TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401

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NOV 28 1989

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

Gentlemen:

In the Matter of) Docket Nos. 50-327
Tennessee Valley Authority) 50-328

SEQUOYAH NUCLEAR PLANT (SQN) - RESPONSE TIME TESTING OF SOLID-STATE PROTECTION SYSTEM (SSPS) INPUT AND MASTER RELAYS

During the upcoming Cycle 4 refueling outages for Units 1 and 2, SQN will be implementing an upgrade to the reactor protection system (RPS) by replacing the analog Foxboro H-Line hardware currently in use with the Westinghouse Electric Corporation Eagle 21 digital system. The Eagle 21 system has built-in automated test features for calibration and response time surveillance testing. These self-test features thoroughly test the Eagle 21 system including its reactor trip and engineered safety features functions. The input and master relays of SSPS, however, are not response time tested as part of the Eagle 21 self-test. In lieu of developing procedures and test methods to response time test the input and master relays with the Eagle 21 RPS configuration, TVA is proposing that technical specification channel functional testing is a sufficient verification of the relays' ability to perform their safety function.

TVA believes that the additional information gained from the response time testing of the SSPS input and master relays does not warrant the resource expenditures necessary to develop the new methodology and procedures to test the relays in the Eagle 21 RPS configuration. Therefore, TVA is proposing the elimination of response time testing requirements for the SSPS input and master relays. The technical justification for eliminating these requirements is provided as an enclosure. This matter was informally discussed during an October 12, 1989, telephone conversation with Jerry Mauck and Jack Donohew of your staff.

TVA is requesting NRC's concurrence with the proposal for eliminating the response time testing requirement. Technical specification changes, corresponding to the elimination of the response time testing requirements for the SSPS input and master relays, will be submitted after formal NRC concurrence of the position is obtained. TVA requests that a formal response to this issue be provided by December 29, 1989, to facilitate preparation of technical specification changes and testing procedures to support Unit 1 Cycle 4 refueling outage preparations.

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U.S. Nuclear Regulatory Commission

NOV 28 1989

Please direct questions concerning this issue to Russell R. Thompson at (615) 843-7470.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

Manager, Nuclear Licensing
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ENCLOSURE

Justification for the Deletion of Solid-State
Protection System (SSPS) Input and
Master Relay Response Time Testing Requirements

Sequoyah Nuclear Plant (SQN) presently performs response time testing on all components in the analog channels and the circuitry associated with SSPS and its outputs. The analog channel test also includes the SSPS input relays and master relays, where applicable, by measuring the time from a step change in loop current to when the relay contact changes to its trip state.

During the upcoming Cycle 4 refueling outages for Units 1 and 2, SQN will implement an upgrade to the reactor protection system (RPS) by installing the Westinghouse Electric Corporation Eagle 21 system in place of the present Foxboro H-Line hardware (see attached figure). The Eagle 21 system has built-in, automated test features for surveillance testing of calibration and response time. These features thoroughly test the Eagle 21 system including its trip and engineered safety features (ESF) functions. The input relays and master relays in SSPS, however, are not response time tested by this feature.

Implementation of Eagle 21 is a significant step in the modernization of RPS and simplifying the activities required to maintain RPS operability. Use of the Eagle 21 self-test features leads to reductions in temporary connections/changes to plant wiring, reduces the chances for personnel error, and reduces craft manpower requirements. TVA believes that these are some of the major advantages of Eagle 21 in terms of surveillance cost, enhanced plant reliability, and enhanced safety. TVA would like to be able to implement a streamlined testing program fully utilizing these features. The deletion of input relay and master relay response time testing would be beneficial to TVA in preparation for the refueling outage and would provide a significant reduction in surveillance testing time, complexity, and cost while not significantly reducing the level of assurance that the RPS will perform its safety functions.

One of the following techniques would have to be implemented to response time test input and master relays:

1. Lift leads on the input of Eagle 21 and inject step changes in loop current while monitoring input and master relay contact closures inside the SSPS. This would measure the response time of the Eagle 21 components and the SSPS input and/or master relay. This technique would not take full advantage of the response time self-test features of Eagle 21.

2. Prepare new procedures to make temporary connections to the outputs of the Eagle 21 bistables and the contact of the SSPS input and/or master relays and initiate another bistable trip to measure the relay response time. This time would then have to be added to the times measured for the other portions of the channel to determine an overall channel response time.

Either test technique would require basically the same level of maintenance involvement that presently is necessary to perform response time testing, thus negating some of the benefits associated with the installation of Eagle 21.

The relays in question are miniature enclosed relays with a very small moving mass. An inspection of previous response time test data shows that response times of less than 40 milliseconds can be routinely expected. The review also identified no signs of degradation of the response time of these relays.

A compilation of the Unit 1 response time data is attached. This data reflects response times for all Unit 1 input relays and a sampling of the Unit 1 master relays. The data for all master relays was not researched, as the master relays are the same as the input relays, except for coil voltage. There is no greater risk of degradation of the response time of these relays than for the input relays. The data reviewed was retrieved from both preoperational and surveillance test packages. The data included the response time of the input and master relays, as well as the response time of the associated analog channel.

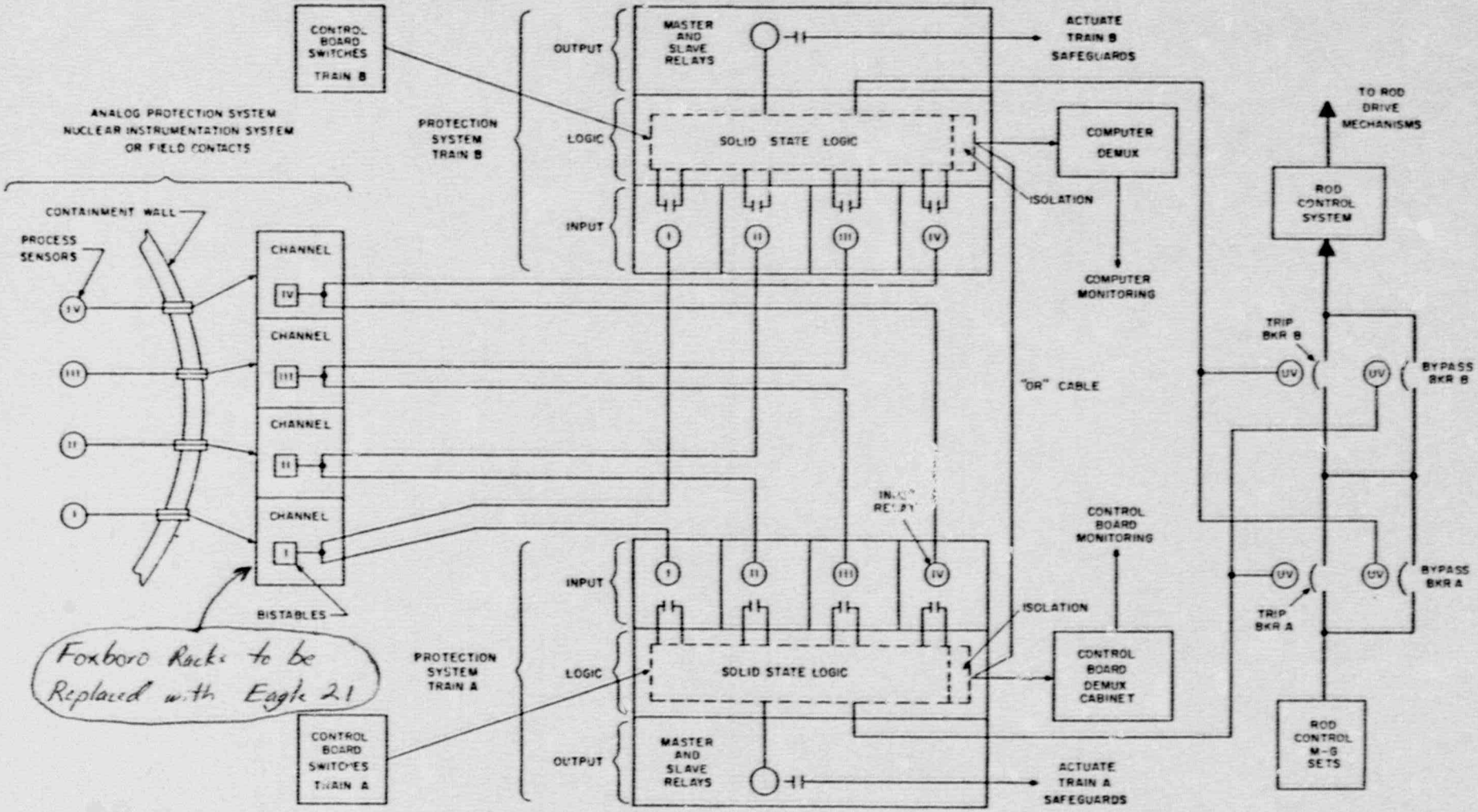
The present response time test program and the preoperational test program measure loop response time from the time a step change is injected into the analog channel to the time that the SSPS input and/or master relay changes state. Changes noted in individual loop response times are attributed to the analog channels themselves or to the methods used to record test data. Some of the channels have modules with lead/lag functions that could cause changes in the response time data because of small variations in the time constants. Some deviations in response time from one performance to another are also introduced by the method used to measure this response time. This is the result of differences in the test performers' subjective determination as to where to make the beginning and end of the test on a strip chart record and the speed of the strip chart. In all cases, the measured response times for the analog channels and input/master relays are short in comparison with the total response times allowed by the technical specifications.

It is important to note that the input relays are functionally tested during routine analog channel functional testing and the master relays are functionally tested by routine SSPS functional testing. This functional testing will provide the periodic testing necessary to ensure that the input and master relays will perform their intended function.

The failure of an input relay to function would be indicated in the main control room. The multiplexing system in SSPS is operated in a mode that would cause the main control room status lamp to flash if a trip signal was present and the input relay in one train failed to operate or was extremely slow to operate.

In summary, TVA contends that the information gained from the response time testing of the SSPS input and master relays does not warrant the development of testing methodology and procedures for response time testing these relays after the implementation of Eagle 21. Historical data indicates no degradation in the performance of these relays, and channel function tests confirm their ability to function as required.

SQN Reactor Protection System



SEQUOYAH NUCLEAR PLANT UNIT 1
REACTOR TRIP CHANNELS
RESPONSE TIMES
OVER THE LIFE OF THE PLANT

RECORD NUMBER	TRIP FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME MEASURED
1	PWR RNG HI FLUX RT-N41 K147 A	03/15/80 06/29/88 / / / /	0.0120 0.0050 0.0000 0.0000	0.0085	0.0120	0.0050
2	PWR RNG HI FLUX RT-N41 K147 B	03/15/80 04/04/84 06/29/88 / /	0.0120 0.0080 0.0150 0.0000	0.0117	0.0150	0.0080
3	PWR RNG HI FLUX RT-N42 K221 A	03/15/80 06/29/88 / / / /	0.0120 0.0125 0.0000 0.0000	0.0123	0.0125	0.0120
4	PWR RNG HI FLUK RT-N42 K221 B	03/15/80 04/17/82 06/29/88 / /	0.0120 0.0160 0.0200 0.0000	0.0160	0.0200	0.0120
5	PWR RNG HI FLUX RT-N43 K302 A	03/15/80 12/13/82 06/29/88 / /	0.0080 0.0250 0.1250 0.0000	0.0527	0.1250	0.0080
6	PWR RNG HI FLUX RT-N43 K302 B	03/15/80 06/29/88 / / / /	0.0080 0.0100 0.0000 0.0000	0.0090	0.0100	0.0080
7	PWR RNG HI FLUX RT-N44 K402 A	03/15/80 06/11/80 06/29/88 / /	0.0160 0.0080 0.0200 0.0000	0.0147	0.0200	0.0080
8	PWR RNG HI FLUX RT-N44 K402 B	03/15/80 04/04/84 05/04/88 / /	0.0160 0.0800 0.0175 0.0000	0.0378	0.0800	0.0160
9	PWR RNG LO FLUX RT-N41 K146 A	03/15/80 06/11/80 06/29/88 / /	0.0080 0.0080 0.0100 0.0000	0.0087	0.0100	0.0080

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10	PWR RNG LO FLUX RT-N41 K146 B	03/15/80 04/04/84 06/29/88 / /	0.0080 0.0080 0.0075 0.0000	0.0078	0.0080	0.0075
11	PWR RNG LO FLUX RT-N42 K220 A	03/15/80 06/29/88 / /	0.0080 0.0150 0.0000 0.0000	0.0115	0.0150	0.0080
12	PWR RNG LO FLUX RT-N42 K220 B	03/15/80 04/17/82 06/29/88 / /	0.0080 0.0140 0.0100 0.0000	0.0107	0.0140	0.0080
13	PWR RNG LO FLUX RT-N43 K303 A	03/15/80 12/13/82 06/29/88 / /	0.0120 0.0200 0.0100 0.0000	0.0140	0.0200	0.0100
14	PWR RNG LO FLUX RT-N43 K303 B	03/15/80 06/29/88 / /	0.0120 0.0250 0.0000 0.0000	0.0185	0.0250	0.0120
15	PWR RNG LO FLUX RT-N44 K403 A	03/15/80 06/11/80 06/29/88 / /	0.0120 0.0080 0.0100 0.0000	0.0100	0.0120	0.0080
16	PWR RNG LO FLUX RT-N44 K403 B	03/15/80 04/04/84 05/04/88 / /	0.0120 0.0800 0.0150 0.0000	0.0357	0.0800	0.0120
17	PWR RNG NEGRATE RT-N41 K153 A	03/15/80 06/11/80 06/29/88 / /	0.1040 0.0640 0.0600 0.0000	0.0760	0.1040	0.0600
18	PWR RNG NEGRATE RT-N41 K153 B	03/15/80 04/04/84 06/29/88 / /	0.1040 0.0960 0.1250 0.0000	0.1083	0.1250	0.0960

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19	PWR RNG NEGRATE RT-N42 K253 A	03/15/80 06/29/88 / / / /	0.0400 0.0625 0.0000 0.0000	0.0513	0.0625	0.0400
20	PWR RNG NEGRATE RT-N42 K253 B	03/15/80 06/29/88 / / / /	0.0400 0.1275 0.0000 0.0000	0.0838	0.1275	0.0400
21	PWR RNG NEGRATE RT-N43 K353 A	03/15/80 12/13/82 06/29/88 / /	0.0960 0.0630 0.1150 0.0000	0.0913	0.1150	0.0630
22	PWR RNG NEGRATE RT-N43 K353 B	03/15/80 06/29/88 / / / /	0.0960 0.0600 0.0000 0.0000	0.0780	0.0960	0.0600
23	PWR RNG NEGRATE RT-N44 K441 A	03/15/80 06/11/80 06/29/88 / /	0.0560 0.0600 0.0625 0.0000	0.0595	0.0625	0.0560
24	PWR RNG NEGRATE RT-N44 K441 B	03/15/80 04/04/84 05/04/88 / /	0.0560 0.0800 0.0550 0.0000	0.0637	0.0800	0.0550
25	PRZR PRESS LO RT-4.5 K129 A	03/15/80 06/11/80 06/29/88 / /	0.0800 0.0760 0.0900 0.0000	0.0820	0.0900	0.0760
26	PRZR PRESS LO RT-4.5 K129 B	03/15/80 04/04/84 06/29/88 / /	0.0760 0.0800 0.0850 0.0000	0.0803	0.0850	0.0760
27	PRZR PRESS LO RT-4.6 K211 A	03/15/80 06/29/88 / / / /	0.0720 0.0700 0.0000 0.0000	0.0710	0.0720	0.0700

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28	PRZR PRESS LO RT-4.6 K211 B	03/15/80 04/17/82 06/29/88 / /	0.0720 0.0600 0.0625 0.0000	0.0648	0.0720	0.0600
29	PRZR PRESS LO RT-4.7 K343 A	03/15/80 12/13/82 06/29/88 / /	0.0880 0.0813 0.0800 0.0000	0.0831	0.0880	0.0800
30	PRZR PRESS LO RT-4.7 K343 B	03/15/80 06/29/88 / / / /	0.0880 0.0850 0.0000 0.0000	0.0865	0.0880	0.0850
31	PRZR PRESS LO RT-4.8 K416 A	03/15/80 12/13/82 06/29/88 / /	0.0800 0.0575 0.0800 0.0000	0.0725	0.0800	0.0575
32	PRZR PRESS LO RT-4.8 K416 B	03/15/80 06/29/88 / / / /	0.0800 0.0850 0.0000 0.0000	0.0825	0.0850	0.0800
33	PRZR PRESS HI RT-4.5 K130 A	03/15/80 06/11/80 06/29/88 / /	0.0640 0.0560 0.0450 0.0000	0.0550	0.0640	0.0450
34	PRZR PRESS HI RT-4.5 K130 B	03/15/80 04/04/84 06/29/88 / /	0.0640 0.0800 0.0500 0.0000	0.0647	0.0800	0.0500
35	PRZR PRESS HI RT-4.6 K212 A	03/15/80 06/29/88 / / / /	0.0520 0.0700 0.0000 0.0000	0.0610	0.0700	0.0520
36	PRZR PRESS HI RT-4.6 K212 B	03/15/80 04/17/82 06/29/88 / /	0.0520 0.0600 0.0713 0.0000	0.0611	0.0713	0.0520

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37	PRZR PRESS HI RT-4.7 K316 A	03/15/80 12/13/82 06/29/88 / /	0.0640 0.1575 0.0650 0.0000	0.0955	0.1575	0.0640
38	PRZR PRESS HI RT-4.7 K316 B	03/15/80 06/29/88 / / / /	0.0640 0.0650 0.0000 0.0000	0.0645	0.0650	0.0640
39	PRZR PRESS HI RT-4.8 K415 A	03/15/80 12/13/82 06/29/88 / /	0.0400 0.0350 0.0350 0.0000	0.0367	0.0400	0.0350
40	PRZR PRESS HI RT-4.8 K415 B	03/15/80 06/29/88 / / / /	0.0400 0.0500 0.0000 0.0000	0.0450	0.0500	0.0400
41	RCS LOW FLOW RT-6.13 K125 A	03/15/80 06/11/80 06/29/88 / /	0.0440 0.0400 0.0450 0.0000	0.0430	0.0450	0.0400
42	RCS LOW FLOW RT-6.13 K125 B	03/15/80 04/04/84 / / / /	0.0400 0.0300 0.0000 0.0000	0.0350	0.0400	0.0300
43	RCS LOW FLOW RT-6.14 K213 A	03/15/80 06/29/88 / / / /	0.0560 0.0850 0.0000 0.0000	0.0705	0.0850	0.0560
44	RCS LOW FLOW RT-6.14 K213 B	03/15/80 09/23/81 / / / /	0.0560 0.0520 0.0000 0.0000	0.0540	0.0560	0.0520
45	RCS LOW FLOW RT-6.15 K312 A	03/15/80 12/13/82 / / / /	0.0680 0.0550 0.0000 0.0000	0.0615	0.0680	0.0550

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46	RCS LOW FLOW RT-6.15 K312 B	03/15/80 06/29/88 / / / /	0.0680 0.0650 0.0000 0.0000	0.0665	0.0680	0.0650
47	RCS LOW FLOW RT-6.16 K126 A	03/15/80 06/11/80 06/29/88 / /	0.0800 0.0600 0.0800 0.0000	0.0733	0.0800	0.0600
48	RCS LOW FLOW RT-6.16 K126 B	03/15/80 04/04/84 / / / /	0.0800 0.0650 0.0000 0.0000	0.0725	0.0800	0.0650
49	RCS LOW FLOW RT-6.17 K214 A	03/15/80 06/29/88 / / / /	0.0720 0.0550 0.0000 0.0000	0.0635	0.0720	0.0550
50	RCS LOW FLOW RT-6.17 K214 B	03/15/80 09/23/81 / / / /	0.0720 0.0440 0.0000 0.0000	0.0580	0.0720	0.0440
51	RCS LOW FLOW RT-6.18 K313 A	03/15/80 12/13/82 / / / /	0.0560 0.0325 0.0000 0.0000	0.0443	0.0560	0.0325
52	RCS LOW FLOW RT-6.18 K313 B	03/15/80 06/29/88 / / / /	0.0560 0.0425 0.0000 0.0000	0.0493	0.0560	0.0425
53	RCS LOW FLOW RT-6.19 K127 A	03/15/80 06/11/80 02/21/84 06/29/88	0.0720 0.0400 0.0350 0.0550	0.0505	0.0720	0.0350
54	RCS LOW FLOW RT-6.19 K127 B	03/15/80 04/04/84 / / / /	0.0720 0.0350 0.0000 0.0000	0.0535	0.0720	0.0350

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55	RCS LOW FLOW RT-6.20 K227 A	03/15/80 06/29/88 / / / /	0.0600 0.0600 0.0000 0.0000	0.0600	0.0600	0.0600
56	RCS LOW FLOW RT-6.20 K227 B	03/15/80 09/23/81 / / / /	0.0560 0.0320 0.0000 0.0000	0.0440	0.0560	0.0320
57	RCS LOW FLOW RT-6.21 K314 A	03/15/80 12/13/82 / / / /	0.0640 0.0500 0.0000 0.0000	0.0570	0.0640	0.0500
58	RCS LOW FLOW RT-6.21 K314 B	03/15/80 06/29/88 / / / /	0.0640 0.0525 0.0000 0.0000	0.0583	0.0640	0.0525
59	RCS LOW FLOW RT-6.22 K128 A	03/15/80 06/11/80 06/29/88 / /	0.0480 0.0400 0.0400 0.0000	0.0427	0.0480	0.0400
60	RCS LOW FLOW RT-6.22 K128 B	03/15/80 04/04/84 / / / /	0.0480 0.0475 0.0000 0.0000	0.0478	0.0480	0.0475
61	RCS LOW FLOW RT-6.23 K228 A	03/15/80 06/29/88 / / / /	0.0480 0.0550 0.0000 0.0000	0.0515	0.0550	0.0480
62	RCS LOW FLOW RT-6.23 K228 B	03/15/80 09/23/81 / / / /	0.0480 0.0280 0.0000 0.0000	0.0380	0.0480	0.0280
63	RCS LOW FLOW RT-6.24 K321 A	03/15/80 12/13/82 / / / /	0.0560 0.0300 0.0000 0.0000	0.0430	0.0560	0.0300

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64	RCS LOW FLOW RT-6.24 K321 B	03/15/80 06/29/88 / / / /	0.0560 0.0625 0.0000 0.0000	0.0593	0.0625	0.0560
65	SG LEVEL LO LO RT-7.13 K407 A	03/15/80 06/11/80 04/04/84 06/29/88	0.0680 0.0680 0.0680 0.0675	0.0679	0.0680	0.0675
66	SG LEVEL LO LO RT-7.13 K407 B	03/15/80 04/04/84 / / / /	0.0720 0.0680 0.0000 0.0000	0.0700	0.0720	0.0680
67	SG LEVEL LO LO RT-7.14 K331 A	03/15/80 06/29/88 / / / /	0.0880 0.0950 0.0000 0.0000	0.0915	0.0950	0.0880
68	SG LEVEL LO LO RT-7.14 K331 B	03/15/80 04/17/82 / / / /	0.0880 0.0880 0.0000 0.0000	0.0880	0.0880	0.0880
69	SG LEVEL LO LO RT-7.15 K230 A	03/15/80 12/13/82 / / / /	0.0680 0.0100 0.0000 0.0000	0.0390	0.0680	0.0100
70	SG LEVEL LO LO RT-7.15 K230 B	03/15/80 06/29/88 / / / /	0.0720 0.0550 0.0000 0.0000	0.0635	0.0720	0.0550
71	SG LEVEL LO LO RT-7.16 K408 A	03/15/80 06/11/80 06/29/88 / /	0.0720 0.0800 0.0900 0.0000	0.0807	0.0900	0.0720
72	SG LEVEL LO LO RT-7.16 K408 B	03/15/80 04/04/84 / / / /	0.0720 0.0140 0.0000 0.0000	0.0430	0.0720	0.0140

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73	SG LEVEL LO LO RT-7.17 K332 A	03/15/80 06/29/88 / / / /	0.0880 0.0777 0.0000 0.0000	0.0829	0.0880	0.0777
74	SG LEVEL LO LO RT-7.17 K332 B	03/15/80 04/17/82 / / / /	0.0880 0.0820 0.0000 0.0000	0.0850	0.0880	0.0820
75	SG LEVEL LO LO RT-7.18 K114 A	03/15/80 12/13/82 / / / /	0.0560 0.0400 0.0000 0.0000	0.0480	0.0560	0.0400
76	SG LEVEL LO LO RT-7.18 K114 B	03/15/80 06/29/88 / / / /	0.0560 0.0600 0.0000 0.0000	0.0580	0.0600	0.0560
77	SG LEVEL LO LO RT-7.19 K409 A	03/15/80 06/11/80 06/29/88 / /	0.0640 0.0760 0.0825 0.0000	0.0742	0.0825	0.0640
78	SG LEVEL LO LO RT-7.19 K409 B	03/15/80 04/04/84 / / / /	0.0640 0.0480 0.0000 0.0000	0.0560	0.0640	0.0480
79	SG LEVEL LO LO RT-7.20 K333 A	03/15/80 06/29/88 / / / /	0.0720 0.0650 0.0000 0.0000	0.0685	0.0720	0.0650
80	SG LEVEL LO LO RT-7.20 K333 B	03/15/80 09/23/81 / / / /	0.0720 0.0480 0.0000 0.0000	0.0600	0.0720	0.0480
81	SG LEVEL LO LO RT-7.21 K113 A	03/15/80 12/13/82 / / / /	0.0640 0.0450 0.0000 0.0000	0.0545	0.0640	0.0450

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RECORD NUMBER	TRIP FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME MEASURED
82	SG LEVEL LO LO RT-7.21 K113 B	03/15/80 06/29/88 / / / /	0.0640 0.0500 0.0000 0.0000	0.0570	0.0640	0.0500
83	SG LEVEL LO LO RT-7.22 K410 A	03/15/80 06/11/80 06/29/88 / /	0.0720 0.0560 0.0600 0.0000	0.0627	0.0720	0.0560
84	SG LEVEL LO LO RT-7.22 K410 B	03/15/80 04/04/84 / / / /	0.0720 0.0064 0.0000 0.0000	0.0392	0.0720	0.0064
85	SG LEVEL LO LO RT-7.23 K334 A	03/15/80 06/29/88 / / / /	0.0720 0.0550 0.0000 0.0000	0.0635	0.0720	0.0550
86	SG LEVEL LO LO RT-7.23 K334 B	03/15/80 04/17/82 / / / /	0.0720 0.0560 0.0000 0.0000	0.0640	0.0720	0.0560
87	SG LEVEL LO LO RT-7.24 K231 A	03/15/80 12/13/82 / / / /	0.0640 0.0463 0.0000 0.0000	0.0552	0.0640	0.0463
88	SG LEVEL LO LO RT-7.24 K231 B	03/15/80 06/29/88 / / / /	0.0560 0.0600 0.0000 0.0000	0.0580	0.0600	0.0560
89	OTDT/PRZR PRESS RT-11.5 K112 A	06/29/88 / / / / / /	0.2300 0.0000 0.0000 0.0000	0.2300	0.2300	0.2300
90	OTDT/PRZR PRESS RT-11.5 K112 B	06/29/88 / / / / / /	0.2300 0.0000 0.0000 0.0000	0.2300	0.2300	0.2300

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91	OTDT/PRZR PRESS RT-11.6 K236 A	06/29/88 / / / / / /	0.1500 0.0000 0.0000 0.0000	0.1500	0.1500	0.1500
92	OTDT/PRZR PRESS RT-11.6 K236 B	06/29/88 / / / / / /	0.1300 0.0000 0.0000 0.0000	0.1300	0.1300	0.1300
93	OTDT/PRZR PRESS RT-11.7 K323 A	06/29/88 / / / / / /	0.1750 0.0000 0.0000 0.0000	0.1750	0.1750	0.1750
94	OTDT/PRZR PRESS RT-11.7 K323 B	06/29/88 / / / / / /	0.1750 0.0000 0.0000 0.0000	0.1750	0.1750	0.1750
95	OTDT/PRZR PRESS RT-11.8 K421 A	06/29/88 / / / / / /	0.1450 0.0000 0.0000 0.0000	0.1450	0.1450	0.1450
96	OTDT/PRZR PRESS RT-11.8 K421 B	06/29/88 / / / / / /	0.1450 0.0000 0.0000 0.0000	0.1450	0.1450	0.1450
97	OTDT/FLUX IMBAL RT-11.5 K112 A	06/29/88 / / / / / /	0.2200 0.0000 0.0000 0.0000	0.2200	0.2200	0.2200
98	OTDT/FLUX IMBAL RT-11.5 K112 B	06/29/88 / / / / / /	0.2200 0.0000 0.0000 0.0000	0.2200	0.2200	0.2200
99	OTDT/FLUX IMBAL RT-11.6 K236 A	06/29/88 / / / / / /	0.2050 0.0000 0.0000 0.0000	0.2050	0.2050	0.2050

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RECORD NUMBER	TRIP FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME MEASURED
100	OTDT/FLUX IMBAL	06/29/88	0.1850	0.1850	0.1850	0.1850
	RT-11.6	/ /	0.0000			
	K236	/ /	0.0000			
	B	/ /	0.0000			
101	OTDT/FLUX IMBAL	06/29/88	0.2280	0.2280	0.2280	0.2280
	RT-11.7	/ /	0.0000			
	K323	/ /	0.0000			
	A	/ /	0.0000			
102	OTDT/FLUX IMBAL	06/29/88	0.2250	0.2250	0.2250	0.2250
	RT-11.7	/ /	0.0000			
	K323	/ /	0.0000			
	B	/ /	0.0000			
103	OTDT/FLUX IMBAL	06/29/88	0.2050	0.2050	0.2050	0.2050
	RT-11.8	/ /	0.0000			
	K421	/ /	0.0000			
	A	/ /	0.0000			
104	OTDT/FLUX IMBAL	06/29/88	0.2050	0.2050	0.2050	0.2050
	RT-11.8	/ /	0.0000			
	K421	/ /	0.0000			
	B	/ /	0.0000			
105	OTDT/DELTA TEMP	03/15/80	1.8400	1.4223	1.8400	0.9120
	RT-11.5	06/11/80	0.9120			
	K112	06/29/88	1.5150			
	A	/ /	0.0000			
106	OTDT/DELTA TEMP	03/15/80	1.8400	1.4517	1.8400	0.9900
	RT-11.5	04/04/84	0.9900			
	K112	06/29/88	1.5250			
	B	/ /	0.0000			
107	OTDT/DELTA TEMP	03/15/80	1.0000	0.8000	1.0000	0.6000
	RT-11.6	06/29/88	0.6000			
	K236	/ /	0.0000			
	A	/ /	0.0000			
108	OTDT/DELTA TEMP	03/15/80	1.0000	0.8893	1.0680	0.6000
	RT-11.6	04/17/82	1.0680			
	K236	06/29/88	0.6000			
	B	/ /	0.0000			

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RECORD NUMBER	TRIP FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME MEASURED
109	OTDT/DELTA TEMP RT-11.7 K323 A	03/15/80 12/13/82 06/29/88 / /	1.7600 1.0000 1.3700 0.0000	1.3767	1.7600	1.0000
110	OTDT/DELTA TEMP RT-11.7 K323 B	03/15/80 06/29/88 / / / /	1.7600 1.3700 0.0000 0.0000	1.5650	1.7600	1.3700
111	OTDT/DELTA TEMP RT-11.8 K421 A	03/15/80 06/29/88 / / / /	1.7040 0.5600 0.0000 0.0000	1.1320	1.7040	0.5600
112	OTDT/DELTA TEMP RT-11.8 K421 B	03/15/80 04/17/82 06/29/88 / /	1.7040 1.1320 0.5550 0.0000	1.1303	1.7040	0.5550
113	OTDT/TAVG RT-11.5 K112 A	06/29/88 / / / / / /	0.6150 0.0000 0.0000 0.0000	0.6150	0.6150	0.6150
114	OTDT/TAVG RT-11.5 K112 B	06/29/88 / / / / / /	0.6150 0.0000 0.0000 0.0000	0.6150	0.6150	0.6150
115	OTDT/TAVG RT-11.6 K236 A	06/29/88 / / / / / /	0.6050 0.0000 0.0000 0.0000	0.6050	0.6050	0.6050
116	OTDT/TAVG RT-11.6 K236 B	06/29/88 / / / / / /	0.6000 0.0000 0.0000 0.0000	0.6000	0.6000	0.6000
117	OTDT/TAVG RT-11.7 K323 A	06/29/88 / / / / / /	0.6600 0.0000 0.0000 0.0000	0.6600	0.6600	0.6600

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RECORD NUMBER	TRIP FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME MEASURED
118	OTDT/TAVG RT-11.7 K323 B	06/29/88 / / / / / /	0.6550 0.0000 0.0000 0.0000	0.6550	0.6550	0.6550
119	OTDT/TAVG RT-11.8 K421 A	06/29/88 / / / / / /	0.5550 0.0000 0.0000 0.0000	0.5550	0.5550	0.5550
120	OTDT/TAVG RT-11.8 K421 B	06/29/88 / / / / / /	0.5520 0.0000 0.0000 0.0000	0.5520	0.5520	0.5520
121	RCP1 UV DPSO RTUV-1 K124 A	03/15/80 06/11/80 12/12/82 06/29/88	0.0040 0.2160 0.2440 0.3000	0.1910	0.3000	0.0040
122	RCP1 UV DPSO RTUV-1 K124 B	03/15/80 04/04/84 06/29/88	0.0040 0.2900 0.2950 0.0000	0.1963	0.2950	0.0040
123	RCP2 UV DPSO RTUV-1 K239 A	03/15/80 06/29/88 / / / /	0.0040 0.2700 0.0000 0.0000	0.1370	0.2700	0.0040
124	RCP2 UV DPSO RTUV-1 K239 B	03/15/80 09/23/81 06/29/88 / /	0.0040 0.1960 0.2750 0.0000	0.1583	0.2750	0.0040
125	RCP3 UV DPSO RTUV-1 K328 A	03/15/80 06/29/88 / / / /	0.0040 0.2400 0.0000 0.0000	0.1220	0.2400	0.0040
126	RCP3 UV DPSO RTUV-1 K328 B	03/15/80 06/29/88 / / / /	0.0040 0.2350 0.0000 0.0000	0.1195	0.2350	0.0040

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127	RCP4 UV DPSO RTUV-1 K413 A	03/15/80 06/11/80 06/29/88 / /	0.0080 0.2240 0.2900 0.0000	0.1740	0.2900	0.0080
128	RCP4 UV DPSO RTUV-1 K413 B	03/15/80 09/23/81 04/04/84 06/29/88	0.0080 0.2000 0.2800 0.2950	0.1958	0.2950	0.0080
129	RCP1 UF DPSO RTUF-1 K151 A	03/15/80 06/11/80 12/12/82 06/29/88	0.0040 0.1840 0.1960 0.2200	0.1510	0.2200	0.0040
130	RCP1 UF DPSO RTUF-1 K151 B	03/15/80 04/04/84 06/29/88 / /	0.0080 0.2300 0.2200 0.0000	0.1527	0.2300	0.0080
131	RCP2 UF DPSO RTUF-1 K251 A	03/15/80 06/29/88 / / / /	0.0080 0.2250 0.0000 0.0000	0.1165	0.2250	0.0080
132	RCP2 UF DPSO RTUF-1 K251 B	03/15/80 09/23/81 06/29/88 / /	0.0040 0.1840 0.2250 0.0000	0.1377	0.2250	0.0040
133	RCP3 UF DPSO RTUF-1 K336 A	03/15/80 06/29/88 / / / /	0.0080 0.2375 0.0000 0.0000	0.1227	0.2375	0.0080
134	RCP3 UF DPSO RTUF-1 K336 B	03/15/80 06/29/88 / / / /	0.0080 0.2350 0.0000 0.0000	0.1215	0.2350	0.0080
135	RCP4 UF DPSO RTUF-1 K426 A	03/15/80 06/29/88 / / / /	0.0080 0.2200 0.0000 0.0000	0.1140	0.2200	0.0080

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RECORD NUMBER	TRIP FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME MEASURED
136	RCP4 UF DPSO RTUF-1 K426 B	03/15/80 06/29/88 / / / /	0.0040 0.2250 0.0000 0.0000	0.1145	0.2250	0.0040

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RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
1	CONT PRESS HI RT 16.6 K217 A	06/18/79 07/27/80 / / 09/24/88	0.0600 0.0300 0.0000 0.0400	0.0433	0.0600	0.0300
2	CONT PRESS HI RT 16.6 K217 B	06/18/79 12/08/83 05/18/84 / /	0.0640 0.0400 0.0480 0.0000	0.0507	0.0640	0.0400
3	CONT PRESS HI RT 16.7 K330 A	06/18/79 / / 09/30/85 08/17/88	0.0520 0.0000 0.0800 0.0450	0.0590	0.0800	0.0450
4	CONT PRESS HI RT 16.7 K330 B	06/18/79 01/30/82 / / / /	0.0560 0.0440 0.0000 0.0000	0.0500	0.0560	0.0440
5	CONT PRESS HI RT 16.8 K430 A	06/18/79 10/06/82 / / / /	0.0560 0.0320 0.0000 0.0000	0.0440	0.0560	0.0320
6	CONT PRESS HI RT 16.8 K430 B	06/18/79 / / / / 09/25/88	0.0600 0.0000 0.0000 0.0550	0.0575	0.0600	0.0550
7	PRZR PRESS LO RT 4.5 K131 A	06/18/79 / / / / 09/28/88	0.0640 0.0000 0.0000 0.0500	0.0570	0.0640	0.0500
8	PRZR PRESS LO RT 4.5 K131 B	06/18/79 07/26/80 02/21/84 09/28/88	0.0640 0.0400 0.1000 0.0575	0.0654	0.1000	0.0400
9	PRZR PRESS LO RT 4.6 K201 A	06/18/79 / / 09/17/86 10/02/88	0.0680 0.0000 0.0560 0.0550	0.0597	0.0680	0.0550

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RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
10	PRZR PRESS LO RT 4.6 K201 B	06/18/79 01/27/82 / / 10/02/88	0.0680 0.0640 0.0000 0.0575	0.0632	0.0680	0.0575
11	PRZR PRESS LO RT 4.7 K344 A	06/18/79 12/05/82 / / 10/13/88	0.0640 0.0638 0.0000 0.0650	0.0643	0.0650	0.0638
12	PRZR PRESS LO RT 4.7 K344 B	06/18/79 / / / / 10/13/88	0.0640 0.0000 0.0000 0.0650	0.0645	0.0650	0.0640
13	STM LINE DP 1-2 RT 9.3 K133 A	06/18/79 06/02/80 / / 09/08/88	0.0920 0.0760 0.0000 0.0600	0.0760	0.0920	0.0600
14	STM LINE DP 1-2 RT 9.3 K134 A	06/18/79 06/02/80 / / 09/08/88	0.0640 0.0640 0.0000 0.0500	0.0593	0.0640	0.0500
15	STM LINE DP 1-2 RT 9.3 K133 B	06/15/79 12/04/83 / / / /	0.0920 0.0550 0.0000 0.0000	0.0735	0.0920	0.0550
16	STM LINE DP 1-2 RT 9.3 K134 B	06/18/79 12/04/83 / / / /	0.0640 0.0950 0.0000 0.0000	0.0795	0.0950	0.0640
17	STM LINE DP 1-3 RT 9.4 K247 A	06/18/79 10/09/85 / / 09/11/88	0.0720 0.0300 0.0000 0.0700	0.0573	0.0720	0.0300
18	STM LINE DP 1-3 RT 9.4 K248 A	06/18/79 10/09/85 / / 09/11/88	0.0800 0.0350 0.0000 0.0875	0.0675	0.0875	0.0350

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RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
19	STM LINE DP 1-3 RT 9.4 K247 B	06/18/79 11/03/81 / / / /	0.0720 0.0490 0.0000 0.0000	0.0605	0.0720	0.0490
20	STM LINE DP 1-3 RT 9.4 K248 B	06/18/79 11/03/81 / / / /	0.0760 0.0560 0.0000 0.0000	0.0660	0.0760	0.0560
21	STM LINE DP 1-4 RT 9.5A K417 A	06/18/79 01/13/83 / / / /	0.0680 0.0625 0.0000 0.0000	0.0653	0.0680	0.0625
22	STM LINE DP 1-4 RT 9.5A K418 A	06/18/79 01/13/83 / / / /	0.0760 0.0500 0.0000 0.0000	0.0630	0.0760	0.0500
23	STM LINE DP 1-4 RT 9.5A K417 B	06/18/79 10/20/82 / / 09/10/88	0.0640 0.0425 0.0000 0.0550	0.0538	0.0640	0.0425
24	STM LINE DP 1-4 RT 9.5A K418 B	06/18/79 10/20/82 / / 09/10/88	0.0800 0.0225 0.0000 0.0725	0.0583	0.0800	0.0225
25	STM LINE DP 2-4 RT 9.7 K203 A	06/18/79 10/10/85 / / 09/11/88	0.0560 0.0500 0.0000 0.0600	0.0553	0.0600	0.0500
26	STM LINE DP 2-4 RT 9.7 K204 A	06/18/79 10/10/85 / / 09/11/88	0.0720 0.0150 0.0000 0.0700	0.0523	0.0720	0.0150
27	STM LINE DP 2-4 RT 9.7 K203 B	06/18/79 09/28/81 / / / /	0.0560 0.0640 0.0000 0.0000	0.0600	0.0640	0.0560

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RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
28	STM LINE DP 2-4 RT 9.7 K204 B	06/18/79 09/28/81 / / / /	0.0720 0.0480 0.0000 0.0000	0.0600	0.0720	0.0480
29	STM LINE DP 2-3 RT 9.8A K317 A	06/18/79 10/15/82 / / / /	0.0560 0.0575 0.0000 0.0000	0.0568	0.0575	0.0560
30	STM LINE DP 2-3 RT 9.8A K318 A	06/18/79 10/15/82 / / / /	0.0760 0.0450 0.0000 0.0000	0.0605	0.0760	0.0450
31	STM LINE DP 2-3 RT 9.8A K317 B	06/18/79 / / / / 09/09/88	0.0640 0.0000 0.0000 0.0550	0.0595	0.0640	0.0550
32	STM LINE DP 2-3 RT 9.8A K318 B	06/18/79 / / / / 09/09/88	0.0800 0.0000 0.0000 0.0500	0.0650	0.0800	0.0500
33	STM LINE DP 3-4 RT 9.9 K118 A	06/18/79 07/28/80 / / 09/12/88	0.0720 0.0380 0.0000 0.0450	0.0517	0.0720	0.0380
34	STM LINE DP 3-4 RT 9.9 K119 A	06/18/79 07/28/80 / / 09/12/88	0.0640 0.0420 0.0000 0.0475	0.0512	0.0640	0.0420
35	STM LINE DP 3-4 RT 9.9 K118 B	06/18/79 12/04/83 / / / /	0.0720 0.0850 0.0000 0.0000	0.0785	0.0850	0.0720
36	STM LINE DP 3-4 RT 9.9 K119 B	06/18/79 12/04/83 / / / /	0.0640 0.0600 0.0000 0.0000	0.0620	0.0640	0.0600

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RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
37	2 STM FLOWS HI RT 8.17 K107 A	06/18/79 07/26/80 10/04/82 08/25/88	0.3720 0.3280 0.3075 0.2750	0.3206	0.3720	0.2750
38	2 STM FLOWS HI RT 8.17 K107 B	06/19/79 05/24/84 / / 08/27/88	0.3760 0.0320 0.0000 0.3200	0.2427	0.3760	0.0320
39	2 STM FLOWS HI RT 8.18 K243 A	06/18/79 10/04/82 10/09/85 08/26/88	0.2720 0.2400 0.2550 0.2650	0.2580	0.2720	0.2400
40	2 STM FLOWS HI RT 8.18 K243 B	06/18/79 11/12/82 / / 08/26/88	0.2720 0.2560 0.0000 0.2700	0.2660	0.2720	0.2560
41	2 STM FLOWS HI RT 8.19 K115 A	06/18/79 07/26/80 10/05/82 08/26/88	0.2960 0.2700 0.2775 0.2705	0.2785	0.2960	0.2700
42	2 STM FLOWS HI RT 8.19 K115 B	06/18/79 05/18/84 / / 08/26/88	0.2960 0.0320 0.0000 0.2650	0.1977	0.2960	0.0320
43	2 STM FLOWS HI RT 8.20 K246 A	06/18/79 07/27/80 09/11/85 09/02/88	0.2400 0.2840 0.2250 0.2950	0.2610	0.2950	0.2250
44	2 STM FLOWS HI RT 8.20 K246 B	06/18/79 07/27/80 01/13/82 05/18/84	0.2560 0.2920 0.2960 0.2080	0.2630	0.2960	0.2080
45	2 STM FLOWS HI RT 8.21 K116 A	06/18/79 07/27/80 10/05/82 09/17/88	0.2960 0.2840 0.2900 0.3100	0.2950	0.3100	0.2840

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RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
46	2 STM FLOWS HI RT 8.21 K116 B	06/18/79 05/18/84 / / 09/17/88	0.3040 0.0350 0.0000 0.3100	0.2163	0.3100	0.0350
47	2 STM FLOWS HI RT 8.22 K244 A	06/18/79 10/04/82 09/19/85 09/04/88	0.2880 0.2900 0.3150 0.3100	0.3008	0.3150	0.2880
48	2 STM FLOWS HI RT 8.22 K244 B	06/18/79 01/24/82 / / 09/06/88	0.2880 0.3120 0.0000 0.3250	0.3083	0.3250	0.2880
49	2 STM FLOWS HI RT 8.23 K117 A	06/18/79 06/04/80 06/03/86 09/02/88	0.3120 0.2880 0.4000 0.3150	0.3287	0.4000	0.2880
50	2 STM FLOWS HI RT 8.23 K117 B	06/18/79 09/27/81 05/18/84 / /	0.3120 0.0280 0.0280 0.0000	0.1227	0.3120	0.0280
51	2 STM FLOWS HI RT 8.24 K245 A	06/18/79 10/04/82 06/23/86 09/04/88	0.2560 0.3175 0.3675 0.2650	0.3015	0.3675	0.2560
52	2 STM FLOWS HI RT 8.24 K245 B	06/18/79 09/27/81 / / 09/10/88	0.2480 0.0320 0.0000 0.2550	0.1783	0.2550	0.0320
53	TAVG LP1 LO LO RT 11.5 K148 A	07/30/79 07/29/80 / / 10/01/88	3.2400 2.0440 0.0000 2.3900	2.5580	3.2400	2.0440
54	TAVG LP1 LO LO RT 11.5 K148 B	07/30/79 / / 02/22/84 10/01/88	3.2400 0.0000 1.8300 2.3950	2.4883	3.2400	1.8300

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55	TAVG LP2 LO LO RT 11.6 K229 A	07/30/79 / / 11/06/85 10/07/88	3.2400 0.0000 2.4600 2.4700	2.7233	3.2400	2.4600
56	TAVG LP2 LO LO RT 11.6 K229 B	07/30/79 02/02/82 / / 10/07/88	3.2320 2.1880 0.0000 2.4600	2.6267	3.2320	2.1880
57	TAVG LP3 LO LO RT 11.7 K306 A	07/30/79 10/17/82 / / 10/17/88	2.6960 1.9530 0.0000 2.5450	2.3980	2.6960	1.9530
58	TAVG LP3 LO LO RT 11.7 K306 B	07/30/79 / / / / 10/17/88	2.6960 0.0000 0.0000 2.5400	2.6180	2.6960	2.5400
59	TAVG LP4 LO LO RT 11.8 K406 A	07/30/79 / / 11/06/85 10/27/88	3.2560 0.0000 2.5000 2.3900	2.7153	3.2560	2.3900
60	TAVG LP4 LO LO RT 11.8 K406 B	07/30/79 02/03/82 / / 10/27/88	3.2560 2.4120 0.0000 2.3900	2.6860	3.2560	2.3900
61	STM 1 PRESS LO RT 9.5 K419 A	06/18/79 05/30/80 / / 09/11/88	0.0560 0.0640 0.0000 0.0725	0.0642	0.0725	0.0560
62	STM 1 PRESS LO RT 9.5 K419 B	06/18/79 12/07/83 / / / /	0.0560 0.0640 0.0000 0.0000	0.0600	0.0640	0.0560
63	STM 2 PRESS LO RT 9.8 K319 A	06/18/79 07/28/80 / / 09/08/88	0.0760 0.0600 0.0000 0.0750	0.0703	0.0760	0.0600

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64	STM 2 PRESS LO RT 9.8 K319 B	06/18/79 11/30/83 / / / /	0.0720 0.0900 0.0000 0.0000	0.0810	0.0900	0.0720
65	STM 3 PRESS LO RT 9.11 K320 A	06/18/79 09/14/85 / / 09/09/88	0.0760 0.0200 0.0000 0.0600	0.0520	0.0760	0.0200
66	STM 3 PRESS LO RT 9.11 K320 B	06/18/79 01/29/82 / / / /	0.0800 0.0800 0.0000 0.0000	0.0800	0.0800	0.0800
67	STM 4 PRESS LO RT 9.14 K420 A	06/18/79 01/12/83 / / 09/10/88	0.0920 0.0675 0.0000 0.0750	0.0782	0.0920	0.0675
68	STM 4 PRESS LO RT 9.14 K420 B	06/18/79 10/12/82 / / / /	0.0920 0.0775 0.0000 0.0000	0.0847	0.0920	0.0775
69	SG1 LEVEL HI HI RT 7.13 K431 A	07/24/79 07/24/80 / / 10/17/88	0.2320 0.0700 0.0000 0.0700	0.1240	0.2320	0.0700
70	SG1 LEVEL HI HI RT 7.13 K431 B	07/24/79 02/22/84 / / / /	0.2320 0.0656 0.0000 0.0000	0.1488	0.2320	0.0656
71	SG1 LEVEL HI HI RT 7.14 K308 A	07/24/79 / / 11/21/85 10/17/88	0.2240 0.0000 0.0825 0.0650	0.1238	0.2240	0.0650
72	SG1 LEVEL HI HI RT 7.14 K308 B	07/24/79 01/30/82 / / / /	0.2240 0.0560 0.0000 0.0000	0.1400	0.2240	0.0560

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73	SG1 LEVEL HI HI RT 7.15 K218 A	07/24/79 10/16/82 / / / /	0.2200 0.0313 0.0000 0.0000	0.1257	0.2200	0.0313
74	SG1 LEVEL HI HI RT 7.15 K218 B	07/24/79 / / / / 10/07/88	0.2200 0.0000 0.0000 0.0475	0.1338	0.2200	0.0475
75	SG2 LEVEL HI HI RT 7.16 K432 A	07/24/79 07/25/80 / / 10/27/88	0.2320 0.0800 0.0000 0.0700	0.1273	0.2320	0.0700
76	SG2 LEVEL HI HI RT 7.16 K433 B	07/24/79 02/23/84 / / / /	0.2320 0.0200 0.0000 0.0000	0.1260	0.2320	0.0200
77	SG2 LEVEL HI HI RT 7.17 K309 A	07/24/79 / / 09/16/85 09/13/88	0.2320 0.0000 0.0400 0.0700	0.1140	0.2320	0.0400
78	SG2 LEVEL HI HI RT 7.17 K309 B	07/24/79 01/26/82 / / / /	0.2320 0.0700 0.0000 0.0000	0.1510	0.2320	0.0700
79	SG2 LEVEL HI HI RT 7.18 K138 A	07/24/79 10/11/82 / / / /	0.2160 0.0550 0.0000 0.0000	0.1355	0.2160	0.0550
80	SG2 LEVEL HI HI RT 7.18 K138 B	07/24/79 / / / / 09/17/88	0.2160 0.0000 0.0000 0.0500	0.1330	0.2160	0.0500
81	SG3 LEVEL HI HI RT 7.19 K433 A	07/24/79 07/25/80 / / 10/18/88	0.2560 0.0640 0.0000 0.0750	0.1317	0.2560	0.0640

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82	SG3 LEVEL HI HI	07/24/79	0.2560	0.1400	0.2560	0.0240
	RT 7.19	02/22/84	0.0240			
	K433	/ /	0.0000			
	B	/ /	0.0000			
83	SG3 LEVEL HI HI	07/24/79	0.2120	0.1423	0.2120	0.0550
	RT 7.20	/ /	0.0000			
	K310	09/16/85	0.1600			
	A	10/12/88	0.0550			
84	SG3 LEVEL HI HI	07/24/79	0.2120	0.1210	0.2120	0.0300
	RT 7.20	09/25/81	0.0300			
	K310	/ /	0.0000			
	B	/ /	0.0000			
85	SG3 LEVEL HI HI	07/24/79	0.2080	0.1305	0.2080	0.0530
	RT 7.21	10/11/82	0.0530			
	K139	/ /	0.0000			
	A	/ /	0.0000			
86	SG3 LEVEL HI HI	07/24/79	0.2080	0.1340	0.2080	0.0600
	RT 7.21	/ /	0.0000			
	K139	/ /	0.0000			
	B	09/30/88	0.0600			
87	SG4 LEVEL HI HI	07/24/79	0.2280	0.1202	0.2280	0.0600
	RT 7.22	07/25/80	0.0600			
	K434	/ /	0.0000			
	A	09/13/88	0.0725			
88	SG4 LEVEL HI HI	07/24/79	0.2280	0.1252	0.2280	0.0224
	RT 7.22	05/18/84	0.0224			
	K434	/ /	0.0000			
	B	/ /	0.0000			
89	SG4 LEVEL HI HI	07/24/79	0.2320	0.1540	0.2320	0.0800
	RT 7.23	/ /	0.0000			
	K311	09/16/85	0.1500			
	A	10/12/88	0.0800			
90	SG4 LEVEL HI HI	07/24/79	0.2320	0.1500	0.2320	0.0680
	RT 7.23	01/27/82	0.0680			
	K311	/ /	0.0000			
	B	/ /	0.0000			

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91	SG4 LEVEL HI HI RT 7.24 K219 A	07/24/79 10/09/82 / / / /	0.2080 0.0525 0.0000 0.0000	0.1303	0.2080	0.0525
92	SG4 LEVEL HI HI RT 7.24 K219 B	07/24/79 / / / / 09/17/88	0.2080 0.0000 0.0000 0.0700	0.1390	0.2080	0.0700
93	SG1 LEVEL LO LO RT 7.13 K407 A	06/15/79 07/24/80 / / 10/17/88	0.0680 0.0680 0.0000 0.0675	0.0678	0.0680	0.0675
94	SG1 LEVEL LO LO RT 7.13 K407 B	06/15/79 02/22/84 / / / /	0.0720 0.0680 0.0000 0.0000	0.0700	0.0720	0.0680
95	SG1 LEVEL LO LO RT 7.14 K331 A	06/15/79 11/21/85 / / 10/17/88	0.0880 0.0958 0.0000 0.0950	0.0929	0.0958	0.0880
96	SG1 LEVEL LO LO RT 7.14 K331 B	06/15/79 01/30/82 / / / /	0.0880 0.0830 0.0000 0.0000	0.0855	0.0880	0.0830
97	SG1 LEVEL LO LO RT 7.15 K230 A	06/15/79 10/16/82 / / / /	0.0680 0.0200 0.0000 0.0000	0.0440	0.0680	0.0200
98	SG1 LEVEL LO LO RT 7.15 K230 B	06/15/79 / / / / 10/07/88	0.0720 0.0000 0.0000 0.0350	0.0635	0.0720	0.0550
99	SG2 LEVEL LO LO RT 7.16 K408 A	06/15/79 07/25/80 / / 10/27/88	0.0720 0.0800 0.0000 0.0900	0.0807	0.0900	0.0720

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100	SG2 LEVEL LO LO RT 7.16 K40A B	06/15/79 02/23/84 / / / /	0.0720 0.0140 0.0000 0.0000	0.0430	0.0720	0.0140
101	SG2 LEVEL LO LO RT 7.17 K332 A	06/15/79 / / 09/16/85 09/13/88	0.0880 0.0000 0.0800 0.0700	0.0793	0.0880	0.0700
102	SG2 LEVEL LO LO RT 7.17 K332 B	06/15/79 01/26/82 / / / /	0.0880 0.0820 0.0000 0.0000	0.0850	0.0880	0.0820
103	SG2 LEVEL LO LO RT 7.18 K114 A	06/15/79 10/11/82 / / / /	0.0560 0.0400 0.0000 0.0000	0.0480	0.0560	0.0400
104	SG2 LEVEL LO LO RT 7.18 K114 B	06/15/79 / / / / 09/17/88	0.0560 0.0000 0.0000 0.0600	0.0580	0.0600	0.0560
105	SG3 LEVEL LO LO RT 7.19 K409 A	06/15/79 07/25/80 / / 10/18/88	0.0640 0.0760 0.0000 0.0825	0.0742	0.0825	0.0640
106	SG3 LEVEL LO LO RT 7.19 K409 B	06/15/79 02/22/84 / / / /	0.0640 0.0480 0.0000 0.0000	0.0560	0.0640	0.0480
107	SG3 LEVEL LO LO RT 7.20 K333 A	06/15/79 / / 09/16/85 10/12/88	0.0720 0.0600 0.1500 0.0650	0.0957	0.1500	0.0650
108	SG3 LEVEL LO LO RT 7.20 K333 B	06/15/79 07/25/81 / / / /	0.0720 0.0480 0.0000 0.0000	0.0600	0.0720	0.0480

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109	SG3 LEVEL LO LO RT 7.21 K113 A	06/15/79 10/11/82 / / / /	0.0640 0.0450 0.0000 0.0000	0.0545	0.0640	0.0450
110	SG3 LEVEL LO LO RT 7.21 K113 B	06/15/79 / / / / 09/30/88	0.0640 0.0000 0.0000 0.0500	0.0570	0.0640	0.0500
111	SG4 LEVEL LO LO RT 7.22 K410 A	06/15/79 07/25/80 / / 09/13/88	0.0720 0.0560 0.0000 0.0600	0.0627	0.0720	0.0560
112	SG4 LEVEL LO LO RT 7.22 K410 B	06/15/79 05/18/84 / / / /	0.0720 0.0640 0.0000 0.0000	0.0680	0.0720	0.0640
113	SG4 LEVEL LO LO RT 7.23 K334 A	06/15/79 / / 09/16/85 10/12/88	0.0720 0.0000 0.1400 0.0550	0.0890	0.1400	0.0550
114	SG4 LEVEL LO LO RT 7.23 K334 B	06/15/79 01/27/82 / / / /	0.0720 0.0560 0.0000 0.0000	0.0640	0.0720	0.0560
115	SG4 LEVEL LO LO RT 7.24 K231 A	06/15/79 10/09/82 / / / /	0.0640 0.0463 0.0000 0.0000	0.0552	0.0640	0.0463
116	SG4 LEVEL LO LO RT 7.24 K231 B	06/15/79 / / / / 09/17/88	0.0560 0.0000 0.0000 0.0600	0.0580	0.0600	0.0560
117	CONT PRES HI HI RT 16.6 K137 A	06/18/79 07/27/80 / / 09/24/88	0.0520 0.0160 0.0000 0.0325	0.0335	0.0320	0.0160

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118	CONT PRES HI HI RT 16.6 K216 A	06/18/79 07/27/90 / / 09/24/88	0.0520 0.0120 0.0000 0.0200	0.0280	0.0520	0.0120
119	CONT PRES HI HI RT 16.6 K137 B	06/18/79 12/09/83 / / / /	0.0520 0.0240 0.0000 0.0000	0.0380	0.0520	0.0240
120	CONT PRES HI HI RT 16.6 K216 B	06/18/79 12/08/83 / / / /	0.0560 0.0240 0.0000 0.0000	0.0400	0.0560	0.0240
121	CONT PRES HI HI RT 16.7 K329 A	06/18/79 01/30/82 09/30/85 08/17/88	0.0600 0.0220 0.0450 0.0300	0.0393	0.0600	0.0220
122	CONT PRES HI HI RT 16.7 K329 B	06/18/79 01/30/82 / / / /	0.0640 0.0220 0.0000 0.0000	0.0430	0.0640	0.0220
123	CONT PRES HI HI RT 16.8 K429 A	06/18/79 10/06/82 / / / /	0.0560 0.0075 0.0000 0.0000	0.0318	0.0560	0.0075
124	CONT PRES HI HI RT 16.8 K429 B	06/18/79 / / / / 09/25/88	0.0600 0.0000 0.0000 0.0350	0.0475	0.0600	0.0350
125	RWST LEV LO LO RT 913 K150 A	02/24/80 / / / / 09/12/88	0.0180 0.0000 0.0000 0.0275	0.0227	0.0275	0.0180
126	RWST LEV LO LO RT 913 K150 B	02/24/80 02/22/84 / / / /	0.0200 0.0175 0.0000 0.0000	0.0188	0.0200	0.0175

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127	RWST LEV LO LO RT 914 K250 A	02/25/80 / / / / 09/12/88	0.0260 0.0000 0.0000 0.0375	0.0318	0.0375	0.0260
128	RWST LEV LO LO RT 914 K250 B	02/25/80 02/23/84 / / / /	0.0280 0.0160 0.0000 0.0000	0.0220	0.0280	0.0160
129	RWST LEV LO LO RT 915 K335 A	02/25/80 / / / / 09/12/88	0.0160 0.0000 0.0000 0.0255	0.0207	0.0255	0.0160
130	RWST LEV LO LO RT 915 K335 B	02/25/80 09/29/81 / / / /	0.0160 0.0120 0.0000 0.0000	0.0140	0.0160	0.0120
131	RWST LEV LO LO RT 916 K425 A	02/25/80 12/12/82 / / / /	0.0180 0.0263 0.0000 0.0000	0.0221	0.0263	0.0180
132	RWST LEV LO LO RT 916 K425 B	02/25/80 / / / / 09/12/88	0.0180 0.0000 0.0000 0.0225	0.0202	0.0225	0.0180
133	SUMP LEVEL HI RT 920 K123 A	02/25/80 / / / / 09/07/88	0.0240 0.0000 0.0000 0.0300	0.0270	0.0300	0.0240
134	SUMP LEVEL HI RT 920 K123 B	02/25/80 02/23/84 / / / /	0.0240 0.0250 0.0000 0.0000	0.0245	0.0250	0.0240
135	SUMP LEVEL HI RT 921 K240 A	02/25/80 / / / / 09/08/88	0.0260 0.0000 0.0000 0.0350	0.0305	0.0350	0.0260

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136	SUMP LEVEL HI RT 921 K240 B	02/25/80 10/13/81 / / / /	0.0240 0.0160 0.0000 0.0000	0.0200	0.0240	0.0160
137	SUMP LEVEL HI RT 940 K340 A	02/25/80 12/24/82 / / / /	0.0260 0.0500 0.0000 0.0000	0.0380	0.0500	0.0260
138	SUMP LEVEL HI RT 940 K340 B	02/25/80 / / / / 09/08/88	0.0280 0.0000 0.0000 0.0400	0.0340	0.0400	0.0280
139	SUMP LEVEL HI RT 941 K412 A	02/25/80 01/17/82 / / / /	0.0220 0.0200 0.0000 0.0000	0.0210	0.0220	0.0200
140	SUMP LEVEL HI RT 941 K412 B	02/25/80 / / / / 09/08/88	0.0200 0.0000 0.0000 0.0375	0.0287	0.0375	0.0200
141	MASTER RELAY RT 16.series K501 A	07/27/80 10/06/82 09/30/85 09/24/88	0.0380 0.0480 0.1350 0.0100	0.0578	0.1350	0.0100
142	MASTER RELAY RT 16.series K501 B	/ / 01/30/82 12/08/83 09/25/88	0.0000 0.0480 0.0480 0.0150	0.0370	0.0480	0.0000
143	MASTER RELAY RT 16.series K502 A	07/27/80 10/06/82 09/30/85 09/24/88	0.0400 0.0500 0.0750 0.0100	0.0437	0.0750	0.0100
144	MASTER RELAY RT 16.series K502 B	/ / 10/06/82 12/08/83 09/25/88	0.0000 0.0460 0.0480 0.0100	0.0347	0.0480	0.0000

SEQUOYAH NUCLEAR PLANT UNIT 1
ENGINEERED SAFETY FEATURES
INPUT AND MASTER RELAY RESPONSE TIMES
OVER THE LIFE OF THE PLANT

RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
145	MASTER RELAY	/ /	0.0000	0.0383	0.0600	0.0000
	RT 16.series	01/30/82	0.0450			
	K503	09/30/85	0.0600			
	A	09/24/88	0.0100			
146	MASTER RELAY	/ /	0.0000	0.0400	0.0640	0.0000
	RT 16.series	01/30/82	0.0460			
	K503	12/08/83	0.0640			
	B	09/25/88	0.0100			
147	MASTER RELAY	07/27/80	0.0240	0.0285	0.0500	0.0150
	RT 16.series	10/06/82	0.0250			
	K504	09/30/85	0.0500			
	A	09/24/88	0.0150			
148	MASTER RELAY	/ /	0.0000	0.0233	0.0320	0.0000
	RT 16.series	01/30/82	0.0280			
	K504	12/08/83	0.0320			
	B	09/25/88	0.0100			
149	MASTER RELAY	07/27/80	0.0220	0.0445	0.1300	0.0100
	RT 16.series	10/06/82	0.0160			
	K505	09/30/85	0.1300			
	A	09/24/88	0.0100			
150	MASTER RELAY	/ /	0.0000	0.0330	0.0350	0.0000
	RT 16.series	01/30/82	0.0320			
	K505	12/08/83	0.0320			
	B	09/25/88	0.0350			
151	MASTER RELAY	07/27/80	0.0240	0.0185	0.0240	0.0100
	RT 16.series	10/06/82	0.0200			
	K506	09/30/85	0.0200			
	A	09/24/88	0.0100			
152	MASTER RELAY	/ /	0.0000	0.0233	0.0320	0.0000
	RT 16.series	01/30/82	0.0280			
	K506	12/08/83	0.0320			
	B	09/25/88	0.0100			
153	MASTER RELAY	07/27/80	0.0240	0.0210	0.0250	0.0150
	RT 16.series	10/06/82	0.0250			
	K519	09/30/85	0.0200			
	A	09/24/88	0.0150			

SEQUOYAH NUCLEAR PLANT UNIT 1
ENGINEERED SAFETY FEATURES
INPUT AND MASTER RELAY RESPONSE TIMES
OVER THE LIFE OF THE PLANT

RECORD NUMBER	ESF FUNCTION TEST PROCEDURE INPUT RELAY NO. TRAIN	PERF DATE 1 PERF DATE 2 PERF DATE 3 PERF DATE 4	RESP TIME 1 RESP TIME 2 RESP TIME 3 RESP TIME 4	AVERAGE RESPONSE TIME	MAXIMUM RESPONSE TIME MEASURED	MINIMUM RESPONSE TIME
154	MASTER RELAY	/ /	0.0000	0.0257	0.0320	0.0000
	RT 16.series	01/30/82	0.0300			
	K519	12/08/83	0.0320			
	B	09/25/88	0.0150			
155	MASTER RELAY	07/27/80	0.0400	0.0350	0.0500	0.0100
	RT 16.series	10/06/82	0.0500			
	K521	09/30/85	0.0400			
	A	09/24/88	0.0100			
156	MASTER RELAY	/ /	0.0000	0.0370	0.0480	0.0000
	RT 16.series	01/30/82	0.0480			
	K521	12/08/83	0.0480			
	B	09/25/88	0.0150			
157	MASTER RELAY	07/27/80	0.0400	0.0350	0.0450	0.0100
	RT 16.series	10/06/82	0.0450			
	K522	09/30/85	0.0450			
	A	09/24/88	0.0100			
158	MASTER RELAY	/ /	0.0000	0.0347	0.0480	0.0000
	RT 16.series	01/30/82	0.0460			
	K522	12/08/83	0.0480			
	B	09/25/88	0.0100			