ENERGY INCORPORATED

PROCEDURE

TITLE ISOLATOR CIRCUIT DIFFERENTIAL HIGH VOLTAGE FAULT TEST PROCEDURE

		DATE
PREPARED BY	Matt Neerman	10-25-84
REVIEWED BY	J.A. Henderson	10 29 84
QUALITY ASSURANCE	K.D. Hopkinson	10-29-84
PROJECT MANAGER	B.M. Kotchen	10-29-84
TECHNICAL MANAGEMENT	Kenneth Mundt	10/29/84

RELEASE DATE 10/31/84

PREPARED FOR _____

REVISIONS

NOTE: All revisions are flagged with the symbol ⚠N in the right margin where N is the number of the revision.

Rev. 0 - Issued for Use - 10/31/84

Rev. 1 - Expanded Test to Include Adjacent Isolator Channels - 11/29/84

Rev. 2 - Procedure Corrections - 12/7/84

RECORD COPY

WAP-EDP-1-004

PROCEDURE NO. EIP-30

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REVIEWED BY	J.A. Henderson	10-29-84
QUALITY ASSURANCE	K.D. Hopkins	10-29-84
PROJECT MANAGER	B.K. Fitch	10-29-84
TECHNICAL MANAGEMENT	S. Kendall Hull	10/29/84

RELEASE DATE 10/31/84

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1.0 PURPOSE

This procedure describes the methods to be used when performing a high voltage fault isolation test. Caution: This is a potentially destructive test and requires dangerous high voltages. When performing the test, employ adequate safeguards to protect against small projectiles, bright flashes, and high voltages.

The test involves applying a 480 Vrms, 10 amp (nominal) source to the output of a single Energy Incorporated isolation amplifier and observing the effects. During the test, the 480 volt source will be applied to the output of channel 2 of the isolator card (798-X assembly) while the inputs of all four isolator channels are monitored. After the test, the isolator card will be inspected and all damage recorded. Also, all isolator channels will be hipot tested to 600 VAC and channels 1, 3, and 4 of the isolator card will be electrically tested for performance.

As added provisions of the test, the system power supply lines will be wired and monitored.

2.0 RESPONSIBILITIES

2.1 Testing Engineer (TE)

It is the responsibility of the testing engineer to:

(1) Provide or arrange for the necessary test equipment,
(2) Ensure the correct application of the test equipment,
(3) Supervise the test technician,
(4) Enter the test records in the project files,
(5) Be trained to level II as per EI QAP 10-2, and
(6) Notify the QC Department of the pending test.

2.2 Quality Control Representative (QCR)

It is the responsibility of the quality control representative to:

(1) Verify the test is conducted per the procedure,
(2) Verify that the data are taken per this procedure,
(3) Verify the equipment used has a current and valid calibration sticker or certificate,
(4) Verify the proper disposition and storage of test records, and
(5) Obtain and maintain the test record copy of the procedure, data sheets, and all applicable drawings.

2.3 Test Technician (IT)

(1) Perform the test.

3.0 TEST PREREQUISITES

3.1 Required Drawings and Special Instructions

The test engineer shall record all required drawings and applicable special instructions in Attachment 1.

3.2 Equipment Required

(1) High voltage source: 480 ± 25 VAC rms open circuit, 12 amp rms minimum short circuit current, 60 Hz, single phase.

(2) Clamp on current meter: 0 to 12 amp, 60 Hz, ± 5%.

(3) Voltmeter: ± 5%, compatible with high voltage probe.

(4) Eight channel strip chart recorder: 60 Hz min., Watanabe model WR 3101-8L or equivalent.

(5) Three 50 Ω, 1/4 watt resistors, two 100 Ω, 1/4 watt resistors, one 48 Ω, 6000 watt resistor, two 1.4 k, 1/4 W resistors, and two each 220 μF 25 volt min. capacitors, electrolytic.

(6) Hipot tester: 600 Vrms AC output, 10 μamp sensitivity, Hiptronics model HD125 or equivalent.

(7) Test leads and switches: as required.

3.3 Inspection

Verify that all special instructions will be followed, that all items under test appear to be in working order (visual inspection only), and that the test equipment is in good shape (no frayed insulation, etc.).

3.4 Procedure Documentation

Attachment 1 will (when completed) become part of the test procedure documentation. It will be incorporated into the test record copy of the test and then submitted to project management for final review.

4.0 EQUIPMENT CALIBRATION

Verify that the following equipment has valid calibration dates. Record these dates and equipment descriptions in Section 3.3/4.0 of Attachment 1.

(1) Both voltmeters,
(2) Strip chart recorder, and
(3) Hipot tester.

Also record a description of the 48 Ω, 6 kw resistor.

5.0 TEST PROCEDURE

(Reference Figure 1 for isolation test setup.)

During the high voltage fault test, the following eight signal points are monitored and recorded with the strip chart recorder:

(1) V_R source,
(2) V_{in} channel 1,
(3) V_{in} channel 2,
(4) V_{in} channel 3,
(5) V_{in} channel 4,
(6) V_{+15},
(7) V_{-15}, and
(8) V_{in} RJC.

CAUTION: Lethal voltages will be present during the performance of this test. Also guard against small projectiles and bright flashes.

(1) Assemble the test setup as shown in Figure 1.

(2) Verify the open circuit voltage and the short circuit current of the 480 VAC source. Obtain these parameters from I_s and V_s via changing the position of switch S1. Record these values in Attachment 1.

(3) While monitoring the fault current and load voltage, apply 480 ± 25 VAC, rms, 60 Hz to the isolator circuit output. Record both the magnitude and time response of all voltage measurements with the eight channel chart recorder.

(4) Remove the applied voltage only after the fault current has reached a steady-state value (within 10%) or after one minute (whichever is longer).

(5) After power is removed from the circuit, inspect for damage caused by the test. Include in your inspection both visual (burnt or melted parts) and electrical (resistance) observations. Record all findings in Section 5.0 (5) of Attachment 1. Disconnect the chart recorder from all points.

(6) Perform an output to input Hipot test as follows.

(7) Turn on Hipot tester and set the voltage control to zero volts.

(8) Connect the Hipot tester to the items under test as shown in Figure 2.

(9) Gradually increase the output voltage up to 600 VAC.

(10) Note and record (Attachment 1) the leakage current when 600 VAC is reached.

(11) Wait at least 15 seconds. Note and record the leakage current again.

NOTE: If the two values (step 10 and step 11) differ by more than ± 20%, record these values in Attachment 1.

(12) Turn off the Hipot tester before disconnecting.

(13) Perform an isolator performance test on isolator channels 1, 3, and 4 as per EIP-24 (Sections 8.2 and 8.7).

Retain the test record copy of the procedure in the test WAP.

6.0 ACCEPTANCE CRITERIA

The isolator circuit is considered to have passed the 600 V differential fault isolation test if the following test criteria are met:

pass Note: 60 Hz RFI greatly exceeds .25mV

(1) During the application of the 480 VAC power, no more than 0.25 mV of the 60 Hz signal shall appear across the 50 Ω isolator input and the 100 Ω isolator and RJC input load resistors.

Note: 60 Hz RFI greatly exceeds 1.5V

pass (2) During the 480 VAC test, no more than 1.5 V RMS may appear across either of the power supply resistor-capacitor networks.

pass (3) The extent of the damage resulting from the test shall be confined to the tested channel's output circuitry (adjucent channels shall be unaffected and the tested channel's input side must remain intact; also, the isolator card connector must not be affected).

smoke damage to Channel 1 only

pass (4) The leakage current resulting from the 600 VAC Hipot test shall be less than 50 μA at all times during the 15-second test.

pass (5) Isolator channels 1, 3, and 4 must pass the testing as required in EIP-24, Sections 8.2 and 8.7, according to the criteria set forth in EIP-24, Sections 10.2 and 10.6 (.1% linearity).

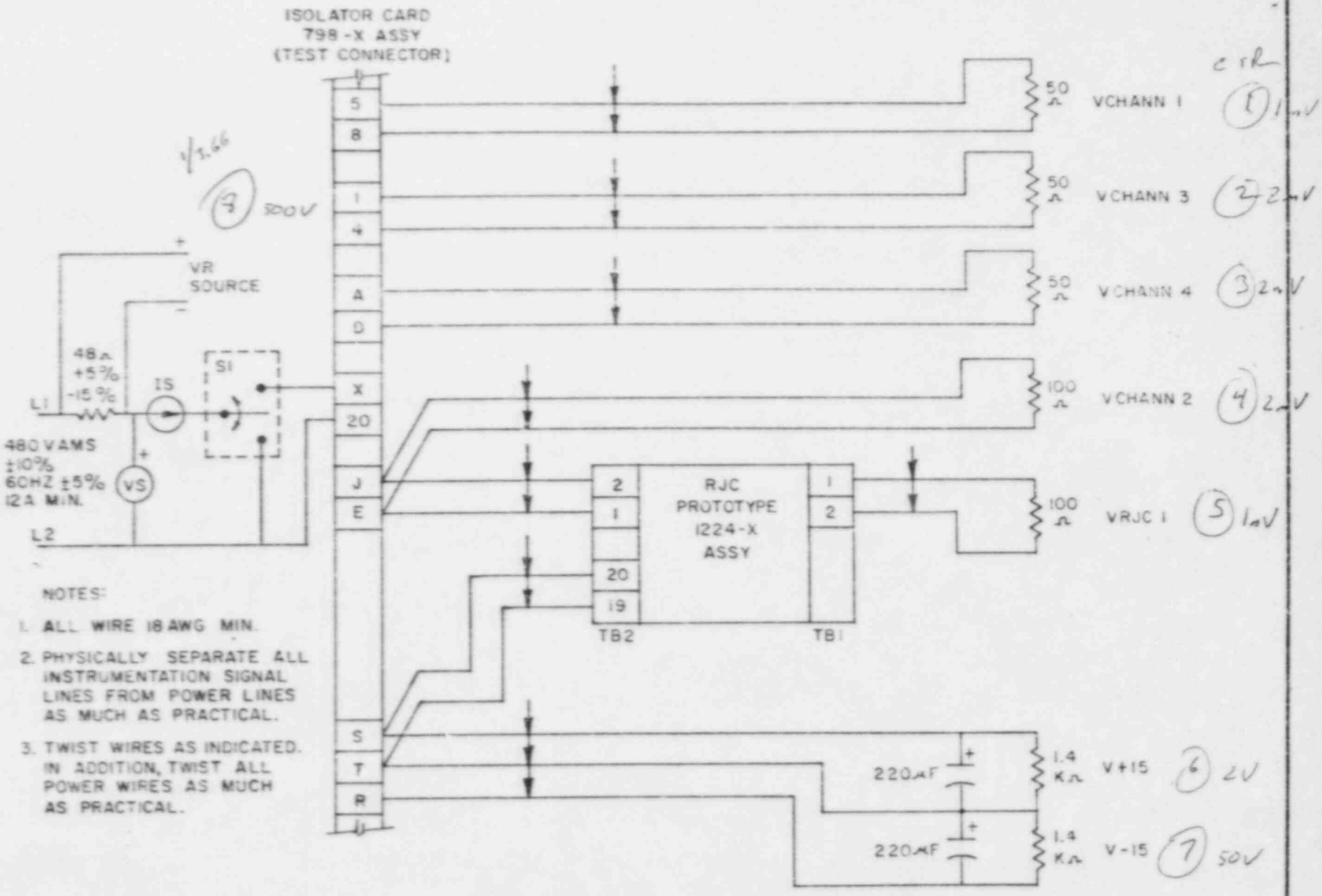

FIGURE 1 DIFFERENTIAL FAULT VOLTAGE TEST SETUP

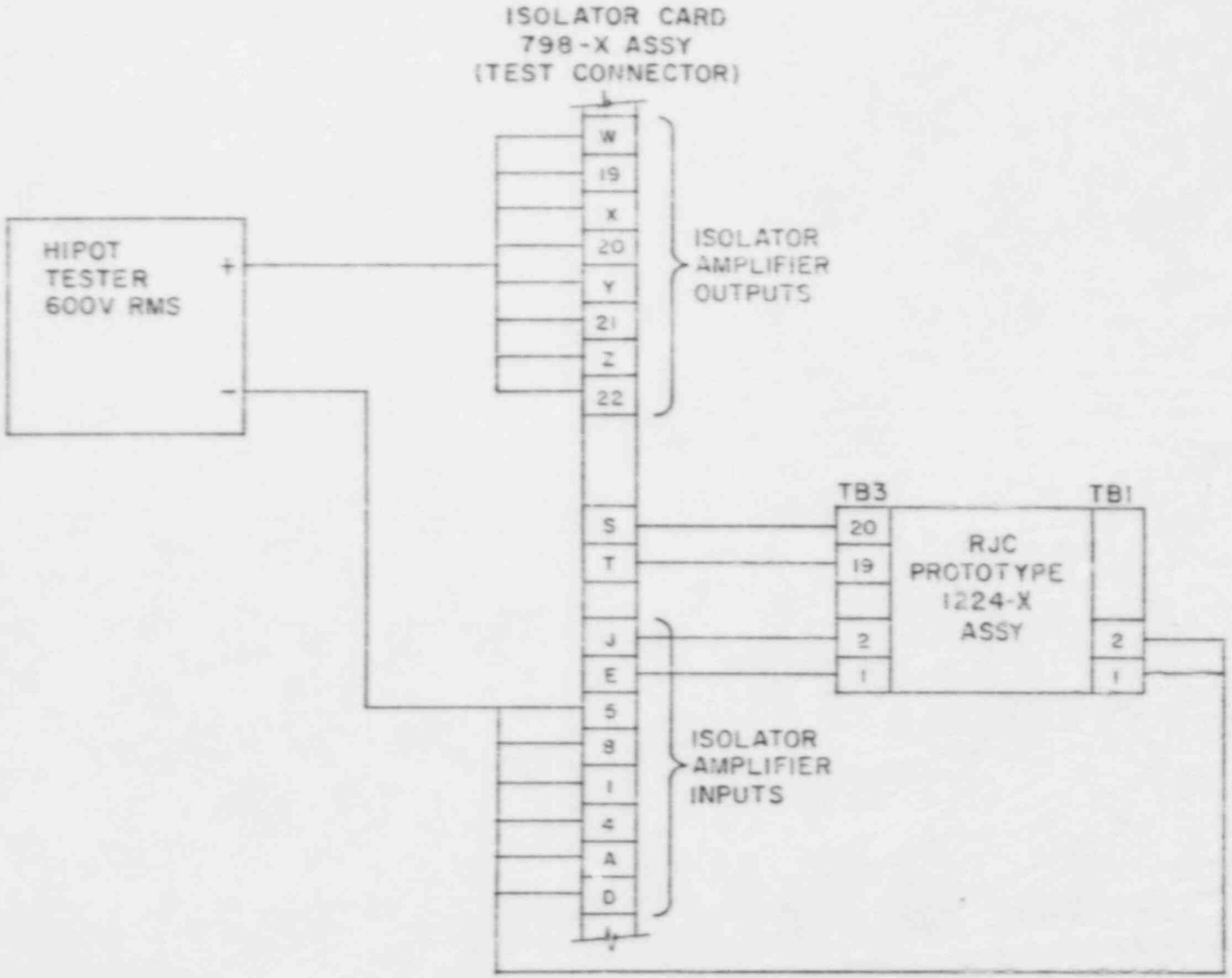

FIGURE 2 HIPOT TEST SETUP

ATTACHMENT 1

EIP-30 DATA SHEET

Reference Section

2.0 TE Training to Level II: Name M. Weisman Date Trained _____

3.1 Special instructions

Design Drawings

798-1 Assembly Part Number

033 Assembly Serial Number

798 Rev. ____ Assembly Drawing (if applicable)

N/A Rev. ____ Wiring and Cable List (if applicable)

Special Instructions

3.2/4.0 Equipment Record

Equipment	Model	Manufacturer	S/N	Cal. Dates Last	Due
High Voltage Source	750V	Fluke	N/A		N/A
Current Meter	Beckman 8050A DMM	Fluke	2826700		N/A

Equipment	Model	Manufacturer	S/N	Cal. Dates Last	Due
Chart Recorder	WR 3101	Gradtec	4018124	Dec 1984	____
Voltmeter	~~2100~~ 805A	~~Data~~ Fluke	~~10324~~ 2896900	~~4-30-84~~ 5-17-84	~~4-30-85~~ 5-17-85 MW 12-18
Hipot Tester	HD100	Hipotronics	1400-1555	Dec 1984	Dec 1985

48 Ω, 6 kw resistor:
3 - 4500 WT 240 V WATER HEATER ~~ELEMENTS~~ ELEMENTS

5.0 TEST PROCEDURE NOTES

Step

(1) Power source open circuit voltage 489.8 V rms
Power source short circuit current 12.3 A rms

(2)	Fault Current	Load Voltages
Max	See Chart	Attach Chart Recorder Chart

Time to Reach
Steady State ~45 sec

(5) Inspection Comments Chann 2 varistor exploded Chann 1 suffered smoke damage. Chann 2 suffered a little smoke damage. Chann 3 & 4 - No effect Chann. 2 output trace gone. Pictures taken

Step

(10) Initial leakage at 600 VAC 60 μ Arms. MW 12-18 LEAKAGE NO GOOD

(11) Final leakage at 600 VAC 60 μ Arms. 20 μ Amps KDH 18/12/84

(13) Results of EIP-24 (Pass/Fail): Chann 1 Pass
Chann 3 Pass
Chann 4 Pass

Test Data Certification

All test data recorded above were measured and recorded as described in procedure EIP-30.

Matt Neeman — 12-18-84
Test Engineer — Date

[signature] — 18 Dec 84
for K.D.H. QC Representative — Date

Test Data Acceptance

All test data and records have been reviewed and accepted according to the criteria of Section 6.0.

Matt Neeman — 12-18-84
Engineer — Date

[signature] — 18 Dec 84
for K.D.H. QC Representative — Date

12/19/84 Functional Manager

BRP 12-19-84 Project Manager