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W. W. Hansen Experimental Physics Laboratory

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Gravity Probe B Relativity Mission

Telescope Readout Electronics (TRE)

Full Functional Test Procedure

For

FWD TRE Engineering Units

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Total Pages 55

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1.0 General Description

This document is the Full Functional Test procedure for the warm electronics of the Engineering Unit Version of the TELESCOPE READOUT ELECTRONICS (TRE). The purpose of the TRE test is to demonstrate and verify the functional capabilities of the TRE FWD Boxes so such units might serve as test apparatus on other flight hardware, i.e. the Detector Modules. Total TRE test verification is accomplished through a combination of tests, inspection, demonstration, and analyses. [Note. This procedure is not intended to test the flight forward TRE units. The flight units have different connector configurations, different scale factors in the gain steps, a different range in the clamp voltage, and some differences in precision and range in the photodiode bias setting. Flight TRE units are tested under LMMS documents TRE-004 for subassemblies, and TRE-005 for flight boxes.]

2.0 Reference Documents

GPB Mission Event Timeline Database
GPB Payload Electronics Units Testing Philosophy LMMS EM No. 449
Full functional Test Procedure for Fully Assembled Forward Flight Units, LMMS TRE-005
GPB Relativity Mission Safety Plan, P0327
LMSC Hand Book on Electrostatic Discharge, F03581
Help for Using the TRE Support Systems, P0391
QA Test Procedure for TRE Ground Support Equipment Rack, P0396

3.0 Test Facilities

Stanford B / CEDAR HALL

4.0 General Requirements

4.1 Test will be performed under the environmental conditions existing in B/ CEDAR Hall at Stanford.

4.2 Oscilloscopes, digital Multi Meters, computers and any other standard test equipment used in this test must be identified by property tag or serial number and calibrated if used for any specific quantitative measurement.

4.3 Any red lines to the procedure shall require the approval and initial of the following key contacts or their representatives prior to final signoff:

Bob Farley, REE
Phil Unterreiner, QA.

4.4 Initial and date the appropriate space (_____) in the procedure description and on the test data sheet to verify the task has been accomplished.

4.5 Test operators shall read this procedure in its entirety and resolve any apparent ambiguities prior to beginning this test. It is suggested that the test operator read the section of P0391 titled *TRE Test Commands and the SQUID Software Program* to aid in operating the test racks.

4.6 Notify Quality Assurance Engineering at least 48 hours prior to the start of test. In the event of a failure during the execution of this test, Quality Assuraance shall again be notified.

Note: For Engineering Units, Product Assurance might not witness the tests, but must be notified.

5.0 Safety/ Security Requirement

5.1 Standard safety practices to ensure safety of personal and prevent damage to equipment shall be observed during performance of this test

5.2 Ensure that power is removed from cable assemblies before connecting or disconnecting cable connectors.

5.3 Examine all mating connectors before attempting to mate them. Remove any foreign particle. Look for any damaged pins or sockets. Do not force the coupling action if excessive resistance is encountered. Ensure that key ways are aligned.

5.4 Special care shall be exercised when handling the TRE Box and Components to prevent damage caused by Electro Static Discharge.

6.0 Hardware under test

Each TRE Box contains two analog printed circuit boards and two digital printed circuit boards, before start of the test, fill out the Drawing No. and Serial No. of the boards, and Serial No. of the Box.

Name	**Drawing No. / Serial No.**
Analog Board (X-Direction)	----------/---------- (_____)
Digital Board (X-Direction)	----------/---------- (_____)
Analog Board (Y-Direction)	----------/---------- (_____)
Digital Board (Y-Direction)	----------/---------- (_____)
Fwd TRE Unit	----------/---------- (_____)

7.0 Support Hardware/Test Equipment / Software

7.1 The following support hardware /test equipment / software will be used and the applicable information for the instruments shall be recorded on the equipment log sheet shown on the next page.

Name/ Description	Mfgr/Model No.	Qty
O - Scope	TD540A	1
Multi - Meter	Fluke Model 87	1
Test Cables	Stanford / LMMS	1
TRE Test Stimulator	LMMS 8A01273 **(TRE-008)**	1
Rev. C Detector / LN2 Dewar	Stanford / LMMS	1
TRE Support Rack	Stanford / LMMS	1
Waveform Generator	H. P / 33120A	1
Power Insert Box	LMMS 8A01274, Sheet 2 **(TRE-007)**	
Cables		As required
Break out Boxes		As required
Software	SQUID.exe V3.51 or Higher	1

8.0 Equipment Log Sheet

Fill out the table on the following page for the equipment actually used during the tests.

Equipment Log Sheet

No.	Name Description	Manufacturer	Model	Prop./Serial No.	Cal. Due Date

9.0 Pre-test Operations

9.1 Verify TRE test Support Rack is checked for proper operation per P0396. The overall layout of the support rack is shown in Appendix 15.2, and the layout of the breakout panel is shown in Appendix 15.1.

(_____)

9.1.1 Verify Detector Emulator Is Checked for proper operation (_____)

10.0 Passive Tests

10.1 Connect TRE Box as per Fig. No. 1

10.1.1 On TRE Support Rack Verify there are **no shorts** between the following Voltages

+5V	to	+12V	(_____)
+5V	t0	-12V	(_____)
+12V	to	-12V	(_____)
+5V	to	Chassis Ground	(_____)
+12V	to	Chassis Ground	(_____)
-12V	to	Chassis Ground	(_____)
+5V	to	Logic Ground	(_____)
+12V	to	Logic Ground	(_____)
-12V	to	Logic Ground	(_____)

10.2 Power On test

10.2.1 Turn on the Power on the Test Rack, and all other associated test equipment
10.2.2 Verify the following Voltages are present at the test Rack
+5V_____, +15V_____, -15V_____

(_____)

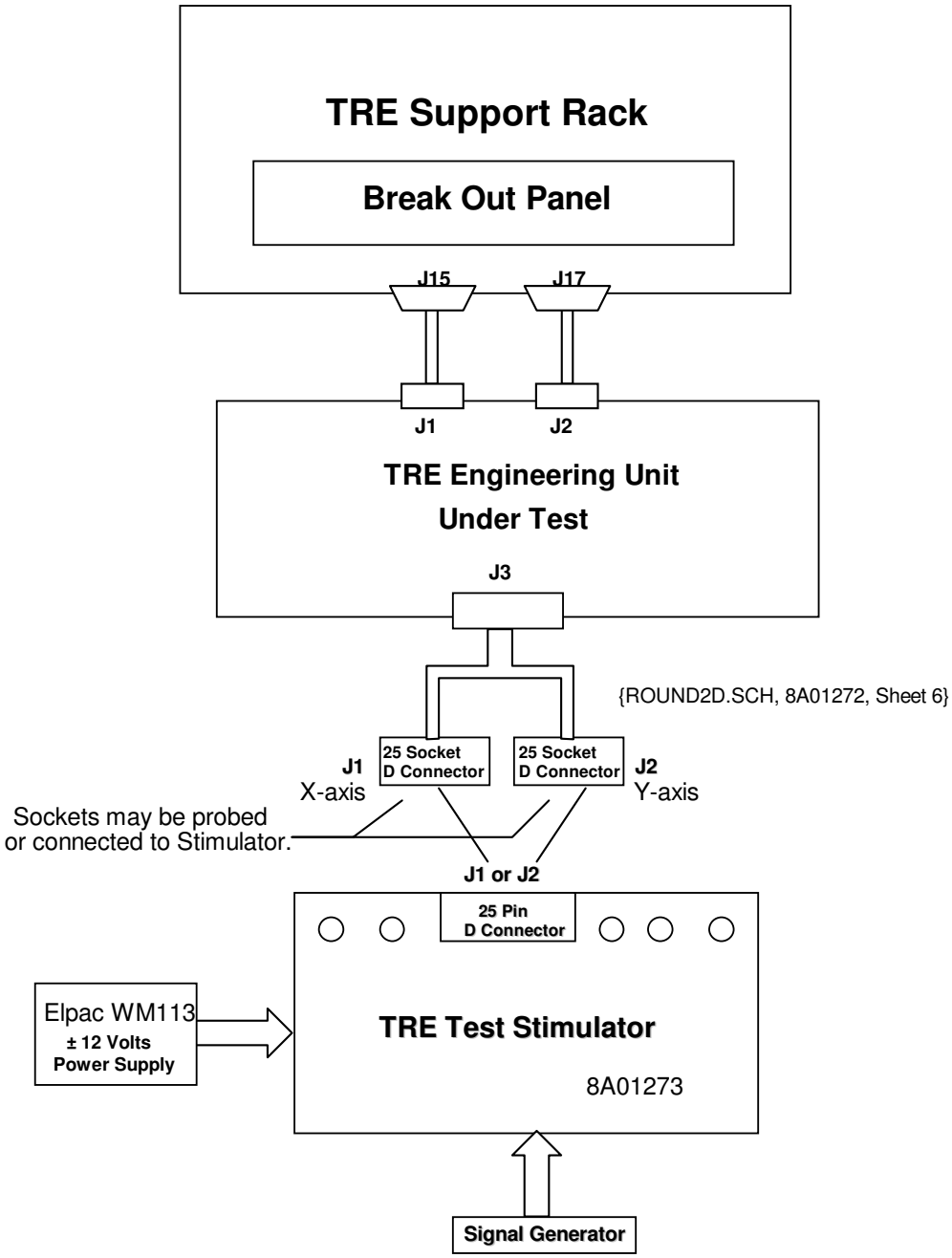


Figure 1 TRE Engineering Unit Test Setup

11.0 Functional Tests

Each forward TRE contains two identical circuits for controlling and servicing two detector modules, designated as X and Y. Similar tests will be performed on the circuits for each axis module, testing the X-axis circuits first and then repeating the tests for the Y-axis circuits. The test rack control program provides separate controlling functions for the X and Y channels, and different test points and accesses are available.

Each detector module has two detectors; one is designated plus direction and the other is minus direction. Thus each forward TRE has circuitry for four similar detector channels: Plus X, Minus X, Plus Y, and Minus Y. Separate data sheets are included in this procedure for these cases. Data sheets 1 through 16 are for use with X-axis circuits, and sheets 17 through 32 are for Y-axis circuits. Sheet 33 is a full assembly data record.

Measurements are made by connecting meters or oscilloscopes to signals available on the breakout panel (Appendix 15.1) or by probing the 25-Socket D connector on the Round2D cable. The arrangement of contacts on the D connector is shown in Figure 2.

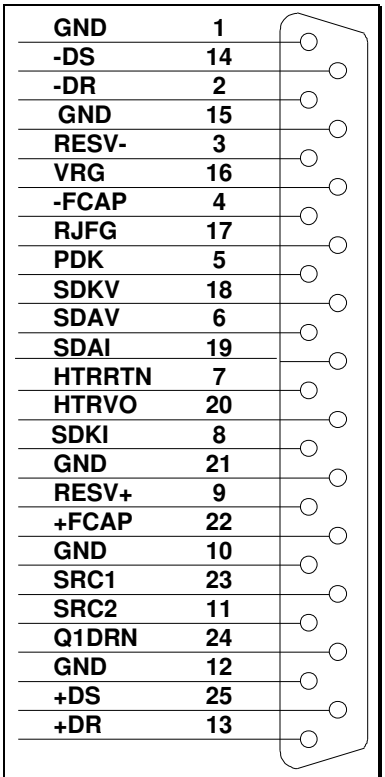


Figure 2 -- Signals available at 25 Socket Connector as Test Points

11.1 CLAMP Voltage Control and Monitoring

11.1.1 Enter the indicated CONTROL values, which command the clock to stop and drive the CLL output from the CLAMP DAC. Measure the output of the corresponding signals on the full differential output of the Engineering Data Channel (EDC). Set the CLAMP DAC with the values indicated on the data sheets listed in sections 11.1.2 through 11.1.5.

X:(_____) Y:(_____)

11.1.2 Verify the (Plus Direction) EDC Clamp voltage (CONTROL= 0623h) are within the limits and write the actual values on data sheet #1 or #17.

X:(_____) Y:(_____)

11.1.3 Verify the (Plus Direction) EDC Feedback voltage (CONTROL= 0624h) are within the limits and write the actual values on data sheet #2 or #18.

X:(_____) Y:(_____)

11.1.4 Verify the (Minus Direction) EDC Clamp voltage (CONTROL= 0627) are within the limits and write the actual values on data sheet #3 or #19.

X:(_____) Y:(_____)

11.1.5 Verify the (Minus Direction) EDC Feedback voltages (CONTROL= 0628h) are within the limits and write the actual values on data sheet #4 or #20.

X:(_____) Y:(_____)

11.2 Offset DAC Voltage Control Verification

11.2.1 Connect a voltmeter (- terminal) between pin 16 (VRG) of the 25-pin D connector of the Round2D cable. Connect the voltmeter (+ terminal) to pin 3 (RESV-) and send commands to the low order byte of OFFSETS. The offsets should range between ±20 mV for values between 1 and 255.

X:(_____) Y:(_____)

11.2.2 Verify the voltages resulting from the values entered in the low byte of OFFSETS are within the limits, and write the actual value on data sheet #5 or #21.

X:(_____) Y:(_____)

11.2.3 Repeat with the meter (+ terminal) connected to pin 9 (RESV+) and send the commands to the high order byte of OFFSETS. Verify the voltages are within the limits,and write the actual values on data sheet #6 or #22.

X:(_____) Y:(_____)

11.2.4 Connect an ammeter (common or minus terminal) between ground (pin 1) of the 25- pin D connector on the Round2D cable and (plus terminal) pin 23 (VSRC1). set CONTROL = 1000h.

X:(_____) Y:(_____)

11.2.5 Verify the current is within the limits and record the actual value on data sheet #7 or #23.

X:(_____) Y:(_____)

11.2.6 Repeat step 11.2.4 and 10.2.5 for pin 11 (VSRC2)

X:(_____) Y:(_____)

11.2.7 Connect the common terminal of a voltmeter to ground (pin 1 of the 25-pin D connector on the Round2D cable and the input terminal to pin 24 (Q1DRN).

X:(_____) Y:(_____)

11.2.8 Verify the voltage is within the limits and record the actual value on data sheet #7 or #23.

X:(_____) Y:(_____)

11.2.9 Select EDC address 23 (Reference +0.5 V voltage), CONTROL = 0037h. Verify the voltage is within the limits, and record the output voltage of the EDC.14.

X:(_____) Y:(_____)

11.3 Temperature

11.3.1 Connect an ammeter between SDAI and ground to measure the current supplied to the temperature sense diode. Probe the 25-pin D connector on the Round2D cable (Connector J1 for X, and J2 for Y) that mates with the 79-pin round connector (J1) of the TRE box. At the 25-pin D connector, SDAI is pin 19, and ground is pin 1.

X:(_____) Y:(_____)

11.3.2 Verify the SDAI Current is within the limits and record the actual values on data sheet #7 or #23.

X:(_____) Y:(_____)

11.3.3 Connect the appropriate axis connector of the Round2D cable to the TRE Test Stimulator. The 10 µA current should now flow through a 105 Kohm resistor.. This will produce a voltage of approximately 1.05 Volts, simulating a temperature indication of approximately 70K. Measure this voltage between TP 4 and TP 5 on the Test Stimulator, and record the value on data sheet #7 or #23.

X:(_____) Y:(_____)

11.3.4 Select EDC address 9 (CONTROL=0029h), (Silicon Diode Voltage), and measure the full differential output voltage of the EDC.

X:(_____) Y:(_____)

11.3.5 Verify and record the actual value on the data sheet.

X:(_____) Y:(_____)

11.3.6 While still connected to the Test Stimulator, select EDC address 13 (CONTROL=002Dh), (Temperature Servo error voltage) and monitor the EDC voltage. Command values to the DTEMP register, and observe that there is a range that the EDC voltage becomes small, and then increases with the other polarity.

X:(_____) Y:(_____)

11.3.7 Send DTEMP Hex command values indicated on the data sheets #7 or #23 and record the resulting voltage on the data sheet. No limits are established for this test

X:(_____) Y:(_____)

11.4 Heater DAC Output

11.4.1 Monitor the heater DAC output by connecting a voltmeter between pins 20 (HTRVO) and 7 (HTRRTN) of the 25 pin D connector of the Adapter cable. Command various values to the HEAT register and record the measured voltages. Voltages should increment from zero to +10 volts as the commands are increased from zero to 4095 (decimal).

X(_____) Y(_____)

11.4.2 Verify the Heater voltages (20 to 7) are within the Limits and record the actual values on Data Sheet #8 or #24.

X(_____) Y(_____)

11.4.3 Select engineering data channel address 11 (Temperature Command DAC full differential voltage).

X(_____) Y(_____)

11.4.4 Verify the full differential output voltage of the engineering data channel as the HEAT command is changed are within limits and record the actual values on Data Sheet. #9 or #25.

X(_____) Y(_____)

11.5 Photo Cathode Voltage DAC

11.5.1 Connect a voltmeter between ground (pin 1 of the 25 pin D connector of the Adapter cable) and PDK (pin 5). The voltage after initial power on should be approximately +3.0 volts. As the bias command is increased between 0 and 31, the voltage should decrease toward -12 volts.

X(_____) Y(_____)

11.5.2 Verify at PDK pin 5 the voltages are within limits and record the actual vales on Data Sheet. #10 or #26.

X(_____) Y(_____)

11.5.3 Select engineering data channel address 18 (Simulated Diode Bias Voltage)

X(_____) Y(_____)

11.5.4 Verify the engineering channel differential output voltage between XHNSHI and XHNSLO and record the actual values on Data Sheet #11 or #27.

X(_____) Y(_____)

11.6 Reset Clock Drive Levels

11.6.1 Connect an oscilloscope probe to measure the voltage at pin 17 (RJFG) of the 25 pin D connector of the Adapter cable. Trigger the oscilloscope on the positive going edge of the ATC strobe. Observe a positive going pulse with a baseline of -7 volts and an upper limit of -3.9 volts. Set INVRST high, and observe that the pulse becomes negative going from a baseline of -3.9 volts to -7 volts. Use a voltmeter to measure these levels, setting INHCYC high to stop the clocks, and record the voltage for INVRST low and high.

X(_____) Y(_____)

11.6.2 Verify the Pulse is as shown on data sheet #12 or #28.

X(_____) Y(_____)

11.6.3 Set the engineering data channel to select address 22 (Reset Drive Level voltage)

X(_____) Y(_____)

11.6.4 Verify the engineering channel differential output voltage between XHNSHI and XHNSLO for both states of INVRST, and record the actual values in Data Sheets #12 or #28.

X(_____) Y(_____)

11.7 Lo-pass Filter Frequency Response.

11.7.1 Command the gain bits to all ones. Connect the appropriate D connector tof the Round2D cable to the TRE Test Stimulator. Monitor the Plus X analog output signal (XNSIGHI) with the oscilloscope Connect the signal generator to the Test Stimulator, both toggle switches of the Stimulator on, and adjust the signal generator to 130 Hz and 0.2 Vp-p. Observe that the flat interval is longer than that observed in the previous test, and that it is within the peak-to-peak range of the sinusoid. Set INHCYC high (CONTROL = 0400h), and observe that the flat portions of the signal disappear.

X(_____) Y(_____)

Connect a meter to measure the rms. amplitude of the inverted signal output (XNSIGLO) and step the frequencies through the following frequencies, recording the rms. amplitude at each step. 5, 10, 25, 40, 70, 100, 150, 200, 300, 450, 500, 600, 800, 1000, 1500, 2500.

X(_____) Y(_____)

11.7.2 Verify The Plus Direction Amplitude are within the limits and record the actual values on Data Sheet #13 or #29.

X(_____) Y(_____)

11.7.3 Repeat these measurements using the Minus direction socket and the XPSIGHI and XPSIGLO connections.

X(_____) Y(_____)

11.7.4 Verify the Minus direction amplitude are within limits and record the actual values on Data Sheet #14 or #30.

X(_____) Y(_____)

11.8 Gain Step Size

Connect the voltmeter to measure the full differential voltage for the negative X signal (XNSIGHI to XNSIGLO). With the appropriate connector still connected to the Test Stimulator. set INHCYC high. Set the HP33120A Wave form Generator set at a frequency of 130 Hz and a peak to peak amplitude of 0.1 volts. Command the Minus direction gain to 15.

X(_____) Y(_____)

11.8.1 Verify the voltmeter reading is within limits and record the actual value in Data Sheet #15 or #31.

X(_____) Y(_____)

11.8.2 Repeat for gain code settings and peak to peak input voltages for the other settings shown in the Data Sheets.

X(_____) Y(_____)

11.8.3 Repeat 11.8 to 11.8.2 , using the Plus direction commands and circuits (XPSIGHI to XPSIGLO). Verify the voltages are within limits and record the actual values in Data Sheets #16 or #32.

X(_____) Y(_____)

11.9 Repeat Para 11.1 to 11.8.3 for Y Module and record the actual values in the data sheets.

(_____)

11.10 Operating Currents and Voltages

When the measurements for both directions have been completed, connect the TRE so that the X-axis is connected to a cold detector module, and the Y-axis is driven by the TRE Test Stimulator. Send the commands as indicated in the table below.

	Cold Module	Test Stimulator
Command	**X-axis settings**	**Y-axis settings**
CONTROL	1000h	1400h
DTEMP	tbd	0869h
HEAT	FFFFh	0000h
CLAMP	tbd	DCDCh
BIAS	AA00h	8800h
OFFSETS	tbd	8080h

Drive test box with with the signal generator set at 130 Hz, 2 Vp-p, both toggle switches on. Adjust the balance pots so the outputs have a dc value within 0.5 volts of zero.

(_____)

11.10.1 Turn the test rack power supply switch off. At the rear of the test rack, remove the connector going to the receptacle labelled +5 Volts, and connect it to the receptacle on the Power Insert Box, 8A01274, Sheet 2. Connect the plug from the Power Insert Box to the +5 Volts receptacle. Connect an ammeter between the green banana jacks and open S2 on the Power Insert Box. Assure that S1 and S3 are closed.

(_____)

11.10.1.1 Turn the test rack power supply switch on. Read the indicated current, and record the value on data sheet #33. Close the switch, S2.

(_____)

11.10.1.2 Turn the test rack power supply switch off. Remove the Power Insert Box and replace the plug into the +5Volts receptacle.

(_____)

11.10.2 At the rear of the test rack, remove the connector going to the receptacle labelled ±15 Volts, and connect it to the receptacle on the Power Insert Box. Connect the plug from the Power Insert Box to the ±15 Volts receptacle. S1, S2, and S3 should all be closed.

(_____)

11.10.2.1 Connect an ammeter between the red banana jacks and open S1 on the Power Insert Box. Assure that S2 and S3 are closed.

(_____)

11.10.2.2 Turn the test rack power supply switch on. Read the indicated current, and record the value on the data sheet. Close the switch, S1.

(_____)

11.10.2.3 Connect an ammeter between the orange banana jacks and open S3 on the Power Insert Box. Assure that S1 and S2 are closed.

(_____)

11.10.2.4 Read the indicated current, and record the value on the data sheet. Close the switch, S3.

(_____)

11.10.2.5 Turn the test rack power supply switch off. Remove the Power Insert Box and replace the plug into the ±15 Volts receptacle.

(_____)

11.10.3 Turn the test rack power on. At the front of the test rack, measure the three power supply voltages and record the values on the data sheet.

(_____)

12.0 Completion of Procedure

The results obtained in the performance of this test procedure are acceptable.

Test Engineer _____ Date _____

REE _____ Date _____

IDTL Leader _____ Date _____

This is to certify that the information obtained under this test procedure is as represented and the documentation is completed and correct.

Product Assurance _____ Date _____

13.0 Data Sheets (X - Modules)

X - Modules

TEST DATA
Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **CLAMPs**	DATA SHEET 1	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
PLUS Direction	**EDC Clamp Volts at 0623**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.1.2	0	0000	-0.00196	0.001959			
	1	0101	-0.01328	-0.00927			
	2	0202	-0.02459	-0.0205			
	23	1717	-0.26219	-0.25622			
	34	2222	-0.38664	-0.3797			
	104	6868	-1.17863	-1.16546			
	151	9797	-1.71039	-1.69304			
	154	9A9A	-1.74433	-1.72672			
	192	C0C0	-2.17426	-2.15327			
	228	E4E4	-2.58157	-2.55738			
	253	FDFD	-2.86442	-2.838			
	254	FEFE	-2.87574	-2.84923			
	255	FFFF	-2.88705	-2.86045			

TEST DATA

Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE		DATA SHEET 2
CLAMPs		

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
PLUS Direction	**EDC Feedback at 0624h**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN	Required Value MAX	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.1.3	0	0000	-0.00338	0.00337			
	1	0101	-0.02276	-0.01578			
	2	0202	-0.04214	-0.0349			
	23	1717	-0.44915	-0.4365			
	34	2222	-0.66234	-0.64686			
	104	6868	-2.01903	-1.98552			
	151	9797	-2.92995	-2.88434			
	154	9A9A	-2.9881	-2.94171			
	192	C0C0	-3.72458	-3.66841			
	228	E4E4	-4.42231	-4.35687			
	253	FDFD	-4.90684	-4.83496			
	254	FEFE	-4.92623	-4.85408			
	255	FFFF	-4.94561	-4.87321			

TEST DATA Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **CLAMPs**	DATA SHEET 3	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
Minus Direction	**EDC Clamp Volts at 0627**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN	Required Value MAX	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.1.4	0	0000	-0.00196	0.001959			
	1	0101	-0.01328	-0.00927			
	2	0202	-0.02459	-0.0205			
	23	1717	-0.26219	-0.25622			
	34	2222	-0.38664	-0.3797			
	104	6868	-1.17863	-1.16546			
	151	9797	-1.71039	-1.69304			
	154	9A9A	-1.74433	-1.72672			
	192	C0C0	-2.17426	-2.15327			
	228	E4E4	-2.58157	-2.55738			
	253	FDFD	-2.86442	-2.838			
	254	FEFE	-2.87574	-2.84923			
	255	FFFF	-2.88705	-2.86045			

TEST DATA Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE **CLAMPs**	DATA SHEET 4	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
MINUS Direction	**EDC Feedback at 0628h**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value in Volts	Pass or Fail	INITIALS & DATE
11.1.5	0	0000	-0.00338	0.00337			
	1	0101	-0.02276	-0.01578			
	2	0202	-0.04214	-0.0349			
	23	1717	-0.44915	-0.4365			
	34	2222	-0.66234	-0.64686			
	104	6868	-2.01903	-1.98552			
	151	9797	-2.92995	-2.88434			
	154	9A9A	-2.9881	-2.94171			
	192	C0C0	-3.72458	-3.66841			
	228	E4E4	-4.42231	-4.35687			
	253	FDFD	-4.90684	-4.83496			
	254	FEFE	-4.92623	-4.85408			
	255	FFFF	-4.94561	-4.87321			

TEST DATA Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Offset DAC Effect**	DATA SHEET 5	

TRE Engineering Unit	**SERIAL NO.**	TEST TECHNICIAN
	Low Byte SBIAS at D Connector Pin3	TEST ENGINEER

Para No.	Low Byte SBIAS Decimal No.	Low Byte SBIAS HEX No. xxDDh	RESV-(PIN 3) Min Value (mV)	RESV-(PIN 3) Max. Value (mV)	RESV-(PIN 3) Actual Value (mV)	**Pass or Fail**	**Initials & Date**
11.2.2	0	00	19.86	20.70			
	1	01	19.70	20.55			
	12	0C	17.96	18.80			
	47	2F	12.39	13.28			
	51	33	11.75	12.65			
	68	44	9.05	9.97			
	121	79	0.61	1.61			
	127	7F	-0.35	0.67			
	129	81	-0.67	0.35			
	162	A2	-5.94	-4.83			
	178	B2	-8.50	-7.34			
	215	D7	-14.42	-13.15			
	254	FE	-20.65	-19.28			
	255	FF	-20.81	-19.44			

TEST DATA
Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Offset DAC Effect**		DATA SHEET 6

TRE Engineering Unit	**SERIAL NO.**	TEST TECHNICIAN
	D Connector Pin 9	TEST ENGINEER

Para No.	High Byte SBIAS Decimal No.	High Byte SBIAS HEX No. DDxxh	RESV+ (PIN 9) Required Value (Min) (mV)	RESV+ (PIN 9) Required Value (Max) (mV)	RESV+ (PIN 9) Actual Value (mV)	Pass or Fail	Initials & Date
11.2.3	0	00	19.86	20.70			
	1	01	19.70	20.55			
	12	0C	17.96	18.80			
	47	2F	12.39	13.28			
	51	33	11.75	12.65			
	68	44	9.05	9.97			
	121	79	0.61	1.61			
	127	7F	-0.35	0.67			
	129	81	-0.67	0.35			
	162	A2	-5.94	-4.83			
	178	B2	-8.50	-7.34			
	215	D7	-14.42	-13.15			
	254	FE	-20.65	-19.28			
	255	FF	-20.81	-19.44			

TEST DATA

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		

Sheet (X Module)

DATA SHEET 7

TRE Engineering Unit	Serial No.	TEST TECHNICIAN
		TEST ENGINEER

Para No.	Requirement Description	Lower Limit	Upper Limit	Actual Value	Pass or Fail	Initials & Date
11.2.5	VSRC1 Current at Pin 23	-106 µA	-98 µA			
11.2.6	VSRC2 Current at Pin 11	-106 µA	-98 µA			
11.2.8	VDD Voltage Pin 24 (Q1DRN)	0.499 V	0.606 V			
11.2.9	EDC Address 23 CONTROL = 0037h	0.99 V	1.03 V			
	VRG (Pin 16) with respect to Pin 1 (Ground)	-4.083 V	-3.922V			
	Temperature					
11.3.2	SDIA Current at Pin 19 with respect to Pin 1 (Ground)	9.82 µA	10.22 µA			
11.3.3	Resistor, TP 4 to TP 5	1.029 V	1.071V			
11.3.5	Voltage at EDC address 9 CONTROL = 0029h	6.11 V	6.49 V			
	Temperature Servo Error Monitoring					
	CONTROL =002Dh	**DTEMP** command		**EDC 13 volts**		
11.3.7		0860h				
		0865h				
		0867h				
		0868h				
		0869h				
		086Ah				
		086Bh				
		086Fh				
		0878h				

TEST DATA

Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Heater DAC Output**		DATA SHEET 8
TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	Heater Voltage (20 to 7)	TEST ENGINEER

Para No.	Decimal No.	HEX No.	Required Value Min (Volts)	Required Value Max (Volts)	Actual Value (Volts)	Pass or Fail	Initials & Date
11.4.2	0	0000	-0.002	0.002			
	19	0013	0.044	0.049			
	146	0092	0.351	0.362			
	384	0180	0.926	0.949			
	484	01E4	1.168	1.196			
	848	0350	2.047	2.093			
	1012	03F4	2.444	2.498			
	1085	043D	2.620	2.678			
	1164	048C	2.811	2.872			
	1450	05AA	3.502	3.578			
	1796	0704	4.339	4.431			
	1987	07C3	4.800	4.902			
	2328	0918	5.625	5.743			
	2468	09A4	5.963	6.088			
	2858	0B2A	6.906	7.050			
	3201	0C81	7.735	7.895			
	3722	0E8A	8.994	9.180			
	4022	0FB6	9.719	9.920			
	4077	0FED	9.852	10.055			
	4090	0FFA	9.883	10.087			
	4095	0FFF	9.895	10.100			

TEST DATA
Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Heater DAC Output**		DATA SHEET 9
TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	EDC Address 11	TEST ENGINEER

Para No	Decimal Numbers	HEX Numbers	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS& DATE
11.4.4	0	0000	-0.002	0.002			
	19	0013	0.029	0.033			
	146	0092	0.233	0.242			
	384	0180	0.616	0.634			
	484	01E4	0.777	0.798			
	848	0350	1.363	1.397			
	1012	03F4	1.627	1.667			
	1085	043D	1.745	1.787			
	1164	048C	1.872	1.917			
	1450	05AA	2.332	2.388			
	1796	0704	2.889	2.958			
	1987	07C3	3.196	3.272			
	2328	0918	3.745	3.833			
	2468	09A4	3.970	4.064			
	2858	0B2A	4.598	4.706			
	3201	0C81	5.150	5.270			
	3722	0E8A	5.988	6.128			
	4022	0FB6	6.471	6.621			
	4077	0FED	6.560	6.712			
	4090	0FFA	6.581	6.733			
	4095	0FFF	6.589	6.742			

TEST DATA
Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE	DATA SHEET 10	
Photo diode Cathode Voltage DAC		

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	PDK, Pin 5	TEST ENGINEER

Para No	Command Value	Bias xxddH	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.5.2	0	0000	3.102	3.12			
	1	0001	2.623	2.634			
	5	0005	0.689	0.705			
	10	000A	-1.742	-1.692			
	12	000C	-2.714	-2.651			
	15	000F	-4.173	-4.089			
	20	0014	-6.604	-6.487			
	25	0019	-9.035	-8.884			
	30	001E	-11.466	-11.1			
	31	001F	-11.952	-11.1			

TEST DATA
Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Photo diode Cathode Voltage DAC**		DATA SHEET 11

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	EDC Address 18	TEST ENGINEER

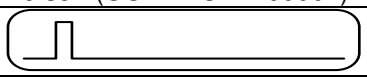
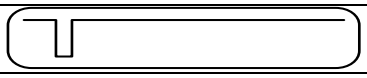
Para No	Command Value		Required Value MIN(Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.5.4	0	0000	2.065	2.083			
	1	0001	1.746	1.758			
	5	0005	0.459	0.471			
	10	000A	-1.163	-1.127			
	12	000C	-1.812	-1.765			
	15	000F	-2.785	-2.723			
	20	0014	-4.408	-4.319			
	25	0019	-6.031	-5.915			
	30	001E	-7.653	-7.391			
	31	001F	-7.978	-7.391			

TEST DATA

Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Reset Clock Drive Levels**		DATA SHEET 12

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
		TEST ENGINEER

Para No.	Requirement Description	Required Value MIN Volts	Required Value Max Volts	Actual Value Volts	Pass or Fail	Initials & Date
11.7.0	At Pin 17 (RJFG) of 25 Pin D Connector Verify Positive Going Pulse . (CONTROL = 0000h)					
		NA	NA			
	Verify Negative Going Pulse (CONTROL = 0100h)					
		NA	NA			
	CONTROL= 0436h INVRST=0 Measure RJFG at Pin 17	-7.05631	-6.90202			
	CONTROL = 0536h INVRST=1 Measure RJFG at Pin 17	-3.94859	-3.81465			
11.6.4	CONTROL= 0436h INVRST=0 Measure EDC Address at 22	-7.05641	-6.90192			
	CONTROL = 0536h INVRST=1 Measure EDC Address at 22	-- 3.94869	-3.81455			

TEST DATA Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		

TEST DATA TITLE	DATA SHEET
Lo-Pass Filter Frequency Response	13

TRE Engineering Unit	**SERIAL NO.**	TEST TECHNICIAN
Set Input Amplitude to 0.2 Volts P-P	**Plus Direction Amplitude**	TEST ENGINEER

Para No	Test Frequency Hertz	Required Value MIN rms. Volts	Required Value MAX rms. Volts	Actual Value rms. Volts	Pass or Fail	INITIALS & DATE
11.7.2	5	4.828	5.031			
	10	4.941	5.150			
	25	4.981	5.192			
	40	4.987	5.196			
	70	4.989	5.197			
	100	4.986	5.194			
	150	4.969	5.176			
	200	4.924	5.133			
	300	4.676	4.899			
	450	3.857	4.050			
	500	3.507	3.688			
	600	2.827	2.979			
	800	1.806	1.906			
	1000	1.210	1.274			
	1500	0.554	0.585			
	2500	0.203	0.215			

TEST DATA Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE		DATA SHEET 14
Lo-Pass Filter Frequency Response		

TRE Engineering Unit	**Serial no.**	TEST TECHNICIAN
Set Input Amplitude to 0.2 Volts P-P	**Minus Direction Amplitude**	TEST ENGINEER

Para No	Test Frequency Hertz		Required Value MIN rms.Volts	Required Value MAX rms. Volts	Actual Value rms. Volts	Pass or Fail	INITIALS & DATE
11.7.4	5		4.828	5.031			
	10		4.941	5.150			
	25		4.981	5.192			
	40		4.987	5.196			
	70		4.989	5.197			
	100		4.986	5.194			
	150		4.969	5.176			
	200		4.924	5.133			
	300		4.676	4.899			
	450		3.857	4.050			
	500		3.507	3.688			
	600		2.827	2.979			
	800		1.806	1.906			
	1000		1.210	1.274			
	1500		0.554	0.585			
	2500		0.203	0.215			

TEST DATA

Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE **Gain Step Size**	DATA SHEET 15	
TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	Minus Direction Voltage	TEST ENGINEER

Para No.	HEX	Set Gain Code	Set Input Voltage P-P	Expected Differential output Volts rms.	Required Value Min (Volts)	Required Value Max (Volts)	Actual Value Volts	Pass or Fail	Initial & Date
11.8.1	F	15	0.1	5.1	4.981	5.209			
11.8.3	E	14	0.2	7.22	7.044	7.363			
	D	13	0.2	5.1	4.978	5.205			
	C	12	0.2	3.61	3.516	3.678			
	B	11	0.5	6.38	6.208	6.486			
	A	10	0.5	4.51	4.369	4.565			
	9	9	1	6.38	6.117	6.391			
	8	8	1	4.51	4.238	4.429			
	7	7	1	3.19	2.872	3.002			
	6	6	2	4.51	3.713	3.879			
	5	5	2	3.19	3.713	3.879			
	4	4	2	2.26	2.575	2.693			
	3	3	5	3.99	4.384	4.578			
	2	2	5	2.82	2.854	2.982			
	1	1	10	3.99	5.715	5.965			
	0	0	10	2.82	4.039	4.217			

TEST DATA
Sheet (X Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		

TEST DATA TITLE	DATA SHEET
Gain Step Size	16

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	Plus Direction Voltage	TEST ENGINEER

Para No.	HEX	Set Gain Code	Set Input Voltage P-P	Expected Differential output Volts rms.	Required Value Min (Volts)	Required Value Max (Volts)	Actual Value Volts	Pass or Fail	Initials & Date
11.8.4	F	15	0.1	5.1	4.981	5.209			
	E	14	0.2	7.22	7.044	7.363			
	D	13	0.2	5.1	4.978	5.205			
	C	12	0.2	3.61	3.516	3.678			
	B	11	0.5	6.38	6.208	6.486			
	A	10	0.5	4.51	4.369	4.565			
	9	9	1	6.38	6.117	6.391			
	8	8	1	4.51	4.238	4.429			
	7	7	1	3.19	2.872	3.002			
	6	6	2	4.51	3.713	3.879			
	5	5	2	3.19	3.713	3.879			
	4	4	2	2.26	2.575	2.693			
	3	3	5	3.99	4.384	4.578			
	2	2	5	2.82	2.854	2.982			
	1	1	10	3.99	5.715	5.965			
	0	0	10	2.82	4.039	4.217			

14.0 Data Sheets (Y - Modules)

Y - Modules

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE **CLAMPs**	DATA SHEET 17	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
PLUS Direction	**EDC Clamp Volts at 0623**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.1.2	0	0000	-0.00196	0.001959			
	1	0101	-0.01328	-0.00927			
	2	0202	-0.02459	-0.0205			
	23	1717	-0.26219	-0.25622			
	34	2222	-0.38664	-0.3797			
	104	6868	-1.17863	-1.16546			
	151	9797	-1.71039	-1.69304			
	154	9A9A	-1.74433	-1.72672			
	192	C0C0	-2.17426	-2.15327			
	228	E4E4	-2.58157	-2.55738			
	253	FDFD	-2.86442	-2.838			
	254	FEFE	-2.87574	-2.84923			
	255	FFFF	-2.88705	-2.86045			

TEST DATA Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **CLAMPs**	DATA SHEET 18	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
PLUS Direction	**EDC Feedback at 0624**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN	Required Value MAX	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.1.3	0	0000	-0.00338	0.00337			
	1	0101	-0.02276	-0.01578			
	2	0202	-0.04214	-0.0349			
	23	1717	-0.44915	-0.4365			
	34	2222	-0.66234	-0.64686			
	104	6868	-2.01903	-1.98552			
	151	9797	-2.92995	-2.88434			
	154	9A9A	-2.9881	-2.94171			
	192	C0C0	-3.72458	-3.66841			
	228	E4E4	-4.42231	-4.35687			
	253	FDFD	-4.90684	-4.83496			
	254	FEFE	-4.92623	-4.85408			
	255	FFFF	-4.94561	-4.87321			

TEST DATA Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **CLAMPs**	DATA SHEET 19	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
Minus Direction	**EDC Clamp Voltage at 0627**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN	Required Value MAX	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.1.4	0	0000	-0.00196	0.001959			
	1	0101	-0.01328	-0.00927			
	2	0202	-0.02459	-0.0205			
	23	1717	-0.26219	-0.25622			
	34	2222	-0.38664	-0.3797			
	104	6868	-1.17863	-1.16546			
	151	9797	-1.71039	-1.69304			
	154	9A9A	-1.74433	-1.72672			
	192	C0C0	-2.17426	-2.15327			
	228	E4E4	-2.58157	-2.55738			
	253	FDFD	-2.86442	-2.838			
	254	FEFE	-2.87574	-2.84923			
	255	FFFF	-2.88705	-2.86045			

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **CLAMPs**	DATA SHEET 20	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
MINUS Direction	**EDC Feedback at 0628**	TEST ENGINEER

Para No	Decimal Numbers	CLAMP Command HEX	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value in Volts	Pass or Fail	INITIALS & DATE
11.1.5	0	0000	-0.00338	0.00337			
	1	0101	-0.02276	-0.01578			
	2	0202	-0.04214	-0.0349			
	23	1717	-0.44915	-0.4365			
	34	2222	-0.66234	-0.64686			
	104	6868	-2.01903	-1.98552			
	151	9797	-2.92995	-2.88434			
	154	9A9A	-2.9881	-2.94171			
	192	C0C0	-3.72458	-3.66841			
	228	E4E4	-4.42231	-4.35687			
	253	FDFD	-4.90684	-4.83496			
	254	FEFE	-4.92623	-4.85408			
	255	FFFF	-4.94561	-4.87321			

TEST DATA

Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Offset DAC Effect**		DATA SHEET 21

TRE Engineering Unit	**SERIAL NO.**	TEST TECHNICIAN
Low Byte BIAS	**Measured at D Connector Pin3**	TEST ENGINEER

Para No.	Low Byte SBIAS Decimal No.	Low Byte SBIAS HEX No. xxDDh	RESV- (PIN 3) Min Value (mV)	RESV- (PIN 3) Max. Value (mV)	RESV- (PIN 3) Actual Value (mV)	**Pass or Fail**	**Initials & Date**
11.2.2	0	00	19.86	20.70			
	1	01	19.70	20.55			
	12	0C	17.96	18.80			
	47	2F	12.39	13.28			
	51	33	11.75	12.65			
	68	44	9.05	9.97			
	121	79	0.61	1.61			
	127	7F	-0.35	0.67			
	129	81	-0.67	0.35			
	162	A2	-5.94	-4.83			
	178	B2	-8.50	-7.34			
	215	D7	-14.42	-13.15			
	254	FE	-20.65	-19.28			
	255	FF	-20.81	-19.44			

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE		DATA SHEET
Offset DAC Effect		22

TRE Engineering Unit	**SERIAL NO.**	TEST TECHNICIAN
	D Connector Pin 9	TEST ENGINEER

Para No.	High Byte SBIAS Decimal No.	High Byte SBIAS HEX . DDxxh	Required Value (Min) (mV)	Required Value (Max) (mV)	RESV+ (PIN 9) Actual Value (mV)	Pass or Fail	Initials & Date
11.2.3	0	00	19.86	20.70			
	1	01	19.70	20.55			
	12	0C	17.96	18.80			
	47	2F	12.39	13.28			
	51	33	11.75	12.65			
	68	44	9.05	9.97			
	121	79	0.61	1.61			
	127	7F	-0.35	0.67			
	129	81	-0.67	0.35			
	162	A2	-5.94	-4.83			
	178	B2	-8.50	-7.34			
	215	D7	-14.42	-13.15			
	254	FE	-20.65	-19.28			
	255	FF	-20.81	-19.44			

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
		DATA SHEET 23

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
		TEST ENGINEER

Para No.	Requirement Description	Lower Limit	Upper Limit	Actual Value	Pass or Fail	Initials & Date
11.2.5	VSRC1 Current at Pin 23	-106 µA	-98 µA			
11.2.6	VSRC2 Current at Pin 11	-106 µA	-98 µA			
11.2.8	VDD Voltage Pin 24 (Q1DRN)	0.499 V	0.606 V			
11.2.9	EDC Address 23 CONTROL = 0037h	0.99 V	1.03 V			
	VRG (Pin 16) with respect to Pin 1 (Ground)	-4.083 V	-3.922V			
	Temperature					
11.3.2	SDIA Current at Pin 19 with respect to Pin 1 (Ground)	9.82 µA	10.22 µA			
11.3.3	Resistor, TP 4 to TP 5	1.029 V	1.071V			
11.3.5	Voltage at EDC address 9 CONTROL = 0029h	6.11 V	6.49 V			
	Temperature Servo Error Monitoring					
	CONTROL =002Dh	**DTEMP** command		**EDC 13 volts**		
11.3.7		0860h				
		0865h				
		0867h				
		0868h				
		0869h				
		086Ah				
		086Bh				
		086Fh				
		0878h				

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE	DATA SHEET 24	
Heater DAC Output		

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	Heater Voltage (20 to 7)	TEST ENGINEER

Para No.	Decimal No.	HEX No.	Required Value Min (Volts)	Required Value Max (Volts)	Actual Value (Volts)	Pass or Fail	Initials & Date
11.4.2	0	0000	-0.002	0.002			
	19	0013	0.044	0.049			
	146	0092	0.351	0.362			
	384	0180	0.926	0.949			
	484	01E4	1.168	1.196			
	848	0350	2.047	2.093			
	1012	03F4	2.444	2.498			
	1085	043D	2.620	2.678			
	1164	048C	2.811	2.872			
	1450	05AA	3.502	3.578			
	1796	0704	4.339	4.431			
	1987	07C3	4.800	4.902			
	2328	0918	5.625	5.743			
	2468	09A4	5.963	6.088			
	2858	0B2A	6.906	7.050			
	3201	0C81	7.735	7.895			
	3722	0E8A	8.994	9.180			
	4022	0FB6	9.719	9.920			
	4077	0FED	9.852	10.055			
	4090	0FFA	9.883	10.087			
	4095	0FFF	9.895	10.100			

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Heater DAC Output**		DATA SHEET 25
TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	EDC Address 11	TEST ENGINEER

Para No	Decimal Numbers	HEX Numbers	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.4.4	0	0000	-0.002	0.002			
	19	0013	0.029	0.033			
	146	0092	0.233	0.242			
	384	0180	0.616	0.634			
	484	01E4	0.777	0.798			
	848	0350	1.363	1.397			
	1012	03F4	1.627	1.667			
	1085	043D	1.745	1.787			
	1164	048C	1.872	1.917			
	1450	05AA	2.332	2.388			
	1796	0704	2.889	2.958			
	1987	07C3	3.196	3.272			
	2328	0918	3.745	3.833			
	2468	09A4	3.970	4.064			
	2858	0B2A	4.598	4.706			
	3201	0C81	5.150	5.270			
	3722	0E8A	5.988	6.128			
	4022	0FB6	6.471	6.621			
	4077	0FED	6.560	6.712			
	4090	0FFA	6.581	6.733			
	4095	0FFF	6.589	6.742			

TEST DATA Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Photo diode Cathode Voltage DAC**	DATA SHEET 26	

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	PDK, Pin 5	TEST ENGINEER

Para No	Command Value	Bias xxddH	Required Value MIN (Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	INITIALS & DATE
11.5.2	0	0000	3.102	3.12			
	1	0001	2.623	2.634			
	5	0005	0.689	0.705			
	10	000A	-1.742	-1.692			
	12	000C	-2.714	-2.651			
	15	000F	-4.173	-4.089			
	20	0014	-6.604	-6.487			
	25	0019	-9.035	-8.884			
	30	001E	-11.466	-11.1			
	31	001F	-11.952	-11.1			

TEST DATA Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Photo diode Cathode Voltage DAC**	DATA SHEET 27	

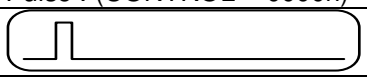
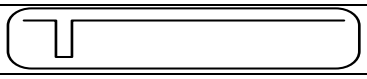
TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	EDC Address 18	TEST ENGINEER

Para No	Command Value	Bias xxddH	Required Value MIN(Volts)	Required Value MAX (Volts)	Actual Value Volts	Pass or Fail	Initials & Date
11.5.4	0	0000	2.065	2.083			
	1	0001	1.746	1.758			
	5	0005	0.459	0.471			
	10	000A	-1.163	-1.127			
	12	000C	-1.812	-1.765			
	15	000F	-2.785	-2.723			
	20	0014	-4.408	-4.319			
	25	0019	-6.031	-5.915			
	30	001E	-7.653	-7.391			
	31	001F	-7.978	-7.391			

TEST DATA Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Reset Clock Drive Levels**		DATA SHEET 28

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
		TEST ENGINEER

Para No.	Requirement Description	Required Value MIN Volts	Required Value Max Volts	Actual Value Volts	Pass or Fail	Initials & Date
11.7.0	At Pin 17 (RJFG) of 25 Pin D Connector Verify Positive Going Pulse . (CONTROL = 0000h)					
		NA	NA			
	Verify Negative Going Pulse (CONTROL = 0100h)					
		NA	NA			
	CONTROL= 0436h INVRST=0 Measure RJFG at Pin 17	-7.05631	-6.90202			
	CONTROL = 0536h INVRST=1 Measure RJFG at Pin 17	-3.94859	-3.81465			
11.6.4	CONTROL= 0436h INVRST=0 Measure EDC Address at 22	-7.05641	-6.90192			
	CONTROL = 0536h INVRST=1 Measure EDC Address at 22	--3.94869	-3.81455			

TEST DATA Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE		DATA SHEET
Lo-Pass Filter Frequency Response		29

TRE Engineering Unit	**SERIAL NO.**	TEST TECHNICIAN
Set Input Amplitude to 0.2 Volts P-P	**Plus Direction Amplitude**	TEST ENGINEER

Para No	Test Frequency Hertz	Required Value MIN rms. Volts	Required Value MAX rms. Volts	Actual Value rms. Volts	Pass or Fail	INITIALS & DATE
11.7.2	5	4.828	5.031			
	10	4.941	5.150			
	25	4.981	5.192			
	40	4.987	5.196			
	70	4.989	5.197			
	100	4.986	5.194			
	150	4.969	5.176			
	200	4.924	5.133			
	300	4.676	4.899			
	450	3.857	4.050			
	500	3.507	3.688			
	600	2.827	2.979			
	800	1.806	1.906			
	1000	1.210	1.274			
	1500	0.554	0.585			
	2500	0.203	0.215			

TEST DATA

Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Lo-Pass Filter Frequency Response**		DATA SHEET 30
TRE Engineering Unit	**Serial no.**	TEST TECHNICIAN
Set Input Amplitude to 0.2 Volts P-P	**Minus Direction Amplitude**	TEST ENGINEER

Para No	Test Frequency Hertz	Required Value MIN rms. Volts	Required Value MAX rms. Volts	Actual Value rms Volts	Pass or Fail	INITIALS & DATE
11.7.4	5	4.828	5.031			
	10	4.941	5.150			
	25	4.981	5.192			
	40	4.987	5.196			
	70	4.989	5.197			
	100	4.986	5.194			
	150	4.969	5.176			
	200	4.924	5.133			
	300	4.676	4.899			
	450	3.857	4.050			
	500	3.507	3.688			
	600	2.827	2.979			
	800	1.806	1.906			
	1000	1.210	1.274			
	1500	0.554	0.585			
	2500	0.203	0.215			

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		

TEST DATA TITLE	DATA SHEET
Gain Step Size	31

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	Minus Direction Voltage	TEST ENGINEER

Para No.	HEX	Set Gain Code	Set Input Voltage P-P	Expected Differential output Volts rms.	Required Value Min (Volts)	Required Value Max (Volts)	Actual Value Volts	Pass or Fail	Initials & Date
11.8.1	F	15	0.1	5.1	4.981	5.209			
11.8.3	E	14	0.2	7.22	7.044	7.363			
	D	13	0.2	5.1	4.978	5.205			
	C	12	0.2	3.61	3.516	3.678			
	B	11	0.5	6.38	6.208	6.486			
	A	10	0.5	4.51	4.369	4.565			
	9	9	1	6.38	6.117	6.391			
	8	8	1	4.51	4.238	4.429			
	7	7	1	3.19	2.872	3.002			
	6	6	2	4.51	3.713	3.879			
	5	5	2	3.19	3.713	3.879			
	4	4	2	2.26	2.575	2.693			
	3	3	5	3.99	4.384	4.578			
	2	2	5	2.82	2.854	2.982			
	1	1	10	3.99	5.715	5.965			
	0	0	10	2.82	4.039	4.217			

TEST DATA
Sheet (Y Module)

TEST PROCEDURE TYPE & NUMBER	REV	TEST DATE
TRE Engineering Unit Test Procedure		
TEST DATA TITLE: **Gain Step Size**		DATA SHEET 32

TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN
	Plus Direction Voltage	TEST ENGINEER

Para No.	HEX	Set Gain Code	Set Input Voltage P-P	Expected Differential output Volts rms.	Required Value Min (Volts)	Required Value Max (Volts)	Actual Value Volts	Pass or Fail	Initials & Date
11.8.4	F	15	0.1	5.1	4.981	5.209			
	E	14	0.2	7.22	7.044	7.363			
	D	13	0.2	5.1	4.978	5.205			
	C	12	0.2	3.61	3.516	3.678			
	B	11	0.5	6.38	6.208	6.486			
	A	10	0.5	4.51	4.369	4.565			
	9	9	1	6.38	6.117	6.391			
	8	8	1	4.51	4.238	4.429			
	7	7	1	3.19	2.872	3.002			
	6	6	2	4.51	3.713	3.879			
	5	5	2	3.19	3.713	3.879			
	4	4	2	2.26	2.575	2.693			
	3	3	5	3.99	4.384	4.578			
	2	2	5	2.82	2.854	2.982			
	1	1	10	3.99	5.715	5.965			
	0	0	10	2.82	4.039	4.217			

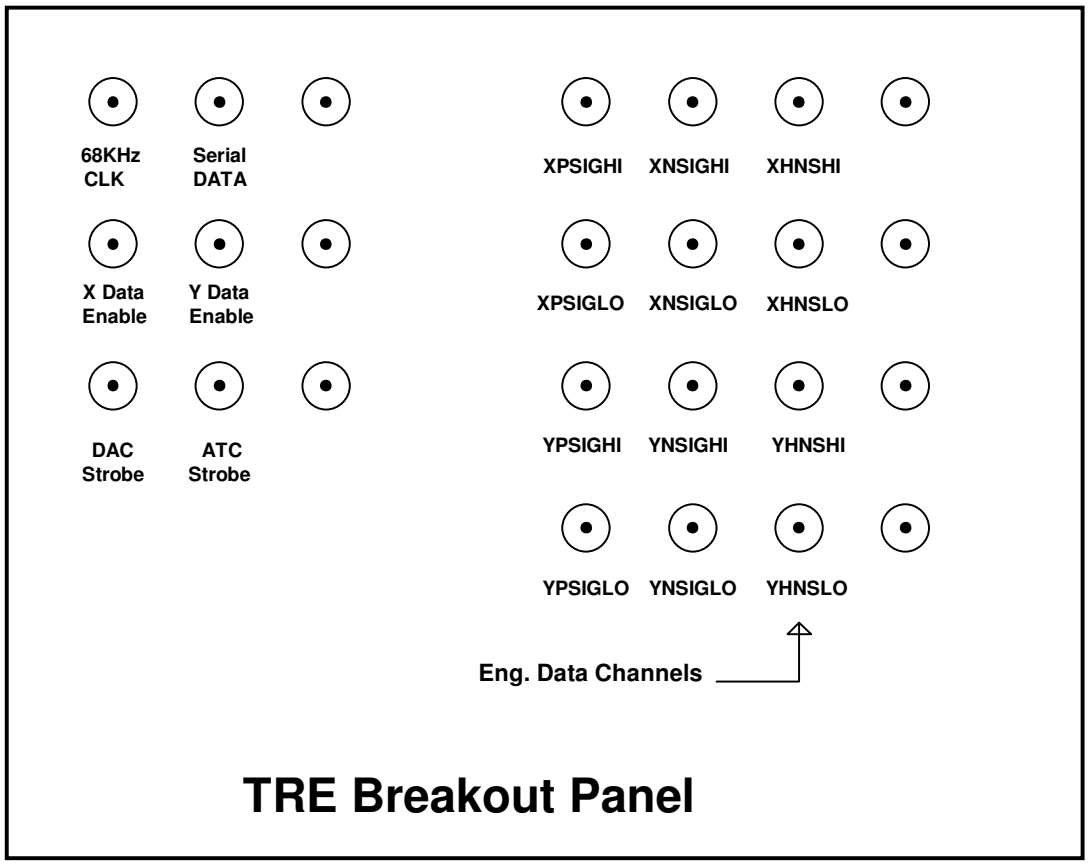
TEST DATA Sheet	TEST PROCEDURE TYPE TRE Engineering Unit Test Procedure	REV	TEST DATE
	TEST DATA TITLE **Power Consumption**	DATA SHEET 33	
TRE Engineering Unit	**Serial No.**	TEST TECHNICIAN	
		TEST ENGINEER	

Para No.	**Test Location Power Insert Box**	**Actual Value, milliamps**		**Initials & Date**	
11.10.1.1	Green Jacks (+5 Volts)				
11.10.2.2	Red Jacks (+15 Volts)				
11.10.2.3	Orange Jacks (-15 Volts)				
Para No.	**Test Location Front Power Panel**	**Actual Value, Volts**		**Initials & Date**	
11.10.3	Green/Black (+5 Volts)				
11.10.3	Red/Black (+15 Volts)				
11.10.3	Orange/Black (-15 Volts)				

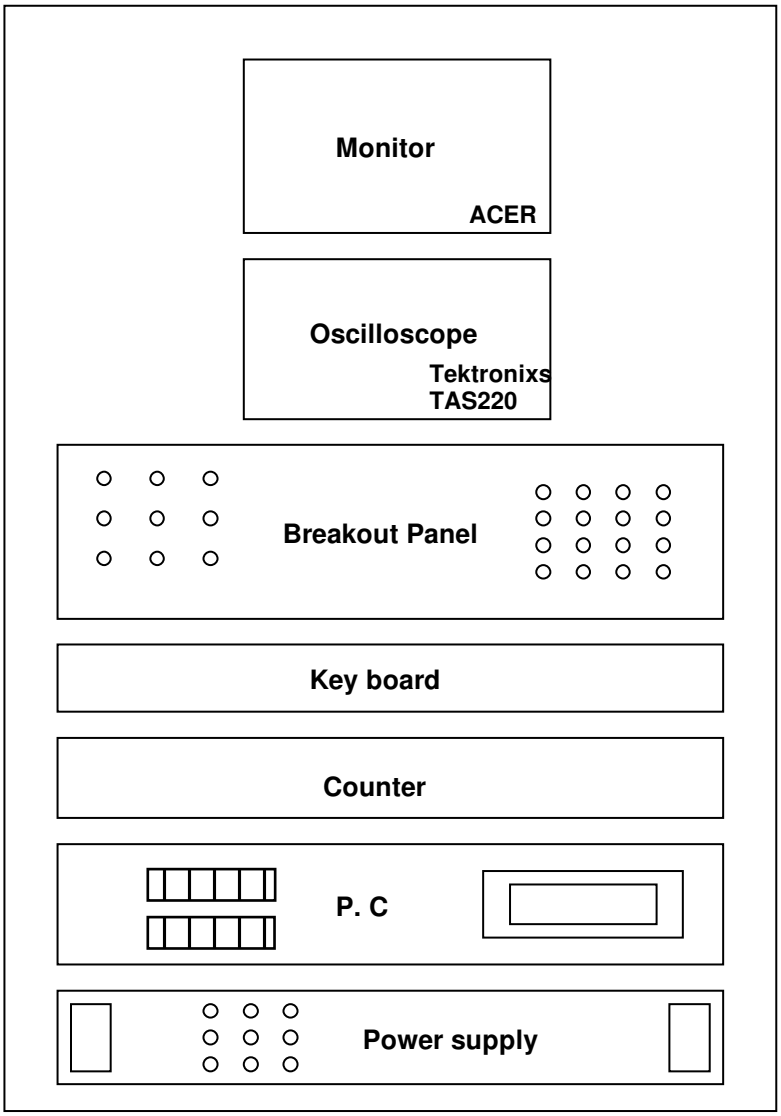
15. Appendices

The following sheets show locations of some of the features of the TRE ground support Test Racks.

15.1 TRE Breakout Panel



15.2 TRE Support Rack Layout



TRE Support Rack Layout