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Van Nuys, California

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S03902-04

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REV C

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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 4 X 20 Vacuum Fluorescent display/data-input panel.

1.2 Application

The 03902-04 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 03902-04 VIP is a vacuum fluorescent mini-terminal which operates on a single 5 volt supply and communicates by RS-232C or RS-422 serial I/O. The VIP has 180° connectors, and a steel dome membrane switch keypad with keys arranged in a 2x4 field and a 5x5 field.

1.3.2 Special Features

Integral front mount bezel
7 or 8 data bits odd, even or no parity 1 or 2 stop bits
Serial RS-232C I/O with CTS & DTR
Serial RS-422 I/O
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 EEPROM
Comprehensive self-test
2x4 and 5x5 integral switch
Rear cover
NEMA 12 Drip-proof sealing with factory provided sealing gasket

1.3.3 Display Panel

This unit consists of a 4 X 20 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 7K bytes of user available EEPROM. Messages can be any length as long as the total length of all messages does not exceed 7K bytes.

The display uses vacuum fluorescent technology to display characters in a 5x7 dot format. 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.

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1.3.3 Display Panel (Continued)

Figure 3 depicts the standard ASCII character set as displayed by the 03902-04 module.

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 serial output port. 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.

When two sides of the switch matrix are connected together, the VIP will output a switch closure message stored in EEPROM corresponding to that switch location. For example, the upper left hand corner of the electrical matrix (column 0, row 0) will output data stored at switch closure message number 01H, and the lower right hand corner of the electrical matrix (column 7, row 7) will output data stored at switch closure message number 40H. Refer to Section 3.3 for further information.

For the purposes of this specification a standard IEE switch array (33970-A09) is assumed. The switch array is wired as follows:

<u>5x5 KEYPAD FIELD COORDINATE</u>	<u>CONNECTION</u>	<u>SWITCH MESSAGE NUMBER</u>
07	J3-8 to J3-9	08H
06	J3-7 to J3-9	07H
05	J3-6 to J3-9	06H
04	J3-5 to J3-9	05H
03	J3-4 to J3-9	04H
0F	J3-8 to J3-10	10H
0E	J3-7 to J3-10	0FH
0D	J3-6 to J3-10	0EH
0C	J3-5 to J3-10	0DH
0B	J3-4 to J3-10	0CH
17	J3-8 to J3-11	18H
16	J3-7 to J3-11	17H
15	J3-6 to J3-11	16H
14	J3-5 to J3-11	15H
13	J3-4 to J3-11	14H
1F	J3-8 to J3-12	20H
1E	J3-7 to J3-12	1FH
1D	J3-6 to J3-12	1EH
1C	J3-5 to J3-12	1DH
1B	J3-4 to J3-12	1CH
27	J3-8 to J3-13	28H
26	J3-7 to J3-13	27H
25	J3-6 to J3-13	26H
24	J3-5 to J3-13	25H
23	J3-4 to J3-13	24H

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1.3.4 Switch Matrix (Continued)

<u>2x4 KEYPAD FIELD COORDINATE</u>	<u>CONNECTION</u>	<u>SWITCH MESSAGE NUMBER</u>
2F	J3-8 to J3-14	30H
2E	J3-7 to J3-14	2FH
2D	J3-6 to J3-14	2EH
2C	J3-5 to J3-14	2DH
37	J3-8 to J3-15	38H
36	J3-7 to J3-15	37H
35	J3-6 to J3-15	36H
34	J3-5 to J3-15	35H

1.3.5 Interface

All data I/O is via DB-25 connector at RS-232C levels with CTS and DTR or RS-422 levels in serial asynchronous format.

1.3.6 Power Requirements

The module requires only 5VDC at 3 watts.

1.3.7 Mechanical

1.3.7.1 Outline Dimensions - See Figure 4

1.3.7.2 Weight - 30 ozs. (853 grams)

1.3.7.3 Drip-Proof (15 Degree):

The 4 X 20 VIP module is 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 factory provided 33506-01 gasket. (See Figure 7).

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2.0 BLOCK DIAGRAM

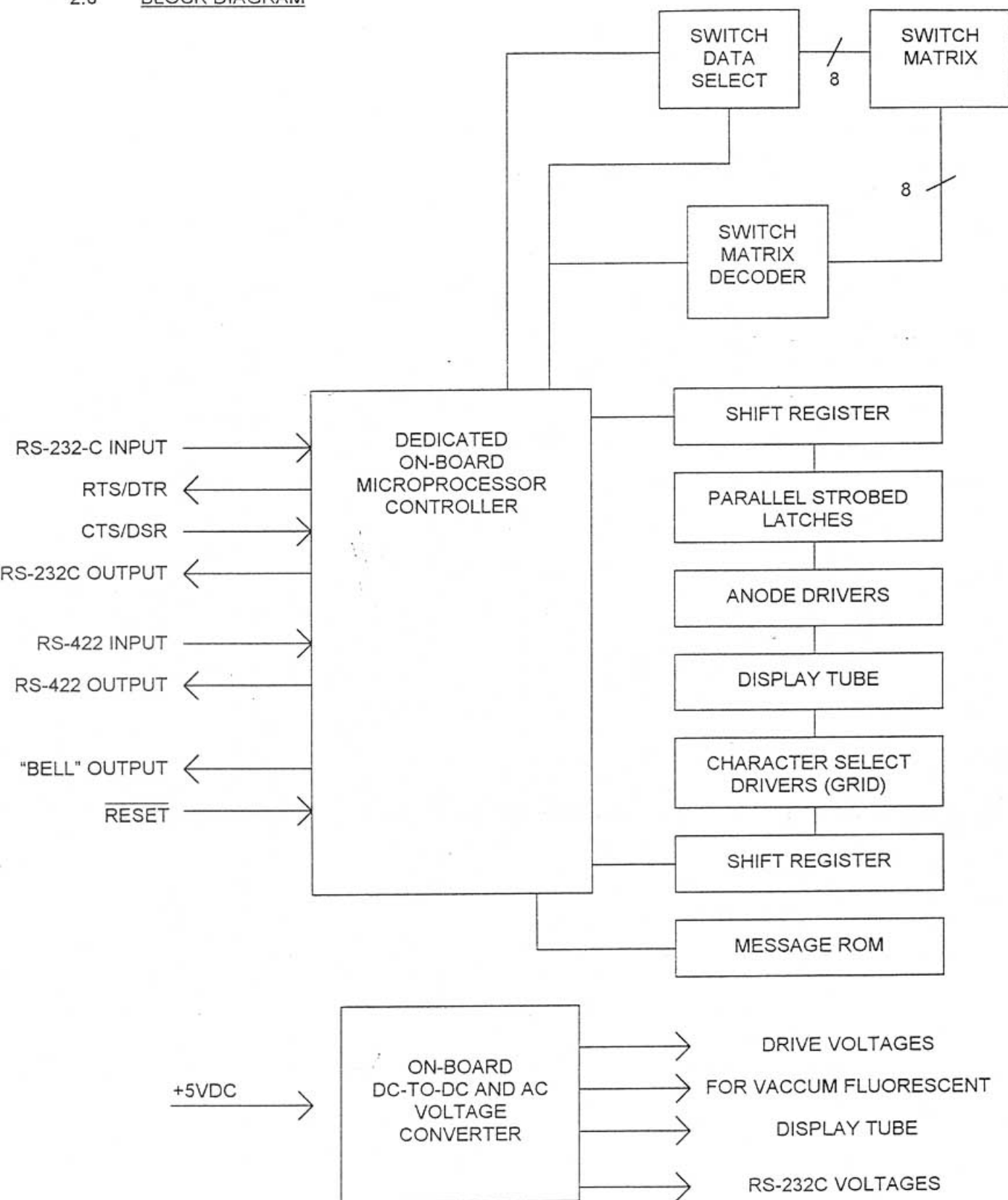


FIGURE 1

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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.

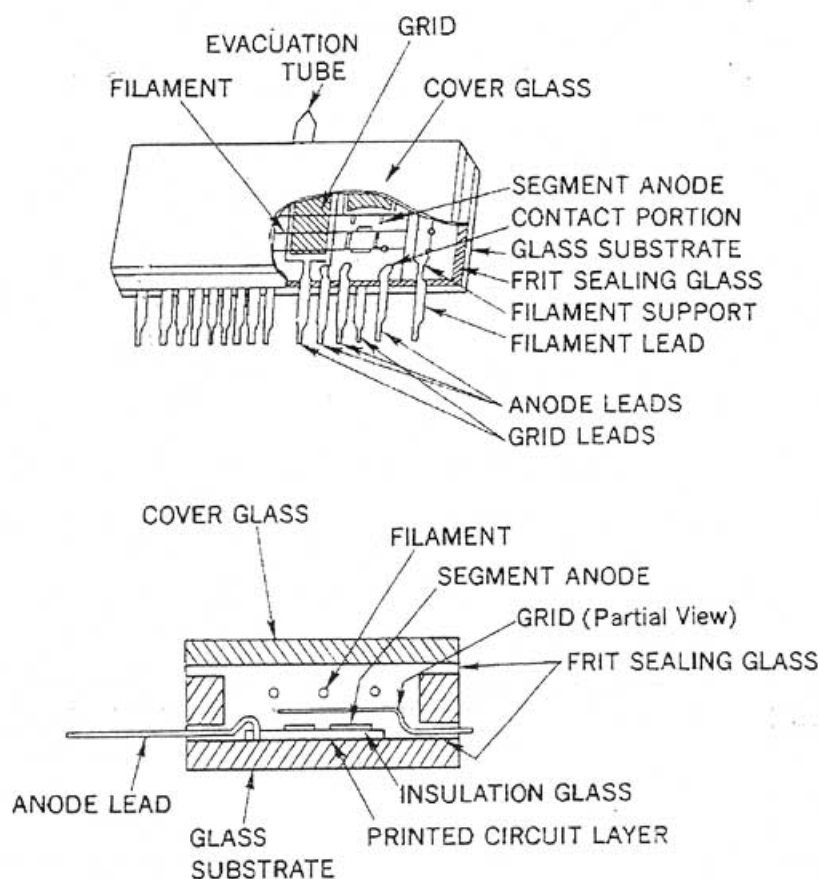


FIGURE 2

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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
07	ENABLE BELL OUTPUT (150ms)
08	BACK SPACE CURSOR LOCATION ONE POSITION
09	ADVANCE CURSOR LOCATION ONE POSITION
0A	LINE FEED (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)
14	RESET
16	PAUSE (Intended for use in stored display messages; creates a 3 second delay before processing the next byte of data following the pause control code)
19	FIRST BYTE OF CERTAIN MULTI-BYTE COMMANDS (See Below)
[1A]	SELECT SCIENTIFIC CHARACTER SET

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3.1.2 Control Codes (Continued)

DATA (HEX)	DESCRIPTION
[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 0-4FH)

The following commands may be written preceded by 19 HEX. Note that the first four (01, 02, 04, + 05) message types are broken down into four types with each type being defined by an ASCII lower case character.

- d - Display data message
- c - Switch closure message
- r - Switch release message
- m - invalid switch (multiple) message

01	DELETE A MESSAGE 01H + (d,c,r or m) + message number in hex.
02	STORE A MESSAGE 02H + (d,c,r or m) + message number in hex + message text + 19H + 03H.
04	TRANSMIT A MESSAGE TO HOST 04H + (d,c,r or m) + message number in hex.
05	RECALL A DISPLAY MESSAGE 05H + d + message number in hex.
06	DELETE ALL MESSAGES
0C	CLEAR DISPLAY AND CURSOR HOME
0E	CURSOR HOME

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3.1.2 Control Codes (Continued)

DATA (HEX)		DESCRIPTION
13		POSITION CURSOR AT LOCATION XX 3-BYTE INSTRUCTION (i.e. 19H + 13H + Location Number 0-4FH)
16		TRANSMIT THE NUMBER OF DISPLAY MESSAGES STORED TO THE HOST
17		TRANSMIT THE NUMBER OF BYTES OF FREE MEMORY LEFT TO THE HOST
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
47		SET BLINK RATE TO 1Hz
48	+	SET BLINK RATE TO 2Hz
4C		DISPLAY BLANK
4D		DISPLAY DIM (25%)
4E		DISPLAY BRIGHT (50%)
4F	+	DISPLAY BRIGHTEST (100%)

+ 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, & 23, and 60H.

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

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3.1.3 Character Chart (5x7 Dot Matrix)

N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
00	01	02	03	04	05	06	07	08	09	0A	0B	0C	0D	0E	0F
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
10	11	12	13	14	15	16	17	18	19	1A	1B	1C	1D	1E	1F
20	21	22	23	24	25	26	27	28	29	2A	2B	2C	2D	2E	2F
30	31	32	33	34	35	36	37	38	39	3A	3B	3C	3D	3E	3F
40	41	42	43	44	45	46	47	48	49	4A	4B	4C	4D	4E	4F
50	51	52	53	54	55	56	57	58	59	5A	5B	5C	5D	5E	5F
60	61	62	63	64	65	66	67	68	69	6A	6B	6C	6D	6E	6F
70	71	72	73	74	75	76	77	78	79	7A	7B	7C	7D	7E	7F

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					
1A	Scientific						
1C	English						
1D	General European						
1E	Scandinavian						
1F	German						

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

3.1.5 Execution Times (Maximum)

3.1.5.1 Characters and control codes (Non-editing) - 1200, 2400, 9600, or 19200 baud (jumper selectable).

3.1.5.2 Editing control codes - the execution time for canned-message memory editing is very difficult to predict since it will depend on individual EEPROM characters as well as the data to be stored and its relationship to messages previously stored. As a result, message editing should never be attempted without operational RS-232C handshaking (see Section 3.1.7.5).

3.1.5.3 Reset (Hardware): 200mS

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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 500 μ S, 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 4 X 20 VIP module RS-232C interface is via a MAXIM MAX232 I.C. and the RS-422 interface is via two T.I. 75176 I.C.'s. See Figure 8.

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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, 2400, 9600 or 19200 baud. Parity is also selectable for odd, even, or no parity. Jumper selection for a desired data format is as follows:

WRITE PROTECT ENABLED	(E39)	()	(E38)	WRITE PROTECT DISABLED
RESERVED	(E37)	()	(E36)	RESERVED
1X DATA RATE	(E35)	()	(E34)	2X DATA RATE
1 STOP BIT	(E33)	()	(E32)	2 STOP BITS
7 DATA BITS	(E31)	()	(E30)	8 DATA BITS
*RESERVED	(E29)	()	(E28)	RESERVED
ODD PARITY	(E27)	()	(E26)	EVEN PARITY
ENABLE PARITY	(E25)	()	(E24)	DISABLE PARITY **
9600 BAUD	(E23)	()	(E22)	1200 BAUD
SELF-TEST	(E21)	()	(E20)	NORMAL OPERATION
CTS & DTR ENABLED	(E19)	()	(E18)	CTS & DTR DISABLED
RS-232C/RS-422	(E17)	()	(E16)	RS-485 ***
DIFFERENTIAL INPUT	(E15)	(E14)	(E13)	RS-232 INPUT

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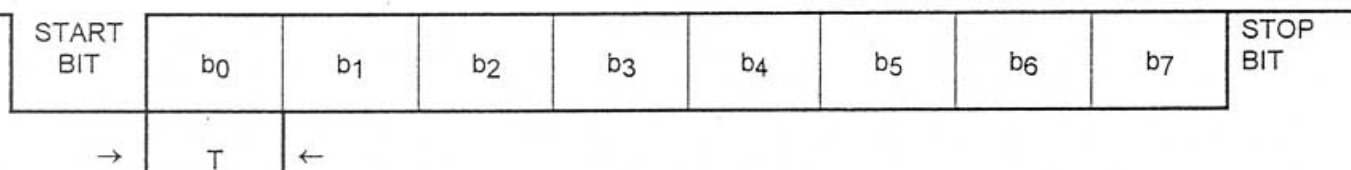
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3.1.7.2 Transmit and Receive Data Configuration and Rate (Continued)

-IN UNTERMINATED	(E12)	(E11)	(E10)	-IN TERMINATED
+IN UNTERMINATED	(E9)	(E8)	(E7)	+IN TERMINATED
-OUT UNTERMINATED	(E6)	(E5)	(E4)	-OUT TERMINATED
+OUT UNTERMINATED	(E3)	(E2)	(E1)	+OUT TERMINATED

NOTE: 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
 ***RS-485 IS NOT SUPPORTED BY THIS MODEL.

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 = 416.6μS when baud rate = 2400 bits/sec.
 T = 104.1μS when baud rate = 9600 bits/sec.
 T = 52μS when baud rate = 19200 bits/sec.

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3.1.7.3 Error Detection

The 4 X 20 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

3.1.7.4.1 RS-232C

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

CTS - When "high" indicates to the VIP that the host is ready to accept data. *

DTR - When "high" indicates that the VIP is ready to accept data from the host. *

* with jumper block on E19.

In an RS-232C interface with no handshaking (only Pins 2, 3 and 7 on the DB25 used) the VIP handshaking requirements can be eliminated by placing a jumper block on E18.

3.1.7.4.2 RS-422

RS-422 OUT TTL+

Serial data output from the VIP used with TTL-.

RS-422 OUT TTL-

Inverted serial data output from the VIP used with TTL+.

RS-422 IN TTL+

Serial data input to the VIP used with TTL-.

RS-422 IN TTL-

Inverted serial data input to the VIP used with TTL+.

Provision is made to terminate the receiving end of the VIP RS-422 data lines. A 120 ohm termination of the receiver may be effected by placing jumper blocks in positions E8 and E11. The receiver inputs are unterminated when jumpers are in positions E9 and E12. See Figure 8 for I/O schematic and Section 3.1.7.2 for jumper block locations. Normally only the extreme ends of data lines are terminated.

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3.1.7.5 Handshaking

Data flow control is available in the form of CTS and DTR when operating the VIP from a RS-232C data link. At 9600 baud and below DTR will go busy under only two conditions: a RESET, either hardware or software or when editing either switch or display message data stored in the EEPROM. Therefore, for message editing, only a RS-232C interface with handshaking is recommended to prevent loss of data. If for some reason handshaking cannot be used, the required delay times can be determined by monitoring the DTR signal on J2 pin 20. For a given set of operations and data the required delay time will be consistent and predictable.

At 19200 baud the VIP will additionally attempt to hold off host data whenever the internal 90 byte input data FIFO is full. FIFO overflow will only occur when multiples of time consuming commands are executed in character strings exceeding the FIFO capacity. Some examples of time consuming commands are vertical scroll, pause, backspace, etc.

3.2 Canned-Message Operation

The 4 X 20 V.I.P. can store four different types of canned-messages. The total of all canned-message data can be up to approximately 7K bytes of ASCII characters and/or control codes, and are saved in the units EEPROM memory.

The EEPROM used for canned-message storage can be write protected by moving a jumper to location E39. Messages may be written to the EEPROM when the jumper is in position E38. Note that if an attempt is made to store a message with the jumper in position E39 the watch-dog timer will cause the unit to reset and lose characters on the display however, EEPROM data will not be lost.

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3.2.1 Store A Message

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.

1) DISPLAY MESSAGE

- a) 19H
- b) 02H
- c) d (64H)
- d) Message number
8 bit binary
(01H to 7FH)
- e) Message data
(00H to 7FH)
- f) 19H
- g) 03H

2) SWITCH CLOSURE MESSAGE

- a) 19H
- b) 02H
- c) c (63H)
- d) Message number
8 bit binary
(01H to 40H)
- e) Message data
(00H to 7FH)
- f) 19H
- g) 03H

See section 3.3 for explanation of the different switch messages.

3) SWITCH RELEASE MESSAGE

- a) 19H
- b) 02H
- c) r (72H)
- d) Message number
8 bit binary
(01H to 40H)
- e) Message data
(00H to 7FH)
- f) 19H
- g) 03H

4) MULTIPLE SWITCH MESSAGE

- a) 19H
- b) 02H
- c) m (6DH)
- d) 01H
- e) Message data
(00H to 7FH)
- f) 19H
- g) 03H

A DISPLAY MESSAGE may contain any ASCII character or 7-bit control code except for the following strings (19H and 01H, 19H and 02H, 19H and 03H, 19H and 04H, 19H and 05H, 19H and 06H, 19H and 41H, 19H and 42H, 19H and 43H).

A SWITCH MESSAGE may contain any ASCII character or 7-bit control code.

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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) 19H
- b) 05H
- c) d (64H)
- d) Message number
8 bit binary
(01H to 7FH)

3.2.3 Transmit A Stored Display Message

A DISPLAY MESSAGE stored in memory may be returned to the host computer using either VIP TRANSMIT PORT by entering the following commands:

TRANSMIT A STORED DISPLAY MESSAGE

- a) 19H
- b) 04H
- c) d (64H)
- d) 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 (02H)
- b) MESSAGE
- c) ETX (03H)

If the selected message does not exist in the memory, the host computer receives only STX (02H) and ETX (03H).

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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 EEPROM 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.

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3.3 VIP Operation (Continued)

Using the standard A09 switch configuration the as shipped switch coordinate data codes output for a given switch location are as follows:

					07	06	05	04	03
					0F	0E	0D	0C	0B
					17	16	15	14	13
2F	2E	2D	2C		1F	1E	1D	1C	1B
37	36	35	34		27	26	25	24	23

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							
		J3-1	J3-2	J3-3	J3-4	J3-5	J3-6	J3-7	J3-8
SWITCH MATRIX ROW	J3-9	01	02	03	04	05	06	07	08
	J3-10	09	0A	0B	0C	0D	0E	0F	10
	J3-11	11	12	13	14	15	16	17	18
	J3-12	19	1A	1B	1C	1D	1E	1F	20
	J3-13	21	22	23	24	25	26	27	28
	J3-14	29	2A	2B	2C	2D	2E	2F	30
	J3-15	31	32	33	34	35	36	37	38
	J3-16	39	3A	3B	3C	3D	3E	3F	40

3.4 Self-test

The VIP unit may be evaluated on a stand-alone basis by moving the jumper from E20 to E21. 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.

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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 E20.

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

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"

"CTS & DTR ENABLED"
"CTS & DTR DISABLED"

The following will then be displayed:

"XXX DISPLAY MESSAGES STORED" (DECIMAL)
"XXXX BYTES FREE" (DECIMAL)
"DISPLAY MESSAGE REVIEW ?"
"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 REVIEW ?", 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 MESSAGE #", 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 "BRIGHTNESS TEST", 3 zeros must be entered on the keypad instead of a message number.

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3.4.1 Display Self-test (Continued)

For entering digits it should be assumed (regardless of the actual switch legends) that the switch functions shown in Section 12.0 are in place.

If a message number is not entered within 3 seconds after the display reads "DISPLAY MESSAGE REVIEW ?", the display will continue to "BRIGHTNESS TEST".

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 in either of two ways: 1) For RS-232C by jumpering TXD to RXD; 2) For RS-422 by jumpering J2 Pin 11 to J2 pin 17 and pin 18 to J2 pin 15. CTS must be held high during this test either by jumpering VIP J2-5 and J2-9 or by moving the handshaking disable on the jumper block to E18.

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4.0 CONNECTOR PIN ASSIGNMENTS

J1 (POWER)

PIN. NO.	FUNCTION
J1-1	+5VDC POWER
J1-2	BELL OUTPUT
J1-3	NO CONNECTION
J1-4	COMMON
J1-5	NO CONNECTION
J1-6	RESET

J3 (SWITCH)

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	NO CONNECTION
J2-5	CLEAR TO SEND (RS-232C)
J2-6	NO CONNECTION
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	RS-422 (-) OUT
J2-12	NO CONNECTION
J2-13	NO CONNECTION
J2-14	NO CONNECTION
J2-15	RS-422 (+) IN
J2-16	NO CONNECTION
J2-17	RS-422 (-) IN
J2-18	RS-422 (+) OUT
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

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05464

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SCALE N/A

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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 200mS after power-up.

5.2 Absolute Maximum Ratings

Primary voltage: +5.5VDC
RS-232C: ± 25 VDC
RS-422: ± 14 VDC
Bell Output: +30VDC Max. Source / 100mA Max. Load

5.3 Normal Operating Ratings

Primary voltage: +5.0 +/- 0.25VDC

PRODUCTION

Dimmest

420mA Min. (Screen clear at 5.0V)

520mA Typ. (Screen filled with "A" character at 5.0V)

Brightest (Default Setting)

450mA Min. (Screen clear at 5.0V)

590mA Typ. (Screen filled with "A" character at 5.0V)

660mA Max. (Screen filled with "A" character at 5.25V)

5.4 Interface Signals

5.4.1 Data

RS-232C Input Levels:

Logic 1 (MARK) < -3VDC

Logic 0 (SPACE) > +3VDC

RS-422 Input Levels:

Logic 1 (MARK) (+ < -) ≥ 0.2 VDC

Logic 0 (SPACE) (+ > -) ≥ 0.2 VDC

RS-232C Output Levels:

Logic 1 (MARK) < -5VDC

Logic 0 (SPACE) > +5VDC

RS-422 Output Levels:

Logic 1 (MARK) (+ < -) ≥ 2.4 VDC

Logic 0 (SPACE) (+ > -) ≥ 2.4 VDC

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SCALE N/A

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6.0 PHYSICAL CHARACTERISTICS

6.1 Display

Format: 4 lines of 20 characters
Character height: 0.20 in. (5.0mm)
Character width: 0.12 in. (3.0mm)
Character spacing: 0.18 in. (4.6mm) center-to-center
Character design: 5 x 7 dot matrix
Type of cursor indicator: Flashing block
Character sets: 96-character U.S. ASCII-7,
General European ECMA-7
Scandinavian ECMA-7
German ECMA-7
Scientific alternate
Color: Blue-green, peak at 5000 Angstroms
Viewing angle: 150 degrees
Brightness: (22°C) 100fL (min), 200fL (typ)
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 5x5 and 2x4 switch uses metal dome switches with a life exceeding 1,000,000 and an actuation force of 15 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)

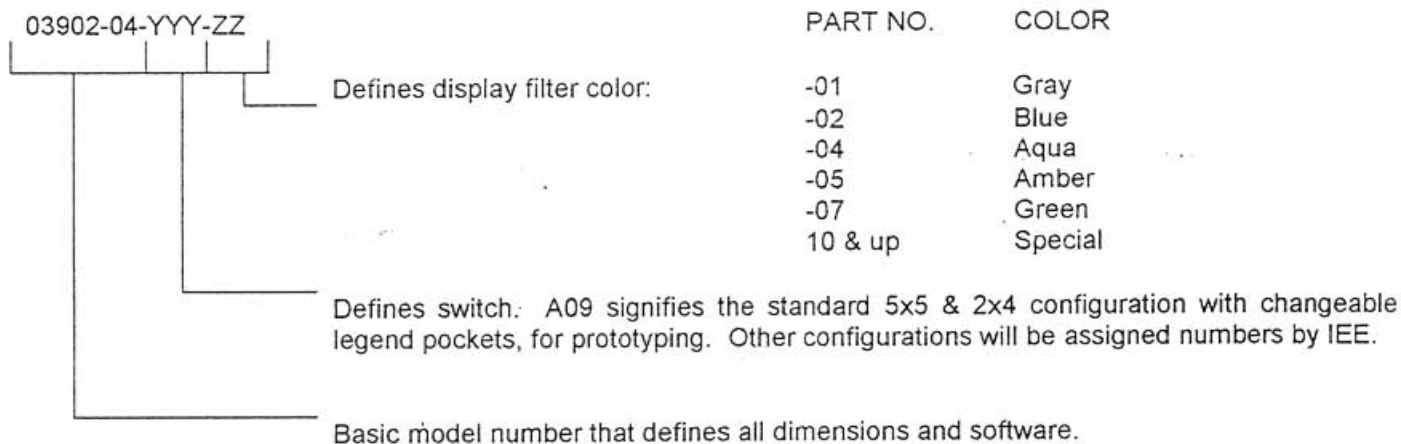
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8.0 ORDERING INFORMATION

8.1 Ordering Description

The 03902-04-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).



For spares purposes, a loose switch mechanically and electrically suitable for use on an 03902 VIP module will carry the part number 33970-YYY-ZZ with Y's and Z's representing the features defined above.

8.2 Accessories

Cables	Part Number	Qty Required
Data Connector	26746-01 (IEE P/N)	1
Power (single-ended, 6-wire)	27349-XX*	1
Power (double-ended, 6-wire)	32420-XX*	1
*XX = Length in inches: -99 omits cables		

Connectors	Mates With:
Power J1	Molex 09-50-3061
Data J2	ITT Cannon DB-25-P
Switch J3	.025 Sq., 0.1" Centers

Replacement Parts	Part Number	Qty Required
Bezel	33461-01	1
Rear cover	33972-01	1
Switch (with legend pockets)	33970-A09-07	1
Spare blank switch strips	34100-A00	2
Gasket	33506-01	1
(For sealing front panel to rear of user panel)		

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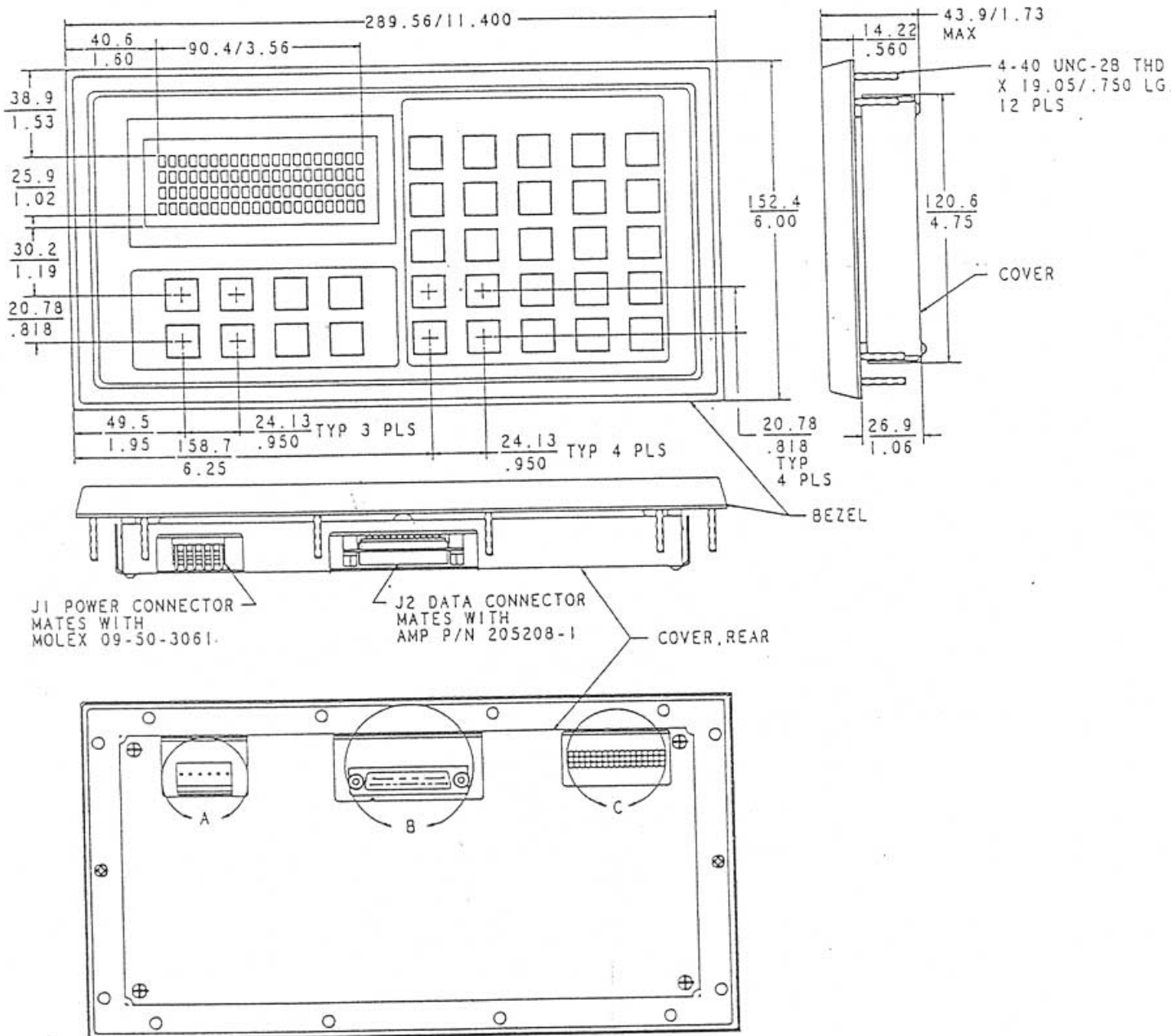
9.0 OUTLINE AND INSTALLATION DRAWINGMM
(UNIT: — OR MM/IN.)
IN.TOLERANCES:.XX = $\pm .8/.03$.XXX = $\pm .25/.010$

FIGURE 4

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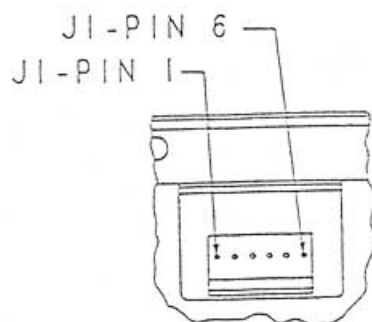
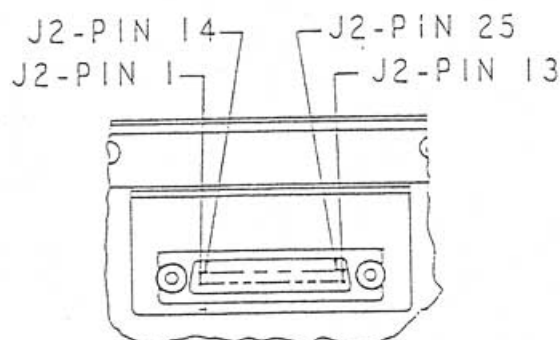
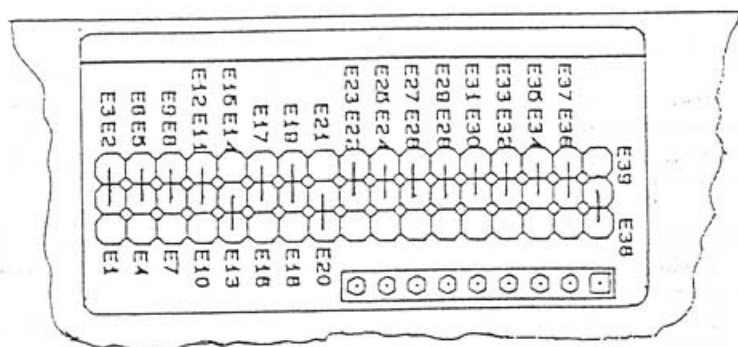
SIZE
ACODE IDENT NO.
05464

S03902-04

SCALE N/A

REV C

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VIEW A
ENLARGEDVIEW B
ENLARGED

VIEW C

PROGRAMMING JUMPERS ENLARGED

TOLERANCES:.XX = $\pm .8/.03$.XXX = $\pm .25/.010$

FIGURE 5

Industrial Electronic Engineers, Inc.

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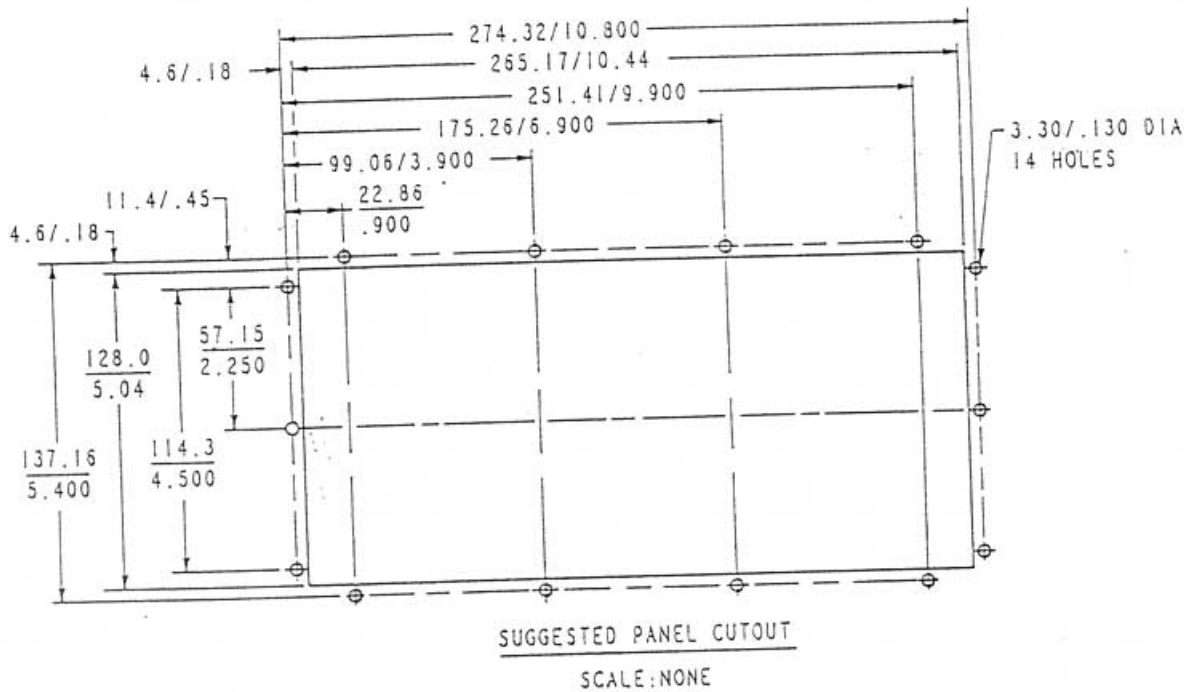
SIZE
ACODE IDENT NO.
05464

SCALE N/A

REV C

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TOLERANCES:

.XX = ± .8/.03

.XXX = ± .25/.010

FIGURE 6

Industrial Electronic Engineers, Inc.

Van Nuys, California

SIZE
ACODE IDENT NO.
05464

S03902-04

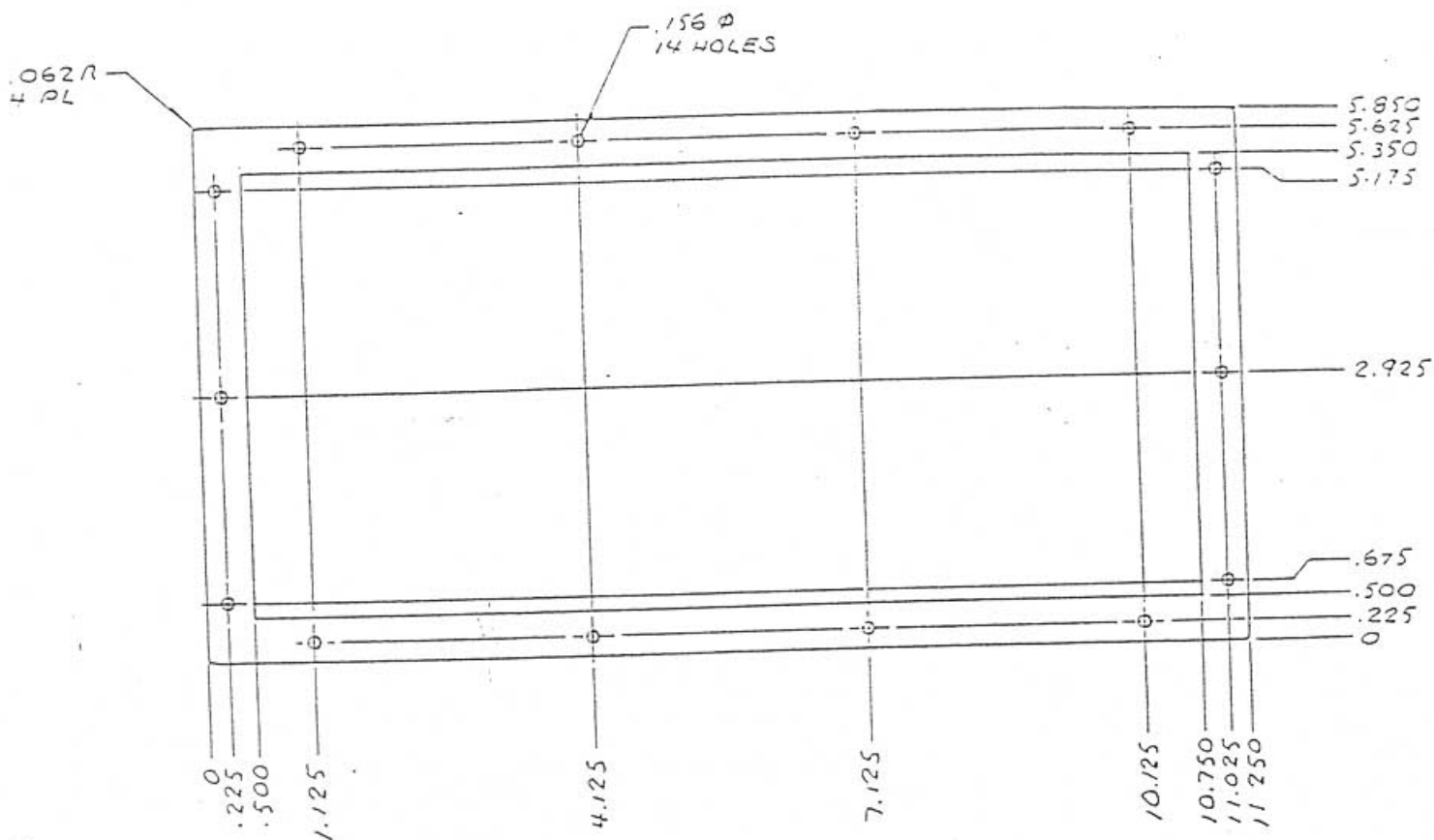
SCALE N/A

REV C

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10.0 GASKET DIMENSIONS

FOR P/N 03902-04



IEE P/N 33506-01

FIGURE 7

Industrial Electronic Engineers, Inc.

Van Nuys, California

SIZE
A

CODE IDENT NO.
05464

S03902-04

SCALE

N/A

REV C

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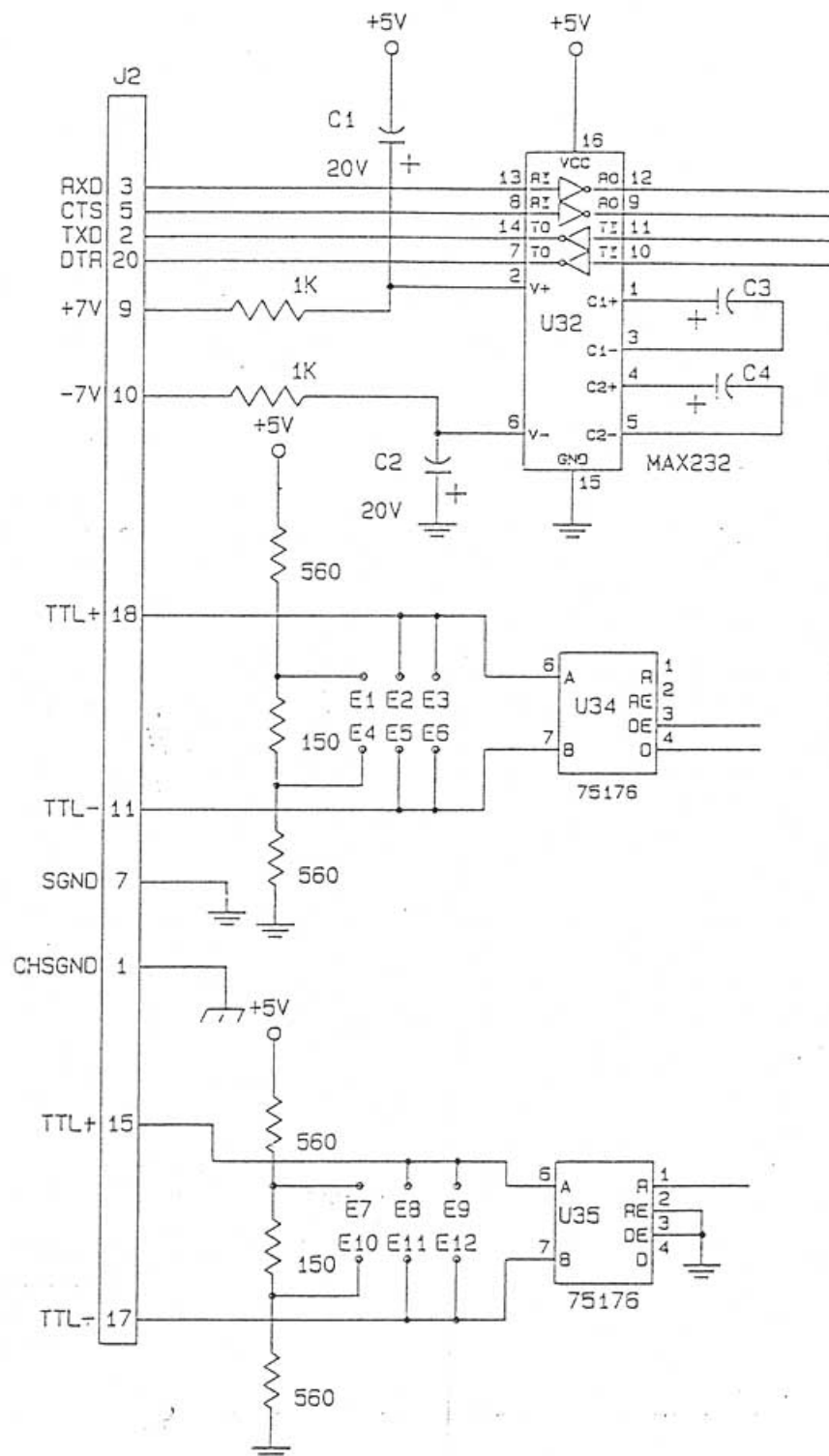


FIGURE 8

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SIZE

A

CODE IDENT NO.

05464

S03902-04

SCALE

N/A

REV C

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12.0 APPENDIX

12.1 Self-test Switch Function

The VIP module as shipped contains an IEE sales demonstration program for the VIP module that can be accessed by moving a shorting jumper to location E28 from location E29.

Shown below are the function/value of each key regardless of the actual legend printed on that key.

					7	8	9	PAUSE	RESUME
					4	5	6	RESET	DEMO
					1	2	3	FEATURES	OPERATION
F1	F2	F3	F4			0		CHAR-SET	SELF-TEST
F5	F6	F7	F8						

KEY FUNCTIONS
FOR SELF-TEST OR DEMO PROGRAM

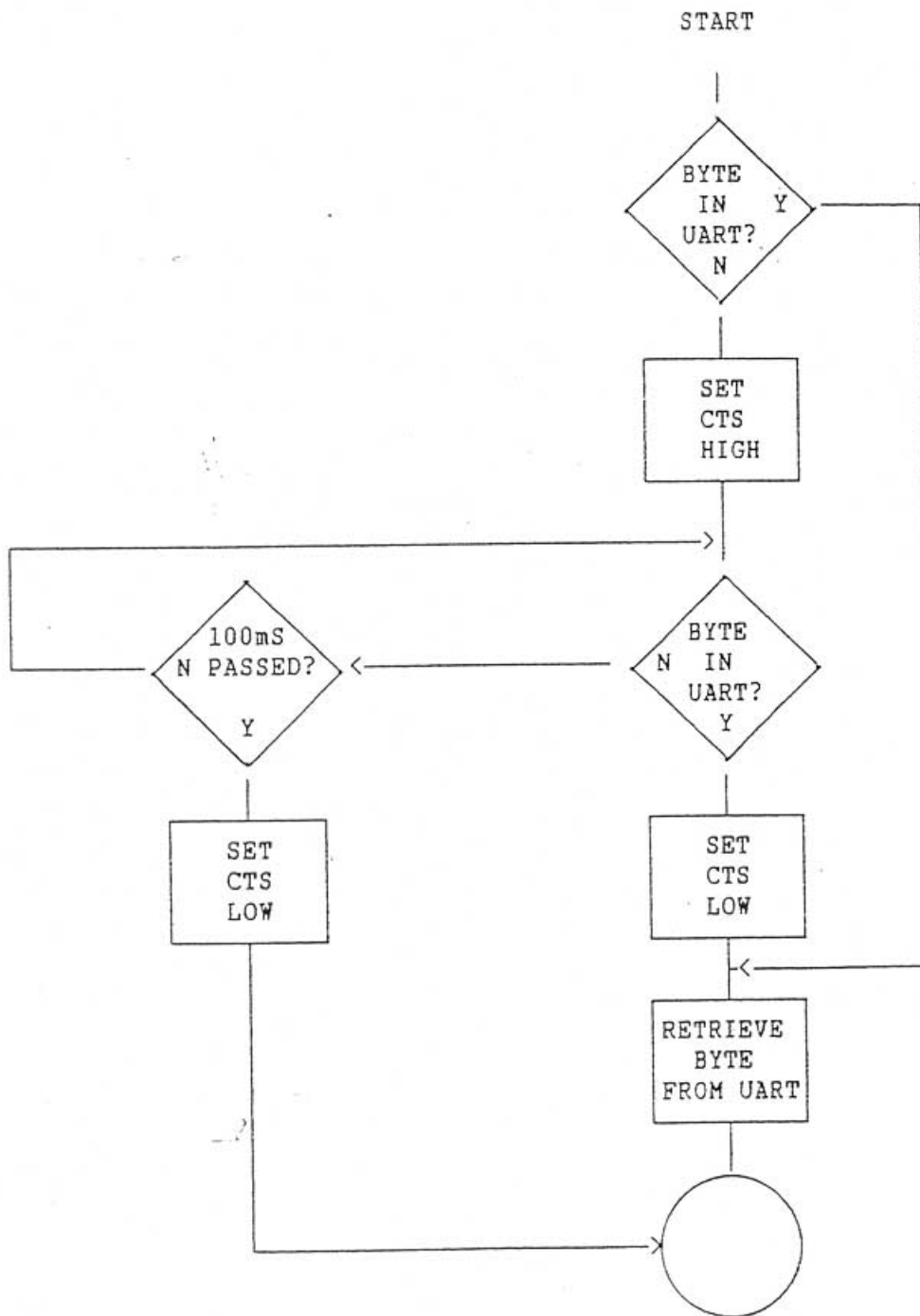
12.2 RS-232 Handshake Algorithm

The time to complete a modification to EEPROM memory contents can vary widely, from milliseconds to many minutes. The time will depend upon such variables as EEPROM parametric characteristics, supply voltage, the amount of bytes to be altered, and the addresses of the bytes to be altered relative to addresses of data that will not be altered. Note that in many cases, particularly for small alterations, the 80 byte input FIFO will mask the actual execution time. In most cases the quickest way to edit the data to be loaded into the VIP is to use an external PC and to down-load the entire memory in one string after first erasing the memory using the 19H + 06H command. Because of all of the above, writing to the EEPROM memory should not be attempted without utilization of hardware handshaking, e.g. CTS & DTR.

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	SCALE	N/A	REV C	SHEET 33 of 34

12.2 RS-232 Handshake Algorithm (Continued)

Flow charted below is a software algorithm that will never miss a byte coming from the VIP regardless of VIP timing. Because of the way a typical UART is implemented it is possible for the host to receive one more byte even after CTS is dropped. To avoid missing a byte in a multiple byte string, CTS must be pulsed for a duration slightly longer than the duration of a single byte. In the example shown 100 milliseconds has been selected as a reasonable time for the host to loop, looking for the last byte in a group, before exiting the routine and returning to other tasks.



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SCALE

N/A

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