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Nuclear Energy

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The Northeast Utilities System

SEP 25 2000

Docket No. 50-423
B18215

RE: 10 CFR 50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Nuclear Power Station, Unit No. 3
Response to a Request for Additional Information
Technical Specifications Change Request TSCR 3-4-00
Elimination of Pressure Sensor Response Time Testing Requirements and
Elimination of Periodic Protection Channel Response Time Tests

In a letter dated June 26, 2000,[1] Northeast Nuclear Energy Company (NNECO) requested a change to the Millstone Unit No. 3 Technical Specifications to eliminate pressure sensor response time tests and periodic protection channel response time tests for the Reactor Trip System and the Engineered Safety Features Actuation System. In a conference call conducted on August 24, 2000, NNECO addressed two questions presented by the staff reviewer and agreed to provide a written response to those two questions.

The responses and supplemental information are contained in Attachments 1 and 2, respectively, of this letter.

There are no regulatory commitments contained within this letter.

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(1) R. P. Necci letter to U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 3, Proposed Revision to Technical Specifications, Elimination of Pressure Sensor Response Time Testing Requirements and Elimination of Periodic Protection Channel Response Time Tests (TSCR 3-4-00)," dated June 26, 2000.

A001

If you should have any questions on the above, please contact Mr. Ravi Joshi at (860) 440-2080.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

Raymond P. Necci
Vice President - Nuclear Technical Services

Sworn to and subscribed before me

this 25th day of September, 2000

Notary Public

My Commission expires

SANDRA J. ANTON
NOTARY PUBLIC
COMMISSION EXPIRES
MAY 31, 2005

Attachments (2)

cc: H. J. Miller, Region I Administrator
V. Nerses, NRC Senior Project Manager, Millstone Unit No. 3
A. C. Cerne, Senior Resident Inspector, Millstone Unit No. 3

Director
Bureau of Air Management
Monitoring and Radiation Division
Department of Environmental Protection
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Docket No. 50-423
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Attachment 1

Millstone Nuclear Power Station, Unit No. 3

Response to a Request for Additional Information
Technical Specifications Change Request TSCR 3-4-00
Elimination of Pressure Sensor Response Time Testing Requirements and
Elimination of Periodic Protection Channel Response Time Tests
Questions and Responses

Response to a Request for Additional Information
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Questions and Responses

In a letter dated June 26, 2000,[1] Northeast Nuclear Energy Company (NNECO) requested a change to the Millstone Unit No. 3 Technical Specifications to eliminate pressure sensor response time tests and periodic protection channel response time tests for the Reactor Trip System and the Engineered Safety Features Actuation System. In a conference call conducted on August 24, 2000, NNECO addressed two questions presented by the staff reviewer and agreed to provide a written response to those two questions. The questions and associated responses are presented below.

Question 1

The request for license amendment states, "Millstone Unit No. 3 (MP3) utilizes only Rosemount Model 1153 and Model 1154 pressure and differential pressure transmitters for sensing pressure in the RTS and ESFAS instrumentation loops. These sensors are bounded by the generic analysis contained in WCAP-13632-P-A, Revision 2, however, an allocated response time for these instruments is not provided in Table 9-1 of the WCAP. As directed in the WCAP, baseline response time values for these transmitters have been determined by evaluating data obtained from previous plant response time testing."

Provide a discussion of the statistical analysis methodology used to obtain the baseline sensor response time values highlighted in the attached Tables, which were provided on page 6, Attachment 1 of the license amendment request. Additionally, provide the data used in the analyses, and the results of the statistical analyses.

Response

NNECO employed the methodology described in Section 9 of WCAP-13632-P-A, Revision 2, "Elimination of Pressure Sensor Response Time Testing Requirements," for determining sensor response time allocations. The methodology described in WCAP-13632-P-A does not employ statistical analysis methods. The WCAP recommends that the allocated values be determined from either the most conservative historical data obtained through plant testing, or vendor specifications.

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[1] R. P. Necci letter to U.S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 3, Proposed Revision to Technical Specifications, Elimination of Pressure Sensor Response Time Testing Requirements and Elimination of Periodic Protection Channel Response Time Tests (TSCR 3-4-00)," dated June 26, 2000.

Rosemount, the transmitter vendor, provides a conservative, upper-bounding time constant intended for suitability reviews when designing protection systems. Response times of individual units vary due to calibrated span, production differences and range code. Rosemount provides two values for the response time of their Model 1153 and Model 1154 transmitters. The lower range code specifies a slower response specification and the remaining range code specify a faster response time. Actually, there are differences in the design of the sensor assemblies that result in differences in response time between each range code covered by the single, faster specification. Additionally, Westinghouse testing methodology and safety analysis are based on introducing a 10% of scale step change and measuring the time delay when the transmitter output changes by 50% of the input step. Rosemount specifications provide a time constant representing the time required for the transmitter output to change by 63% when a full scale step change in input is introduced. Because of these differences, plant data generally indicate that the transmitters have a faster response time than the vendor specification.

The safety analysis response time assumptions contain sufficient margin to allow sensor allocations significantly greater than the vendor specifications. However, since the allocated response time will be used to determine if a replacement transmitter is functioning properly, it is more conservative to use an allocation that more closely matches a particular transmitter. Using the most conservative value obtained from plant testing might lead to a situation where available spare transmitters may not meet the allocated value, forcing the plant to operate with one channel in tripped condition while locating a spare with faster response or changing the allocation. Therefore, NNECO decided to include additional margin beyond the most conservative historical data.

Statistical methods were considered, but very little data is available for each transmitter. The Technical Specification surveillance frequency for transmitter sensor response time testing is once every three or four refueling intervals. In addition, test methodology was changed from white noise analysis to hydraulic, and five years ago the Veritrak transmitters used for Pressurizer Pressure, Pressurizer Level and Steam Generator Level were replaced with Rosemount Model 1154 transmitters. The small sample populations available are not suitable for the application of statistical methods. Small samples require the use of large k factors, which in some applications produced allocations greater than the vendor specification. Statistical analysis methods employ the W test for normalcy. However, some of the small samples do not meet the W(0.05) criteria for normalcy because the data tends to be clumped around one or two peaks. Since statistical methods were determined to be inappropriate for the data available, a more subjective approach was used to determine the transmitter response time allocations.

Response time data was obtained from plant records for testing conducted during the three year period from 1996 to 1998. The most conservative value from each group of sensors was increased by 50%, and the result compared to manufacturer

specifications. An allocated value was selected, approximately 50% greater than the most conservative measured response time, but not exceeding the manufacturer specification. This was done to provide confidence that available spares would meet the allocated value, and that the plant would not install a defective sensor.

The allocation for Containment Pressure transmitters has been increased slightly as a result of reviews conducted in response to this question. A revised version of the information associated with the Containment Pressure transmitters contained in the Engineered Safety Features Actuation System Table provided on page 6 of Attachment 1 of the original submittal is provided below. The only change to this information is an increase in sensor time from 0.120 to 0.150 seconds.

Engineered Safety Features Actuation System
Response Time Allocations for Components Subject to RTT Elimination

ESFAS Function	Sensor (Time)	7300 String + SSPS Input Relay	Time	SSPS	Time
Ctmt Press Hi 1	0.150	NLP+NAL+IR	0.085	Logic+Master+ Slaves	0.135
Ctmt Press Hi 3	0.150	NLP+NAL+IR(EN)	0.091	Logic+Master+ Slaves	0.099
Ctmt Press Hi 2	0.150	NLP+NAL+IR	0.085	Logic+Master+ Slaves	0.099

An excerpt from the associated calculation (Calculation No. 31024-01674-E3, Rev. 0), and historical data for numerous transmitters are contained in Attachment 2.

Question 2

The request for license amendment states, "NNECO has confirmed that the FMEA presented in WCAP-14036 is applicable to and valid for the equipment actually installed at MP3. Therefore, the TSs are being revised to indicate that the system response time shall be verified utilizing system response times justified by the methodology described in WCAP-14036. Allocations for system response times may be obtained from the bounding criteria in WCAP-14036 or plant specific configurations."

Provide the results of the analyses supporting the conclusion that the FMEA presented in WCAP-14036 is applicable to and valid for the equipment actually installed at MP3.

Response

7300 Process Protection System

WCAP-14036-P-A, Revision 1, "Elimination of Periodic Protection Channel Response Time Tests," evaluated 7300 cards 4NRA, 4NCH, 4NSA, 9NAL, 6NLP and 7NMD (or older artwork revision levels) for response time elimination. Applicability to Millstone Unit No. 3 was verified by inspecting the existing cabinet configuration and reviewing the protection set schematic diagrams. Two types of circuit cards that are in use were not evaluated by the Westinghouse FMEA. The first is a newer version of the NLP card. The 11NLP (or GO5) has been supplied as a direct replacement for all versions of the NLP card. Performance specifications are identical to the 6NLP. Comparison of the two card schematics indicate that changes to the card do not effect the components evaluated under the original FMEA and that no new components were added that could affect the card response time. Based on review of the card design NNECO has concluded that the Westinghouse FMEA applies to the 11NLP. The second card is the Reactor Coolant Pump Underspeed (3NCP) which was supplied specifically for MP3. The card processes pulses produced by Reactor Coolant Pump shaft rotation and functions as a countdown timer - if a pulse is not received from the sensor within a period corresponding to the low speed setpoint, it produces a trip input to the Solid State Protection System (SSPS). There are no components on the card whose failure or degradation would produce an increase in card response time without affecting the setpoint. NNECO has concluded that the periodic channel operational test provides sufficient assurance that the card will function within its allowed time, and that routine response time testing of the 3NCP may be eliminated.

Nuclear Instrumentation System

Review of the Nuclear Instrumentation System as installed at Millstone Unit No. 3 indicates no differences between the currently installed equipment and the equipment described in WCAP-14036-P-A, Revision 1. Isolation amplifier and level trip response times stated in the WCAP-14036-P-A, Revision 1 are applicable to Millstone Unit No. 3.

Solid State Protection System

The SSPS used at Millstone Unit No. 3 uses Midtex/AEMCO 156 relays for input and master relays, and Potter & Brumfield MDR slave relays. NNECO review of plant data and inspection of plant components verifies that there is no difference between the currently installed equipment and the equipment analyzed by Westinghouse in WCAP-14036-P-A, Revision 1. Potter & Brumfield MDR relays installed in SSPS are in compliance with the recommendations of WCAP-1378, "Reliability Assessment of Potter & Brumfield MDR Series Relays." The SSPS response times stated in WCAP-14036-P-A, Revision 1 are applicable to the SSPS installed at Millstone Unit No. 3.

Docket No. 50-423
B18215

Attachment 2

Millstone Nuclear Power Station, Unit No. 3

Response to a Request for Additional Information
Technical Specifications Change Request TSCR 3-4-00
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Supplemental Information

Response to a Request for Additional Information
Technical Specifications Change Request TSCR 3-4-00
Elimination of Pressure Sensor Response Time Testing Requirements and Elimination of Periodic Protection Channel Response Time Tests
Supplemental Information

An excerpt from the associated calculation (Calculation No. 31024-01674-E3, Rev. 0), and the actual transmitter test data used to determine baseline sensor response time are attached.

6. BODY OF CALCULATION

6.1. *Component Acceptance Criteria*

6.1.1. Sensors

6.1.1.1.RTD's used for ΔT/Tavg functions

The required RTD response time is obtained from WCAP 11496 (Reference 3.3). RTD response time is evaluated separately and should *not* be added to the remainder of the channel response time because of the way the channel is modeled for the safety analysis. The RTD response time is modeled as a first-order lag. The remainder of the channel (up to and including decay of the stationary gripper coils) is modeled as a simple delay.

RTD Time Constant **acceptance criteria is 5.5 seconds** per Table 2.1-1 of the RTD Bypass Elimination Licensing Report (REF 3.3). The response time test for the RTD will **add 10% to the measured time constant** to allow for measurement uncertainty (REF 3.8).

6.1.1.2.Pressurizer Pressure Transmitters(P_PZR)

Mfr/Model: Rosemount 1154SH9RC & 1154GP9RC
Manufacturer Specification: Fixed Time constant 0.2 second
Plant data from I&C Form 3443E40-1 (dated 11-18-97) and data taken during the replacement of 3RCS*PT455 (AWO M3-97-02235) and 3RCS*PT456 (AWO M3-97-02238) show a typical response time of 40 to 50 mSec. Based on this information, a value of **0.1 seconds** is chosen for Acceptance Criteria.

6.1.1.3.RCS Flow Transmitters (F_RCS)

Mfr/Model: Rosemount 1153HD5PC
Manufacturer Specification: Fixed Time constant < 0.2 second
Plant data from I&C Form 3443E21-1 (dated 5-24-96) show response times ranging from 122 to 132 mSec. Plant data from I&C Form 3443E31-1 (dated 1-28-98) response times of 136 to 152 mSec. Based on this information, a value of **0.2 seconds** is chosen for Acceptance Criteria. CCN #3

6.1.1.4.Steam Generator Pressure Transmitters (P_SG)

Mfr/Model: Rosemount 1153GB9PC
Manufacturer Specification: Fixed Time constant < 0.2 second
Plant data from I&C Form 3443E21-1 (dated 5-24-96) show response times ranging from 40 to 68 mSec. Plant data from I&C Form 3443E31-1 (dated 1-28-98) show response times from 40 to 74 mSec. Based on this information, **0.1 seconds** will be used for Acceptance Criteria. CCN #3

6.1.1.5.Steam Generator Level Transmitters (L_SG)

Mfr/Model: Rosemount 1154DH4RCN011
Manufacturer Specification: Fixed Time constant 0.5 second

In 1997, the transmitters were replaced per DCR M3-94-084. Plant data from the installation AWO's show response times ranging from 0.26 to 0.35 seconds. Based on this information, a value of **0.5 seconds** is recommended for Acceptance Criteria.

6.1.1.6.Pressurizer Level Transmitters (L_PZR)

Mfr/Model: Rosemount 1153HD5PC (LT460, LT461)
Manufacturer Specification: Fixed Time constant < 0.2 second
Plant data from the from I&C Forms 3443 E21-1 (5-24-96) and 3443E31-1 (1-28-98) shows response times of 100 mSec and 120 mSec. Acceptance Criteria should be **0.2 seconds.**

6.1.1.7.Containment Pressure Transmitters (P_CS)

Mfr/Model: Rosemount 1153AB6PC
Manufacturer Specification: Fixed Time constant < 0.2 second
Plant data from I&C Form 3443E21-1 (5-24-96) and Form 3443E31-1 (1-28-98) provide response times ranging from 62 to 90 mSec. One measurement of 44 mSec was inconsistent and was disregarded. Acceptance Criteria will be **0.15 second**. CCN #3

6.1.2. Instrument Rack Components (7300, NIS and SSPS)

The following 7300 and NIS Channel Components are either obtained from Reference 3.4, WCAP 14036, or determined in this section. The FMEA analysis for the 7300 NLP card was performed before the Group 5 was available. Review of the new card version specifications and schematics indicate that it performs identically to the versions available at the time the FMEA was performed. CCN #1

Description	Code	RT Limit	RT Typical	Source
Bistable/Comparator	NAL	0.005	0.005	WCAP, Section 4.4
Function Generator	NCH	0.0675	0.045	WCAP, Section 4.4
RCP Speed Card	NCP	0.08	0.046	Section 6.1.2.2
NIS Isolation Amplifier	NIS IA	0.001	0.001	WCAP, Section 4.6
NIS Overpower Function	NIS OP	0.065	0.065	WCAP, Section 4.6
Lead/Lag Amplifier (Lead-Lag)	NLL LL	0.042	0.028	Section 6.1.2.1
Lead/Lag Amplifier (Rate-Lag)	NLL RL	0.169	0.112	Section 6.1.2.1
Lead/Lag Amplifier (Filter)	NLL F	iterate function	iterate function	Section 6.1.2.1
Loop Power Supply	NLP	0.06	0.045	WCAP, Section 4.4
RTD Amplifier	NRA	0.213	0.11	WCAP, Section 4.4
Summing Amplifier	NSA	0.0375	0.025	WCAP, Section 4.4
SSPS Input & Master Relays (De-energize)	IMR DE	0.02	0.01	WCAP, Section 4.8
SSPS Input & Master Relays (Energize)	IMR EN	0.026	0.013	WCAP, Section 4.8
SSPS Logic	SSPS	0.001	0.0005	Section 6.1.2.3
SSPS Slave Relays (Energize)	SR	0.036	0.018	WCAP, Section 4.8

CCN #1 CCN #1 CCN #1

6.1.2.1.Response Time of the 7300 Lead/Lag Card (NLL)

In addition to providing programmable dynamic functions, the circuitry of the NLL card produces inherent filtering (first-order lag). This inherent filtering cannot be eliminated and its' associated time delay must be considered regardless of the card's programmed function. MP3 I&C performs response time tests with the cards in circuit. Because of this test methodology, when the card is programmed to perform a filter (lag) function, additional delays are introduced and must be included when determining expected channel response time. WCAP-14036 does not provide data for the time response of this card. The Technical Bulletin (NLL-1, Ref 3.9) shows two stages of inherent lag with time constants of 0.1 and 0.04 seconds. When a card is programmed for lead/lag and filter modes, only the 0.04 second filter adds to the delay of the response. Both filters contribute to the card delay when it is programmed for rate-lag. Our response time tests introduce a step from 50% below to 50% above setpoint - a first order lag output changes by 63% in one time constant. Expressed algebraically, $F(t) = 1 - e^{-\frac{t}{\tau}}$. Determining $\frac{t}{\tau}$ for $F(t) = 50\%$ produces -0.693. Thus, the time delay produced by the output filter is 0.693 x 0.14 or 0.097 seconds. The only delay[1] associated with **lead-lag mode** can be determined by 0.693 times 0.04, or 0.028 second. We will add approximately 50% to allow for the tolerances of the resistors and capacitors which produce the delay, bringing the total inherent delay allowance to **0.042 second**.
The two filters operate in series for a NLL card programmed for **rate-lag mode** producing a 0.113 second delay. This value has been determined by iterating time (t) and solving for the nominal output of two filters in series. The time delay is the first value of t where the output has changed by 50% of input step. A 50% increase in the delay will allow for R-C network component tolerances, resulting in a **0.169 second** limit.
When the NLL is used as a **filter**, the programmed lag time constant must also be considered. In that case, the delay can be determined by iterating t and solving for the output of three filters in series. The time constants of the filters are 0.1, 0.04 and the programmed time constant.

6.1.2.2.Reactor Coolant Pump Speed Card (NCP)

The NCP card processes the pulses originating from the sensor to produce the Reactor Trip input to SSPS. It is basically a countdown timer - if a pulse is not received from the sensor within the period corresponding to the low speed setpoint it produces a trip input to SSPS. Given the principle of operation and the setpoint, it is expected that the card response time will be approximately 27mSec. MP3 response time tests include the delay produced by the input relay to SSPS and the response time of one piece of M&TE (the frequency generator). The last performances obtained response times ranging from 40 to 52 mSec. The input relays typically have a response time of approximately 10 mSec -- there appears to be as much as 15mSec additional delay introduced by including the M&TE response time. An acceptance criteria of **0.08 second** is chosen to allow for differences in M&TE response time and the additional delay resulting from MP3 test methodology.

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[1] Because rate-lag units have no output unless the input is changing, functions which utilize rate-lag compensation are actuated by the "dynamic" component of the card output. The "dynamic" output is processed through both the 0.1 and 0.04 second filters.

It should be noted that the principle of operation of the card makes separate response time testing unnecessary. If the card produces a trip at the correct setpoint during the calibration test, it's response time is normal.

6.1.2.3.SSPS Logic (SSPS)

The semi-automatic test verifies that the outputs of the logic circuit under test are correct for a given set of inputs. Each input test pulse lasts 1 millisecond. If the logic circuit outputs do not agree with the test inputs within approximately 100 microseconds during a semi-automatic test, then the test fails. The semi-automatic tester does not test all circuits of some logic functions in a single test switch position, but fewer than five switch positions are required to test the most complex logic function. Thus, performance of the semi-automatic test verifies that the total response time of any complete logic function is less than 500 microseconds. We will assume that the response time of the SSPS Logic circuitry is **0.001 second** for the purpose of this calculation.

6.1.3. EGLS Components (Actuation Logic and Timers)

6.1.3.1.Actuation Logic (EGLS)

The logic components in EGLS are of the same type as the SSPS, Motorola High Threshold Logic (MHTL). The duration of each "test state" of the auto tester is 1 millisecond - the logic circuitry must produce the correct output within that window to prevent an Auto Logic Test failure (Ref. 3.20). We will use **0.001 second**.

6.1.3.2.Sequencer Timers

Sequencer timers are set according to SP-M3-EE-321, Ref. 3.17. The following values were used in ESF function response time validations:

Description	Code	Delay
CHS*P3A/B/C	N/A	0
SIH*P1A/B	N/A	5
RHS*P1A/B	N/A	10
Max SI Delay	SI_DEL	10
SWP*P1A/B/C/D	SW_DEL	20.5
FWA*P1A/B	AFW_DEL	30
QSS*P3A/B	CDA_DEL	5

6.1.3.3.Sequencer Input & Output Relays (EGLSR)

The operation time of the sequencer relays have not been measured separately. Their response times are verified when starting the loads actuated by EGLS. Relays which operate to provide digital inputs (Diesel Ready to Load, SIS, etc.) are also tested as part of a string, when the inputs are actuated. The Agastat GP Series Power relays (D.C. operated) operate within a nominal 30 mSec according to the vendor data sheet found in reference 3.20. We will use **0.06 second** for relay acceptance criteria.

Blue Channel Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*LT461	C3–441 BS–1	C3–451 SW–7	249.0 inH_2O	223.8 inH_2O	< 0.5 sec	0.100 secs
RCS*FT416	C3–433 BS–1	C3–452 SW–5	276.2 inH_2O	222.3 inH_2O	< 0.5 sec	0.136 secs
RCS*FT426	C3–434 BS–1	C3–452 SW–6	269.2 inH_2O	216.4 inH_2O	< 0.5 sec	0.152 secs
RCS*FT436	C3–435 BS–1	C3–452 SW–7	275.3 inH_2O	221.2 inH_2O	< 0.5 sec	0.140 secs
RCS*FT446	C3–436 BS–1	C3–452 SW–2	228.5 inH_2O	183.6 inH_2O	< 0.5 sec	0.144 secs
MSS*PT526	C3–427 BS–1, 2	C3–452 SW–1	171 psig	41 psig	< 0.5 sec	0.062 secs
			730 psig	600 psig	< 0.5 sec	0.044 secs
MSS*PT536	C3–428 BS–1, 2	C3–452 SW–4	171 psig	41 psig	< 0.5 sec	0.074 secs
			730 psig	600 psig	< 0.5 sec	0.040 secs

6.1.1.6

6.1.1.3

6.1.1.4

Low Press

High rate

INDEPENDENT VERIFICATION

RCS*LT461

Lead Disconnected: RP CMR IV

Lead Connected: CMR RP IV

1-28-98

5

Red Channel Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
LMS*PT937	C1–754 BS–1	C1–768 SW–5	19.7 psia	25.7 psia	< 0.5 sec	0.062 secs

6.1.1.7 H.3

Yellow Channel Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
MSS*PT516	C4–427 BS–1, 2	C4–449 SW–5	171 psig	41 psig	< 0.5 sec	0.066 secs
			730 psig	600 psig	< 0.5 sec	0.042 secs
MSS*PT546	C4–428 BS–1, 2	C4–449 SW–6	171 psig	41 psig	< 0.5 sec	0.064 secs
			730 psig	600 psig	< 0.5 sec	0.044 secs
LMS*PT934	C4–434 BS–1, 2, 3	C4–448 SW–5	19.7 psia H.3	25.7 psia	< 0.5 sec	0.044 RPI 1/28/98 ~~0.121~~ secs
			14.7 psia	20.7 psia	< 0.5 sec	0.068 secs

6.1.1.4

6.1.1.7 H.1.2

1-28-98

White Channel Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time	
RCS*LT460	C2–751 BS–1	C2–767 SW–7	248.7 inH_2O	223.4 inH_2O	< 0.5 sec	.120	6.1.1.6
RCS*FT415	C2–747 BS–1	C2–769 SW–5	280.8 inH_2O	225.9 inH_2O	< 0.5 sec	.122	6.1.1.3
RCS*FT425	C2–748 BS–1	C2–769 SW–6	279.8 inH_2O	225.1 inH_2O	< 0.5 sec	.132	
RCS*FT435	C2–749 BS–1	C2–769 SW–7	288.3 inH_2O	232.0 inH_2O	< 0.5 sec	.127	
RCS*FT445	C2–750 BS–1	C2–770 SW–5	283.4 inH_2O	228.0 inH_2O	< 0.5 sec	.124	
MSS*PT515	C2–726 BS–1, 2	C2–767 SW–5	171 psig	41 psig	< 0.5 sec	.064	6.1.1.4
			730 psig	600 psig	< 0.5 sec	.040	
MSS*PT525	C2–732 BS–1, 2	C2–768 SW–6	171 psig	41 psig	< 0.5 sec	.043	
			730 psig	600 psig	< 0.5 sec	.041	
MSS*PT535	C2–731 BS–1, 2	C2–767 SW–6	171 psig	41 psig	< 0.5 sec	.068	
			730 psig	600 psig	< 0.5 sec	.044	

INDEPENDENT VERIFICATION

RCS*LT460

Lead Disconnected: SC / IV

Lead Connected: SC / IV

5-24-96

JUL 14 1993

White Channel Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
MSS*PT545	C2–741 BS–1, 2	C2–768 SW–7	171 psig	41 psig	< 0.5 sec	.043
			730 psig	600 psig	< 0.5 sec	.042

6.1.1.4

Blue Channel Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
LMS*PT935	C3–442 BS–1, 2, 3	C3–450 SW–5	19.7 psia	25.7 psia	< 0.5 sec	.089
			14.7 psia	20.7 psia	< 0.5 sec	.090

6.1.1.7

5-24-96

8

JUL. 14 1993

11-18-97

Transmitter Time Response

Reference for 6.1.1.2

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT458 PZR Pres	C4–425 BS–1, 2, 3 C4–455 BS–1 C4–422 BS–3, 4	C4–450 SW–5	1969 psia	1889 psia	< 0.5 sec	0.05 SEC
			2374 psia	2454 psia	< 0.5 sec	0.05 SEC
FWS*LT517 S/G Level	C4–429 BS–1, 2	C4–449 SW–1	53.4 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.2 inH_2O	< 0.5 sec	
FWS*LT527	C4–430 BS–1, 2	C4–449 SW–2	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	
			100.6 inH_2O	109.5 inH_2O	< 0.5 sec	
FWS*LT537	C4–431 BS–1, 2	C4–449 SW–3	54.6 inH_2O	45.6 inH_2O	< 0.5 sec	
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	
FWS*LT547	C4–432 BS–1, 2	C4–449 SW–4	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	
			101.1 inH_2O	110.1 inH_2O	< 0.5 sec	

9

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT455	C1–725 BS–1, 2, 3, 4 C1–775 BS–1 C1–722 BS–3, 4	C1–770 SW–5	1969 psia	1889 psia	< 0.5 sec	.04 SEC.
			2374 psia	2454 psia	< 0.5 sec	.05 SEC.
FWS*LT551	C1–736 BS–1, 2	C1–771 SW–1	53.4 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	N/A
FWS*LT529	C1–752 BS–1, 2	C1–769 SW–1	53.3 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT539	C1–753 BS–1, 2	C1–769 SW–2	53.7 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A
FWS*LT554	C1–735 BS–1, 2	C1–771 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	N/A

6.1.1.2
11-19-97

INDEPENDENT VERIFICATION
FWS*LT551
N/A
Lead Disconnected ____ IV ____ Lead Connected ____ IV ____

INDEPENDENT VERIFICATION
FWS*LT554
N/A
Lead Disconnected ____ IV ____ Lead Connected ____ IV ____

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT456	C2–725 BS–1, 2, 3, 4 C2–775 BS–1 C2–722 BS–3, 4	C2–768 SW–5	1969 psia	1889 psia	< 0.5 sec	.05 SEC.
			2374 psia	2454 psia	< 0.5 sec	.05 SEC.
FWS*LT519	C2–752 BS–1, 2	C2–767 SW–1	54.7 inH_2O	45.7 inH_2O	< 0.5 sec	N/A
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	N/A
FWS*LT552	C2–736 BS–1, 2	C2–769 SW–1	53.5 inH_2O	44.6 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	N/A
FWS*LT553	C2–735 BS–1, 2	C2–769 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	N/A
FWS*LT549	C2–753 BS–1, 2	C2–767 SW–2	53.8 inH_2O	44.8 inH_2O	< 0.5 sec	N/A
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	N/A

INDEPENDENT VERIFICATION
FWS*LT552
Lead Disconnected N/A Lead Connected
IV IV

INDEPENDENT VERIFICATION
FWS*LT553
Lead Disconnected N/A Lead Connected
IV IV

6.1.1.2
11-20-97

11

Section 4.1

Transmitter Time Response

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT458	C4–425 BS–1, 2, 3 C4–455 BS–1 C4–422 BS–3, 4	C4–450 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT517	C4–429 BS–1, 2	C4–449 SW–1	53.4 inH_2O	44.4 inH_2O	< 0.5 sec	.26 SEC.
			100.2 inH_2O	109.2 inH_2O	< 0.5 sec	.30 SEC.
FWS*LT527	C4–430 BS–1, 2	C4–449 SW–2	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			100.6 inH_2O	109.5 inH_2O	< 0.5 sec	N/A
FWS*LT537	C4–431 BS–1, 2	C4–449 SW–3	54.6 inH_2O	45.6 inH_2O	< 0.5 sec	N/A
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	N/A
FWS*LT547	C4–432 BS–1, 2	C4–449 SW–4	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			101.1 inH_2O	110.1 inH_2O	< 0.5 sec	N/A

6.1.1.5
4-10-97 13

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT457	C3–425 BS–1, 2, 3, 4 C3–455 BS–1 C3–422 BS–3, 4	C3–451 SW–6	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT518	C3–429 BS–1, 2	C3–451 SW–1 Hi Hi	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	.29 SEC.
		Lo	100.9 inH_2O	109.9 inH_2O	< 0.5 sec	.31 SEC
FWS*LT528	C3–430 BS–1, 2	C3–451 SW–2	53.9 inH_2O	45.0 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	109.9 inH_2O	< 0.5 sec	N/A
FWS*LT538	C3–431 BS–1, 2	C3–451 SW–4	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			100.7 inH_2O	109.6 inH_2O	< 0.5 sec	N/A
FWS*LT548	C3–432 BS–1, 2	C3–451 SW–5	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A

6.1.1.5
6-9-97

13

Section 4.1

Transmitter Time Response

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT456	C2–725 BS–1, 2, 3, 4 C2–775 BS–1 C2–722 BS–3, 4	C2–768 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	✓
FWS*LT519	C2–752 BS–1, 2	C2–767 SW–1	54.7 inH_2O	45.7 inH_2O	< 0.5 sec	.27 SEC
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	.31 SEC
FWS*LT552	C2–736 BS–1, 2	C2–769 SW–1	53.5 inH_2O	44.6 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	
FWS*LT553	C2–735 BS–1, 2	C2–769 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	
FWS*LT549	C2–753 BS–1, 2	C2–767 SW–2	53.8 inH_2O	44.8 inH_2O	< 0.5 sec	
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	✓

INDEPENDENT VERIFICATION
FWS*LT552
Lead Disconnected N/A IV
Lead Connected N/A IV

INDEPENDENT VERIFICATION
FWS*LT553
Lead Disconnected N/A IV
Lead Connected N/A IV

6.1.5
9-10-97
14

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT458	C4–425 BS–1, 2, 3 C4–455 BS–1 C4–422 BS–3, 4	C4–450 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT517	C4–429 BS–1, 2	C4–449 SW–1	53.4 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT527	C4–430 BS–1, 2	C4–449 SW–2	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	0.294 sec
			100.6 inH_2O	109.5 inH_2O	< 0.5 sec	0.32 sec
FWS*LT537	C4–431 BS–1, 2	C4–449 SW–3	54.6 inH_2O	45.6 inH_2O	< 0.5 sec	N/A
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	N/A
FWS*LT547	C4–432 BS–1, 2	C4–449 SW–4	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			101.1 inH_2O	110.1 inH_2O	< 0.5 sec	N/A

6.1.1.5
4-10-97
15

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT457	C3–425 BS–1, 2, 3, 4 C3–455 BS–1 C3–422 BS–3, 4	C3–451 SW–6	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT518	C3–429 BS–1, 2	C3–451 SW–1	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	N/A
FWS*LT528	C3–430 BS–1, 2	C3–451 SW–2	53.9 inH_2O	45.0 inH_2O	< 0.5 sec	.29 SEC.
			101.0 inH_2O	109.9 inH_2O	< 0.5 sec	.35 SEC.
FWS*LT538	C3–431 BS–1, 2	C3–451 SW–4	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			100.7 inH_2O	109.6 inH_2O	< 0.5 sec	N/A
FWS*LT548	C3–432 BS–1, 2	C3–451 SW–5	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A

6.1.1.5
9-9-97

16

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT455	C1–725 BS–1, 2, 3, 4. C1–775 BS–1 C1–722 BS–3, 4	C1–770 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT551	C1–736 BS–1, 2	C1–771 SW–1	53.4 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	N/A
FWS*LT529	C1–752 BS–1, 2	C1–769 SW–1	53.3 inH_2O	44.4 inH_2O	< 0.5 sec	.33 SEC.
			100.3 inH_2O	109.2 inH_2O	< 0.5 sec	.35 SEC
FWS*LT539	C1–753 BS–1, 2	C1–769 SW–2	53.7 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A
FWS*LT554	C1–735 BS–1, 2	C1–771 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	N/A

6.1.5
9-9-97

INDEPENDENT VERIFICATION
FWS*LT551
Lead Disconnected N/A Lead Connected
____ ____ IV ____ ____ IV

INDEPENDENT VERIFICATION
FWS*LT554
Lead Disconnected N/A Lead Connected
____ ____ IV ____ ____ IV

Section 4.1

Transmitter Time Response

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT458	C4–425 BS–1, 2, 3 C4–455 BS–1 C4–422 BS–3, 4	C4–450 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT517	C4–429 BS–1, 2	C4–449 SW–1	53.4 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT527	C4–430 BS–1, 2	C4–449 SW–2	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			100.6 inH_2O	109.5 inH_2O	< 0.5 sec	N/A
FWS*LT537	C4–431 BS–1, 2	C4–449 SW–3	54.6 inH_2O	45.6 inH_2O	< 0.5 sec	.26 Sec.
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	.27 Sec.
FWS*LT547	C4–432 BS–1, 2	C4–449 SW–4	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			101.1 inH_2O	110.1 inH_2O	< 0.5 sec	N/A

6.1.1.5
9-11-97

18

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT457	C3–425 BS–1, 2, 3, 4 C3–455 BS–1 C3–422 BS–3, 4	C3–451 SW–6	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT518	C3–429 BS–1, 2	C3–451 SW–1	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	N/A
FWS*LT528	C3–430 BS–1, 2	C3–451 SW–2	53.9 inH_2O	45.0 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	109.9 inH_2O	< 0.5 sec	N/A
FWS*LT538	C3–431 BS–1, 2	C3–451 SW–4	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	.29 SEC.
			100.7 inH_2O	109.6 inH_2O	< 0.5 sec	.33 SEC
FWS*LT548	C3–432 BS–1, 2	C3–451 SW–5	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A

SP 3443E30
INPUT: #2 TRACE

6.1.1.5
9-9-97

19

Section 4.1

Transmitter Time Response

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT455	C1–725 BS–1, 2, 3, 4 C1–775 BS–1 C1–722 BS–3, 4	C1–770 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT551	C1–736 BS–1, 2	C1–771 SW–1	53.4 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	N/A
FWS*LT529	C1–752 BS–1, 2	C1–769 SW–1	53.3 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT539	C1–753 BS–1, 2	C1–769 SW–2	53.7 inH_2O	44.7 inH_2O	< 0.5 sec	.32 SEC.
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	.33 SEC.
FWS*LT554	C1–735 BS–1, 2	C1–771 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	N/A

6.1.1.5
9-9-97

INDEPENDENT VERIFICATION
FWS*LT551
Lead Disconnected N/A Lead Connected
IV IV

INDEPENDENT VERIFICATION
FWS*LT554
Lead Disconnected N/A Lead Connected
IV IV

20

Section 4.1

Transmitter Time Response

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT458	C4–425 BS–1, 2, 3 C4–455 BS–1 C4–422 BS–3, 4	C4–450 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT517	C4–429 BS–1, 2	C4–449 SW–1	53.4 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT527	C4–430 BS–1, 2	C4–449 SW–2	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			100.6 inH_2O	109.5 inH_2O	< 0.5 sec	N/A
FWS*LT537	C4–431 BS–1, 2	C4–449 SW–3	54.6 inH_2O	45.6 inH_2O	< 0.5 sec	N/A
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	N/A
FWS*LT547	C4–432 BS–1, 2	C4–449 SW–4	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	0.28 sec
			101.1 inH_2O	110.1 inH_2O	< 0.5 sec	0.32 sec

6.1.1.5
9-10-97
21

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT457	C3–425 BS–1, 2, 3, 4 C3–455 BS–1 C3–422 BS–3, 4	C3–451 SW–6	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT518	C3–429 BS–1, 2	C3–451 SW–1	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	N/A
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	N/A
FWS*LT528	C3–430 BS–1, 2	C3–451 SW–2	53.9 inH_2O	45.0 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	109.9 inH_2O	< 0.5 sec	N/A
FWS*LT538	C3–431 BS–1, 2	C3–451 SW–4	53.6 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			100.7 inH_2O	109.6 inH_2O	< 0.5 sec	N/A
FWS*LT548	C3–432 BS–1, 2	C3–451 SW–5	53.9 inH_2O	44.9 inH_2O	< 0.5 sec	.30 SEC
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	.32 SEC.

22

(White) Four Channel RPS/ESFAS Time Response Data Sheet (Transmitters)

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT456	C2–725 BS–1, 2, 3, 4 C2–775 BS–1 C2–722 BS–3, 4	C2–768 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	
FWS*LT519	C2–752 BS–1, 2	C2–767 SW–1	54.7 inH_2O	45.7 inH_2O	< 0.5 sec	
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	
FWS*LT552	C2–736 BS–1, 2	C2–769 SW–1	53.5 inH_2O	44.6 inH_2O	< 0.5 sec	
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	
FWS*LT553	C2–735 BS–1, 2	C2–769 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	
FWS*LT549	C2–753 BS–1, 2	C2–767 SW–2	53.8 inH_2O	44.8 inH_2O	< 0.5 sec	.28 SEC
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	.32 SEC

INDEPENDENT VERIFICATION
FWS*LT552
Lead Disconnected: N/A IV
Lead Connected: N/A IV

INDEPENDENT VERIFICATION
FWS*LT553
Lead Disconnected: N/A IV
Lead Connected: N/A IV

I&C Form 3443E20–1
Rev. 2

6.1.15
9-10-97

23

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT455	C1–725 BS–1, 2, 3, 4 C1–775 BS–1 C1–722 BS–3, 4	C1–770 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT551	C1–736 BS–1, 2	C1–771 SW–1	53.4 inH_2O	44.5 inH_2O	< 0.5 sec	.29 SEC.
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	.35 SEC.
FWS*LT529	C1–752 BS–1, 2	C1–769 SW–1	53.3 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT539	C1–753 BS–1, 2	C1–769 SW–2	53.7 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A
FWS*LT554	C1–735 BS–1, 2	C1–771 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	N/A

INDEPENDENT VERIFICATION
FWS*LT551
Lead Disconnected N/A Lead Connected
____ ____ IV ____ ____ IV

INDEPENDENT VERIFICATION
FWS*LT554
Lead Disconnected N/A Lead Connected
____ ____ IV ____ ____ IV

6.1.1.5
9-9-97

24

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT456	C2–725 BS–1, 2, 3, 4 C2–775 BS–1 C2–722 BS–3, 4	C2–768 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	✓
FWS*LT519	C2–752 BS–1, 2	C2–767 SW–1	54.7 inH_2O	45.7 inH_2O	< 0.5 sec	
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	✓
FWS*LT552	C2–736 BS–1, 2	C2–769 SW–1	53.5 inH_2O	44.6 inH_2O	< 0.5 sec	0.3 sec
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	0.34 sec.
FWS*LT553	C2–735 BS–1, 2	C2–769 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	✓
FWS*LT549	C2–753 BS–1, 2	C2–767 SW–2	53.8 inH_2O	44.8 inH_2O	< 0.5 sec	
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	✓

INDEPENDENT VERIFICATION
FWS*LT552
Lead Disconnected ____ N/A IV
Lead Connected ____ N/A IV

INDEPENDENT VERIFICATION
FWS*LT553
Lead Disconnected ____ N/A IV
Lead Connected ____ N/A IV

6.1.1.5
9-10-97

25

Transmitter Time Response

Section 4.1

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT456	C2–725 BS–1, 2, 3, 4 C2–775 BS–1 C2–722 BS–3, 4	C2–768 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT519	C2–752 BS–1, 2	C2–767 SW–1	54.7 inH_2O	45.7 inH_2O	< 0.5 sec	N/A
			101.9 inH_2O	110.9 inH_2O	< 0.5 sec	N/A
FWS*LT552	C2–736 BS–1, 2	C2–769 SW–1	53.5 inH_2O	44.6 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	N/A
FWS*LT553	C2–735 BS–1, 2	C2–769 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	.28 SEC
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	.308 SEC.
FWS*LT549	C2–753 BS–1, 2	C2–767 SW–2	53.8 inH_2O	44.8 inH_2O	< 0.5 sec	N/A
			100.9 inH_2O	109.9 inH_2O	< 0.5 sec	N/A

INDEPENDENT VERIFICATION
FWS*LT552
Lead Disconnected N/A IV
Lead Connected N/A IV

INDEPENDENT VERIFICATION
FWS*LT553
Lead Disconnected N/A IV
Lead Connected N/A IV

6.1.1.5
9-10-97
26

Section 4.1

Transmitter Time Response

Transmitter	Channel Test Card Bistable Switches	Master Test Switch	Step From	Step To	Desired	Response Time
RCS*PT455	C1–725 BS–1, 2, 3, 4 C1–775 BS–1 C1–722 BS–3, 4	C1–770 SW–5	1969 psia	1889 psia	< 0.5 sec	N/A
			2374 psia	2454 psia	< 0.5 sec	N/A
FWS*LT551	C1–736 BS–1, 2	C1–771 SW–1	53.4 inH_2O	44.5 inH_2O	< 0.5 sec	N/A
			100.2 inH_2O	109.1 inH_2O	< 0.5 sec	N/A
FWS*LT529	C1–752 BS–1, 2	C1–769 SW–1	53.3 inH_2O	44.4 inH_2O	< 0.5 sec	N/A
			100.3 inH_2O	109.2 inH_2O	< 0.5 sec	N/A
FWS*LT539	C1–753 BS–1, 2	C1–769 SW–2	53.7 inH_2O	44.7 inH_2O	< 0.5 sec	N/A
			101.0 inH_2O	110.0 inH_2O	< 0.5 sec	N/A
FWS*LT554	C1–735 BS–1, 2	C1–771 SW–2	53.5 inH_2O	44.5 inH_2O	< 0.5 sec	.30 SEC
			100.3 inH_2O	109.3 inH_2O	< 0.5 sec	.34 SEC.

INDEPENDENT VERIFICATION
FWS*LT551
Lead Disconnected N/A Lead Connected
IV IV

INDEPENDENT VERIFICATION
FWS*LT554
Lead Disconnected N/A Lead Connected
IV IV

6.1.15
6-9-97

27