

# **F3A/F3P/F3M OPTION**

**07657ML-01**

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## 1.0 DESCRIPTION

### 1.1 GENERAL - F3A/F3P/F3M

The basic F3A provides the customer with buffered, gated and stored BCD information. A big advantage of this option over the normal BCD outputs of an instrument is that it provides three-state buffering which makes it ideally suited to bussing of signals for digital systems applications.

The F3A, F3P, and F3M options provide the following capabilities to the customer:

1. All output data (parallel BCD, POLARITY, and  $\overline{\text{DATA READY}}$ ) is buffered through three-state output devices.
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.

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 outputs. The instrument will not start a new conversion until Pin F of J2 is brought high again. Closing solder switches ST and MH enable a strobed  $\overline{\text{METER HOLD}}$  mode. In this mode of operation, a high going pulse (1 m Sec minimum, less than 1/conversion rate maximum) into  $\overline{\text{METER HOLD}}$  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.

**NOTE:** When closing solder-switches ST and MH, solder-switches  $\overline{\text{ST}}$  and  $\overline{\text{MH}}$  must be opened.

4. A latched polarity output signal corresponding to the displayed polarity is available at Pin D of J2.
5. A  $\overline{\text{BCD HOLD}}$  control input at Pin 1 of J2 is used for holding the BCD data stored in the latches without inhibiting successive conversions with the instrument being used. This input is active low.

6. A low or open input at the BCD ENABLE control input (Pin E of J2) places all output signals in their high-impedance state. **This control input must be tied high for F3P or normal single meter operation using F3A.**
7. The polarity of all control signals is user-selectable via solder-switches on the circuit side of the F3A option card.
8. The least significant digit is programmable to count by one, two, or five.

## 1.2 GENERAL - F3P (OPTIONAL PEAK OR VALLEY DETECTOR)

The F3P Peak or Valley Detector option is useful for situations where parameter extremes need to be digitally monitored, detected, and stored for recording at a later period. The F3P option is mutually exclusive with the F3M option.

The F3P Peak or Valley Detector option provides the user the following additional capabilities:

1. Display of Peak or Valley reading on immediate display by toggling front-panel switch to extreme left.
2. Peak or Valley information in three-state BCD format for monitoring with an external display, printing recorder, or other data acquisition device is present when switch is in center position.
3. Peak or Valley reading is reset when toggle switch is toggled to extreme right.
4. Ability to switch from Peak or Valley detection to track meter display at BCD outputs is accomplished with switch toggled to extreme right.
5. With the F3P option installed, the BCD HOLD input function (J2-Pin 1) becomes a PRINT output command and goes high only when a new Peak or Valley reading has occurred. When used with a printer, this PRINT command (J1-Pin 1) will result in the printing of all the Peak or Valley occurrences.

## 1.3 GENERAL - F3M (BINARY ADDRESSING OPTION)

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 (see Figure 5-5). In this mode of operation, solder-switch EN is closed while  $\overline{EN}$  and  $\overline{EN}^1$  are left open. Pin E of J2 (BCD ENABLE control line) is normally left open for multiplex applications, although it may be pulled high to override the 4-bit meter address for enabling the BCD outputs in single meter fashion. The F3M option is mutually exclusive with the F3P option.

## 2.0 SPECIFICATIONS

### 2.1 ACCURACY AT 25°C

Does not affect basic instrument specifications

### 2.2 DIGITAL SIGNALS

Logical '0'

0 to 1.5 V (input) (BCD enable 0 to .6 V)

0 to .5 V (output)

Logical '1'

3.5 to 5.5 V (input)

4.0 to 5.5 V (output)

1 Unit Load

Logical '0' - 1.6 mA

Logical '1' - .04 mA

#### Solder-switch Procedure

$\overline{+POLARITY}$

'0' = Positive (Close  $\overline{POL}$  - Open POL)

+POLARITY\*

'1' = Positive (Close POL - Open  $\overline{POL}$ )

METER HOLD

'1' = Hold Reading (Close MH - Open  $\overline{MH}$ )

$\overline{METER HOLD}^*$

'0' = Hold Reading (Close  $\overline{MH}$  - Open MH)  
Input Load = 0.5 TTL Unit Loads

DATA READY

'1' = Valid Data (Close DR - Open  $\overline{DR}$ )

$\overline{DATA READY}^*$

'0' = Valid Data (Close  $\overline{DR}$  - Open DR)

BCD HOLD

'1' = Hold Data in Latches (Close H - Open  $\overline{H}$ )

$\overline{BCD HOLD}^*$

'0' = Hold Data in Latches (Close  $\overline{H}$  - Open H)

BCD ENABLE\*

'0' or Open Input = BCD Lines to HI-Z State  
(Close EN - Open  $\overline{EN}$ ,  $\overline{EN}^1$ )

$\overline{BCD ENABLE}$

'1' or Open Input = BCD Lines to HI-Z State  
(Close  $\overline{EN}$ ,  $\overline{EN}^1$  - Open EN)

\* Denotes the standard factory configuration.

### 2.3 BCD DATA

Logical '0'

0 to 0.5 V (output)

Logical '1'

4.0 to 5.5 V (output)

HI-Z State

25  $\mu$ A Leakage Current at 2.4 V applied

Output Drive

1 TTL Unit Load

1 TTL Unit Load

Logical '0' 1.6 mA

Logical '1' 0.04 mA

### 2.4 POWER

Supplied by instrument

### 3.0 MECHANICAL ASSEMBLY AND INSTALLATION

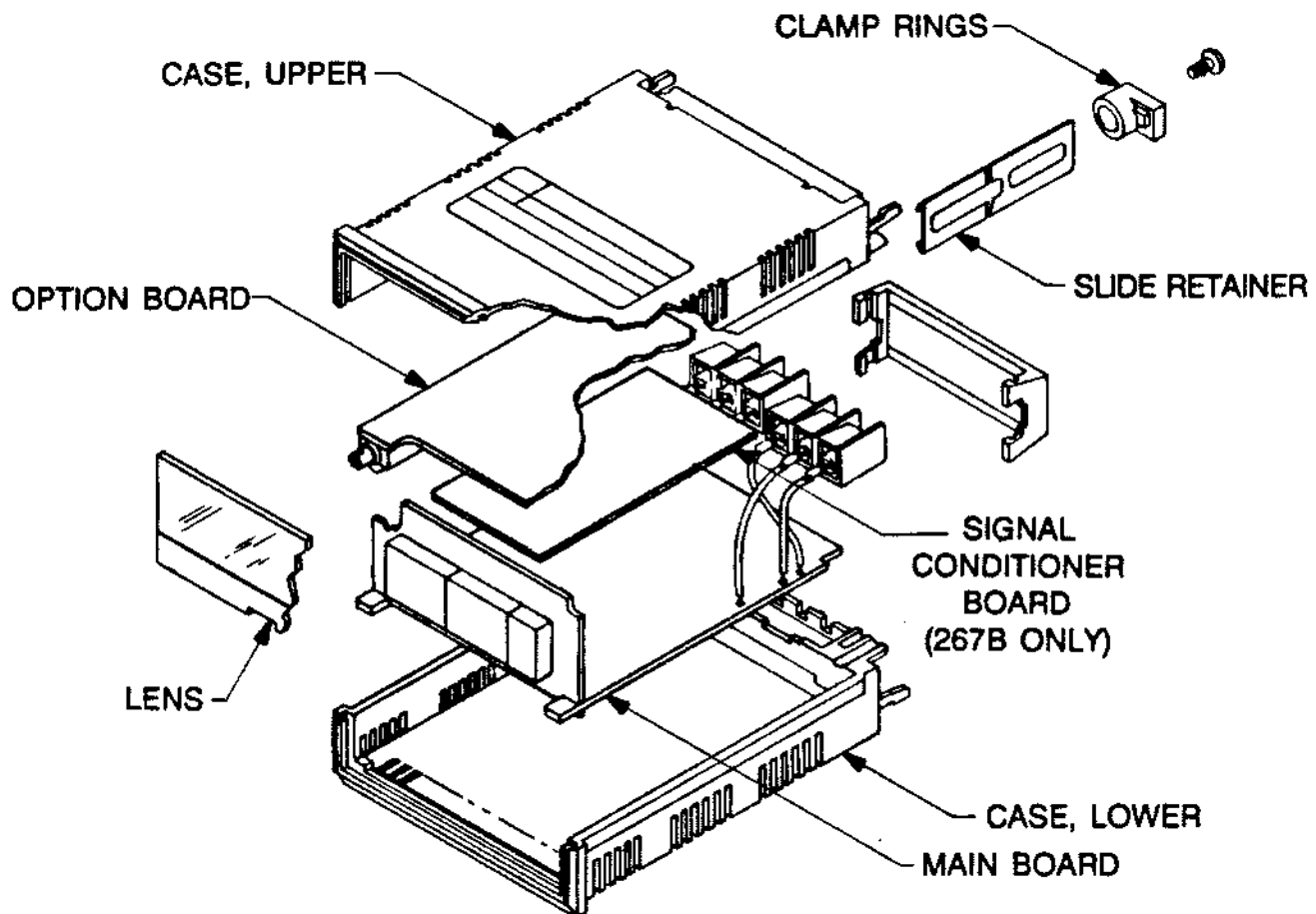


Figure 3-1 Exploded View

1. Remove AC power from the instrument in which the option is to be installed.
2. Remove lens, two screws, clamp rings, and slide retainers.
3. Remove upper half of case and carefully remove meter from case.
4. Locate appropriate 'E' points on main P.C. board as indicated in Section 4.0 and install teflon insulated #24 wires, as required in Tables 4-1 and 4-2.
5. Modify display board per Figure 3-2 for 267B, 268, 204A/B, 2004, 2003B, and 258 and per Figure 3-3 for 2003A and 203A.
6. Reassembly meter into lower half of case.
7. Install option board into upper half of case and reassemble meter. (Refer to Figure 3-1.)
8. Proceed to Section 4.0 for Interconnection Tables.

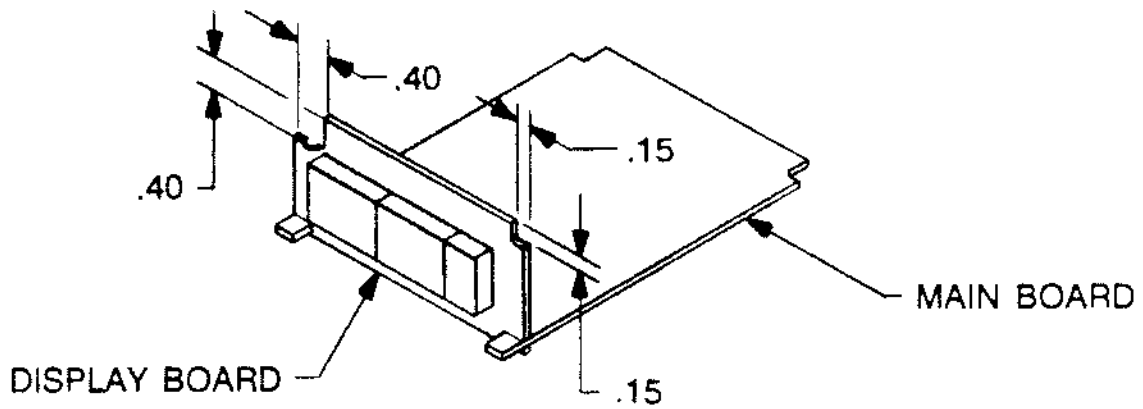


Figure 3-2 F3A Display Board Modifications  
(267B, 268, 204A/B, 2003B, 2004, and 258 only)

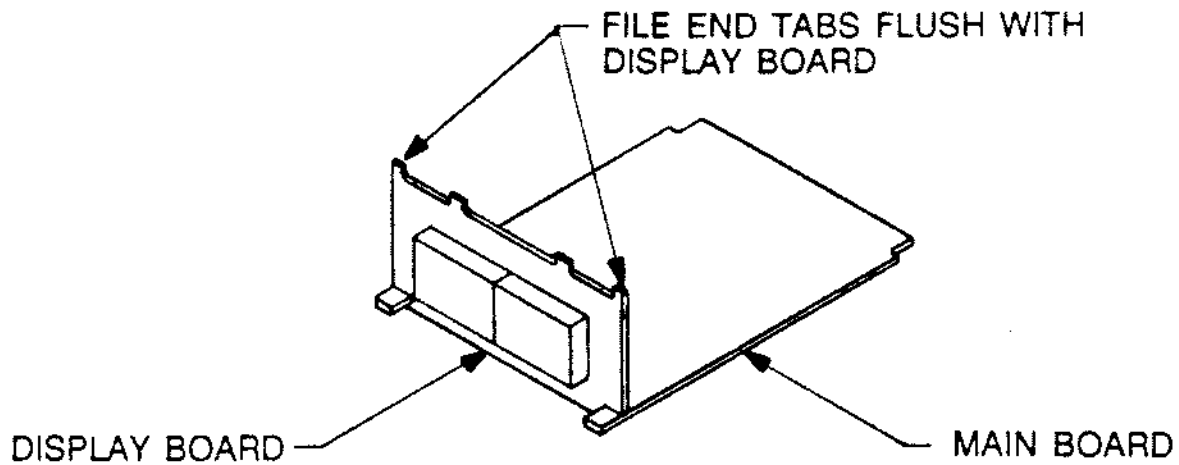


Figure 3-3 F3A Display Board Modifications  
(2003A and 203A only)

**NOTE:** Trim top row of all display board IC leads flush with the boards.

## 4.0 OPERATING INSTRUCTIONS

### 4.1 PIN ASSIGNMENTS

PIN	FUNCTION	PIN	FUNCTION
1	$\overline{\text{BCD HOLD/PRINT}}$	A*	REF
2	$\overline{\text{DATA READY}}$	B*	POL
3	BCD 400	C*	CLK
4	BCD 800	D	POLARITY
5	BCD 200	E	$\overline{\text{BCD ENABLE}}$
6	BCD 100	F	$\overline{\text{METER HOLD}}$
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	$\overline{\text{ADDRESS B8}}$	N	BCD 2
13	BCD 20 k	P	BCD 8
14	BCD 10 k	R	BCD 4
15	$\overline{\text{OL/TEST}}$	S	COMP
16*	$\overline{\text{HOLD}}$	T	$\overline{\text{ADDRESS B1}}$
17*	+5 V	U	$\overline{\text{ADDRESS B2}}$
18*	DIGITAL GND	V	$\overline{\text{ADDRESS B4}}$

\* Denotes inputs from or to the instrument. For the F3A option, the +5 V and ground are provided by the instrument.

**NOTE:** The +5 V is provided to power the F3A option only. No capability is available for driving external loads.

Connector Type Viking VK18D/12  
SAE SAC18D/12

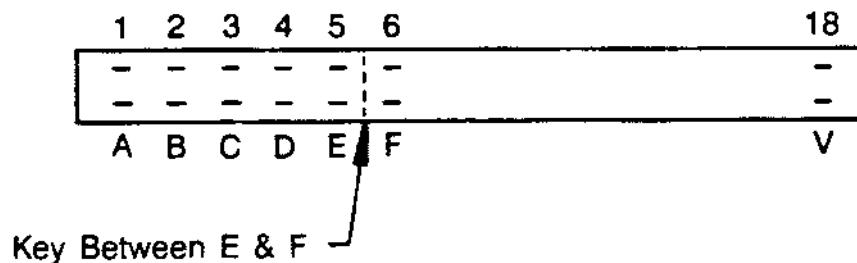


Figure 4-1 Connector Pin Orientation  
(Viewed from rear of meter)

## 4.2 F3A INTERCONNECTION TABLE

The following connections are required from the F3A option to the instrument being used. (Section 4.3 lists F3P connections.)

SIGNAL	OPTION F3A	INSTRUMENT USED					
		TO	203A	204A/ 204B	258	267A 268	2004 2003A/B
CLK	J2-C	TO	J1-S	J1-7	J1-7	J1-7	J1-18
REF	J2-A	TO	J1-P	J1-18	J1-S	J1-V	J1-U
POL	J2-B	TO	J1-N	J1-N	J1-N	J1-N	J1-N
$\overline{\text{HOLD}}$	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

Table 4-1 F3A Interconnections

### MODEL

### Main Board Modifications

- 203A Internally jumper Pin 3 of U8 to E2 of edge connector. On underside of board, cut ground trace to Pin 5 of U9. Internally jumper Pin 5 of U9 to Pin 2 of U9.
- 204A Internally jumper E4 to E10 (Remove E10 to E13). Internally jumper E22 to E28.
- 204B Remove E11 to E12. Jumper E12 to E24 (CLK). Jumper E21 to E34 (REF).
- 258 No modification required.
- 268 No modification required.
- 267B No modification required.
- 2003A Jumper Pin 6 of U6 to E3. Internally jumper E4 to feed-through 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).

### 4.3 F3P INTERCONNECTION TABLE (PEAK/VALLEY DETECTOR OPTION)

To display Peak or Valley reading on the instrument, the following interconnections are required from the F3P option to the instrument.

SIGNAL	OPTION F3P	INSTRUMENT USED					
		TO	204A/B	258	267A/B	268	2003B 2004
COMP	J2-S	TO	J1-5	J1-V	J1-5	J1-5	J1-14
$\overline{OL/TEST}$	J2-15	TO	J1-S	J1-R	J1-S	J1-S	J1-S
CLK	J2-C	TO	J1-7	J1-7	J1-7	J1-7	J1-18
REF	J2-A	TO	J1-18	J1-S	J1-V	J1-V	J1-U
POL	J2-B	TO	J1-N	J1-N	J1-N	J1-N	J1-N
$\overline{HOLD}$	J2-16	TO	J1-R	①	J1-R	J1-R	J1-R
+5 V	J2-17,E	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

Table 4-2 F3P Interconnections

NOTE: P/V Option is not available for Models 2003A or 203A.)

#### WARNING

Perform the following modifications in addition to those previously outlined in Section 4.2

#### MODEL Main Board Modifications

- 204A (Useable only on 'C' revision boards)
1. Cut ribbon cable jumper E39 to E6 at E6.
  2. Install jumper from E6 to E7, under ribbon cable (COMP).
  3. Install jumper from E23 to E25, by card edge connector ( $\overline{OL/TEST}$ ).
- 204B
1. Open solder switch 'B'.
  2. Jumper E8 to E25 (COMP).
  3. Jumper E13 to E14 ( $\overline{OL/TEST}$ ).
- 258 Consult factory for modifications.

① The  $\overline{HOLD}$  function is no longer available on 258 with F3P.

267A/B None

268 None

2003B 1. Jumper E23 to E12 (COMP). **2**

2. Jumper E27 to E11 (OL). **2**

2004 1. Jumper E23 to E12 (COMP). **2**

2. Jumper E27 to E11 (OL) **2**

3. Open solder switch 'A'. Close solder switch 'B' (+5 V).

**2** Remove any existing jumpers to these points. Decimal points must be internally connected to E25 as required.

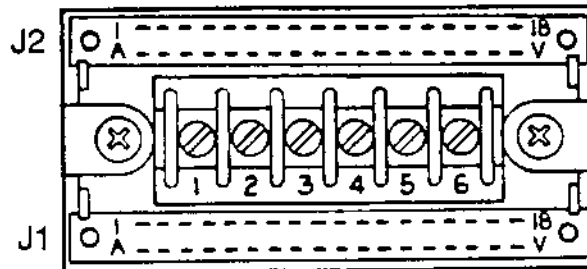


Figure 4-2 Rear View

#### 4.4 PEAK/VALLEY DETECTOR PROGRAMMING

Refer to solder switch configuration diagram Figure 5-3.

Peak Detect (on solder side of board):

1. Close solder switch 'P' (Peak) located between U8 and U11.
2. Close solder switch 'H' (Hold) located between U4 and U8.
3. Leave open solder switch 'V' (Valley) and 'H' (Hold).

Valley Detect (on solder side of board):

1. Close solder switch 'V' (Valley) located between U8 and U11.
2. Close solder switch 'H' (Hold) located between U4 and U8.
3. Leave open solder switch 'P' (Peak) and 'H' (Hold).

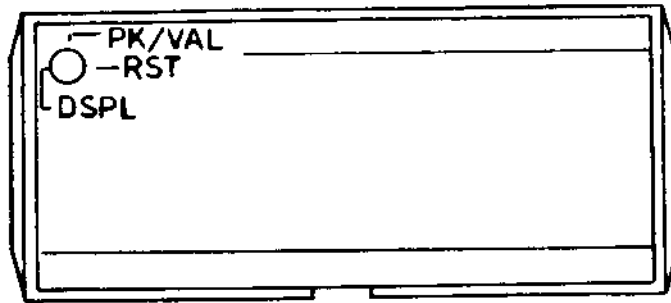


Figure 4-3 Front View F3P Equipped Instrument

Three-position front-panel toggle switch definition:

Left	<u>DSPL</u>	Display peak or valley value on display.
Center	<u>PK/VAL</u>	BCD outputs retain highest peak or lowest valley reading obtained.
Right	<u>RST</u>	Reset BCD outputs to currently displayed instrument signal reading.

**NOTE:** A low or open input at the BCD Enable control input (Pin E of J2) places all output signals in their high-impedance state. **This control input must be tied high for normal single meter operation.**

5.0 DRAWINGS

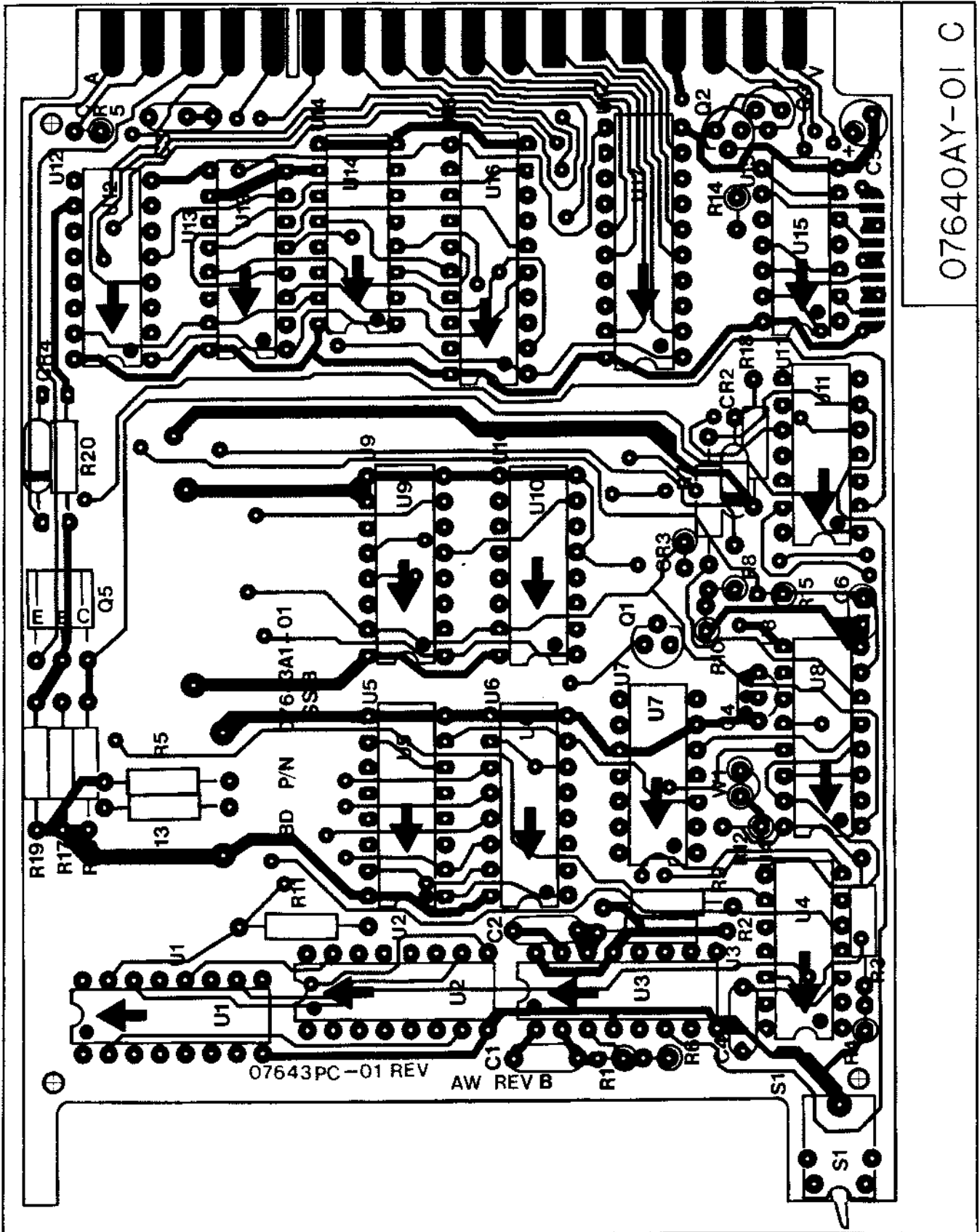
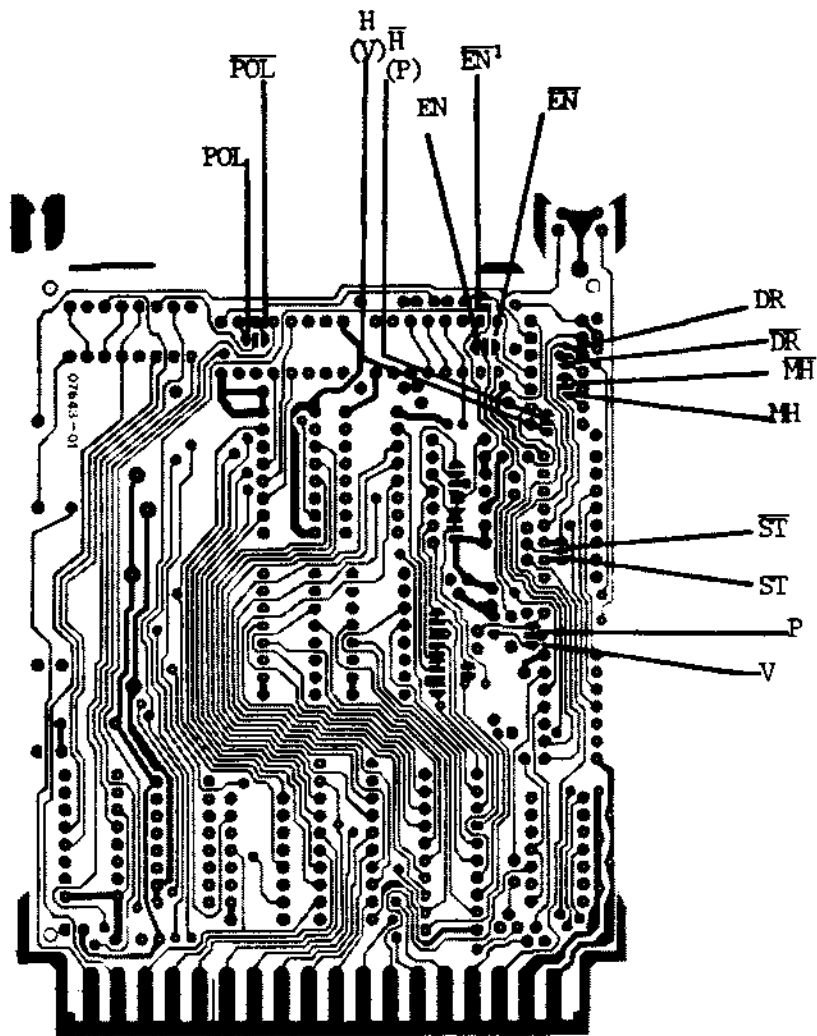


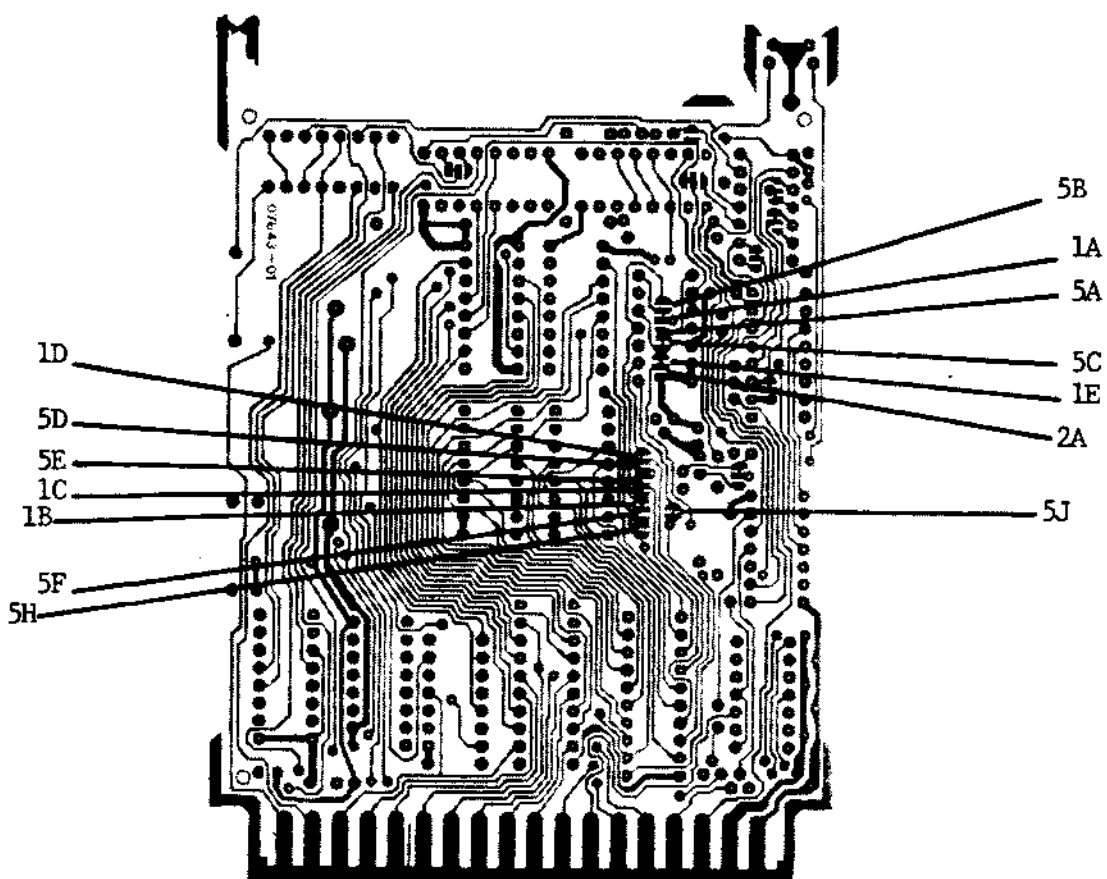
Figure 5-1 F3A PCB Assembly Diagram





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

Figure 5-3 Solder Switch Control Functions Diagram



**SOLDER SWITCH STATUS (1 = Close 0 = Open)**

	1A	1B	1C	1D	1E	2A	5A	5B	5C	5D	5E	5F	5H	5J
COUNT BY ONE	1	1	1	1	1	0	0	0	1	0	0	0	0	1
COUNT BY TWO	1	1	1	1	0	1	0	0	1	0	0	0	0	1
COUNT BY FIVE	0	0	0	0	1	0	1	1	0	1	1	1	1	0

Figure 5-4 Solder Switch Count Modes Diagram

**SOLDER SWITCH ADDRESS ENCODING**

DECIMAL NUMBER #	BINARY ADDRESS A3 A4 A2 A1	SOLDER SWITCH STATUS			
		8 $\bar{8}$	4 $\bar{4}$	2 $\bar{2}$	1 $\bar{1}$
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	■	■	■	■

**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

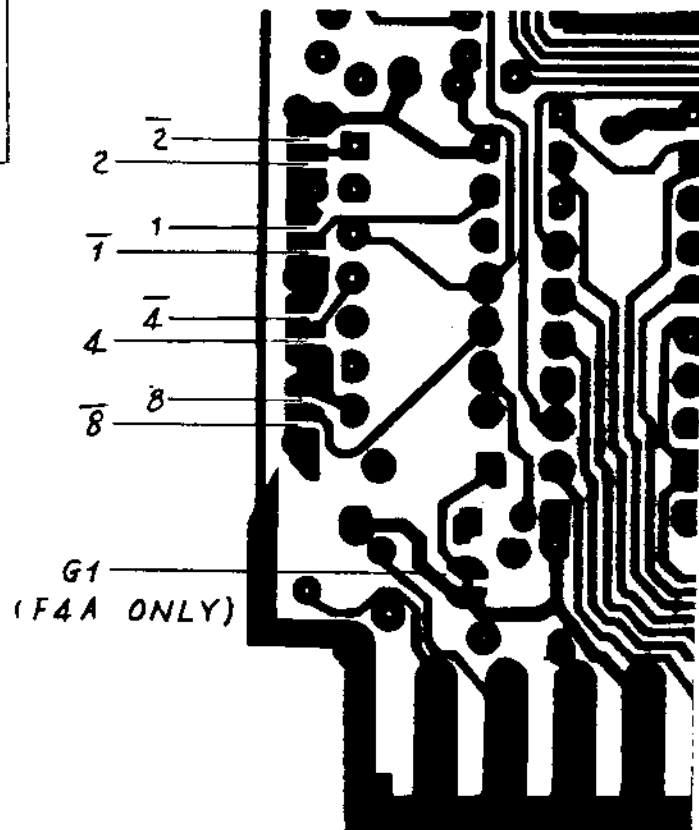


Figure 5-5 Solder Switch M Option Diagram