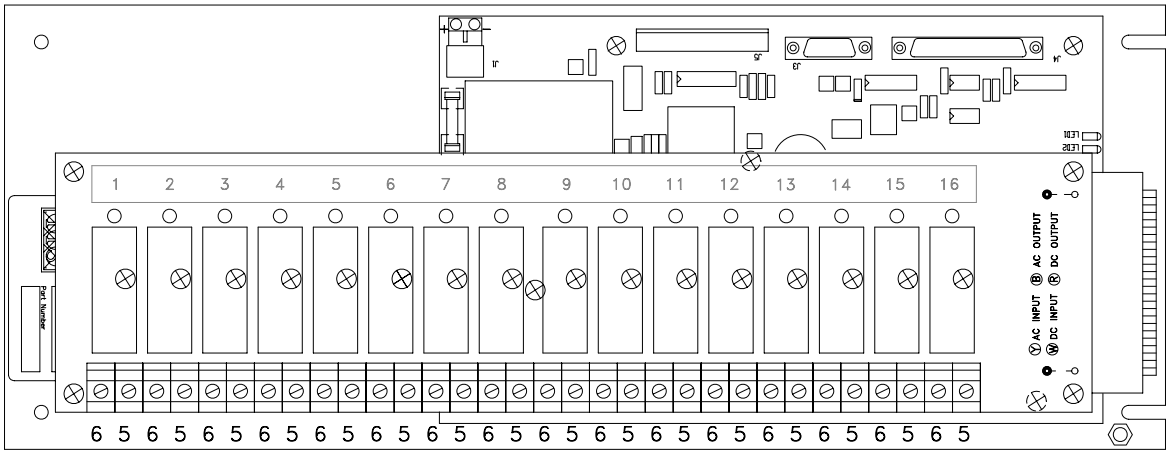
IB-11B028

CONTROL SYSTEMS **APRIL 2008**



RPV-100

ASSEMBLY

INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

Revision - B
Approved By: TSO

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 About This Instruction Book

This document provides information about the RPV-100 Assembly (Resolver to PLS to VideoJet Converter Assembly) including a product overview, product description, product specifications, description indicators and connection diagrams. The RPV-100 Assembly is intended to be used with various machine applications involving a VideoJet Printer.

1.2 Product Overview

The RPV-100, **Figure 1.2**, takes in a resolver position and outputs positional limit switches per preset angular positions programmed via the RS-232 port. It will also output an ASCII string to the VideoJet Excel 178I type printer so that information may be printed onto each product unit from the machine.

The RPV-100 Assembly is a panel mounted assembly with 16 positions for optically isolated OPTO 22 type input and output modules. I/O Modules 1 thru 11 is dedicated to be inputs, while 12 thru 16 are dedicated to be outputs.

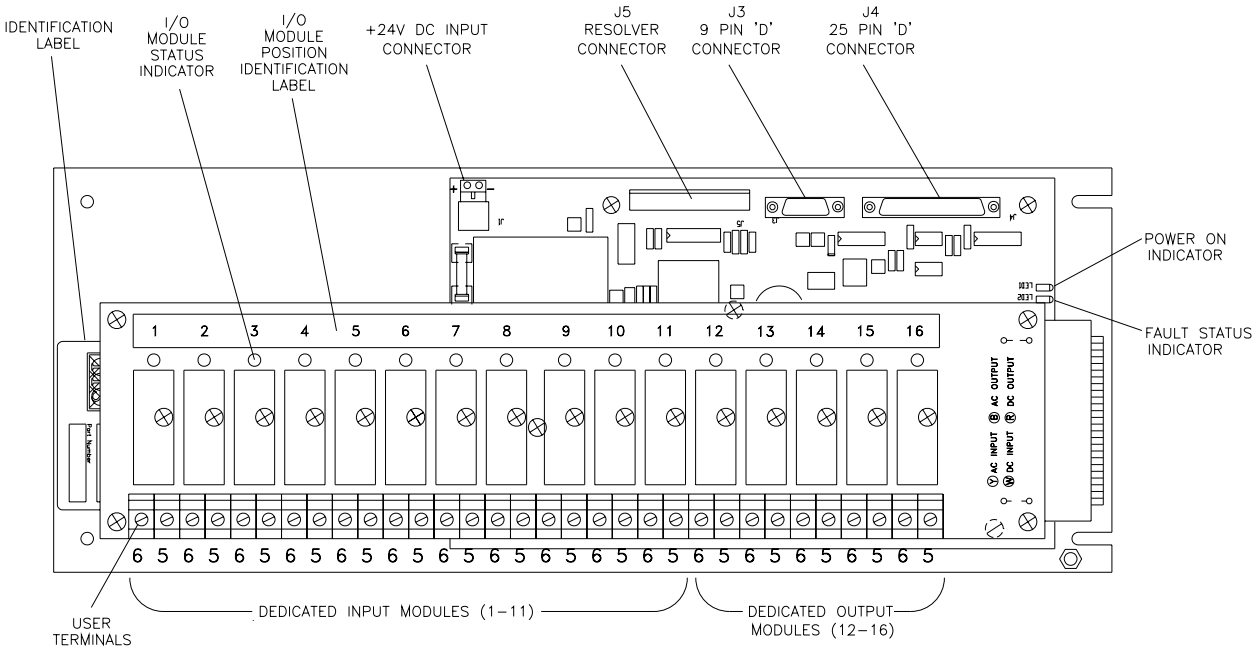


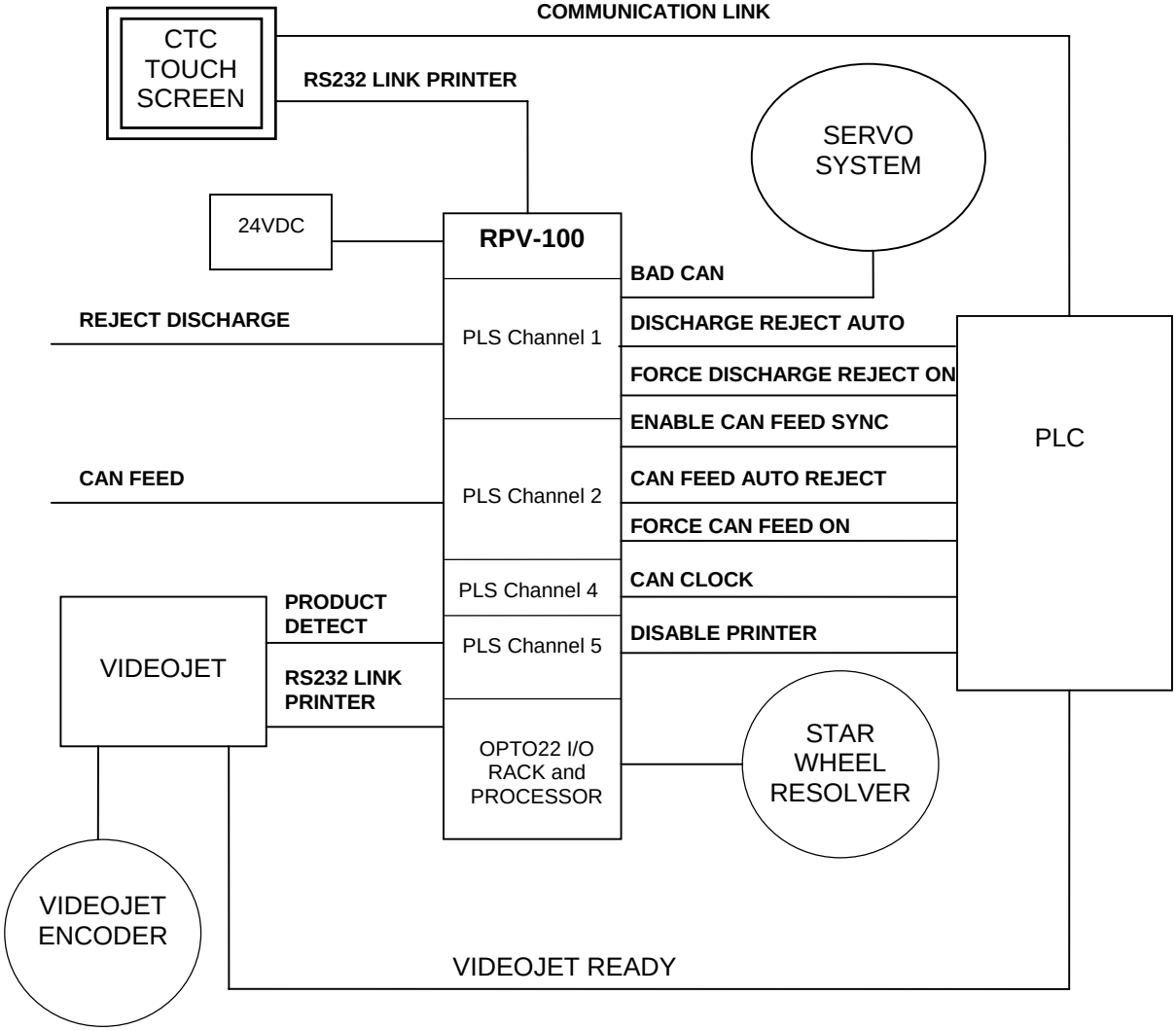
Figure 1.2 - RPV-100 Assembly

J5: The Resolver input, accepts resolved sine and cosine signals for position generation. Each embossing station on the machine is one revolution on the resolver input. The resolver line count is 4096 for each revolution.

J3: A 9 pin D connector is a RS-232 connection to allow PLS setup and control. This RS-232 connection is intended to be wired to a Host communicating via IIS MSC protocol. Refer to IIS IB-11A002 for MSC protocol.

J4: A 25-pin DI connector is a RS-232 connection allowing connection to a VideoJet EXCEL printer. The RPV-100 updates product message strings to the VideoJet once per revolution of the resolver.

1.3 RPV-100 System Functional Block Diagram



1.4 RPV Enabling Function

The RPV can be enabled one of two ways. The first is the original method this is done by the operator interface writing over the machines turret angle to memory location 72 Start-Up Turret Angle. The second method available with sfo-3920R02 and later is by using input 7 Zrev Prox. When the input turns on the RPV itself writes a value of zero to memory location 72 Start-Up Turret Angle thus emulating method one. The input is edge triggered meaning if the unit powers up and the input is on it needs to turn off then back on to trigger.

2.0 SPECIFICATIONS

2.1 Operating Power

The RPV-100 Assembly power is supplied at connector J1 from a nominal 24V DC.

Input Voltage:	20 to 28 VDC
Input Current:	1 Amp DC Max.

2.2 Input Modules

Input modules are to be inserted as needed into the module rack in locations 1 thru 11. The following modules are acceptable.

AC Input Module (IAC5)

Voltage Range	90 to 140v AC
Off Voltage	30v AC Max.
On Current	11mA Max.
Input Impedance	14KW

DC Input Module (IDC5)

Voltage Range	10 to 32v DC
Off Voltage	3v
On Current	25mA
Off Current	1mA
Turn-on Time	5 ms Max.
Turn-off Time	5 ms Max.

2.3 Output Modules

Output modules are to be inserted as needed into the module rack in locations 12 thru 16. The following modules are acceptable.

AC Output Module (OAC5)

Voltage Range	12 to 140v AC
Current Rating	2A
Output Voltage Drop	1.6V peak
Off-state Leakage	5mA RMS

DC Output Module (ODC5)

Voltage Range	5 to 60v DC
Current Rating	2.75A Max.
Output Voltage Drop	1.6v Max.
Off-state Leakage	1mA

2.4 Resolver Reference Output

2.6Khz @ 8VRMS

2.5 Resolver Feedback

8VRMS Differential input

2.6 Position Characteristics

Positional Range	+/- 2047 revolutions in 1/4096 revolution increments
Positional Absolute Accuracy	+/-10 min of arc
Positional Repeatability	+/- 5 min of arc

2.7 Environmental

Operating Temperature	32° to 140°F (0° to 60° C)
Operating Humidity	30 to 90% (Non-condensing)

2.8 Physical Characteristics

Dimensions (H, W, D)	6 in. (147 mm), 15¾ in. (400 mm), 2 in. (51 mm)
Weight	3 lbs. (1.36 Kg.)
Mounting type	Panel

I/O Modules

TYPE	COLOR
IAC5	Yellow
OAC5	Black
IDC5	White
ODC5	Red

3.0 RPV-100 OPERATION

3.1 RPV-100 and Cables

The RPV-100 is designed for operation within the following machine environment as illustrated in **Figure 3.1**.

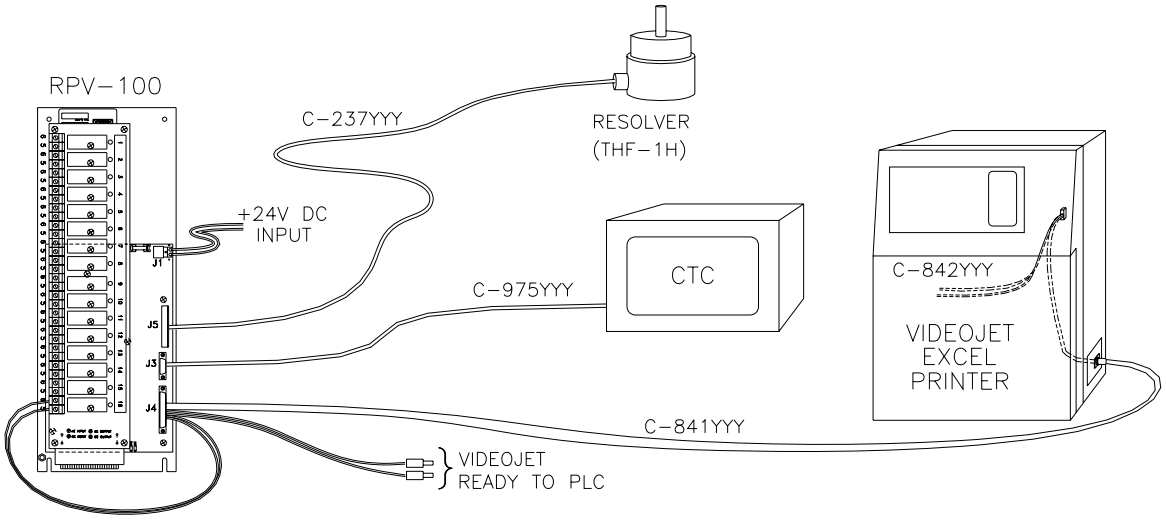


Figure 3.1 - RPV-100 System Cable Diagram

3.2 Resolver Functional Description

A resolver is similar to a variable transformer. It has five windings: two are used to form a rotary transformer, one is a rotor primary winding and the other two are stator secondary windings. The rotor winding is excited with a 2.6KHZ sine wave generated by an onboard reference. As the rotor of the resolver turns, the energy generated in the two-stator windings is sent to a resolver to digital converter circuit located on the RPV-100.

The R/D converter is a 12-bit resolution circuit, which divides one revolution of the resolver into 4096 parts. This provides absolute position of the shaft. One part is equal to 0.0879 degrees on the shaft.

NOTE

For correct RPV-100 operation the resolver position update as seen on CTC screen must be positive, in other words each update should be greater than the next until position starts over again from zero when machine is running normally.

3.3 CTC Communications Memory Operation

The CTC is programmed to communicate to the RPV-100 over one of its' PC COM ports. The operator can then program the RPV-100's PLS outputs to activate as required. The following table lists the memory variables and their byte offsets that are needed to program the RPV-100 for proper operation.

Table 3.2 - Communications Memory

BYTE OFFSET	NAME	DESCRIPTION
0	PLS 1 ON Angle	Programmed for the angle at which the first PLS output is to turn on. Reject discharge.
4	PLS 1 OFF Angle	Programmed for the angle at which the first PLS output is to turn off. Reject discharge. If the on and off angles are equal, the PLS output will remain OFF.
8	PLS 1 Time Advance	Is the time advance in milliseconds of the PLS crossing the ON and/or OFF Angles.
12	PLS 2 ON Angle	Same as offset 0, only for PLS 2 output. Can feed
16	PLS 2 OFF Angle	Same as offset 4, only for PLS 2 output. Can feed
20	PLS 2 Time Advance	Same as offset 8, only for PLS 2 output. Can feed
24	PLS 3 ON Angle	Same as offset 0, only for PLS 3 output. Spare
28	PLS 3 OFF Angle	Same as offset 4, only for PLS 3 output. Spare
32	PLS 3 Time Advance	Same as offset 8, only for PLS 3 output. Spare
36	PLS 4 ON Angle	Same as offset 0, only for PLS 4 output. Can Clock
40	PLS 4 OFF Angle	Same as offset 4, only for PLS 4 output. Can Clock
44	PLS 4 Time Advance	Same as offset 8, only for PLS 4 output. Can Clock
48	PLS 5 ON Angle	Same as offset 0, only for PLS 5 output. Product detect
52	PLS 5 OFF Angle	Same as offset 4, only for PLS 5 output. Product detect
56	PLS 5 Time Advance	Same as offset 8, only for PLS 5 output. Product detect
60	Machine Character	Using only the lower 8 bits to get a unique machine ASCII character to add to the station number when creating a print string for the VideoJet.
64	Maximum Station	Is the total number of embossing stations on the machine? The value may be programmed from 1 to 99.
68	VideoJet Print head Offset	Used by the RPV to offset its' internal station number at start-up. This may be necessary depending on the location of the VideoJet print head in relationship with the machines main Turret Angle zero. Any write to this address offset shall disable the RPV and the RPV shall wait for a new Start-Up Turret Angle.
72	Start-Up Turret Angle	A write to this address offset after power up will synchronize the RPV to the correct station number. The RPV is not considered enabled until the Start-Up Angle has been written. The angle should be in resolver bits from 0 to 4095.
READ ONLY ADDRESS OFFSETS		
76	RPV Status bits	Bit 0: cleared RPV Disabled, set RPV Enabled. Bit 1: set when the VideoJet is not responding over the RS-232 connection to the RPV-100. Bit 2: cleared when ZREV input is off, set when ZREV input is on.
80	RPV Internal Station Number	The present station number to be put in the serial command to the VideoJet. Assuming a zero VideoJet print head offset this is one ahead of the machine station number.
84	RPV resolver position	Present resolver position, 24 bits.
88	R0_SPARE1	Spare
92	R0_SPARE2	Spare
96	R0_SPARE3	Spare
100	INPUT Status Word	Shows the state of the inputs. Bit 0 is Input 1, bit 1 is Input 2, and so on … bit 10 is input 11.
104	Control Mask	Allows user to configure behavior of RPV. Bit 0: enables HOURS out to VideoJet. Bit 1: enables DELIMITER out to VideoJet. Bit 2: enables MINUTES out to VideoJet.

BYTE OFFSET	NAME	DESCRIPTION
108	Total Minutes	Total Minutes from CTC. A write to this location enables the time stamp output from the RPV to the VideoJet per associated bits in the "Control Mask".
112	Delimiter	ASCII Delimiter between hours and minutes. Enabled and disabled via "Control Mask". For example, a setting of 58 is the ASCII equivalent of a colon (:).

NOTE
Additional logic functions may be required to have physical output turn on/off. **See Section 4.**

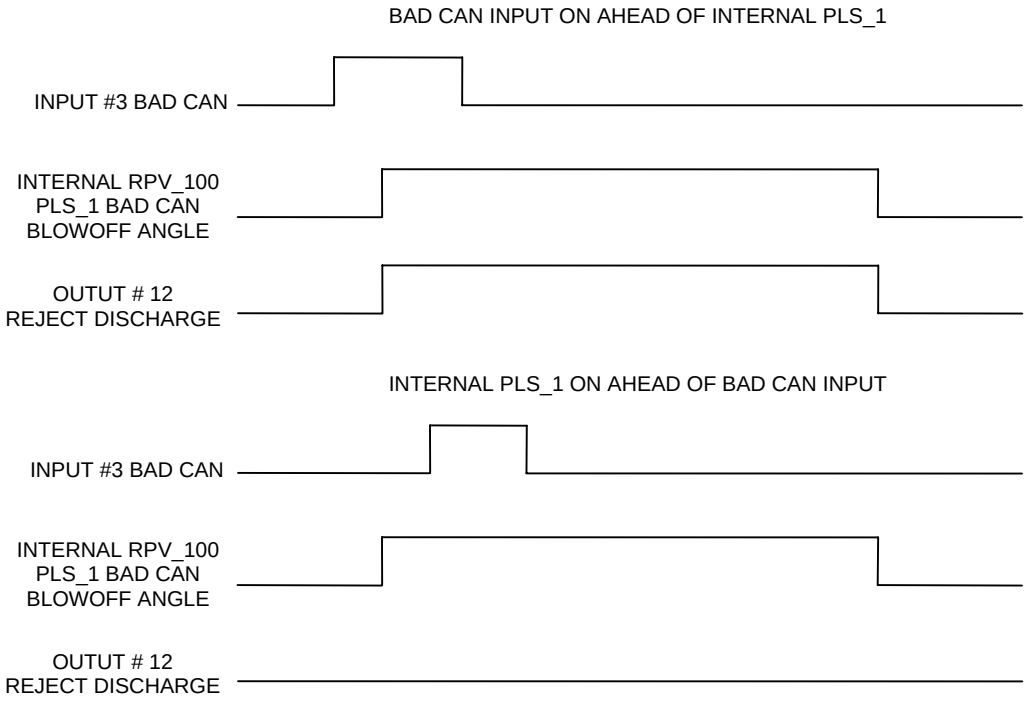
4.0 RPV-100 INPUT AND OUTPUT FUNCTIONS

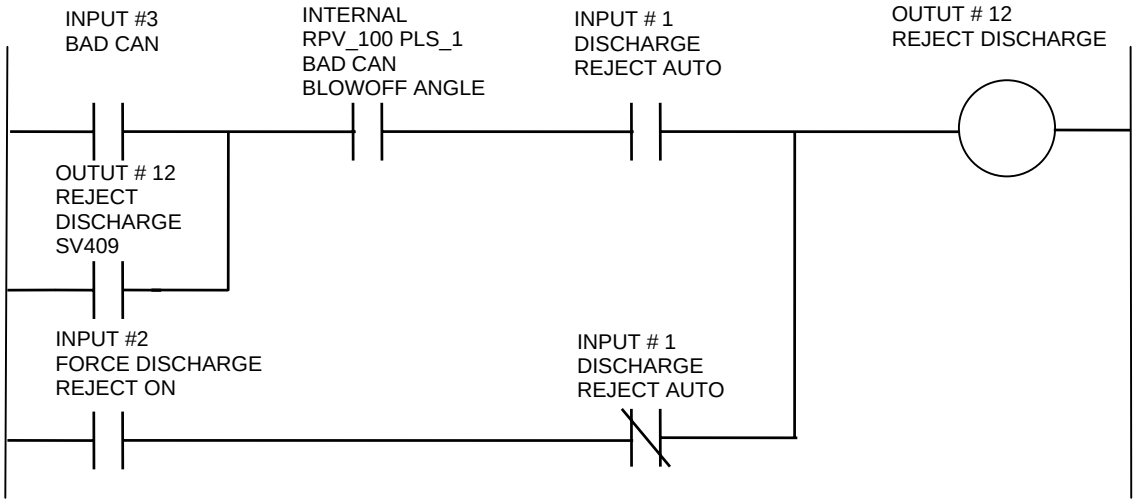
The RPV-100 is preprogrammed to operate automatically with seven inputs and three outputs as follows.

I/O MODULE TYPE	I/O RACK LOCATION	FUNCTION
INPUT	1	Discharge Reject Auto.
INPUT	2	Force Discharge Reject On.
INPUT	3	Bad Can.
INPUT	4	Enable Can Feed Sync.
INPUT	5	Can Feed Auto.
INPUT	6	Force Can Feed ON.
INPUT	7	ZREV Prox input.
INPUT	8	Spare Output_A, Enable.
INPUT	9	NOT USED.
INPUT	10	Disable Printer.
----------	11	Not Available.
OUTPUT	12	PLS 1, Reject Discharge.
OUTPUT	13	PLS 2, Can Feed.
OUTPUT	14	PLS 3, Spare Output_A.
OUTPUT	15	PLS 4, Can Clock.
OUTPUT	16	PLS 5, Product Detect.

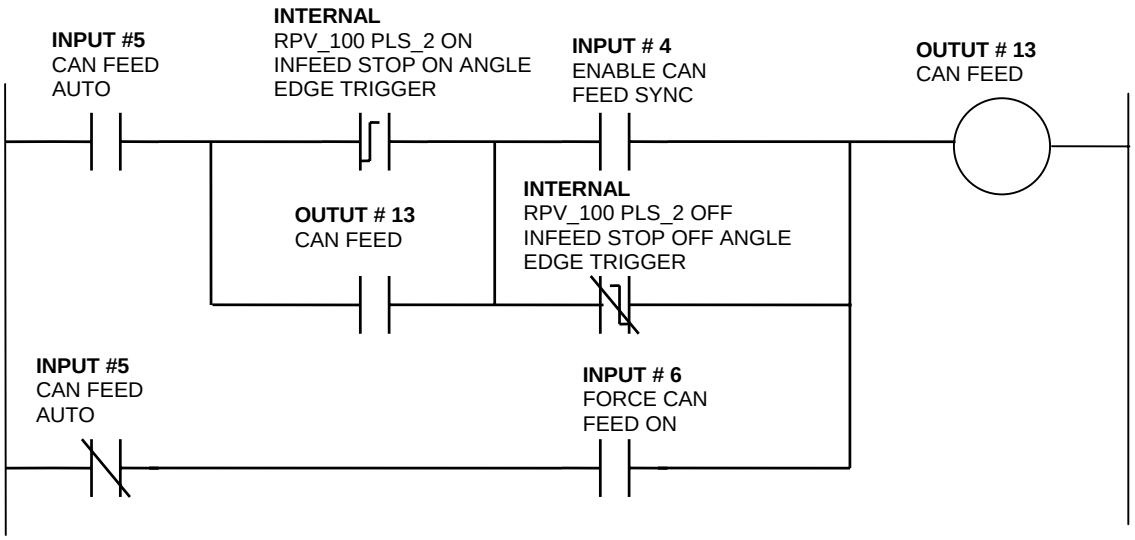
4.1 PLS_1 - Output #12, Reject Discharge

When this output is used in Auto mode the BAD CAN input must turn on prior to the internal PLS_1 turning on in order to get the output to turn on.

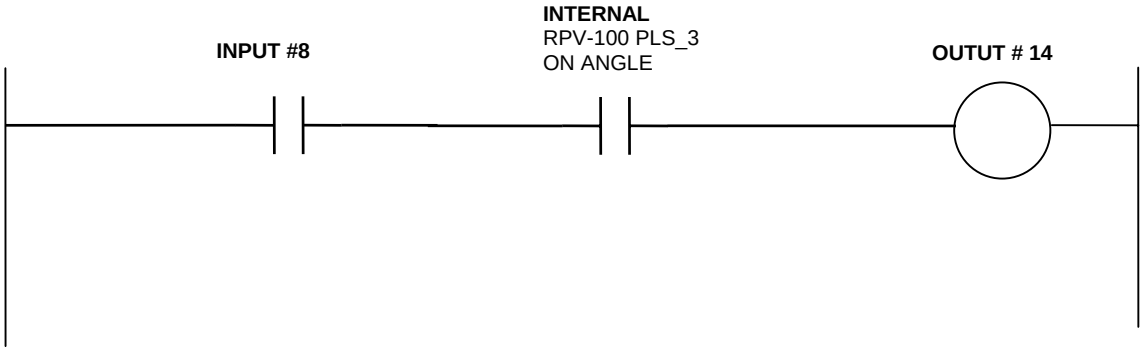




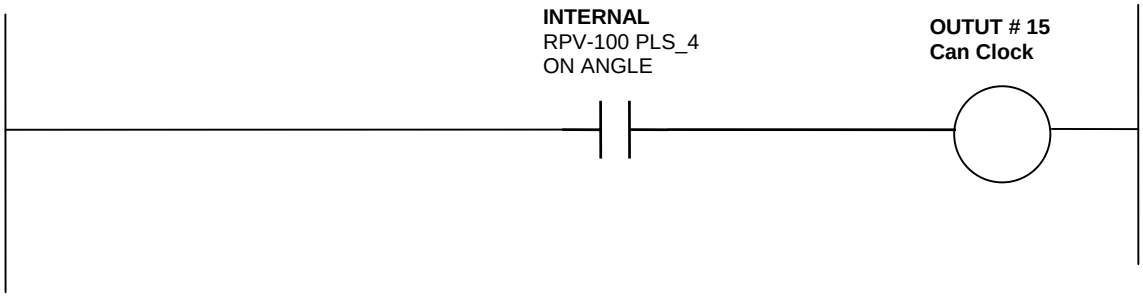
4.2 PLS_2 - Output #13, Can Feed Logic



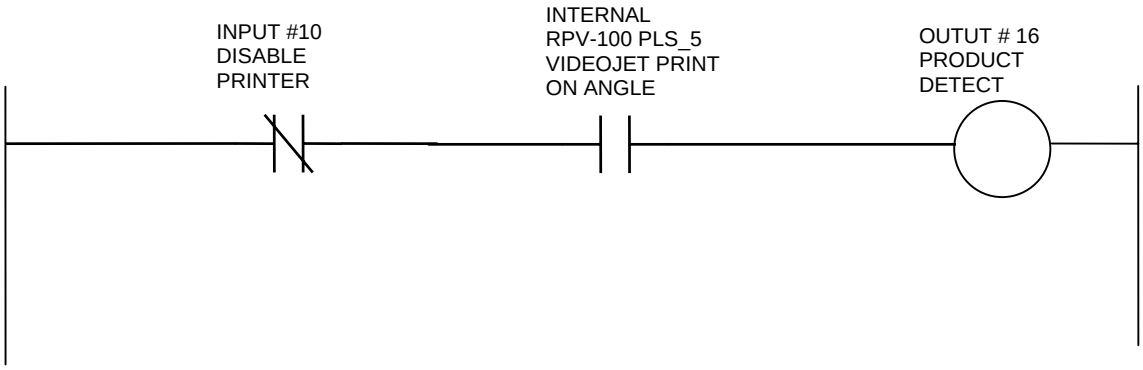
4.3 PLS_3 - Output #14, Spare Output_A



4.4 PLS_4 - Output #15, Can Clock



4.5 PLS_5 - Output #16, VideoJet Product Detect Logic



5.0 INDICATORS

The RPV-100 Assembly is equipped with 18 status indicators (**Figure 4.1**). 2 of the 18 are dedicated to the status of the unit and each of the other 16 indicators is related to the 16 I/O Module positions on the assembly.

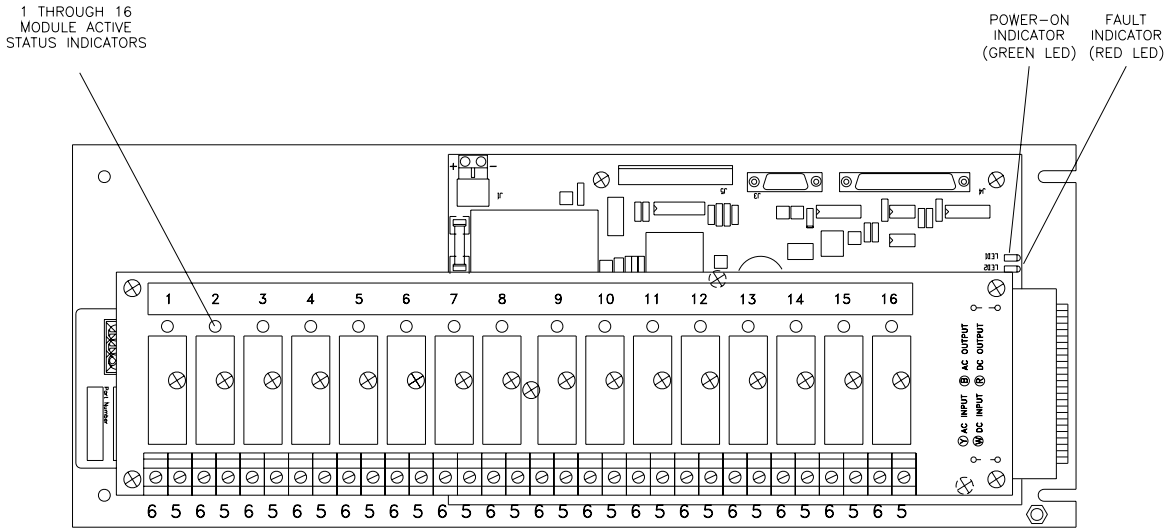


Figure 4.1

The power status indicator is a green LED. When power is applied to the assembly, the green LED is lighted.

The fault status indicator is a red LED. When the red LED is on without the green LED, this is a serious fault indication. Power shall need to be cycled for operation to continue.

The 16 I/O Module status indicators are red LED's. When an I/O Module is installed in the position and the I/O Module is activated (on state), the red LED (adjacent to the terminals associated with the I/O Module) is lighted.

6.0 VIDEOJET

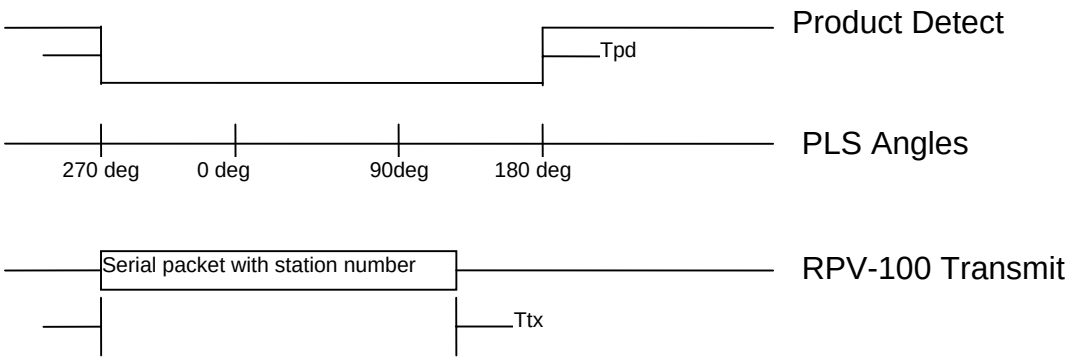
6.1 RPV-100 Product Detect Output

The RPV-100 connects directly to the Product Detect Input of the VideoJet connector J15 on the main electronics board inside the VideoJet cabinet as follows:

VideoJet		RPV-100 PLS_5 Output
J15-4	to	Output_16-5
J15-3	to	Output_16-6

The product detect jumpers on the VideoJet electronics board define the necessary timing between the PLS angles for the RPV-100 Product Detect Output. The jumpers should be arranged so that the VideoJet starts to print on the falling edge of the product detect. The RPV-100 starts sending its serial packet to the VideoJet at the beginning of the PLS_5 output, or in other words at the PLS_5 On Angle (see **Table 3.2**). The RPV-100 using the VideoJet Print head Offset, from **Table 3.2**, automatically advances its station number by one so that the station number in the serial packet to the VideoJet is always ahead of the present station over the print head on the machine.

Timing example for VideoJet Jumpers E108 OUT and E109 IN, VideoJet prints on Product Detect rising edge:



PLS On angle is 270deg.
PLS Off angle is 180deg.

The RPV-100 will complete it's transmit (Ttx) within 20 milliseconds, this is approximately a third of the total cycle period of the Stolle Embosser running at 1800 cans/minute. The width of the Product Detect (Tpd) should be adjusted per VideoJet Product detect input requirements.

NOTE

The Product Detect Level high should be adjusted as short as possible for maximum serial packet transmission time. Also serial packets are only present with positive resolver position updates.

6.2 RPV-100 Serial Packet

The RPV-100 serial packet to the VideoJet contains a total of 7 characters. The packet is made up of a **clear print buffers** command to the VideoJet, followed by the machine identifier character and station number for the next print, then finally a terminating carriage return character. In each consecutive packet the station number is incremented up to the total number of stations on the machine then starts over again at one. The total number of stations is programmable at the CTC using the "Maximum Station Variable" of **Table 3.2**.

Example: 1Bh,01h,01h,32h,33h,3Ah,35h,39h,41h,30h,31h,0Dh (the "h" indicates a hexadecimal number)

Where (in order from above):

1) 1Bh,01h,01h	is the **clear print buffers** command.
2) 32h,33h	is the ASCII character for hours.
3) 3Ah	is the ASCII character for ":".
4) 35h,39h	is the ASCII character for minutes.
5) 41h	is the ASCII character equivalent for an "A".
6) 30h,31h	ASCII station number, 01 for station one.
7) 0Dh	is the carriage return character.

The clear print buffers command has the effect of clearing the View Print display on the VideoJet front panel, therefore, if operating in Product Detect MODE 1 described above the printed characters are immediately cleared from the display. This has the consequence of not allowing the operator to view printed results at the VideoJet panel even at low speeds.

The hours, minutes and delimiter outputs to the VideoJet may be enabled or disabled via the Control Mask in communication memory (see **Table 3.2**).

6.3 Print Matrix Adjustment

During initial setup of the VideoJet and RPV-100 it is important to consider the desired Print Matrix. The maximum speed at which the product may pass over the print head is dependent by the Print Matrix selected at the VideoJet. For the EXCEL 178i Printer with a selected 5x7 single line Print Matrix, the maximum print speed is 611feet/minute.

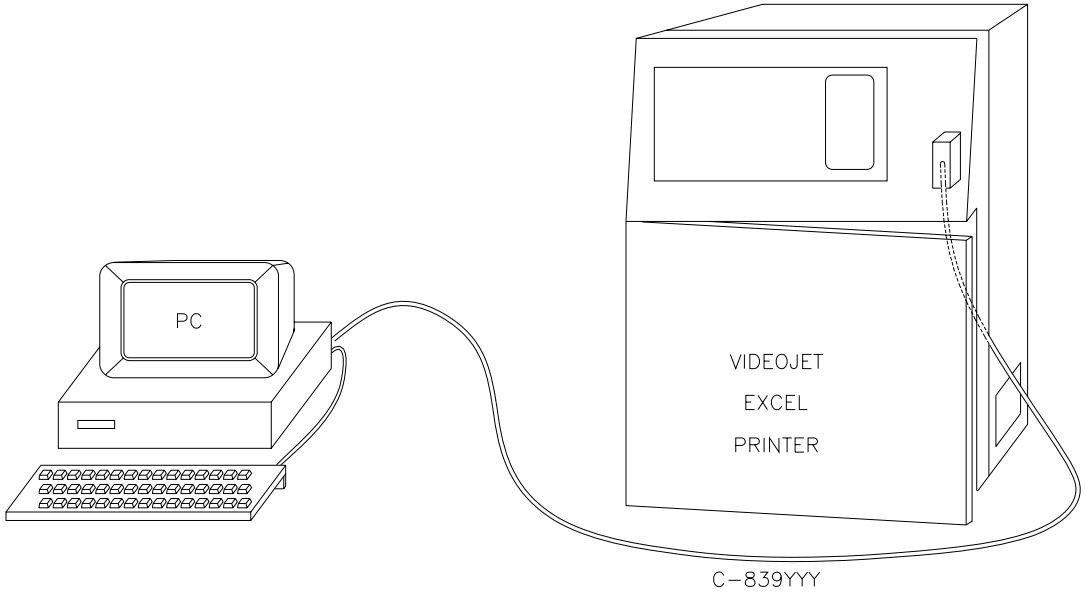
To change the Print matrix at the VideoJet front panel it is necessary to first take the VideoJet out of **remote message mode**, and then load a message after the new Print matrix has been selected.

The following steps should be followed; keyboard operations are defended in the VideoJet Users Manual:

01) Select the 02 SYSTEM display at the VideoJet front panel.
02) Depress SHIFT and F2 keys at the same time to change the remote mode to INSERT, then depress ENTER key.
03) Select the 02 EDIT display.
04) Depress the F2 key to change to the desired Print Matrix, then depress ENTER key.
05) Select the 01 EDIT display.
06) Depress the F4 key to load the newly selected Print Matrix.
07) If accepted, the printer will respond with “MESSAGE LOADED”.
08) Select the 02 SYSTEM display.
09) Depress SHIFT and F2 keys at the same time to change the remote mode to MESSAGE, then depress ENTER key.
10) Continue to press the ENTER key until viewing desired display for present operation. This procedure is now complete.

6.4 PC/Laptop to VideoJet Serial Communications Test Setup.

A desktop or laptop PC may be used to test the VideoJet communications and display VideoJet serial responses with the following arrangement.



The following basic program will exercise the serial communications roughly in the same manor as the RPV-100:

```
REM  This command initializes the PC com port, it may be changed to com2.  Most
REM  laptops are com1.
CLS
PRINT "CONTROL BREAK will exit program"
OPEN "com1:9600,n,8,1" FOR RANDOM AS #1
REM   This commands outputs a serial message to the VideoJet.
Lp:
PRINT #1, CHR$(&H1B) + CHR$(&H01) + CHR$(&H01) + "A01"
REM  This command inputs the response from the VideoJet then prints on the PC screen.
REM  The 4 is the number of bytes expected, the INPUT will wait for all the bytes expected.
PRINT ASC (INPUT$(1,1));
PRINT ASC (INPUT$(1,1));
PRINT ASC (INPUT$(1,1));
PRINT ASC (INPUT$(1,1))
PRINT "Press SPACE BAR to continue..."
DO
LOOP UNTIL INKEY$=CHR(&H20)
GOTO Lp
```

It is necessary to in some way toggle the Product Detect Input to view the results of a print from a remote message. This may be accomplished by connecting the PLS_5 output from the RPV-100 to the VideoJet, a resolver shall also need to be connected to the RPV-100 to toggle the output.

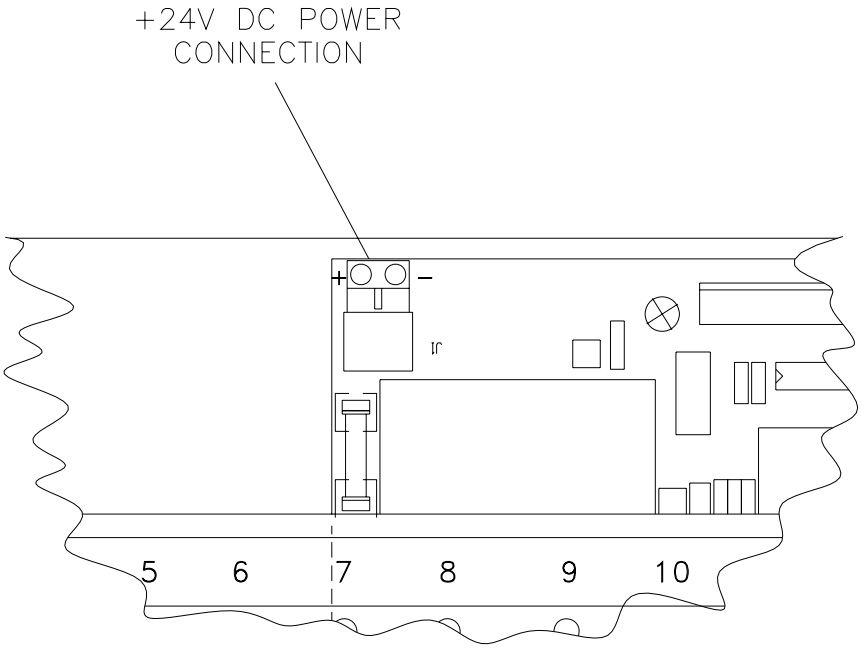
6.5 RPV-100 to PC/Laptop Serial Communications Test Setup.

The following basic program will emulate the VideoJet EXCEL178i, it may be run from a Laptop PC com1 port connected to the RPV-100:

```
REM ******************************************************
REM **   This program emulates the VideoJet EXCEL 178 i response        **
REM **   to the RPV.  USES COM1!!!                                      **
REM ******************************************************
CLOSE
CLS
OPEN “com1:9600,n,8,1” FOR RANDOM AS #1

lp:
PRINT “”
PRINT “MESSAGE FROM RPV:”;
REM ******************************************************
REM **   Accept and display inputs from RPV up to carriage return       **
REM ******************************************************
lpa:
 InByte$ = INPUT$(1, 1)

 IF InByte$ > CHR$(&H1F) AND InByte$ < CHR$(&H7F) THEN
   PRINT InByte$;
ELSE
   PRINT ASC(InByte$);
END IF

REM ******************************************************
REM **   Look for carriage return so can jump to xmit vjet response     **
REM ******************************************************
IF InByte$ = CHR$(&HD) THEN
   GOTO xmit
ELSE
   GOTO lpa
END IF

xmit:
PRINT “TRANSMITTED, 0x7 0x8 0x7 0x7, AS A RESPONSE TO THE RPV”
PRINT #1, CHR$(&H7) + CHR$(&H8) + CHR$(&H7) + CHR$(&H7)
GOTO lp
```

7.0 CONNECTION DIAGRAMS

7.1 24vDC Power Connection



7.2 DC Input Module Connections

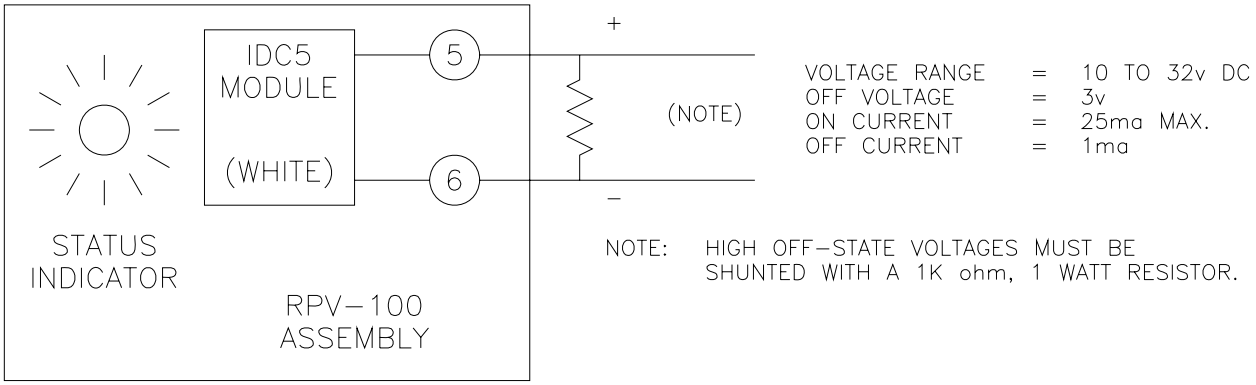


Figure 7.2

7.3 AC Input Module Connections

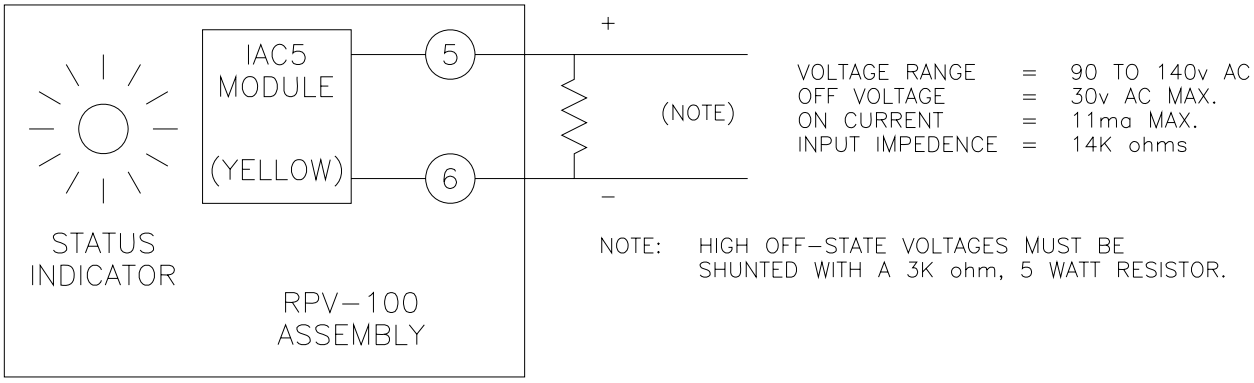


Figure 7.3

7.4 DC Output Module Connections

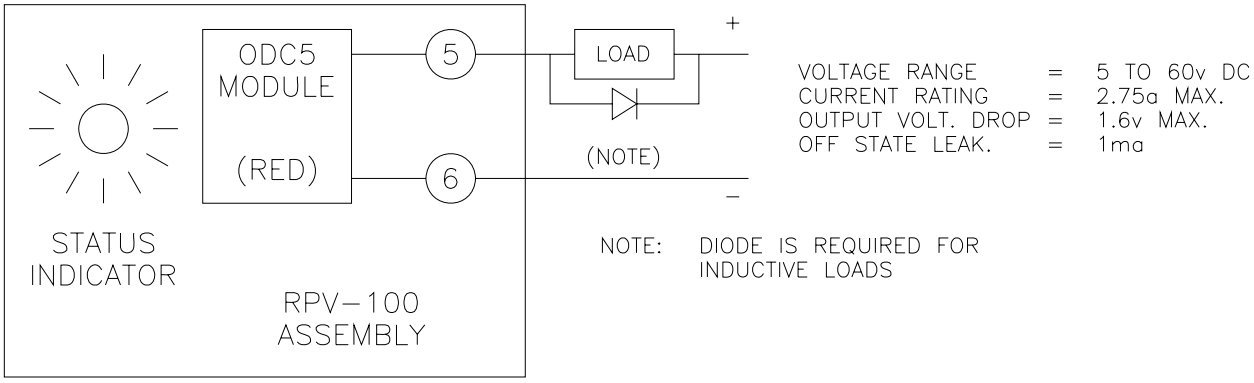


Figure 7.4

7.5 AC Output Module Connections

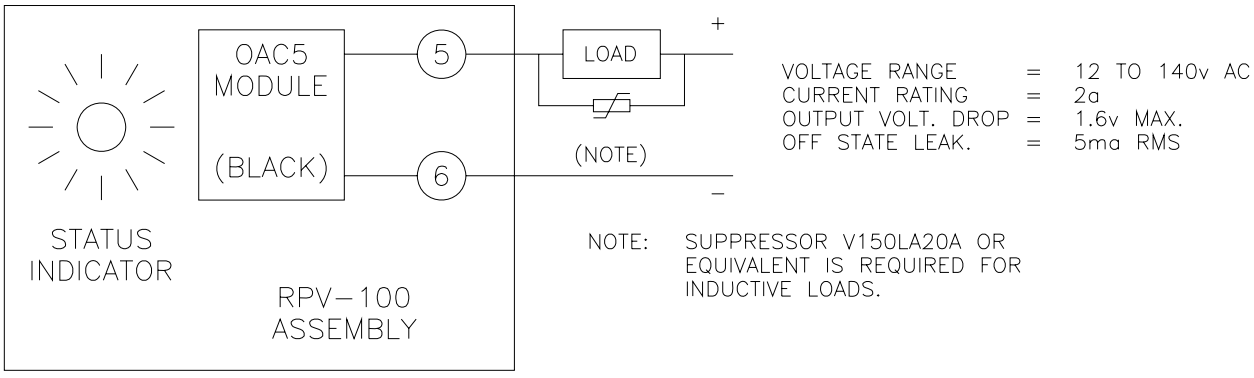


Figure 7.5

8.0 ASSEMBLY DRAWINGS

8.1 Overall

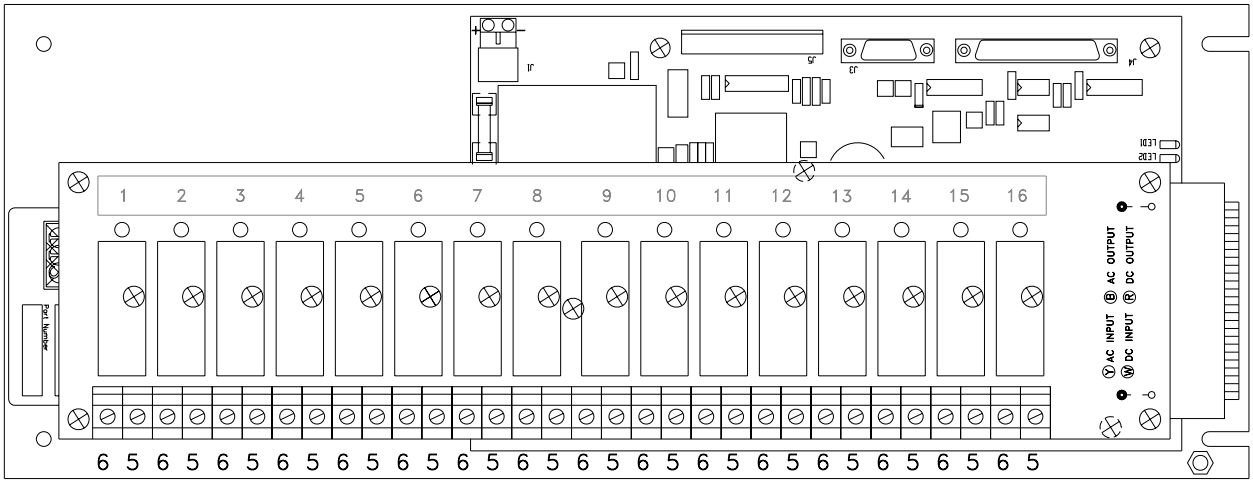


Figure 8.1 - Overall Assembly

8.2 Mounting

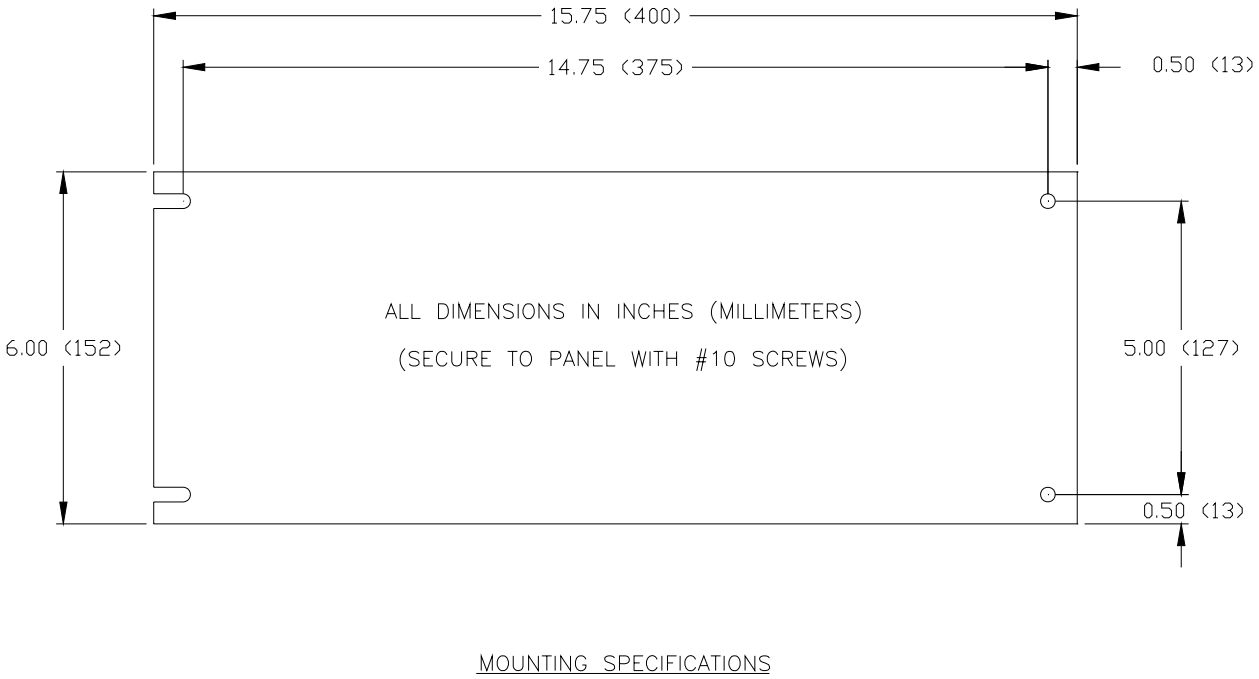


Figure 8.2

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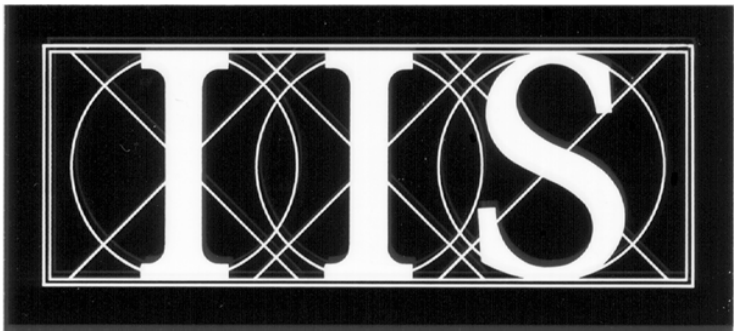

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