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1.0 GENERAL INFORMATION

1.1 Introduction

This specification describes the features, as well as the mechanical and electrical requirements, of a 1 X 40 Vacuum Fluorescent display/data-input panel.

1.2 Application

The 03901-A1-YYY-ZZ VIP module is ideally suited to applications that require user interaction. Typical applications are small machine tools, process control, test equipment, etc.

1.3 Description

1.3.1 General

The 03901-A1-YYY-ZZ VIP is a vacuum fluorescent mini-terminal which operates on a single 5 volt supply and communicates by RS-232C serial I/O.

1.3.2 Special Features

Serial RS-232C I/O with RTS/CTS & DTR/DSR
Bell output allows for audible feedback with user-provided signaling device
Operates from a single +5VDC supply
Provisions for "Canned-Messages"
(Display messages & switch messages) in EPROM
7 or 8 data bits odd, even or no parity,
1 or 2 stop bits

180° Power &
data connectors
Comprehensive
self-test
ESD shielded
2x11 keypad
Rear cover

1.3.3 Display Panel

This unit consists of a 1 X 40 vacuum fluorescent display tube with a minimal amount of electronic hardware. Primary complexity is contained within the microprocessor software, which controls all display functions.

The unit is capable of storing up to 127 display messages, 64 switch closure messages, 64 switch release messages, and 1 multiple switch message in its approximately 11K bytes of user available EPROM. Messages can be any length as long as the total length of all messages does not exceed 11K.

The display uses vacuum fluorescent technology to display characters in a 5x7 dot format with underbar cursor. All display characters and standard control codes are in 7-bit ASCII. An ASCII-coded English font employs a standard 96 character set. The characters are bright, but soft, providing comfortable short or long-term viewing. Figure 3 depicts the standard ASCII character set as displayed by the 03901-A1-YYY-ZZ module.

The front panel is ESD protected and designed to be drip-proof when tested according to MIL-STD-108E, 4.3 procedure and will meet the requirements of NEMA 12 when used with the optional gasket (IEE PN 32205-01).

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1.3.4 Switch Matrix

Custom switch designs can be specified with up to 64 locations since the VIP electronics will support an 8x8 matrix. Switches are scanned in a row/column matrix, without common, by the on-board microprocessor. Two key rollover is provided. Switch data is output on the RS-232C output port.

When two sides of the switch matrix are connected together, the VIP will output a switch closure message stored in EPROM corresponding to that switch location. For example, the upper left hand corner of the matrix (column 0, row 0) will output data stored at switch closure message number 81H, and the lower right hand corner of the matrix (column 7, row 7) will output data stored at switch closure message number C0H. In order to prevent system malfunction or damage by operator induced electrostatic discharge (ESD), a shielded layer connected to the mounting panel, is incorporated directly beneath the first layer of the switch sandwich.

For the purposes of this specification a standard IEE switch array (31688-A01) is assumed. The switch array is wired as follows:

KEYPAD VALUE	CONNECTION	SWITCH MESSAGE NUMBER
0	J3-1 to J3-9	81H
1	J3-2 to J3-9	82H
2	J3-3 to J3-9	83H
3	J3-4 to J3-9	84H
4	J3-5 to J3-9	85H
5	J3-6 to J3-9	86H
6	J3-7 to J3-9	87H
7	J3-8 to J3-9	88H
8	J3-1 to J3-10	89H
9	J3-2 to J3-10	8AH
	.	
	.	
	.	
21	J3-4 to J3-11	96H
etc.		

1.3.5 Interface

All data I/O is via DB-25 connector at RS-232C levels with RTS/CTS and DTR/DSR in serial asynchronous format.

1.3.6 Power Requirements

The module requires only 5VDC at 2.4 watts.

1.3.7 Mechanical

1.3.7.1 Outline Dimensions - See Figure 4

1.3.7.2 Weight - 21 ounces (595 grams)

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2.0 BLOCK DIAGRAM

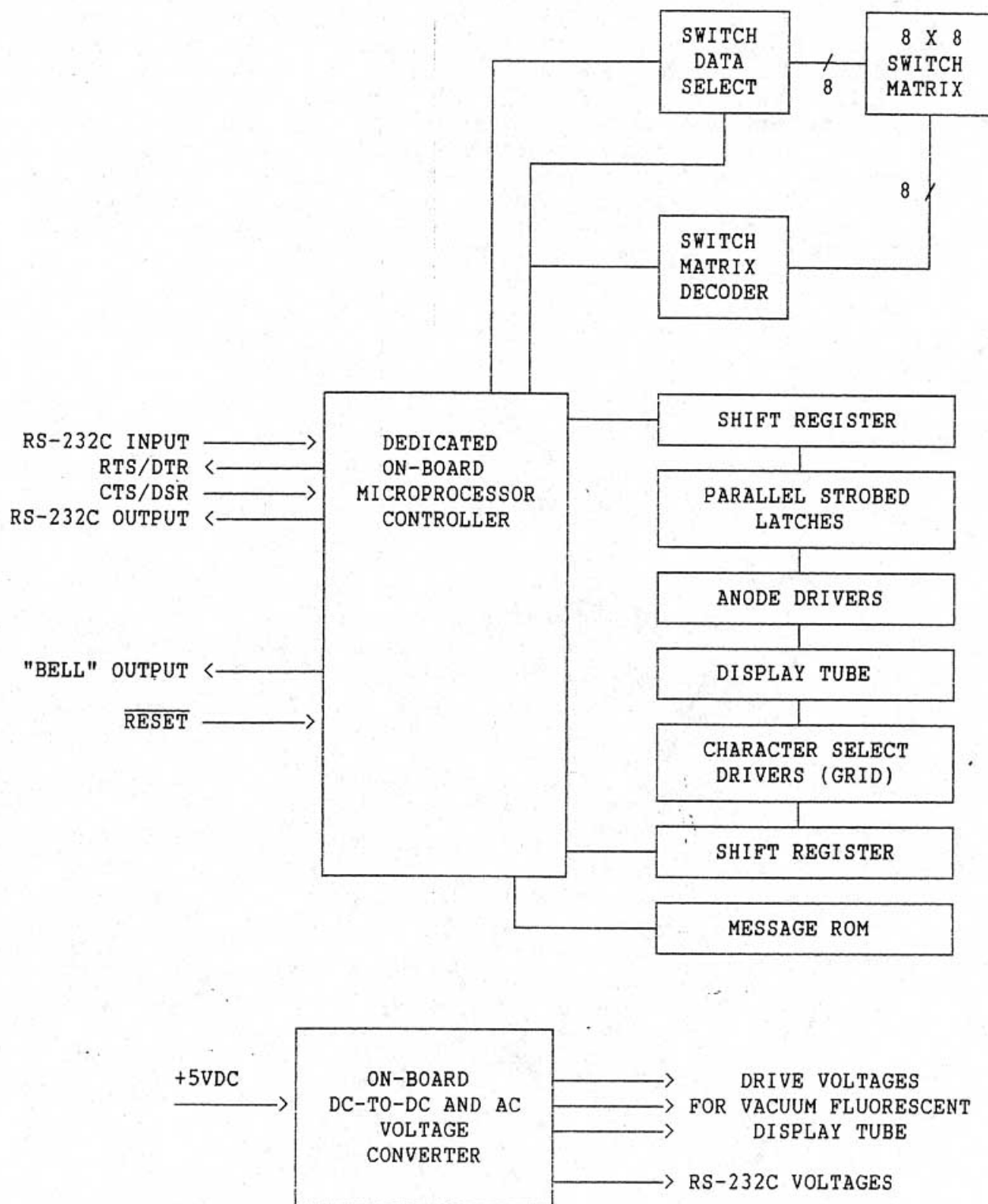


FIGURE 1

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3.0 THEORY OF OPERATION (Dot Matrix Displays)

The Vacuum Fluorescent Display array consists of three basic electrodes which are enclosed in an evacuated glass chamber. The first electrode is the filament, which spans the entire length of the display, and is made from a small diameter oxide coated tungsten wire. This element is common to all characters and supplies the electron emission needed for operation. Individual grid electrodes are provided, one for each character, to control current passing to the anodes. Each grid is a fine mesh screen which provides digit-select electrical control with no visual interference. When the grid is positive with respect to the filament, electrons are allowed to pass on to the third electrode, the anode dots, causing the fluorescent phosphor coating on each positively charged dot to glow. Selectively energizing these fluorescent dots causes the desired character to be displayed.

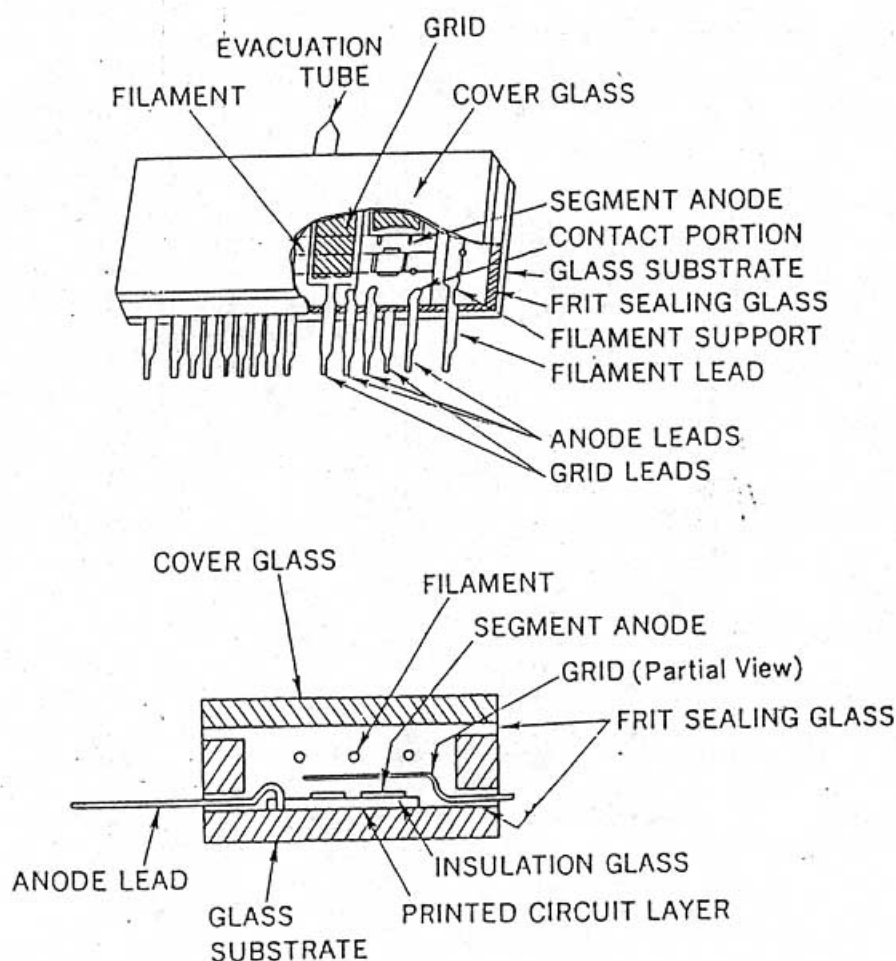


FIGURE 2

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3.1 Display Operation

3.1.1 Loading ASCII Character Data

All printing characters are located in standard ASCII code locations from 20 (HEX) to 7F (HEX). Control character assignments are as follows.

3.1.2 Control Codes

NOTE: CARE SHOULD BE TAKEN NOT TO SEND UNDEFINED CONTROL OR COMMAND CODES TO THE VIP DISPLAY MODULE AS THIS MAY CAUSE A SOFTWARE MALFUNCTION OF THE MODULE.

DATA (HEX)	DESCRIPTION
04	TRANSMIT A DISPLAY MESSAGE; See Transmit a Stored Display Message (3.2.3)
05	DISPLAY A DISPLAY MESSAGE; See Display a Stored Display Message (3.2.2)
07	ENABLE BELL OUTPUT (150ms)
08	BACK SPACE CURSOR LOCATION ONE POSITION
09	ADVANCE CURSOR LOCATION ONE POSITION
0A	LINE FEED (clears display, cursor positions to the left-most character position)
0B	BEGIN CHARACTER BLINK FIELD
0C	END CHARACTER BLINK FIELD
0D	CARRIAGE RETURN (returns cursor to left-most character position; does not clear display)
0E	MAKE CURSOR INDICATOR INVISIBLE (the cursor location counter continues to function but there is no visible indicator of next character location)
0F	+ MAKE CURSOR INDICATOR VISIBLE
<11>	+ NORMAL DATA ENTRY WITH AUTOMATIC CARRIAGE RETURN
<12>	OVERWRITE MODE (overwrites the last character after display has been filled)
<13>	HORIZONTAL SCROLL MODE (From right to left after display has been filled)

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3.1.2 Control Codes (Continued)

DATA (HEX)	DESCRIPTION
14	RESET
16	PAUSE (Intended for use in stored messages; creates a 3 second delay before processing the next byte of data following the pause control code)
19	FIRST BYTE OF CERTAIN MULTIBYTE COMMANDS (See Below)
[1A]	SELECT SCIENTIFIC CHARACTER SET
[1C]	+ SELECT ENGLISH CHARACTER SET (U.S. ASCII-7)
[1D]	SELECT GENERAL EUROPEAN CHARACTER SET (ECMA-7)
[1E]	SELECT SCANDINAVIAN CHARACTER SET (ECMA-7)
[1F]	SELECT GERMAN CHARACTER SET (ECMA-7)
20-7F	CHARACTER SET (see CHARACTER CHART)

MULTIBYTE COMMANDS

DATA (HEX)	DESCRIPTION
1B	POSITION CURSOR AT LOCATION XX 2-BYTE INSTRUCTION (i.e. 1BH + Location Number 0-27H)

Additional commands may be written preceded by 19 HEX. They are as follows:

0C	CLEAR DISPLAY AND CURSOR HOME
0E	CURSOR HOME
13	POSITION CURSOR AT LOCATION XX 3-BYTE INSTRUCTION (i.e. 19H + 13H + Location Number 0-27H)
41	* PREPARE TO READ CURSOR LOCATION VALUE
42	* PREPARE TO READ DATA AT PRESENT CURSOR LOCATION
43	* PREPARE TO READ DATA AT PRESENT CURSOR LOCATION AND INCREMENT CURSOR

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3.1.2 Control Codes (Continued)

DATA (HEX)	DESCRIPTION
<4C>	DISPLAY BLANK
<4D>	DISPLAY DIM
<4E>	DISPLAY BRIGHT
<4F>	+ DISPLAY BRIGHTEST

* When VIP READY is high, send 19H to units RXD. When VIP READY is high send read code (41H, 42H, or 43H) to unit's RXD. Set HOST READY high. Receive data via units TXD, repeat as required.

+ Display automatically defaults to these conditions after power-up and reset.

< > These instructions are mutually exclusive.

[] Character set control affects ASCII characters 5B, 5C, 5D, 5F, 23 & 60.

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3.1.3 Character Chart (5x7 Dot Matrix)

DATA BITS				b7	0	0	0	0	0	0	0	0
				b6	0	0	0	0	1	1	1	1
				b5	0	0	1	1	0	0	1	1
				b4	0	1	0	1	0	1	0	1
b3	b2	b1	b0	HEX	0	1	2	3	4	5	6	7
0	0	0	0	0			SP					
0	0	0	1	1								
0	0	1	0	2								
0	0	1	1	3								
0	1	0	0	4								
0	1	0	1	5								
0	1	1	0	6								
0	1	1	1	7								
1	0	0	0	8								
1	0	0	1	9								
1	0	1	0	A								
1	0	1	1	B								
1	1	0	0	C								
1	1	0	1	D								
1	1	1	0	E								
1	1	1	1	F								

FIGURE 3

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3.1.4 Alternate Character Codes

1A, 1C-1F are mutually exclusive latched functions. The following characters appear as a function of the last control code (1A, 1C-1F) and their ASCII location.

CONTROL CODES	CHARACTER SET	ASCII	LOCATION (HEX)					CHARACTERS
		23	5B	5C	5D	5F	60	
1A	Scientific	⌘	⌘	⌘	⌘	⌘	⌘	⌘
1C	English	⌘	⌘	⌘	⌘	⌘	⌘	⌘
1D	General European	⌘	⌘	⌘	⌘	⌘	⌘	⌘
1E	Scandinavian	⌘	⌘	⌘	⌘	⌘	⌘	⌘
1F	German	⌘	⌘	⌘	⌘	⌘	⌘	⌘

Default at power-up is 1C (English).

3.1.5 Execution Times (Maximum)

Character Rate	1200 or 9600 baud (Jumper Selectable)
Reset (Hardware):	200mS
Reset (Software):	200mS

3.1.6 Dedicated Hardware Lines

3.1.6.1 RESET

Hardware reset is available on J1 (power), pin 6. Holding RESET low for at least 500μS, and then returning it to high, will clear the display and set the cursor to the home position (power-up condition); this sequence requires approximately 200mS to complete. RESET input must be able to sink an HC input with a 10K resistor connected to Vcc.

3.1.6.2 Enable Bell Output (150mS)

When the bell command is received (07H) the bell output (J1-pin 2) will be activated once for approximately 150mS. This open-collector output is intended to drive an audible signaling device that draws no more than 0.1 amp from a positive source not exceeding 24VDC. If the signaling device is inductive, the resulting transient must be suitably suppressed.

3.1.7 Serial Data

3.1.7.1 Serial Interface

The 1 X 40 VIP module RS-232C interface is via a MOTOROLA MC145406.

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3.1.7.2 Transmit and Receive Data Configuration and Rate

A set of jumpers on the control board allows the user to select a data rate of 1200 or 9600 baud. Parity is also selectable for odd, even, or no parity. Jumper selection for a desired data format is as follows:

INTERNAL PROGRAM ACCESS	(E7)	(E8)	(E9)	*EXTERNAL PROGRAM ACCESS
NORMAL OPERATION	(E10)	(E11)	(E12)	SELF-TEST
1200 BAUD	(E20)	()	(E13)	9600 BAUD
**DISABLE PARITY	(E21)	()	(E14)	ENABLE PARITY
EVEN PARITY	(E22)	()	(E15)	ODD PARITY
RESERVED	(E23)	()	(E16)	*RESERVED
8 DATA BITS	(E24)	()	(E17)	7 DATA BITS
2 STOP BITS	(E25)	()	(E18)	1 STOP BIT
RESERVED	(E26)	()	(E19)	RESERVED

VIP READY	(E38)	(E37)	(E36)	HOST READY	For more information refer to Section 3.1.7.4 and Figure 4.
HOST READY	(E35)	(E34)	(E33)	VIP READY	
VIP READY	(E32)	(E31)	(E30)	HOST READY	
HOST READY	(E29)	(E28)	(E27)	VIP READY	
TXD	(E6)	(E5)	(E4)	RXD	
RXD	(E3)	(E2)	(E1)	TXD	

NORMALLY SHIPPED FROM THE FACTORY IN THIS CONFIGURATION

*DO NOT REMOVE JUMPER AS DISPLAY MALFUNCTION MAY RESULT

**7 DATA BITS, NO PARITY, 1 STOP BIT IS NOT SUPPORTED

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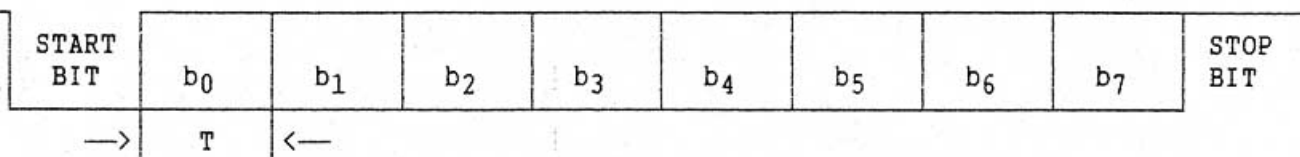
REV

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3.1.7.2 Transmit and Receive Data Configuration and Rate (Continued)

Input and output word for the VIP module is 7 or 8 data bits, odd, even, or no parity, with 1 or 2 stop bits. Each byte is 10, 11 or 12 bit intervals in length. The example byte shown has eight data bits, no parity bit, and one stop bit. Actual word will depend upon jumper selection.



T = 833μS when baud rate = 1200 bits/sec.

T = 104.1μS when baud rate = 9600 bits/sec.

3.1.7.3 Error Detection

The 1 X 40 VIP module is able to detect errors in data transmission. Each character received with an error is replaced with the error symbol "#". An error is detected if data rate is distorted by more than 5%.

3.1.7.4 Signal Definition

The VIP RS-232C interface supports four signals defined as follows:

- RXD - Serial data input to the VIP
- TXD - Serial data output from the VIP
- HOST READY - When "high" indicates to the VIP that the host is ready to accept data.
- VIP READY - When "high" indicates that the VIP is ready to accept data from the host.

A flexible pin block allows for jumpering to configure the VIP as either a DTE or DCE and to support either DSR or CTS (but not both simultaneously) and either DTR or RTS (but not both simultaneously). Jumpering will allow Pin 4, 5, 6 or 20 to be connected to either HOST READY or VIP READY.

In an interface with no handshaking (only Pins 2 and 3 on the DB25 used) the VIP handshaking requirements can be conveniently satisfied by placing jumper blocks between E29/E32 and E35/E38.

VIP units are shipped from the factory with the jumpers installed as follows: E1/E2, E4/E5, E30/E31 and E37/E38.

This arrangement will configure the VIP as a DTE with RXD on Pin 3, TXD on Pin 2, CTS on Pin 5 and DTR on Pin 20. Utilizing Figure 7, a configuration to satisfy almost any requirement can be worked out. However, care must be taken not to install jumper blocks so that unused cables are driven and the line drivers loaded down unnecessarily.

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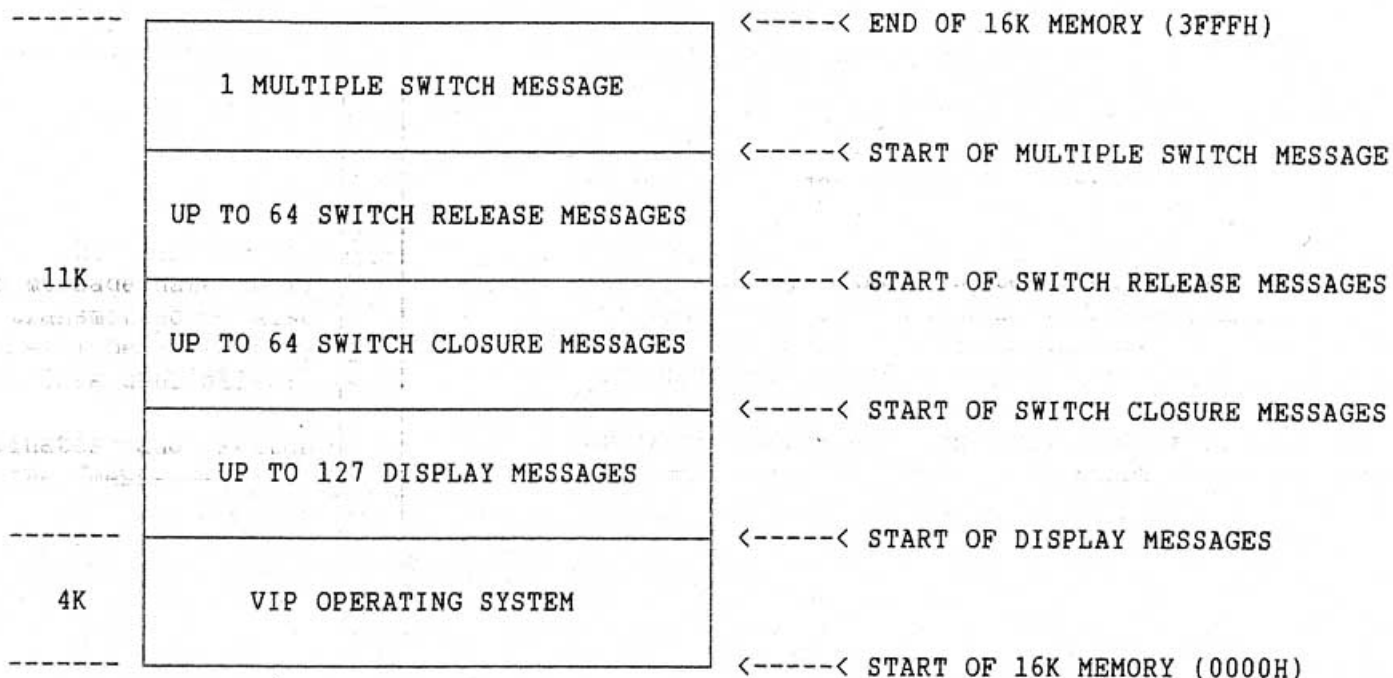
SCALE

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3.2 Canned-Message Operation

The 1 X 40 VIP can store four different types of canned-messages. The total of all canned-message data can be up to approximately 11K bytes of ASCII characters and/or control codes, and are saved in the units 27128 (16K) EPROM memory. Canned-message types and the order in which they are to be stored are as follows:



EPROM messages are not programmed through the VIP. EPROM messages are programmed externally (e.g., PROM programmer). The EPROM message area begins at the end of the VIP operating system. There is one EPROM starting address for the display messages and one EPROM starting address for each of the switch message types. Each of the four starting addresses points to where the first message of a particular type starts. The starting address for the display messages is fixed. The starting address for each switch message type depends on the length of all the messages stored in the previous message types. These addresses are displayed during the self-test routine.

The following section describes how to program the different message types, the necessary data that must be included in each message, and the sequence in which it must be placed.

3.2.1 Program A Message

1) DISPLAY MESSAGE

- a) Message number
8 bit binary
(81H to FFH)
- b) Message data
(00H to 7FH)
- c) Last message only
(80H)*

See section 3.3 for explanation
of the different switch messages.

3) SWITCH RELEASE MESSAGE

- a) Message number
8 bit binary
(81H to C0H)
- b) Message data
(00H to 7FH)
- c) Last message only
(80H)*

2) SWITCH CLOSURE MESSAGE

- a) Message number
8 bit binary
(81H to C0H)
- b) Message data
(00H to 7FH)
- c) Last message only
(80H)*

4) MULTIPLE SWITCH MESSAGE

- a) Message number
8 bit binary
(81H)
- b) Message data
(00H to 7FH)
- c) Last message only
(80H)*

*.The 80 HEX is required at the end of the last message in each category. If no messages are to be programmed of a particular category the 80 HEX must still be present for that category. The 80 HEX indicates the end of all messages in that category.

The DISPLAY MESSAGE numbers are in the range of 81 HEX to FF HEX. Therefore, message number one is identified as 81 HEX and message number 127 is labeled FF HEX. A DISPLAY MESSAGE may contain any ASCII character or 7-bit control code except (02H, 03H, 04H, or 05H). These control codes may be a part of a DISPLAY MESSAGE if they are preceded by the cursor locate control code string (19H and 13H, or 1BH).

The SWITCH MESSAGE numbers are in the range of 81 HEX to C0 HEX. A SWITCH MESSAGE may contain any ASCII character or 7-bit control code.

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3.2.1 Program A Message (Continued)

Messages do not have to be programmed in numerical order; however, if an existing message is edited and the new message is to be placed in a different location in memory than it originally was in, then the following step must be followed.

- 1) Write 00 HEX to the memory location containing the old message number. (This will cause the old message text to be ignored).

If the old message was also the last message in its category, then the following two steps must also be followed:

- 2) Write 00 HEX to the memory location which had previously stored the 80 HEX; and
- 3) Write 80 HEX after the end of the message that is now the last message in its category.

Once the messages have been developed, the 8051 operating system contained in the modules 27128 EPROM must be copied into an EPROM programmer. Append the messages to the operating system, erase the EPROM, and copy the new code (operating system plus messages) back into the EPROM.

3.2.2 Display A Stored Display Message

A DISPLAY MESSAGE stored in memory can be displayed by entering the following commands:

DISPLAY A STORED DISPLAY MESSAGE

a) CTL E (05 HEX)

b) Message number
8 bit binary
(01H to 7FH)*

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3.2.3 Transmit A Stored Display Message

A DISPLAY MESSAGE stored in memory may be returned to the host computer using the RS-232C TRANSMIT PORT by entering the following commands:

TRANSMIT A STORED DISPLAY MESSAGE

a) CTL E (04 HEX)

b) Message number
8 bit binary
(01H to 7FH)*

If 00 HEX is used in place of the message number in the above sequence, the VIP will return data presently displayed on the entire display to the host computer. After the above sequence has been completed, the VIP returns data to the host computer according to the following format:

a) STX (02 HEX)

b) MESSAGE

c) ETX (03 HEX)

If the selected message does not exist in the memory, the host computer receives only STX (02 HEX) and ETX (03 HEX). (02H, 03H, 04H, or 05H) may be part of a message if it is preceded by a cursor locate control code string (19H and 13H, or 1BH).

* The message number used to Display or Transmit a DISPLAY MESSAGE differs from the message number used to Program a DISPLAY MESSAGE. To Display or Transmit a DISPLAY MESSAGE, you drop the 8th bit off the message number you used to Program a DISPLAY MESSAGE. Therefore the message numbers 81H to FFH that were used to Program a DISPLAY MESSAGE become 01H to 7FH when Displaying or Transmitting a DISPLAY MESSAGE.

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3.3 VIP Operation

The switch encoding electronics scans the switch matrix columns until a connection between a single row and a single column is detected. Scanning continues for one more cycle to see if any other row/column connections have been established. When a valid switch closure is detected a switch closure message is output. When the contacts open a switch release message is output.

The VIP module as-shipped contains, in the EPROM canned-message storage area, preprogrammed switch messages for all of the switch message types. Note that the actual message output can be altered (see section 3.2.1) and the messages listed below are only the messages in the as-shipped condition. SWITCH CLOSURE MESSAGE data resulting from initial operator interaction with the VIP switch matrix will be output in a two byte format as follows:

First byte of SWITCH CLOSURE MESSAGE (5F HEX)

Second byte of SWITCH CLOSURE MESSAGE will contain
switch coordinates (00 HEX to 3F HEX)

Removal of an operator's finger from the switch matrix will result in the following sequence of SWITCH RELEASE MESSAGE data being transmitted:

First byte of SWITCH RELEASE MESSAGE (6F HEX)

Second byte of SWITCH RELEASE MESSAGE will contain
switch coordinates (00 HEX to 3F HEX)

If two or more switches are actuated simultaneously, the VIP module will output the following MULTIPLE SWITCH MESSAGE data:

First byte of MULTIPLE SWITCH MESSAGE (7F HEX)

Second byte of MULTIPLE SWITCH MESSAGE (00 HEX)

The VIP features two key rollover. If a second key is depressed while the first is still actuated, the VIP will output data in the following sequence:

First finger down on first switch: 5F, XX

Second finger down on second switch: 7F, 00

First finger removed from first switch: 5F, YY

Second finger removed from second switch: 6F, YY

XX = Switch coordinate data for first switch pressed

YY = Switch coordinate data for second switch pressed.

In all cases above, switch coordinate data output for the upper left-most switch (connected to the Column 0 and Row 0 connections on J3) will be binary 0.

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3.3 VIP Operation (Continued)

Using a standard A01 switch configuration the as-shipped switch message data codes output for a given switch location are as follows:

	Closure	Release
Top row, left side	5FH 00H	6FH 00H
Top row, right side	5FH 0AH	6FH 0AH
Second row, left side	5FH 0BH	6FH 0BH
Second row, right side	5FH 15H	6FH 15H

NOTE: If data has been requested from the display portion of the VIP (e.g., display message memory contents are being reviewed) no switch message data will be output while the display message memory data is being transmitted. Also switch message data detected during display data transmission will be lost. See paragraph 3.2.1 for a detailed explanation of switch location data generation.

Tabulated below is the relationship between switch coordinates and switch message number. The actual codes output are a function of the messages programmed per section 3.2.1.

SWITCH MATRIX COLUMN

SWITCH MATRIX ROW	SWITCH MATRIX COLUMN							
	J3-1	J3-2	J3-3	J3-4	J3-5	J3-6	J3-7	J3-8
J3-9	81	82	83	84	85	86	87	88
J3-10	89	8A	8B	8C	8D	8E	8F	90
J3-11	91	92	93	94	95	96	97	98
J3-12	99	9A	9B	9C	9D	9E	9F	A0
J3-13	A1	A2	A3	A4	A5	A6	A7	A8
J3-14	A9	AA	AB	AC	AD	AE	AF	B0
J3-15	B1	B2	B3	B4	B5	B6	B7	B8
J3-16	B9	BA	BB	BC	BD	BE	BF	C0

3.4 Self Test

The VIP unit may be evaluated on a stand-alone basis by moving the jumper from E10/E11 to E11/E12. Upon initiation of Self-Test, the VIP unit will execute a "DISPLAY TEST". If after completion of "DISPLAY TEST" a switch is actuated, the unit will enter a switch test mode.

3.4.1 Display Self-Test

The following sequence will be displayed when the display enters the self-test mode. User can terminate self-test at any time during the test by reconnecting jumper E10 to E11.

"DISPLAY TEST"
"SOFTWARE # XXXXX-XX"
"XXXX BAUD"

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SIZE
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SCALE

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3.4.1 Display Self-Test (Continued)

Depending on jumper settings, one each from each of the groups of messages will appear.

"8 DATA BITS"

"7 DATA BITS"

"ODD PARITY"

"EVEN PARITY"

"NO PARITY"

"ONE STOP BIT"

"TWO STOP BITS"

The following will then be displayed:

"XXX DISPLAY MESSAGES STORED" (DECIMAL)

"XXXX BYTES FREE" (DECIMAL)

"DISPLAY MESSAGE ROM BEGINS AT XXXXH"

"SWITCH CLOSURE ROM BEGINS AT XXXXH"

"SWITCH RELEASE ROM BEGINS AT XXXXH"

"MULTIPLE SWITCH ROM BEGINS AT XXXXH"

"BRIGHTNESS TEST"

The VIP module will then go through a sequence of brightness levels (blank, dim, bright, brightest).

After the above sequence has been completed, ASCII characters from 20 (Hex) to 7F (Hex) will be displayed advancing through the character field at approximately a 3 character per second rate. After the above procedures have been completed, the display will read "READY", after which the display will show incoming data in Hex format.

If, while the display reads "DISPLAY MESSAGE ROM BEGINS AT XXXXH", the three digits representing a display message number are entered on the keypad in decimal, the display message associated with that number will be displayed. The message will remain displayed until a new message number is entered. If an unassigned message number is entered, the module will display "unassigned #", until a new message number is entered. If an invalid message number is entered, the invalid message number will be left on the display until a new message number is entered. Once a message number is entered you may continue to enter other message numbers indefinitely. To escape message viewing and continue to "SWITCH CLOSURE ROM BEGINS AT XXXXH", 3 zeros must be entered on the keypad instead of a message number.

If a message number is not entered within 3 seconds after the display reads "DISPLAY MESSAGE ROM BEGINS AT XXXXH", the display will continue to "SWITCH CLOSURE ROM BEGINS AT XXXXH".

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3.4.2 Switch Self-Test

After the module reads "READY", the user may enter the switch self-test mode by pressing any key on the keypad. The switch message data corresponding to that switch location in the matrix will then be displayed. The user may then proceed to test any switch on the keypad. See section 3.3 for switch message data output.

3.4.3 I/O Self-Test

The two comprehensive test modes outlined in the previous paragraphs will establish a high degree of confidence that the VIP module is working properly; however, a key group of components not evaluated are the line drivers and receivers. Complete evaluation may be initiated by selecting Display Self-Test and jumpering the serial output to the serial input. This is done by jumpering TXD to RXD. HOST READY must be held high during this test. This is done by jumpering VIP READY to HOST READY.

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4.0 CONNECTOR PIN ASSIGNMENTS

J1 (POWER)

PIN NO.	FUNCTION
J1-1	+5VDC @ 470mA (TYP) +
J1-2	BELL OUTPUT *
J1-3	NO CONNECTION
J1-4	COMMON
J1-5	NO CONNECTION
J1-6	RESET

+FOR BRIGHTEST SETTING

*OPEN COLLECTOR OUTPUT 100mA MAX. SINK

J3 (SWITCH) (+24VDC MAX.)

PIN NO.	FUNCTION
J3-1	SWITCH COLUMN 0
J3-2	SWITCH COLUMN 1
J3-3	SWITCH COLUMN 2
J3-4	SWITCH COLUMN 3
J3-5	SWITCH COLUMN 4
J3-6	SWITCH COLUMN 5
J3-7	SWITCH COLUMN 6
J3-8	SWITCH COLUMN 7
J3-9	SWITCH ROW 0
J3-10	SWITCH ROW 1
J3-11	SWITCH ROW 2
J3-12	SWITCH ROW 3
J3-13	SWITCH ROW 4
J3-14	SWITCH ROW 5
J3-15	SWITCH ROW 6
J3-16	SWITCH ROW 7

J2 (DATA)

PIN NO.	FUNCTION
J2-1	CHASSIS GROUND
J2-2	TRANSMIT DATA (RS-232C)
J2-3	RECEIVE DATA (RS-232C)
J2-4	REQUEST TO SEND (RS-232C)*
J2-5	CLEAR TO SEND (RS-232C)*
J2-6	DATA SET READY (RS-232C)*
J2-7	SIGNAL GROUND
J2-8	NO CONNECTION
J2-9	+7V OUT (1K INT. SERIES RES.)
J2-10	-7V OUT (1K INT. SERIES RES.)
J2-11	NO CONNECTION
J2-12	NO CONNECTION
J2-13	NO CONNECTION
J2-14	NO CONNECTION
J2-15	NO CONNECTION
J2-16	NO CONNECTION
J2-17	NO CONNECTION
J2-18	NO CONNECTION
J2-19	NO CONNECTION
J2-20	DATA TERMINAL READY (RS-232C)*
J2-21	NO CONNECTION
J2-22	NO CONNECTION
J2-23	NO CONNECTION
J2-24	NO CONNECTION
J2-25	NO CONNECTION

* SEE SECTION 3.1.6.2

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SCALE

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5.0 ELECTRICAL CHARACTERISTICS

5.1 Power Requirements

There are no deleterious effects associated with power ON and OFF of this display; however, rapid ON/OFF sequencing is not recommended. Neither data nor power connectors should be connected/disconnected while power is applied.

Because of the power-up cycle within the microprocessor, rise time of the power supply should be less than 100ms. The display module is not ready to accept data for 500ms after power-up.

5.2 Absolute Maximum Ratings

Primary voltage: +5.5VDC
RS-232C: +3VDC to +25VDC / -3VDC to -25VDC
Bell Output: +24VDC Max. Source / 100mA Max. Load

5.3 Normal Operating Ratings

Primary voltage: +5.0 +/- 0.25VDC

PRODUCTION

Dimmest

330mA Min. (Screen clear at 5.0V)
400mA Typ. (Screen filled with "A" character at 5.0V)

Brightest (Default setting)

370mA Min. (Screen clear at 5.0V)
470mA Typ. (Screen filled with "A" character at 5.0V)
550mA Max. (Screen filled with "A" character at 5.25V)

5.4 Interface Signals

RS-232C Input Levels:

Logic 1 (MARK) < -3VDC
Logic 0 (SPACE) > +3VDC

RS-232C Output Levels:

Logic 1 (MARK) < -5VDC
Logic 0 (SPACE) > +5VDC

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CODE IDENT NO.
05464

S03901-A1-YYY-ZZ

SCALE

REV

-

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6.0 PHYSICAL CHARACTERISTICS

6.1 Display

Format:	1 line of 40 characters
Character height:	0.20 in. (5.05mm)
Character width:	0.14 in. (3.55mm)
Character spacing:	0.19 in. (4.75mm) center-to-center
Character design:	5 x 7 dot matrix
Type of cursor indicator:	Blinking block
Character set:	96-character U.S. ASCII-7 General European ECMA-7 Scandinavian ECMA-7 German ECMA-7 Scientific alternates
Color:	Blue-green, peak at 5000 Angstroms
Viewing angle:	150 degrees
Brightness: (22°C)	100fL (min), 180fL (typ) - At brightest setting 45fL (typ) - Fully dimmed
Projected life at rated operating conditions:	40,000 to 100,000 hours*

* Note: End of useful life is defined as the point when the display tube light output has decreased to half its initial minimum rated brightness. This life rating is based on use with random text messages. To obtain maximum life, users are encouraged to avoid fixed messages and to blank or clear the display when it is not in use.

6.2 Switch

The standard 2x11 matrix uses metal dome switches with a life exceeding 1,000,000 operations and an actuation force of 15 ± 4 ounces.

Note that the switch ESD shield is connected only to the metal bezel therefore, for the shield to be effective in an application where the front panel is non-conductive (e.g. plastic) an external conductor should be added between a VIP cover mounting screw and the power mains green wire.

7.0 ENVIRONMENTAL CHARACTERISTICS

Operating temperature:	0 to +70 (°C) +32 to +158 (°F)
Storage temperature:	-55 to +85 (°C) -67 to +185 (°F)
Relative humidity:	0 to 95% (non-condensing)
Vibration:	10 to 50 Hz 2mm peak-to-peak (3 axis)
Shock:	20 G (3 axis)

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8.0 ORDERING INFORMATION

8.1 Ordering Description

The 03901-A1-YYY-ZZ VIP module consists of two basic components: the electronics with its associated switch mounting frame and the switch assembly held to the frame with pressure sensitive adhesive.

The module is completely defined by a multi-digit model number consisting of four zones. Note: The switch assembly is included with the unit and need not be ordered as a separate item. (Spares are available; see below).

03901-A1-YYY-ZZ

PART NO. COLOR

Defines display filter color:

-01	Gray
-02	Blue
-04	Aqua
-05	Amber
-07	Green
-10 & up	Special

Defines switch. A01 signifies the standard 2x11 configuration with changeable legend pockets, for prototyping. Other configurations will be assigned numbers by IEE.

Basic model number that defines all dimensions and software.

For spares purposes, a loose switch mechanically and electrically suitable for use on an 03901 VIP module will carry the part number 31688-YYY-ZZ with Y's and Z's representing the features defined above.

8.2 Accessories

Cables	Part Number	Qty Required
Power (single-ended, 6-wire)	27349-XX*	1
Power (double-ended, 6-wire)	32420-XX*	1
Data connector	26746-01 (IEE P/N)	1

*XX = Length in inches: -99 omits cables

Connectors	Mates With
Power	Molex 09-50-3061
Data	ITT Cannon DB-25-P

Optional Accessory	Part Number
Gasket	32205-01
(For sealing front panel to rear of user panel)	

Replacement Parts	Part Number
Switch (with legend pockets)	31688-YYY-ZZ**
Set of SWITCH POCKET STRIP INSERTS	33801-YYY
Rear cover	32432-01

**ZZ = Filter color (see above)

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SCALE

REV

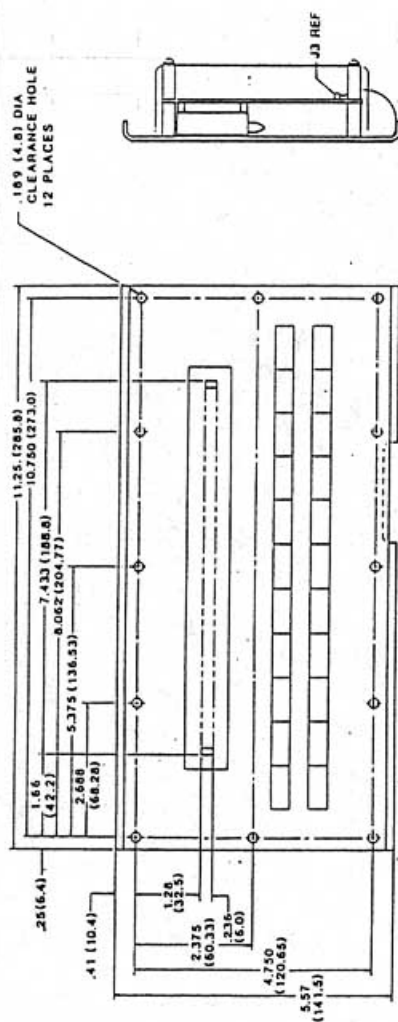
A

SHEET

25

9.0 OUTLINE AND INSTALLATION DRAWING

FOR P/N 03901-A1

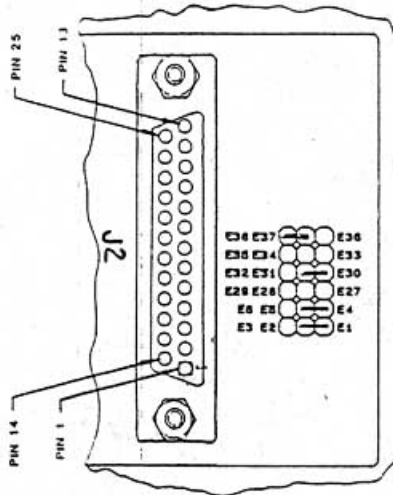
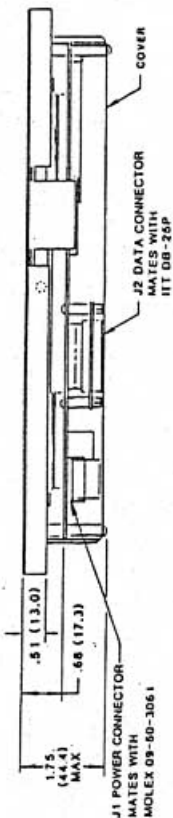


TOLERANCE:

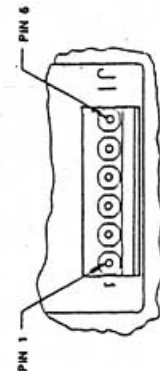
.XX = ± 0.03 (0.8)

.XXX = ± 0.010 (0.25)

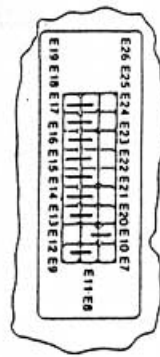
Dimensions in inches (mm)



VIEW B
PROGRAMMING JUMPERS
ENLARGED

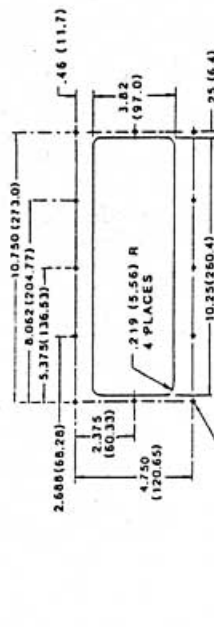
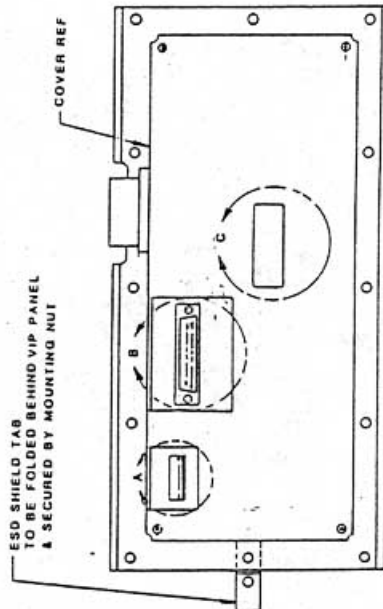


VIEW A
ENLARGED



VIEW C
PROGRAMMING JUMPERS
ENLARGED

FIGURE 4



1.89 (4.8) DIA
CLEARANCE HOLE
12 PLACES

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SIZE
A

CODE IDENT NO.
05464

S03901-A1-YYY-ZZ

SCALE

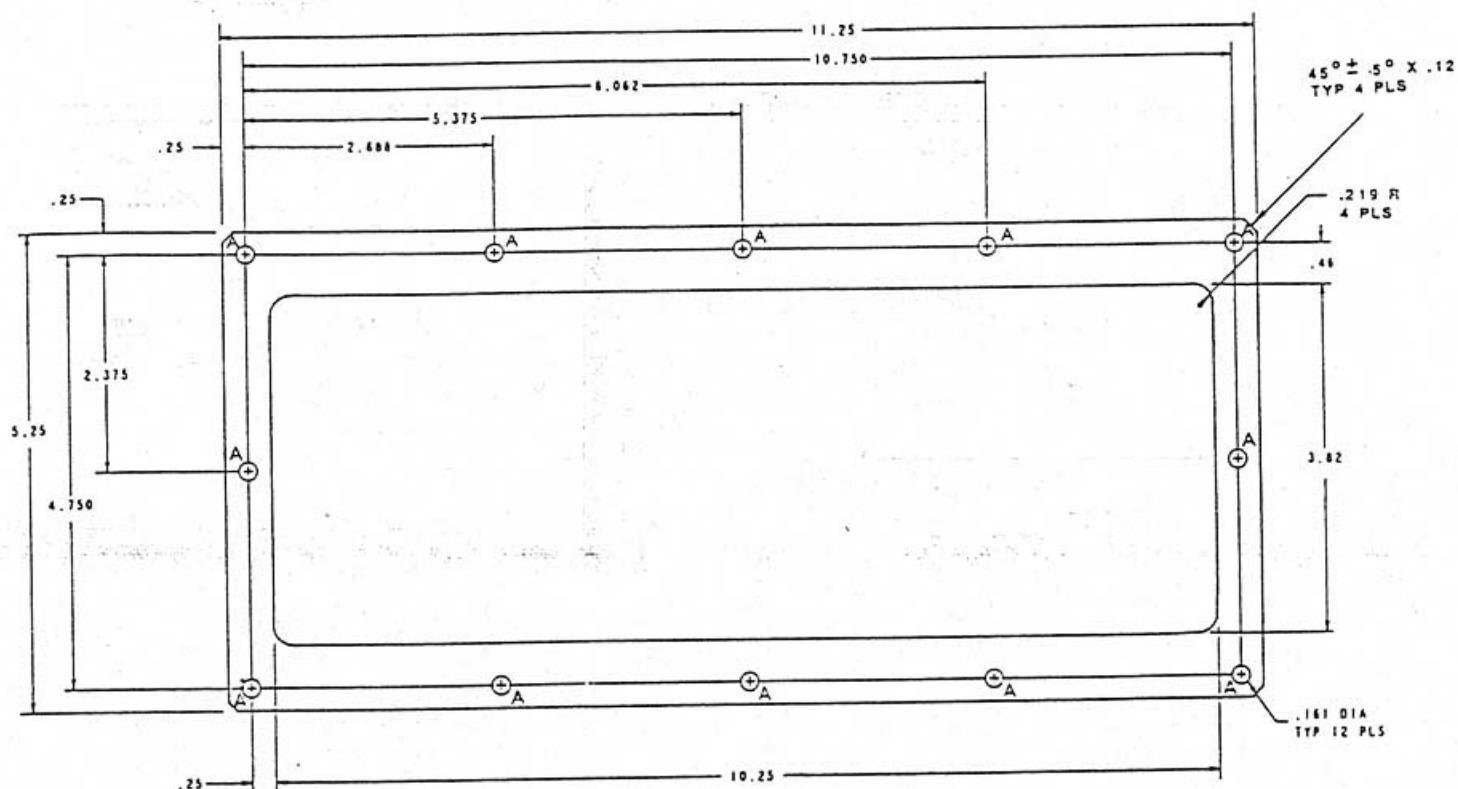
REV

-

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10.0 GASKET DIMENSIONS

FOR P/N 03900-A1 AND 03901-A1



IEE P/N 32205-01

FIGURE 5

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SIZE
A

CODE IDENT NO.
05464

S03901-A1-YYY-ZZ

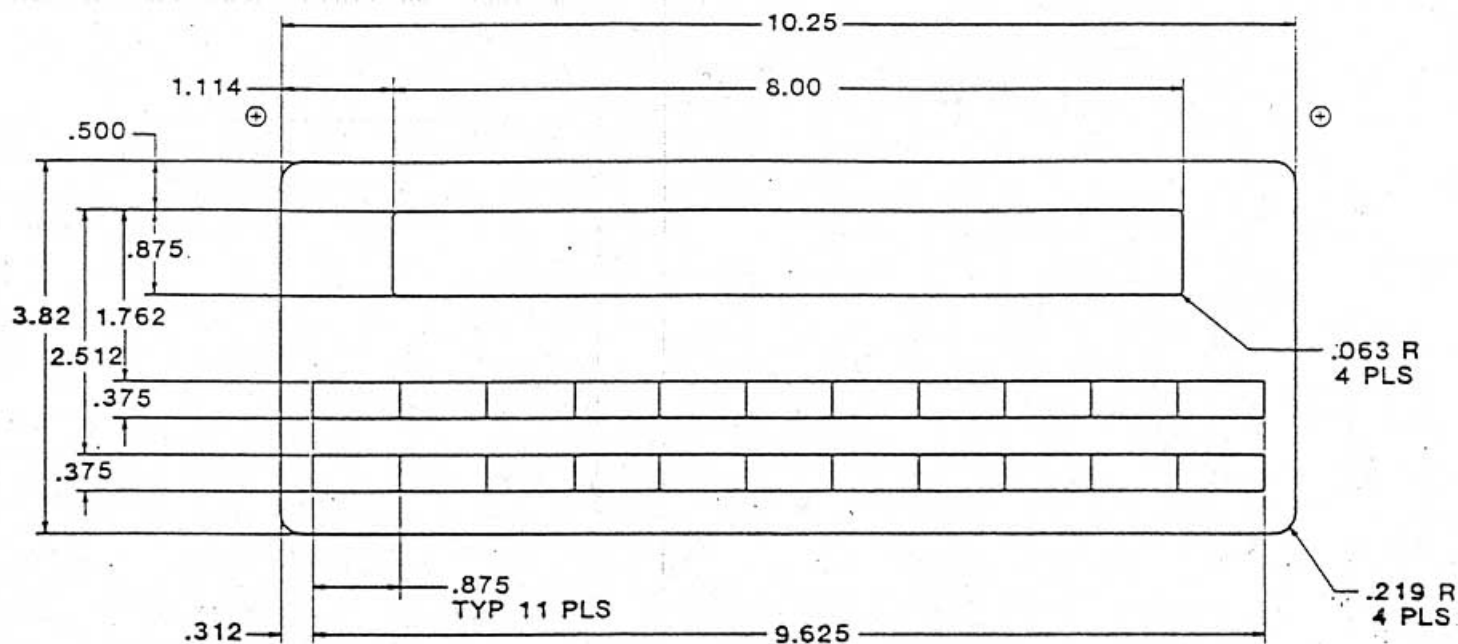
SCALE

REV -

SHEET 27

11.0 SWITCH DIMENSIONS

FOR P/N 03900-A1 AND 03901-A1



IEE P/N 31688-A01-XX

APPEARANCE WHEN MOUNTED IN CUSTOMER'S CUTOUT

FIGURE 6

Note: Artwork targets in upper corners coincide with mounting holes - see Figure 4.

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SIZE
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CODE IDENT NO.
05464

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SCALE

REV

-

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12.0 SERIAL INTERFACE

DB-25-S

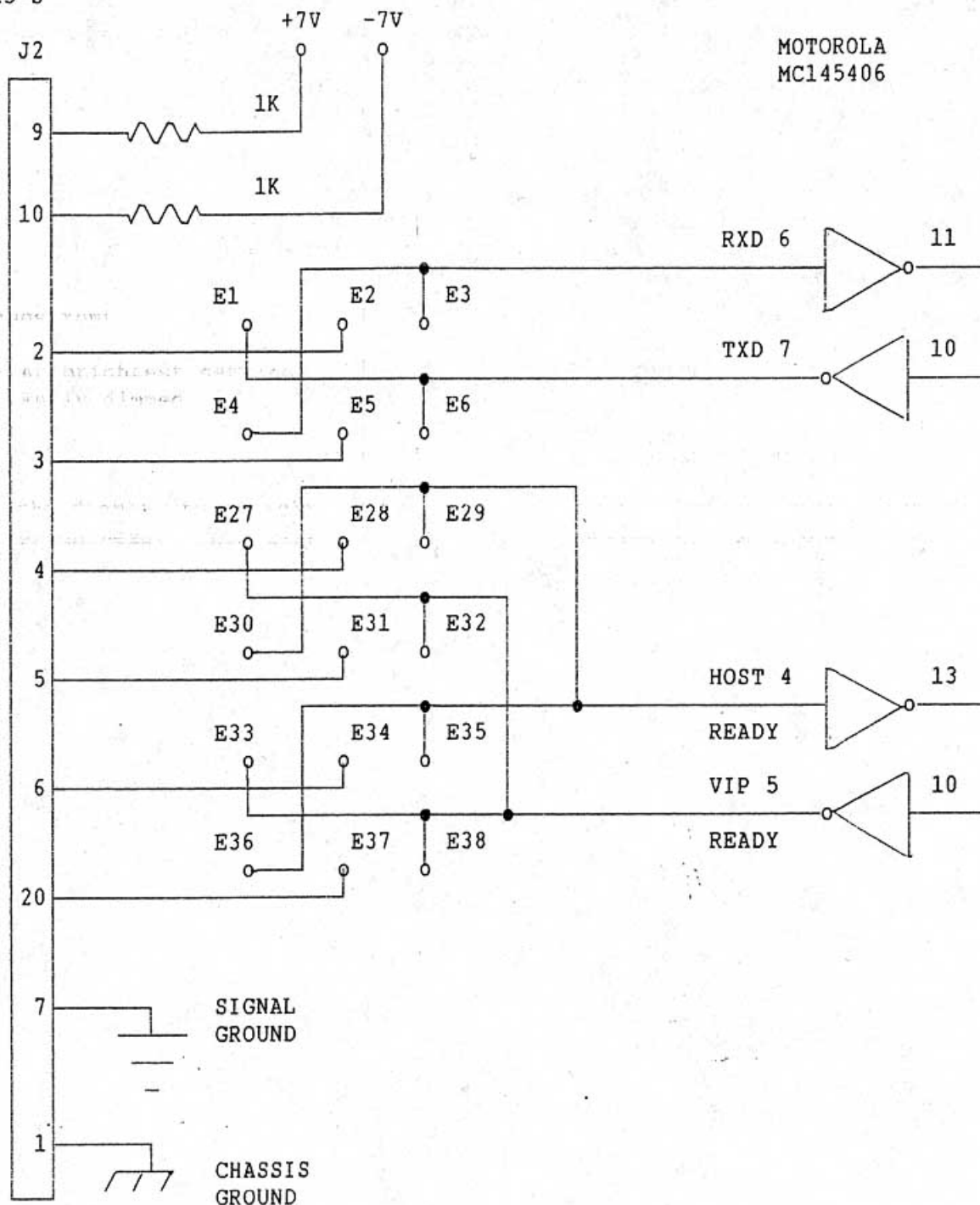


FIGURE 7

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SIZE
A

CODE IDENT NO.
05464

S03901-A1-YYY-ZZ

SCALE

REV

-

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13.0 APPENDIX

The VIP module as-shipped contains, in the EPROM canned-message storage area, an IEE sales demonstration program for the VIP module that can be accessed by moving a shorting jumper to location E23 from location E16. The program takes the form of display messages one thru five with some of the messages interactive with the key pad. The approximate starting address is 1000H, however, the exact starting address for display messages can be read from the VIP display while watching the self-test routine.

When display messages are to be added to a VIP module two options are available. If the message space required is small, append them after the demo program as display messages six thru "n". Alternatively, you may overwrite the demo program starting at the memory address specified in the Self-Test routine.

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SCALE

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