

# **F4A/F4M OPTION**

**07656**

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## 1.0 DESCRIPTION

### 1.1 GENERAL-F4A/F4M (BUFFERED, ISOLATED, GATED AND STORED BCD)

The F4A/F4M option provides the customer with Buffered, Isolated, Gated and Stored BCD information at its Three-Stateable BCD data outputs. The Three-Stateable BCD data and control line outputs are ideally suited to parallel 'bussing' in data-acquisition system applications.

The F4A opto-isolators and pulse-transformer isolation permit as much as 350 volts between signals and meter voltages.

Some advantages of the F4A BCD systems-interface card are:

1.1.1 All output data (parallel BCD, POLARITY, and  $\overline{\text{DATA READY}}$ ) are buffered through Three-State output devices.

1.1.2 The  $\overline{\text{DATA READY}}$  output signal (Pin 2 of J2) remains high for a period of 200 to 700 microseconds, insuring sufficient settling time for valid data transfer after output latch update.

NOTE: When used in an edge-triggered data-acquisition application, external equipment should trigger on the falling edge of  $\overline{\text{DATA READY}}$  if rising-edge triggering is desired, solder-switch DR must be opened and switch  $\overline{\text{DR}}$  closed.

1.1.3 The  $\overline{\text{METER HOLD}}$  control input allows the instrument to be placed in a hold condition when Pin F of J2 is brought low. In this state, the last reading displayed is the information present at the BCD data outputs. The instrument will not start a new conversion until Pin F of J2 is brought high again.

Closing solder-switches ST and MH, and opening  $\overline{\text{ST}}$  and  $\overline{\text{MH}}$ , enable a strobed  $\overline{\text{METER HOLD}}$  mode. In this mode of operation a high-going pulse (1 m Sec minimum and less than one conversion time maximum) into the  $\overline{\text{METER HOLD}}$  input allows a single conversion to occur. After the conversion is complete, the instrument goes back into a hold state until the next strobe pulse is acknowledged.

1.1.4 A latched polarity output signal corresponding to the displayed polarity is available at Pin D of J2.

1.1.5 A low at the  $\overline{\text{BCD HOLD}}$  control input a Pin 1 of J2 will hold the BCD data stored in the latches without inhibiting successive conversions of the instrument being used.

1.1.6 A low or open input at the BCD ENABLE control input (Pin E of J2) places all output signals into their high-impedance state. This control input must be tied high from normal single-meter operation. (See PP 1.2.1 for F4M.)

1.1.7 The polarity of all control signal is user selectable via solder switches on the circuit side of the F4A (solder-switch drawing #07658-01).

1.1.8 The least-significant digit is programmable to count by one, two or five.

## 1.2 GENERAL - F4M (BINARY ADDRESSING OPTION)

1.2.1 A 4-bit address decoder option allows the user to enable the parallel BCD data output with a 4-bit binary address (ADDRESS B1 through ADDRESS B8) for Three-State data-bussing applications. The user may program the address decoder with any one of sixteen 4-bit address codes by solder-switches (per dwg. #07652-02). In this mode of operation, solder switch EN is closed while  $\overline{EN}$  and  $\overline{EN}^1$  are left open. Pin E of J2 is normally left open (BCD ENABLE control line), although it may be pulled high to override the 4-bit meter address.

## 1.3 SPECIFICATIONS

### 1.3.1 ACCURACY @ 25°C

Does not affect basic instrument specifications.

### 1.3.2 Digital Control Signals

Logical '0'      0 to .6 V (input)  
                  0 to .5 V (output)

Logical '1'      2.4 to 5.5 V (input)  
                  2.4 to 5.25 V (output)

1 Unit Load     Logical '0' 1.6 mA  
                  Logical '1' .17 mA

#### Solder Switch Procedure

<u>+POLARITY</u>	'0' = Positive (close $\overline{POL}$ - open POL)
* <u>+POLARITY</u>	'1' = Positive (close POL - open $\overline{POL}$ ) Output Drive = 12 Unit loads
<u>METER HOLD</u>	'1' = Hold Reading (close MH - open $\overline{MH}$ )
* <u>METER HOLD</u>	'0' = Hold Reading (close $\overline{MH}$ - open MH) Input load = .5 Unit load
<u>DATA READY</u>	'1' = Valid data (close DR - open $\overline{DR}$ )
* <u>DATA READY</u>	'0' = Valid data (close $\overline{DR}$ - open DR) Output drive = 24 Unit loads
<u>BCD HOLD</u>	'1' = Hold data in latches (close H - open $\overline{H}$ )
* <u>BCD HOLD</u>	'0' = Hold data in latches (close $\overline{H}$ - open H) Input load = .5 Unit load
* <u>BCD ENABLE</u>	'0' or Open Input = BCD lines to HI-Z state (close EN, - open $\overline{EN}$ , $\overline{EN}^1$ )
<u>BCD ENABLE</u>	'1' or Open Input = BCD lines to HI-Z state (close EN, $\overline{EN}^1$ - open EN)

### 1.3.3 BCD Data

Logical '0'	0 to .5 V (Output)
Logical '1'	2.4 to 5.25 V (Output)
HI-Z STATE	20 uA Leakage Current @ 2.4 V applied
Output Drive	12 Unit loads @ VOL = .5 V
1 Unit Load	Logical '0' 1.6 mA Logical '1' .17 mA

NOTE: Asterisk (\*) denotes standard factory configuration.

### 1.3.4 Power

Input Voltage	+5 V dc $\pm 5\%$
Input Power	100 mA (130 mA max. with M-Option)
Power Dissipation	500 mw

### 1.3.5 Clock Frequency

1 MHz maximum @ 50% duty cycle

### 1.3.6 Isolated Voltage

350 V dc or Peak ac

### 1.3.7 Storage Temperature

-40°C to 85°C

### 1.3.8 Operating Temperature

0°C to 55°C

### 1.3.9 Humidity

To 95%, 0 to 40°C

## 2.0 RECEIVING AND INSTALLATION

### 2.1 UNPACKING AND INSPECTION

Your F4A/F4M Option was fully inspected and tested, then carefully packed before shipment. Unpack the unit carefully and inspect it for obvious damage.

If the option is received assembled in a unit, proceed to Section 3.0 for connector hook-up.

### 2.2 FIELD INSTALLATION

1. Remove ac power from the instrument in which the F4A option is to be installed.
2. Remove lens, two screws, clamp rings and slide retainers shown in outline and mounting drawings.
3. Remove top half of case.
4. Carefully remove meter from case.
5. Locate appropriate 'E' points on main P.C. board as listed in Section 3.0 and install insulated #24 wires as required.
6. Modify display board per Figure 2 on 267B, 268, 204A/B, 258, 2004, 2003B and per Figure 3 on 2003A and 203A.
7. Reassemble meter into lower case half.
8. Install option board into upper case half and reassemble meter. Refer to Figure 1.
9. Proceed to Section 3.0 for Interconnection Table.



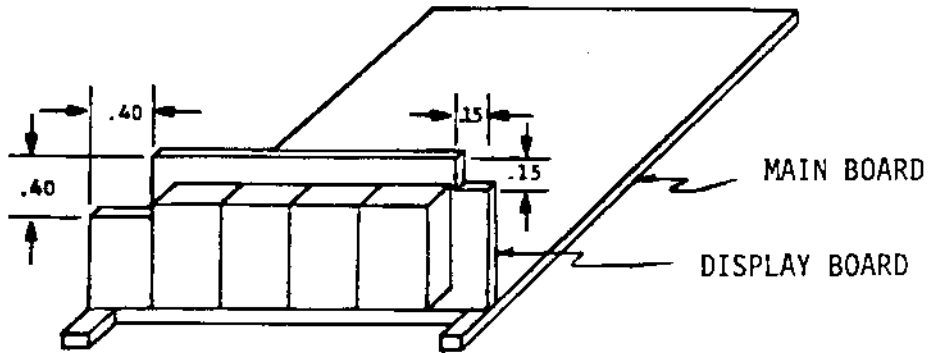


FIGURE 2

DISPLAY BOARD MODIFICATIONS FOR INSTALLATION OF F4A OPTION  
(267B, 268, 204, AND 258 ONLY)

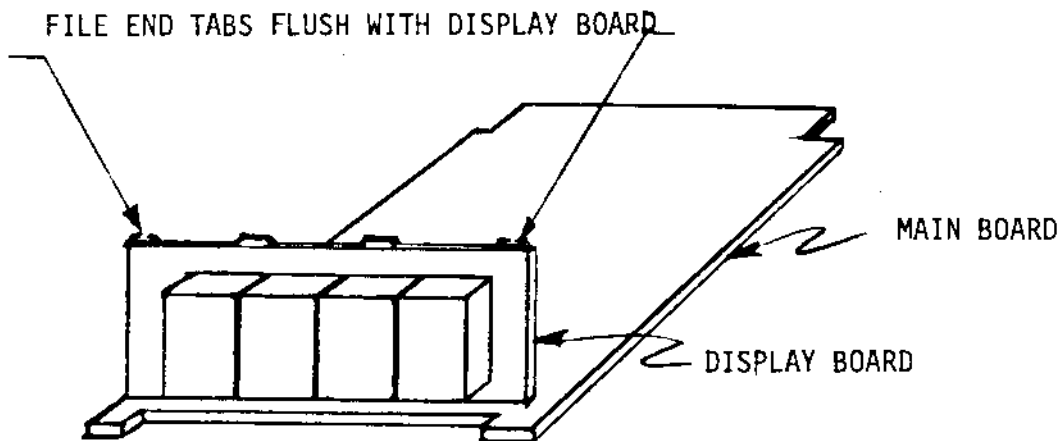


FIGURE 3

DISPLAY BOARD MODIFICATIONS FOR INSTALLATION OF F4A OPTION  
(2003 AND 203 ONLY)

\*NOTE: TRIM TOP ROW OF ALL DISPLAY-BOARD IC LEADS FLUSH WITH BOARD

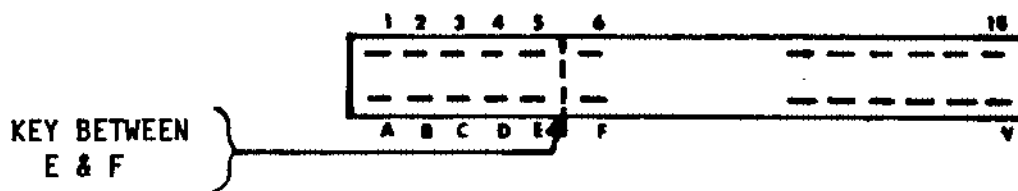
### 3.0 OPERATING INSTRUCTIONS

#### 3.1 PIN ASSIGNMENTS

<u>PIN</u>	<u>FUNCTION</u>	<u>PIN</u>	<u>FUNCTION</u>
1	BCD HOLD	A*	REF
2	DATA READY	B*	POL
3	BCD 400	C*	CLK
4	BCD 800	D	POLARITY
5	BCD 200	E	BCD ENABLE
6	BCD 100	F	METER HOLD
7	BCD 4 k	H	BCD 10
8	BCD 8 k	J	BCD 20
9	BCD 2 k	K	BCD 80
10	BCD 1 k	L	BCD 40
11	BCD 40 k	M	BCD 1
12	ADDRESS B8	N	BCD 2
13	BCD 20 k	P	BCD 8
14	BCD 10 k	R	BCD 4
15	+5 V (Isolated)	S	DIGITAL GND (Isolated)
16*	HOLD	T	ADDRESS B1
17*	+5 V (Meter)	U	ADDRESS B2
18*	DIGITAL GND (Meter)	V	ADDRESS B4

\* Denotes signals from or to the instrument. For the F4A/F4M option, the +5 V and Ground provided by the instrument are isolated from the +5 V and Ground indicated at Pins 15 and S; the customer supplied +5 V and Ground are to be connected to Pins 15 and S.

3.1.1 Connector Type: Viking: YK18D/12  
SAE: SAC18D/12



Connector Pin Orientation as Viewed From the Rear of the Meter.

### 3.2 F4A/F4M INTERCONNECTION TABLE

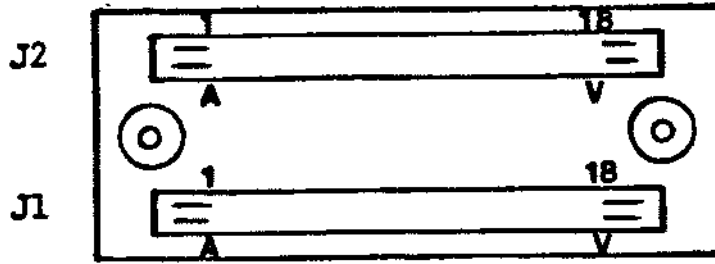
The following connections are required from the F4A/F4M option to the instrument being used.

Interconnection Table

Signal	F4A/F4M Option	To	Instrument Used				
			204A/B	258	2003A/B 2004	267B/268	203A
CLK	J2-C	To	J1-7	J1-7	J1-18	J1-7	J1-S
REF	J2-A	To	J1-18	J1-S	J1-U	J1-V	J1-P
POL	J2-B	To	J1-N	J1-N	J1-N	J1-N	J1-N
HOLD	J2-16	To	J1-R	J1-R	J1-R	J1-R	J1-R
+5 V	J2-17	To	J1-15	J1-15	J1-15	J1-15	J1-15
DIG GND	J2-18	To	J1-T	J1-T	J1-T	J1-T	J1-T

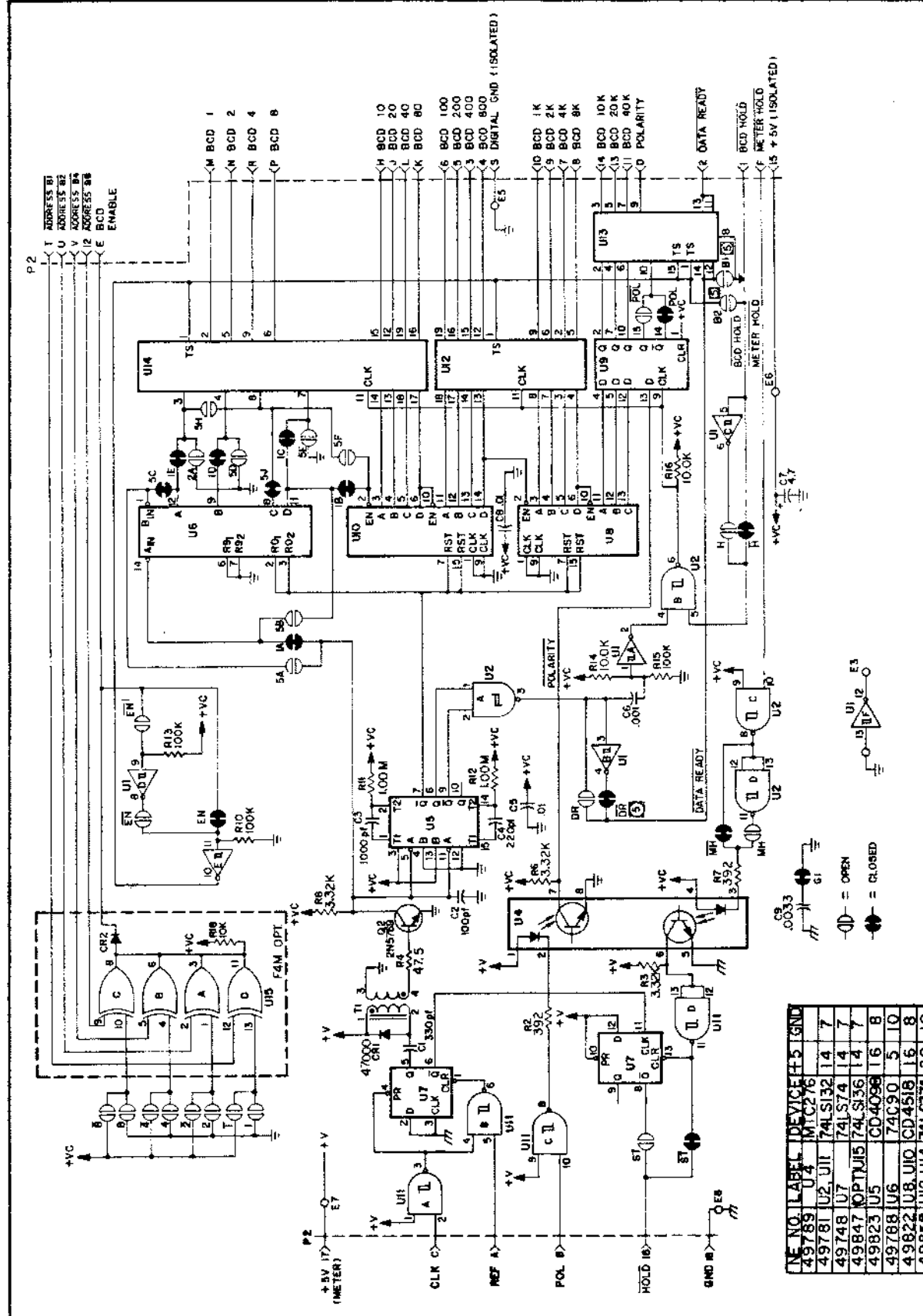
#### Board Modifications

- 204A Internally jumper E4 to E10. (Remove E10 to E13)  
Internally jumper E22 and E28.
- 204B Internally jumper E12 to E24 - CLK (Remove E11 to E12)  
Internally jumper E21 to E34 - REF
- 2003A Jumper Pin 6 of U6 to E3.  
Internally jumper E4 to feedthrough located between R40 and C16 near display board.
- 2003B Jumper E14 to P3-Pin 4. Jumper E13 to P3-Pin 5.
- 2004 Jumper E14 to P3-Pin 4. Jumper E13 to P3-Pin 5. Open solder switch "A". Close solder switch "B" (+5 V).
- 258/268 No modifications necessary.
- 267 Install a 0.01 uFd capacitor (25 V ceramic) from U2-Pin 3 to U2-Pin 7. (Newport P/N 5162103)
- 203A Internally jumper Pin 3 of U8 to E2. On underside of board, cut ground trace to Pin 5 of U9. Internally jumper Pin 5 of U9 to Pin 2 of U9.



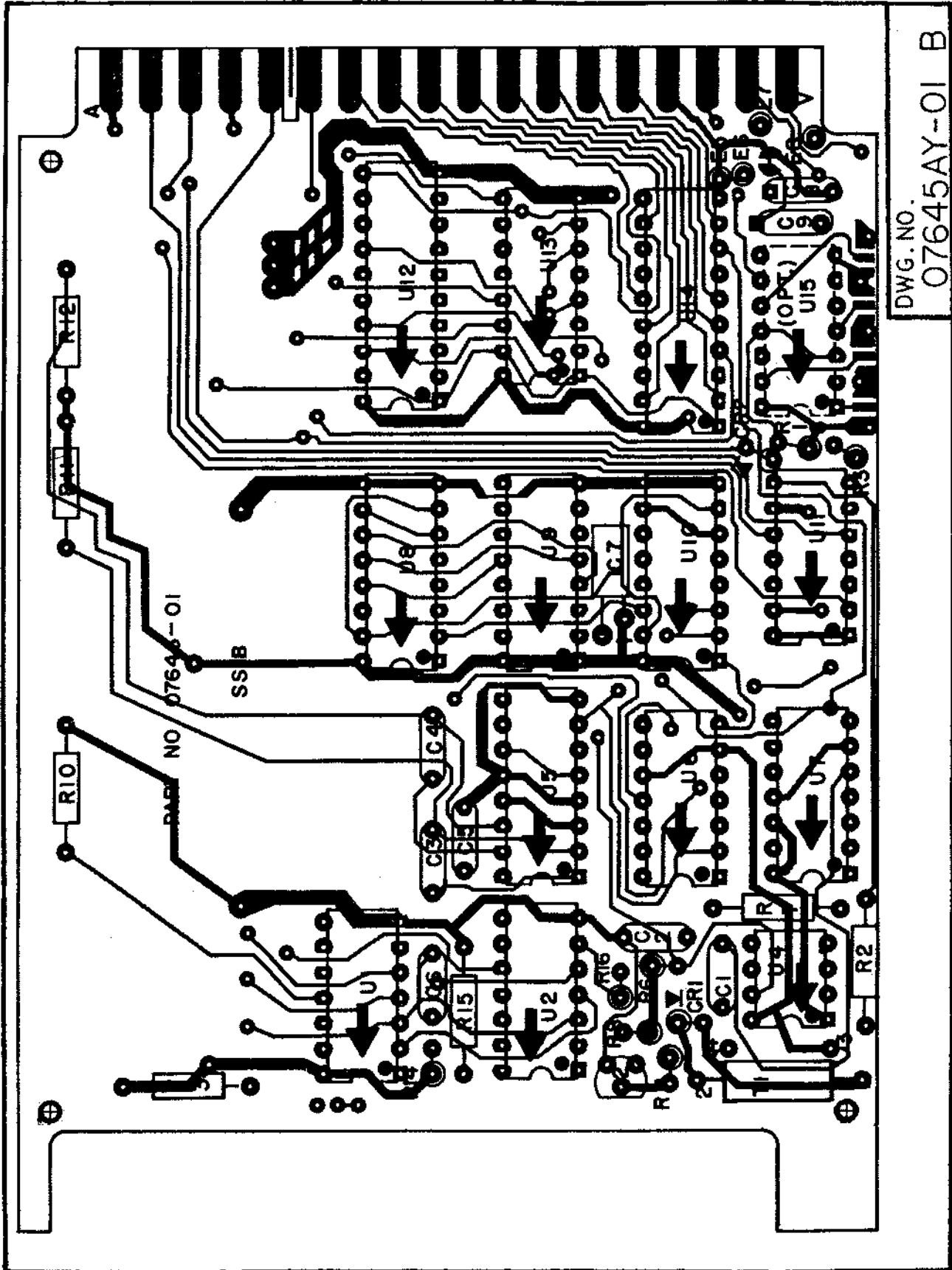
Rear View of Unit  
Figure 3

DWG. NO.  
07645SC-01 A



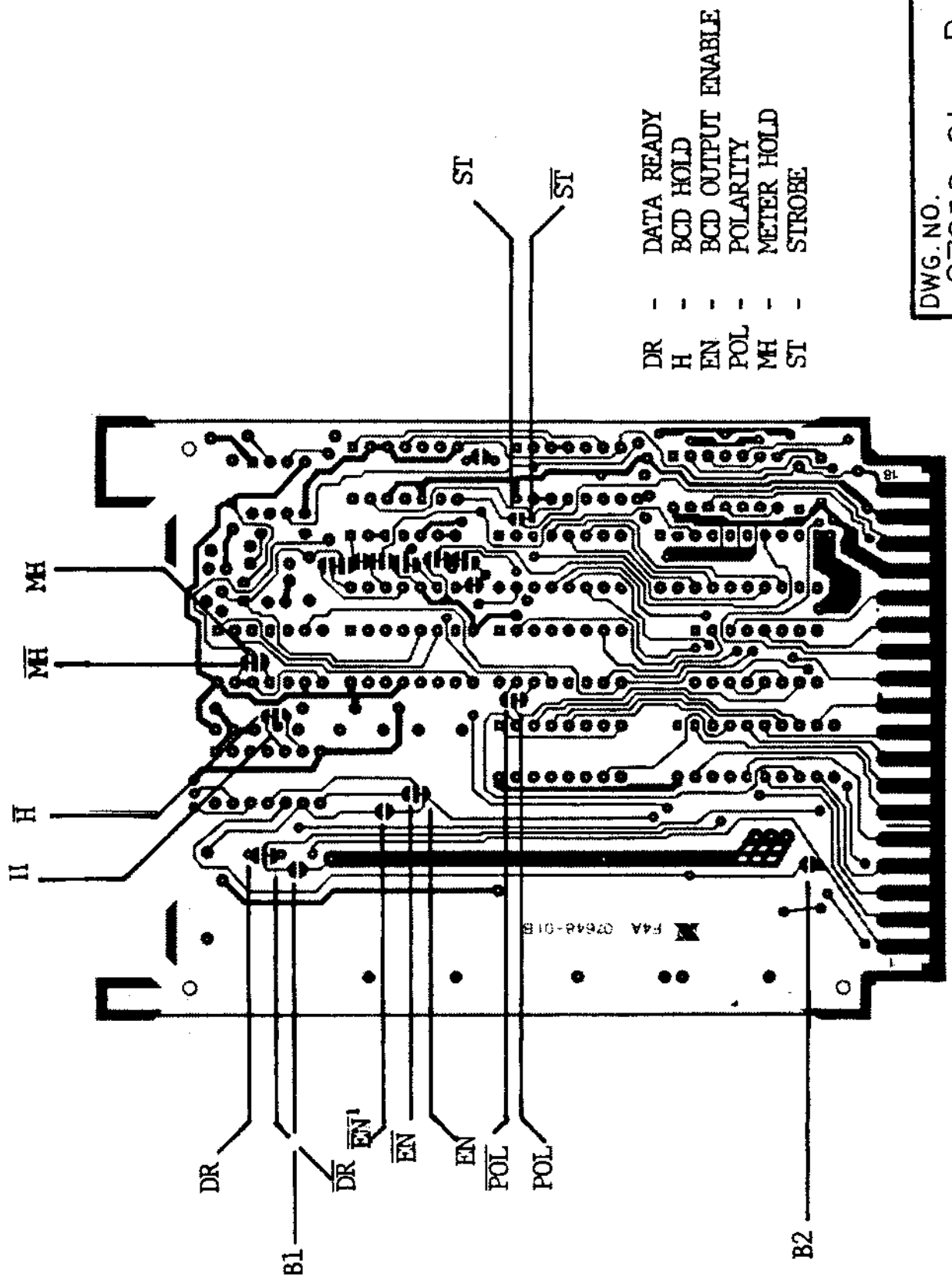
NE NO.	LABEL	DEVICE	±5 GND
49789	U4	74LS13	14 7
49781	U2, U11	74LS13	14 7
49748	U7	74LS74	14 7
49847	OPT, U15	74LS36	14 7
49823	U5	CD4096	16 8
49788	U6	74C90	5 10
49822	U8, U10, CD4518	16 8	
49858	U12, U14	74LS374	20 10
49849	U9	74C175	16 8
49828	U13	74LS367	16 8
49848	U1	74C14	14 7

F4A ISOLATED BCD SYSTEMS INTERFACE



DWG. NO. 07645AY-01 B

SOLDER - SWITCH DIAGRAM CONTROL FUNTIONS



DR	-	DATA READY
H	-	BCD HOLD
EN	-	BCD OUTPUT ENABLE
POL	-	POLARITY
MH	-	METER HOLD
ST	-	STROBE

DWG. NO. 07658-01 B

**NOTE :**

FOR POS TRUE ADDRESS (1=LOGIC HIGH)

■ = SOLDER SWITCH CLOSED

□ = SOLDER SWITCH OPEN

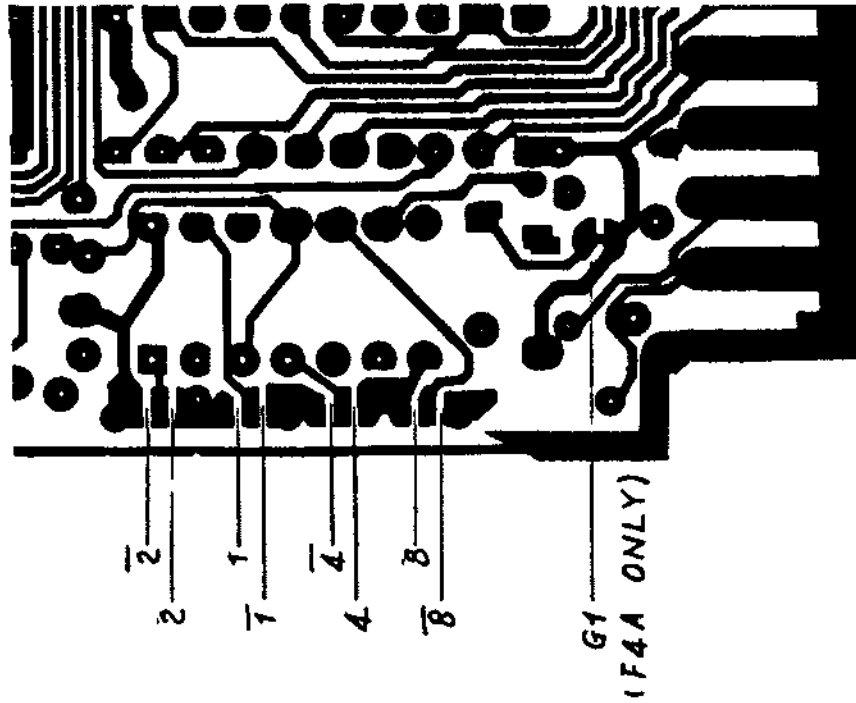
FOR NEG TRUE ADDRESS (0=LOGIC HIGH)

■ = SOLDER SWITCH OPEN

□ = SOLDER SWITCH CLOSED

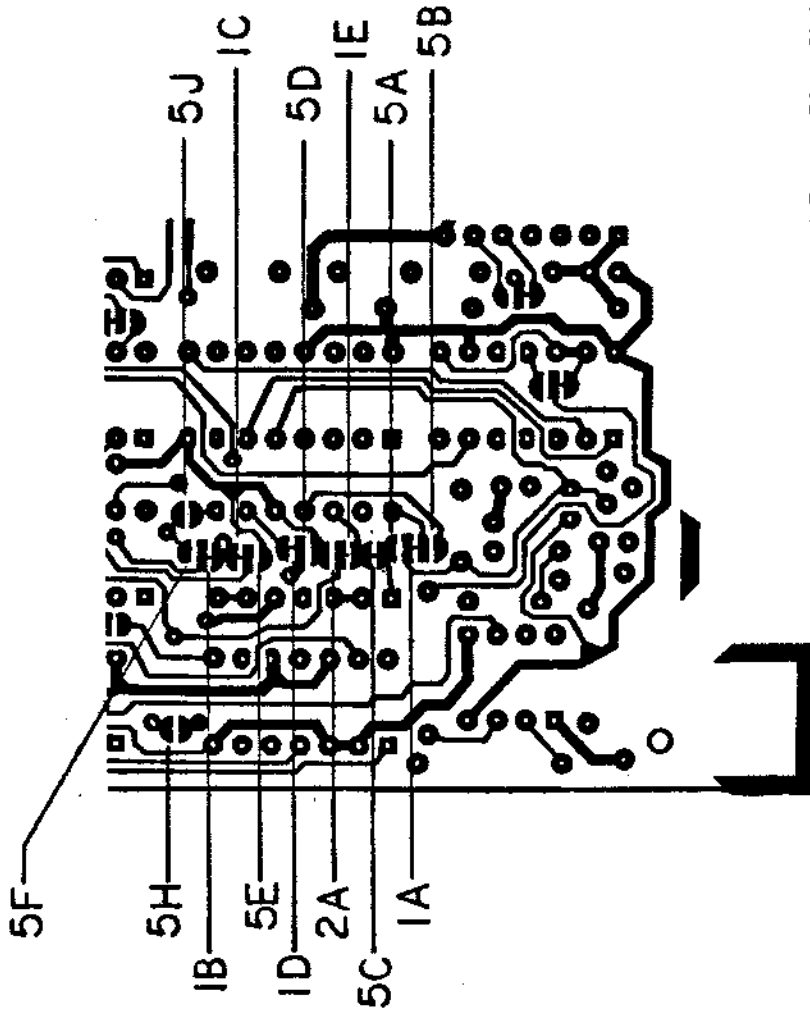
SOLDER SWITCH ADDRESS ENCODING

DECIMAL NUMBER #	BINARY ADDRESS A8 A4 A2 A1	SOLDER SWITCH STATUS							
		B	5	4	3	2	1	7	6
1	0 0 0 1	□	□	□	□	□	□	□	□
2	0 0 1 0	□	□	□	□	□	□	□	□
3	0 0 1 1	□	□	□	□	□	□	□	□
4	0 1 0 0	□	□	□	□	□	□	□	□
5	0 1 0 1	□	□	□	□	□	□	□	□
6	0 1 1 0	□	□	□	□	□	□	□	□
7	0 1 1 1	□	□	□	□	□	□	□	□
8	1 0 0 0	□	□	□	□	□	□	□	□
9	1 0 0 1	□	□	□	□	□	□	□	□
10	1 0 1 0	□	□	□	□	□	□	□	□
11	1 0 1 1	□	□	□	□	□	□	□	□
12	1 1 0 0	□	□	□	□	□	□	□	□
13	1 1 0 1	□	□	□	□	□	□	□	□
14	1 1 1 0	□	□	□	□	□	□	□	□
15	1 1 1 1	□	□	□	□	□	□	□	□



DWG. NO.  
07652-02 C

SOLDER SWITCH DIAGRAM - COUNT MODES



**SOLDER SWITCH STATUS**

= SOLDER SWITCH CLOSE      = SOLDER SWITCH OPEN

	1A	1B	1C	1D	1E	2A	5A	5B	5C	5D	5E	5F	5H	5J
COUNT BY ONE	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COUNT BY TWO	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
COUNT BY FIVE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

REVISE & REDRAWN AT REV 'C'

DWG. NO.  
07658-02 C