RELIANCE ELECTRIC

INSTRUCTION SHEET D2-3170-1
Rail Interface Card
Model 1SC4000
For use with 230 VAC, 460 VAC and 575 VAC
1-10 HP 230 VAC
1-20 HP 460/575 VAC
GP-2000/VTAC V
General Purpose A-C V★S® Drive Controllers

Receive and Accept the Shipment

Reliance® Electric's terms of sale, in all instances, are F.O.B. point of origin. The user is responsible for thoroughly inspecting the equipment before accepting shipment from the transportation company.

If all the items called for on the bill of lading or on the express receipt are not included or if any items are obviously damaged, do not accept the shipment until the freight or express agent makes an appropriate notation on your freight bill or express receipt. If any concealed loss or damage is discovered later, notify your freight or express agent within 15 days of receipt and request that he make an inspection of the shipment. Keep the entire shipment intact in its original shipping container.

The user is responsible for making claim against the Carrier for any shortage or damage occurring in transit. Claims for loss or damage in shipment must not be deducted from the Reliance Electric invoice, nor should payment of the invoice be withheld while awaiting adjustment of such claims since the Carrier guarantees safe delivery.

File a Return Request

1. To return equipment, send a written request to Reliance Electric within ten days of receipt.
2. Do not return equipment without a numbered Equipment Return Authorization (ERA) from Reliance Electric.
3. Reliance Electric reserves the right to inspect the equipment on site.

Store the Kit until Installation

After receipt inspections, repack the kit in its original shipping container until installation. If a period of storage is expected, store in the original shipping container with its internal packing.

To ensure satisfactory operation at startup and to maintain warranty coverage, store the equipment:

- in its original shipping container in a clean, dry, safe place.
- within an ambient temperature range of −10°C to 40°C.
- within a relative humidity range of 5 to 95% without condensation.
- away from a highly corrosive atmosphere. In harsh environments, cover the shipping/storage container.

Related Publications

Refer to the following documentation as it applies to your system:

- GP 2000/VTAC V Main Controller Installation, Operation and Maintenance Instruction Manual
- J-3750: AutoMax Programming Executive Instruction Manual
- J-3063: AutoMate Programming Executive Instruction Manual
- J-3012: AutoMate/AutoMax Digital I/O Rail and Modules Manual
- J-3049: AutoMate Local Head Instruction Manual
- J-3649: AutoMax Configuration Task Instruction Manual
- J-3650: AutoMax Processor Module Instruction Manual
- J-3671: AutoMate Local I/O Head Instruction Manual
- J-3675: AutoMax Enhanced Basic Language Instruction Manual
- J-3676: AutoMax Control Block Language Instruction Manual
- J-3677: AutoMax Ladder Logic Language Instruction Manual
- J-3684: AutoMax Programming Executive V2.0 Instruction Manual
- J-3750: AutoMax Programming Executive V3.0 Instruction Manual
- J-3150: AutoMate 30/40 Reference Manual
- J-3120: AutoMate 20/20E User Manual
- J-3606: Remote I/O Communications Instruction Manual

Description

The products described in this instruction manual are manufactured by Reliance Electric Industrial Company.

The Rail Interface Card provides communications between the Reliance V★S GP-2000/VTAC V controller and the AutoMate™ or AutoMax™ products. The AutoMate or AutoMax act as a host controller to the GP-2000, and can control and monitor the drive through the use of this card.

The Rail Interface Card sends (4), 16-bit registers (64 bits total) to the host AutoMate or AutoMax controller. (See Table 1 for the 4-register memory map.) Two registers are used for controlling the operation of the GP-2000/VTAC V (write only), and the remaining two registers are used for monitoring capabilities (read only).

The actual register numbers used in the AutoMate can be any 4 contiguous digital I/O registers. In AutoMax, the register numbers used will be 0, 1, 2, or 3. For purposes of simplifying this manual, the registers used to interface to the Rail Interface Card, are named 0, 1, 2, and 3.

The Rail Interface card allows the host controller to perform the following:

1. Operation Control functions, such as start/stop, reverse/forward, jog/run and IET reset.
2. Speed settings.
3. Monitor the control mode, start/stop status, output relay status, and IET faults.
4. Monitor feedback such as output frequency, output voltage, and output current.

The Rail Interface card can only mount on GP-2000/VTAC V regulator boards (part numbers given in Table 2). Check that your GP-2000/VTAC V Controller has the correct regulator board before installing this kit. The kit cannot be used in conjunction with the GP-2000/VTAC V Remote Meter Interface Card option (M/N 1MI4000), as both cards require the same installation area on the GP-2000/VTAC V Controller regulator board. The host controller (AutoMate or AutoMax) must have a minimum of 64 I/O points available for communication.

Kit Contents

The Rail Interface kit consists of the parts given in Table 2.

Table 1. Register Memory Map[1].

Register	Read/Write from the Host Direction	Register Description
0	Write Only	Drive Control Register
1	Write Only	Drive Speed Reference in Hz (scaled × 10)
2	Read Only	Drive Status Register
3	Read Only	Drive Feedback in Output Frequency (Hz), Output Voltage (VAC), or Output Current (⅒ Amps)

(1) See Table 3 for detailed bit mapping.

Table 2. Kit Contents

Description	Quantity Required	Part Number
Host Controller Interface Card (HCI-001)	1	0-48680-319
Cable (10 ft. or 3 meters)	1	M/N 4508
Spacer Studs	4	NS-15
Regulator Board	1	GPI-2 0-48680-116B[1]
		GPI-100 0-48680-117B[1]
		VTAC V-3 0-48680-118B[1]

(1) B denotes the minimum software version number required to operate this kit.

System Configuration

AutoMate

The Rail Interface Card can only be used with the following AutoMate host controllers:

AutoMate 20, 20E
AutoMate 30, 30E
AutoMate 40, 40X, 40E

When configuring the AutoMate system, the Rail Interface Card is added to the system in the same way that a Local Head is configured. (Model number 61C22 can be used as an example of a Local Head.) Refer to Figure 1. The Rail Interface Card is physically connected through a rail port to the AutoMate Remote Head (M/N 45C37 or 45C38), the Local I/O Processor (M/N 45C200), or to the front of any of the AutoMate Processors which support the Local Head.

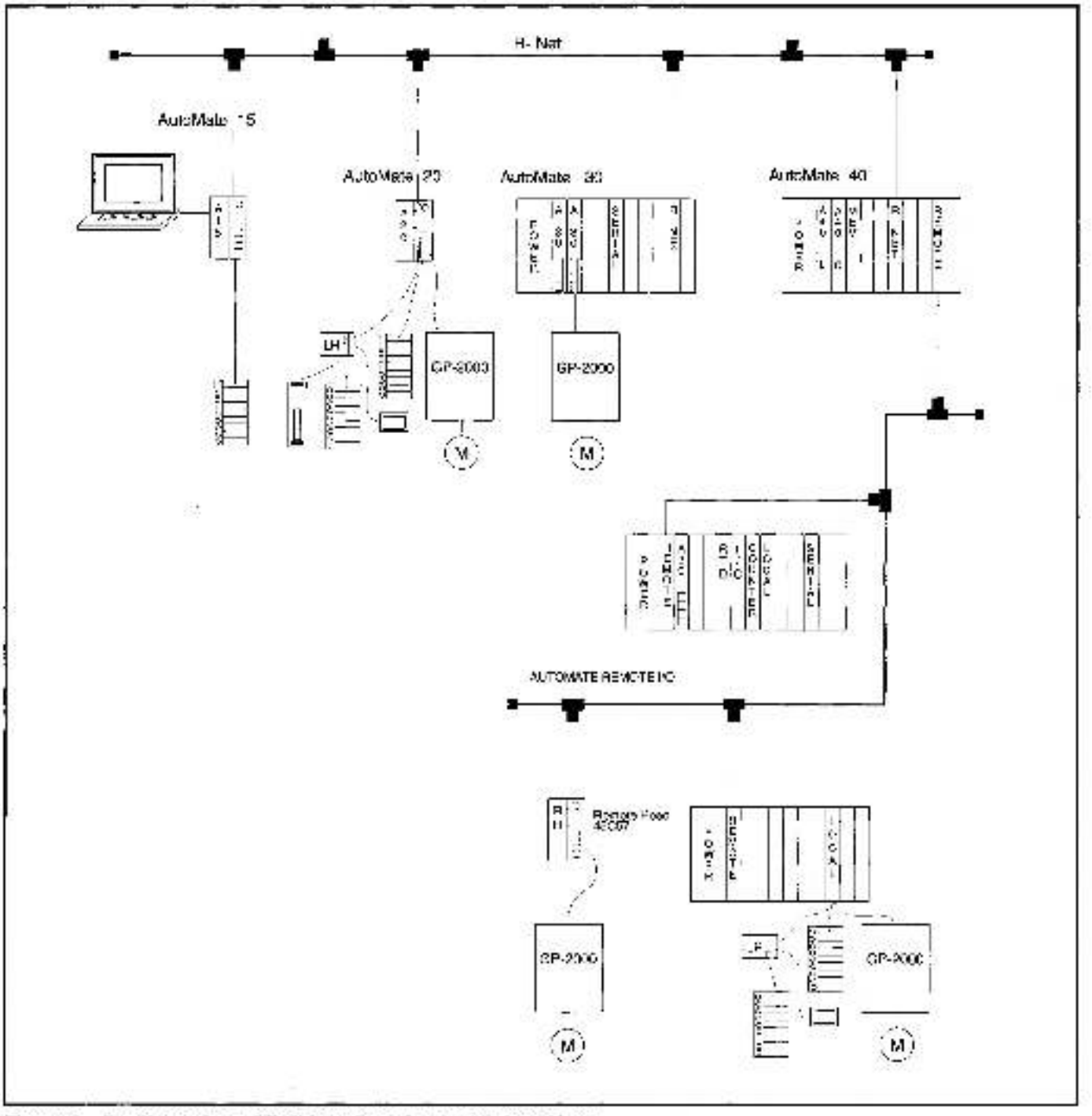


Figure 1. Configuration of Rail Interface Card with AutoMate.

AutoMax

CAUTION: The M/N 57C329 Remote Drive Interface Head can be used only as an interface between the AutoMax I/O network and the GP-2000/VTAC V controller. This Head must not be connected to Local Heads, digital or analog rails, LED modules, or thumbwheel switch modules. Failure to observe this precaution could result in damage to, or destruction of, the equipment.

When used with an AutoMax system, the GP-2000/VTAC V is connected to the AutoMax Remote Head (Model Number 57C329). Refer to Figure 2. The Rail Interface Card is supported in the AutoMax Programming Executive before Version 3.3, by configuring it as any other local head. In Version 3.3 or later, it is configured using the Rack Configurator.

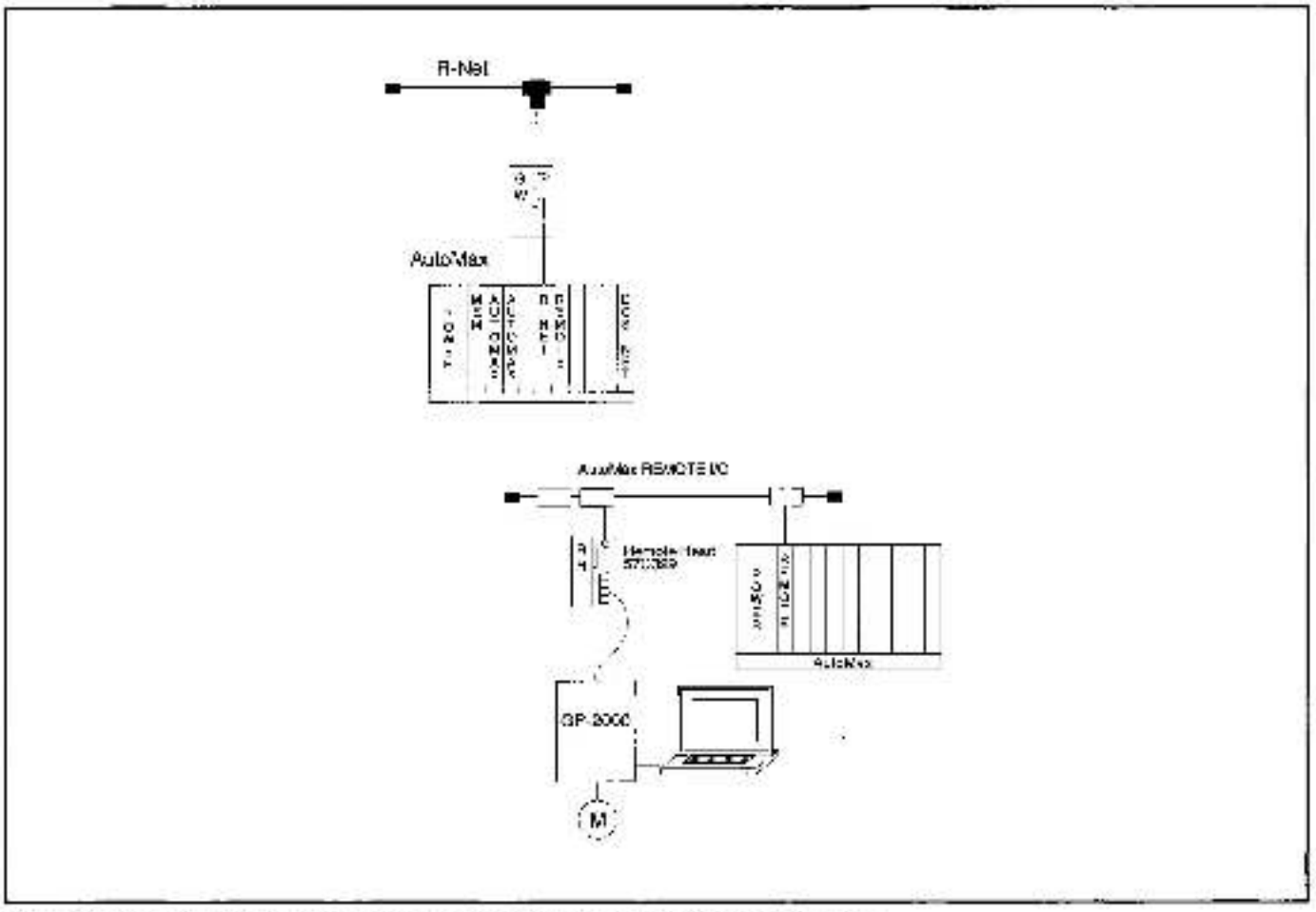


Figure 2. Configuration of Rail Interface Card with AutoMax Remote Head.

Installation of the Rail Interface Card to the GP-2000/VTAC V Regulator Board

DANGER

ONLY QUALIFIED ELECTRICAL PERSONNEL FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF THIS EQUIPMENT AND THE HAZARDS INVOLVED SHOULD INSTALL, ADJUST, OPERATE, AND/OR SERVICE THIS EQUIPMENT. READ AND UNDERSTAND THIS MANUAL IN ITS ENTIRETY BEFORE PROCEEDING. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

DANGER

THE USER IS RESPONSIBLE FOR CONFORMING TO THE NATIONAL ELECTRICAL CODE AND ALL OTHER APPLICABLE LOCAL CODES. WIRING, GROUNDING, DISCONNECTS, AND OVERCURRENT PROTECTION ARE OF PARTICULAR IMPORTANCE. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

DANGER

DO NOT INSTALL MODIFICATION KITS WITH POWER APPLIED TO THE CONTROLLER. DISCONNECT AND LOCK OUT INCOMING POWER BEFORE ATTEMPTING SUCH INSTALLATION. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN SEVERE BODILY INJURY OR LOSS OF LIFE.

WARNING

FAILURE OF THE DRIVE COULD CAUSE UNEXPECTED STARTING OR FAILURE TO STOP THE MOTOR. AN EMERGENCY STOP PUSHBUTTON MUST BE PROVIDED TO INTERRUPT DRIVE OPERATION AND SHUT THE DRIVE DOWN AS A POSITIVE INTERRUPT. FAILURE TO OBSERVE THIS PRECAUTION COULD RESULT IN BODILY INJURY.

1. Disconnect all power to the GP-2000/VTAC V Controller.
2. Loosen the four (4) screws at the corners of the GP-2000/VTAC V Controller enclosure.
3. Remove the cover.
4. Remove all conduit entering the GP-2000/VTAC V Controller.
5. Remove the bottom plate of the GP-2000/VTAC V Controller.
6. Locate the four (4) spacers with pins as shown in Figure 3.
7. Place the spacers into the four GP-2000/VTAC V Controller regulator board holes marked A, B, C, and D in Figure 4.
8. Press the pins slightly to temporarily maintain the spacer vertical position on the regulator board. See Figure 3.
9. Place the Rail Interface Card over the regulator board so that the two connectors (E and F in Figure 4) and the two holes align over the regulator connectors and spacers. Press the Rail Interface card to lock the connectors.
10. Press the pins firmly (but do not bend them or the connector pins) to lock the Rail Interface card and spacers onto the regulator board.

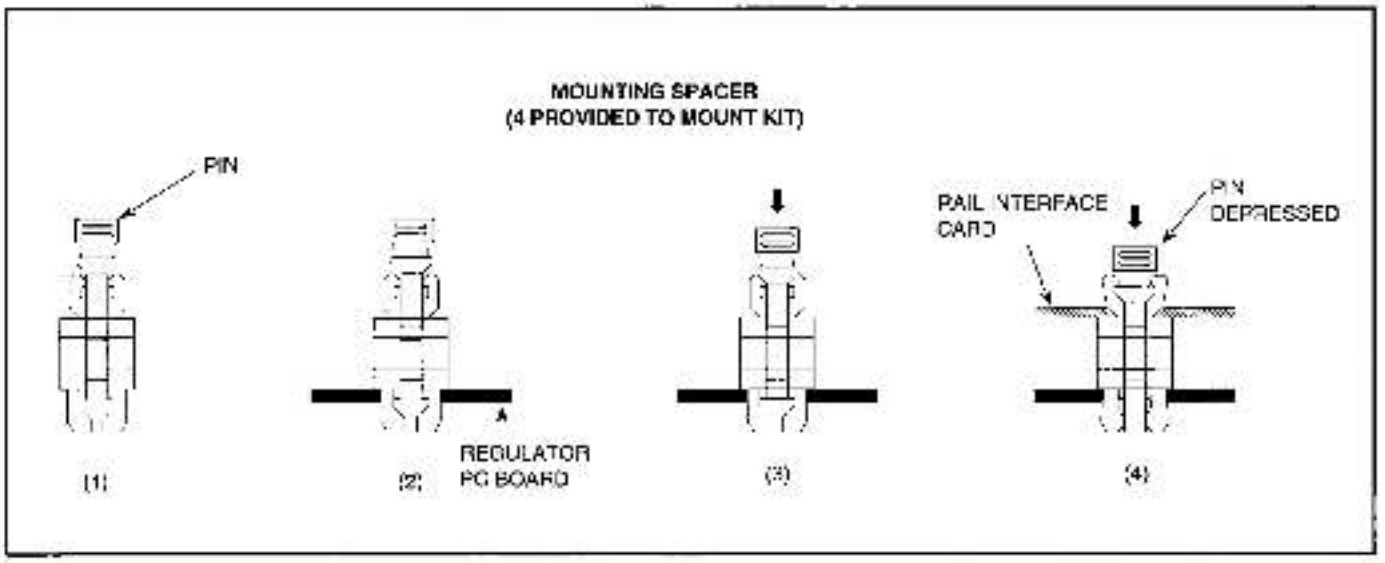


Figure 3. Spacer Installation to the Regulator PC Board.

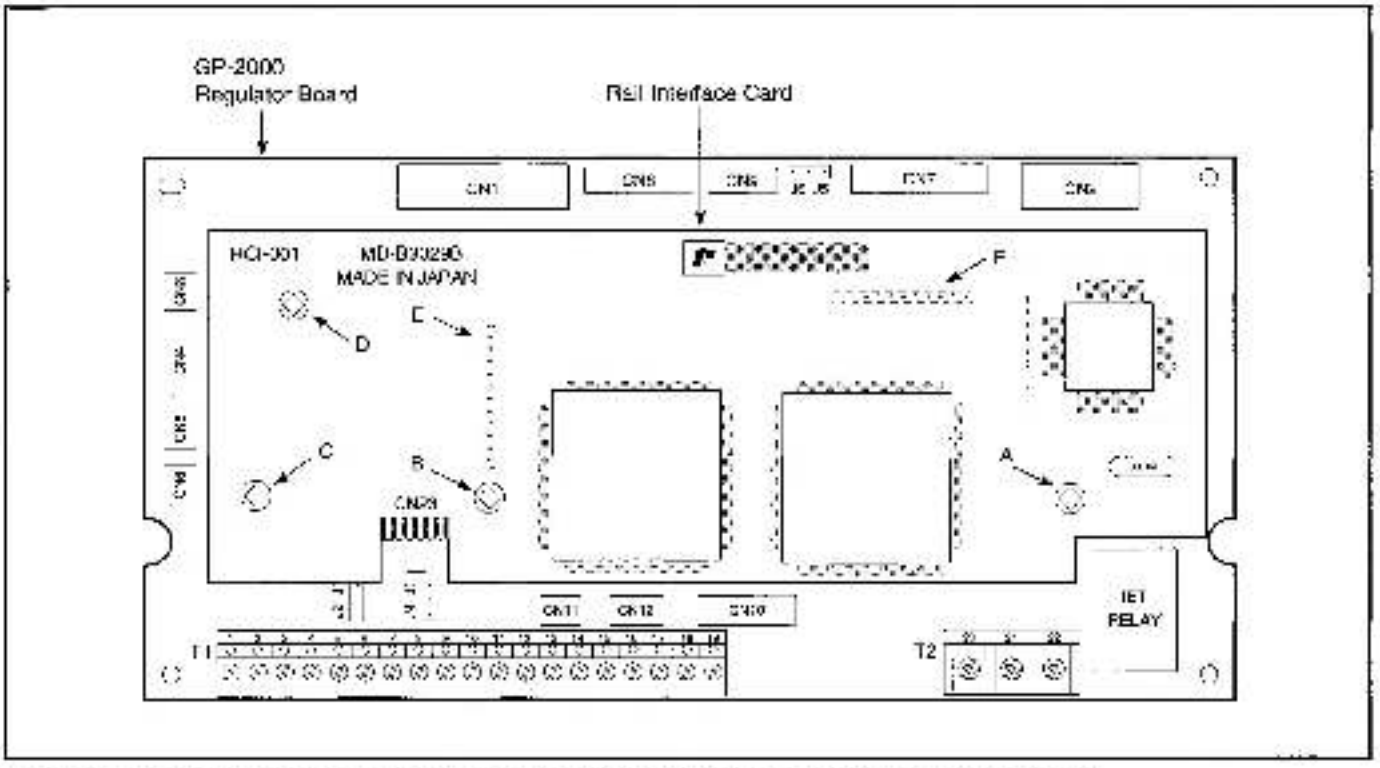


Figure 4. Installation of the Rail Interface Card to the GP-2000/VTAC V Regulator Board.

Installation of the Rail Interface Card/GP-2000/VTAC V to the Host Controller

1. Route the cable supplied with this kit (M/N 45C8) through either of the openings in the bottom of the GP-2000/VTAC V controller. Make sure the cable does not come in contact with uninsulated components.
2. Connect one end of the cable to the CN23 connector on the Rail Interface card as shown in Figure 5. Note that the cable connectors are keyed for proper insertion.
3. Connect the other end to the either the Remote Head (for AutoMax) or to the AutoMate Remote Head, Local I/O Processor, or AutoMate Processor. Consult with any documentation provided with the AutoMax or AutoMate for further installation information.

Installation of Emergency Stop

A hard-wired emergency stop pushbutton must be wired to the GP-2000/VTAC V controller Function Loss circuit at terminals 11 and 12 on the Control Signal Buffer Board or regulator PCB. This will ensure a fail-safe stop. Refer to Figure 6 for wiring details. Consult with the GP-2000/VTAC V Controller Instruction Manual for location of these terminals on the Control Signal Buffer Board or regulator PCB.

Note: Bit 4 and Bit 13 of the Drive Status Register (Register 2) will be set to a 1 when a coast-stop is activated. This should be used in the Host controller system for interlocking.

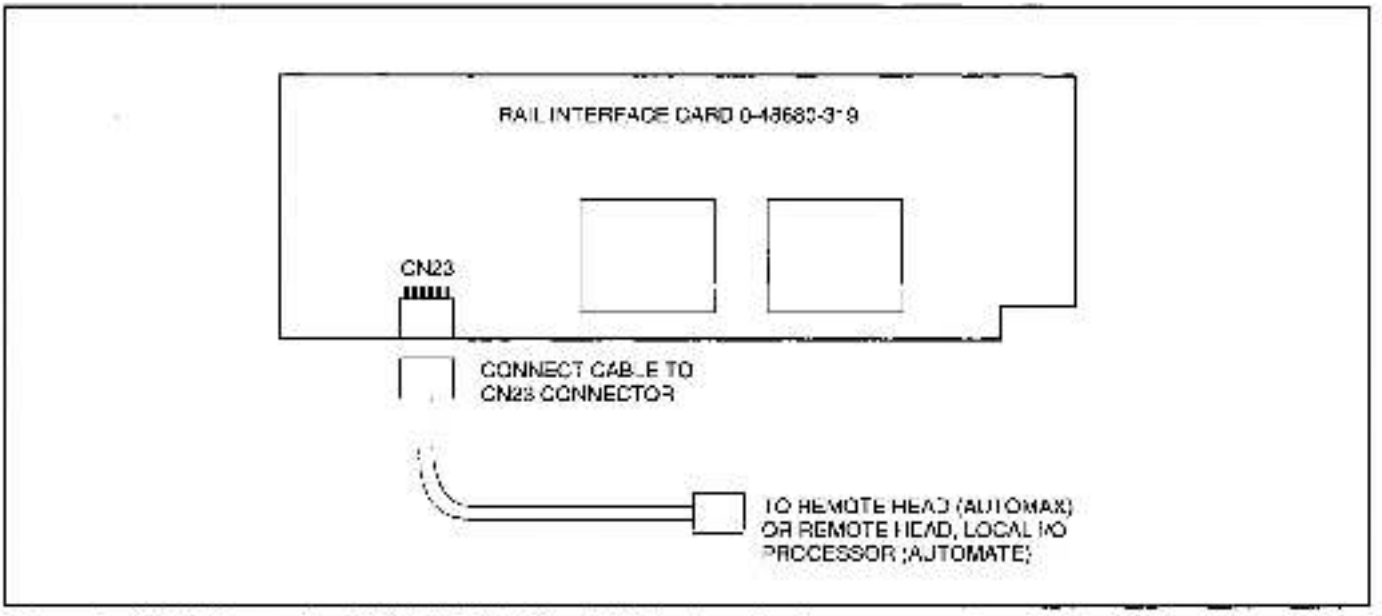


Figure 5. Cable Connection (M/N 45C8) to the Rail Interface Card.

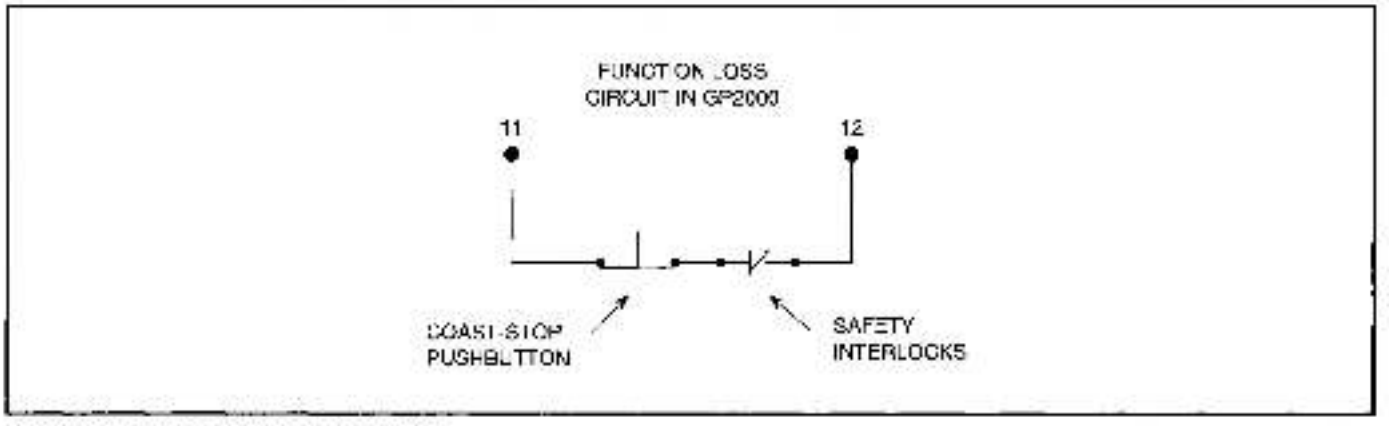


Figure 6. Wiring of User Interlocks.

Register and Bit Details

Table 3 details the four register configuration of the Rail Interface Card. Table 3 is shown in decimal notation (as used in the AutoMax system), and octal notation (as used in the AutoMate system).

Table 3. Register Memory Map.

Drive Control Register (Register 0) - Write Only from Host		
Bits Decimal Notation (AutoMax)	**Bits Octal Notation (AutoMate)**	**Bit Description (The bit can be equal to a zero or a one)**
0	0.00	0 = Stop/Run Interlock
1	0.01	1 = Run Enable
2	0.02	0 = Forward Select; 1 = Reverse Select
3	0.03	1 = Jog/Run Reference Select
4	0.04	1 = IET Reset
5-13	0.05-0.15	Not Used
14	0.16	Feedback Selection (Status of the feedback selected in this bit is read from Register 2, Bit 16). Also specifies what type of signal (frequency, current, or volts) is being returned from Register 3. (See Table 4 for bit combinations.)
15	0.17	Feedback Selection (Status of the feedback selected in this bit is read from Register 2, Bit 17). Also specifies what type of signal (frequency, current, or volts) is being returned from Register 3. (See Table 4 for bit combinations.)
Drive Speed Reference Register (Register 1) - Write Only from Host - 16 Bits = Signed Integer Value (Value will be read in units of Hertz scaled × 10)		
Drive Status Register (Register 2) - Read Only from Host		
Bits Decimal Notation (AutoMax)	**Bits Octal Notation (AutoMate)**	**Bit Description (The bit can be equal to a zero or a one)**
0	2.00	1 = Host controls the GP-2000/VTAC V (Function 0 of GP-2000/VTAC V must be set to = 2)
1	2.01	1 = GP-2000/VTAC V is active/running.
2	2.02	1 = GP-2000/VTAC V Output Relay 1 is energized.
3	2.03	1 = GP-2000/VTAC V Output Relay 2 is energized.
4	2.04	1 = Drive IET Fault (This bit in combination with bits 5-12 (Decimal) or Bit 2.05 thru 2.14 (Octal) are used to indicate the specific IET fault)
5	2.05	1 = High D-C Bus Fault
6	2.06	1 = Low D-C Bus Fault
7	2.07	1 = Ground Fault
8	2.10	1 = Overcurrent Fault
9	2.11	1 = Overload Fault
10	2.12	1 = Overtemperature Fault
11	2.13	1 = Function Loss Fault
12	2.14	1 = Drive Internal Fault
13	2.15	Not Used
14	2.16	Feedback Selection (See Table 4 for bit combinations)
15	2.17	Feedback Selection (See Table 4 for bit combinations)
Drive Feedback Register (Register 3) - Read Only from Host - 16-bit Signed Integer Value - Contains value as indicated by the Feedback Select Status Bits (Register 2, Bits 16 and 17)		

Drive Control Register (Register 0)

Stop/Run Interlock and Run Enable:

Decimal Bit	*Octal Bit*
0	0.00
1	0.01

Description

To run the drive, Bit 0 of the Drive Control Register must be set to a 0 and Bit 1 of the Drive Control Register, must be set to a 1.

Note: The Host must maintain the RUN command in the combination above, to keep the drive running. Any other combination will stop the drive.

A stop signal must be asserted to reset the controller so it can run again. The GP-2000/VTAC V controller will only start when it sees bits 0 and 1 transition from a STOP state to a RUN state. If the GP-2000/VTAC V controller is given a RUN command immediately after power-up, it will not start again until a STOP command and another RUN command is given. This is the same case as when the GP-2000/VTAC V controller is stopped by the keypad. (Refer to the AutoMate Sample Application Program in Appendix A.)

Reverse/Forward Selection:

Decimal Bit	*Octal Bit*
2	0.02

Description

The direction of the motor is commanded by Bit 2. Reverse or Forward direction is indicated by the following:

0 = Forward direction
1 = Reverse direction

Jog/Run Reference Selection:

Decimal Bit	*Octal Bit*
3	0.03

Description

Jog operation is commanded by Bit 3 set to a 1. When in Jog Mode, the speed reference is automatically taken from the GP-2000/VTAC V internal reference (Function 8, Jog Frequency). Setting this Bit to a 1 does not break the run seal in the circuit, but only selects the jog frequency speed reference.

Drive IET Reset:

Decimal Bit	*Octal Bit*
4	0.04

Description

When Bit 4 transitions from a 0 to a 1, an IET reset in the GP-2000/VTAC V is commanded. When the Auto-Reset function (Function 40 in the GP-2000/VTAC V controller) is enabled, the IET fault will be reset automatically without commands by the host controller. Refer to the main GP-2000/VTAC V instruction manual provided with the controller.

Reserved:

Decimal Bit	*Octal Bit*
5-13	0.05-0.15

Description

These Bits are not used.

Feedback Selection:

Decimal Bit	*Octal Bit*
14	0.16
15	0.17

Description

These 2 bits specify which signal is going to be returned from the Drive Feedback Register 3. The same bits in the Drive Status Register 2 give the status of which signal is being supplied in the Drive Feedback Register 3 to the Host Controller. See Table 4 for the bit selection combinations. The default selection condition is 0, 0 (Output Frequency).

As shown in Table 4, when both bits 16 and 17 (Bits 14 and 15 for Decimal) in Drive Control Register 0 are equal to zero, output frequency is the selected feedback. If only Bit 16 (Bit 14 for Decimal) is a 1, output voltage is selected. If only Bit 17 (Bit 15 for Decimal) is a 1, output current is selected.

Table 4. Feedback Selection.

Drive Control Register (Register 0)			Drive Status Register (Register 2)		
Decimal Bit 14; or Octal Bit 0.16	Decimal Bit 15; or Octal Bit 0.17	Type of Feedback Selected by the Value Set into the Drive Control Register Bits	Decimal Bit 14; or Octal Bit 2.16	Decimal Bit 15; or Octal Bit 2.17	Feedback Read by the Host to Determine Type of Signal in Register 3
0	0	Output Frequency (Default Selection)	0	0	Register 3 is Output Frequency
0	1	Output Current	0	1	Register 3 is Output Current
1	0	Output Voltage	1	0	Register 3 is Output Voltage
1	1	Output Frequency	0	0	Register 3 is Output Frequency
			1	1	This combination means the data is invalid.

Speed Reference Register (Register 1)

This register value is the preset speed reference value written to the GP-2000/VTAC V, from the Host, in units of Hertz. Register 1 is a 16-bit, signed integer value. A negative value is read as zero. The data resolution is 0.1 Hz. For example, if the frequency is 60 Hz, this register would read 600. See below for other examples:

Register Value	*Speed Reference in Hz*
0	0
200	20.0
305	30.5
4000	400.0

Drive Status Register (Register 2)

Control Mode Source:

Decimal Bit	*Octal Bit*
0	2.00

Description

When Bit 0 is 1, the controlling source of the drive is the host controller. Function 0 of the GP-2000/VTAC V controller must be set to Parameter 2 to activate the rail port communications with the host controller. When Function 0 in the GP-2000/VTAC V controller is set to any other value (Parameters 0, 1, or 3) this bit should be 0. Refer to the main GP-2000/VTAC V controller Instruction Manual for more details on Function 0.

Drive Running:

Decimal Bit	*Octal Bit*
1	2.01

Description

When Bit 1 is 1, the GP-2000/VTAC V controller is active or running.

Status of Output Relay 1:

Decimal Bit	*Octal Bit*
2	2.02

Description

When Bit 2 is 1, the Output Relay 1 of the GP-2000/VTAC V Function 28 is energized. Refer to the main GP-2000/VTAC V controller Instruction Manual where Function 28 is discussed for more details.

Drive Status Register (Register 2) continued

Status of Output Relay 2:

Decimal Bit	*Octal Bit*
3	2.03

Description

When Bit 3 is 1, the Output Relay 2 of the GP-2000/VTAC V Function 29 is energized. Refer to the main GP-2000/VTAC V controller Instruction Manual where Function 29 is discussed for more details.

Drive IET Fault:

Decimal Bit	*Octal Bit*
4	2.04

Description

When Bit 4 is 1, an IET has occurred. This bit in combination with any of Bits 5 - 14 will be a 1, indicating the IET fault. Refer to the example given below for AutoMate systems.

Example:
If Register 2 is shown as:
0000 0000 0011 0001;
this represents a High D-C Bus Fault in the GP-2000/VTAC V.

High D-C Bus Fault (HU Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
5	2.05

Description

When Bit 5 is 1, a D-C bus overvoltage fault has occurred.

Low D-C Bus Fault (LU Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
6	2.06

Description

When Bit 6 is 1, a D-C bus undervoltage fault has occurred.

Ground Fault (OC-G Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
7	2.07

Description

When Bit 7 is 1, an overcurrent by ground fault IET has occurred.

Overcurrent Fault (OC Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
8	2.10

Description

When Bit 8 (Octal Bit 2.10) is 1, an overcurrent fault (except ground fault) has occurred.

Overload Fault (OL Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
9	2.11

Description

When 9 (Octal Bit 2.11) is 1, an Electronic Thermal overload fault has occurred.

Overtemperature Fault (OH Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
10	2.12

Description

When Bit 10 (Octal Bit 2.12) is 1, a cooling fan fault has occurred.

Function Loss Fault (FL Code on GP-2000/VTAC V Display):

Decimal Bit	*Octal Bit*
11	2.13

Description

When Bit 11 (Octal Bit 2.13) is 1, a function loss fault has occurred.

Drive Internal Fault:

Decimal Bit	*Octal Bit*
12	2.14

Description

When Bit 12 (Octal Bit 2.14) is 1, any other fault not covered in Bits 5-13 has occurred.

Reserved:

Decimal Bit	*Octal Bit*
13	2.15

Description

This Bit is not used.

Feedback Selection:

Decimal Bit	*Octal Bit*
14	2.16
15	2.17

Description

Gives the status of which signal is being supplied to the Host in the Drive Feedback Register 3.

Drive Feedback Register (Register 3)

This register will contain the present value of the feedback indicated by the Feedback Select status bits (Drive Control Register 0, Bits 16 and 17). If Drive Control Register 0, Bit 16 and 17 are 0, then Register 3 is the output frequency in Hz. If Drive Control Register 0, Bit 16 is 1, then Register 3 is the output voltage. If Bit 17 is 1, then Register 3 is the output current. If both 16 and 17 bits are 1, then Register 3 data is not valid.

If the data selected is requested in output frequency (0,0 combination), the value in Register 3 would be in units of hertz, scaled x 10. For example, 60 Hz would read 600 in this register.

If the data selected is requested in output current (0,1 combination), the value in Register 3 would be in percent of controller rated amps (0-100%). For example, 90% of rated current would read 900 in Register 3.

If the data selected is requested in output voltage (1,0 combination), the value in Register 3 would be in volts (scaled x 10). For example, 460 volts would read 4600 in Register 3.

This register has a maximum scaling value of 6325. This is because the maximum value for output voltage is 575 V ±10% (or 632.5 V).

Setting Up Communications

GP-2000/VTAC V Controller

After installing the Rail Interface Card to the GP-2000/VTAC V regulator board, set the operation control source (via the GP-2000/VTAC V keypad) to Function 0, Parameter = 2. This will set the drive to rail port I/O communications.

Host Controller

The I/O configuration of the host controller (AutoMax or AutoMate) is the same as when installing a Local Head device. Refer to Appendix A for a Sample AutoMate Program, and Appendix B for a Sample AutoMax Program.

Troubleshooting

Two additional IET fault codes can appear on the GP-2000/VTAC V display when using the Rail Interface communications port. Table 5 lists these faults and the recommended actions. Figure 7 shows the circuit diagram of the Rail Interface Card.

If no faults are displayed on the GP-2000/VTAC V, and the controller still will not operate, check that the GP-2000/VTAC V Function 0 is set correctly, or check that the GP-2000/VTAC V regulator board is one of the part numbers given in Table 2.

Removal of the Kit

To remove the kit for replacement or troubleshooting purposes:

1. Remove all power from the GP-2000/VTAC V.
2. Remove the cable (M/N 45C8) connector from the Rail Interface Card.
3. Grab the pin of one of the spacers with pliers and turn the pin 45 degrees in either direction. Pull the pin to unlock the kit from the regulator board. Repeat this method with the other (3) spacers.

Table 5. Troubleshooting IETs.

Code	Type of IET	Possible Cause	Action
OP	Option Fault	Option Board Internal Fault	1. Check the Rail Interface Card Installation. 2. Replace the Rail Interface Card.
		Rail Interface Card has not been installed before operation was put in Host control.	1. Check that Function 0 in the GP-2000/VTAC V is set to Parameter 2. 2. Verify that the Rail Interface Card is installed correctly onto the GP-2000/VTAC V Regulator Board.
CF	Communication [1]	Communications have been disrupted between the Host and the GP-2000/ VTAC V controller.	1. Check the cable connections from the Rail Interface Card to the Host Controller.

[1] If a communications error occurs, the "RAIL FAULT LED" of the Host Controller will be lit, and the GP-2000/VTAC V will stop running.

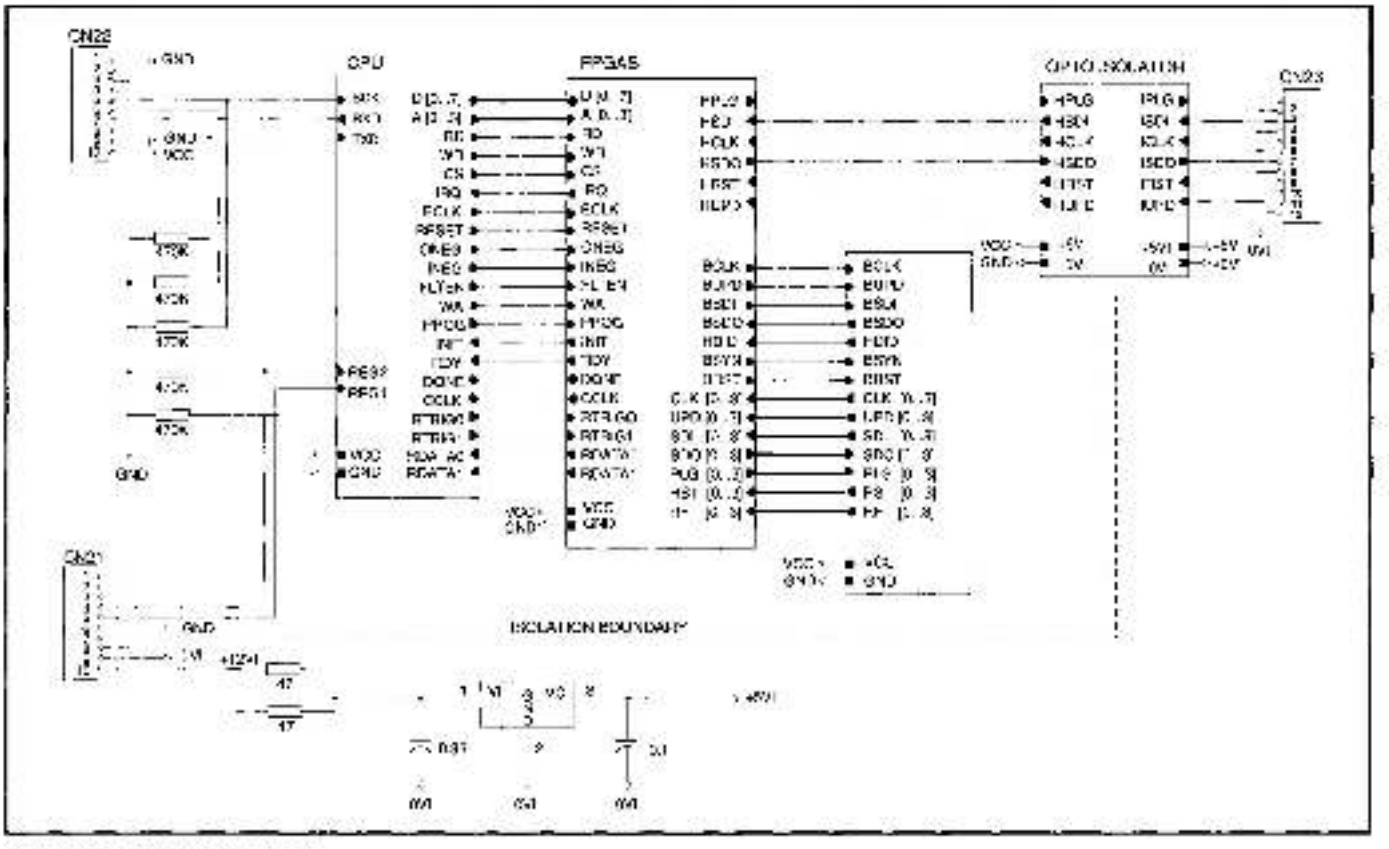


Figure 7. Circuit Diagram.

Appendix A: Sample AutoMate Application Program

The Rail Interface card talks to one of four rail ports available (directly to the AutoMate 20E). These rail ports are labeled 0 through 3. In order for the AutoMate to communicate with the inputs and outputs correctly, it needs to know how many inputs and outputs are connected to each port, and which data registers (from the I/O rail, or in this case the Rail Interface Card) to store the information in.

To configure the AutoMate 20E, you need to put the number of bits and the starting register to be used into the correct port configuration register as shown below. In this example, we are using only ports 0 and 1. We are sending 4 data registers (0-3) of digital I/O to Port 0, and 1 data register (4) of operator inputs to Port 1. The data stored in the Port Configuration register number is always the same when configuring the GP-2000 Rail Interface Card.

Rail Port	*A20/20E Port Configuration Register*	*Data Value*	*Description*
0	2734	6400	64 bits/4 data registers (starting in Register 0)
1	2735	1604	16 bits (starting in Register 4)
2	2736	0	Not used
3	2737	0	Not used

The following information is transmitted between the AutoMate and the GP-2000 every scan as part of the normal AutoMate I/O update. (Bits are in octal notation):

Port 0

Register 0 (Drive Control Register) - Used by the AutoMate to control the drive.

Bit	0.00	Stop/Run Interlock	Bit	0.05 - 0.15	Not used
	0.01	Run Enable		0.16	Feedback Selection
	0.02	Reverse/Forward Select		0.17	Feedback Selection
	0.03	Jog/Run Reference Select			
	0.04	Fault Reset			

Register 1 (Drive Speed Reference Register) - Used by the AutoMate to set the drive speed reference.

16 Bit Integer Value

Register 2 (Drive Status Register) - Used by the AutoMate to monitor the status of the drive.

Bit	2.00	Host Control Interface Mode	Bit	2.10	Overcurrent Fault
	2.01	Drive Running		2.11	Overload Fault
	2.02	Status of Output Relay 1		2.12	Overtemperature Fault
	2.03	Status of Output Relay 2		2.13	Function Loss Fault
	2.04	Drive IET Fault		2.14	Drive Internal Fault
	2.05	High DC Bus Fault		2.15	Not used
	2.06	Low DC Bus Fault		2.16	Feedback Selection Status
	2.07	Ground Fault		2.17	Feedback Selection Status

Register 3 (Drive Reference Feedback Register) - Used by the AutoMate to monitor the drive speed reference.

16 Bit Integer Value

Port 1

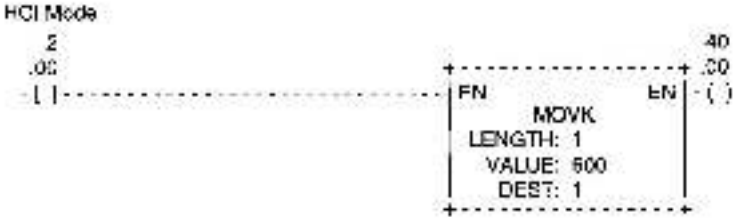
Register 4 (Operator Input Register) - Used to control the GP-2000

Bit	4.00	Start pushbutton wired normally open (off)
	4.01	Stop pushbutton wired normally closed (on)

Writing the AutoMate Program

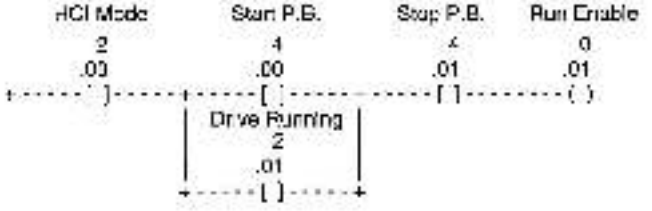
Sequence #1

When the drive is in Host Control Interface Mode (Drive Status Register 2, Bit 00 is 1), then, move a reference of 60.0 Hz into the Drive Speed reference at Register 1.



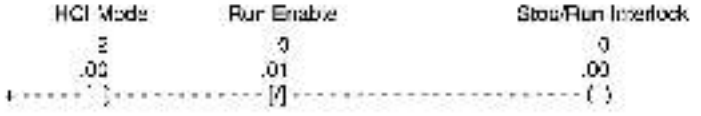
Sequence #2

When the drive is in Host Control Interface Mode (Drive Status Register 2, Bit 00 is 1);
and the operator START pushbutton is pressed (Operator Input Register 4, Bit 00 is 1);
or the drive running input is ON (Drive Status Register 2, Bit 01 is 1);
and the operator STOP pushbutton is ON (Operator Input Register 4, Bit 01 is 1);
then turn ON Drive Run Enable (Drive Control Register 0, Bit 01 is 1):



Sequence #3

When the drive is in Host Control Interface Mode (Drive Status Register 2, Bit 00 is 1), and the Drive Run Enable is ON (Drive Control Register 0, Bit 01 is 1);
then turn OFF the Stop/Run Interlock (Drive Control Register 0, Bit 00 is 0):



Appendix B: Sample AutoMax Application Program

In this sample application program, an example of the written program is given, along with the associated sequencing logic.

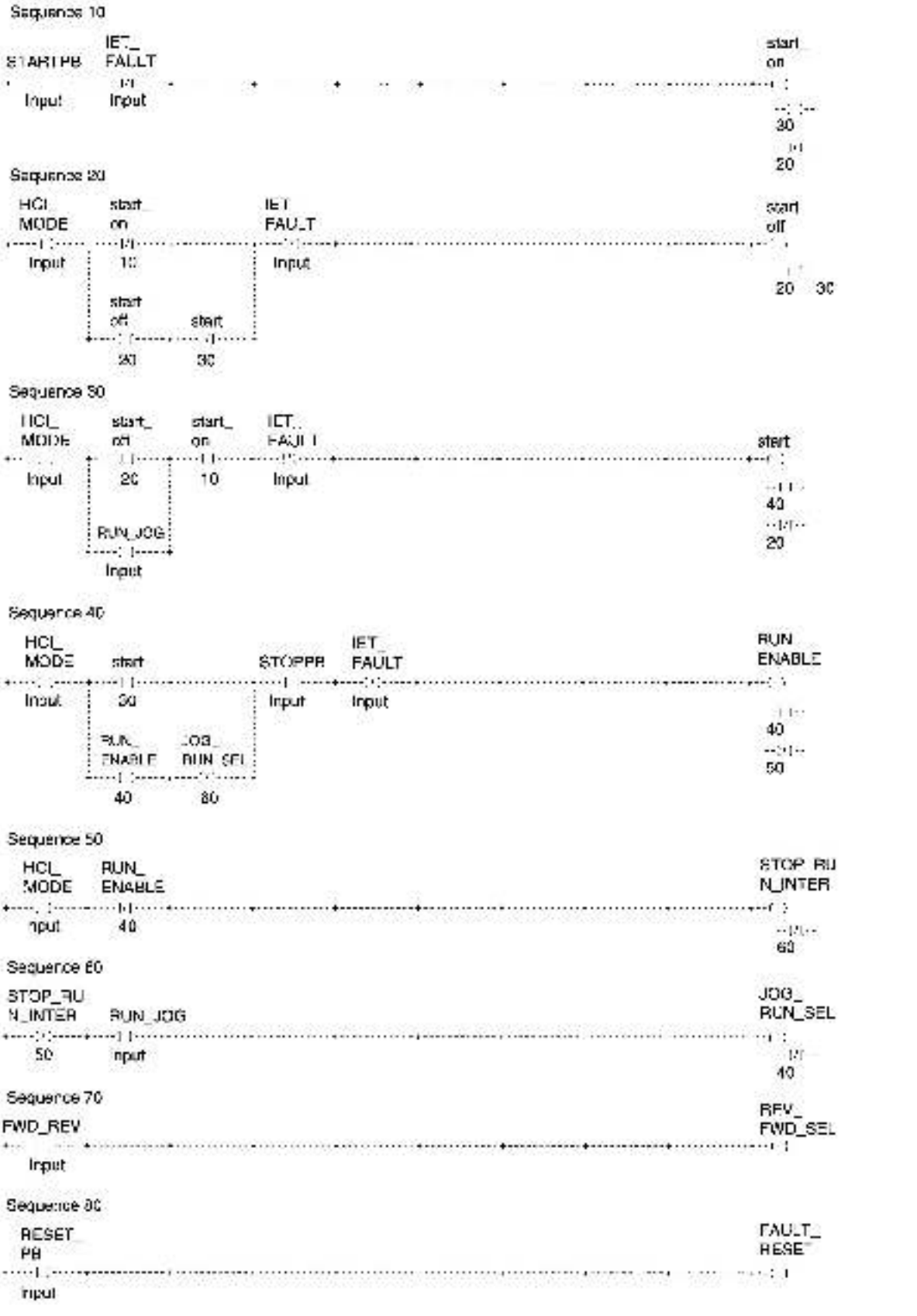
Program

```
1       !* DESCRIPTION:  CONFIGURATION FOR GP2000
2       !* TASK FILENAME:  CONF.CNF       REV. DATE:11-22-92
3       !* SECTION:        ANYSECT DROP 1       S/O NUMBER:  <nnnnnn>
4       !* ENGINEER:
5       !* THIS IS AN EXAMPLE CONFIGURATION FOR AN AUTOMAX TO GP2000
6       !* CONNECTION.  THE DRIVE IS CONNECTED TO AN AUTOMAX REMOTE HEAD (M/N 57C329).
7       !* THE REMOTE DROP NUMBER IS 1 AND CABLE IS PLUGGED INTO SERIAL I/O
8       !* PORT 0.  THE RIO MASTER IS IN SLOT 7.  A RAIL WITH 5 INPUTS WIRED TO IT,
        !* IS PLUGGED INTO SERIAL I/O PORT 1.
9       !*****************************************************************

90      !DRIVE CONTROL REGISTER (WRITE ONLY)

100             TASK            GPRUN[TYPE=PC, PRIORITY=8, SLOT=1, CRITICAL=TRUE]
110             RIODEF          STOP_RUN_INTER@[MASTRER_SLOT=7,DROP=1,SLOT=0, REGISTER=0,BIT=0]
120             RIODEF          RUN_ENABLE@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=0,BIT=1]
130             RIODEF          REV_FWD_SEL@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=0,BIT=2]
140             RIODEF          JOG_RUN_SEL@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=0,BIT=3]
150             RIODEF          FAULT_RESET@[MASTER_SLOT=7,DROP=1, SLOT=0, REGISTER=0,BIT=4]
160             RIODEF          FDBK_SEL1@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=0,BIT=14]
170             RIODEF          FDBK_SEL2@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=0,BIT=15]

180     !DRIVE SPEED REFERENCE IN HZ (WRITE ONLY)

190             RIODEF          SPEED_REF%[MASTER_SLOT=7,DROP=1,SLOT=0, REGISTER=1]

200     !DRIVE STATUS REGISTER (READ ONLY)

210             RIODEF          HCI_MODE@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=0]
220             RIODEF          DRIVE_RUN@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=1]
230             RIODEF          STAT_RELAY_1@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=2]
240             RIODEF          STAT_RELAY_2@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=3]
250             RIODEF          IET_FAULT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=4]
260             RIODEF          HI_DC_BUS_FAULT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=5]
270             RIODEF          LO_DC_BUS_FAULT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=6]
280             RIODEF          GRND_FAULT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=7]
290             RIODEF          OVERCURRENT_FLT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=8]
300             RIODEF          OVERLOAD_FLT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=9]
310             RIODEF          OVERTEMP_FLT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=10]
320             RIODEF          FUNCLOSS_FLT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=11]
330             RIODEF          DRV_INT_FLT@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=12]
340             RIODEF          DRV_FDBK_SEL1@[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=14]
350             RIODEF          DRV_FDBK_SEL2 @[MASTER_SLOT=7,DROP=1,SLOT=0,REGISTER=2,BIT=15]

360     !DRIVE FEEDBACK REGISTER (READ ONLY)

370             RIODEF          DRV_FDBK%[MASTER_SLOT=7,DROP=1,SLOT=0, REGISTER=3]

380     !INPUTS COMING IN FROM THE RAIL

390             RIODEF          STARTPB@[MASTER_SLOT=7,DROP=1,SLOT=1,REGISTER=0,BIT=0]
400             RIODEF          STOPPB@[MASTER_SLOT=7,DROP=1,SLOT=1,REGISTER=0,BIT=1]
410             RIODEF          RUN_JOG@[MASTER_SLOT=7,DROP=1,SLOT=1,REGISTER=0,BIT=2]
420             RIODEF          FWD_REV@[MASTER_SLOT=7,DROP=1,SLOT=1,REGISTER=0,BIT=3]
430             RIODEF          RESET_PB@[MASTER_SLOT=7,DROP=1,SLOT=1,REGISTER=0,BIT=4]

32767           END
```

Task Name: \GPRUN.PC
Customer:
Title:

Sales Order:
Engineer:

Last Edit: Mar 20 20:07:06 1997



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