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IM-135-562-00 IDIM INSTRUCTION MANUAL

for the 'ISOLATED DIGITAL INPUT MODULE' for SLC.*

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MASTER

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This unit is designed as a general purpose digital input module. Each input is opto-isolated, and is designed to operate over a wide range of positive input voltages. The unit is nonlatching, each CAMAC Read of the unit presenting the data as seen at the inputs at the time of the Read command.

This manual includes the following sections:

1. Specifications
2. Front Panel, Lights and Connectors
3. Reference List
4. Functional Description
5. 82S100 Logic Equations
6. Test and Checkout Procedures
7. Appendix A, SLAC 82S100 Programming Data
8. Appendix B, JXX-FORTH 135-562 Program Listing

Module Specifications

1. Module width: single.
2. Number of input channels: 32, (numbered 0 through 31).
3. Input levels: "0" = -30 through +1 volts.
"1" = +3 through +30 volts.
(undefined from +1 volt to +3 volts.)
4. Input: Optically isolated with current drawn not to exceed 10 mA at 30 Volts in.
5. Latching: all inputs nonlatching. During a CAMAC read cycle the data is held.
6. Response time: 100 microseconds maximum from input to Dataway.
7. CAMAC codes, X and Q responses:
 - a. Read functions:
 1. F(0).A(0) reads J1 inputs, R1 = Channel 0 X=1, Q=1 if J1-C9 > 12 volts;
 2. F(0).A(1) reads J2 inputs, R1 = Channel 16 X=1, Q=1 if J2-C9 > 12 volts.
 - b. Write functions: none.
 - c. Command functions: none.
 - d. Other X and Q responses: X=Q=0 for all other codes and conditions.
 - e. C, Z, and I: C, Z and I have no effect on this module.
8. CAMAC speed: the module will respond to all CAMAC cycles as defined in IEEE Standard 583-1978.
9. Power Required: + 6 volts, 500 mA typ., 700 mA max;
+24 volts, 2-170 mA, dependant upon
J1&2-C9 loading.

10. Protection:

- a. Inputs will withstand ± 30 V indefinitely, and ± 60 V for one (1) second without damage.
- b. The +6 and +24 volt lines are each protected with a fuse consisting of a single strand of #36 tinned copper wire, fusing current is about 3.5 Amps.

11. Operating temperature range: 10 to 65 degrees C.

Front Panel

1. Front panel indicators: "N" & "X", red LED's,
"Q" & "V", green LED's.
("V" lighted indicates both J1&J2-C9 > 12 volts.)
2. Front panel connectors: 2 each, AMP P/N 204731-1.

Pin assignments as follows:

CHAN #	SIGNAL	RETURN	OTHER SIGNALS CONNECTION / FUNCTION
00	J1-A1	J1-A2	
01	I-A3	I-A4	J1-C9 +24 Volts Out
02	I-A5	I-A6	(see note)
03	I-A7	I-A8	J1-C10 Gnd
04	I-A9	I-A10	
05	I-A11	I-A12	J1-C11 N C
06	I-B1	I-B2	
07	I-B3	I-B4	J1-C12 Gnd
08	I-B5	I-B6	
09	I-B7	I-B8	
10	I-B9	I-B10	
11	I-B11	I-B12	
12	I-C1	I-C2	J2-C9 +24 Volts Out
13	I-C3	I-C4	(see note)
14	I-C5	I-C6	J2-C10 Gnd
15	J1-C7	J1-C8	
16	J2-A1	J2-A2	J2-C11 N C
17	I-A3	I-A4	
18	I-A5	I-A6	J2-C12 Gnd
19	I-A7	I-A8	
20	I-A9	I-A10	
21	I-A11	I-A12	
22	I-B1	I-B2	NOTE: J1&J2-C9 are connected to the fused +24 volts thru independent 100 Ohm, 10 Watt resistor strings.
23	I-B3	I-B4	
24	I-B5	I-B6	
25	I-B7	I-B8	
26	I-B9	I-B10	
27	I-B11	I-B12	
28	I-C1	I-C2	
29	I-C3	I-C4	
30	I-C5	I-C6	
31	J2-C7	J2-C8	

Reference List

1. Full drawing package: DL-135-562-00
2. Schematic only: SD-135-562-00
3. Test module: 'Tester for (135-562) Isolated Digital Input Module', SLAC 135-648.
4. IM-135-648-00, the IDIM-TESTER Instruction Manual (SLAC TN-83-04).
5. 82S100 programming: PS-135-562-10 (also see Appendix A).

Functional Description

Reference: SD-135-562-00, the schematic drawing.

U1, the FPLA, is used as the CAMAC command decoder. U2 and U3 are used as pulse extenders to allow visual observation of the M, X and Z signals on the front panel LEDs. U5 is a voltage comparator (2 sections) used to detect the presence of a minimum of +12 volts on the supply lines to pins C9 of J1 and J2. This voltage is usable as a source for the opto-isolators in the absence of an external power source. Pins C10 and C12 of the two connectors are then used as the power return.

The components of the input circuit (Figure 1) allow the unit to meet the requirements of the input specification. The 3 KOhm resistor limits the 30 Volt input current to less than 10 milliamperes. The HCPL-2731 opto-isolator allows operation with limited current at +3 volts, and does not respond to a signal at or below +1 volt. The 1N3064 diode protects the opto-isolator from damage causeable by a reversed input voltage, over the entire negative input range (0 to -30 VDC or -60V pulsed).

Figure 1. IDIM Input circuit (one channel).

U8 through U11 are used to latch and pass the selected channel data during a CAMAC read cycle of the module. At all other times the outputs are disabled. U6 and U7 are the CAMAC Read-line drivers, with open-collector outputs. These units are also disabled except during a CAMAC read cycle.

PS-135-562-10, 82S100 Logic Equations

(I.C. # U-01 , PF-135-562-10)

FPLA100 0

AS OF 83-01-07

DATA-I/O LOGIC-PAK & 303A-101 ADAPTER

PF-135-562-10

FAMILY 96,

PINOUT 01,

RAM F1

LOGIC TO INTEL 0000 00F1

PIN ASSIGNMENTS:

;

;

ALL INPUT AND OUTPUT TERMS ARE SHOWN AS POSITIVE TRUE LOGIC

;

/ IMPLIES LOW TRUE LOGIC, OR 'HOT' SIGNAL

;

CAMAC CODES ARE SHOWN BELOW THE EQUATION LINES FOR INFORMATION

;

;

FE ; PIN 1, NC

/F16 ; PIN 2, INPUT 7

/F4 ; PIN 3, INPUT 6

/F1 ; PIN 4, INPUT 5

/A4 ; PIN 5, INPUT 4

/A1 ; PIN 6, INPUT 3

/N ; PIN 7, INPUT 2

NC ; PIN 8, INPUT 1

NC ; PIN 9, INPUT 0

X ; PIN 10, OUTPUT 7

NC ; PIN 11, OUTPUT 6

V ; PIN 12, OUTPUT 5

Q ; PIN 13, OUTPUT 4

GND ; PIN 14, GROUND

/READ ; PIN 15, OUTPUT 3

/READ1 ; PIN 16, OUTPUT 2

/READ0 ; PIN 17, OUTPUT 1

NOUT ; PIN 18, OUTPUT 0

/CE ; PIN 19, NOT CHIP-SELECT

NC ; PIN 20, INPUT 15

NC ; PIN 21, INPUT 14

V1 ; PIN 22, INPUT 13

V2 ; PIN 23, INPUT 12

/A2 ; PIN 24, INPUT 11

/A8 ; PIN 25, INPUT 10

/F2 ; PIN 26, INPUT 9

/F8 ; PIN 27, INPUT 8

VCC ; PIN 28, +5 VOLTS


```
;
;
; PF-135-562-10 LOGIC EQUATIONS
;
NOUT = N
;
V = V1*V2
;
READ00 = N*/F1*/F2*/F4*/F8*/F16*/A1*/A2*/A4*/A8
;         = N.F(0).A(0)
;
READ11 = N*/F1*/F2*/F4*/F8*/F16*/A1*/A2*/A4*/A8
;         = N.F(0).A(1)
;
READ0 = READ00
;
READ1 = READ11
;
READ = READ00 + READ11
;         = N.F(0).A(0+1)
;
X = READ00 + READ11
;         = N.F(0).A(0+1)
;
Q = READ00*V1 + READ11*V2
;         = N.F(0).[A(0).V1 + A(1).V2]
;
```

Test and Checkout Procedurea. Required equipment:

1. An LSI-11 test stand including a CAMAC crate and a dual floppy-disk drive.

Note: Insure that the LSI-11 system will operate with CAMAC crate power off, without having to HALT, or disconnect the CAMAC system.

2. A 135-648 test module (IDIM-TESTER).
3. A +63 Volt, 500 milliamperere power supply. 100 milliamperere, power supply, including an output current monitor (milliammeter).

Note: 100 milliampereres is adequate for complete single channel tests. Should simultaneous multiple pulsed outputs be desired, use a 0.5 Amp supply.
4. A digital volt-ohmmeter.
5. 2 each, 36-pin AMP connectored test cables.
6. A FORTH-CAMAC source diskette.
7. A JXX-CAMAC source diskette.
8. A cable to connect the +63-volt power supply to the 135-648 +63-volt input BNC connector.

b. Setup procedure.

1. Install the diskettes, FORTH-CAMAC in Unit-0, and JXX-CAMAC in Unit-1.
2. Install the 135-648 (IDIM-TESTER) in the CAMAC crate.
3. Apply system power, and bootstrap FORTH.
4. Enter '500 LOAD' to load the JXX-FORTH system.
5. Enter 'SINGLE-CRATE' or 'MULTI-CRATE' to load the appropriate CAMAC drivers.
6. Enter '135-562' to load the IDIM and TESTER programs.
7. Turn on the +63-volt power supply, and set the output to +63.0 volts.
8. Turn off the +63-volt power supply.

9. Connect the +63-volt power supply to the IDIM-TESTER.
10. Turn on the CAMAC crate power.
11. Enter 'GO' or '135-562-TESTS' to select the test menus.
12. Select 'INITIALIZE-IDIM-TESTER', and respond to the prompts with the 135-648 crate and slot locations.
13. Turn on the +63-volt power supply.
14. Observe the 'V' LED on the front of the IDIM-TESTER. If not lighted at this time, there is a problem with the IDIM-TESTER or the test setup.
15. Select 'FULL-TESTER-TEST'.
16. If any problems are indicated, correct and re-test before proceeding.
17. Turn off the CAMAC crate power.

c. IDIM test procedure.

1. In performing the following sequence of tests, each must be passed successfully before proceeding.

Should the unit fail any test, repair and retest before continuing.
2. If this is a production test of a new unit, continue with the next step.

If this is a test of a previously functioning unit, proceed directly to step 7.
3. Remove the component-side cover, and visually inspect the unit for obvious problems. Compare with a known good unit if one is available.
4. With an Ohmmeter, measure between ground and +6V, +24V, +63V, and Vcc, checking for direct short circuits.
5. Insure that a properly programmed FPLA is installed in the IDIM (PF-135-562-10 in U1).

Note: if the 82S100 FPLA is installed, but not labeled with the correct PF number, there is a high probability that the unit is NOT programmed. Remove the FPLA and install a programmed unit.

6. Insure that the cable connectors fit cleanly to the board connectors without interference passing through the front panel cut-outs.

If there is interference, loosen the mounting screws and reposition the circuit board as necessary to eliminate the problem.

7. Turn off the CAMAC crate power.
8. Install the 135-562 (IDIM) to be tested, in the CAMAC crate, or on an extender.
9. Connect J1 and J2 of the IDIM-TESTER to the same connectors of the IDIM.
10. Turn on the CAMAC crate power.
11. Select 'INITIALIZE-IDIM', and respond to the prompts with the IDIM crate and slot locations.
12. Select 'FULL-TEST'. The program will indicate if there are any problems with the IDIM.
13. If the IDIM passes the 'FULL-TEST' routine, the unit is good, and no further testing is required.

Should the unit fail the 'FULL-TEST' routine, maintenance is require. If the maintenance is to be done at this time, proceed to the 'Maintenance procedure' section.

14. Turn off the CAMAC crate power.
15. Disconnect the test cables and remove the IDIM.
16. Replace any module covers that have been removed.

d. Maintenance procedure.

1. Perform the setup and test procedures as outlined above.
2. Select 'IDIM-TESTS' to obtain a detailed selection of available module tests.
3. Should it be necessary to return to FORTH to program additional specific tests to aid in the determination of the specific problem, a return to the test menus is easiest done by entering the FORTH command 'GO'.

4. The selectable tests are explained below:

- a. IDIM-HARTTEST checks the X and Q responses of the unit for all CAMAC function codes and subaddresses.
- b. 562-LED runs a loop which should cause all front panel LEDs to be lighted.
- c. CHANNEL-SET requests a specific channel number, and stores it for a subsequent channel test.
- d. CHANNEL-TEST performs the full set of single channel tests on the specified channel.

Note that although the channel number is retained at the completion of the test, the IDIM-TESTER output voltage has been reset to zero.

- e. TEST-ALL runs a full module check with the exception of the X-Q map and LED tests.
- f. OUTPUT-VOLTAGE-SET calls up the menu for selection of the IDIM-TESTER output voltages.
- g. OUTPUT-PATTERN-SET calls up the IDIM-TESTER output pattern menu, allowing selection of several options for detailed tests.
- h. CAMAC-MENU allows the selection of the standard general-purpose CAMAC tests.
- i. DEBUG selects the general-purpose debugger menu.
- j. The following tests require the prior selection of an IDIM-TESTER output voltage using the OUTPUT-VOLTAGE-SET menu.

Note that execution of any of the above general tests may cause the selected channel number and output voltage to be changed at the completion of the test, and that the channel and voltage may require reselection prior to again executing any of the channel-specific tests.

1. TEST-ON walks an 'on' bit through all 32 'off' channels, testing for both proper single channel operation, and improper multiple channel shorted operation.
2. TEST-OFF, as above, only walking an 'off' bit through all 32 'on' channels.
3. CHANNEL-LOOP alternates 'on' and 'off' inputs to a single channel.

Appendix A. SLAC 82S100 Programming Data

AS OF 83-01-07
PF-135-562-10

DATA-I/O LOGIC-PAK 2 303A-101 ADAPTER
FAMILY 96. PINOUT 01, RAM F1

```

*****
*
*
FE * 1* *28* VCC
*
* F P L A 1 0 0
*
/F16 * 2* *27* /F8
*
*
/F4 * 3* *26* /F2
*
*
/F1 * 4* *25* /A8
*
*
/A4 * 5* *24* /A2
*
*
/A1 * 6* *23* V2
*
*
/N * 7* *22* V1
*
*
NC * 8* *21* NC
*
*
NC * 9* *20* NC
*
*
X *10* *19* /CE
*
*
NC *11* *18* NOUT
*
*
V *12* *17* /READ0

```


JXK-FORTH 135-562 Program Listing

Note: see also Appendix B of IM-135-648-00.

Also, the latest FORTH source code for these programs is contained in the dataset 'BUyyymmdd FORTH', on the VM minidisk 'JXKPU8 200'. on the main SLAC computer complex. 'yyymmdd' is a 6-digit number listing the date that the backup (BU) file was created. The highest number is the latest version on VM.

```
632 0 HERE-LOADS 135-562 ( ISOLATED DIGITAL INPUT MODULE )
632 1
632 2          FORTH DEFINITIONS
632 3 : 135-562 ; ( DEFINED SO 135-648 DON'T RE-LOAD )
632 4
632 5 135-648 ( IDIM-TESTER PROGRAM LOAD )
632 6
632 7          FORTH DEFINITIONS      HERE
632 8
632 9 1--> JXK-821220
632 10
632 11
632 12
632 13
632 14
632 15

633 0 --> ( 135-562 ... initialize .. cont )
633 1
633 2     VARIABLE 135-562-C
633 3     VARIABLE 135-562-N
633 4 : 135-562@ 135-562-C @ 135-562-N @ ;
633 5 : 135-562! 135-562-N ! 135-562-C ! ;
633 6
633 7 0 135-562-C ! ( SET NOMINAL CRATE # )
633 8 7 135-562-N ! ( SET NOMINAL SLOT # )
633 9
633 10 : XNAME ." 135-562 " ;
633 11 : MNAME LD-CALL MODULE-NAME XNAME ;
633 12 : INITIALIZE-IDIM ( Get new C and N. ) MNAME 135-562@
633 13          ASK-CN 135-562! ;
633 14 1--> JXK-821203
633 15
```



```
634 0 --> ( 135-562 ... R-LO R-HI IDIM?Q RT-LO 562-LED )
634 1
634 2      FORTH DEFINITIONS      DARIABLE TREAD
634 3
634 4 : R-LO 135-562 0 0 *XR ;
634 5 : R-HI 135-562 1 0 *XR ;
634 6 : IDIM?Q 135-562-C 0 ?Q 0 IF XNAME ." VOLTAGE LOW " BELL
634 7     THEN ;
634 8 : RT-LO R-LO IDIM?Q ;      : RT-HI R-HI IDIM?Q ;
634 9 : 562-LED 135-562 TEST-LED ;
634 10
634 11 1--> JXX-830107
634 12
634 13
634 14
634 15

635 0 --> ( 135-562 ... EXPN VSAVE V-PRINT P-CHN CH-MASK T-CHN )
635 1
635 2      VARIABLE VVAL
635 3 : EXPN 2 SWAP ** ;
635 4 : VSAVE DUP VVAL ! VSET ;
635 5 : V-PRINT ." OUTPUT VOLTAGE IS " VVAL 0 . ;
635 6 : P-CHN ." CHANNEL " CHN . ;
635 7 : CH-MASK CHN DUP %16 - <0
635 8     IF 0 SWAP EXPN ELSE 16 - EXPN 0 THEN SWAP ;
635 9 : T-CHN R-LO R-HI 2DUP TREAD D! CH-MASK DAND OR ;
635 10
635 11 1--> JXX-830118
635 12
635 13
635 14
635 15

636 0 --> ( 135-562 ... T-OFF T-ON I-READ I-PRINT T-FAIL )
636 1
636 2 : T-OFF T-CHN IF CR P-CHN ." ON WHEN SHOULD BE OFF, "
636 3     V-PRINT THEN ;
636 4 : T-ON T-CHN =0 IF CR P-CHN ." OFF WHEN SHOULD BE ON, "
636 5     V-PRINT THEN ;
636 6 : I-READ R-LO R-HI TREAD D! ;
636 7 : I-PRINT I-READ TREAD D0 DO. ;
636 8 : T-FAIL PATT D0 TREAD D0 ROT - ROT2 - OR IF CR
636 9     ." PATTERN FAILED' OUTPUT = " PATT D0 DO.
636 10     ." INPUT = " TREAD D0 DO. V-PRINT THEN ;
636 11 1--> JXX-821203
636 12
636 13
636 14
636 15
```

```

637 0  --> ( 135-562 ... 0VT --> 60VT )
637 1
637 2 : 0VT 0 VSAVE 1 MSEC T-OFF ;
637 3 : 1VT 1 VSAVE 001 MSEC T-OFF ;
637 4 : 3VT 3 VSAVE 001 MSEC T-ON ;
637 5 : 5VT 5 VSAVE 01 MSEC T-ON ;
637 6 : 24VT X24 VSAVE T-ON 135-562-C @ DUP R-LO DROP ?Q IF 1 ELSE 0
637 7       THEN SWAP R-HI DROP ?Q IF 1 ELSE 0 THEN AND =0
637 8       IF CR ." IDIM OUTPUT SUPPLY VOLTAGE BELOW 12 VOLTS. "
637 9       THEN ;
637 10 : 30VT X30 VSAVE T-ON ;
637 11 : M30VT X-30 VSAVE T-OFF ;
637 12 : 60VT X60 VSAVE T-ON 1100 MSEC T-OFF ;
637 13
637 14 1--> JXK-821203
637 15

638 0  --> ( 135-562 ... TEST-ON TEST-OFF CHANNEL-LOOP CHANNEL-SET )
638 1
638 2 : TEST-ON WALK-INIT 32 0 DO I CHN-SET WALK-ONE-ON I-READ
638 3       T-FAIL ?TER IF LEAVE THEN LOOP ;
638 4 : TEST-OFF WALK-INIT 32 0 DO I CHN-SET WALK-ONE-OFF I-READ
638 5       T-FAIL ?TER IF LEAVE THEN LOOP ;
638 6 : CHANNEL-LOOP BEGIN TURN-ON TURN-OFF ?TER END ;
638 7 : CHANNEL-SET ASK-CHN ;
638 8
638 9 1--> JXK-830116
638 10
638 11
638 12
638 13
638 14
638 15

639 0       BLK @ 2+ LOAD ( --> ) ;S ( 135-652 ...cont )
639 1       VARIABLE 135-562-MAP
639 2 : ALL-OFF? I-READ TREAD D0 OR IF CR TREAD D0
639 3       ." SHOULD ALL BE OFF, ARN'T. INPUT = " DO. THEN ;
639 4 : T-SEQ ( T-SEQ -> ,full test of one channel ) 1VT 3VT
639 5       5VT 24VT 30VT M30VT 5000 MSEC 5VT 60VT 5VT 0 VSAVE ;
639 6 : CHAN-TST CR ." TESTING " P-CHN TURN-ON T-SEQ TURN-OFF ;
639 7 : TEST-ALL ( TEST-ALL -> ,full test of all 32 channels )
639 8       0 VSAVE ALL-OFF ALL-OFF? 5 VSAVE TEST-ON TEST-OFF
639 9       ALL-OFF 32 0 DO I ch# !
639 10      CHAN-TST ?TER IF LEAVE THEN LOOP ;
639 11 : CHANNEL-TEST BEGIN CHAN-TST ?TER END ;
639 12
639 13      BLK @ DUP 1+ 135-562-MAP ! 2+ 1BLOAD ;S
639 14      JXK-830113
639 15

```

```
640 0 XQXQ
640 1
640 2
640 3
640 4
640 5
640 6
640 7
640 8
640 9
640 10
640 11
640 12
640 13
640 14
640 15

641 0 --> ( 135-562 ... 562-TESTMAP IDIM-MAP FULL-TEST )
641 1
641 2 : 562-TESTMAP 135-5620 BUFMAP 0 NMAP! 135-562-MAP 0 BLOCK
641 3 MAP-COMPARE ;
641 4 : IDIM-MAPTEST X1024 BUFGET ?DUP IF BCFMAP !
641 5 562-TESTMAP BUFMAP 0 BUFREE ELSE NOBUF ABORT THEN ;
641 6 : FULL-TEST IDIM-MAPTEST 562-LED TEST-ALL ;
641 7
641 8 1--> JXK-830107
641 9
641 10
641 11
641 12
641 13
641 14
641 15

642 0 --> ( 135-562 ... menus GO )
642 1
642 2 DEF-MENU IDIM-TESTS IDIM-MAPTEST 562-LED
642 3 TEST-ON TEST-OFF CHANNEL-SET CHANNEL-TEST
642 4 CHANNEL-LOOP TEST-ALL
642 5 OUTPUT-VOLTAGE-SET OUTPUT-PATTERN-SET
642 6 CAMAC-MENU DEBUG M;
642 7 LD-NAME IDIM-TESTS 0 0 0 0 SHOW-CHN M;
642 8
642 9 DEF-MENU 135-562-TESTS INITIALIZE-IDIM FULL-TEST
642 10 IDIM-TESTS INITIALIZE-IDIM-TESTER
642 11 FULL-TESTER-TEST 135-648-TESTS M;
642 12 : GO 135-562-TESTS ;
642 13
642 14 1--> JXK-830118
642 15
```

```
643 0 --> ( 135-562 ... end )
643 1
643 2 LD-MENU 135-648-TESTS 0 0 0 0 0 135-562-TESTS M;
643 3
643 4 VCLEAR CR ." 135-562 " HERE LOADLENGTH
643 5
643 6 CR CR ." ENTER 'GO or 135-562-TESTS' TO INVOKE TESTS. "
643 7 BELL CR
643 8
643 9 ;S JXX-821221
643 10
643 11
643 12
643 13
643 14
643 15
```