND MAINTAINED AT 95°C USING GLAS-COL TM 512 HEATER. TEMP CHECKED W/ N_2 THERM. # 1238001

POTENTIOSTAT ESC 440 LABELED 440-1 CHANNEL #3 BOARD #2 CALIBRATED 13 JAN 92 DUE 13 JAN 93 POTENTIOSTAT CONTROLLED W/ WORKBENCH REPTIMER.WBB DATA SAVED AS: C:WB\DATA\REPTIM12.DAT AND AS: B: REPTIM12.DAT ON REPTIME #2 3.5" DISK.

PIT INITIATION: 600 mV SCE 30 min

PIT GROWTH: 400 MV SCE 6 hours

PIT REPASSIVATION: 200 mV SCE

SCE ELECTRODE FISHER 13-620-51 SN 8211163

11/12/92 LOGIC ERROR IN REPTIMER.WBB PROGRAM REPASSIVATION POTENTIAL WAS CATHODIC (-100MV) FOR ≈ 5 min. SAMPLE REPASSIVATED VERY QUICKLY.

Daniel A. Dunn
11/12/92

11/13/92 REPASSIVATION EXPT ALLOY 825 REPTIM 13

SAMPLE: ALLOY 825 600 GRIT FINISH CLEANED IN 15% HNO_3 AND RINSED IN DI WATER

SOLUTION: SAME AS REPTIM 11 & REPTIM 12
1000 PPM Cl^-, 85 PPM NCO_3^-, 20 PPM $SO_4^=$
10 PPM NO_3^-, 2 PPM F^- DEAIRATED
WITH HIGH PURITY N_2 AND MAINTAINED
AT 95 °C WITH GLAS-COL TM 512
TEMP CHECKED WITH Hg THERMO # 1238004

POTENTIOSTAT: SAME AS REPTIM 11 P 144
DATA STORED AS B:\REPTIM13.DAT AND
C:\WB\DATA\REPTIM 13.DAT

PIT INITIATION: 600 mV SCE FOR 30 min 11:50 AM
PIT GROWTH: 400 mV SCE FOR 6 HOURS
REPASSIVATION: 150 mV SCE

OPEN CIRCUIT POTENTIALS:
SAMPLE -53 mV SCE
pt -1.5 mV SCE
SCE ELECTRODE: FISHER 13-620-51 SN 8211163
DATA ~~AQUI~~ ACQUISITION RATE TOO SLOW
SAMPLE DISCONNECTED EXPT STOPPED 11/16/92

11/16/92

11/13/92 REPASSIVATION EXPT ALLOY 825 REPTIM 14

SAMPLE: ALLOY 825 600 GRIT FINISH CLEANED IN 15% HNO_3 AND RINSED IN DI WATER

SOLUTION: SAME AS REPTIM 11 & REPTIM 12
1000 PPM Cl^-, 85 PPM NCO_3, 20 PPM $SO_4^=$
10 PPM NO_3 2 PPM F^- DEAIRATED
WITH HIGH PURITY N_2 AND MAINTAINED
AT 95 °C WITH GLASSCOL TM 512
TEMP CHECKED WITH Hg THERMO # 1238001

POTENTIOSTAT SAME AS REPTIM 12 P 145
DATA STORED AS B:\REPTIM14.DAT
AND C:\WB\DATA\REPTIM 14.DAT

PIT INITIATION: 600 mV SCE 30 min 11:50 AM
PIT GROWTH: 400 mV SCE FOR 6 HOURS
REPASSIVATION: 200 mV SCE
SPECIMEN DID NOT REPASSIVATE AFTER 254,000 SEC

OPEN CURCUIT POTENTIALS:
SAMPLE -432.9 mV SCE
pt -25.1 mV SCE
SCE ELECTRODE FISHER 13-620-51 SN 0165415
DATA ACQUISITION RATE TOO SLOW
EXPT STOPPED 11/16/92

11/16/92

11/19/92 REPASSIVATION EXPT ALLOY 825 REPTIM 15

SAMPLE ALLOY 825 600 GRIT FINISH RINSED IN ACETONE, DI WATER, CLEANED IN 10% HNO_3 FOR 60 MIN. AND RINSED IN DI WATER

SOLUTION SAME AS REPTIM 11-14 1000 PPM Cl^- 85 PPM NCO_3^- 20 PPM $SO_4^=$ 10 PPM NO_3^- 2 PPM F^- SOLUTION MAINTAINED AT 95 °C AS BEFORE CHECKED WITH Hg THERMO. # 1238001 SOLUTION PURGED WITH 99.999 % N_2

POTENTIOSTAT: SAME AS PAGE 144
DATA STORED AS B:REPTIM15.DAT
AND AS C:\WB\DATA\REPTIM15.DAT

PIT INITIATION: 600 mV SCE FOR 30 MIN STARTED 3:15 PM
PIT GROWTH: 400 mV SCE FOR ~~12 HOURS~~ 7/27/94 6 HOURS
REPASSIVATION: ~~150 mV SCE FOR~~ 7/27/94 175 mV SCE

SAMPLE START WEIGHT 11.56053
SCE ELECTRODE FISHER 1362051 SN 0169033
START Pt POTENTIAL: -54.3 mV SCE
START 825 POTENTIAL: -509.9 mV
START PH (25°C NOT DEAIRATED) 8.086

SAMPLES STOPPED AT 5:20 HELD AT -2.00 V FOR 2 min AND RE STARTED AT 5:25 PM

SAMPLE STOPPED 11/20/92 TIME: 10:30 AM
RUNTIME: 61,400 SEC
REPASSIVATION TIME AT 175 mV SCE 275 SEC
END pH: 9.345
CHARGE DENSITY = 36 C/cm²

11/20/92

11/19/92 REPASSIVATION EXPT ALLOY 825 REPTIM 16

SAMPLE: SAME AS PAGE 148.
SOLUTION: SAME AS PAGE 148 1000 PPM Cl^- 85 PPM NCO_3^- 20 PPM $SO_4^=$ 10 PPM NO_3^- 2 PPM F^- PURGED W/ 99.999% N_2 AND MAINTAINED AT 95°C. TEMP CHECKED WITH Hg THERMO # 1238004
POTENTIOSTAT: SAME AS PAGE 145
DATA STORED AS B:REPTIM16.DAT
AND AS C:\WB\DATA\REPTIM16.DAT

PIT INITIATION 600 mV SCE FOR 30 MIN STARTED 3:15 PM
PIT GROWTH 400 mV SCE FOR 12 HOURS
REPASSIVATION 150 mV SCE

SAMPLE START WEIGHT 11.58224
SCE ELECTRODE FISHER 1362051 SN 8211163
START Pt POTENTIAL +12.8 mV SCE (OPEN CIRCUIT)
START 825 POTENTIAL -595 mV SCE. (OPEN CIRCUIT)
START PH (25°C NOT DEAIRATED) 8.086.

SAMPLE STOPPED AT 5:25 PM HELD AT -2.00 V FOR 2.0 min AND RE STARTED AT 5:27 PM

SAMPLE STOPPED 11/20/92 TIME: 11:08 AM
RUN TIME: 63,100 SEC
REPASSIVATION TIME AT 150 mV SCE: 446 SEC
END pH: 9.302 7/27/94
CHARGE DENSITY ~~77 C/cm²~~ 46 C/cm²

11/20/92

11/24/92 REPASSIVATION EXPT ALLOY 825 REPTIM 17

SAMPLE. ALLOY 825 600 GRIT FINISH, RINSED IN ACETONE, DI WATER CLEANED IN 10% HNO_3 FOR 60 MIN, AND RINSED IN DI WATER

SOLUTION: SAME AS REPTIM 15. 95°C TEMP CHECKED WITH Hg THERMO 1238001 PURGED WITH 99.999% N_2

POTENTIOSTAT: SAME AS PAGE 144 DATA SAVED AS C:\WB\DATA\REPTIM17.DAT AND AS B:\REPTIM17.DAT.

CATHODIC STRIP: -2.00 V SCE FOR 2 MIN

PIT INITIATION: 600 mV SCE FOR 30 min

PIT GROWTH: 400 mV SCE FOR 6 HOURS

REPASSIVATION: 180 mV SCE

SCE ELECTRODE: FISHER 13-620-51 SN 8211163

SAMPLE START WEIGHT: 11.60060

SOLUTION PH AT 25°C 8.132

OPEN CIRCUIT POTENTIALS AT START. 11:20 AM

ALLOY 825 SAMPLE: -582 mV SCE

Pt COUNTER ELECTRODE: ~~-34~~ mV SCE

DD 7/27/94

SAMPLES STOPPED 11/25/92 TIME: 2:52 pm

RUNTIME 97,800 SEC

REPASSIVATION TIME AT 180 mV SCE 43075 SEC

END PH (11/30/92): 8.873

CURRENT DENSITY LESS THAN 5×10^{-5} A/cm² AT 525 SEC AFTER SWITCHING TO 180mV. AT 6535 SEC AFTER 180 mV CURRENT INCREASED ABOUT 5×10^{-5} A/cm²

CHARGE DENSITY = ~~35 C/cm²~~ DD 7/27/94 28 C/cm²

11/30/92

11/24/92 REPASSIVATION EXPT ALLOY 825 REPTIM 18

SAMPLE ALLOY 825 600 GRIT FINISH, RINSED IN ACETONE, DI WATER, CLEANED IN 10% HNO_3 FOR 60 MIN, AND RINSED IN DI WATER.

SOLUTION: SAME AS REPTIM 15 P148 95°C TEMP CHECKED WITH Hg THERMO # 1238004 PURGED WITH 99.999% N_2

POTENTIOSTAT: SAME AS PAGE 145 DATA SAVED AS C:\WB\DATA\REPTIM18.DAT AND AS B:\REPTIM18.

CATHODIC STRIP: -2.00 V SCE FOR 2 MIN

PIT INIATION: 600 mV SCE FOR 30 MIN.

PIT GROWTH: 400 mV SCE FOR 6 HOURS.

REPASSIVATION: 190 mV SCE

SCE ELECTRODE: FISHER 13-620-51 SN 0169033

SAMPLE START WT: 11.54103

SOLUTION pH AT 25°C 8.132.

OPEN CIRCUIT POTENTIALS AT START. 11:20 AM

ALLOY 825 SAMPLE: -523 mV SCE

Pt COUNTER ELECTRODE: -46 mV SCE

SAMPLES STOPPED: 11/25/92 TIME: 2:42 pm

RUNTIME: 97,000 SEC

REPASSIVATION TIME AT 190 mV SCE: 49,867 SEC

END PH (11/30/92): 8.940

CHARGE DENSITY = ~~103 C/cm²~~ DD 7/27/94 34 C/cm²

11/30/92

12/15/92

CREVICE CORROSION SAMPLE 825-3
STARTED 12/10/92 ENDED 12/11/92

SPECIMEN: ALLOY 825 600 GRIT FINISH
SURFACE AREA 20.87 cm^2

SOLUTION 0.5 M NaCl, 85 PPM NCO_3^-, 20 PPM SO_4^{2-}
10 PPM NO_3^-, 2 PPM F^- AT ROOM TEMP
≈ 64°F PURGED WITH N_2

ELECTRICAL CONTACT MADE WITH 1.13 mm 825 WIRE TO TOP OF SPECIMEN NO MICRO STOP USED TO COVER CONTACT.
SPECIMEN PLACED IN PLEXIGLASS CELL WITH 2 PORTS FOR ELECTRODES. TIP PORT pH ELECTRODES (pH #1) AND Cl^- ELECTRODE (Cl^- #2) MOUTH PORT PH ELECTRODES (pH #2 PAGE 128 FOR INFORMATION ON ELECTRODE #'s). pH #3 PLACED IN BULK ELECTROLYTE. Ag/Ag_2Cl REF FISHER 13-620-53 SN 8118182 IN BULK SOLUTION WITH BRIDGE TUBE. Pt COUNTER ELECTRODE IN SIDE COMPARTMENT OF GLASS VESSEL.
CELL WAS PLACED IN SOLUTION THEN BOLTS WERE TORQUED TO 20 IN-OZ.

DATA SAVED IN 825-3.DAT ON COMPUADD 333t COMPUTER USING WB\CREVICE.WBB. SLOPE AND INTERCEPT OF PH AND Cl ELECTRODES:

MI506 #1 / MI 402 #1 (PH #1)
mV = −58.76 (PH) + 406.33
pH = −17.018(V) + 6.915

MI 506 #2 / MI 402 #2 (PH #2)
mV = −58.17 (PH) + 402.57
pH = −17.192(V) + 6.921

12/15/92

CREVICE CORROSION 825-3
MI 506 #3 / MI 402 #3 (pH #3)
mV = −57.77 (pH) + 398.17
pH = −17.311(V) + 6.892

MI 200 #2 / MI 403 #2 (Cl #2)
mV = −19.102 · Ln (ppm Cl^-) + 232.293
ppm Cl^- = Exp [50.755(V) + 11.790]

DURING EXPT SLOW DECREASE IN PH WAS OBSERVED AT MOUTH AND TIP POSITIONS. pH AT MOUTH WAS LOWER THAN THAT AT TIP SEVERE CORROSION OF SPECIMEN AT POINT OF ELECTRICAL CONTACT WAS ALSO OBSERVED. AFTER REMOVING SAMPLE SOME CREVICE CORROSION BETWEEN TIP & MOUTH ELECTRODE PORTS ON TOP SIDE OF SPECIMEN NO CREVICE CORROSION WAS OBSERVED ON BOTTOM SIDE OF SPECIMEN

INITIAL CONDITIONS
825-3 REST POTENTIAL = +0.083 V vs Ag/AgCl
Pt REST POTENTIAL = +0.2121 V vs Ag/AgCl

pH TIP = 5.90 MOUTH = 4.90 BULK = 9.00
Cl AT ~~DD~~ 7/27/94 TIP = 13,000 PPM

POST EXPT CHECK OF ELECTRODES INDICATED PH ELECTRODES WERE OPERATING CORRECTLY BUT Cl ELECTRODE HAD BUBBLE IN OUTER BARREL.

12/15/92

PH AND Cl^- ISE CALIBRATION DATA STORED IN 8253CAL.DAT ON IWPE 025 DISK 4/28/94

12/16/92

REPASSIVATION EXPT ALLOY 825 REPTIM 19

SAMPLE: ALLOY 825 600 GRIT FINISH RINSED IN ACETONE, DI WATER CLEANED IN 10% HNO_3 FOR 60 MIN, AND RINSED IN DI WATER.

SOLUTION: SAME AS REPTIM 15 95°C CHECKED WITH Ng THERMO 1238001 PURGED WITH 99.999% N_2

POTENTIOSTAT: SAME AS PAGE 145 DATA STORED AS C:\WB\DATA\REPTIM19.DAT AND B:REPTIM19.DAT

CATHODIC STRIP -2.00 V FOR 2 MIN
PIT INITIATION 600 mV SCE FOR 30 MIN
PIT GROWTH 400 mV SCE FOR 6 hr
REPASSIVATION 175 mV SCE
SCE ELECTRODE FISHER 13-620-51 SN 0169033
SAMPLE START WEIGHT 11.4705 g
SOLUTION PH AT 25°C 8.054
OPEN CIRCUIT POTENTIALS AT START: 5:00 PM 12/15/92
ALLOY 825 SAMPLE -651 mV
Pt COUNTER ELECTRODE NOT RECORDED

SAMPLE STOPPED 12/18/92 TIME 9:40 AM
RUNTIME 144,700 SEC
REPASSIVATION TIME AT 175 mV 173 SEC
END PH 9.196
CHARGE DENSITY 9 C/cm²

Donald S. Dunn
12/18/92

REPASSIVATION EXPT ALLOY 825 REPTIM 20

SAMPLE ALLOY 825 600 GRIT FINISH RINSED IN ACETONE, DI WATER, CLEANED IN 10% HNO_3 FOR 60 MIN AND RINSED IN DI WATER.

SOLUTION: SAME AS REPTIM 15 95°C CHECKED WITH Ng THERMO 1238004 PURGED WITH 99.999% N_2

POTENTIOSTAT SAME AS PAGE 144 DATA STORED AS C:\WB\DATA\REPTIM20.DAT AND B:\REPTIM20.DAT.

CATHODIC STRIP -2.00 V FOR 2 MIN
PIT INITIATION 600 mV SCE FOR 30 MIN
PIT GROWTH 400 mV SCE FOR 6 hr
REPASSIVATION 190 mV SCE
SCE ELECTRODE FISHER 13-620-51 SN 0165415
SAMPLE START WEIGHT 11.5802 6g
SOLUTION pH AT 25°C 8.054
OPEN CIRCUIT POTENTIALS AT START 5:10 pm 12/15/92
ALLOY 825 SPECIMEN -735 mV
Pt COUNTER ELECTRODE NOT RECORDED

SAMPLE STOPPED 12/21/92 TIME 2:00 PM
RUNTIME 506,000 SEC
REPASSIVATION TIME AT 190 mV 151,825
END PH 9.049
CHARGE DENSITY 54 C/cm²

Donald S. Dunn
12/21/92

2/21/92

CREVICE CORROSION EXPT 825-4 RUN 12/16/92

SPECIMEN ALLOY 825 600 GRIT FINISH
SURFACE AREA 20.90 cm²
START WEIGHT: 24.22537 END WEIGHT 24.22[illegible]
SOLUTION 0.5m NaCl 85PPM NCO_3 20ppm SO_4^{2-}
10ppm NO_3^- 2PPM F^- AT ROOM TEMP.
≈ 64°F PURGED WITH N_2

ELECTRICAL CONTACT MADE WITH 2.35mm 825 ROD
WITH GROUND FLATS TO SIDE OF
825 SPECIMEN NO MICROSTOP USED
TO COVER CONTACT
SPECIMEN PLACED IN PLEXIGLASS CELL, ELECTRODE
PLACEMENT SAME AS 825-3 P.152.
DATA SAVED AS 825-4.DAT ON COMPUADD
333+ USING WORKBENCH CREVICE.WBB

SLOPE AND INTERCEPT OF PN AND Cl ELECTRODES

MI 506 #1 / MI 402 #1 (PN #1)
mV: -57.75 (pN) + 397.30
pH: -17.31 (V) + 6.897

MI 506 #2 / MI 402 #2 (PN #2)
mV: -57.58 (pN) + 394.70
pN: -17.368 (V) + 6.855

MI 506 #3 / MI 402 #3 (PN #3)
mV: -57.527 (pN) + 396.897
pN: -17.383 (V) + 6.899

MI 200 #1 MI 403 #1
mV: -18.574 ln(ppm Cl^-) + 223.952

MI 200 #2 MI 403 #2
mV: -21.127 ln(ppm Cl^-) + 244.012

12/21/92

START CONDITIONS TIMER 73,700 SEC
E_c = + 195 mV Ag/AgCl
E_{pT} = + 0.424 V Ag/AgCl
REFERENCE ELECTRODE FISHER 13-620-53
pN TIP: 5.95 pN MOUTH: 4.45
pN BULK: 9.06 Cl BULK = 15K-16K PPM
Cl TIP: 15K-16K PPM

APPLIED POTENTIAL = 400 mV Ag/AgCl

TEST INTERRUPTED AFTER 2 HOURS DUE TO
ELECTRODE INTERFERENCE PROBLEMS.

12/21/92 CREVICE CORROSION EXPT 825-5 RUN 12/17/92

SPECIMEN ALLOY 825 600 GRIT FINISH
SURFACE AREA = 20.65 cm²
START WEIGHT 23.72003 g 12/17/92
END WEIGHT 23.70692 g 12/18/92

SOLUTION, ELECTRICAL CONTACT, PLEXIGLASS CELL
PN & Cl ELECTRODE PLACEMENT SLOPES AND INTERCEPT
SAME AS 825-4 P 156.

DATA STORED AS 825-5 ON COMPUADD 333+

APPLIED POTENTIAL +400 mV Ag/AgCl
REFERENCE ELECTRODE = FISHER 13-620-53

UPON APPLYING POTENTIAL TO SPECIMEN INTERFERENCE
WITH pN AND Cl^- ELECTRODES OCCURS.
PROBLEM TRACED TO WORKBENCH DATA CARD
pN AND Cl ISE CALIBRATION DATA STORED AS 8254CAL.DAT
ON IWAS-025 DISK
4/28/94

12/21/92

12/21/92 CREVICE CORROSION EXPT 825-6 12/21/92

SPECIMEN ALLOY 825 600 GRIT FINISH
SURFACE AREA
START WEIGHT = 23.42206 g 12/21/92
END WEIGHT = NOT RECORDED

SOLUTION 0.5m NaCl (29.22549 g NaCl LOT 922649A)
85 PPM NCO_3 (0.11880 g $NaNOO_3$ LOT 897789)
20 ppm SO_4^{2-} (20ml/1000ppm STOCK SOLUTION
USING 1.4787 g Na_2SO_4 ~~IN 1000~~ IN 1000ml) LOT 901213
10 PPM NO_3^- (10ml/1000ppm STOCK SOLUTION
USING 1.3706 g $NaNO_3$ IN 1000 ml LOT 897183)
2 PPM F^- (2 ml/1000ppm STOCK SOLUTION
USING 2.2100 g NaF LOT 896405 IN 1000ml)
ELECTRICAL CONTACT MADE WITH 2.35mm 825 ROD
WITH GROUND FLATS SPOT WELDED TO SIDE
OF SPECIMEN NO MICROSTOP USED TO COVER CONTACT
SOLUTION PURGED WITH N_2
SPECIMEN PLACED IN PLEXIGLASS CELL MI 506/MI 402
#1 (PN #1) PLACED IN TIP LOCATION)
MI 506 #2/MI 402 #2 (PN #2) PLACED IN MOUTH
MI 506 #3/MI 402 #3 (PN #3) PLACED IN BULK
MI 200 #1/MI 403 #1 (Cl^- #1) PLACED IN TIP
MI 200 #2/MI 403 #2 (Cl^- #2) PLACED IN BULK
pH #1 CONNECTED TO ORION 720A SN005885 CH 1
pH #2 CONNECTED TO ORION 720A SN003368 CH #1
pH #3 CONNECTED TO ORION 720A SN003368 CH 2
Cl^- #1 CONNECTED TO ORION EA920 SN 5001/A CH 1
Cl^- #2 CONNECTED TO ORION EA920 SN 5001/A CH 2
pH #1 RECORDED BY RED PEN ABB SN 0515265 CHART
RECORDER PH #2 TO BLUE PEN
Cl #1 RECORDED BY RED PEN ABB SG 120 SN
0049616 CURRENT TO BLUE PEN
CURRENT MEASURED WITH A KEITHLEY 485 PICOAMMETER

12/21/92 CREVICE CORROSION EXPT 825-6 12/21/92

POTENTIAL MEASURED WITH KEITHLEY 614 ELECTROMETER
HIGH IMP LEAD TO REFERENCE ELECTRODE (FISHER)
BLACK LEAD TO SPECIMEN.
CREVICE POTENTIAL MEASURED WITH ORION 720A
SN 005885 CHANNEL #2 USING MI 402 #44671

POTENTIAL APPLIED WITH ESC 410 ID# 9105557
AND ESC 420A ID# 9029495
Ag/AgCl REF ELECTRODE FISHER 13-620-53
SN 8118182

SLOPE AND INTERCEPT OF pH AND Cl ELECTRODES

MI 506 #1/MI 402 #1 (PH #1) AT TIP
$mV = -57.733(pH) + 400.833$
$pH = -0.01732(mV) + 6.943$
MI 506 #2/MI 402 #2 (PH #2) AT MOUTH
$mV = -57.578(pH) + 394.647$
$pH = -0.01737(mV) + 6.854$
MI 506 #3/MI 402 #3 (PH #3) IN BULK
$mV = -57.753(pH) + 398.293$
$pH = -0.01732(mV) + 6.896$
7/27/94
MI 200 #1/MI 403 #1 ~~(Cl #1)~~ (Cl^- #1) AT TIP.
$mV = -20.469 \cdot \ln(ppm\ Cl^-) + 242.384$
$ppm\ Cl^- = Exp[-0.04885 \cdot mV + 11.8414]$
MI 200 #2/MI 403 #2 (Cl^- #2) AT BULK
$mV = -18.3023 \cdot \ln(ppm\ Cl^-) + 226.473$
$ppm\ Cl^- = Exp[-0.05464 \cdot mV + 12.3740]$

pH AND Cl^- ISE CALIBRATION DATA SAVED AS
825CAL.DAT ON IWPE-025 DISK 4/28/94

12/21/92

12/31/92 REPASSIVATION EXPT ALLOY 825 REPTIM 21

SAMPLE: ALLOY 825 600 GRIT FINISH RINSED IN ACETONE, DI WATER, CLEANED IN 10% HNO_3 FOR 60 MIN AND RINSED IN DI WATER.

SOLUTION: 1000 PPM Cl^- 85 PPM NCO_3 20 PPM $SO_4^=$ 10 PPM NO_3^- 2 PPM F^- AS Na SALTS
3.29554 g NaCl LOT 922649A
0.11572 g $NaHCO_3$ LOT 897789
40 ml / 1000 PPM SO_4^{2-} (1.4787 g Na_2SO_4 LOT 901203)
20 ml / 1000 PPM NO_3^- (1.3767 g $NaNO_3$ LOT 897183)
4 ml / 1000 PPM F^- (2.2100 g NaF LOT 896405)
+ DI N_2O TO A VOLUME OF 2000 ml
SOLUTION PURGED W/ N_2 AND TEMP CHECKED WITH Hg THERMO # 1238004
TEMP AT 95°C

POTENTIOSTAT ESC 440-1 CALIBRATION DUE 13 JAN 93 CHANNEL #2
DATA SAVED AS WB\DATA\REPTIM 21.DAT AND AS B:\REPTIM 21.DAT.

CATHODIC STRIP: -2.00V FOR 2 MIN
PIT INITIATION: 600 mV SCE FOR 30 MIN 10:04 AM
PIT GROWTH: 400 mV SCE FOR 6 HOURS
REPASSIVATION: 160 mV SCE
SCE ELECTRODE FISHER 13-620-51 SN0169033
SAMPLE START WEIGHT 11.62603g
SOLUTION PH AT 25°C: 8.144
OPEN CURCUIT POTENTIALS AT START
ALLOY 825 SAMPLE: -592 mV -922 AFTER STRIP
PT COUNTER ELECTRODE: -341 mV

SAMPLE STOPPED 1/1/93 11:12 AM
RUNTIME 89249 SEC
REPASSIVATION TIME: 654.3 SEC TO 1×10^{-6} A/cm²
END PH 9.256 \ 199 SEC TO 5×10^{-5} A/cm²
CHARGE DENSITY 20 C/cm² 1/1/93

12/31/92 REPASSIVATION EXPT ALLOY 825 REPTIM 22

SAMPLE: ALLOY 825 600 GRIT FINISH RINSED IN ACETONE DI WATER CLEANED IN 10% HNO_3 FOR 60 MIN AND RINSED IN DI WATER.

SOLUTION SAME AS REPTIM 21 P 160
SOLUTION AT 95°C PURGED WITH N_2
TEMP CHECKED WITH Hg THERMO 1238001

POTENTIOSTAT ESC 440-1 CALIBRATION DUE 13 JAN 93 CHANNEL # 3 DATA SAVED AS WB\DATA\REPTIM 22.DAT AND AS: B:\REPTIM 22.DAT

CATHODIC STRIP: -2.00V FOR 2 MIN
PIT INITIATION: 600 mV SCE FOR 30 MIN 10:22 AM
PIT GROWTH: 400 mV SCE FOR 6 HOURS
REPASSIVATION: 169 mV SCE 7/27/94
SCE ELECTRODE FISHER 13-620-51 SN0165043
SAMPLE START WEIGHT: 11.57849 g
SOLUTION PH AT 25°C: 8.144
OPEN CIRCUIT POTENTIALS AT START
ALLOY 825 SAMPLE -524 mV -903 AFTER STRIP
PT COUNTER ELECTRODE. -345 mV

SAMPLE STOPPED 1/1/93 11:12 AM
RUNTIME 88921 SEC
RE PASSIVATION TIME 45202 TO 1×10^{-6} A 25178 TO 5×10^{-5} A
END PH: 9.504
CHARGE DENSITY 23 C/cm²

1/1/93

1/10/93

REPASSIVATION POTENTIAL ALLOY 825 RP825P1

SPECIMEN: ALLOY 825 1.915" LONG 0.249" DIA
600 GRIT FINISH CLEANED IN ACETONE,
10% HNO_3 FOR 60 MIN, RINSED IN DI
WATER HH 4371 FC
START WT: 11.65891 g
END WT: 11.47200 g 1/22/93 DD

SOLUTION: 1000 PPM Cl^-, 85 PPM HCO_3 20 PPM $SO_4^=$
10 PPM NO_3^- 2 PPM F^- MADE AS FOLLOWS
- 3.29963 g NaCl LOT 922649A
- 0.23303 g $NaHCO_3$ LOT 897789
- 40ml / 1000 ppm $SO_4^=$ STOCK SOLUTION MADE USING
1.4787 g Na_2SO_4 / 1000 ml DI N_2O LOT# 901213
- 20ml / 1000 PPM NO_3^- STOCK SOLUTION USING
1.3767 g $NaNO_3$ LOT 897183 / 1000 ml w/ DI N_2O
- 4ml NaF 1000 PPM LOT 896405 MADE USING
2.2100 g NaF + N_2O TO 1000 ml
+ DI H_2O TO 2000 ml
SOLUTION AT 95°C TEMP CHECKED WITH
Hg THERMO 123800H PURGED WITH N_2
POTENTIOSTAT ESC 440-1 CHANNEL #3 PROGRAM
WORKBENCH WB\WBB\REPASS2B. DATA IN RP825P1.DAT
ELECTRODE FISHER SCE 1362051 SN 0165415
CATHODIC STRIP -2.00 V SCE FOR 2 min
PIT INITIATION +0.600 V SCE FOR 30 min
PIT GROWTH +0.400 V SCE FOR 12 HRS.
SOLUTION PH AT 25°C 7.815
REST POTENTIALS AT START.
E_{CORR} = -689 mV SCE KEITHLEY 614 * -1
E_{PT} = -225 mV SCE " " "
SAMPLE STARTED 1.40 PM 1/10/93
SAMPLE STOPPED 10:00 AM 1/11/93
RUNTIME 73,400 SEC
REPASSIVATION POTENTIAL 105 mV
CHARGE DENSITY 96 COUL/cm^2
END PH: 9.073

1/10/93

1/10/92

REPASSIVATION POTENTIAL ALLOY 825 RP825P2

SPECIMEN ALLOY 825 HH 4371FC 1.914" LONG 0.249" DIA
600 GRIT FINISH CLEANED IN ACETONE
10% HNO_3 FOR 60 MIN RINSED IN DI
N_2O
START WT: 11.63461 g
END WT: 11.63326 g 1/22/93 DD

SOLUTION: 100 PPM Cl^- 85 PPM NCO_3 20 PPM $SO_4^=$
10 PPM NO_3^- 2 PPM F^-. MADE AS FOLLOWS.
100 ml STOCK SOLUTION # 1000 Cl - 1/93 (1000 PPM Cl^-)
0.11614 g $NaHCO_3$ LOT 897789
20 ml STOCK SOLUTION # SO_4 - 1/93 (1000 PPM $SO_4^=$)
10 ml STOCK SOLUTION # NO_3 - 1/93 (1000 PPM NO_3^-)
2 ml STOCK SOLUTION # F - 1/93 (1000 PPM F^-)
(STOCK SOLUTION DETAILS ON PAGE 164)
IN 1000 ml FLASK + N_2O TO 1000 ml
SOLUTION AT 95°C Hg THERMO
PURGED WITH N_2
POTENTIOSTAT ESC 440-1 CHANNEL #2 WORKBENCH
WB\WBB\REPASS2B DATA IN RP825P2.DAT
ELECTRODE FISHER SCE 1362051 SN 0169033
CATHODIC STRIP -260 V SCE FOR 2.00 MIN
PIT INITIATION +0.600 V SCE FOR 30 MIN
PIT GROWTH +0.400 V SCE FOR 12 HOURS.
SOLUTION PH AT 25°C 8.150
REST POTENTIALS AT START
E_{CORR} -575 mV SCE KEITHLEY 614 X -1
E_{PT} -366 mV SCE " " "
SPECIMEN STARTED 1/10/93 1:45 PM
SAMPLE STOPPED 10:AM 1/11/93
RUNTIME 73,200 SEC
REPASSIVATION POTENTIAL: NA PITTING NEVER STARTED
CHARGE DENSITY 8.3×10^{-2} COUL/cm^2
END PH 9.964

1/10/93

1/11/93

STOCK SOLUTIONS 1/93

SO4-1/93
1000 ppm $SO_4^=$ AS Na_2SO_4
1.48040 g Na_2SO_4 FISNER LOT # 901213
+ DI N_2O TO ~~1000~~ ml

NO_3-1/93
1000 ppm NO_3^- AS $NaNO_3$
1.37258 g $NaNO_3$ FISNER LOT # 897183
+ DI N_2O TO 1000 ml

F-1/93
1000 PPM F^- AS NaF
2.20977g NaF FISNER LOT# 896405
+ DI N_2O TO 1000 ml

1m Cl-1/93
1MOLAR NaCl
58.44 g NaCl + H_2O TO 1000 ml
FISNER LOT 922649A

1000 Cl-1/93
3.29721 g NaCl + N_2O TO 2000 ml
FISNER LOT 922649A

100 Cl-1/93
100 ml 1000 Cl-1/93 + 900 ml N_2O

10 Cl-1/93
10 ml 1000 Cl-1/93 + 990 ml N_2O

David S. Q
1/11/93

1/13/93

REPASSIVATION POTENTIAL ALLOY 825 RP825P3

*SPECIMEN ALLOY 825 600 GRIT FINISH
L = 1.915" d = 0.250"
START WT: 11.63209g HEAT # NH 4371 FC
END WT: ~~11.58856~~g 1/22/93 DD 8.91711g
WET SURFACE AREA = 8.0 cm^2
SOLUTION 10000 PPM Cl^- 85 PPM NCO_3 20 PPM SO_4^-
10 ppm NO_3^- 2 PPM F^- MADE AS FOLLOWS
16.48255 g NACl LOT 922649A
0.11648 g $NaNOO_3$ LOT 897789
20 ml SS# SO4-1/93 (1000 PPM $SO_4^=$ AS Na_2SO_4)
10 ml SS# NO_3-1/93 (1000 PPM NO_3^- AS $NaNO_3$)
2 ml SS# F-1/93 (1000 PPM F^- AS NaF)
STOCK SOLUTION DETAILS ON PAGE 164
+ DI N_2O TO 1000 ml T AT 95°C CHECKED
WITH N_2 TNERMO # 1238001 PURGED
WITH N_2 99.999%
START PH = 7.960
END pH = 9.431
POTENTIOSTAT ESC 440-1 CHANNEL #3 DATA
SAVED AS WB\DATA\RP825P3.DAT USING
WB\WBB\REPASS2B PROGRAM.
ELECTRODE: FISNER SCE 13-620-51 SN0169033
E_{CORR} = -608mV SCE KEITHLEY 614 SN 467374
E_{PT} = -105mV SCE " " " "
CATHODIC STRIP: -2.0V FOR 2min
PIT INITATION: 600mV SCE FOR 30min
PIT GROWTH 400 mV SCE FOR 12 HOURS
SPECIMEN STARTED 1/13/93 2:45 PM
SPECIMEN STOPPED 1/14/93 9:34 AM
RUNTIME 67500 SEC
REPASSIVATION POTENTIAL +5.4mV KEITHLEY 614
CHARGE DENSITY 1.4×10^3 COUL/cm^2
* SPECIMEN CLEANED IN DI WATER, ACETONE, 10% HNO_3 FOR 60 MIN, RINSED IN DI WATER.
David S. Q 1/13/93

1/13/93 REPASSIVATION POTENTIAL RP825P4 ALLOY 825

SPECIMEN ALLOY 825 600 GRIT FINISH BULK COMPOSITION
ℓ = 1.916" d = 0.249" WET SURFACE AREA = 8.0 cm²
START WT = 11.638034 HEAT # HH4371FC
END WT: ~~8.11779~~ DD 1/22/93 11.58956 g
SPECIMEN CLEANED IN DI N_2O, ACETONE,
10% HNO_3 FOR 60 min RINSED IN DI N_2O
SOLUTION 500 ppm Cl^- 85 ppm NCO_3 20 ppm $SO_4^=$
10 ppm NO_3^- 2 ppm F^- MADE AS FOLLOWS
0.82285 g NaCl LOT 922649A
0.11534 g $NaNCO_3$ LOT 897789
20 ml SS# SO_4-1/93 (1000 ppm $SO_4^=$ AS Na_2SO_4)
10 ml SS # NO_3-1/93 (1000 ppm NO_3^- AS $NaNO_3$)
2 ml SS # F-1/93 (1000 ppm F^- AS NaF)
+ DI N_2O TO 1000 ml SS# ON PAGE 164
T = 95°C CHECKED W/ Hg THERMO # 1238004
PURGED W/ N_2 99.999%
START PN = 8.186.
END PN = 9.470
POTENTIOSTAT ESC 440-1 CHANNEL 2 DATA
SAVED ON WORKBENCH WB|DATA|RP825P4.DAT
USING WB|WBB|REPASS2B
ELECTRODE SCE FISNER 13-620-51 SN0165405
E_{CORR} = -456 mV SCE KEITHLEY 614 SN 463374
E_{PT} 1.1 mV SCE " " " "
CATHODIC STRIP: -200 V FOR 2m
PIT INITIATION 600 mV SCE FOR 30 min
PIT GROWTH 400 mV SCE FOR 12 HOURS
SPECIMEN STARTED 1/13/93 2:50 pm
SPECIMEN STOPPED 1/14/93 9:35 AM
RUN TIME 67400 SEC
REPASSIVATION POTENTIAL 147.7 mV KEITHLEY 614
CHARGE DENSITY 2.6×10¹ COUL/cm²

Donald A Duquette 1/14/93

1/14/93 CREVICE CORROSION EXPT 825-7 1/11/93 - 1/14/93

SPECIMEN ALLOY 825 600 GRIT FINISH CLEANED
IN ACETONE RINSED W/ DI WATER.
SURFACE AREA = 20.69 cm²
START WT: 24.06859 g
END WT: 24.04532 g
HEAT # HH4371FC
SOLUTION: 0.5 m NaCl 85 ppm NCO_3 20 ppm $SO_4^=$
10 ppm NO_3^- 2 ppm F^- MADE AS FOLLOWS.
29.22437 g NaCl LOT 922649A
0.11682 g $NaNCO_3$ LOT 897789
20 ml 1000 ppm $SO_4^=$ STOCK SOLUTION # SO_4-1/93
10 ml 1000 ppm NO_3^- STOCK SOLUTION # NO_3-1/93
2 ml 1000 ppm F^- STOCKSOLUTION # F-1/93
+ DI WATER TO 1000 ml (SS# PAGE 164)
T AT ROOM TEMP ≈ 20°C PURGED W N_2
ELECTRICAL CONTACT SAME AS 825-6 P158
SPECIMEN PLACED IN PLEXIGLASS CELL WITH
2 ELECTRODE PORTS, 5 ELECTRODES IN EACH PORT.
PORT #1 AT TIP LOCATION:
MI 506 #1/MI 402 #1 (PN #1) TO ORION 720A SN 5885 CH #1
MI 200 #1/MI 403 #1 (CI #1) TO ORION EA920 SN S001A CH #1
MI 402 SN 44629 TO ORION EA940 SN 2330 CH #1
PORT #2 AT MOUTH LOCATION 7/27/94
MI 506 #2/MI 402 #2 (PN #2) TO ORION 720A SN ~~5885~~ 003368 CH #1
MI 200 #2/MI 403 #2 (CI #2) TO ORION ~~720A SN 003368~~ EA920 SN S001A CH #2 DD 7/27/94
MI 402 SN 44671 TO ORION EA940 SN 2330 CH #2
BULK ELECTRODES
MI 200 (RIGID Si ELECTRODE) W/ MI 402 SN 44628
TO ORION ~~720A~~ 7/27/94 720A SN 5885 CH #2
MI 506 #3/MI 402 #3 (PN #3) TO ORION 720A SN 003368
CHANNEL #2 ELECTRODE IDENTIFICATION ON
PAGE 128.
CURRENT MEASURED WITH KEITHLEY 485 PICOAMMETER
SN 13096 RECORDED W/ ABB CHART RECORDER
SE 120 SN 0049616 BLUE PEN

Cl TIP RECORDED WITH ABB SE 120 SN 0049616
WITH RED PEN.
pH #1 RECORDED WITH ABB SE120 SN 0 515265
WITH RED PEN BLUE PEN OF SN 0515265
RECORDED pH #2
POTENTIAL (APPLIED) MEASURED WITH KEITHLEY 617
SN 15981 CAL DUE 12/23/93
CREVICE POTENTIAL MONITORED W/ ORION EA 940
SN 2380 AND REF ELECTRODES (MICROELECTRODES)
POTENTIAL APPLIED WITH ESC #410 ID# 9105557
AND ESC 420A ID# 9029495
Ag/AgCl REF ELECTRODE FISHER 13-620-53
SN 8118182
SLOPE AND INTERCEPT OF pH AND Cl⁻ ELECTRODES

MI 506 #1 / MI 402 #1 (pH #1) AT TIP
mV = -57.71 (pH) + 403.88
pH = -0.01733 (mV) + 6.993
MI 506 #2 / MI 402 #2 (pH #2) AT MOUTH
mV = -58.00 (pH) + 401.95
pH = -0.01724 (mV) + 6.930
MI 506 #3 / MI 402 #3 (pH #3 AT BULK
mV = -57.50 (pH) + 398.76
pH = -0.01739 (mV) + 6.935

Cl MI 200 #1 / MI 403 #1 (Cl #1) AT TIP
mV = -21.388 · ln (ppm Cl⁻) + 236.806
ppm Cl⁻ = Exp [0.04676 · mV + 11.072] QK 7/27/94
MI 200 #2 / MI 403 #2 (Cl #2) AT MOUTH
mV = -21.552 · ln (ppm Cl⁻) + 251.659
ppm Cl⁻ = Exp [-0.04640 (mV) + 11.677] DK 7/27/94
MI 200 RIGID Cl ELECTRODE SN 47978 & MI 402 # 44678
mV = -21.185 · ln (ppm Cl⁻) + 257.92
~~pH = Exp (0.04720 · [illegible]~~ QK 7/27/94
ppm Cl⁻ = Exp [-0.04720 (mV) + 12.174]

SOLUTION START pH = 7.838
SOLUTION END pH = 8.067

APPLIED POTENTIAL + 300 mV Ag/AgCl
CURRENT : 1.1 mA (HIGH) - 0.30 mA (LOW)

SPECIMEN HAD CREVICE CORROSION BETWEEN MOUTH AND PORT CLOSEST TO MOUTH ON TOP SIDE SOME CREVICE CORROSION BETWEEN MOUTH AND TIP ELECTRODE PORTS. RUN STOPPED DUE TO PROBLEM WITH TIP pH ELECTRODE AND NOISY Cl⁻ ELECTRODE SIGNALS. CAUSED BY BUBBLE IN Cl REFERENCE ELECTRODES
pH AT MOUTH DROPPED TO ≈ pH 4.0
pH AT TIP TO ≈ 6.5 - 7.0
Cl MEASURMENTS NOT RELIABLE DUE TO REFERENCE PROBLEMS.
BULK pH DID DECREASE SOMEWHAT
BULK Cl⁻ MOSTLY CONSTANT.

Ronald S. Lasn
1/14/93

pH AND Cl⁻ ISE CALIBRATION DATA SAVED AS 8257CAL.DAT ON JUNE-02S DISK