NEXTera ENERGY SEABROOK

10 CFR 50.90

SBK-L-20110

August 20, 2020

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Seabrook Station
Docket No. 50-443
Renewed Facility Operating License No. NPF-86

Seabrook Station
Response to Request for Additional Information Regarding Degraded Voltage Time Delay Setpoint License Amendment Request

References:

1. NextEra Energy Seabrook, LLC letter SBK-L-20001, "License Amendment Request 19-03, Application to Revise Degraded Voltage Time Delay Setpoint", January 24, 2020 (ML20027A239).
2. NRC Request for Additional Information Regarding Degraded Voltage Time Delay Setpoint, April 23, 2020 (ML20114E159)
3. NextEra Energy Seabrook, LLC letter SBK-L-20057, "Response to Request for Additional Information Regarding Degraded Voltage Time Delay Setpoint License Amendment Request", May 20, 2020 (ML20027A239).
4. NRC Request for Additional Information Regarding Degraded Voltage Time Delay Setpoint, July 21, 2020 (ML20114E159).

In Reference 1, NextEra Energy Seabrook, LLC (NextEra) submitted License Amendment Request (LAR) 19-03, requesting an amendment to Renewed Facility Operating License No. NPF-86 to revise the degraded voltage time delay set point for Seabrook Nuclear Plant Unit 1 (Seabrook). Specifically, the LAR would decrease the trip setpoint and allowable value for the 4.16 kV Bus 5 and Bus 6 degraded voltage time delays listed in Technical Specifications (TS) Table 3.3-4.

In Reference 2, the NRC requested additional information to complete the review of LAR 19-03.

In Reference 3, NextEra submitted letter SBK-L-20057, "Response to Request for Additional Information Regarding Degraded Voltage Time Delay Setpoint License Amendment Request."

In Reference 4, the NRC requested additional information to complete the review of LAR 19-03.

The enclosure provides NextEra's response to the NRC's Request or Additional Information (RAI).

This response does not alter the conclusion in Reference 1 that the change does not involve a significant hazards consideration pursuant to 10 CFR 50.92, and there are no significant environmental impacts associated with this change.

No new or revised commitments are included in this letter.

If you have any questions regarding this correspondence, please contact Mr. Kenneth Browne, Safety Assurance and Learning Site Director, at (603) 773-7932.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 20, 2020.

Sincerely,

NextEra Energy Seabrook, LLC

Eric McCartney
Site Vice President – Seabrook Nuclear Power Plant

Enclosure

cc: NRC Region I Administrator
NRC Project Manager
NRC Senior Resident Inspector

Director Homeland Security and Emergency Management
New Hampshire Department of Safety
Division of Homeland Security and Emergency Management
Bureau of Emergency Management
33 Hazen Drive

Concord, NH 03305

Katharine Cederberg, Lead Nuclear Planner
The Commonwealth of Massachusetts
Emergency Management Agency
400 Worcester Road
Framingham, MA 01702-5399

Enclosure to SBK-L-20110

Response to Request for Additional Information Regarding Degraded Voltage Time Delay Setpoint License Amendment Request

By letter dated January 24, 2020, as supplemented by letter dated May 20, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML20027A239 and ML20142A204, respectively), NextEra Energy Seabrook, LLC (NextEra, the licensee) submitted a license amendment request (LAR) to revise the degraded voltage time delay setpoint for Seabrook Station, Unit No. 1. Specifically, this amendment will modify the trip setpoint and allowable values (AVs) found in Technical Specifications (TS) 3.3-4, "Engineered Safety Actuation System Instrumentation Trip Setpoints" for the degraded voltage time delay relays for Function Unit 9.b "4.16 kV Bus E5 and E6 Degraded Voltage":

Function 9.b	Trip Setpoint	Allowable Value
Existing	≥ 3933 volts with a ≤10 second time delay	≥ 3902 volts with a ≤10.96 second time delay
Proposed	≥ 3933 volts with a ≤ **6** second time delay	≥ 3902 volts with a ≤ **6.72** second time delay

The NRC staff has identified the need for additional information to complete their review of the LAR.

Responses to these requests for additional information (RAIs) are provided below.

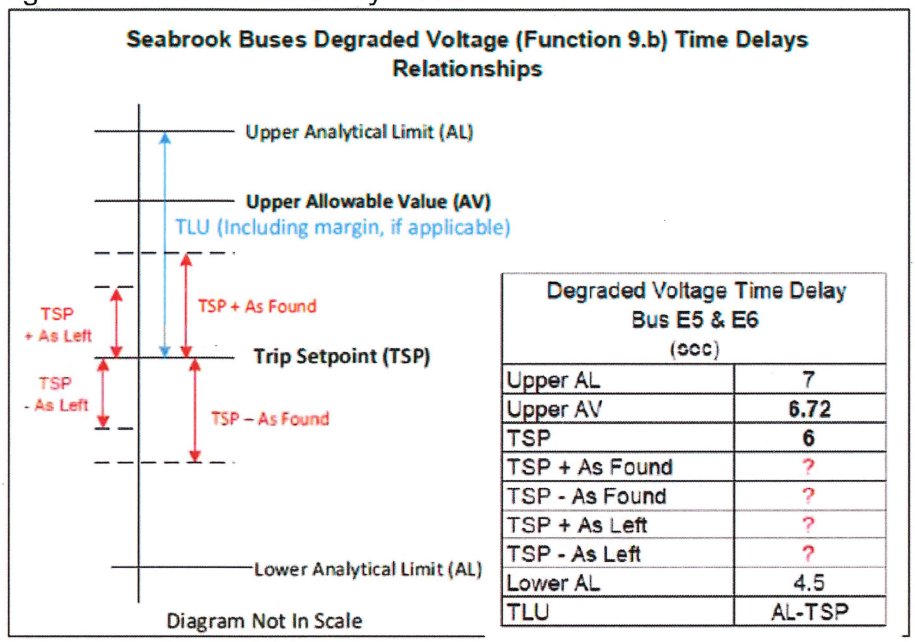
RAI #1

Provide a summary of the relevant calculation information that determined the new time delay setpoint for the 4.16 kV Bus 5 and 6 degraded voltage time delay relays, reducing the delay from a nominal 10 seconds (10.96 seconds allowable value) to 6 seconds (6.72 seconds allowable value). The summary should include the relay setting design basis, including the trip setpoint, the setting and tolerances to be used during calibration and required surveillances, the uncertainties associated with these settings, the expected relay drift between surveillances, measurement and test equipment uncertainties, and the as-found and as-left tolerance acceptance values to be applied during initial calibration and technical specification-related surveillances. Alternatively, the full setpoint uncertainty calculation may be provided for convenience but is not necessary.

This information is needed to enable the staff to understand the relationships among the trip setpoint, the as-left and as-found surveillance test acceptance criteria as further depicted below, in order to verify that the regulatory requirements and guidance above are being met regarding the selection and periodic surveillance of the setpoint and allowable time delay of Function 9.b. (Refer to Figure 1 below).

In the summary of the calculation, please indicate how the as-left and as-found surveillance test acceptance criteria were determined. This information is needed by the staff to evaluate whether key criteria within RIS 2006-17 are being met.

Figure 1 - Staff Confirmatory Review



Degraded Voltage Time Delay Bus E5 & E6 (sec)	
Upper AL	7
Upper AV	6.72
TSP	6
TSP + As Found	?
TSP - As Found	?
TSP + As Left	?
TSP - As Left	?
Lower AL	4.5
TLU	AL-TSP

NextEra Energy Seabrook Response #1

Requested information regarding the relay setting design basis, the trip setpoint, relay drift, measurement and test uncertainties, and relay accuracy has been previously provided in Seabrook letter SBK-L-20057. Supporting vendor documentation for the calculation information is provided in the response to RAI #2 below.

Bus 5 and 6 62D relay calibration is performed by station procedure LX0563.61, 4.16kV Bus Degraded Voltage Protection Channel Calibration and Relay PM. According to this procedure, if the as-found operate time of the 62D relay is not 5.85 to 6.15 seconds, technicians will adjust the relay as necessary to be within the acceptance criteria of 5.85 to 6.15 seconds. This acceptance criteria is chosen to be 50% of the relay accuracy of 0.3 seconds. The requested information to be included in Figure 1 is as follows:

Degraded Voltage Time Delay Bus E5 & E6 (sec)	
Upper AL	7
Upper AV	6.72
TSP	6
TSP + As Found	6.15
TSP - As Found	5.85

TSP + As Left	6.15
TSP - AS Left	5.85
Lower AL	4.5
TLU	AL-TSP

RAI #2

a) Provide the full 62D time delay relay catalog number and vendor performance specification datasheet, which provides the performance specification including accuracy, drift, associated drift interval, and the setting range of time delays of this device.

b) If any of these values are not provided in the manufacturer's datasheet, but are treated as assumptions within the calculation, provide a justification for the values used in these assumptions.

This information is needed to enable the staff to evaluate and understand how the vendor performance specifications were used to establish the as-found, as-left, and Allowable Value so as to address the performance monitoring criteria within RIS 2006-17.

NextEra Energy Seabrook Response #2

a) The installed relay is an Agastat 7012 PC, which has a time delay range of 1.5-15 seconds. This relay replaced the previously installed Agastat 7012 PD in order to accommodate the revised setpoint of 6 seconds. The Agastat 7012 PD has a time delay range of 5-50 seconds. The vendor datasheet is included in the pages that follow.

b) The relay drift is not included in the manufacturer's datasheet. This is assumed in the calculation to be 3% of span (0.41 second). The relay drift for the previously installed Agastat 7012 PD was 1% of span (0.45 second). Therefore, the revised relay drift considered in the station setpoint calculation is conservative relative to the previously installed relay. The Bus 5 and 6 62D relays are calibrated every 36 months. Therefore, the associated drift interval is 36 months.

Although the vendor datasheet specifies a relay accuracy of 10%, the relay accuracy is considered 5% based on previous vendor correspondence for Agastat time delay relays purchased as Class 1E. Station procedure LS0550.09, Timing Relay Acceptance Testing and Maintenance Program, requires verification that the relays meet the 5% accuracy. Recent relay calibrations were reviewed back to April of 2011. Because the 7012 PC relay was installed in April of 2020, there is no calibration history data for that relay. However, a review of the calibration history for the 7012 PD relay shows relay operation within the expected accuracy and drift. The

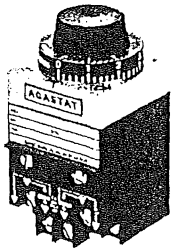
replacement Agastat 7012 PC is the same manufacturer and type as the replaced 7012 PD relay. Therefore, the past performance of the 7012 PD relay indicates acceptable future performance for the 7012 PC relay. As-found operate times during past calibrations for the previous 10 second time delay are shown in the table below.

Refueling Outage	SWG-5 62D As-found Operate Time (s)	% Span SWG-5	SWG-6 62D As-Found Operate Time (s)	% Span SWG-6
OR19	10.277	0.62		
OR18			10.063	0.14
OR17	10.104	0.23		
OR16	10.29	0.64	10.083	0.18
OR15	10.428	0.95	9.611	0.86
OR14	10.054	0.12	9.653	0.77

70-2

AGASTAT®

7000 Series timing relay
Models 7012, 7022, 7032
INSTALLATION AND OPERATION



Every AGASTAT timing relay is a precise timing instrument which balances pneumatic, electrical and mechanical forces in a unique design using a minimum of moving parts. Its accuracy and performance to specifications have been carefully tested before shipment. Properly applied, it offers exceptional life expectancy. A few minutes spent in familiarizing yourself with these instructions will help you get the best possible service from this unit in your application.

Because of the skilled calibration and adjustment required on certain components prior to final assembly, we recommend that field servicing be limited to the replacement of the switchblock and coil assemblies, listed below. These have been designed to insure factory-built performance after field servicing without elaborate calibration. In cases where damage or abuse make it impossible to restore satisfactory performance by replacing these assemblies, the unit should be returned to the factory for repair or replacement.

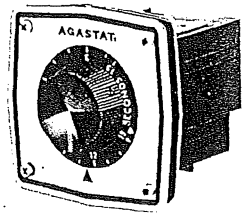
MOUNTING INSTRUCTIONS

A. VERTICAL

Normal mounting for the basic 7000 Series unit is in a vertical position, from the back of the panel. Four 8-32 tapped holes are provided in the back plate, making it interchangeable with earlier models. Mounting screws should not project more than 5/32" into the back of the unit, to prevent internal damage.

A bracket for mounting the unit from the front, and the screws required to attach it to the relay are also supplied with each unit. The bracket extends approximately 3/8" from each side of the unit.

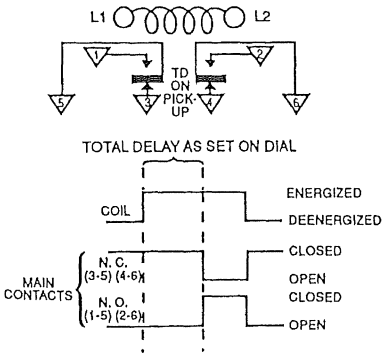
B. HORIZONTAL/PANELMOUNT



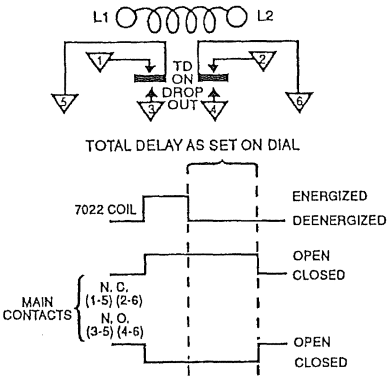
All basic 7000 Series units may be mounted horizontally. However, a dial calibration error (as much as 32% in some units) will result unless the timer is factory equipped with horizontal operation option X or Y1. A unit factory equipped with vertical-horizontal operation option Y2 will require the removal of the Position Compensation Spring in order to maintain accurate calibration. This spring may be removed after the removal of the plastic dust cover, which is fastened to the bottom of the timer with two screws. The dust cover must be replaced after removing the spring.

If the Panel Mounting Kit (option X) is added in the field to units not factory equipped with options Y1 or Y2, an error in dial calibration will result.

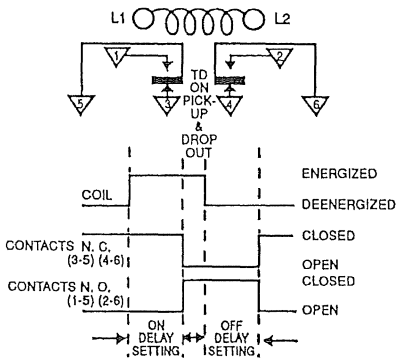
On-Delay Models, 7012
(Delay on pick-up)



Off-Delay Models, 7022
(Delay on drop-out)



On-Delay, Off-Delay Models, 7032
(Double Head)



LINEAR TIMING RANGES

Time Range Code	Models 7012, 7022	*Model 7032
A	.1 to 1 Sec.	.2 to 2 Sec.
B	.5 to 5 Sec.	.7 to 7 Sec.
C	1.5 to 15 Sec.	2 to 20 Sec.
D	5 to 50 Sec.	10 to 100 Sec.
E	20 to 200 Sec.	30 to 300 Sec.
F	1 to 10 Min.	1.5 to 15 Min.
H	3 to 30 Min.	3 to 30 Min.
I	6 to 60 Min.	Not avail.
J	3 to 120 Cyc.	Not avail.
K	1 to 300 Sec.	Not avail.

Basic models are furnished with dials calibrated in linear increments covering the range selected. In addition, time-calibrated ranges B through K provide non-linear adjustment from .2 second to the beginning of the linear zone. For easiest adjustment and lowest cost, the shortest time range suitable for the application should be selected.

*Model 7032 is available with letter calibrated dials only. The upper end of the time ranges in this model may be twice the values shown.

COIL DATA

AC

Coil Part Number	Code Letter	Rated Voltage @ 60 Hz	Operating Voltage Range @ 60 Hz	Rated Voltage @ 50 Hz	Operating Voltage Range @ 50 Hz
7000—	A	120	102-132	110	93.5-121
	B	240	204-264	220	187-242
	C	480	408-528		
	D	550	468-605		
	E	24	20.5-26.5		
	F			127	108-140
	G			240	204-264
	H	12	10.2-13.2		
	I	6	5.1-6.6		
	J	208	178-229		
	K	DUAL VOLTAGE COIL (COMBINES A & B)			

AC SPECIALS L1, L2, etc.

A C Coils (Part No. = 7000 followed by dash and code letter above.)

DC

Coil Part Number	Code Letter	Rated Voltage	Operating Voltage Range DC
7010—	M	28	22.5-33.5
	N	48	38.5-57.5
	O	24	19.2-28.8
	P	125	100-150
	Q	12	9.6-14.4
	R	60	48-74
	S	250	200-300
	T	550	440-660
	U	16	12.8-19.2
	V	32	25.6-38.4
	W	96	76.8-115
	Y	6	4.8-7.2
	Z	220	176-264

DC SPECIALS X1, X2, etc.

D C Coils (Part No. = 7010 followed by dash and code letter above.)

All units draw approximately 8 watts power at rated voltage.

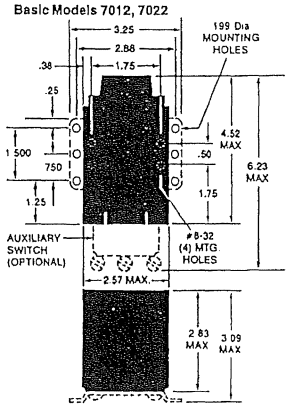
Minimum operating voltages are based on vertically mounted 7012 (on-delay) units. 7012 horizontally mounted or 7022 (off-delay) vertically or horizontally mounted units will operate satisfactorily at minimum voltages approximately 5% lower than those listed.

A C units drop out at approximately 50% of rated voltage. D C units drop out at approximately 10% of rated voltage.

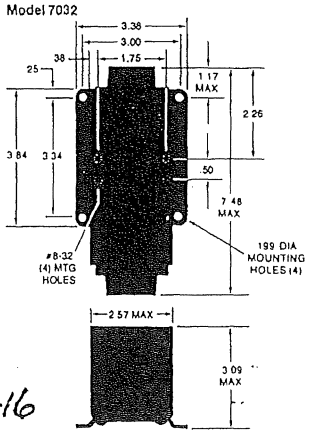
All units may be operated on intermittent duty cycle at voltages 10% above the listed maximums. (Intermittent duty — maximum 50% duty cycle and 30 minutes "on" time.)

Dimensions

Basic Models 7012, 7022



Model 7032

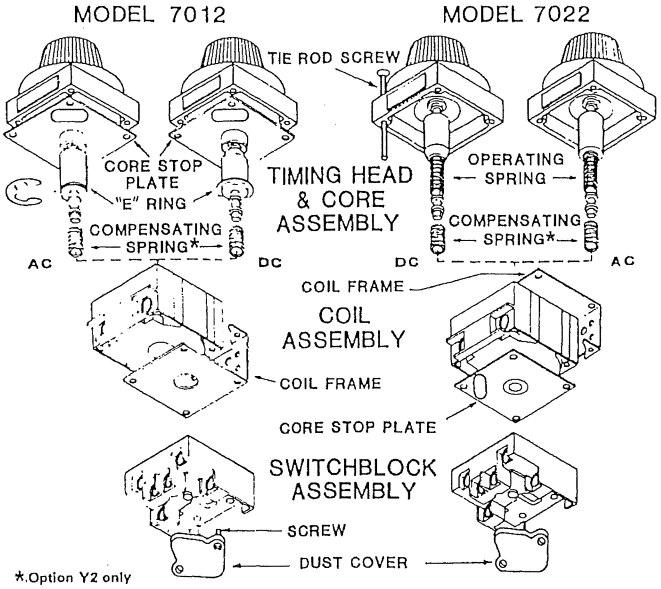


1 OF 16

70-2

REPLACING SWITCHBLOCK AND COIL ASSEMBLIES — MODEL 7012 AND 7022

Switchblock assemblies are universally interchangeable between all standard 7000 Series units. The same assembly is used for A C and D C models for delay on pull-in or delay on dropout service. Neither timing head/core assembly nor coil assembly is interchangeable between A C and D C models.



AUXILIARY SWITCH ADJUSTMENT

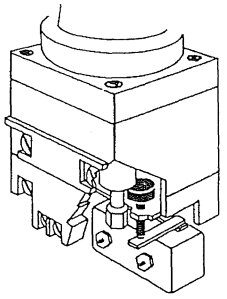
MODEL 7012

(INSTANT TRANSFER AUX. SWITCH)
(CODE L OR CODE LL)

Aux. switch should transfer immediately when relay coil is energized, and should reset shortly before solenoid core returns to its normal position, following deenergization. If it fails to reset before end of core's downward stroke, loosen screw in slotted hole of mounting bracket and move switch closer to terminal block.

TWO STEP AUX. SWITCH (CODE T)

Aux. switch contacts should transfer following first delay period after coil energization, and should reset shortly before core returns to its normal position, following coil deenergization. To increase first delay period, increase the distance between actuator screw head and arm by turning it clockwise, using 1/4" open end wrench.*



CODE L & LL

MODEL 7022

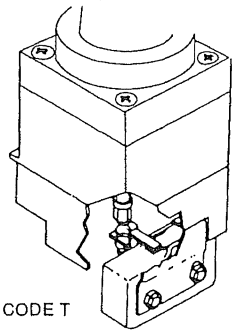
INSTANT TRANSFER AUX. SWITCH
(CODE T)

Aux. switch should transfer immediately when relay coil is energized, and should reset shortly before spindle returns to its normal position, following deenergization. To increase aux. switch delay period, increase the distance between actuator screw head and arm by turning it clockwise, using 1/4" open end wrench.

TWO STEP AUX. SWITCH (CODE T)

Check operation as for Instant Transfer, above. Increase first delay period by turning actuator screw clockwise until the desired delay before aux. switch transfer is reached.

*First delay is independently adjustable, but must be no more than 30% of overall delay. (Recommended max. 100 sec.)



CODE T

CONTACT RATINGS

Contact Capacity in Amperes (Resistive Loads)

Contact Voltage	Min. 100,000 Operations	Min. 1,000,000 Operations
30 vdc	15.0	7.0
110 vdc	1.0	0.5
120 v 60 Hz	20.0	15.0
240 v 60 Hz	20.0	15.0
480 v 60 Hz	12.0	10.0

Contact Ratings are listed under the UL Component Recognition Program for 100,000 operations:

10 Amps Resistive, 240 VAC
¼ Horsepower, 120 VAC/240 VAC
15 Amps, 30 VDC
} Per Pole
5 Amps., General Purpose, 600 VAC

REPLACEMENT ASSEMBLIES

	Part No.
AC Coil Assembly	7000-*
DC Coil Assembly	7010-*
Switchblock Assembly	700030
Auxiliary Switch Kit (Code L)	700047
Auxiliary Switch Kit (Code T)	700121
Auxiliary Switch Kit (Code LL)	700048

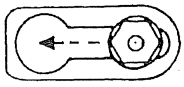
*Specify voltage with code letter.

REMOVING SWITCHBLOCK

(Before disassembling unit: Slice decal on right side of unit with razor blade between switchblock and coil assembly.)

1. Remove four tie rod screws.
2. Hold timing head and coil assembly in one hand, switchblock in the other.
3. Slide switchblock 1/2" forward of coil assembly to center spindle in large end of keyhole slot in switch blade. (See diagram A).
4. Slowly lift timing head and coil assembly off switchblock, being careful to keep spindle collar away from switchblade while withdrawing it.

REVERSE THIS PROCEDURE TO INSTALL NEW SWITCHBLOCK



A

REMOVING COIL

Follow steps 1 to 4 above, then:

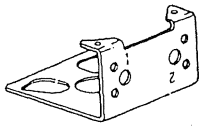
5. Remove timing head and core assembly. (On Model 7022 units the core stop plate and operating spring are loose pieces, located below the core rather than attached to the timing head and core assembly, as on the Model 7012 units. These two pieces should be removed before removing the coil frame, to prevent loss of the loose spring.)

   7012 models require removal of "E" ring from core to permit removing core from coil.

6. Slide off coil frame.

When installing new coil, be sure to replace coil frame with proper side up. Number "1" on back of frame should be up on 7012 (Delay on Pull-In) Models, Number "2" should be up on 7022 (Delay on Drop-out) Models. See Diagram B.

On 7012 models, replace "E" ring in core slot after assembling coil frame to coil.



B

WARRANTY

This product is warranted against mechanical and electrical defects for a period of two years from date of shipment from factory if it has been installed and used in accordance with factory recommendations. Any field repairs or modifications to the original unit will void this warranty. Amerace Corporation's liability is limited to replacement of parts proved defective in workmanship or materials. (W-AB2).

FOR REPAIR SERVICE

Return defective units to:
AMERACE ELECTRONIC COMPONENTS
ATTN PRODUCT SERVICE DEPT.
7474 UTILITIES ROAD
PUNTA GORDA, FL 33982

AMERACE
ELECTRONIC COMPONENTS
7474 UTILITIES ROAD, PUNTA GORDA, FL 33982
TEL (813) 575-8400 • FAX (813) 575-8484

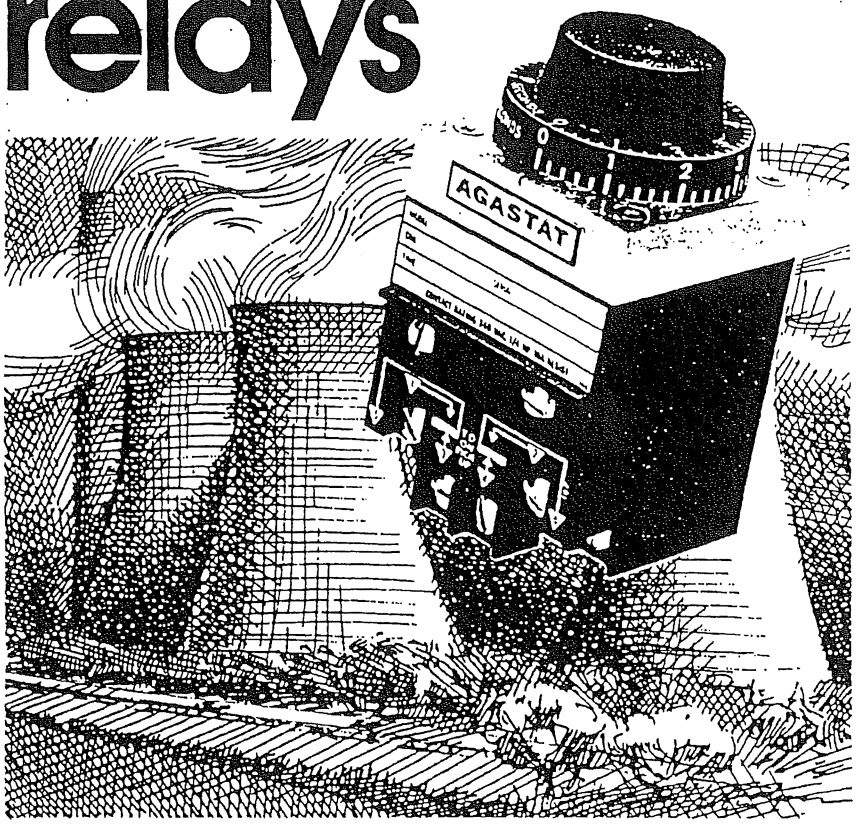
70-2
5/88
(supersedes 4/85)
PN 39999-03
Printed in U.S.A.

= Revised since last printing.

p. 3

AGASTAT®

seismic & radiation tested time delay relays



In order to satisfy the growing need for electrical control components suitable for class 1E service in nuclear power generating stations, the Control Products Division is now offering a series of AGASTAT® timing relays which have been tested for these applications. These E7000 Series electropneumatic devices have demonstrated compliance with the requirements of IEEE Standards 323-1974 (Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations) and IEEE Standard 344-1975 (Seismic Qualification for Nuclear Power Generating Stations). Testing was also referenced to ANSI/IEEE C37.98 (formerly IEEE Standard 501-1978, Standard for Seismic Testing of Relays).

The present E7000 Series design was evolved over 40 years of continual field use in a wide range of industrial applications. On-Delay, Off-Delay and Four-Pole versions are available for use with a choice of 25 coil voltages, as well as time-calibrated delay adjustment to as long as 60 minutes.

CONTROL PRODUCTS DIVISION

70-1

p.4

test procedure

TEST PROCEDURE

AGASTAT® timing relay Models E7012, E7022, E7014 and E7024 were tested in accordance with the requirements of IEEE STD. 323-1974 (Standard for Qualifying Class 1E Equipment for Nuclear Power Generating Stations), IEEE STD. 344-1975 (Seismic Qualification for Nuclear Power Generating Stations) and referenced to ANSI/IEEE C37.98 (formerly IEEE Standard 501-1978, Standard for Seismic Testing of Relays). The relays were tested according to parameters which, in practice, should encompass the majority of applications. Documented data apply to timing relays which were mounted on rigid test fixtures. The following descriptions of the tests performed are presented in their actual sequence.

RADIATION AGING

Relays were subjected to a radiation dosage of 2.0 X 10^3 Rads, which is considered to exceed adverse plant operating requirements for such areas as auxiliary and control buildings.

CYCLING WITH LOAD AGING

The radiated units were then subjected to 27,500 operations at accelerated rate, with one set of contacts loaded to 120VAC, 60Hz at 10 amps; or 125VDC at 1 amp, and the number of mechanical operations exceeding those experienced in actual service.

TEMPERATURE AGING

This test subjected the relays to a temperature of 100°C for 42 days, with performance measured before and after thermal stress.

SEISMIC AGING

Sufficient interactions were performed at levels less than the fragility levels of the devices in order to satisfy the seismic aging requirements of IEEE STD 323-1974 and IEEE STD 344-1975.

SEISMIC QUALIFICATION

Artificially aged relays were subjected to simulated seismic vibration, which verified the ability of the individual device to perform its required function before, during and/or following design basis earthquakes. Relays were tested in the non-operating, operating and transitional modes.

HOSTILE ENVIRONMENT

Since the timing relays are intended for use in auxiliary and control buildings, and not in the reactor containment areas, a hostile environment test was performed in place of the Loss of Coolant Accident (LOCA) test. Relays were subjected to combination extreme temperature/humidity plus under/over voltage testing to prove their ability to function under adverse conditions even after having undergone all the previous aging simulation and seismic testing. The devices were operated at minimum and maximum voltage extremes: 85 and 120 percent of rated voltage for AC units, and 80 and 120 percent of rated voltage for DC units, with temperatures ranging from 40°F to 172°F at 95 percent relative humidity.

BASELINE PERFORMANCE

In addition to aging tests, a series of baseline tests were conducted before, and immediately after each aging sequence, in the following areas:

- Pull-in Voltage
- Drop-out Voltage
- Dielectric Strength at 1650V 60Hz
- Insulation Resistance
- Operate Time (milliseconds)
- Recycle Time (milliseconds)
- Time Delay (seconds)
- Repeatability (percent)
- Contact Bounce (milliseconds at 28VDC, 1 amp.)
- Contact Resistance (milliohms at 28VDC, 1 amp.)

Data were measured and recorded and used for comparison throughout the qualification test program in order to detect any degradation of performance.

The SRS shape (at 5 percent damping), is defined by four points:
point A = 1.0 Hz and an acceleration equal to 25 percent of the Zero Period Acceleration
point D = 4.0 Hz and 250 percent of the ZPA
point E = 16.0 Hz and 250 percent of the ZPA
point G = 33.0 Hz and a level equal to the ZPA

SPECIMEN 1 & 3 (E7012 SERIES)
RELAY STATE: TRANSITIONAL MODE (TD X 2)
AXIS (H+V):
TEST RUN NO. 41, 45, 60, 63
COMPOSITE OF FB/V-, SS/V-, SS/V+, FB/V+ X .707
DUE TO 45° INCLINATION OF TEST MACHINE.

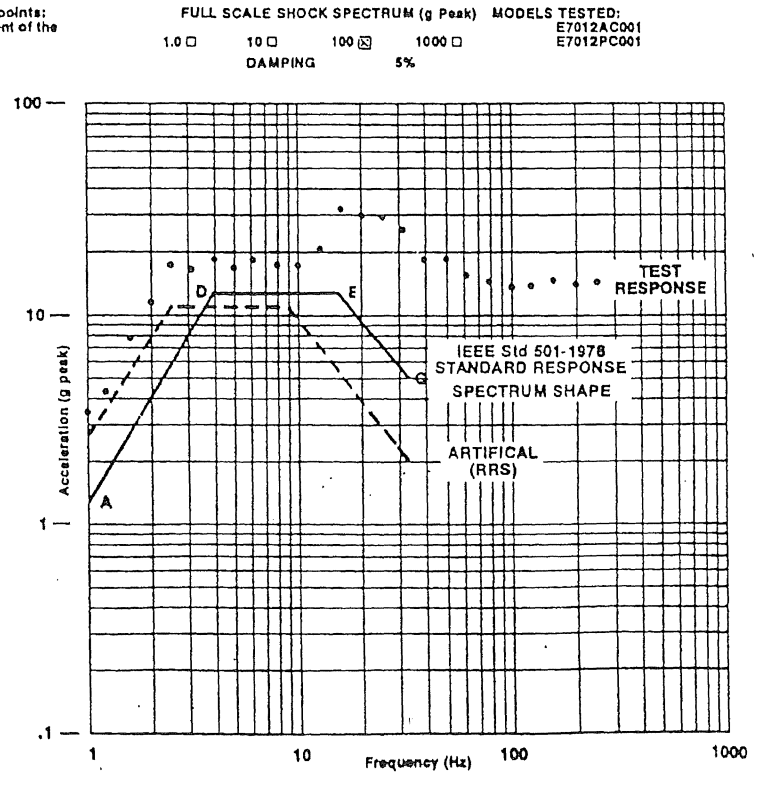


Figure 1. Response Spectrum, Transitional Mode

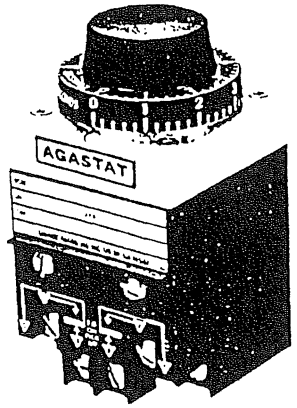
70-1

70-1

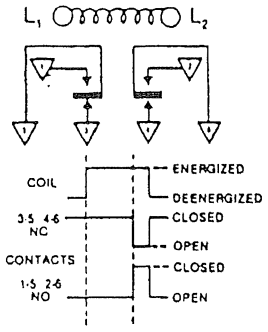
operation

Two basic operating types are available. "On-delay" models provide a delay period on energization, at the end of which the switch transfers the load from one set of contacts to another. De-energizing the unit during the delay period immediately recycles the unit, readying it for another full delay period on reenergization.

In "off-delay" models the switch transfers the load immediately upon energization, and the delay period does not begin until the unit is deenergized. At the end of the delay period the switch returns to its original position. Reenergizing the unit during the delay period immediately resets the timing, readying it for another full delay period on deenergization. No power is required during the timing period.



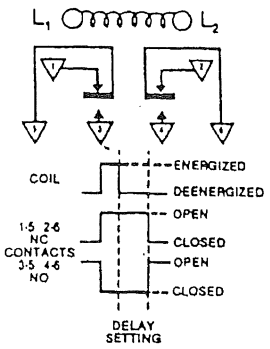
On-Delay Models, E7012
(Delay on pick-up)



Applying continuous voltage to the coil (L1-L2) starts a time delay lasting for the preset time. During this period the normally closed contacts (3 — 5 and 4 — 6) remain closed. At the end of the delay period the normally closed contacts break and the normally open contacts (1 — 5 and 2 — 6) make. The contacts remain in this transferred position until the coil is deenergized, at which time the switch instantaneously returns to its original position.

Deenergizing the coil, either during or after the delay period, will recycle the unit within .050 second. It will then provide a full delay period upon reenergization, regardless of how often the coil voltage is interrupted before the unit has been permitted to "time-out" to its full delay setting.

Off-Delay Models, E7022
(Delay on drop-out)



Applying voltage to the coil (for at least .050 second) will instantaneously transfer the switch, breaking the normally closed contacts (1 — 5 and 2 — 6), and making the normally open contacts (3 — 5 and 4 — 6). Contacts remain in this transferred position as long as the coil is energized. The time delay begins immediately upon deenergization. At the end of the delay period the switch returns to its normal position.

Reenergizing the coil during the delay period will immediately return the timing mechanism to a point where it will provide a full delay period upon subsequent deenergization. The switch remains in the transferred position.

Four Pole Models, E7014, E7024

With the addition of an extra switch block at the bottom of the basic units, this version of the E7000 Series offers four pole switch capacity with simultaneous timing or two-step timing. The two-step operation is achieved by factory adjustment to your specifications.

specifications

TIME DELAY INFORMATION

All units are furnished with dials calibrated in linear increments covering the range selected. (See "Catalog Number Code"). In addition, time-calibrated ranges B through K provide non-linear adjustment from .2 second to the beginning of the linear zone. For easiest adjustment and lowest cost, the shortest time range suitable to the application should be selected.

REPEAT ACCURACY

Repeat accuracy at any fixed temperature is defined as:

* The repeat accuracy deviation (A_R) of a time-delay relay is a measure of the maximum deviation in the time-delay that will be experienced in successive operations at any particular time setting of the relay and for any particular operating voltage or current.

Repeat accuracy is obtained from the following formula:

$$A_R = \pm 100 \frac{(T_1 - T_2)}{(T_1 + T_2)}$$

Where —
T_1 = Maximum time delay.
T_2 = Minimum time delay.

* NEMA part ICS 2-218.02

Repeat accuracy at any fixed temperature is ± 10% of setting.

The first time delay afforded by units with H (3 to 30 minutes) and I (6 to 60 minutes) time ranges may be up to 15% longer than subsequent delays, due to coil temperature rise.

Dial calibration error is not included in the repeat accuracy specification above.

DELAY SETTING

Dial calibrations are provided to minimize the time required to set the unit to a specific delay. Rotate the dial clockwise to increase the delay; counter-clockwise to decrease it.

The following procedure is recommended if the unit must be set to a very precise delay value:

1. Set dial to desired time delay. (On letter-calibrated units, this requires an approximation of a percentage value between the arrowhead "▼" on the dial, which provides minimum time, and the letter "E," which provides maximum time.)
2. Record as many time delays as required to establish a stable average.
3. If the recorded average delay is shorter than the desired time, turn dial slightly clockwise; if it is longer, turn dial counter-clockwise.
4. Repeat step 2 after each adjustment, until required delay is recorded.

Because of the variety of environments in which time delay relays are applied, we recommend a re-check of the time delay after approximately three hours of operation. If any change from the initial time setting is apparent, the relay should be reset to the desired delay. The time delay accuracy should then be monitored on a monthly basis for several months, and if no substantial change in time delay has taken place, the frequency of checking may be reduced. It is recommended that this procedure be incorporated in the Operating Instructions for your equipment.

CONTACT RATINGS — NUCLEAR

Resistive at 125VDC ..... 1.0 Amp.
Resistive at 120 VAC 60 Hz .... 10.0 Amp.

CONTACT RATINGS — NON-NUCLEAR

CONTACT CAPACITY IN AMPS.
(Resistive Loads)

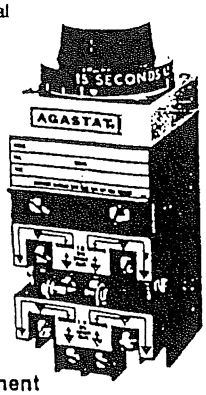
Contact Voltage	Min. 100,000 Operations	Min. 1,000,000 Operations
30VDC	15.0	7.0
110 VDC	1.0	0.5
120V 60Hz	20.0	15.0
240V 60Hz	20.0	15.0
480V 60Hz	12.0	10.0

p.6

70-1

For two-step operation, a maximum timing ratio between upper and lower switches of 3:2 is recommended. Once adjusted at the factory, this ratio remains constant regardless of changes in dial settings. (Ex: if upper switch transfer is set on dial at 60 sec., minimum time on lower switch should be 40 sec.)

Four pole models add approximately 1¼" to the maximum height of the basic model, approximately ⅛" to the depth. They are designed for vertical operation only.



Timing Adjustment

The AGASTAT E7000 Series is the first electropneumatic timer to offer the ease of adjustment and resetting of a calibrated dial head. Discrete ranges covering a total span from .1 second to 60 minutes are available. (See table on page 6.) Each has its own calibrated, clearly identified dial. Timing is set by simply turning the dial to the desired time value. In the zone of approximately 25° separating the high and low ends of timing ranges A, D, E, and K, instantaneous operation (no time delay) will occur. All other ranges produce an infinite time delay when the dial is set in this zone.

OPERATING CHARACTERISTICS

Environmental Conditions. (Qualified Life)

PARAMETER	MIN.	NORMAL	MAX.
Temperature (°F)	40	70-104	156
Humidity (R.H. %)	10	40-60	95
Pressure	—	Atmospheric	—
Radiation (rads)	—	—	2.0×10^3 (Gamma)

Operating Conditions. (Normal Environment)

NORMAL OPERATING SPECIFICATIONS	WITH DC COILS	WITH AC COILS
Coil Operating Voltage, Nominal (Rated)	As Spec	As Spec
Pull-in (% of rated value)	80% Min.	85% Min.
Drop-out (% of rated value)	10% Approx.	50% Approx.
Power (Watts at rated value)	8 Approx.	8 Approx.
Relay Operate Time		
Model E7012	N/A	N/A
Model E7022	50 ms Max.	50 ms Max
Relay Release (Recycle) Time		
Model E7012	50 ms Max.	50 ms Max.
Model E7022	N/A	N/A
Contact Ratings, Continuous		
(Resistive at 125 vdc)	1.0 amp	1.0 amp
(Resistive at 120 vac, 60 Hz)	10.0 amp	10.0 amp
Insulation Resistance (In megohms at 500 vdc)	500 Min.	500 Min.
Dielectric (vrms, 60 Hz)		
Between Terminals and Ground	1,500	1,500
Between Non-connected Terminals	1,000	1,000
Repeat Accuracy	± 10%	± 10%

Operating Conditions. (Abnormal Environment)

ADVERSE OPERATING SPECIFICATIONS	NORMAL	DBE "A"	DBE "B"	DBE "C"	DBE "D"
Temperature (°F)	70-104	40	120	145	156
Humidity (R.H. %)	40-60	10-95	10-95	10-95	10-95
Coil Operating Voltage * (% of Rated)					
Model E7012 (AC)	85-110	85-110	85-110	85-110	85-110
(DC)	80-110	80-110	80-110	90-110	90-110
Model E7022 (AC)	85-110	85-110	85-110	85-110	85-110
(DC)	80-110	80-110	80-110	80-110	80-110

* All coils may be operated on intermittent duty cycles at voltages 10% above listed maximums (Intermittent Duty = Maximum 50% duty cycle and 30 minutes "ON" time.)

Contact ratings as listed under the UL Component Recognition Program for 100,000 operations:

10 Amps., resistive, 240 VAC
¼ horsepower, 120 VAC/240 VAC
15 Amps., 30VDC
5 Amps., General Purpose, 600 VAC

} Per Pole

COIL DATA

All units draw approximately 8 watts power at rated voltage.

The operating voltage range for AC relays is 85 to 110 percent of nominal rated value.

AC units drop-out at approximately 50% of rated voltage.

The operating range of DC relays is 80 to 110 percent of nominal rated value.

DC units drop-out at approximately 10% of rated voltage.

All units may be operated on intermittent duty cycles (50% on/off, maximum 30 minutes on) at voltages 10% above the listed maximums.

APPROXIMATE WEIGHT

Model E7012 and E7022 with AC Coils — 2.13 lbs.
Model E7012 and E7022 with DC Coils — 2.25 lbs.
Model E7014 and E7024 with AC Coils — 2.43 lbs.
Model E7014 and E7024 with DC Coils — 2.57 lbs.
(Weight may vary slightly with particular coil voltage.)

TERMINALS

Standard screw terminals (#8 — 32 truss head screws supplied) are located on the front of the unit, with permanent schematic markings. Barrier isolation is designed to accommodate spade or ring-tongue terminals with spacing to meet industrial control specifications.

In the event of malfunction, return units to:
CONTROL PRODUCTS DIVISION
AMERACE CORPORATION
1000 HICKORY STREET
GRAFTON, WISCONSIN 53024

ATTENTION: PRODUCT SERVICE DEPARTMENT

WARRANTY

The AGASTAT® timing relay is warranted against mechanical and electrical defects for a period of one year from date of shipment from factory if it has been installed and used in accordance with factory recommendations.

Any field repairs or modifications to the original unit will void the Warranty and the Qualification.

NOTE

Control Products Division of Amerace Corporation does not recommend the use of its products in the containment areas of Nuclear Power Generating Stations.

REPLACEMENT SCHEDULE

The qualified life of this unit is 25,000 operations or 10 years from the date of manufacture, whichever occurs first.

The date of manufacture can be found in the first four (4) digits of the serial number on the nameplate:

XX XX
First two digits indicate the year.
Second two digits indicate the week.

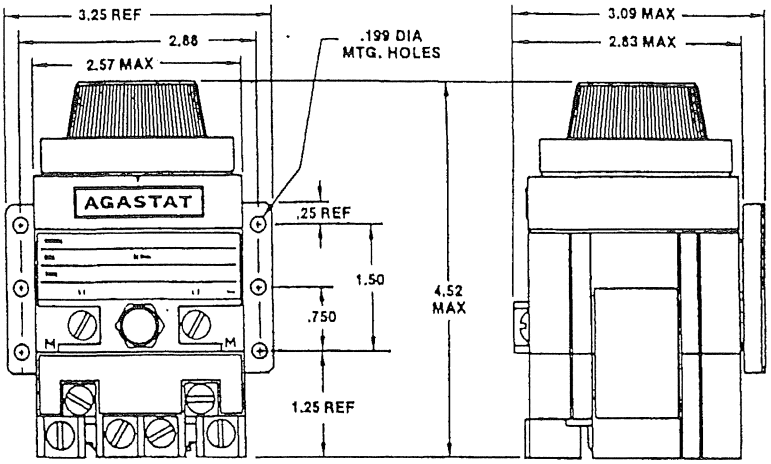
Example: Date code 8014: 80 indicates 1980; 14 indicates the week of April 2 through 8.

MODEL E7012PC002
COIL 125VDC Serial 8014 —
TIME 1.5 TO 15 SEC.
L1 L2

70-1

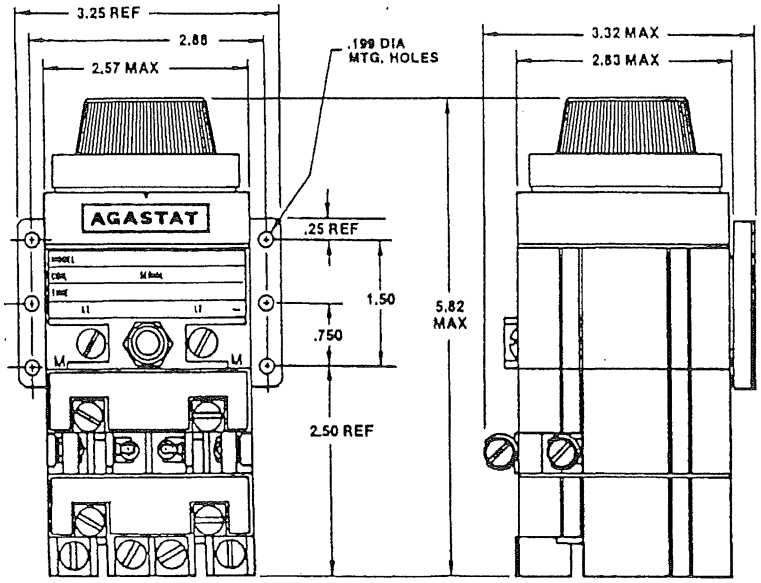
dimensions & mounting

MODEL E7012, E7022



QUALIFICATION TESTED FOR VERTICAL OPERATION ONLY

MODEL E7014, E7024



QUALIFICATION TESTED FOR VERTICAL OPERATION ONLY

MOUNTING INSTRUCTIONS

The E7000 Series relay must be mounted in the vertical position. All performance specifications of these units are valid only when they are mounted in this manner.

A bracket for mounting the device and the screws and lockwashers required to attach it to the relay are supplied with each unit. Four 8 — 32 tapped holes are provided in the rear of the device for attaching the mounting bracket, or for mounting the relay directly to a panel, from the rear.

70-1

ordering information

CATALOG NUMBER CODE

E	70	1	2	A	A	**002
NUCLEAR SAFETY RELATED	AGASTAT® 7000 Series Timing Relay	OPERATION 1—On-delay 2—Off-delay	CONTACT ARRANGEMENT 2—Double Pole Double Throw 4—Four Pole Double Throw	COIL VOLTAGE	TIME RANGE E7012, E7022	CONFIGURATION CODE

COIL VOLTAGE

CODE		
AC	A	120V 60Hz 110V 50Hz
AC	B	240V 60Hz 220V 50Hz
AC	C	480V 60Hz
AC	D	550V 60Hz
AC	E	24V 60Hz
AC	F	127V 50Hz
AC	G	240V 50Hz
AC	H	12V 60Hz
AC	I	6V 60Hz
AC	J	208V 60Hz
DC	M	28 VDC
DC	N	48 VDC
DC	O	24 VDC
DC	P	125 VDC
DC	Q	12 VDC
DC	R	60 VDC
DC	S	250 VDC
DC	T	550 VDC
DC	U	16 VDC
DC	V	32 VDC
DC	W	96 VDC
DC	Y	6 VDC
DC	Z	220 VDC

TIME RANGE E7012, E7022

CODE	
A	.1 to 1 sec.
B	.5 to 5 sec.
C	1.5 to 15 sec.
D	5 to 50 sec.
E	20 to 200 sec.
F	1 to 10 min.
H	3 to 30 min.
I	6 to 60 min.
K	1 to 300 sec.

*E7014

A	.2 to 2 sec.
B	.7 to 7 sec.
C	.2 to 20 sec.
D	10 to 100 sec.
E	30 to 300 sec.
F	1.5 to 15 min.
H	3 to 30 min.

E7024

A	.1 to 1 sec.
B	.5 to 5 sec.
C	1.5 to 15 sec.
D	5 to 50 sec.
E	20 to 200 sec.
F	1 to 10 min.
H	3 to 30 min.
I	6 to 60 min.
K	1 to 300 sec.

* Model E7014 is available with letter-calibrated dials only. The upper end of the time ranges in these models may be twice the values shown.

** CONFIGURATION CODE

The Configuration Code is a suffix to the Model Number which provides a means of identification. When a significant product change is introduced, the Configuration Code and specification sheets will be revised. (001 to 002, etc.).

CONTROL PRODUCTS DIVISION

Amerace Corporation, Control Products Division
2330 Vauxhall Road, Union, New Jersey 07083, U.S.A.
Telex 138-978

E70-1
June 1982

8

Printed in U.S.A.