Bus Interface Unit

for use with Interbus-S and

GE Fanuc Field Control™

User Manual for HE670IBU100

7 MAY 2002 **MAN0035-03**

CHAPTER 1: Introduction

1.1 Overview

Field Control is a family of highly modular distributed I/O and control products. The heart of the Field Control system is the Field Processor. The Field Processor provides the configuration, I/O scanning and fault reporting for a group of up to eight local Field Control I/O modules. The Field Processor also acts as an interface to pass fault and I/O data on to a remote distributed control system. Together, the Field Processor and its I/O modules make up a Field Control station.

The HE670IBU100 Interbus-S Field Processor provides access to Field Control I/O through the Interbus-S distributed I/O system. Interbus-S is a high speed serial network which is implemented as remote and local bus types. The HE670IBU100 Interbus-S Field Processor attaches to the Interbus-S network as a remote bus module. The Interbus-S remote bus allows for high speed communications using RS-485 for segment distances of up to 400 m with a total network length up to 12.8 km. The Field Processor does not support Interbus-S local bus expansion.

The HE670IBU100 Interbus-S Field Processor consumes up to 32 process words from the Interbus-S frame protocol. Of these possible 32 process words, the first is always reserved for reporting and resetting Field Control I/O module fault information. The remaining 31 words can be used to transfer I/O module data. Note that these words carry both the input and output information, therefore there are up to 31 words of input data, and up to 31 words of output data. The number of input and output process words will always be equal. All analog modules should take one process word(16 bits) per channel depending on the type of analog.

The HE670IBU100 Interbus-S Field Processor provides a 90-30 Hand Held programming port which allows local configuration, control and fault information for the attached Field Control I/O modules. While the configuration for the Field Control I/O modules can be entered manually, an auto-configuration option (default) is also available. The auto-configuration option allows the Field Control Station to be initially installed without the requirement of a 90-30 Hand Held programmer.

The HE670IBU100 Interbus-S Field Processor monitors and provides continuous Field Control I/O module fault information. This information can be extracted though either the Hand Held interface or remotely though the first Interbus-S process word.

1.2 Functional Specifications

Field Processor:

Power:

24VDC @ 210mA typical IBS only

Testing for Humidity, Vibration, UL have not yet been completed. This information will be included after testing. All other testing listed below has been completed, with levels passed shown where appropriate.

Environmental Specifications being tested to:

Vibration	IEC68-2-6	10 to 57 Hz 0.012 in displacement (peak to peak) 57 to 500 Hz at 1g
	IEC68-2-27	Shock: 15G, 11 milliseconds, half sine wave
Noise	Emissions	FCC part 15, section J, class A, Computing Devices CISPR11 Class A
	Susceptiblity	IEC 801-2 ESD, 8KV Air, 4KV Contact IEC 801-3 RF Radiated Immunity, 10V/m IEC 801-4 Fast Transient Immunity, 1KV I/O, 2KV Power IEC 801-5 Surge, 2KV IEC 801-6 RF Conducted Immunity, 10V/m ENV50140 RF Radiated Immunity, 10V/m ENV61000-4-11 Voltage Dip and Variation
Temperature	0° C to 60° C Operational -40° C to 100° C Storage	
Humidity	5% to 95%, non-condensing	

UL Class I Division 2 Approval: Pending

CE Mark Approval: Pending

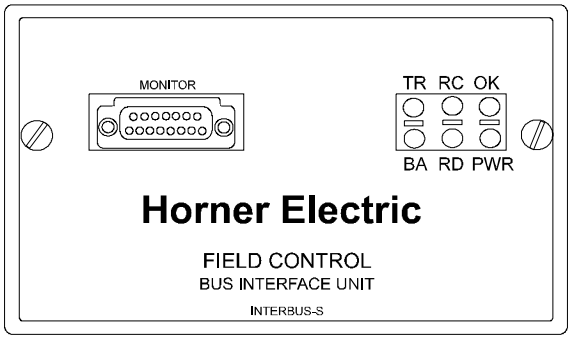
For information about I/O modules, please see the Field Control I/O Modules User's Manual, (GFK-0926)

CHAPTER 2: INSTALLATION

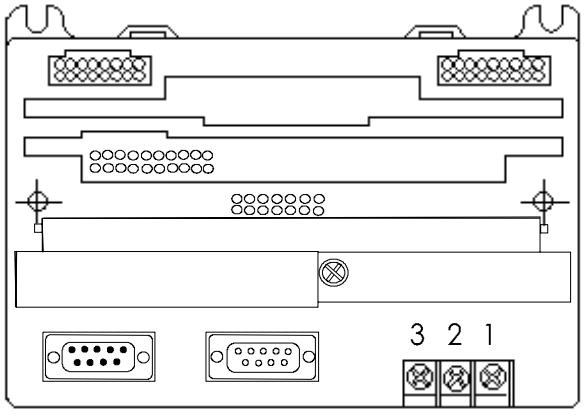
2.1 Field Processor Module

The HE670IBU100 Interbus-S Field Processor is actually made up of a Field Processor Terminal Block and a Field Processor Module. These two units are held together by two long screws which are exposed at the top of the Field Processor Module.

To separate the two units, completely loosen the two exposed screws on the top of the Field Processor Module and carefully pull the two units apart. Use care to pull the Field Processor Module straight up from the Field Processor Terminal Block. Tilting or pulling at an angle can damage internal connectors. **You must separate these two parts to install the system.**



Field Processor Module



Field Processor Terminal Block

The Field Processor Terminal Block provides connections for power, Interbus-S and the Field Control I/O Terminal Blocks.

The Field Processor Module is a sturdy aluminum housing which contains the printed circuit cards of the Field Processor and mounts to the top of the Field Processor Terminal Block. The Field Processor Module also contains a Hand-Held Programmer (HHP) connector for configuration and monitoring purposes, plus status LED's to indicate Device and Bus status. Inside the Field Processor Module is the power supply board, which contains a replaceable 1A 5x20mm 250VAC slow-blow fuse on the input power lines.

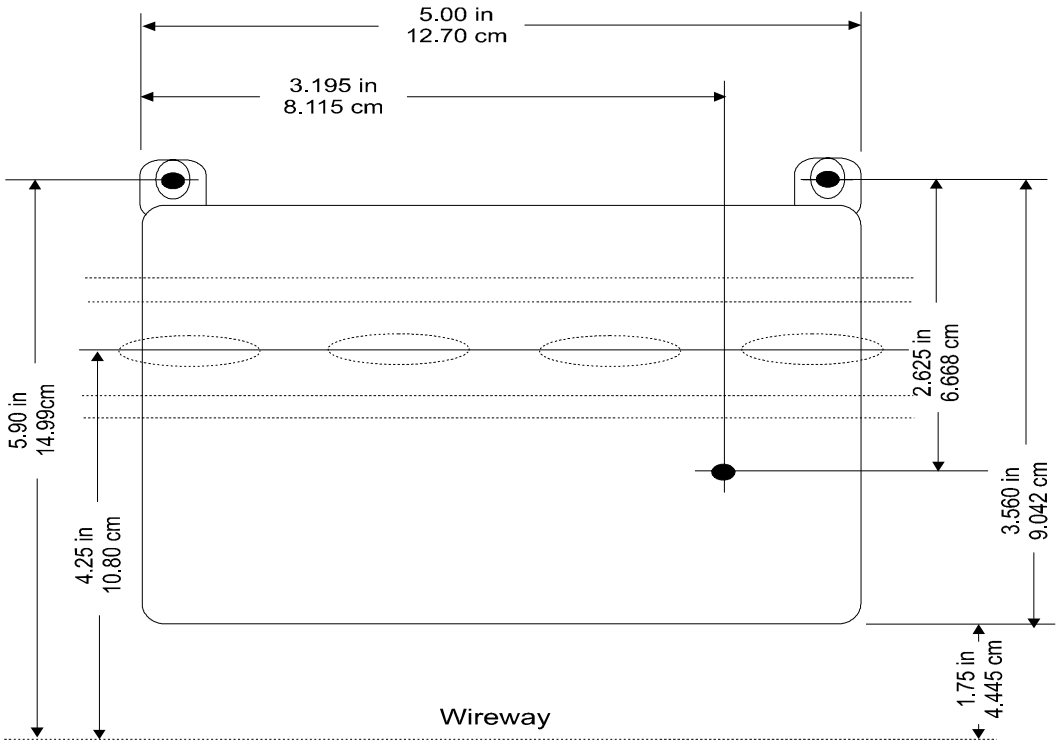
2.2 Field Processor Terminal Block

The Field Processor Terminal Block provides electrical connections for the Field Processor. Since the Field Processor Terminal Block is designed to be extremely reliable, it should not be necessary to replace or rewire it after installation.

NOTE:
The Field Processor Terminal Block also stores the configuration parameters for the station; therefore, the Field Processor Module can be removed or replaced without removing the wiring or reconfiguring the station. All configuration information would be retained in the Field Processor Terminal Block.

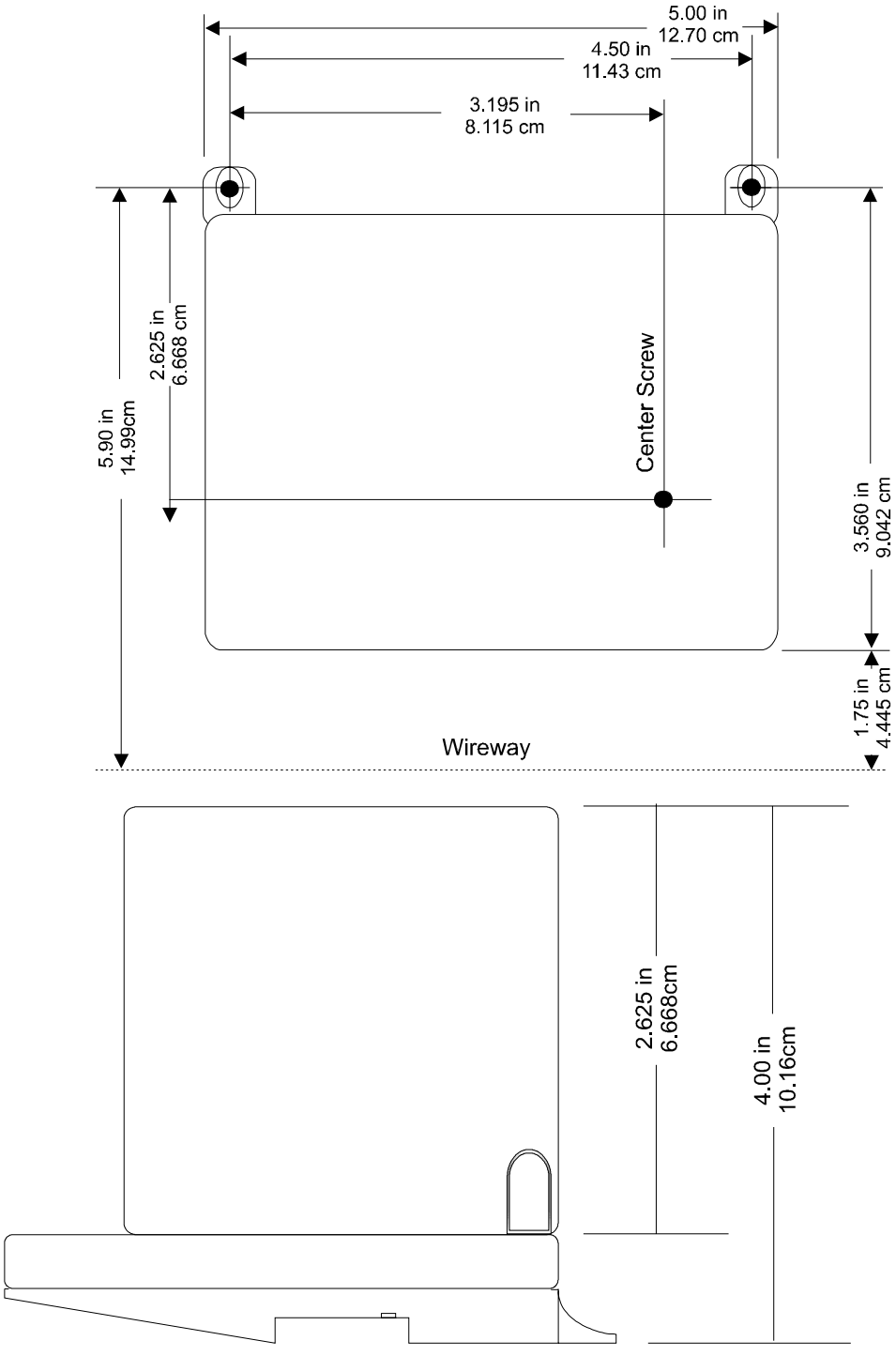
DIN rail Installation:

1. With a phillips-head screwdriver, turn the screw a couple of turns to loosen the clamp (Field Processor PC Board Shell be removed).
2. Tilt the Field Processor Terminal Block and position it over the rail, as shown below, catching the rail behind the tabs and loosened clamp.
3. Pivot the terminal block downward until the spring-loaded-DIN-rail-latches snap and lock the terminal block to the DIN rail.
4. Tighten the phillips-head screw to lock the clamp.



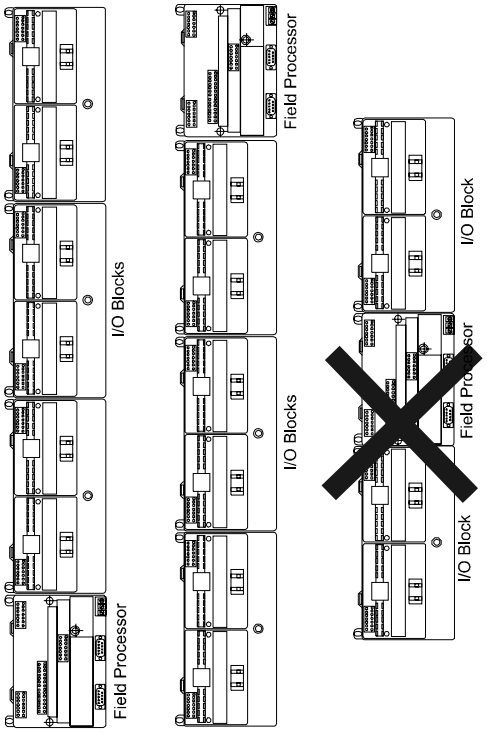
Panel mount installation:

1. The DIN rail clamp and screw should be removed to provide a third point screw location (Field Processor PC Board Shell must be removed).
2. Use the screw mounting tabs and the center opening for the DIN rail clamp to secure the Field Processor Terminal Block (#6 screws are suggested).

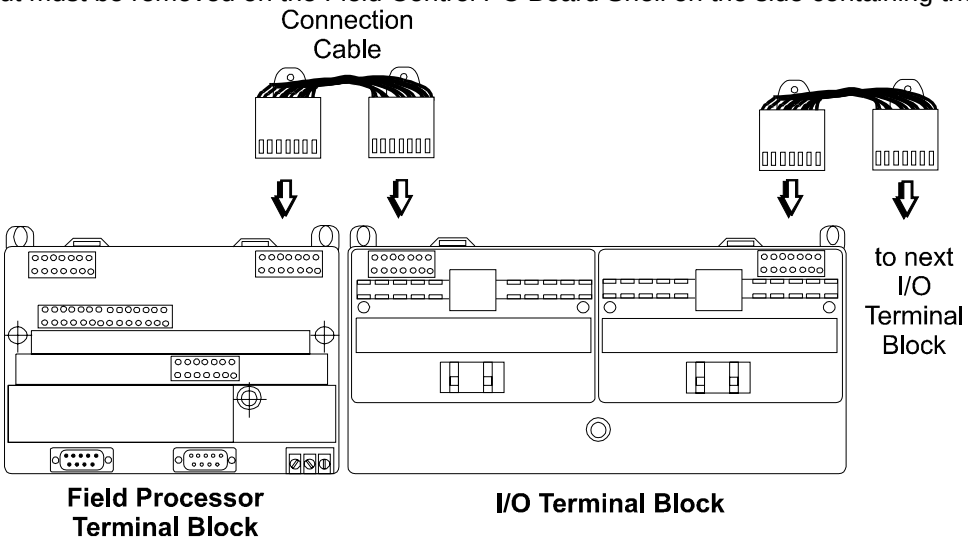


2.3 Field Control I/O Terminal Block Connection

Field Control I/O Terminal Blocks provide a mounting base for I/O modules. Since the Field Control I/O Terminal Blocks are designed to be extremely reliable, it should not be necessary to replace or rewire it after installation. The I/O Terminal Blocks can be panel-mounted or installed on a 35mm DIN rail in the same manner as the Field Processor Terminal Block. The Field Control I/O Terminal Blocks can be mounted on either side of the Field Processor Terminal Block with the exception that **ALL I/O Terminal Blocks must be on one side only.**



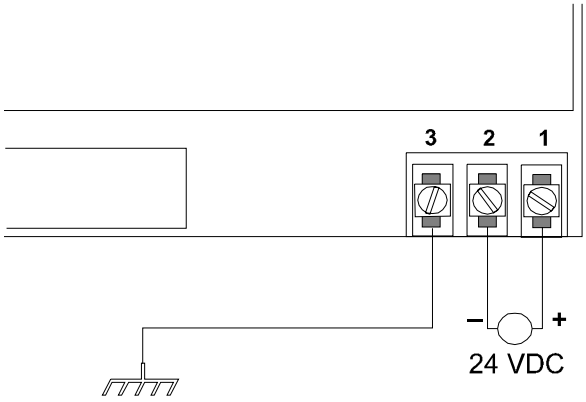
A connecting cable is provided with each I/O Terminal Block. This cable is used to connect the first Field Control I/O Terminal Block to the Field Processor Terminal Block. The same type of cable also interconnects subsequent I/O Terminal Blocks. The cable has molded connectors that are keyed to assure proper orientation. These cables are short to guarantee that the Terminal blocks are mounted as close as possible. To access the I/O Terminal Block cable connector on the Field Processor Terminal Block, the Field Processor Module must be removed as described above. Once the connecting cable has been placed between the Field Control Terminal Block and the Field Control I/O Terminal Block, the Field Control Module may be reinstalled. Note that a cable knock-out must be removed on the Field Control PC Board Shell on the side containing the connecting cable.



IMPORTANT NOTE FOR GM OEMS:
For the purposes of the GM Powertrain PV-6 project, a standard installation should be followed when placing the I/O modules. This is to standardize each Field Control Node, for I/O order. The order of the module starting with the BIU is as follows:

BIU
Digital Input Modules (16 pt modules followed by 8 pt modules)
Digital Output Modules (16 pt modules followed by 8 pt modules)
Analog Input Modules
Analog Output Modules

2.4 Field Processor Power Supply Connection

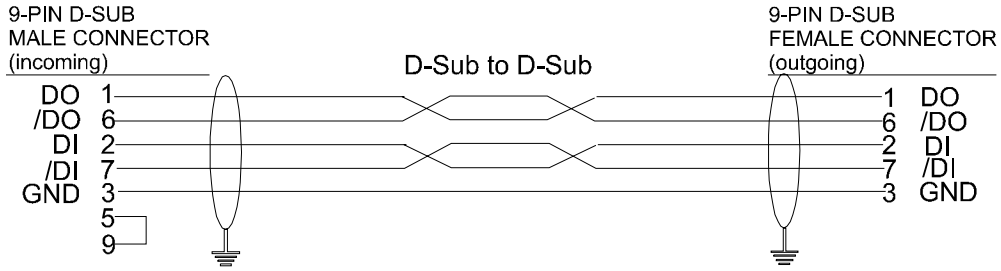


Terminal	Connection
1	+ 24VDC
2	24VCOMMON
3	Frame Ground

The 24 VDC supplied though the screw terminals on the Field Processor Terminal block. This provides power for the Field Processor and the logic on the associated Field Control I/O modules.

2.5 Interbus-S Distributed I/O Connection

Connect the continuation link to the incoming DB9 (male connector on base board). If the network is to be continued, connect the to the outgoing DB9 (female connector on the base board.)



2.6 Interbus-S Distributed I/O, Module ID

The fixed module ID for the Bus Interface Unit is 3. This will be used for all Interbus BIU units in any system.

CHAPTER 3: OPERATION

3.1 Overview

The Interbus-S Field Processor is acts as a main interface between the I/O in the system and the Interbus-S network. It configures the I/O, and organizes the data into process words to be transmitted/received on the Interbus-S network. It also updates the I/O data, and monitors the system for any faults and reports them as necessary.

3.2 Operation at Power-up

At power-up, the Field Processor performs a series of self-diagnostic tests. The OK LED will momentarily come on and then go out until these self tests are completed successfully. Once lit the OK LED will stay illuminated unless there is a fault in the system, in which case it begins to flash. If there is any self-diagnostic test failure, the OK led will remain OFF.

Next, the Field Processor starts scanning the I/O modules and builds a table of those present. If the auto-configuration option is set (default), this table is compared against the last stored configuration. If modules have been added this table is used to update the active I/O Configuration. If any modules are missing or incorrect, a fault will be logged and the OK LED will flash.

If the auto-configuration option is not set, and a valid configuration has been pre-programmed into memory, then the Field Processor will compare the I/O modules scanned to the stored configuration. If the configuration is in-correct, a fault will be logged and the OK LED will flash.

The active I/O configuration contains information such as the type of I/O module installed in a slot and the number of points on that module. It also contains I/O module specific information such as default output value, alarm setpoints and scaling. Finally, it specifies the mapping of the I/O points into the internal data tables and the offset and length of the internal table to pass to the Interbus-S process words.

After the configuration is established and before Interbus-S communications is activated, the Field Processor will go into a default I/O state. Outputs will go to the programmed default output state or forced state.

If the auto-configuration option is not set, outputs with the exception of those that are presently forced, will default to the pre-programmed Default Output State. I/O that are forced at the time of power-up will start operation in the forced state and value. Outputs remain at the Output Default State until the module receives valid output data from the Interbus-S master. Therefore, outputs do not ‘glitch on’ during power-up. Once Interbus-S begins sending valid data, the field processor goes in the last programmed operating mode. If the configuration option I/O Scan is disabled, the I/O will remain at the Output Default State, otherwise, the I/O will reflect the Interbus-S data.

3.3 Configuration

The Interbus-S Field Processor in normal operation receives and sends the process words over the Interbus-S network. The first word is for controlling and receiving controller and I/O fault information. The remaining words (up to 31) are for passing input and output data. The Field Processor first attempts to load the specified %I points to the input process words. The Field Processor will then load the %AI points into the remaining available process words. Likewise, the output process words are loaded to the %Q and %AQ tables.

While a Field Control I/O rack may contain up to 8 modules (maximum of 16 points or 8 analog words per module), only the first 496 bits of data of a given type (input or output) are passed on the Interbus-S network. However the system is limited to only 128 bits of digital Inputs or outputs.

The I/O configuration ultimately determines where the I/O module point information is stored in the Interbus-S process words allocated to the Field Processor. Field Control I/O Input information is stored in the outgoing process words with discrete data first, followed by the analog data. Field Control I/O Output information is retrieved from the incoming process words again with discrete data first, followed by analog data. The actual

starting offset in a process word for a specific I/O module can be specified manually through the programming port or automatically by setting the AUTOCONFIG parameter.

With the auto-configuration option set, the Field Processor packs the I/O points into the process words consecutively in the same order from which they are physical placed from the processor. Points from the module at slot 1 would be first in the process words. The least significant bit on the I/O module will be the least significant bit in the process word.

NOTE: Any unused slots will cause the auto-configuration scan to end with any modules in place beyond the empty slots being listed as extra modules.

For example, considering that process word #1 is used for fault display and control, determine the point order stored in process words 2-12 by the auto-config option with the following hardware placement.

slot 1: Digital Input 8 point
slot 2: Digital Input 16 point
slot 3: Digital Input 8 point
slot 4: Digital Output 8 point
slot 5: Digital Output 16 point
slot 6: Digital Output 16 point
slot 7: Analog Input 8 Channel
slot 8: Analog Output 4 Channel

slot 1 points would be placed in **outgoing** process word #2 starting at offset 0
slot 2 points would be placed in **outgoing** process word #2 starting at offset 8
and would span into the first 8 bits of **outgoing** process word #3.
(this is why 8 point modules should be paired if possible)
slot 3 points would be placed in **outgoing** process word #3 starting at offset 8
slot 4 points would be placed in **incoming** process word #2 starting at offset 0
slot 5 points would be placed in **incoming** process word #2 starting at offset 8
and would span into the first 8 bits of **incoming** process word #3.
slot 6 points would be placed in **incoming** process word #3 starting at offset 8
and would span into the first 8 bits of **incoming** process word #4.
slot 7 words would be placed in **outgoing** process word #4 through #11
slot 8 words would be placed in **incoming** process word #4 offset 8 through #12 offset 8
(this is why 8 point modules should be paired if possible)

Note: In this example, the Field Processor would occupy 12 process words for input and output since they must be equal. The value of the 12th outgoing process word would be undefined and should be ignored in this example. Likewise the upper byte of the 12th incoming process word would be ignored by the Field Processor.

After the Field Processor determines the number of words required it determines the actual process words it will occupy on the Network. It is restricted to certain numbers of process words. As shown in the table.

1	Process Word
2	Process Words
3	Process Words
4	Process Words
5	Process Words
6	Process Words
7	Process Words
8	Process Words
9	Process Words
10	Process Words
12	Process Words
14	Process Words
16	Process Words
24	Process Words
32	Process Words

Note: After use of the first ten consecutive words, Interbus-S limits the use to increments shown to left.

For instance if the number of process words needed was 10. The Field Processor would occupy 10 words on the network. However if the number of process words needed was 17, which is not a valid number of process words, the Field Processor would have to occupy 24 process words with the values of the unused process words being unknown.

With the auto-configuration option disabled, the location within a process word for a specific I/O module's points can be explicitly defined with the 90-30 Hand Held Programmer. However, using this method requires the additional level of complexity of dealing with internal data tables. The Field Processor contains internal data tables for each of the four data types (%I, %Q, %AI and %AQ). During I/O updates, parts of the data tables are read and written with values from the process words. The section of each data table to be updated must be specified with a starting offset and length (see 90-30 Configuration below for configuration details).

During the I/O update, the Field Processor combines the two input tables (discrete and analog) to load the outgoing process words. The incoming words are likewise divided between the two output tables. Once each table section is defined, each Field Control I/O module configuration also requires the offset in the associated data table where the data is stored or retrieved for that module. If a module offset is defined outside the range of the table which is updated, that modules data will be lost.

3.4 Auto-configuration

The Field Processor auto-configuration feature is designed to allow the user to update the configuration of the Field Control station without the use of a separate configuration tool. This feature will never delete an individual module from the configuration unless the Field Processor is powered up without any modules on the backplane. This feature has two basic modes of operation; 1) The entire configuration can be cleared at power-up. 2) Modules can be added to the configuration of a station at power-up.

Auto-configuration is enable by default and all new units should come in this mode. This mode can only be disabled in the Field Processor through the Hand Held Programmer. However if Auto-configuration is disabled and an error in the stored configuration is detected at power-up, the configuration stored will be erased and the Field Processor will do an autoconfig for the I/O modules presently in the system.

When auto-configuration is enabled and the user wants to erase the stored configuration, the Field Processor should be disconnected from **ALL** I/O modules and then powered up. This will erase all stored configuration and the reset the Field Processor to default values. The user can then power down the Field Processor and re-attach any I/O than is needed and the Field Processor will then auto-configure all of the attached I/O at power-up.

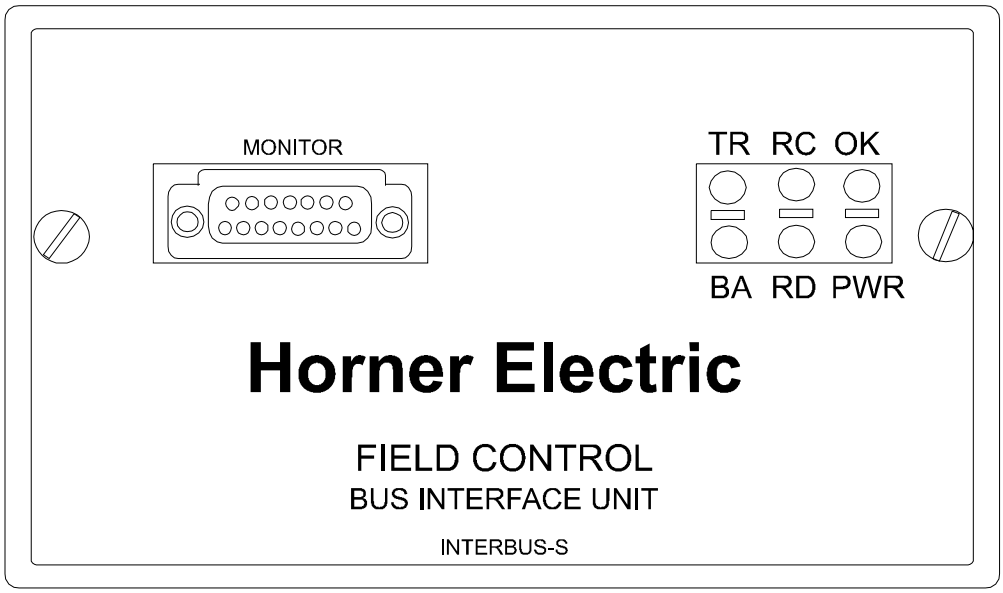
The auto-configuration feature does not allow an individual module's configuration to be deleted, but will only allow I/O modules to be added. When modules are added to an already configured system, the Field Processor will add the new module into the configuration. Also an "Addition of Module" fault will be generated when this new module is detected.

3.5 Normal Operation

Field Control Input modules are scanned in the order of physical location. The Field Processor stores the input data in its own %I and %AI memories. These memories always contain the most recent value for each input. After the input scan, the Field Processor scans the output modules in order, sending them the most recent output data form its internal %Q and %AQ memories.

The data then sent out on the network, is pulled from these %I and %AI memories. The data is packed into the process words as shown above, and sent out on the network. As the output data is received from the network, it is placed into the %Q and %AQ memories, for transmission to the output modules.

3.6 LED Indicators



PWR - Lights to indicate that +5v power is available for logic operations
OK - Lights to indicate that the module has passed its powerup diagnostics.
Also indicates if Field Control I/O faults exist.
BA - Indicates that Interbus-S is active and clocking.
RC - Indicates that cable connection is good and that Interbus-S master is not reset.
TR - Indicates that PCP communications is occurring with IB master.
RD - Indicates that the remote bus is disabled.

CHAPTER 4: Faults and diagnostics

4.1 Overview

The Field Processor is capable of detecting Field Control I/O module faults. This fault information is passed to the Interbus-S master through use of the first process word and the Interbus-S STATERR/MODACK module error messaging service.

When a fault is first detected, it is queued both for the 90-30 programming port and the Interbus-S interface. In addition, the RUN led will begin to blink indicating that un-acknowledged faults exists and a fault value will appear in the first process word. Also, an Interbus-S "*Module Error Indication*" message (5340h) will be sent to the master indicating that a module fault has occurred. Therefore, the Interbus-S master can either wait for the "*Module Error Indication*" message or continuously sample the first process word for a non-zero value to determine if a fault has occurred.

The fault value is latched into the first process word by the Field Processor until the Interbus-S master acknowledges receiving the value. The master acknowledges the fault by asserting the MODACK which is accomplished in FloPro() or the fault can be acknowledge manually by writing a 01 hex value in the first process word (assigned to the Field Processor) or optionally by sending a "*Control Device Function Request"* message (0714h). Once the Field Processor receives acknowledgment that the Interbus-S master received the fault value, it will clear the fault value from the first process word. It will then also check the internal fault queue for any additional pending faults. If a new fault is found, it is placed in the first process word and the Interbus-S master is notified as described above. Up to 32 fault values may be queued at any one time. The internal queue will store the first 31 faults, and then store the most recent fault as the 32nd fault. Therefore the 32nd fault will be repeatedly written over if faults continue to occur, and the last one to occur will be the one shown.

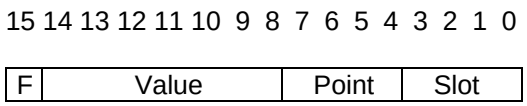
Note that if the master acknowledged the fault value by returning a 01 hex value, it must also thereafter clear the first process word before writing the next 01 hex (acknowledge) value. Note that a short delay on the order of 500mS may be necessary between writes to the 1st process word.

If a Field Control I/O fault of a specific nature continues to occur, it may only be reported once until an "Clear All Faults" command is issued by the Interbus-S master. Since an "Clear All Faults" command will erase any queued faults, the Interbus-S master should acknowledge each individually queued fault before sending an "Clear All Faults" command. The "Clear All Faults" command is accomplished by the Interbus-S master writing a 80 hex value in the first process word back to the Field Processor. Note that the Interbus-S master must clear the first process word back to zero before the next "Clear All Faults" command is issued. Note that a short delay on the order of 500mS may be necessary between writes to the 1st process word. If all faults are cleared and no more are pending, the OK led will quit flashing after the "Clear All Faults" command is issued. Note that some Field Control modules may latch a fault in hardware. These hardware latches are generally cleared with the "Clear All Faults".

When a Field Control Fault is received, the application must pickup the message within 7 minutes or a controller error will be generated. The time is reduced to 7 seconds if more than one module has reported an error. The application then has the option whether or not to acknowledge a module error message. However, failing to acknowledge a module with latched error capability can have repercussions.

With the exception of local busses, cable disruptions or module 'deaths' will stop a running Interbus-S network. This indication is available in the controller status. Thereafter, on a network reset, only the modules up to the malfunctioning module will be activated.

The fault value written to the first output process word also contains additional fields which provide a more descriptive indication of the fault type. Therefore, once the fault is detected by using one of the above methods, the Interbus-S master can read the first output process word of the faulted Field Processor to obtain additional information. The diagram below defines the fault bit information contained in the first process word during a module error:



Fault bit indicates a fault value is present.

Value describes the nature of the error:

0: "*Unknown fault*"
1: "*Corrupted eeprom fault*"
2: "*Unsupported feature fault*"
3: "*Cal memory failure fault*"
4: "*Config mismatch fault*"
5: "*Fuse blown fault*"
6: "*Loss of io module fault*"
7: "*Addition of io module fault*"
8: "*Extra io module fault*"
9: "*Loss of user power fault*"
10: "*Open wire fault*"
11: "*High alarm fault*"
12: "*Low alarm fault*"
13: "*Overrange fault*"
14: "*Underrange fault*"
15: "*Short circuit fault*"

Point specifies which module I/O point or channel has caused the error.

Slot specifies which I/O module caused the error. Slot 0 specifies the Field Processor. Slot 1 specifies the I/O module closest to the Field Processor.

The fault value is held in the first input process word by the Field Processor until the Interbus-S master acknowledges receiving the value. Once acknowledged, the Field Processor will clear the process word; then, if more faults are pending, will display the next queued fault.

CHAPTER 5: GE 90-30 Hand-Held Programming port

5.1 Overview

3.5.0 Main Menu

- If the 90-30 Hand Held was connected to the Field Processor at powerup, it will display the main menu:

1 Monitor 2 Configuration

The main menu can be reached from any lower level menu by repeated pressing the up arrow key '^'. The following sequences always assume that you are starting from the main menu.

3.5.1 Configuration of the Field Processor

Utilize the following screens to access the current version and the global options: Report Faults and Config Protect.

- From the main menu, press <2> on the key pad to select **Configuration**. The following screen will be displayed:

1 Station Config 2 Module Config

- Press <1> on the key pad to select **Station Config**. The following screen will be displayed.

1 BIU Config 2 COMM Config

- Press <1> on the key pad to select **BIU Config**. Currently, there are no user configurable parameters under **COMM Config**. The following screen will be displayed.

Software Version 1.0

- Press the right arrow '->' to select the global **Report Faults** option. The following screen will be displayed.

Report Faults YES

If you wish to disable Fault Reporting to the IBS Interface, press the <±> key followed by the <enter> key.

- Press the right arrow '->' to select the global **Config Protect** option. The following screen will be displayed.

Config Protect NO

If you wish to enable Config Protect to prevent access to any lower level module configuration screens, press the <±> key followed by the <enter> key.

3.5.2 Configuration of I/O

Utilize the following screens to set the Auto Configuration and I/O Scan options, specify the I/O map, and configure each Field Control I/O module.

- From the main menu, press <2> on the key pad to select **Configuration**. The following screen will be displayed:

1 Station Config 2 Module Config

- Press <2> on the key pad to select **Module Config**. The following screen will be displayed.

Auto Config ENABLED

If you wish to disable the Auto Config state, press the <±> button followed by the <enter> key.

- Press the right arrow '->' to select the global **I/O Scan** option. The following screen will be displayed:

I/O Scan ENABLED

While you configure the modules in the station, you may want to disable the Field Processor from scanning I/O. When disabled, previously un-configured module I/O will default to 0. Previously-configured I/O modules will either default to zero or, if so configured, will hold their last state. If you wish to disable the I/O Scan and have the outputs default to their fault state, press the <±> key followed by the <enter> key.

- Press the right arrow '->' to display the first I/O **Blk Map Start** screen:

Blk Map Start %I I00001

The next screens are used to assign the starting addresses and lengths for the four internal data tables (%I, %Q, %AI and %AQ).

The first screen specifies the starting offset in the internal discrete input table (%I) from which values are loaded to the Interbus-S process word. Note that each I/O module configuration also specifies an offset into its associated I/O table. If the module offset is outside the specified Blk Map start and range, its data will not be available to Interbus-S.

To change the starting address type the number of the new starting address followed by the <enter> key. The address must be on an eight bit boundary and typically should always be 1.

- Press the right arrow '->' to display the first I/O **Blk Map Length** screen:

Blk Map Lngth %I 48

This screen specifies the number of digital inputs which are loaded to the process word. This value should be in increments of 8 and should never exceed 48 points. To change the starting address type the number of the new starting address followed by the <enter> key.

- Continue as above, entering starting addresses and lengths for the other 3 data types.

The input lengths and outputs lengths separately must not add up to more than 4 words each, else data will be lost. The lengths selected should include all the I/O circuits or channels in the station.

- If you changed any starting address or length entries, moving past these screens will produce the following screen:

Map has changed Accept ?

To accept the changes and continue, press <enter>. To reject the configuration press <clear>.

- Press the right arrow '->' past the Blk Map screens to display the first **I/O Module configuration** screen:

R0:S1 EMPTY

The first part of the screen displays the rack and slot of the current configuration. For this Field Processor, the rack number is always 0. The slot number refers to the physical location of the module in the station, relative to the Field Processor.

If the field displays 'EMPTY' no module has been defined. If you do not wish to define a module for this slot press the right arrow to move to the next slot. To define a **I/O Type** for this slot, first toggle the <±> key to select either a Generic I/O or Special I/O and then <enter> to register the entry.

```
R0:S1  I/O Type ?
Generic I/O
```

Generic I/O	Modules	Special I/O	Modules
Discrete Input 4/8		Analog 8 Volt In	
Discrete Input 16		Analog 8 Current In	
Discrete Output 4/8		Analog 4 Current Out	
Discrete Output 16		ESCP Discrete Output 8	

- Once the I/O type is selected, toggle the <±> key to select the appropriate **Module Type** and then <enter> to register the entry.

```
R0:S1 Mod Type?
Discrete In 4/8
```

- Once the Module type is selected, specify the starting offset.

```
R0:S1      I:8
 I_
```

Enter the location in the associated internal I/O map where the points are to be stored. Values entered must be on an 8bit boundary. Pressing <enter> without a value will cause one to be auto-selected.

- Once the module is selected and the I/O offset specified, a screen similar to the one below will be displayed.

```
R0:S1      I:8
  I00001- I00008
```

The module may have unique sub-configuration screens which require values. Access the lower configuration level by pressing the down arrow 'v'. When that screen is displayed, the additional lower level screens may be accessed with the right arrow key '->'. For example, a discrete input has 3 sub-level configuration menus: Change reference (offset) address, report faults and hold last state.

- Once a module is configured, it may be **deleted** by pressing the 'DEL' key when the current module is displayed.

```
R0:S1  Delete ?
  I00001- I00008
```

Press <clear> to abort the delete command or press <enter> to accept it.

3.5.3 Displaying and Forcing I/O

- From the main menu, press <1> on the key pad to select **Monitor**. The following screen will be displayed:

```
1 Monitor I/O
2 Faults
```

- Then from the configuration menu, press <1> on the key pad to select **Monitor I/O**. The following screen will be displayed:

```
I00001    0    B
```

This screen displays the first discrete input bit value. If a '*' proceeds the value, then it is forced. To force or unforce the value, press <enter> to display the following screen:

```
1 FORCE
2 UNFORCE
```

If you are forcing the value, press <1> to select **FORCE**, then type the force value. To abort the force, press <clear>. To register the force value, press <enter>.

- To select a new point to monitor/force press either the right arrow or <±> and the point number to change too. To change the table (%I,%Q,...) reference, press the <±> multiple number of times.

3.5.4 Displaying and Clearing Faults

- From the main menu, press <1> on the key pad to select **Monitor**. The following screen will be displayed:

```
1 Monitor I/O
2 Faults
```

- Press <2> on the key pad to select **Faults**. The following screen will be displayed:

```
1 First 16 Flts
2 Last 16 Flts
```

The first 16 faults are those which occurred first and will not be overwritten. The last 16 faults contains the last 16 faults. Faults may be overwritten and lost if more than 32 faults occur. Select which set of faults to observe. If no faults are present, NO FAULTS will be displayed. If faults are present, a screen similar to below will be displayed:

```
Slot 1  Fault #01
Extra I/O Module
```

To display the next fault in the list, press the right arrow key '->'.

Select 'Ent' to display the fault clear menu.

1 Clear 2 Exit

Press '1' [Clear] to clear the fault. If all faults have been cleared, the OK led will stay on solid.