



| REVISIONS |     |             |         |                    |
|-----------|-----|-------------|---------|--------------------|
| LTR       | ECO | DESCRIPTION | DATE    | APPROVED           |
| A         |     | See DCN     | 4/27/81 | <i>[Signature]</i> |
| B         |     | See DCN     | 5/12/81 | <i>[Signature]</i> |
| C         |     | See DCN     | 6/30/81 | <i>[Signature]</i> |

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| SIGNATURE    |                    | DATE    | TITLE                       |       |
|--------------|--------------------|---------|-----------------------------|-------|
| TEST         | <i>[Signature]</i> | 3/24/81 | DI325-Q2                    |       |
| ENGINEERING  | <i>[Signature]</i> | 3/23/81 | Digital Encoder, Four Input |       |
| QUAL CONTROL | <i>[Signature]</i> | 3/26/81 | NUMBER                      | REV   |
|              |                    |         | ATP #452                    | C     |
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1.0 SCOPE

This document defines the acceptance test procedure (ATP) for the DI325-Q2, Signal Conditioning four input status module. The ATP performs functional checks of all operating characteristics. A sample test report to be used with the ATP is contained in Appendix A.

2.0 EQUIPMENT REQUIRED

Table 1 lists the test equipment required to perform the ATP.

TABLE 1 EQUIPMENT REQUIRED FOR ATP

| Description               | Manufacturer   | Part No. or Model | Alternate             |
|---------------------------|----------------|-------------------|-----------------------|
| MC1-X                     | Validyne       | --                | None                  |
| Extender Card (MC1-MC170) | Validyne       | --                | None                  |
| Two Digital Multimeters   | Data Precision | 248               | Commercial Equivalent |
| Oscilloscope              | B&K            | 1470              | Commercial Equivalent |
| Function Generator        | Exact          | 100               | Commercial Equivalent |
| Frequency Counter         | HP             | 5314A             | Commercial Equivalent |
| Audio Amplifier           | McIntosh       | 60                | Commercial Equivalent |
| Power Supply              | Lambda         | LPD-4 22A-FM      | Commercial Equivalent |
| Megohmmeter               | General Radio  | 1864              | Commercial Equivalent |

3.0 PRELIMINARY PROCEDURE

- 3.1 Refer to Circuit Board Assembly No. Q10033 and visually check the unit for completeness and accuracy.
- 3.2 Refer to Figure 1 and visually inspect R3, R14, R24 and R34. These resistors should be 10K ohm each.
- 3.3 Visually inspect fuse F1 for current rating. It should be rated at 3/8A (Figure 1).
- 3.4 Connect a megohmmeter between input pins 14 and 10. Set megohmmeter to 1000V and 10 G-ohm range. The measured isolation resistance should be 1 G ohm minimum. Indicate acceptance by checkmark on test report.

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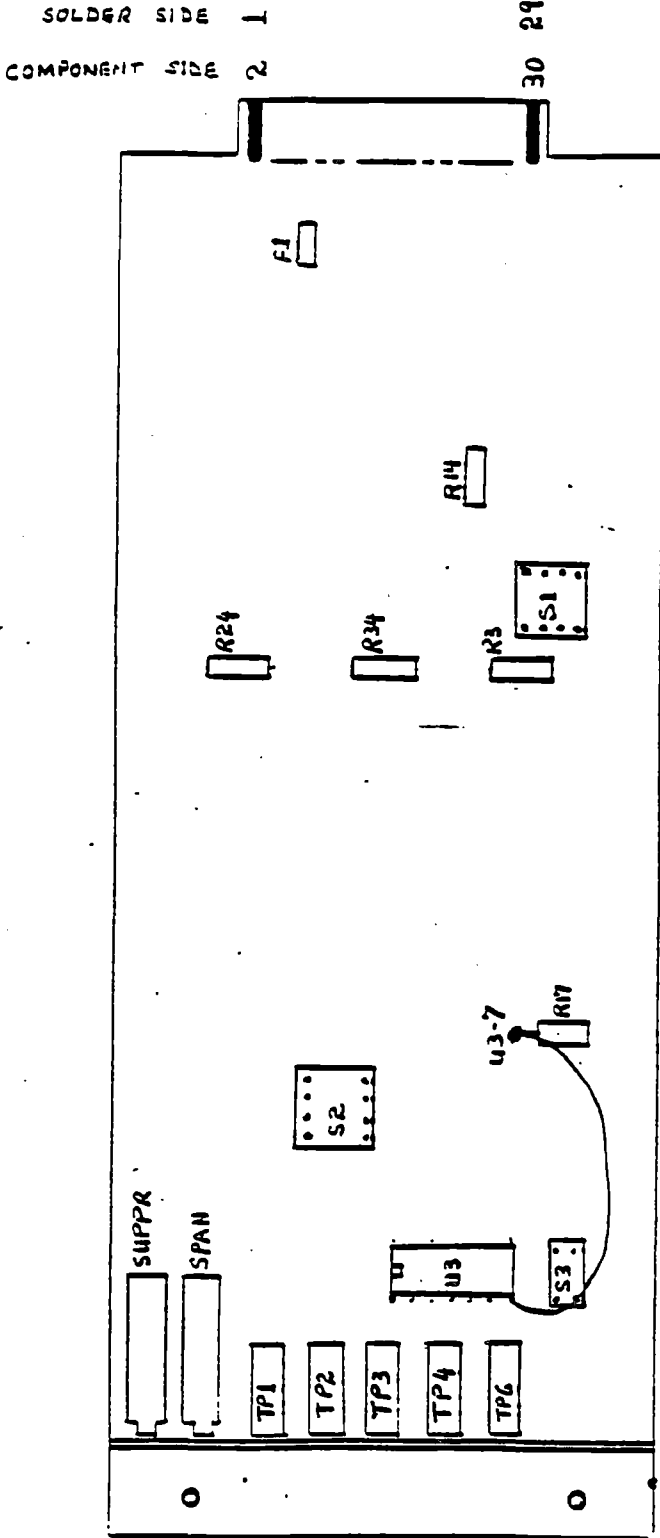


FIGURE 1. DI-325-Q2 PARTS LOCATIONS.

|      |   |      |   |       |       |       |       |       |             |
|------|---|------|---|-------|-------|-------|-------|-------|-------------|
| SUPP | ⊗ | GAIN | ⊗ | ○ 1P1 | ○ 1P2 | ○ 1P3 | ○ 1P4 | ○ 000 | 01226<br>V7 |
|------|---|------|---|-------|-------|-------|-------|-------|-------------|

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4.0 INITIAL TEST SET UP

4.1 Connect MC1-X, extender card, digital multimeters (DMM's), power supply and oscilloscope as shown in Figure 2.

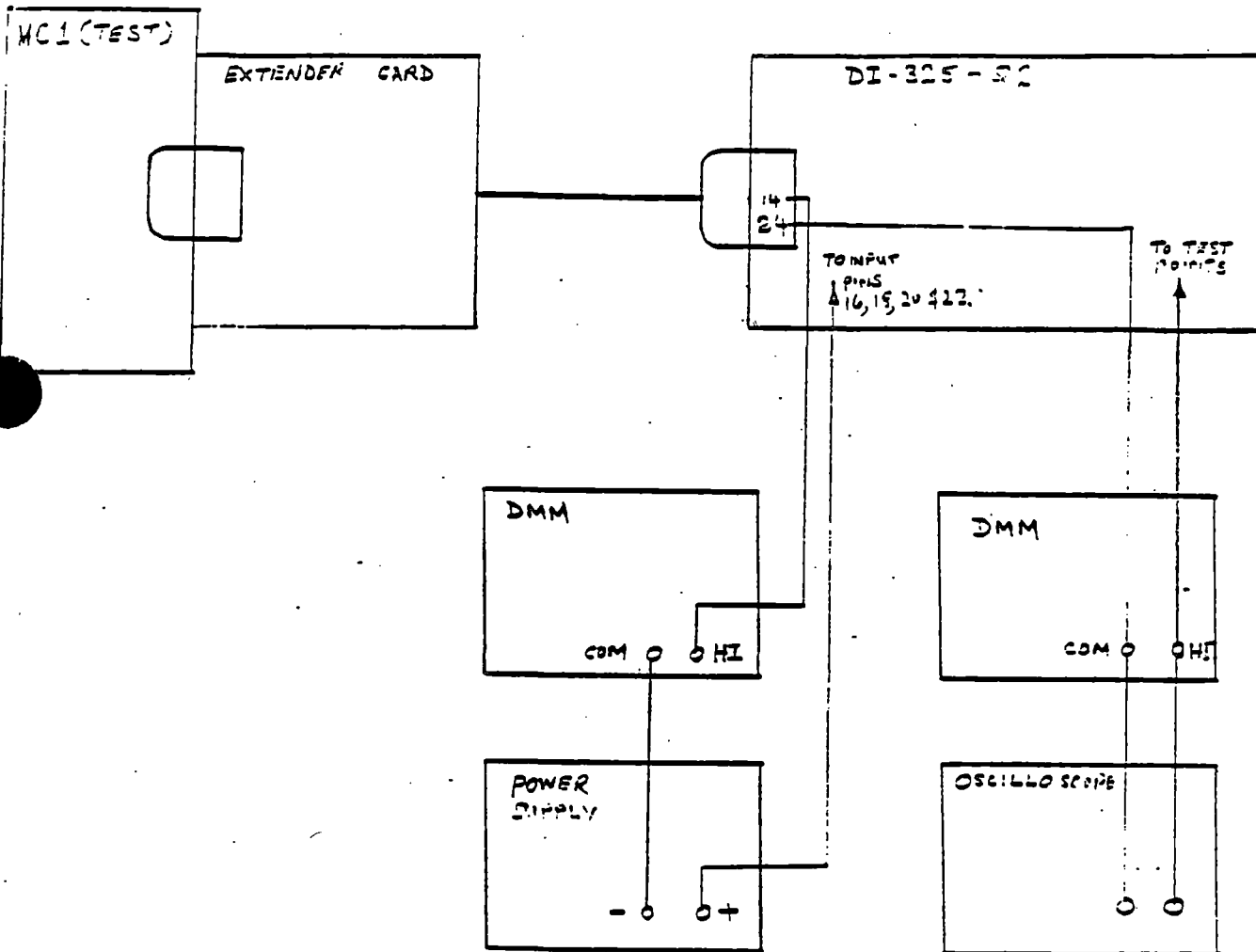


FIGURE 2. INITIAL TEST SETUP

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- 4.2 Refer to Figure 1. Set S1-1 thru S1-4, S2-1 thru S2-4 and S3-1 thru S3-2 to open position.
- 4.3 Plug DI325-Q2 into extender card cable connector.
- 4.4 If necessary, connect MCl-X to 115 Vac and press MCl-X power switch. Observe that power-on indicator lights.
- 4.5 Set the DMM in series with the power supply to mAdc and 100 range.
- 4.6 Set the DMM, connected to test point (TP1) to DC volts and 100 V range.
- 4.7 Set oscilloscope, connected to test point (TP1) to DC coupled.
- 4.8 Set power supply (P.S.) for 0.00 Vdc output.
- 4.9 Connect DMM to Input Pin 14.
- 4.10 Connect P.S. (+) output to input pin 20 on DI325-Q2.
- 4.11 Connect P.S. (-) output and DMM (-) input together.
- 4.12 Switch P.S. on.
- 5.0 FORWARD AND REVERSE SETTINGS OF S2
- 5.1 Measure DC voltage at U3 Pin 7 (location on Figure 1), and record for reference  $E_{10V} = \underline{\hspace{2cm}}$ .  $E_{10V}$  should be  $+10.0 \pm 0.5$ -Vdc.
- 5.2 With signal input power supply turned off, TP1 voltage shall  $E_{0V} = +0.08 \pm 0.05$  Vdc. Record  $E_{0V} = \underline{\hspace{2cm}}$ .
- 5.3 Switch P.S. on and adjust signal input power supply to 12 mAdc. TP1 voltage should equal  $E_{10V} \pm 0.02$  Vdc. Indicate acceptance with check mark on test report.
- 5.4 Set S2-1 in CLOSED position. TP1 voltage shall equal  $E_{0V} \pm 0.05$  Vdc. (Adjust R48 to obtain this result.) Indicate acceptance with checkmark on test report.
- 5.5 Turn off the signal input power supply. TP1 voltage shall equal  $E_{10V} \pm 0.25$  Vdc. Indicate acceptance with checkmark on test report.
- 5.6 Set S2-1 to OPEN position.

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6.0 DC THRESHOLD CHECK

6.1 Turn the voltage adjust potentiometer of the PS fully counter-clockwise (CCW).

6.2 Switch on the PS.

6.3 Slowly increase P.S. output to where TP1 output goes to  $10.00 \pm .500$  VDC. (This will be seen as an abrupt change, referred to as threshold, on the oscilloscope. The input current at this point should be  $7.0 \pm 0.7$  mADC. Indicate acceptance by checkmark on test report. Increase P.S. output to make input current  $10.0 \pm .5$  mADC.

6.4 Set switch S2-1 to close. Output will go to  $.08 \pm 0.10$  VDC. Indicate acceptance by checkmark on test report.

6.5 Slowly lower P.S. output to where TP1 output goes to  $10.00 \pm .50$  VDC. The input current at this point should be  $7.0 \pm .7$  mADC. Indicate acceptance by checkmark on test report.

6.6 Set switch S2-1 to OPEN. The output will go to  $0.08 \pm 0.10$  VDC. Indicate acceptance by checkmark on test report.

6.7 Repeat step 6.1.

6.8 Disconnect oscilloscope and DMM from TP1 and connect these to TP2.

6.9 Connect P.S. (+) output to input pin 22 instead of input pin 20.

6.10 Repeat step 6.3.

6.11 Repeat step 6.4 by closing switch S2-2 instead of S2-1.

6.12 Repeat step 6.5.

6.13 Repeat step 6.6 by setting S2-2 to open instead of S2-1.

6.14 Repeat step 6.1.

6.15 Disconnect oscilloscope and DMM from TP2 and connect these to TP3.

6.16 Connect P.S. (+) output to input pin 16 instead of input pin 22.

6.17 Repeat step 6.3.

6.18 Repeat step 6-4 by closing switch S2-3 instead of S2-1.

6.19 Repeat step 6.5.

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- 6.20 Repeat step 6.6 by setting switch S2-3 to open instead of S2-1.
- 6.21 Repeat step 6.1.
- 6.22 Disconnect oscilloscope and DMM from TP3 and connect these to TP4.
- 6.23 Connect P.S. (+) output to input pin 18 instead of input pin 16.
- 6.24 Repeat step 6.3.
- 6.25 Repeat step 6.4 by closing switch S2-4 instead of S2-1.
- 6.26 Repeat step 6.5.
- 6.27 Repeat step 6.6 by setting switch S2-4 to open instead of S2-1.
- 6.28 Repeat step 6.1.

7.0 ZERO AND SPAN SETTING

- Disconnect oscilloscope and DMM from TP4 and connect these to TP6.
- 7.2 Jumper input pins 16, 18, 20 and 22.
  - 7.3 Adjust suppression potentiometer (R53) fully clockwise (CW). The output should be  $+10.5 \pm 0.5$  VDC. Indicate acceptance by checkmark on test report.
  - 7.4 Adjust suppression potentiometer (R53) fully CCW. The output should be  $-10.5 \pm 0.5$  VDC. Indicate acceptance by checkmark on test report.
  - 7.5 Adjust suppression potentiometer (R53) for TP6 output of  $0.000 \pm 0.002$  VDC.
  - 7.6 Set signal P.S. output for input current of  $50.00 \pm 1.00$  mADC.
  - 7.7 Adjust gain potentiometer (R50) for TP6 output of  $10.000 \pm 0.005$  VDC.
  - 7.8 Check the output noise on the oscilloscope. It should be less than 15 mV peak. Indicate acceptance with checkmark on test report.

8.0 FUNCTIONAL TESTS

8.1 Scaling Check

- 8.1.1 With the conditions above, close S2-1. The output should be  $4.667 \pm 0.100$  VDC. Indicate acceptance with a checkmark on test report. Set S2-1 to open.
- 8.1.2 Close S2-2, the output should be  $7.333 \pm 0.050$  VDC. Indicate acceptance with checkmark on test report. Set S2-2 to open.

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- 8.1.5 Close S2-5. The output should be  $8.667 \pm 0.040$  VDC. Indicate acceptance with checkmark on test report. Set S2-3 to open.
- 8.1.4 Close S2-4. The output should be  $9.333 \pm 0.030$  VDC. Indicate acceptance with checkmark on test report. Set S2-4 to open.
- 8.1.5 Remove jumper from pins 16, 18, 20 and 22.
- 8.2 DC Threshold
- 8.2.1 Decrease P.S. to input current of  $0.00 \pm 0.10$  mA DC.
- 8.2.2 Connect P.S. (+) output to input pin 20. Output should be  $0.000 \pm 0.002$  VDC. Indicate acceptance by checkmark on test report.
- 8.2.3 Slowly increase P.S. output to threshold at TP6. Output should be  $5.333 \pm 0.100$  VDC at input current of  $7.0 \pm .7$  mADC. Indicate acceptance by checkmark on test report.
- 8.2.4 Lower P.S. output to input current of  $0.00 \pm 0.10$  mADC.
- 8.2.5 Connect P.S. (+) output to input pin 22 instead of pin 20.
- 8.2.6 Slowly increase P.S. output to threshold. Output should be  $2.667 \pm 0.050$  VDC at input current of  $7.0 \pm 0.7$  mADC. Indicate acceptance by checkmark on test report.
- 8.2.7 Repeat step 8.2.4.
- 8.2.8 Connect P.S. (+) output to input pin 16 instead of pin 22.
- 8.2.9 Slowly increase P.S. output to threshold. Output should be  $1.333 \pm 0.025$  VDC at input current of  $7.0 \pm 0.7$  mADC. Indicate acceptance by checkmark on test report.
- 8.2.10 Repeat step 8.2.4.
- 8.2.11 Connect P.S. (+) output to input pin 18 instead of pin 16.
- 8.2.12 Slowly increase PS output to threshold. Output should be  $0.667 \pm 0.015$  VDC at input current of  $7.0 \pm 0.7$  mADC. Indicate acceptance by checkmark on test report.
- 8.3 AC Threshold
- 8.3.1 Disconnect P.S. (+) output from DI325-Q2.
- 8.3.2 Disconnect P.S. (-) output from DMM (-) input.

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- 8.3.3 Connect DMM, audio amplifier, function generator, frequency counter and unit under test as shown in Figure 3.
- 8.3.4 Set DMM for ACmA measurement.
- 8.3.5 Set audio amplifier gain potentiometer fully CCW.
- 8.3.6 Set function generator for 50 Hz, sinewave and  $0.500 \pm 0.050$  V rms output.
- 8.3.7 Connect audio amplifier output (16) to input pin 20.
- 8.3.8 Connect oscilloscope to TP1. Set it to DC coupling.
- 8.3.9 Set switches S1-1 thru S1-4 to close. The output on the oscilloscope will be 0.0 VDC.
- 8.3.10 Increase audio amplifier output to obtain 10 VDC output as seen on the oscilloscope. Input current should be less than 10 mA rms. Indicate acceptance by checkmark on test report.
- 8.3.11 Lower input current to obtain 0 VDC on oscilloscope. Input current should be greater than 5 mA rms. Indicate acceptance by checkmark on test report.
- 8.3.12 Connect audio amplifier (16) to input pin 22 instead of 20 and connect oscilloscope to TP2 instead of TP1.
- 8.3.13 Repeat steps 8.3.10 and 8.3.11.
- 8.3.14 Connect audio amplifier (16) to input pin 16 instead of 22 and connect oscilloscope to TP3 instead of TP2.
- 8.3.15 Repeat steps 8.3.10 and 8.3.11.
- 8.3.16 Connect audio amplifier (16) to input pin 18 instead of 16 and connect oscilloscope to TP4 instead of TP3.
- 8.3.17 Repeat 8.3.10 and 8.3.11.
- 8.4 Zero and Span CAL
- 8.4.1 Connect DMM to TP6. Set it to measure DC volts.
- 8.4.2 Set switch S3-1 to close. The output should be  $-0.100 \pm 0.030$  VDC. Indicate acceptance by checkmark on test report.
- 8.4.3 Set switch S3-2 to close. The output should be  $-8.64 \pm 0.50$  VDC. Record reading on test report.

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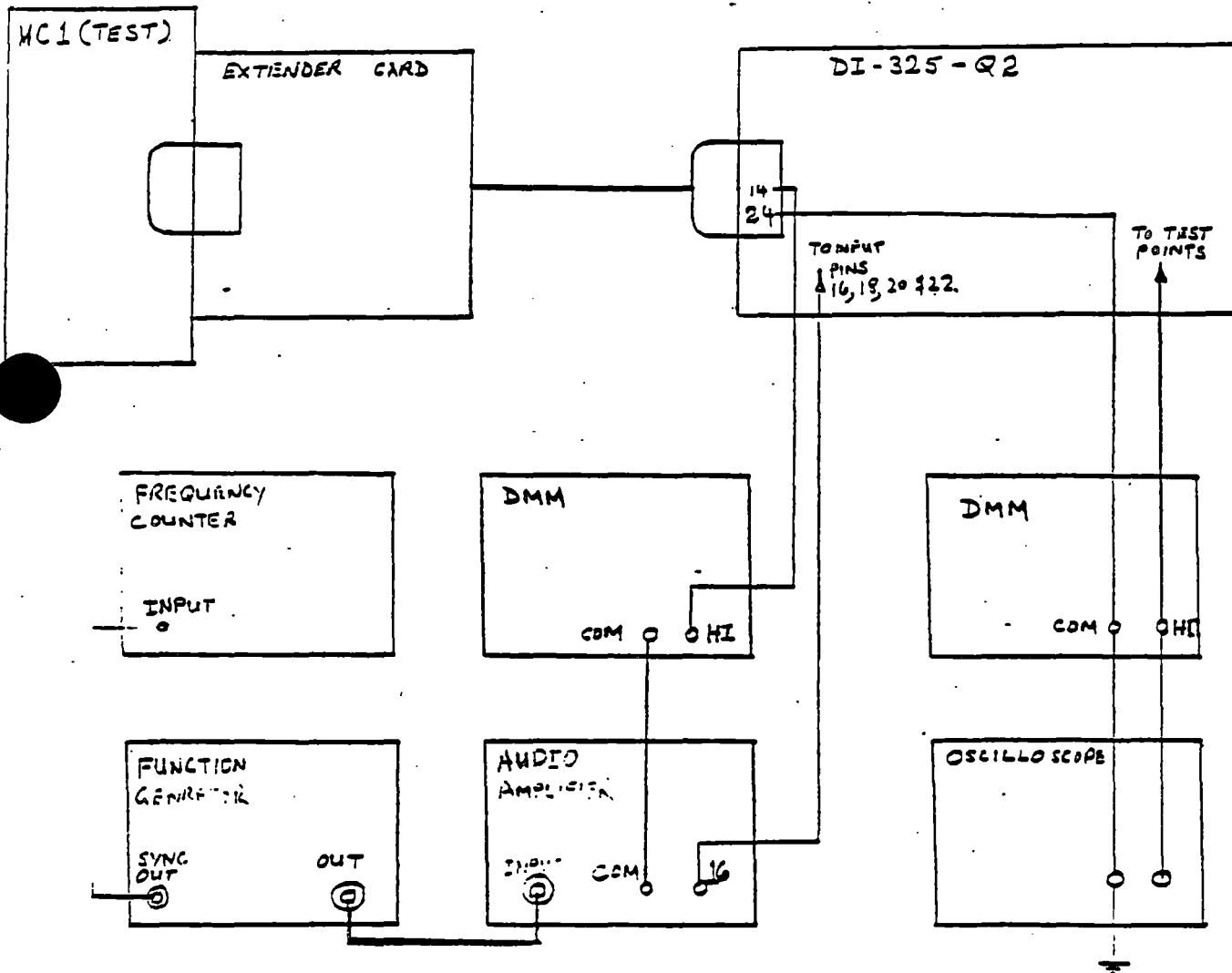
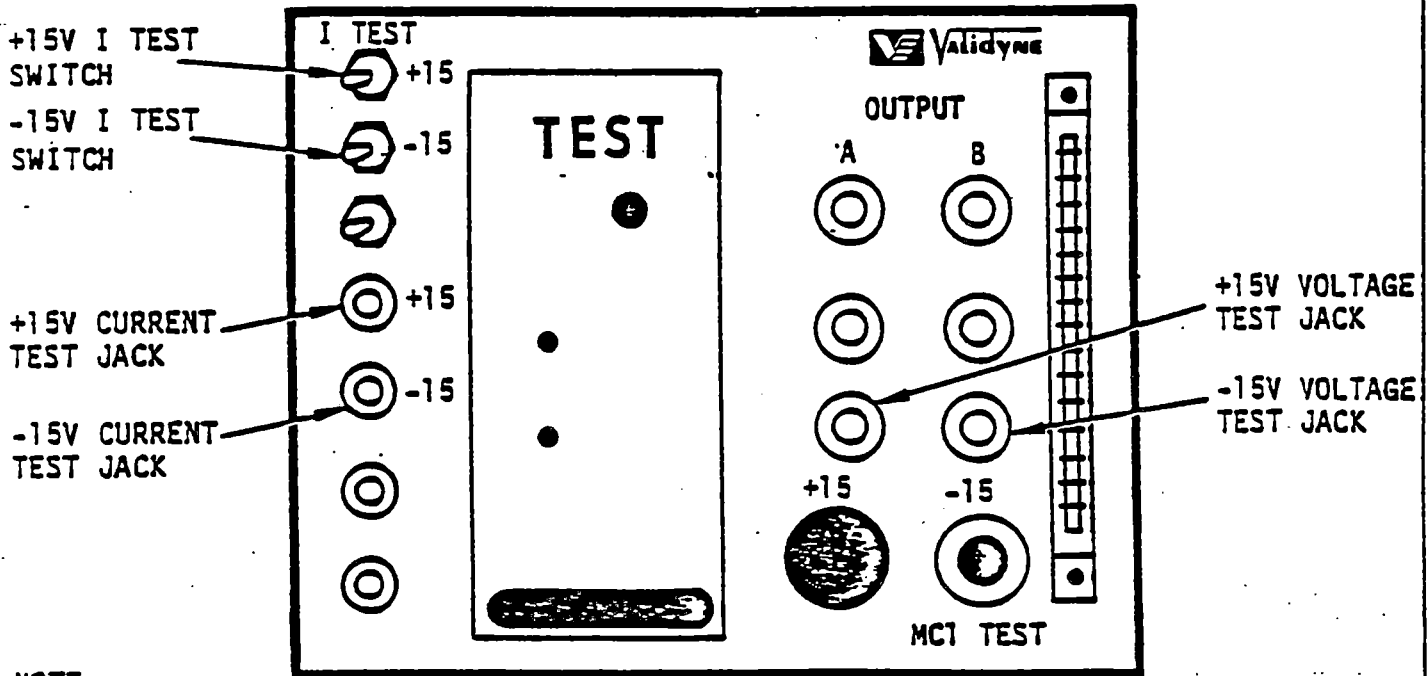


FIGURE 3. AC THRESHOLD SETUP

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8.5 Current consumption

- 8.5.1 Connect the DMM leads to the MC1 +15 current and voltage test jacks (Figure 4).
- 8.5.2 Set the MC1 +15V I test switch (Figure 4) to +15; the DMM indication should not exceed 22mA. Indicate acceptance by checkmark on test report.
- 8.5.3 Set the MC1 +15V I test switch to unmarked position and disconnect the DMM leads from the MC1.
- 8.5.4 Connect the DMM leads to the MC1 -15V current and voltage test jacks (Figure 4).
- 8.5.5 Set the MC1 -15V I test switch (Figure 4) to -15 and the DMM indicator should not exceed 22 mA. Indicate acceptance by checkmark on test report.
- 8.5.6 Set the MC1 -15V I test switch to the unmarked position. Disconnect the DMM leads from the MC1.
- 8.7 Unplug DI325-Q2 from card cable connector.



NOTE :

- 1. CONNECT DMM COM LEAD TO CURRENT TEST JACK AND HI LEAD TO VOLTAGE TEST JACK

Figure 4. MC1 (Test) ±15V Current Test Switch and Jack Locations

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APPENDIX A  
DI325-Q2 SAMPLE TEST REPORT

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# TEST REPORT

ASSY DI325-Q2  
DIGITAL ENCODER, FOUR-INPUT

S/O \_\_\_\_\_ CUSTOMER \_\_\_\_\_

W/O \_\_\_\_\_ SERIAL NO. \_\_\_\_\_

TESTED BY \_\_\_\_\_ DATE \_\_\_\_\_

| <u>Paragraph/Step</u>                | <u>Accepted</u> | <u>Specification</u>    |
|--------------------------------------|-----------------|-------------------------|
| 3.0 Preliminary Procedure            |                 |                         |
| 3.4 Isolation Resistance             | —               | 1 G Ohm                 |
| 5.0 Forward & Reverse Setting of S-2 |                 |                         |
| 5.1 $E_{10V}$                        | —               | +10.0±.5 VDC            |
| 5.2 $E_{0V}$                         | —               | +0.08±0.05 VDC          |
| 5.3 Output Voltage (TP1)             | —               | $E_{10V} \pm 0.02$ VDC  |
| 5.4 Output Voltage (TP1)             | —               | $E_{0V} \pm 0.05$ VDC   |
| 5.5 Output Voltage (TP1)             | —               | $E_{10V} \pm 0.250$ VDC |
| 6.0 DC Threshold                     |                 |                         |
| 6.3 Output Voltage                   | —               | 10.000±0.500            |
| Input Current                        | —               | 7.0±0.7 mADC            |
| 6.4 Output Voltage                   | —               | 0.08±0.1 VDC            |
| 6.5 Output Voltage                   | —               | 10.000±0.500 VDC        |
| Input Current                        | —               | 7.0±0.7 mADC            |
| 6.6 Output Voltage                   | —               | 0.08±0.10 VDC           |
| 6.10 Output Voltage                  | —               | 10.000±0.500 VDC        |
| Input Current                        | —               | 7.0±.7 mADC             |

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# TEST REPORT

ASSY DI325-Q2  
DIGITAL ENCODER, FOUR-INPUT

S/O \_\_\_\_\_

CUSTOMER \_\_\_\_\_

W/O \_\_\_\_\_

SERIAL NO. \_\_\_\_\_

TESTED BY \_\_\_\_\_

DATE \_\_\_\_\_

| <u>Paragraph/Step</u> | <u>Accepted</u> | <u>Specification</u>     |
|-----------------------|-----------------|--------------------------|
| 6.11 Output Voltage   | —               | 0.08±0.10 Vdc            |
| 6.12 Output Voltage   | —               | 10.000±0.500 Vdc         |
| Input Current         | —               | 7.0±.7 mA <sub>dc</sub>  |
| 6.13 Output Voltage   | —               | 0.08±0.10 Vdc            |
| 17 Output Voltage     | —               | 10.000±.500 Vdc          |
| Input Current         | —               | 7.0±.7 mA <sub>dc</sub>  |
| 6.18 Output Voltage   | —               | 0.08±0.10 Vdc            |
| 6.19 Output Voltage   | —               | 10.000±0.500 Vdc         |
| Input Current         | —               | 7.0±0.7mA <sub>dc</sub>  |
| 6.20 Output Voltage   | —               | 0.08±0.10 Vdc            |
| 6.24 Output Voltage   | —               | 10.000±0.500 Vdc         |
| Input Current         | —               | 7.0±0.7 mA <sub>dc</sub> |
| 6.25 Output Voltage   | —               | 0.08±0.10 Vdc            |
| 6.26 Output Voltage   | —               | 10.000±0.500 Vdc         |
| Input Current         | —               | 7.0±0.7 mA <sub>dc</sub> |
| 6.27 Output Voltage   | —               | 0.08±0.10 Vdc            |
| 7.0 Zero and Span     | —               |                          |
| Output Voltage (TP6)  | —               | 10.500±0.500 Vdc         |

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ASSY DI325-Q2  
DIGITAL ENCODER, FOUR-INPUT

S/O \_\_\_\_\_

CUSTOMER \_\_\_\_\_

W/O \_\_\_\_\_

SERIAL NO. \_\_\_\_\_

TESTED BY \_\_\_\_\_

DATE \_\_\_\_\_

| <u>Paragraph/Step</u>       | <u>Accepted</u> | <u>Specification</u> |
|-----------------------------|-----------------|----------------------|
| 7.4 Output Voltage (TP6)    | _____           | -10.500±0.500 Vdc    |
| 7.8 Output Noise            | _____           | 15mV Max.            |
| 8.0 Functional Tests        |                 |                      |
| 8.1.1 Output Voltage (TP6)  | _____           | 4.667±0.100 Vdc      |
| 8.1.2 Output Voltage (TP6)  | _____           | 7.333±0.050 Vdc      |
| 8.1.3 Output Voltage (TP6)  | _____           | 8.667±0.040 Vdc      |
| 8.1.4 Output Voltage (TP6)  | _____           | 9.333±0.030 Vdc      |
| 8.2 DC Threshold            |                 |                      |
| 8.2.2 Output Voltage (TP6)  | _____           | 0.000±0.002 Vdc      |
| 8.2.3 Output Voltage (TP6)  | _____           | 5.333±0.100 Vdc      |
| 8.2.6 Output Voltage (TP6)  | _____           | 2.667±0.050 Vdc      |
| 8.2.9 Output Voltage (TP6)  | _____           | 1.333±0.025 Vdc      |
| 8.2.12 Output Voltage (TP6) | _____           | 0.667±0.015 Vdc      |
| 8.3 AC Threshold            |                 |                      |
| 8.3.10 Input Current (ON)   | _____           | 10mA rms Max.        |
| 8.3.11 Input Current (OFF)  | _____           | 5mA rms Min.         |
| 8.3.13 Input Current (ON)   | _____           | 10mA rms Max.        |
| Input Current (OFF)         | _____           | 5mA rms Min.         |

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# TEST REPORT

ASSY DI325-Q2  
DIGITAL ENCODER, FOUR INPUT

S/O \_\_\_\_\_

CUSTOMER \_\_\_\_\_

W/O \_\_\_\_\_

SERIAL NO. \_\_\_\_\_

TESTED BY \_\_\_\_\_

DATE \_\_\_\_\_

| <u>Paragraph/Step</u>       | <u>Accepted</u> | <u>Specification</u> |
|-----------------------------|-----------------|----------------------|
| 8.3.15 Input Current (ON)   | —               | 10mA rms Max.        |
| Input Current (OFF)         | —               | 5mA rms Min.         |
| 8.3.17 Input Current (ON)   | —               | 10mA rms Max.        |
| Input Current (OFF)         | —               | 5mA rms Min.         |
| 8.4 Zero and Span CAL       |                 |                      |
| 8.4.2 Output Voltage (TP6)  | —               | -0.100±0.030 VDC     |
| 8.4.3 Output Voltage (TP6)  | —               | -8.64±0.50 VDC       |
| 8.5 Current Consumption     |                 |                      |
| 8.5.2 Supply Current (+15V) | —               | 22mA Max.            |
| 8.5.5 Supply Current (-15V) | —               | 22mA Max.            |

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