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| Bwp_3l8 |  | | | | | | | |  |
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| Intermediate Range Monitor (IRM) Channel A Calibration | | | | | | | | | |
| Revision | | | | | | | | | |
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|  | | | | Level of Use or Other Information: Key # P2237A | | |  | | |
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| Effective Date: | | |  | | |  | |  | |
| Responsible Organization: | | | | |  | | | | |
| Prepared By: | |  | | | | | | | |
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| Current Revision Description | | | |
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| Pages Affected: | 59 | | |
| Type of Change: | Enhancement | Tracking Number: | 029 |
| CR 1673556-001 / PCR 20000108 Step 6.12[109] Corrected 2‑LPNL‑925‑0061 to 2‑LPNL‑925‑0027 to match panel that pre‑amp was removed from in Step 6.12[2]. | | | |
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1. INTRODUCTION
   1. Purpose

This procedure is performed to determine the operability of IRM function of Reactor Protection System (RPS) Instrumentation, Control Rod Block Instrumentation, and Surveillance Instrumentation in the Neutron Monitoring System (NMS).

* 1. Scope
  2. This procedure is performed on IRM Channel A. Surveillance Requirements (SR) 2‑SR‑3.3.1.1.9(IRM B), 2‑SR‑3.3.1.1.9(IRM C), 2‑SR‑3.3.1.1.9(IRM D), 2‑SR‑3.3.1.1.9(IRM E), 2‑SR‑3.3.1.1.9(IRM F), 2‑SR‑3.3.1.1.9(IRM G), and 2‑SR‑3.3.1.1.9(IRM H) must also be performed to satisfy Technical Specification SR 3.3.1.1.9 and Technical Requirements Manual (TRM) Technical Surveillance Requirements (TSR) 3.3.4.6 and 3.3.5.8 for IRM Channel calibration.
  3. When this procedure is performed with the Reactor Mode Switch NOT in RUN position this procedure also partially satisfies SR 3.3.1.1.3 and SR 3.3.1.1.4 and TSR 3.3.4.3 and TSR 3.3.4.4 relating to IRM Channel functional test and TSR 3.3.4.9 for Rod Block Logic functional test. With the Reactor Mode Switch NOT in RUN position, 2‑SR‑3.3.1.1.3(IRMs) is performed to satisfy Technical Specification (TS) and TRM requirements for IRM Channel functional test.
  4. This procedure also partially satisfies SR 3.10.3.1 and SR 3.10.4.1 relating to IRM Channel calibration and functional test. This procedure in conjunction with those listed in Section 1.2A fully satisfies SR 3.10.3.1 and SR 3.10.4.1 relating to IRM Channel calibration and functional test. SR 2‑SR‑3.3.1.1.3(IRMs) satisfies these requirements for IRM Channel functional test.
  5. This procedure provides overlap testing for, and partially satisfies, requirements of SR 3.3.1.1.14 for RPS Instrumentation Logic System Functional Test.
  6. INOP bypass function has been added to allow functional testing of RPS and Reactor Manual Control System (RMCS).
  7. Frequency and Conditions
     1. Frequency
  8. This procedure is performed once every 92 days.
  9. This procedure is NOT required to be performed when entering Mode 2 from Mode 1 until 12 hours after entering Mode 2.
     1. Conditions
  10. This procedure can be performed in any operational mode.
  11. The following IRM functions are required to be OPERABLE in the modes listed below:

|  |  |
| --- | --- |
| TS/TRM Function | Mode |
| Neutron Flux ‑ HIGH INOP | 2, 3(1), 4(1), 5(2) |
| IRM UPSCALE IRM DOWNSCALE Detector NOT in Startup Position | 2 |

|  |  |
| --- | --- |
| (1) | With Reactor Mode Switch in REFUEL |
| (2) | With any control rod withdrawn from a core cell containing one or more fuel assemblies |

1. REFERENCES
   1. Performance References

None

* 1. Developmental References
  2. 2‑SIMI‑92B, Neutron Monitoring Scaling and Setpoint Document
  3. BFN Final Safety Analysis Report (FSAR), Section 7.2, Reactor Protection System
  4. BFN Final Safety Analysis Report (FSAR), Section 7.5, Neutron Monitoring System
  5. BFN Final Safety Analysis Report (FSAR), Section 7.7, Reactor Manual Control
  6. BFN Technical Requirements Manual, Section TR 3.3.4, Control Rod Block Instrumentation
  7. BFN Technical Requirements Manual, Section TR 3.3.5, Surveillance Instrumentation Developmental References
  8. BFN Technical Specifications, Section 3.3.1.1, Reactor Protection System (RPS) Instrumentation
  9. BFN Technical Specifications, Section 3.10.3, Single Control Rod Withdrawal ‑ Hot Shutdown
  10. BFN Technical Specifications, Section 3.10.4, Single Control Rod Withdrawal ‑ Cold Shutdown
  11. VTD‑G080‑9335, SRM and IRM Preamplifier Enclosure
  12. VTM‑G080‑3740, GEK‑858D, Voltage preamplifier
  13. VTM‑G080‑3800, GEK‑27723A, Mean Square Voltage Wide Range Monitor
  14. Commitments

PER 129518, IRM Out of Tolerance

1. PRECAUTIONS AND LIMITATIONS
   1. Precautions

[PER/C]The Range 6 to 7 Correlation shall be checked any time the IRM preamp is replaced per SII‑0‑XX‑92‑054. [129518‑005]

* 1. Limitations
  2. Calibration and functional test is to be performed on one channel at a time. All trips are to be reset and channel returned to fully operable status before starting another channel, unless otherwise directed by Unit Senior Reactor Operator (Unit SRO).
  3. Jumpers are installed if scram links have been removed, in order to test IRM logic. These jumpers defeat non‑coincidence Scram function of neutron monitoring system. When jumpers are installed, refueling operations are to stop until completion of this procedure and removal of jumpers.
  4. If any other IRM in RPS trip Channel A is INOP (or becomes INOP during performance of this procedure), entry into TS Conditions and Required Actions can be delayed for up to 6 hours provided associated function maintains RPS trip capability. This procedure can exceed the 6 hour testing limit.

1. PREREQUISITE ACTIONS
   1. Preliminary Actions

ENSURE STS for this procedure and work activity is included in work order. (Key # P2237A) \_\_\_\_\_\_\_\_

ENSURE training requirements are met prior to performance of this procedure:

IMP 563 ‑ Conduct SI (Calibration and Functional) on Intermediate Range Neutron Monitoring System  
  
and

IMP 556 ‑ Conduct SI (Calibration and Functional) on Reactor Protection System \_\_\_\_\_\_\_\_

IF 2‑HS‑99‑5A/S1, REACTOR MODE SWITCH, is NOT in RUN, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK RPS Sub Channel Trip does NOT exist. \_\_\_\_\_\_\_\_

CHECK no other test or maintenance is in progress that is going to provide a half scram signal to RPS logic. \_\_\_\_\_\_\_\_

IF prerequisites in Steps 4.1[3.1] OR 4.1[3.2] are NOT met, THEN  
  
OBTAIN Unit SRO permission to continue. Otherwise, MARK N/A.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| Unit SRO Signature |  | Date |

IF 2‑HS‑99‑5A/S1, REACTOR MODE SWITCH, is NOT in RUN, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK Control Rod Drive (CRD) platform is in NORMAL position. \_\_\_\_\_\_\_\_

IF IRM cables are NOT routed in normal configuration, THEN  
  
MONITOR movement of IRM cables by direct observation or remote video camera. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

* 1. Special Tools, Measuring and Test Equipment, Parts, and Supplies
     1. Special Tools

OBTAIN the following:

Plug‑in adapter GE129B2048G1 and G2

Test Cable G.E. 175A9111G01

Hewlett Packard Oscillator, Model 651B or 652A

Two Oscilloscope probes (matched pair) labeled Inverter Test Cable

2000 pF Capacitor (Substitution box is NOT acceptable)

HV‑1 Test Box

J4 Adapter

Three BNC to UHF Adapters

BNC‑T connector

BNC ‑ Barrel

Six Coax Cables

J‑42 Test Cable

MEAN SQUARE ANALOG Module Test Cover

Calculator

Isolation transformer

Two pronged adapter \_\_\_\_\_\_\_\_

IF Reactor Mode Switch is NOT in RUN, THEN  
  
OBTAIN Two Volt Ohm Meters (VOMs). Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF RPS shorting links are removed AND Reactor Mode Switch is NOT in RUN, THEN  
  
OBTAIN two 12‑14 inch jumpers with discs. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

* + 1. Measuring and Test Equipment (M&TE)

| 1. NOTES |
| --- |
| * 1. If it is necessary to change M&TE, then identification number, calibration due date and step numbers for new M&TE used is documented in remarks section of STS.   2. M&TE Used (Y or N) column will be completed in performance of Step 7.1[3].   3. Only two Digital Multimeters (DMM) are required. |

OBTAIN M&TE listed in M&TE table. \_\_\_\_\_\_\_\_

RECORD M&TE data in M&TE table. \_\_\_\_\_\_\_\_

| M&TE Table | | | | | |
| --- | --- | --- | --- | --- | --- |
| Parameter | Recommended Instrument | | Required Range | Required Accuracy |  |
| Voltage | Digital Multimeter | | 0‑100 Vdc | 1.0 Vdc | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  |  |  |  |
| Voltage | Digital Multimeter | | 0‑1 Vdc | 0.004 Vdc | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  |  |  |  |
| Voltage | Digital Multimeter | | 0‑4.20 Vdc | 0.005 Vdc | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  |  |  |  |
| Torque | Torque Wrench | | 20 In‑lbs | N/A | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  |  | N/A |  |
| Volts RMS | RMS Voltmeter | | N/A | N/A | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  | N/A | N/A |  |
| Wave form | Oscilloscope (Dual Trace) | | N/A | N/A | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  | N/A | N/A |  |
| Test Fixture | IRM Test Fixture G.E. 117C2956G001 | | N/A | N/A | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  | N/A | N/A |  |
| Time | Programma TM200 Timer | | N/A | N/A | M&TE Used |
| TVA ID# | Cal. Due Date | Actual Range | Actual Accuracy | (Y or N) |
|  |  | N/A | N/A |  |

ENSURE, with Peer Check, applicable M&TE meets or exceeds Required Range. \_\_\_\_\_\_\_\_

ENSURE, with Peer Check, applicable M&TE is equal to or better than Required Accuracy. \_\_\_\_\_\_\_\_

* 1. Approvals and Notifications

EVALUATE operability of Intermediate Range Monitoring System based on current operability status of IRM’s C, E, and G.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| Unit SRO Signature |  | Date |  |  |

OBTAIN Unit SRO authorization to begin. \_\_\_\_\_\_\_\_

1. ACCEPTANCE CRITERIA

Responses which fail to meet Acceptance Criteria (AC) constitute unsatisfactory surveillance procedure results and require immediate notification of Unit SRO.

* 1. The following AC are applicable in all mode switch positions:
     1. When high voltage power supply is lowered to 90 Vdc (88 to 92 Vdc) the INOP indicating light on CHANNEL A IRM drawer ILLUMINATES. (TS/TRM)
     2. As‑found DOWNSCALE, UPSCALE HIGH, and UPSCALE HIGH HIGH trip setpoints are within TS/TRM Allowable Values.
     3. DOWNSCALE ‑ Greater than or equal to 0.040
     4. UPSCALE HIGH ‑ Less than or equal to 0.864
     5. UPSCALE HIGH HIGH ‑ Less than or equal to 0.960
     6. When an internal signal is applied to IRM front panel meter, the front panel meter responds with an indication of between 38 and 42 UNITS on the 125 UNITS scale. (TRM)
  2. The following AC are only applicable when 2‑HS‑99‑5A/S1, REACTOR MODE SWITCH is NOT in RUN.
     1. When simulated DOWNSCALE condition is sensed by IRM, annunciator CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) alarms or contacts OPEN in rod block logic circuit. (TRM)
     2. When simulated UPSCALE HIGH condition is sensed by IRM, annunciator CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) comes in ALARM or contacts open in rod block logic circuit.(TRM)
     3. When simulated UPSCALE HIGH HIGH condition is sensed by IRM, SCRAM SOLENOID GROUP A LOGIC RESET indicating lights EXTINGUISH. (TS)
     4. When IRM Mode switch is in a position other than OPERATE, an INOP condition is sensed by IRM and the following occurs:
        1. SCRAM SOLENOID GROUP A LOGIC RESET indicating lights EXTINGUISH. (TS)
        2. CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) alarms or contacts OPEN in rod block logic circuit. (TRM)
     5. When IRM A detector is withdrawn until IN indicating light is EXTINGUISHED, CONTROL ROD WITHDRAWAL BLOCK   
        (2‑XA‑55‑5A, window 7) alarms or contacts OPEN in rod block logic circuit. (TRM)

| 1. NOTE |
| --- |
| Completion of steps performed by an operator or another Instrument Mechanic (IM) can be identified by placing that persons initials in the blank first followed by word “by” or a slash (/), then initials of the IM recording completion.  Examples:   * + - * 1. OP or IM by IM         2. OP or IM/IM |

1. PERFORMANCE
   1. Initial Requirements

NOTIFY UO procedure is commencing. \_\_\_\_\_\_\_\_

CHECK following annunciators are CLEAR:

NEUTRON MONITORING SYS HALF SCRAM (2‑XA‑55‑4A, window 16) \_\_\_\_\_\_\_\_

REACTOR CHANNEL A AUTO SCRAM (2‑XA‑55‑5B, window 1) \_\_\_\_\_\_\_\_

REACTOR CHANNEL B AUTO SCRAM (2‑XA‑55‑5B, window 2) \_\_\_\_\_\_\_\_

IRM HIGH (2‑XA‑55‑5A, window 26) \_\_\_\_\_\_\_\_

IRM CHAN A, C, E, G HI‑HI/INOP (2‑XA‑55‑5A, window 33) \_\_\_\_\_\_\_\_

IRM CHAN B, D, F, H HI‑HI/INOP (2‑XA‑55‑5A, window 34) \_\_\_\_\_\_\_\_

IF none of the other IRMs are DOWNSCALE, THEN  
  
CHECK IRM DOWNSCALE (2‑XA‑55‑5A, window 19) is CLEAR. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

CHECK following indicating lights are ILLUMINATED on Panel 2‑9‑5:

SCRAM SOLENOID GROUP A LOGIC RESET indicating lights (4) \_\_\_\_\_\_\_\_

SCRAM SOLENOID GROUP B LOGIC RESET indicating lights (4) \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/AB, SYSTEM A BACKUP SCRAM VALVE   
indicating lights (2) \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/CD, SYSTEM B BACKUP SCRAM VALVE   
 indicating lights (2) \_\_\_\_\_\_\_\_

PROVIDE UO a copy of Attachment 1, Control Room Components Affected By Procedure Performance. \_\_\_\_\_\_\_\_

REQUEST UO or designee annotate the following at Recorder 2‑XR‑92‑7/46A Channel 3 on Panel 2‑9‑5:

Channel 3

2‑SR‑3.3.1.1.9(IRM A)

Initials \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Local trips may be reset as needed throughout the procedure. |

* 1. Removal From Service

REQUEST UO place IRM A in BYPASS by placing 2‑HS‑92‑7A/S4A, IRM BYPASS, in CH‑A Position. \_\_\_\_\_\_\_\_

IF 2‑HS‑99‑5A/S1, REACTOR MODE SWITCH is NOT in RUN, THEN  
  
CHECK CHAN A IRM BYPASSED indicating light is ILLUMINATED on Panel 2‑9‑5. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

CHECK BYPASSED IRM CH A indicating light is ILLUMINATED on Panel 2‑9‑12. \_\_\_\_\_\_\_\_

OPEN CHANNEL A IRM drawer on Panel 2‑9‑12. \_\_\_\_\_\_\_\_

IF no other IRMs are bypassed AND computer is OPERABLE, AND 2‑HS‑99‑5A/S1, REACTOR MODE SWITCH is NOT in RUN THEN  
  
CHECK computer point DIG125 indicates BYPASS. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD date and time channel removed from service.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date |  | Time |  |  | \_\_\_\_\_\_\_\_ |

| 1. NOTE |
| --- |
| All actions will be performed at CHANNEL A IRM drawer unless otherwise stated. |

* 1. Channel IRM A As‑Found Data

DISCONNECT preamp input cable from J1 in IRM drawer. \_\_\_\_\_\_\_\_

ADJUST amplitude controls on test oscillator for minimum voltage output. \_\_\_\_\_\_\_\_

ADJUST oscillator output frequency to 100 KHz. \_\_\_\_\_\_\_\_

Using BNC‑T connector, CONNECT RMS voltmeter to test oscillator 600Ω output cable. \_\_\_\_\_\_\_\_

CONNECT test oscillator to J1. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH in Position 2. \_\_\_\_\_\_\_\_

RAISE oscillator amplitude until IRM front panel meter indicates 15 UNITS on black scale. \_\_\_\_\_\_\_\_

RESET local IRM alarms using RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

CHECK following local indicating lights on IRM drawer are EXTINGUISHED:

DOWNSCALE \_\_\_\_\_\_\_\_

UPSCALE HIGH \_\_\_\_\_\_\_\_

UPSCALE HIGH HIGH. \_\_\_\_\_\_\_\_

INOP \_\_\_\_\_\_\_\_

DISCONNECT recorder cable from J4 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT J4 adapter to J4 at rear of IRM drawer. \_\_\_\_\_\_\_\_

PLACE DMM on 2 Vdc scale. \_\_\_\_\_\_\_\_

CONNECT DMM to J4 adapter test jacks H(+) and K(‑). \_\_\_\_\_\_\_\_

APPLY power to Programma TM200 timer. \_\_\_\_\_\_\_\_

SET START and STOP functions as shown in Attachment 2, TM200 To 2‑RLY‑92‑741ATDR Test Setup. \_\_\_\_\_\_\_\_

On top of 2‑RLY‑92‑741ATDR, CONNECT TM200 START terminals to coil terminals 12VDC(+) and 12VDC(‑). \_\_\_\_\_\_\_\_

On top of 2‑RLY‑92‑741ATDR, CONNECT TM200 STOP terminals to contact terminals Common and Normally Open. \_\_\_\_\_\_\_\_

LOWER oscillator amplitude until IRM DOWNSCALE light is ILLUMINATED. \_\_\_\_\_\_\_\_

RECORD As‑found DMM indication for IRM DOWNSCALE trip point in Table 1. \_\_\_\_\_\_\_\_

RAISE oscillator amplitude until IRM UPSCALE HIGH light is ILLUMINATED. \_\_\_\_\_\_\_\_

RECORD As‑found DMM indication for IRM UPSCALE HIGH trip point in Table 1. \_\_\_\_\_\_\_\_

PRESS RESET on TM200 to ensure timer is ready to capture trigger events. \_\_\_\_\_\_\_\_

RAISE oscillator amplitude until IRM UPSCALE HIGH HIGH light is ILLUMINATED. \_\_\_\_\_\_\_\_

RECORD As‑found DMM indication for UPSCALE HIGH HIGH trip point in Table 1. \_\_\_\_\_\_\_\_

RECORD As‑found TM200 value in Table 2 \_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 1 | | | | | | |
| Trip Function | Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc | TS/TRM Allowable Value Vdc |
| DOWNSCALE | 0.060 | 0.048 |  |  | 0.072 | ≥ 0.040 |
| UPSCALE HIGH | 0.720 | 0.700 |  |  | 0.740 | ≤ 0.864 |
| UPSCALE HIGH HIGH | 0.931 | 0.911 |  |  | 0.951 | ≤ 0.960 |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 2 | | | | | |
| Time Delay Relay | | | | | |
| Desired | Min | As‑found | As‑left | Max | Max Allowable |
| 700 ms | 630 ms |  |  | 770 ms | ≤ 800 ms |

CHECK As‑found trip setpoints are within TS/TRM Allowable values listed in Table 1. \_\_\_\_\_(AC)

IF As‑found value in Table 2 is within Min/Max values, THEN  
  
PERFORM the following, otherwise MARK steps N/A:

RECORD As‑found value in As‑left column of Table 2. \_\_\_\_\_\_\_\_

MARK Step 6.3[28] through 6.3[29.9] N/A. \_\_\_\_\_\_\_\_

IF As‑found value in Table 2 is greater than 800 ms, THEN  
  
INITIATE CR to document and correct component failure, otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF As‑found value in Table 2 is outside Min/Max values, THEN  
  
PERFORM the following. Otherwise, MARK steps N/A:

REMOVE cover from DELAY ADJ. potentiometer on 2‑RLY‑92‑741ATDR. \_\_\_\_\_\_\_\_

LOWER oscillator amplitude until IRM UPSCALE HIGH HIGH light is EXTINGUISHED.

PRESS RESET on TM200 to ensure timer is ready to capture trigger events.

ADJUST DELAY ADJ. potentiometer on 2‑RLY‑92‑741ATDR to either raise (CW) or lower (CCW) time delay.

RAISE oscillator amplitude until IRM UPSCALE HIGH HIGH light is ILLUMINATED.

COMPARE new TDR value to Min/Max values in Table 2.

IF values are outside Min/Max values in Table 2, THEN  
  
REPEAT Steps 6.3[29.2] through 6.3[29.6], otherwise MARK N/A. \_\_\_\_\_\_\_\_

REPLACE cover on DELAY ADJ. potentiometer. \_\_\_\_\_\_\_\_

RECORD As‑left value in As‑left column of Table 2. \_\_\_\_\_\_\_\_

DISCONNECT TM200 from top of 2‑RLY‑92‑741ATDR. \_\_\_\_\_\_\_\_

REMOVE power from Programma TM200 timer. \_\_\_\_\_\_\_\_

RAISE oscillator output amplitude until DMM indication is 1.000 Vdc (0.990 Vdc to 1.010 Vdc). \_\_\_\_\_\_\_\_

RECORD RMS voltmeter indication.

|  |  |  |
| --- | --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_ mVac. |  | \_\_\_\_\_\_\_\_ |

IF RMS voltmeter reading in Step 6.3[33] is NOT 30 to 60 mVac THEN  
  
NOTIFY Foreman or Cognizant Engineer prior to continuing. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

CONNECT IRM Test Fixture to 120 Vac power source. \_\_\_\_\_\_\_\_

TURN S4 to ON to allow for 10 minute warm‑up before Section 6.6 is begun.

|  |  |  |  |
| --- | --- | --- | --- |
| Time |  |  | \_\_\_\_\_\_\_\_ |

* 1. VOLTAGE PREREGULATOR Module VR27 Calibration

REMOVE VOLTAGE PREREGULATOR Module VR27 from IRM drawer. \_\_\_\_\_\_\_\_

INSTALL plug‑in adapter GE129B2048G 001 in place of VOLTAGE PREREGULATOR Module VR27. \_\_\_\_\_\_\_\_

INSTALL VOLTAGE PREREGULATOR Module VR27 on plug‑in adapter. \_\_\_\_\_\_\_\_

CONNECT DMM on 200 Vdc scale between TP 17(+) and TP 3 (common) on plug‑in adapter. \_\_\_\_\_\_\_\_

RECORD As-found value in As-found (+)20 Vdc column of Table 3. \_\_\_\_\_\_\_\_

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 3 | | | | | |
| Power Supply | Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc |
| (+)20 Vdc | 20.00 | 19.90 |  |  | 20.10 |
| (‑)20 Vdc | (‑)20.00 | (‑)19.90 |  |  | (‑)20.10 |

IF As‑found output voltage of (+)20 Volt VOLTAGE PREREGULATOR Module VR27 is NOT within 19.90 to 20.10 Vdc, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

IF R9 is NOT accessible, THEN  
  
REMOVE cover from VOLTAGE PREREGULATOR Module VR27. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

ADJUST R9 on VOLTAGE PREREGULATOR Module VR27 to obtain indication of (+)20.00 Vdc (19.90 to 20.10 Vdc) on DMM. \_\_\_\_\_\_\_\_

RECORD value in As‑left (+)20 Vdc column of Table 3. \_\_\_\_\_\_\_\_

MOVE DMM lead from TP 17(+) to TP 1 (-). \_\_\_\_\_\_\_\_

RECORD As‑found (‑)20 Vdc voltage in As-found (‑)20 Vdc column of Table 3. \_\_\_\_\_\_\_\_

IF As‑found output voltage of (‑20) Volt VOLTAGE PREREGULATOR Module VR27 is NOT within (‑)19.90 to (‑) 20.10 Vdc, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

IF R20 is NOT accessible, THEN  
  
REMOVE cover from VOLTAGE PREREGULATOR Module VR27. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

ADJUST R20 on VOLTAGE PREREGULATOR Module VR27 to obtain indication of (‑)20.00 Vdc  
 ((‑)19.90 to (‑)20.10 Vdc) on DMM. \_\_\_\_\_\_\_\_

RECORD value in As‑left (‑)20 Vdc column of Table 3. \_\_\_\_\_\_\_\_

DISCONNECT DMM. \_\_\_\_\_\_\_\_

REMOVE plug‑in adapter. \_\_\_\_\_\_\_\_

REMOVE VOLTAGE PREREGULATOR Module VR27 from plug‑in adapter. \_\_\_\_\_\_\_\_

IF cover on VOLTAGE PREREGULATOR Module VR27 was removed, THEN  
  
REPLACE cover on VOLTAGE PREREGULATOR Module VR27. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REINSTALL VOLTAGE PREREGULATOR Module VR27 in IRM drawer. \_\_\_\_\_\_\_\_

* 1. VOLTAGE REGULATOR Module VR29 Calibration

CONNECT DMM on 20 Vdc scale between J1(+) and J2 (common) on VOLTAGE REGULATOR Module VR29. \_\_\_\_\_\_\_\_

RECORD As‑found (+)15 Vdc voltage in Table 4. \_\_\_\_\_\_\_\_

MOVE positive lead of DMM from J1 to J3 on VOLTAGE REGULATOR Module VR29. \_\_\_\_\_\_\_\_

RECORD As‑found (‑)15 Vdc voltage in Table 4. \_\_\_\_\_\_\_\_

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 4 | | | | | |
| Power Supply | Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc |
| (+)15 Vdc | (+)15.00 | (+)14.90 |  |  | (+)15.10Vdc |
| (‑)15 Vdc | (‑)15.00 | (‑)14.90 |  |  | (‑)15.10Vdc |

DISCONNECT DMM. \_\_\_\_\_\_\_\_

IF As‑found voltages of VOLTAGE REGULATOR Module VR29 are within tolerance, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found values in the As‑left columns of Table 4. \_\_\_\_\_\_\_\_

MARK Steps 6.5[7] through 6.5[20] N/A. \_\_\_\_\_\_\_\_

REMOVE VOLTAGE REGULATOR Module VR29. \_\_\_\_\_\_\_\_

IF R9 and R12 are NOT accessible, THEN  
  
REMOVE VOLTAGE REGULATOR Module VR29 cover. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

PLACE VOLTAGE REGULATOR Module VR29 on GE129B2048G1 plug‑in adapter. \_\_\_\_\_\_\_\_

INSTALL VOLTAGE REGULATOR Module VR29 with GE129B2048G1 plug‑in adaptor in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT DMM between J1(+) and J2(‑) on VOLTAGE REGULATOR Module VR29. \_\_\_\_\_\_\_\_

ADJUST R9 to obtain an indication of (+)15.00 Vdc (14.90 to 15.10 Vdc) on DMM. \_\_\_\_\_\_\_\_

MOVE positive lead of DMM from J1 to J3 on VOLTAGE REGULATOR Module VR29. \_\_\_\_\_\_\_\_

ADJUST R12 to obtain an indication of (‑)15.00 Vdc ((‑)14.90 to (‑)15.10 Vdc) on DMM. \_\_\_\_\_\_\_\_

REPEAT Steps 6.5[11] through 6.5[14] until both (+)15 Vdc and (‑)15 Vdc indications are within tolerance and no further adjustment is required. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left voltages in Table 4. \_\_\_\_\_\_\_\_

DISCONNECT DMM. \_\_\_\_\_\_\_\_

REMOVE VOLTAGE REGULATOR Module VR29 and GE129B2048G1 plug‑in adapter from IRM drawer. \_\_\_\_\_\_\_\_

IF VOLTAGE REGULATOR Module VR29 cover was removed, THEN  
  
REPLACE cover. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REINSTALL VOLTAGE REGULATOR Module VR29 in IRM drawer. \_\_\_\_\_\_\_\_

* 1. MEAN SQUARE ANALOG Card (MSA) As‑Found Data

CONNECT test lead between J8 (‑)15 jack on IRM TEST FIXTURE and J3 (‑) on VR29 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT test lead between COM (J7) jack on IRM TEST FIXTURE and J2 (common) on VR29 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT test lead between J6 (+)15 jack on IRM TEST FIXTURE and J1(+) on VR29 in IRM drawer. \_\_\_\_\_\_\_\_

REMOVE MEAN SQUARE ANALOG CARD Z13 from IRM drawer. \_\_\_\_\_\_\_\_

INSTALL MEAN SQUARE ANALOG CARD Z13 to J5 on IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

COVER MEAN SQUARE ANALOG CARD Z13 with module test cover to protect it from drafts. \_\_\_\_\_\_\_\_

ENSURE 10 minute warm‑up time has occurred since IRM TEST FIXTURE was turned ON in Step 6.3[36].

|  |  |  |  |
| --- | --- | --- | --- |
| Time |  |  | \_\_\_\_\_\_\_\_ |

CONNECT DMM to Output jacks (+)J9 and (‑)J10 on IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Waiting 1 to 3 minutes after each switch position change allows voltage readings to stabilize prior to taking reading. |

PLACE INPUT SELECTOR switch (S2) and VOLTAGE switch (S3) to positions listed in Table 5. \_\_\_\_\_\_\_\_

RECORD voltage values from DMM in As‑found Vdc column of Table 5. \_\_\_\_\_\_\_\_

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 5 | | | | | | | | |
| INPUT SELECTOR (S2) | VOLTAGE SELECTOR (S3) | Desired Vdc | Min Vdc | LAI MIN Vdc | As‑found Vdc | As‑left Vdc | LAI MAX Vdc | Max Vdc |
| 1 | 1 | 10.00 | 9.80 | 9.90 |  |  | 10.10 | 10.20 |
| 3 | 1 | 10.00 | 9.80 | 9.90 |  |  | 10.10 | 10.20 |
| 3 | 2 | 6.40 | 6.20 | 6.30 |  |  | 6.50 | 6.60 |
| 1 | 2 | 6.40 | 6.20 | 6.30 |  |  | 6.50 | 6.60 |
| 1 | 3 | 3.60 | 3.40 | 3.50 |  |  | 3.70 | 3.80 |
| 3 | 3 | 3.60 | 3.40 | 3.50 |  |  | 3.70 | 3.80 |
| 3 | 4 | 1.60 | 1.50 | 1.55 |  |  | 1.65 | 1.70 |
| 1 | 4 | 1.60 | 1.50 | 1.55 |  |  | 1.65 | 1.70 |
| 1 | 5 | 0.40 | 0.30 | 0.35 |  |  | 0.45 | 0.50 |
| 3 | 5 | 0.40 | 0.30 | 0.35 |  |  | 0.45 | 0.50 |
| 3 | 6 | 0.10 | 0.00 | 0.05 |  |  | 0.15 | 0.20 |
| 1 | 6 | 0.10 | 0.00 | 0.05 |  |  | 0.15 | 0.20 |

CHECK all As‑found voltages in Table 5 are within MIN/MAX values. \_\_\_\_\_\_\_\_

IF all As‑found voltages in Table 5 are within LAI Min/ LAI Max values, THEN   
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found values in As‑left Vdc column of Table 5. \_\_\_\_\_\_\_\_

DISCONNECT DMM. \_\_\_\_\_\_\_\_

DISCONNECT all test equipment from IRM drawer and IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

REMOVE MEAN SQUARE ANALOG CARD Z13 from IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

REINSTALL MEAN SQUARE ANALOG card Z13 in IRM drawer. \_\_\_\_\_\_\_\_

MARK Section 6.7 N/A. \_\_\_\_\_\_\_\_

* 1. MEAN SQUARE ANALOG (MSA) CARD Calibration

IF access to junction VR1/VR2(‑) AND Junction R10/R13(+) OR TP1 is NOT available with cover installed, THEN  
  
REMOVE metal back cover from MEAN SQUARE ANALOG unit. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

CONNECT DMM between the junction VR1/VR2(‑) [left side of VR1] and the junction R10/R13(+) or TP1, card. (Reference Attachment 3, MSA Circuit Card Layout.) \_\_\_\_\_\_\_\_

COVER MEAN SQUARE ANALOG CARD Z13 with module test cover to protect it from drafts. \_\_\_\_\_\_\_\_

PLACE IRM TEST FIXTURE Input Selector switch (S2) in Position 2. \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 6. \_\_\_\_\_\_\_\_

RECORD As‑found DMM voltage in Table 6. \_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 6 | | | | |
| Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc |
| 4.200 | 4.195 |  |  | 4.205 |

IF As‑found voltage in Table 6 is within Min/Max values, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found value in the As‑left Vdc column of Table 6. \_\_\_\_\_\_\_\_

DISCONNECT DMM. \_\_\_\_\_\_\_\_

MARK Steps 6.7[8] through 6.7[13] N/A. \_\_\_\_\_\_\_\_

ADJUST R10 for DMM reading of 4.200 Vdc (4.195 to 4.205 Vdc). \_\_\_\_\_\_\_\_

RECORD As‑left DMM voltage in Table 6. \_\_\_\_\_\_\_\_

DISCONNECT DMM. \_\_\_\_\_\_\_\_

CONNECT DMM to output jacks (+)(J9) and (‑)(J10) on IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Waiting 1 to 3 minutes after each switch position change allows voltage readings to stabilize prior to taking reading. |

Using the switch positions listed in Table 5, PLACE INPUT SELECTOR Switch (S2) and VOLTAGE Switch (S3) to positions listed. \_\_\_\_\_\_\_\_

CHECK voltages taken in Step 6.7[12]. \_\_\_\_\_\_\_\_

IF all voltages in Step 6.7[12] are within LAI Min/ LAI Max values, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD values in As‑left column of Table 5. \_\_\_\_\_\_\_\_

MARK Steps 6.7[14] through 6.7[37] N/A. \_\_\_\_\_\_\_\_

ENSURE DMM is connected to Output jacks (+)(J9) and (‑)(J10) on IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

ENSURE Input Selector Switch (S2) is in Position 2. \_\_\_\_\_\_\_\_

ENSURE Voltage Switch (S3) is on Position 6. \_\_\_\_\_\_\_\_

ADJUST R11 fully clockwise. \_\_\_\_\_\_\_\_

ADJUST R9 for a DMM reading of 0.035 Vdc (0.030 to 0.040 Vdc). \_\_\_\_\_\_\_\_

PLACE Input Selector Switch (S2) in Position 3. \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 6. \_\_\_\_\_\_\_\_

ADJUST R11 for a DMM reading of 0.10 Vdc (0.05 to 0.15 Vdc). \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 5. \_\_\_\_\_\_\_\_

ADJUST R17 for a DMM reading of 0.40 Vdc (0.35 to 0.45 Vdc). \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 4. \_\_\_\_\_\_\_\_

ADJUST R16 for a DMM reading of 1.60 Vdc (1.55 to 1.65 Vdc). \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 3. \_\_\_\_\_\_\_\_

ADJUST R15 for a DMM reading of 3.60 Vdc (3.50 to 3.70 Vdc). \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 2. \_\_\_\_\_\_\_\_

ADJUST R14 for a DMM reading of 6.40 Vdc (6.30 to 6.50 Vdc). \_\_\_\_\_\_\_\_

PLACE Voltage Switch (S3) in Position 1. \_\_\_\_\_\_\_\_

ADJUST R13 for a DMM reading of 10.00 Vdc (9.90 to 10.10 Vdc). \_\_\_\_\_\_\_\_

PLACE Input Selector Switch (S2) in Position 1. \_\_\_\_\_\_\_\_

PLACE Voltage switch (S3) in Position 4. \_\_\_\_\_\_\_\_

ADJUST R5 for a DMM reading of 1.60 Vdc (1.55 to 1.65 Vdc). \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Waiting 1 to 3 minutes after each switch position change allows voltage readings to stabilize prior to taking reading. |

PLACE INPUT SELECTOR Switch (S2) and VOLTAGE Switch (S3) to positions listed in Table 5. \_\_\_\_\_\_\_\_

CHECK voltages taken in Step 6.7[35]. \_\_\_\_\_\_\_\_

IF all voltages are NOT within tolerance, THEN  
  
REPEAT Steps 6.7[19] through 6.7[35], until all voltage readings are within tolerance. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

WHEN all voltages are within tolerance, THEN  
  
RECORD values in the As‑left column of Table 5. \_\_\_\_\_\_\_\_

DISCONNECT all test equipment from IRM drawer and IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

REMOVE MEAN SQUARE ANALOG CARD Z13 from IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

IF metal back was removed, THEN  
  
REPLACE metal back. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

INSTALL MEAN SQUARE ANALOG CARD Z13 in IRM drawer. \_\_\_\_\_\_\_\_

* 1. IRM Drawer Zero Adjust

CONNECT DMM, on 2 Vdc range, between J1(+) on DC AMPLIFIER AR15 and J2 (common) on VOLTAGE REGULATOR Module VR29. \_\_\_\_\_\_\_\_

PLACE IRM Mode switch to ZERO 1 position. \_\_\_\_\_\_\_\_

RECORD As‑found ZERO 1 voltage in Table 7. \_\_\_\_\_\_\_\_

PLACE IRM Mode switch to ZERO 2 position. \_\_\_\_\_\_\_\_

RECORD As‑found ZERO 2 voltage in Table 7. \_\_\_\_\_\_\_\_

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Table 7 | | | | | |
| Switch Position | Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc |
| ZERO 1 | 0.000 | (‑)0.005 |  |  | 0.005 |
| ZERO 2 | 0.000 | (‑)0.005 |  |  | 0.005 |

IF both ZERO 1 and ZERO 2 As‑found voltages are within tolerance, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found values in As‑left column of Table 7. \_\_\_\_\_\_\_\_

MARK Steps 6.8[7] through 6.8[12] N/A. \_\_\_\_\_\_\_\_

PLACE IRM Mode switch to ZERO 2 position. \_\_\_\_\_\_\_\_

ADJUST R11 (ZERO 2 adjustment) on FEEDBACK UNIT Z14 to obtain an indication of 0.000 Vdc. ((‑)0.005 Vdc to (+)0.005 Vdc) \_\_\_\_\_\_\_\_

PLACE IRM Mode switch to ZERO 1 position. \_\_\_\_\_\_\_\_

ADJUST R1 (for Type G3 card) or R2 (for Type G1 card) on DC AMPLIFIER AR15 to obtain an indication of 0.000 Vdc. ((‑)0.005 Vdc to (+)0.005 Vdc) \_\_\_\_\_\_\_\_

IF both voltages are NOT within tolerance, THEN  
  
REPEAT Steps 6.8[7] through 6.8[10] until interaction is minimized and both voltages are within tolerance. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD final values in the As‑left column of Table 7. \_\_\_\_\_\_\_\_

IF 0 UNITS are NOT indicated on black scale, THEN  
  
ADJUST mechanical ZERO on front panel to obtain 0 UNITS indication on the black scale. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REMOVE DMM from VOLTAGE REGULATOR Module VR29 and DC AMPLIFIER AR15. \_\_\_\_\_\_\_\_

* 1. INVERTER Module AR12 Calibration

REMOVE CALIBRATION & DIODE LOGIC UNIT Z10 from IRM drawer. \_\_\_\_\_\_\_\_

REMOVE AMPLIFIER & ATTENUATOR Module AR11 from IRM drawer. \_\_\_\_\_\_\_\_

PLACE IRM Mode switch to STANDBY position. \_\_\_\_\_\_\_\_

CONNECT DMM between J1(+) on FEEDBACK UNIT Z14 and J2(‑) common on VOLTAGE REGULATOR VR29. \_\_\_\_\_\_\_\_

RECORD DMM indication in space below.

|  |  |  |
| --- | --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_Vdc. |  | \_\_\_\_\_\_\_\_ |

IF using INVERTER TEST CABLE, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CONNECT INVERTER TEST CABLE to oscilloscope. \_\_\_\_\_\_\_\_

INSERT INVERTER TEST CABLE into INVERTER Module AR12 Test Points J1 and J2. \_\_\_\_\_\_\_\_

CONNECT INVERTER TEST CABLE ground to chassis ground. \_\_\_\_\_\_\_\_

MARK Steps 6.9[7] through 6.9[9] N/A. \_\_\_\_\_\_\_\_

PERFORM compensation adjustment on oscilloscope probes and amplifiers to ensure they are matched. \_\_\_\_\_\_\_\_

CONNECT two oscilloscope probes to INVERTER Module AR12 Test Points J1 and J2. \_\_\_\_\_\_\_\_

CONNECT each probe ground to chassis ground. \_\_\_\_\_\_\_\_

Using BNC‑T connector, CONNECT RMS voltmeter to test oscillator output cable. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| J11‑A3 is receptacle into which AMPLIFIER & ATTENUATOR Module AR11 plugs. |

Using test Cable GE 175A9111G01, CONNECT output signal from test oscillator to J11‑A3 in IRM drawer in place of AMPLIFIER & ATTENUATOR Module AR11. \_\_\_\_\_\_\_\_

ADJUST test oscillator frequency for 500 KHz and amplitude for a 0.5V RMS output. \_\_\_\_\_\_\_\_

IF two equal amplitude, 180° out of phase signals are displayed on the oscilloscope display, THEN  
  
CONTINUE. Otherwise, MARK Steps 6.9[14] through 6.9[15.2] N/A. \_\_\_\_\_\_\_\_

RAISE output frequency of test oscillator to 5 MHz. \_\_\_\_\_\_\_\_

IF two equal amplitude, 180° out of phase signals are displayed on the oscilloscope display, THEN  
  
PERFORM the following, otherwise, MARK steps N/A. \_\_\_\_\_\_\_\_

REMOVE two oscilloscope probes. \_\_\_\_\_\_\_\_

MARK Steps 6.9[16] through 6.9[29] N/A. \_\_\_\_\_\_\_\_

REMOVE INVERTER MODULE AR12 from IRM drawer. \_\_\_\_\_\_\_\_

IF R7 AND C2 on INVERTER Module AR12 are NOT accessible, THEN  
  
REMOVE cover from INVERTER Module AR12. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

INSTALL INVERTER Module AR12 on GE129B2048G2 plug‑in adapter. \_\_\_\_\_\_\_\_

INSTALL INVERTER Module AR12 and GE129B2048G2 plug‑in adapter in INVERTER Module AR12 location in IRM drawer. \_\_\_\_\_\_\_\_

ADJUST test oscillator frequency for 500 KHz and amplitude for a 0.5 volt RMS output. \_\_\_\_\_\_\_\_

IF two equal amplitude, 180° out of phase signals are NOT displayed on oscilloscope, THEN  
  
ADJUST R7 until two equal amplitude, 180° out of phase signals are displayed on oscilloscope. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RAISE output frequency of test oscillator to 5 MHz. \_\_\_\_\_\_\_\_

IF two equal amplitude, 180° out of phase signals are NOT displayed on oscilloscope, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

ADJUST C2 until two equal amplitude, 180° out of phase signals are displayed on oscilloscope. \_\_\_\_\_\_\_\_

REPEAT Steps 6.9[20] through 6.9[23.1] until interaction between two adjustments is minimized. \_\_\_\_\_\_\_\_

IF inverter cable was connected, THEN  
  
 REMOVE inverter cable. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF oscilloscope probes were connected, THEN  
  
REMOVE oscilloscope probes. Otherwise, MARK N/A \_\_\_\_\_\_\_\_

REMOVE plug‑in adapter and INVERTER Module AR12 from IRM drawer. \_\_\_\_\_\_\_\_

REMOVE INVERTER Module AR12 from GE129B2048G2 plug‑in adapter. \_\_\_\_\_\_\_\_

IF cover was removed, THEN  
  
REPLACE cover on INVERTER Module AR12. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REINSTALL INVERTER Module AR12, without plug‑in adapter, in IRM drawer in INVERTER Module AR12 location. \_\_\_\_\_\_\_\_

REINSTALL CALIBRATION & DIODE LOGIC Module Z10. \_\_\_\_\_\_\_\_

LOWER output frequency of test oscillator to 100 KHz. \_\_\_\_\_\_\_\_

RECORD DMM indication from Step 6.9[5] in Step 6.9[33]. \_\_\_\_\_\_\_\_

SUBTRACT 10 Vdc from that value.

|  |  |  |  |
| --- | --- | --- | --- |
|  |  | Vdc from Step 6.9[5] |  |
| ‑ | 10 Vdc |  |  |
| = |  | Vdc | \_\_\_\_\_\_\_\_ |

\_\_\_\_\_\_\_\_  
 IV

RAISE output signal amplitude of test oscillator to obtain DMM reading equal to value calculated in Step 6.9[33]. \_\_\_\_\_\_\_\_

ENSURE RMS voltmeter is connected to measure output level of test oscillator and test cable from J11‑A3. \_\_\_\_\_\_\_\_

RECORD output value of RMS voltmeter in Table 8. \_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Table 8 | | | |
| Desired Vac | Min Vac | As‑found Vac | Max Vac |
| 1.58 | 1.43 |  | 1.73 |

IF As‑found value in Table 8 is outside Min/Max, THEN   
  
PERFORM the following, otherwise, MARK steps N/A:

NOTIFY Unit SRO. \_\_\_\_\_\_\_\_

INITIATE Condition Report (CR). \_\_\_\_\_\_\_\_

CORRECT problem prior to continuing. \_\_\_\_\_\_\_\_

DISCONNECT the following test equipment:

Test oscillator \_\_\_\_\_\_\_\_

RMS voltmeter \_\_\_\_\_\_\_\_

Test cable from J11‑A3 \_\_\_\_\_\_\_\_

REINSTALL AMPLIFIER & ATTENUATOR Module AR11 in IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT DMM connected between J1(+) on FEEDBACK UNIT Z14 and J2(‑) common on Regulator VR29. \_\_\_\_\_\_\_\_

CONNECT preamp cable to J1 in IRM drawer. \_\_\_\_\_\_\_\_

PLACE IRM Mode switch to OPERATE. \_\_\_\_\_\_\_\_

* 1. High Voltage INOP Trip Calibration

DISCONNECT high voltage cable from J7 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT DMM to monitoring terminals red(+) and black(‑) on Special High Voltage Test Box. \_\_\_\_\_\_\_\_

CONNECT Special High Voltage Test Box, to J7. \_\_\_\_\_\_\_\_

CONNECT high voltage cable (cable disconnected from J7) to test box. \_\_\_\_\_\_\_\_

RECORD As‑found high voltage as read on DMM in Table 9. \_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 9 | | | | |
| Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc |
| 100.0 | 99.0 |  |  | 101.0 |

Using R1 on POWER SUPPLY CARD in slot PS 24, ADJUST high voltage until INOP indicating light on IRM drawer just ILLUMINATES. \_\_\_\_\_\_\_\_

CHECK INOP indicating light on IRM drawer is ILLUMINATED. \_\_\_\_\_(AC)

RECORD As‑found high voltage trip point as read on DMM in Table 10. \_\_\_\_\_\_\_\_

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Table 10 | | | | |
| Desired Vdc | Min Vdc | As‑found Vdc | As‑left Vdc | Max Vdc |
| 90.0 | 88.0 |  |  | 92.0 |

CHECK As‑found high voltage trip point voltage is 90.0 Vdc (88.0 to 92.0 Vdc). \_\_\_\_\_(AC)

IF As‑found INOP trip voltage is 90.0 Vdc (88.0 to 92.0 Vdc), THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found voltage in As‑left column of Table 10. \_\_\_\_\_\_\_\_

MARK Steps 6.10[11] through 6.10[17] N/A. \_\_\_\_\_\_\_\_

Using R1 on POWER SUPPLY CARD in slot PS 24, ADJUST to obtain 90.0 Vdc (88.0 to 92.0 Vdc) on DMM. \_\_\_\_\_\_\_\_

IF INOP light on IRM drawer remains ILLUMINATED, THEN  
  
ADJUST Z32‑R1 until INOP indicating light on IRM drawer EXTINGUISHES. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

ADJUST Z32‑R1 until INOP indicating light on IRM drawer is ILLUMINATED. \_\_\_\_\_\_\_\_

ADJUST R1 on POWER SUPPLY CARD in slot PS 24 until IRM INOP indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

ADJUST R1 on POWER SUPPLY CARD in slot PS 24 until IRM INOP indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IF IRM INOP trip is NOT 90.0 Vdc (88.0 to 92.0 Vdc), THEN  
  
REPEAT Steps 6.10[12] through 6.10[15] until IRM INOP trip is within 88.0 to 92.0 Vdc. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left INOP trip voltage in Table 10. \_\_\_\_\_\_\_\_

Using R1 on POWER SUPPLY CARD PS 24, ADJUST to obtain 100.0 Vdc (99.0 to 101.0 Vdc) reading on DMM. \_\_\_\_\_\_\_\_

RECORD As‑left high voltage reading in Table 9. \_\_\_\_\_\_\_\_

DISCONNECT HV‑1, Special High Voltage Test box, from J7 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT high voltage cable to J7. \_\_\_\_\_\_\_\_

* 1. As‑Left Trip Setpoints

IF all As‑found trip setpoints in Table 1 are within tolerance AND NEITHER VOLTAGE PREREGULATOR Module VR27 (Table 3) NOR VOLTAGE REGULATOR Module VR29 (Table 4) was adjusted, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found values from Table 1 in As‑left column of Table 1 for DOWNSCALE, UPSCALE HIGH, and UPSCALE HIGH HIGH trip setpoints. \_\_\_\_\_\_\_\_

MARK Steps 6.11[2] through 6.11[36] N/A. \_\_\_\_\_\_\_\_

DISCONNECT preamp input cable from J1 in IRM drawer. \_\_\_\_\_\_\_\_

MINIMIZE voltage output using amplitude controls on test oscillator. \_\_\_\_\_\_\_\_

ADJUST oscillator output frequency to 100 KHz. \_\_\_\_\_\_\_\_

CONNECT test oscillator to J1 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT J4 adapter to J4 on rear of IRM drawer. \_\_\_\_\_\_\_\_

CONNECT DMM to J4 adapter test jacks H(+) and K(‑). \_\_\_\_\_\_\_\_

IF As‑found DOWNSCALE trip setpoint in Table 1 is within tolerance AND NEITHER VOLTAGE PREREGULATOR Module VR27 (Table 3) NOR VOLTAGE REGULATOR Module VR29 (Table 4) was adjusted, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found value from Table 1 in As‑left column of Table 1 for DOWNSCALE trip setpoint. \_\_\_\_\_\_\_\_

MARK Steps 6.11[9] through 6.11[15] N/A. \_\_\_\_\_\_\_\_

ADJUST test oscillator amplitude until DMM indicates 0.060 Vdc (0.048 to 0.072 Vdc). \_\_\_\_\_\_\_\_

IF IRM DOWNSCALE indicating light is ILLUMINATED, THEN  
  
ADJUST Z32‑R2 until indicating light is EXTINGUISHED. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

ADJUST Z32‑R2 until IRM DOWNSCALE indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

ADJUST test oscillator until front panel meter indicates 15 UNITS on black scale. \_\_\_\_\_\_\_\_

LOWER test oscillator output amplitude until IRM DOWNSCALE indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IF DOWNSCALE trip point is NOT within 0.048 to 0.072 Vdc, THEN  
  
REPEAT Steps 6.11[9] through 6.11[13] until DOWNSCALE trip point is within 0.048 to 0.072 Vdc. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left DOWNSCALE trip voltage in Table 1. \_\_\_\_\_\_\_\_

IF As‑found UPSCALE HIGH trip setpoint in Table 1 is within tolerance AND NEITHER VOLTAGE PREREGULATOR Module VR27 (Table 3) NOR VOLTAGE REGULATOR Module VR29 (Table 4) was adjusted, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found value from Table 1 in As‑left column of Table 1 for UPSCALE HIGH trip setpoint. \_\_\_\_\_\_\_\_

MARK Steps 6.11[17] through 6.11[22] N/A. \_\_\_\_\_\_\_\_

ADJUST test oscillator amplitude until DMM indicates 0.720 Vdc (0.700 to 0.740 Vdc). \_\_\_\_\_\_\_\_

| 1. NOTES |
| --- |
| * 1. Steps 6.11[18.1] through 6.11[18.5] may be performed sequentially without signing each individual step until completion of the last step.   2. Steps 6.11[18.2] through 6.11[18.4] are performed with the Reset switch held in the rotated position. |

IF IRM drawer UPSCALE HIGH indicating light is ILLUMINATED, THEN   
  
PERFORM the following, otherwise, MARK steps N/A:

HOLD RESET switch in the RESET position. \_\_\_\_\_\_\_\_

ADJUST Z32‑R3 until UPSCALE HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

ADJUST Z32‑R3 until UPSCALE HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

ADJUST test oscillator until front panel meter indicates 80 UNITS on black scale. \_\_\_\_\_\_\_\_

RELEASE RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

CHECK UPSCALE HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

RAISE test oscillator output amplitude until UPSCALE HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IF UPSCALE HIGH trip point is NOT 0.720 Vdc (0.700 to 0.740 Vdc), THEN  
  
REPEAT Steps 6.11[17] through 6.11[20] until UPSCALE HIGH trip point is within 0.700 to 0.740 Vdc. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left UPSCALE HIGH trip voltage in Table 1. \_\_\_\_\_\_\_\_

IF As‑found UPSCALE HIGH HIGH trip setpoint in Table 1 is within tolerance AND NEITHER VOLTAGE PREREGULATOR Module VR27 (Table 3) NOR VOLTAGE REGULATOR Module VR29 (Table 4) was adjusted, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

RECORD As‑found value from Table 1 in As‑left column of Table 1 for UPSCALE HIGH HIGH trip setpoint. \_\_\_\_\_\_\_\_

MARK Steps 6.11[24] through 6.11[32] N/A. \_\_\_\_\_\_\_\_

ADJUST test oscillator amplitude until DMM indicates 0.931 Vdc (0.911 to 0.951 Vdc). \_\_\_\_\_\_\_\_

| 1. NOTES |
| --- |
| * 1. Steps 6.11[25.1] through 6.11[25.5] may be performed sequentially without signing each individual step until completion of the last step.   2. Steps 6.11[25.2] through 6.11[25.4] are performed with the Reset switch held in the rotated position. |

IF UPSCALE HIGH HIGH indicating light is ILLUMINATED, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

HOLD RESET switch in RESET position. \_\_\_\_\_\_\_\_

ADJUST Z32‑R4 until UPSCALE HIGH HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

ADJUST Z32‑R4 until UPSCALE HIGH HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

ADJUST test oscillator until front panel meter indicates 110 UNITS on black scale. \_\_\_\_\_\_\_\_

RELEASE RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

CHECK UPSCALE HIGH HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

RAISE test oscillator output amplitude until UPSCALE HIGH HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IF UPSCALE HIGH HIGH trip setpoint is NOT 0.931 Vdc (0.911 to 0.951 Vdc), THEN  
  
REPEAT Steps 6.11[24] through 6.11[27] until UPSCALE HIGH HIGH trip point is within 0.911 to 0.951 Vdc. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left UPSCALE HIGH HIGH trip voltage in Table 1. \_\_\_\_\_\_\_\_

ADJUST test oscillator until front panel meter indicates 110 UNITS on black scale. \_\_\_\_\_\_\_\_

Using RESET switch on IRM drawer, RESET local IRM alarms. \_\_\_\_\_\_\_\_

CHECK UPSCALE HIGH HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

REMOVE DMM. \_\_\_\_\_\_\_\_

IF NOT performing Section 6.12, THEN  
  
REMOVE J4 adapter. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REMOVE test oscillator from J1 at back of IRM. \_\_\_\_\_\_\_\_

CONNECT preamp input cable J1 at rear of IRM drawer. \_\_\_\_\_\_\_\_

IF NOT performing Section 6.12, THEN  
  
CONNECT recorder cable to J4 at rear of IRM drawer. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

* 1. IRM System Gain and Range Correlation

DISCONNECT high voltage cable from J7 at back of IRM Drawer. \_\_\_\_\_\_\_\_

PERFORM the following at Panel 2‑LPNL‑925‑0027 (located at EL 565', R10‑S Line):

DISCONNECT INPUT cable from J‑1 on 2‑AMP‑092‑0007/41A, IRM CH A PREAMP. \_\_\_\_\_\_\_\_

DISCONNECT OUTPUT cable from J‑2 on IRM‑A preamp. \_\_\_\_\_\_\_\_

DISCONNECT HV input cable from J‑3 on IRM‑A preamp. \_\_\_\_\_\_\_\_

DISCONNECT LOW VOLTAGE input cable from J‑4 on IRM‑A preamp. \_\_\_\_\_\_\_\_

REMOVE IRM‑A preamp from Panel 2‑LPNL‑925‑0027. \_\_\_\_\_\_\_\_

MOVE IRM‑A preamp to Unit 2 Control Room. \_\_\_\_\_\_\_\_

DISCONNECT preamp input cable from J‑1 on IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT low voltage cable from J‑42 on IRM drawer. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 is 194X667 G1, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

REMOVE AMPLIFIER & ATTENUATOR Module AR11 from IRM drawer. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 R19 or R1 is NOT accessible, THEN  
  
REMOVE cover from AMPLIFIER & ATTENUATOR Module AR11. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

INSTALL AMPLIFIER & ATTENUATOR Module AR11 on GE129B2048G2 plug‑in adapter. \_\_\_\_\_\_\_\_

INSTALL AMPLIFIER & ATTENUATOR Module AR11 with GE129B2048G2 plug‑in adapter in AMPLIFIER & ATTENUATOR Module AR11 location in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT test equipment as shown on Attachment 4, Test Setup For IRM Channel Calibration. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, to Range 6 Position. \_\_\_\_\_\_\_\_

PLACE Test Attenuator switch S1 in Position 6. \_\_\_\_\_\_\_\_

ADJUST test oscillator for 8 KHz output. \_\_\_\_\_\_\_\_

ADJUST test oscillator amplitude to produce a midscale indication on IRM front panel meter. \_\_\_\_\_\_\_\_

ADJUST output frequency between 8 and 16 KHz, while maintaining constant output amplitude from test oscillator, until a minimum indication is observed on DMM. \_\_\_\_\_\_\_\_

ADJUST amplitude of test oscillator to 2.29 mV as read on RMS voltmeter. \_\_\_\_\_\_\_\_

ADJUST R19 or R1 on AMPLIFIER & ATTENUATOR Module AR11 until DMM connected to IRM drawer indicates same voltage calculated in Step 6.9[33]. \_\_\_\_\_\_\_\_

RECORD As‑left voltage from previous step in space below.

|  |  |  |
| --- | --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Vdc. |  | \_\_\_\_\_\_\_\_ |

DISCONNECT DMM at IRM drawer. \_\_\_\_\_\_\_\_

CONNECT J4 adapter to J4. \_\_\_\_\_\_\_\_

CONNECT DMM to J4 adapter H(+) and K(‑). \_\_\_\_\_\_\_\_

ADJUST R10 on FEEDBACK UNIT Z14 for 1.000 Vdc (0.990 to 1.010 Vdc) indication on DMM. \_\_\_\_\_\_\_\_

RECORD As‑left voltage in Table 11. \_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Table 11 | | | |
| Desired Vdc | Min Vdc | As‑left Vdc | Max Vdc |
| 1.000 | 0.990 |  | 1.010 |

PLACE IRM drawer Mode switch to 125 position. \_\_\_\_\_\_\_\_

IF Vdc is NOT in range of 0.990 to 1.010 Vdc, THEN  
  
ADJUST R9 on Diode Logic and Calibration Unit Z10 for 1.000 Vdc (0.990 to 1.010 Vdc) indication on DMM. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left voltage in Table 12. \_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Table 12 | | | |
| Desired Vdc | Min  Vdc | As‑left Vdc | Max  Vdc |
| 1.000 | 0.990 |  | 1.010 |

PLACE IRM drawer Mode switch to 40 position. \_\_\_\_\_\_\_\_

RECORD As‑left voltage in Table 13. \_\_\_\_\_\_\_\_

|  |  |  |  |
| --- | --- | --- | --- |
| Table 13 | | | |
| Desired Vdc | Min Vdc | As‑left Vdc | Max Vdc |
| 0.316 | 0.306 |  | 0.326 |

IF AMPLIFIER & ATTENUATOR Module AR11 is 194X667 G1, THEN  
  
PERFORM the following, otherwise, MARK steps N/A.

REMOVE AMPLIFIER & ATTENUATOR Module AR11 and plug‑in adapter from IRM drawer. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 cover was removed, THEN  
  
REPLACE cover. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REINSTALL AMPLIFIER & ATTENUATOR Module AR11, without GE129B2048G2 plug‑in adapter, in AMPLIFIER & ATTENUATOR Module AR11 location in IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT test oscillator from IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to OPERATE position. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Steps 6.12[29] through 6.12[32] may be performed sequentially without signing each individual step until completion of the last step. |

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, to range Position 1. \_\_\_\_\_\_\_\_

PLACE IRM TEST FIXTURE switch to range Position 1. \_\_\_\_\_\_\_\_

RECORD DMM reading for Range 1 in Noise Only column of Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[29] through 6.12[31] for ranges 2 through 6. \_\_\_\_\_\_\_\_

ENSURE 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH is in Position 6. \_\_\_\_\_\_\_\_

ENSURE Test Attenuator switches are in Position 6. \_\_\_\_\_\_\_\_

CONNECT test oscillator to J1 on Test Attenuator portion of IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

ADJUST test oscillator output frequency to 8 KHz. \_\_\_\_\_\_\_\_

ADJUST test oscillator amplitude to produce a midscale indication on IRM front panel meter. \_\_\_\_\_\_\_\_

ADJUST output frequency between 8 and 16 KHz, while maintaining constant output amplitude from test oscillator, until a maximum indication is observed on DMM. \_\_\_\_\_\_\_\_

ADJUST Amplitude control of test oscillator to obtain a 1.000 Vdc (0.995 to 1.005 Vdc) reading on DMM. \_\_\_\_\_\_\_\_

RECORD RMS voltage signal in space below.

|  |  |  |
| --- | --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_ mVac. |  | \_\_\_\_\_\_\_\_ |

| 1. NOTE |
| --- |
| Steps 6.12[41] through 6.12[45] may be performed sequentially without signing each individual step until completion of the last step. |

MAINTAIN test oscillator output level to value recorded in Step 6.12[40] during the performance of the following steps. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, to range Position 1. \_\_\_\_\_\_\_\_

PLACE IRM TEST FIXTURE switch to range Position 1. \_\_\_\_\_\_\_\_

RECORD DMM reading for Range 1 in Noise (+) Signal column of Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[42] through 6.12[44] for ranges 2 through 6. \_\_\_\_\_\_\_\_

DISCONNECT test oscillator from test attenuator. \_\_\_\_\_\_\_\_

SUBTRACT Noise Only DMM readings from Noise (+) Signal readings for Ranges 1 through 6 on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 IV

RECORD Ranges 1 through 6 results in Signal Only columns on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

RECORD highest Signal Only voltage for Ranges 1 through 6 on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

RECORD lowest Signal Only voltage for Ranges 1 through 6 on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

SUBTRACT lowest Signal Only voltage from highest Signal Only voltage for Ranges 1 through 6. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 IV

RECORD results on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| A problem exists with the IRM or the test equipment setup if value calculated in Step 6.12[52] is greater than 0.060 Vdc. |

IF value calculated in Step 6.12[52] is greater than 0.060 Vdc, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK test equipment setup. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[29] through 6.12[52] \_\_\_\_\_\_\_\_

IF repeating Steps 6.12[29] through 6.12[52] does NOT result in a value equal to or less than 0.060 Vdc, THEN  
  
NOTIFY Instrument Foreman or Cognizant Engineer for direction prior to continuing this procedure. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

DISCONNECT capacitor from test attenuator. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Steps 6.12[56] through 6.12[59] may be performed sequentially without signing each individual step until completion of the last step. |

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, to range Position 7. \_\_\_\_\_\_\_\_

PLACE IRM TEST FIXTURE switch to range Position 7. \_\_\_\_\_\_\_\_

RECORD DMM reading for Range 7 in Noise Only column of Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[56] through 6.12[58] for ranges 8 through 10. \_\_\_\_\_\_\_\_

CONNECT test oscillator to J1 on IRM TEST FIXTURE. \_\_\_\_\_\_\_\_

REQUEST UO at 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, and IM at IRM TEST FIXTURE place respective switches to Range 7. \_\_\_\_\_\_\_\_

ADJUST test oscillator frequency to 350 KHz. \_\_\_\_\_\_\_\_

ADJUST test oscillator amplitude output level to produce a midscale indication on IRM front panel meter. \_\_\_\_\_\_\_\_

ADJUST output frequency between 350 and 450 KHz, while maintaining constant output amplitude from test oscillator, until a maximum indication is observed on DMM. \_\_\_\_\_\_\_\_

ADJUST Amplitude control of test oscillator to obtain a 1.000 Vdc (0.995 to 1.005 Vdc) reading on DMM. \_\_\_\_\_\_\_\_

RECORD RMS voltage signal in space below.

|  |  |  |  |
| --- | --- | --- | --- |
|  | mVAC |  | \_\_\_\_\_\_\_\_ |

RECORD DMM reading for Range 7 in Noise (+) Signal column of Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Steps 6.12[68] through 6.12[72] may be performed sequentially without signing each individual step until completion of the last step. |

MAINTAIN test oscillator output level to value recorded in Step 6.12[66] during the performance of the following steps. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, to range Position 8. \_\_\_\_\_\_\_\_

PLACE IRM TEST FIXTURE switch to range Position 8. \_\_\_\_\_\_\_\_

RECORD DMM reading for Range 8 in Noise (+) Signal column of Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[69] through 6.12[71] for ranges 9 and 10. \_\_\_\_\_\_\_\_

SUBTRACT Noise Only DMM readings for Ranges 7 through 10 from Noise (+) Signal readings on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 IV

RECORD results in Signal Only for Ranges 7 through10 columns on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

RECORD highest Signal Only voltage for Ranges 7 through 10 on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

RECORD lowest Signal Only voltage for Ranges 7 through 10 on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

SUBTRACT lowest Signal Only voltage from highest Signal Only voltage for Ranges 7 through 10. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 IV

RECORD results on Attachment 5, Range Switch Signal Acceptance, Table 14. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| A problem exists with the IRM or the test equipment setup if value calculated in Step 6.12[77] is greater than 0.060 Vdc. |

IF value calculated in Step 6.12[78] is greater than 0.060 Vdc, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK test equipment setup. \_\_\_\_\_\_\_\_

DISCONNECT test oscillator from test attenuator. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[56] through 6.12[78]. \_\_\_\_\_\_\_\_

IF repeating Steps 6.12[56] through 6.12[78] does NOT result in a value equal to or less than 0.060 Vdc, THEN  
  
NOTIFY Instrument Foreman or Cognizant Engineer for direction prior to continuing this procedure. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

DISCONNECT all test equipment from IRM preamp. \_\_\_\_\_\_\_\_

PERFORM the following at Panel 2‑LPNL‑925‑0027:

INSTALL IRM‑A preamplifier in 2‑LPNL‑925‑0027. \_\_\_\_\_\_\_\_

TORQUE, with Peer Check, four IRM‑A preamplifier retaining nuts to 20 in‑lbs each. \_\_\_\_\_\_\_\_

CONNECT LOW VOLTAGE cable to J4 on IRM preamp. \_\_\_\_\_\_\_\_

CONNECT OUTPUT cable to J2 on IRM preamp. \_\_\_\_\_\_\_\_

CONNECT INPUT cable to J1 on IRM preamp. \_\_\_\_\_\_\_\_

CONNECT HV cable to J3 on IRM preamp. \_\_\_\_\_\_\_\_

CONNECT high voltage cable to J7 in IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT test cable from J42 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT low voltage cable to J42. \_\_\_\_\_\_\_\_

ADJUST amplitude controls on test oscillator for minimum voltage input. \_\_\_\_\_\_\_\_

ADJUST oscillator output frequency to 100 KHz. \_\_\_\_\_\_\_\_

Using BNC‑T connector, CONNECT RMS Voltmeter to test oscillator 600Ω output cable. \_\_\_\_\_\_\_\_

CONNECT test oscillator to J1 in IRM drawer. \_\_\_\_\_\_\_\_

REQUEST UO ensure 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, in Position 2. \_\_\_\_\_\_\_\_

RECORD RMS Voltmeter value below that was recorded in Step 6.3[33].

|  |  |  |
| --- | --- | --- |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_ mVac. |  | \_\_\_\_\_\_\_\_ |

ADJUST oscillator amplitude until RMS Voltmeter indicates value recorded in Step 6.12[91]. \_\_\_\_\_\_\_\_

IF DMM value is within allowable range of 0.990 Vdc to 1.010 Vdc, THEN  
  
MARK Steps 6.12[94] through 6.12[96.3] N/A. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 is 194X667 G1, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

REMOVE AMPLIFIER & ATTENUATOR Module AR11 from IRM drawer. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 R19 or R1 is NOT accessible, THEN  
  
REMOVE cover from AMPLIFIER & ATTENUATOR Module AR11. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

INSTALL AMPLIFIER & ATTENUATOR Module AR11 on GE129B2048G2 plug‑in adapter. \_\_\_\_\_\_\_\_

INSTALL AMPLIFIER & ATTENUATOR Module AR11, with plug‑in adapter, in AMPLIFIER & ATTENUATOR Module AR11 location in IRM drawer. \_\_\_\_\_\_\_\_

ADJUST gain pot R19 on Amplifier and Attenuator board until DMM indication is 1.000 Vdc (0.990 Vdc to 1.010 Vdc) or gain pot is adjusted for maximum gain. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 is 368X189AA G001 or G002, THEN  
  
ADJUST gain pot R1 on Amplifier and Attenuator board until DMM indication is 1.000 Vdc (0.990 Vdc to 1.010 Vdc) or gain pot is adjusted for maximum gain. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 is 194X667 G1, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

REMOVE AMPLIFIER & ATTENUATOR Module AR11 and plug‑in adapter from IRM drawer. \_\_\_\_\_\_\_\_

IF AMPLIFIER & ATTENUATOR Module AR11 cover was removed THEN  
  
REPLACE cover. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

INSTALL AMPLIFIER & ATTENUATOR Module AR11, without plug‑in adapter, in AMPLIFIER & ATTENUATOR Module AR11 location in IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT test oscillator from J1 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT test oscillator to J1 of test attenuator. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to 125 position. \_\_\_\_\_\_\_\_

IF DMM is NOT indicating 0.990 to 1.010 Vdc, THEN  
  
ADJUST R9 on DIODE LOGIC & CALIBRATION Unit Z10 to obtain 1.000 Vdc (0.990 to 1.010 Vdc) on DMM. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

RECORD As‑left Vdc below.

|  |  |  |
| --- | --- | --- |
| As‑left Vdc \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  | \_\_\_\_\_\_\_\_ |

PLACE IRM drawer Mode switch to OPERATE. \_\_\_\_\_\_\_\_

CONNECT preamp input cable to J1 in IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT high voltage cable from J‑7 in IRM drawer. \_\_\_\_\_\_\_\_

PERFORM the following at 2‑LPNL‑925‑0027:

DISCONNECT HV cable from J‑3 at IRM A preamp. \_\_\_\_\_\_\_\_

DISCONNECT INPUT cable from J‑1 at IRM A preamp. \_\_\_\_\_\_\_\_

Utilizing BNC/HN adapter, CONNECT High Voltage input cable to preamp at J‑1(Signal Input). \_\_\_\_\_\_\_\_

At IRM drawer, utilizing BNC/Barrel adapter, CONNECT test attenuator output (J‑3) to high voltage cable coming to IRM drawer. \_\_\_\_\_\_\_\_

PERFORM the following:

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, in Position 1. \_\_\_\_\_\_\_\_

PLACE IRM TEST FIXTURE range switch (S1) in Position 1. \_\_\_\_\_\_\_\_

| 1. NOTES |
| --- |
| * 1. Noise levels on lower ranges may cause OFFSCALE indication on IRM drawer.   2. Increased IRM indication is expected when UO selects Range 7. |

ADJUST oscillator output amplitude for 50% indication on UNITS scale of IRM drawer front panel meter. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, in next higher range position. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| A decreasing IRM indication upon selection of next higher range demonstrates IRM is attenuating. |

CHECK decreased IRM indication. \_\_\_\_\_\_\_\_

SELECT next higher range at IRM TEST FIXTURE to match range selected by UO in Step 6.12[107.4]. \_\_\_\_\_\_\_\_

REPEAT Steps 6.12[107.3] through 6.12[107.6] for ranges 2 through 10. \_\_\_\_\_\_\_\_

DISCONNECT BNC/Barrel adapter from high voltage cable. \_\_\_\_\_\_\_\_

PERFORM the following at 2‑LPNL‑925‑0027:

DISCONNECT BNC/HN adapter and cable from J‑1 at preamp. \_\_\_\_\_\_\_\_

CONNECT HV cable to J‑3 at preamp. \_\_\_\_\_\_\_\_

CONNECT INPUT cable to J‑1 on IRM preamp. \_\_\_\_\_\_\_\_

CONNECT high voltage cable to J‑7 in IRM drawer. \_\_\_\_\_\_\_\_

DISCONNECT test equipment from J4 in IRM drawer. \_\_\_\_\_\_\_\_

CONNECT recorder cable to J4. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to 40 position. \_\_\_\_\_\_\_\_

CHECK IRM CH A, CH 3 of Recorder 2‑XR‑92‑7/46A, IRM‑APRM LEVEL, on Panel 2‑9‑5 indicates between 38 and 42. \_\_\_\_\_\_\_\_

IF recorder indication is NOT between 38 and 42, THEN  
  
INITIATE CR to calibrate or repair recorder. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

CHECK computer point IRM A indicates between 38 and 42. \_\_\_\_\_\_\_\_

IF computer is OPERABLE AND computer point IRM A does NOT indicate between 38 and 42, THEN  
  
INITIATE CR. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to 125 position. \_\_\_\_\_\_\_\_

CHECK computer point IRM A indicates between 123 and 127. \_\_\_\_\_\_\_\_

IF computer is OPERABLE AND computer point IRM A does NOT indicate between 123 and 127, THEN  
  
INITIATE CR. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

CLOSE IRM drawer. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to OPERATE. \_\_\_\_\_\_\_\_

RESET IRM alarms using RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, to a position appropriate for current plant conditions. \_\_\_\_\_\_\_\_

* 1. Functional Test of IRM Channel A with Reactor Mode Switch in RUN

IF Reactor Mode Switch is in RUN, THEN  
  
CONTINUE. Otherwise, MARK Steps 6.13[2] through 6.13[23] N/A. \_\_\_\_\_\_\_\_

CHECK the following conditions exist for IRM Channel A: \_\_\_\_\_\_\_\_

IRM HIGH HIGH OR INOP indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM HIGH indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM BYPASSED indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM drawer Mode switch in OPERATE. \_\_\_\_\_\_\_\_

IRM drawer INOP indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

IRM drawer UPSCALE HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

IRM drawer UPSCALE HIGH HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to ZERO 2 position. \_\_\_\_\_\_\_\_

CHECK the following on IRM drawer:

INOP light ILLUMINATED. \_\_\_\_\_\_\_\_

Front panel meter indicates 0 UNITS. \_\_\_\_\_\_\_\_

IF computer is OPERABLE, THEN  
  
CHECK Computer point IRM A indicates 0. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to 125 position. \_\_\_\_\_\_\_\_

CHECK the following:

IRM drawer UPSCALE HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IRM drawer UPSCALE HIGH HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IRM drawer front panel meter indicates 125 UNITS (123 to 125 UNITS). \_\_\_\_\_\_\_\_

CH 3 of Recorder 2‑XR‑92‑7/46A, IRM‑APRM LEVEL, indicates 125 (123 to 127) on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
CHECK ICS Computer point IRM A indicates 125 (123 to 127). Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to 40 position. \_\_\_\_\_\_\_\_

CHECK IRM drawer front panel meter indicates between 38 and 42 UNITS. \_\_\_\_\_(AC)

CHECK IRM drawer DOWNSCALE indicating light is EXTINGUISHED on Panel 2‑9‑12. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
CHECK Computer point IRM A indicates 38 to 42. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to ZERO 1 position. \_\_\_\_\_\_\_\_

CHECK the following on IRM drawer:

DOWNSCALE indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

Front panel meter indicates 0 UNITS. \_\_\_\_\_\_\_\_

RESET local IRM alarms using RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

CHECK the following on IRM drawer:

UPSCALE HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

UPSCALE HIGH HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to OPERATE position. \_\_\_\_\_\_\_\_

RESET local IRM alarms using RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

CHECK the following on IRM drawer:

INOP indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

UPSCALE HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

UPSCALE HIGH HIGH indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

REQUEST UO or designee annotate the following at Recorder 2‑XR‑92‑7/46A Channel 3 on Panel 2‑9‑5:

Channel 3

2‑SR‑3.3.1.1.9(IRM A)

Initials \_\_\_\_\_\_\_\_

REQUEST UO remove IRM A from BYPASS by removing 2‑HS‑92‑7A/S4A, IRM BYPASS from CH‑A Position. \_\_\_\_\_\_\_\_

CHECK BYPASS IRM CH A indicating light is EXTINGUISHED on Panel 2‑9‑12. \_\_\_\_\_\_\_\_

MARK Steps 6.14[1] through 6.14[68.3] N/A. \_\_\_\_\_\_\_\_

* 1. Functional Test of IRM Channel A with Reactor Mode Switch NOT in RUN

CHECK following conditions exist for CHANNEL A IRM:

IRM drawer Mode switch in OPERATE position. \_\_\_\_\_\_\_\_

IRM INOP indicating light is EXTINGUISHED on Panel 2‑9‑12. \_\_\_\_\_\_\_\_

IRM HIGH HIGH or INOP indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM HIGH indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM BYPASSED indicating light is ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IF CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is in ALARM, THEN  
  
REQUEST UO clear CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7). Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) are NOT cleared, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CONNECT VOM #1 between terminal F‑39 and F‑41 in Panel 2‑9‑12 to monitor contact action. \_\_\_\_\_\_\_\_

CHECK VOM #1 connected in Step 6.14[3.1] indicates contacts are CLOSED. \_\_\_\_\_\_\_\_

CONNECT VOM #2 between terminal F‑45 and F‑46 in Panel 2‑9‑12 to monitor contact action. \_\_\_\_\_\_\_\_

CHECK VOM #2 connected in Step 6.14[3.3] indicates contacts are CLOSED. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Steps 6.14[4] and 6.14[5] may be performed concurrently. |

IF blue scram links are removed, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

NOTIFY Unit SRO the following will be defeated for performance of this procedure:

Reactor manual scram Channel B3 function of SRM's A and C.

APRM 2‑out‑of‑4 voter Channels 1 and 3.

IRM's A, C, E, and G. \_\_\_\_\_\_\_\_

CONNECT jumper between terminals CC‑76 and CC‑77, at Panel 2‑9‑15, Bay 2, in Auxiliary Instrument Room. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 CV

RECORD date and time jumper was placed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Date: |  |  | Time: |  |  |  |

IF red scram links are removed, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

NOTIFY Unit SRO the following will be defeated for performance of this procedure:

Reactor manual scram Channel A3 function of SRM's A and C.

APRM 2‑out‑of‑4 voter Channels 1 and 3.

IRM's A, C, E, and G. \_\_\_\_\_\_\_\_

CONNECT jumper between terminals CC‑74 and CC‑75 at Panel 2‑9‑15, Bay 2, in Auxiliary Instrument Room. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 CV

RECORD date and time jumper was placed.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Date: |  |  | Time: |  |  |  |

| 1. NOTE |
| --- |
| INOP/INHIBIT pushbutton in the next step remains PRESSED until Step 6.14[38]. |

PRESS and HOLD 2‑HS‑92‑7/41A, IRM CHANNEL A INOP/INHIBIT pushbutton on IRM drawer until instructed to release it. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to ZERO 2 position. \_\_\_\_\_\_\_\_

CHECK the following:

IRM drawer DOWNSCALE indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IRM drawer front panel meter indicates 0 UNITS. (0 to 2 UNITS). \_\_\_\_\_\_\_\_

CH 3 of Recorder 2‑XR‑92‑7/46A, IRM‑APRM LEVEL, indicates 0 on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
CHECK Computer point IRM A indicates 0. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH in Position 1. \_\_\_\_\_\_\_\_

IF IRM DOWNSCALE (2‑XA‑55‑5A, window 19) is NOT in ALARM, THEN  
  
NOTIFY UO IRM DOWNSCALE (2‑XA‑55‑5A, window 19) is going to ALARM. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO remove IRM CHANNEL A from BYPASS by removing 2‑HS‑92‑7A/S4A, IRM BYPASS from CH‑A Position. \_\_\_\_\_\_\_\_

CHECK the following:

IRM BYPASSED indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM DNSCL indicating light is ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM DOWNSCALE (2‑XA‑55‑5A, window 19) is in ALARM. \_\_\_\_\_\_\_\_

IRM drawer BYPASSED IRM indicating light is EXTINGUISHED on Panel 2‑9‑12. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE AND no other IRM is bypassed, THEN  
  
CHECK computer point DIG125 indicates NORMAL. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is NOT in ALARM, THEN  
  
NOTIFY UO CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is going to ALARM. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH in Position 2. \_\_\_\_\_\_\_\_

CHECK CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is in ALARM or VOM #1 connected in Step 6.14[3.1], indicates contacts OPEN. \_\_\_\_\_(AC)

IF ICS computer is OPERABLE AND 2‑HS‑99‑5A/S1 is NOT in SHUTDOWN, THEN  
  
CHECK computer point DIG127 indicated TRIP. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO place IRM A in BYPASS by placing 2‑HS‑92‑7A/S4A, IRM BYPASS in CH‑A Position. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to ZERO 1 position. \_\_\_\_\_\_\_\_

CHECK IRM drawer front panel meter indicates 0 UNITS. \_\_\_\_\_\_\_\_

IF any local IRM alarms are in ALARM, THEN  
  
Using RESET switch on IRM drawer, RESET local IRM alarms. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO return 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH to Position 1. \_\_\_\_\_\_\_\_

REQUEST UO remove IRM A from BYPASS by removing 2‑HS‑92‑7A/S4A, IRM BYPASS from CH‑A Position. \_\_\_\_\_\_\_\_

CHECK CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is CLEAR or if connected in Step 6.14[3.1], VOM #1 indicates contacts CLOSED. \_\_\_\_\_\_\_\_

IF CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is NOT in ALARM, THEN  
  
NOTIFY UO CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is going to ALARM. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF CRD platform is NOT in normal position OR IRM Cables are NOT routed in normal configuration, THEN  
  
MONITOR IRM detector when being withdrawn. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO withdraw IRM A Detector until IRM A detector IN indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

CHECK CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is in ALARM, or VOM #1 connected in Step 6.14[3.1], indicates contacts OPEN. \_\_\_\_\_(AC)

IF ICS computer is OPERABLE, THEN  
  
CHECK computer point DIG126 indicates ABNORMAL. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

IF CRD platform is NOT in normal position OR IRM cables are NOT routed in normal configuration, THEN  
  
MONITOR IRM detector when being inserted. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO insert IRM A Detector to FULL IN position. \_\_\_\_\_\_\_\_

CHECK IRM A detector IN indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE AND no other IRM is withdrawn, THEN  
  
CHECK computer point DIG126 indicates NORMAL. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO reset affected annunciators. \_\_\_\_\_\_\_\_

CHECK CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is CLEAR, or VOM #1 connected in Step 6.14[3.1], indicates contacts CLOSED. \_\_\_\_\_\_\_\_

NOTIFY UO the following steps are going to result in a rod block, neutron monitoring system half scram, and associated annunciators. \_\_\_\_\_\_\_\_

RELEASE INOP/INHIBIT pushbutton on IRM drawer. \_\_\_\_\_\_\_\_

CHECK the following:

IRM drawer INOP indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is in ALARM, or VOM #1 connected in Step 6.14[3.1], indicates contacts OPEN. \_\_\_\_\_(AC)

SCRAM SOLENOID GROUP A LOGIC RESET indicating lights (4) are EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_(AC)

2‑IL‑99‑5A/AB, SYSTEM A BACKUP SCRAM VALVE left indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/CD, SYSTEM B BACKUP SCRAM VALVE left indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

CHANNEL A IRM HIGH HIGH or INOP indicating light is ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM CHAN A, C, E, G HI‑HI/INOP (2‑XA‑55‑5A, window 33) is in ALARM. \_\_\_\_\_\_\_\_

NEUTRON MONITORING SYS HALF SCRAM (2‑XA‑55‑4A, window 16) is in ALARM. \_\_\_\_\_\_\_\_

REACTOR CHANNEL A AUTO SCRAM (2‑XA‑55‑5B, window 1) is in ALARM. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK Computer point DIG129 indicates INOP. \_\_\_\_\_\_\_\_

CHECK Computer point SOE035 indicates TRIP. \_\_\_\_\_\_\_\_

REQUEST UO place IRM A in BYPASS by placing 2‑HS‑92‑7A/S4A, IRM BYPASS in CH‑A Position. \_\_\_\_\_\_\_\_

REQUEST UO reset half scram and associated annunciators. \_\_\_\_\_\_\_\_

CHECK the following:

SCRAM SOLENOID GROUP A LOGIC RESET indicating lights (4) are ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/AB, SYSTEM A BACKUP SCRAM VALVE indicating lights (2) are ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/CD, SYSTEM B BACKUP SCRAM VALVE indicating lights (2) are ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM HIGH HIGH OR INOP indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

REACTOR CHANNEL A AUTO SCRAM (2‑XA‑55‑5B, window 1) is CLEAR. \_\_\_\_\_\_\_\_

NEUTRON MONITORING SYS HALF SCRAM (2‑XA‑55‑4A, window 16) is CLEAR. \_\_\_\_\_\_\_\_

IRM CHAN A, C, E, G HI‑HI/INOP (2‑XA‑55‑5A, window 33) is CLEAR. \_\_\_\_\_\_\_\_

CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is CLEAR, or VOM #1 connected in Step 6.14[3.1], indicates contacts CLOSED. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK Computer point DIG129 indicates NORMAL. \_\_\_\_\_\_\_\_

CHECK Computer point SOE035 indicates NOTTRIP. \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| INOP/INHIBIT pushbutton in the next step remains PRESSED until Step 6.14[60]. |

PRESS and HOLD 2‑HS‑92‑7/41A, IRM CHANNEL A INOP/INHIBIT pushbutton on IRM drawer until instructed to release it. \_\_\_\_\_\_\_\_

IF IRM DOWNSCALE (2‑XA‑55‑5A, window 19) is NOT in ALARM, THEN  
  
NOTIFY UO IRM DOWNSCALE (2‑XA‑55‑5A, window 19) is going to ALARM. Otherwise, MARK N/A. \_\_\_\_\_\_\_\_

REQUEST UO remove IRM A from BYPASS by removing 2‑HS‑92‑7A/S4A, IRM BYPASS from CH‑A Position. \_\_\_\_\_\_\_\_

NOTIFY UO the following steps are going to result in a rod block, neutron monitoring system half scram, and associated annunciations. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch in 125 position. \_\_\_\_\_\_\_\_

CHECK the following:

IRM drawer UPSCALE HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IRM drawer UPSCALE HIGH HIGH indicating light is ILLUMINATED. \_\_\_\_\_\_\_\_

IRM drawer front panel meter indicates 125 UNITS (123 to 125 UNITS). \_\_\_\_\_\_\_\_

IRM HIGH (2‑XA‑55‑5A, window 26) is in ALARM. \_\_\_\_\_\_\_\_

IRM CHAN A, C, E, G HI‑HI/INOP (2‑XA‑55‑5A, window 33) is in ALARM. \_\_\_\_\_\_\_\_

CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is in ALARM, or VOM #2 connected in Step 6.14[3.3], indicates contacts OPEN. \_\_\_\_\_(AC)

NEUTRON MONITORING SYS HALF SCRAM (2‑XA‑55‑4A, window 16) is in ALARM. \_\_\_\_\_\_\_\_

REACTOR CHANNEL A AUTO SCRAM (2‑XA‑55‑5B, window 1) is in ALARM. \_\_\_\_\_\_\_\_

SCRAM SOLENOID GROUP A LOGIC RESET indicating lights (4) are EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_(AC)

2‑IL‑99‑5A/AB, SYSTEM A BACKUP SCRAM VALVE left indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/CD, SYSTEM B BACKUP SCRAM VALVE left indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM CH A ‑ CH 3 of Recorder 2‑XR‑92‑7/46A indicates between 123 and 127 on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM HIGH indicating light is ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IRM HIGH HIGH OR INOP indicating light is ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK Computer point DIG128 indicates HIGH. \_\_\_\_\_\_\_\_

CHECK Computer point SOE052 indicates TRIP. \_\_\_\_\_\_\_\_

REQUEST UO place IRM A in BYPASS by placing 2‑HS‑92‑7A/S4A, IRM BYPASS in CH‑A. \_\_\_\_\_\_\_\_

REQUEST UO reset half scram and associated annunciators. \_\_\_\_\_\_\_\_

CHECK the following:

SCRAM SOLENOID GROUP A LOGIC RESET indicating lights (4) are ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/AB, SYSTEM A BACKUP SCRAM VALVE indicating lights (2) are ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

2‑IL‑99‑5A/CD, SYSTEM B BACKUP SCRAM VALVE indicating lights (2) are ILLUMINATED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

CHANNEL A IRM HIGH indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

CHANNEL A IRM HIGH HIGH OR INOP indicating light is EXTINGUISHED on Panel 2‑9‑5. \_\_\_\_\_\_\_\_

CONTROL ROD WITHDRAWAL BLOCK (2‑XA‑55‑5A, window 7) is CLEAR, or VOM #2 connected in Step 6.14[3.3], indicates contacts CLOSED. \_\_\_\_\_\_\_\_

IRM CHAN A, C, E, G HI‑HI/INOP (2‑XA‑55‑5A, window 33) is CLEAR. \_\_\_\_\_\_\_\_

IF ICS computer is OPERABLE, THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

CHECK Computer point DIG128 indicates NORMAL. \_\_\_\_\_\_\_\_

CHECK Computer point SOE052 indicates NOTTRIP. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to 40 position. \_\_\_\_\_\_\_\_

CHECK IRM drawer front panel meter indicates between 38 and 42 UNITS. \_\_\_\_\_(AC)

REQUEST UO place 2‑XS‑92‑7/42A, CHANNEL A IRM RANGE SWITCH, in position required for current plant condition. \_\_\_\_\_\_\_\_

PLACE IRM drawer Mode switch to OPERATE. \_\_\_\_\_\_\_\_

RELEASE 2‑HS‑92‑7/41A, IRM CHANNEL A INOP/INHIBIT pushbutton. \_\_\_\_\_\_\_\_

RESET local IRM alarms using RESET switch on IRM drawer. \_\_\_\_\_\_\_\_

CHECK the following IRM drawer indicating lights are EXTINGUISHED:

UPSCALE HIGH \_\_\_\_\_\_\_\_

UPSCALE HIGH HIGH \_\_\_\_\_\_\_\_

INOP \_\_\_\_\_\_\_\_

IF VOMs were connected in Steps 6.14[3.1] and 6.14[3.3], THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

REMOVE VOM #1 connected to terminals F‑39 and F‑41. \_\_\_\_\_\_\_\_

REMOVE VOM #2 connected to terminals F‑45 and F‑46. \_\_\_\_\_\_\_\_

REQUEST UO remove IRM A from BYPASS by removing 2‑HS‑92‑7A/S4A, IRM BYPASS from CH‑A Position. \_\_\_\_\_\_\_\_

CHECK IRM drawer BYPASS IRM Ch. A indicating light is EXTINGUISHED. \_\_\_\_\_\_\_\_

REQUEST UO or designee annotate the following at Recorder 2‑XR‑92‑7/46A Channel 3 on Panel 2‑9‑5:

Channel 3

2‑SR‑3.3.1.1.9(IRM A)

Initials \_\_\_\_\_\_\_\_

| 1. NOTE |
| --- |
| Steps 6.14[67] and 6.14[68] may be performed concurrently. |

IF a jumper was installed in Step 6.14[4.2], THEN  
  
PERFORM the following, otherwise, MARK steps N/A:

NOTIFY Unit SRO the following will be activated with removal of jumper:

Reactor manual scram Channel B3 function of SRM's A and C

APRM 2‑out‑of‑4 voter Channels 1 and 3

IRM's A, C, E, and G \_\_\_\_\_\_\_\_

REMOVE jumper between terminals CC‑76 and CC‑77 at Panel 2‑9‑15, Bay 2, in Auxiliary Instrument Room. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 IV

RECORD date and time jumper was removed.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date |  | Time |  |  |  |

IF a jumper was installed in Step 6.14[5.2], THEN  
  
PERFORM the following, otherwise, MARK steps N/A: \_\_\_\_\_\_\_\_

NOTIFY Unit SRO the following will be activated with removal of jumper:

Reactor manual scram Channel A3 function of SRM's A and C.

APRM 2‑out‑of‑4 voter Channels 1 and 3.

IRM's A, C, E, and G. \_\_\_\_\_\_\_\_

REMOVE jumper between terminals CC‑74 and CC‑75 at Panel 2‑9‑15, Bay 2, in Auxiliary Instrument Room. \_\_\_\_\_\_\_\_  
 \_\_\_\_\_\_\_\_  
 IV

RECORD date and time jumper was removed.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date |  | Time |  |  |  |

1. POST PERFORMANCE ACTIVITY
   1. Test Completion

RECORD date and time channel returned to service.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Date |  | Time |  |  |  |

NOTIFY UO any INOPERABLE or bypassed IRM removed from BYPASS for performance of this procedure can be returned to mode required for current plant conditions. \_\_\_\_\_\_\_\_

RECORD M&TE Used (Y or N) in table in Step 4.2.2[2]. \_\_\_\_\_\_\_\_

IF any AC was NOT satisfied, THEN  
  
ENSURE CR is initiated. Otherwise, MARK N/A.

|  |  |  |  |
| --- | --- | --- | --- |
| CR# | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |  | \_\_\_\_\_\_\_\_ |

NOTIFY UO procedure is complete. \_\_\_\_\_\_\_\_

NOTIFY Unit SRO procedure is complete. \_\_\_\_\_\_\_\_

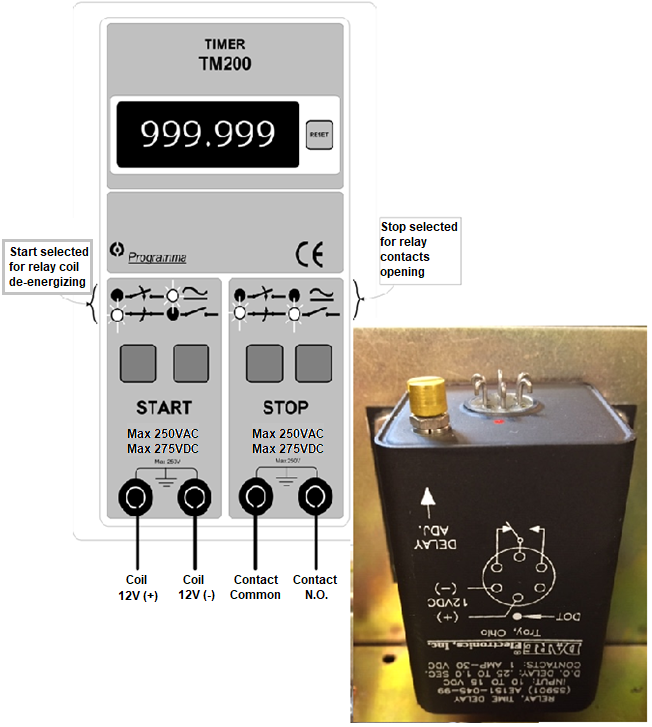
1. RECORDS

All completed portions of this procedure and STS are to be maintained per NPG‑SPP‑31.2, Records Management.

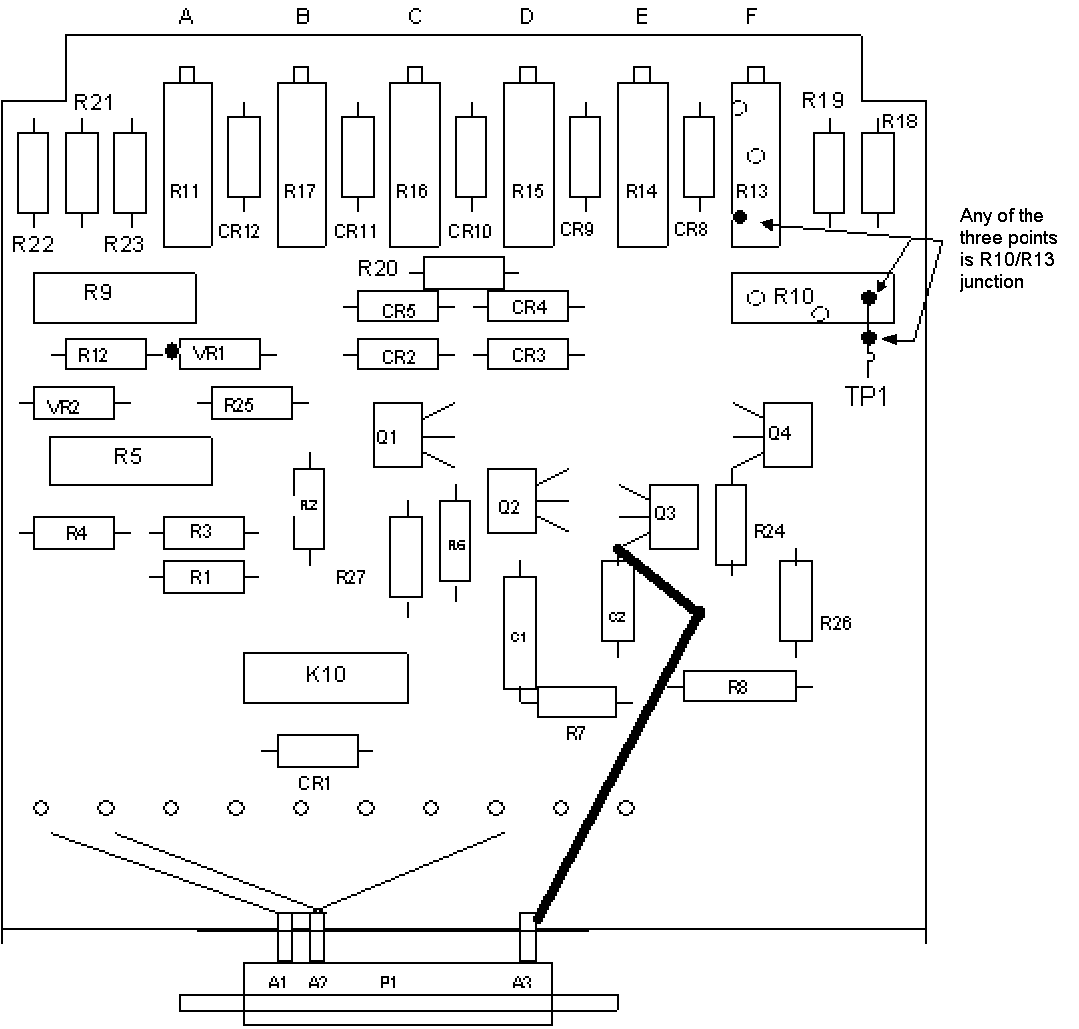
|  |
| --- |
| Attachment 1 |
| (Page 1 of 1) |
| Control Room Components Affected By Procedure Performance |

|  |  |  |
| --- | --- | --- |
| UNID | DESCRIPTION | LOCATION |
| 2‑XA‑55‑4A window 16 | NEUTRON MONITORING SYS HALF SCRAM | Panel 2‑9‑4 |
| 2‑XA‑55‑5B window 1 | REACTOR CHANNEL A AUTO SCRAM | Panel 2‑9‑5 |
| 2‑XA‑55‑5A window 19 | IRM DOWNSCALE | Panel 2‑9‑5 |
| 2‑XA‑55‑5A window 26 | IRM HIGH | Panel 2‑9‑5 |
| 2‑XA‑55‑5A window 33 | IRM CHAN A, C, E, G HI‑HI/INOP | Panel 2‑9‑5 |
| 2‑XA‑55‑5A window 7 | CONTROL ROD WITHDRAWAL BLOCK | Panel 2‑9‑5 |
|  | Indicating Lights (4 Red lights) ‑ SCRAM SOLENOID GROUP A LOGIC RESET | Panel 2‑9‑5 |
|  | Indicating Light CHANNEL A IRM DNSCL | Panel 2‑9‑5 |
|  | Indicating Light CHANNEL A IRM HIGH | Panel 2‑9‑5 |
|  | Indicating Light CHANNEL A IRM HIGH HIGH or INOP | Panel 2‑9‑5 |
|  | Indicating Light CHANNEL A IRM BYPASSED | Panel 2‑9‑5 |
| 2‑XR‑092‑7/46A | Recorder IRM‑APRM LEVEL,   CHANNEL A IRM ‑CH 3 | Panel 2‑9‑5 |
|  | ICS Computer Points |  |
| 2‑IL‑99‑5A/AB | SYSTEM A BACKUP SCRAM VALVE Left Indicating Light | Panel 2‑9‑5 |
| 2‑IL‑99‑5A/CD | SYSTEM B BACKUP SCRAM VALVE Left Indicating Light | Panel 2‑9‑5 |

|  |
| --- |
| Attachment 2 |
| (Page 1 of 1) |
| TM200 To 2‑RLY‑92‑741ATDR Test Setup |



|  |
| --- |
| Attachment 3 |
| (Page 1 of 1) |
| MSA Circuit Card Layout |



|  |
| --- |
| Attachment 4 |
| (Page 1 of 1) |
| Test Setup For IRM Channel Calibration |



|  |
| --- |
| Attachment 5 |
| (Page 1 of 1) |
| Range Switch Signal Acceptance |
|  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Table 14 | | | | | | |
| Range switch Position | Noise (+) Signal (Vdc) | ‑ | Noise Only (Vdc) | = | Signal Only | Acceptable Limit |
| 1 |  |  | |  | | Compare Ranges 1 through 6: |
| 2 |  |  | |  | | \_\_\_\_\_\_\_Vdc (Highest) |
| 3 |  |  | |  | | ‑ \_\_\_\_\_\_\_\_Vdc (Lowest) |
| 4 |  |  | |  | | = \_\_\_\_\_\_Vdc (≤ 0.060 Vdc) |
| 5 |  |  | |  | |  |
| 6 |  |  | |  | |  |
| 7 |  |  | |  | | Compare Ranges 7 through 10: |
| 8 |  |  | |  | | \_\_\_\_\_\_\_Vdc (Highest) |
| 9 |  |  | |  | | ‑ \_\_\_\_\_\_\_\_Vdc (Lowest) |
| 10 |  |  | |  | | = \_\_\_\_\_\_Vdc (≤ 0.060 Vdc) |