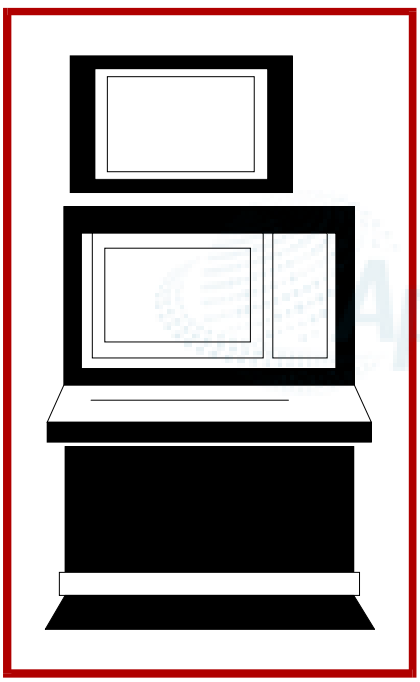
Apter Power

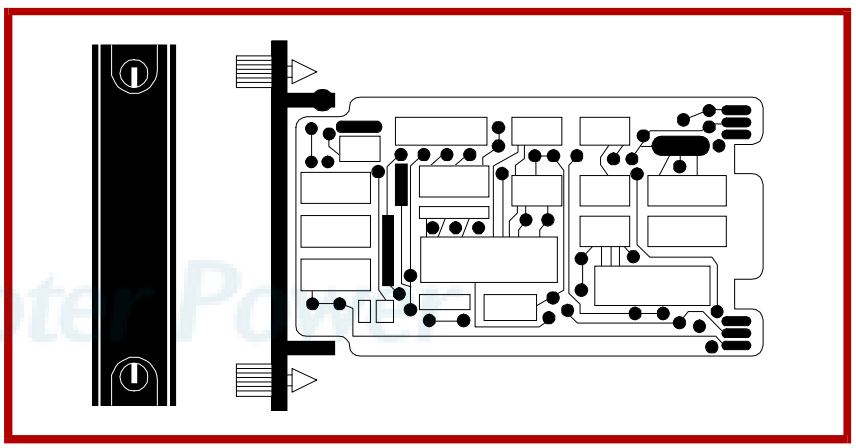
Bailey infi 90

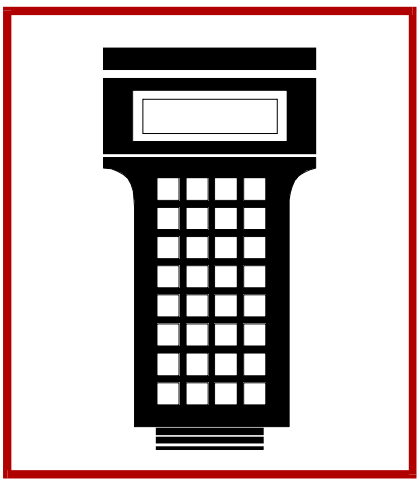
E96-301

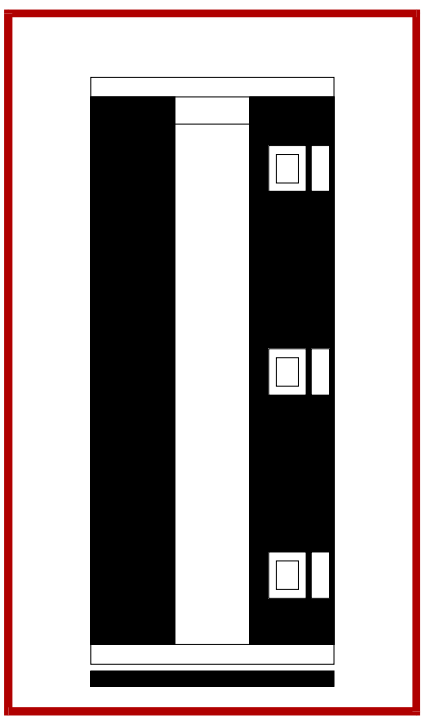
Instruction

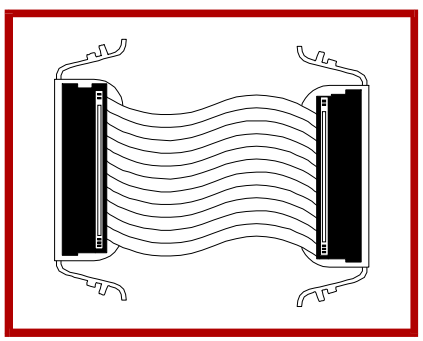
# Universal Analog Input Slave Module
## (IMASI03)

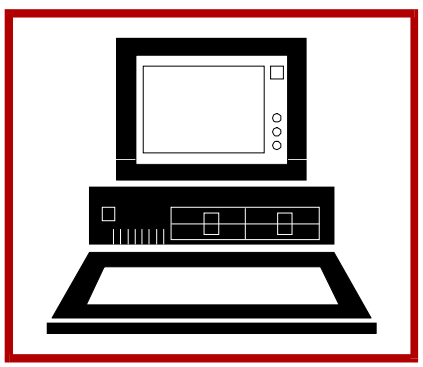












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# SECTION 1 - INTRODUCTION

## OVERVIEW

The Universal Analog Input Slave Module (IMASI03) performs analog input signal processing for up to 16 input channels and sends this information to a Multi-Function Processor (IMMFP01/02/03) in the INFI 90® System.

This manual explains the purpose, operation, maintenance, handling precautions and installation procedures of the slave module.

## INTENDED USER

System engineers and technicians should read this manual before installing the IMASI03 module. Put the module into operation only after reading and understanding the information in this manual. Refer to the ***Table of Contents*** to find specific information. Refer to the ***HOW TO USE THIS MANUAL*** entry in this section to get started.

## MODULE DESCRIPTION

The IMASI03 is a single printed circuit board that occupies one slot in an INFI 90 Module Mounting Unit (MMU). Two captive latches on the module faceplate secure it to the MMU. The slave module has three card edge connectors for external signals and power: P1, P2 and P3. P1 connects to the supply voltages. P2 connects the IMASI03 to the slave expander bus, over which it communicates with the MFP.

Connector P3 carries the inputs from the input cable plugged into the termination unit (TU) or termination modules (TM). The terminal blocks for field wiring are on the TU/TM.

The single dipswitch on the IMASI03 module sets the address for the slave or selects on-board tests. Refer to Section 3 for the steps to set the module address. Refer to Section 6 for the on-board tests. Be sure to check the switch setting before putting the module into the MMU.

Jumpers configure the type of analog input signals. Refer to Section 3 for the correct setting of these jumpers.

Figure 1-1 shows the INFI 90 communication levels.

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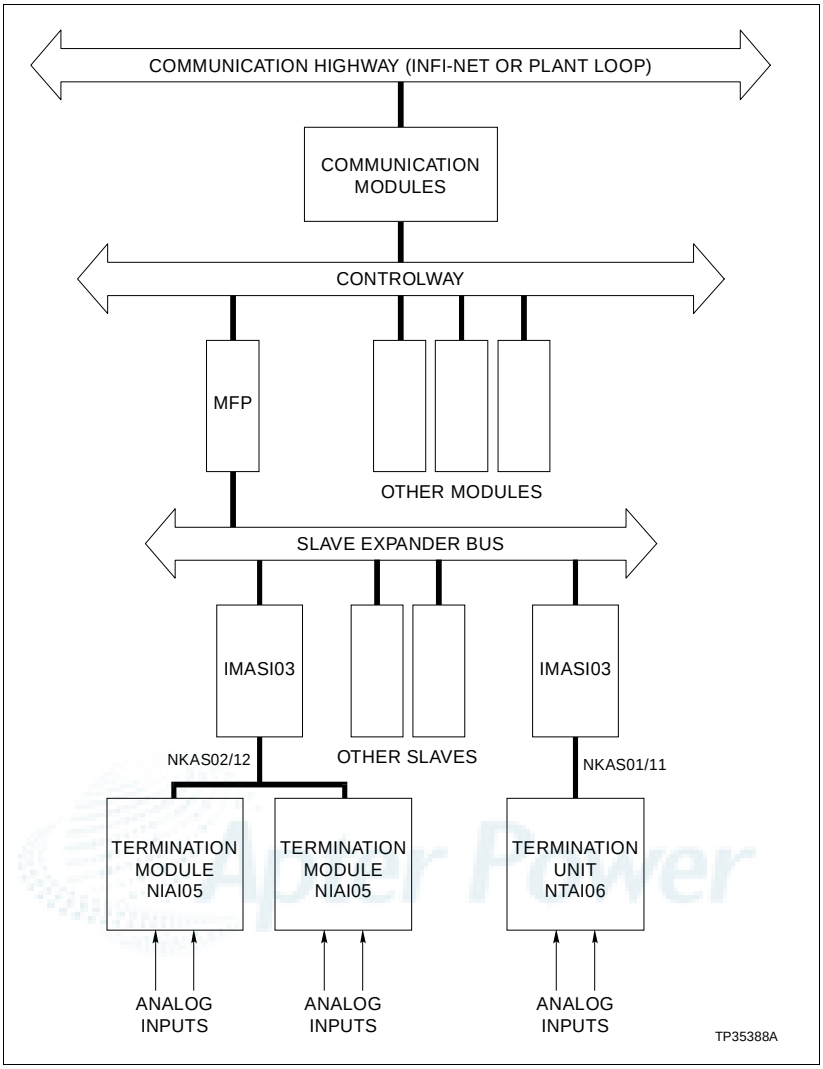


*Figure 1-1. INFI 90 Communication Levels*

## FEATURES

The design of the IMASI03 module, as with all INFI 90 modules, allows for flexibility in creating a process management system. Refer to the ***NOMENCLATURE*** entry of this section to see the list of devices that can be used with the slave module in an INFI 90 system.

- The IMASI03 conditions (filters, amplifies and isolates) up to 16 analog input signals.
- The IMASI03 converts analog signals to digital values, adds compensation and corrections as needed, and provides digital values to the MFP through the slave expander bus.

- Each channel is individually programmable for these input types:

  E, J, K, L, N (14 AWG), N (28 AWG), R, S, T, U thermocouples.
  Chinese type E and Chinese type S thermocouples.
  Millivolt (-100 to +100 mV).
  3-wire RTDs (10, 100 U.S., 100 European, 120 and Chinese 53 Ohm).
  High level (-10 to +10 V).
  Current (4-20 mA).

- Resolution of the analog-to-digital conversion process is programmable over a range from 16 to 24 bits.

- Input type and channel resolution may be selected independently for each channel, permitting any mix of inputs on a single IMASI03 module.

- Channel isolation and open input detection are provided for each channel.

- Input circuit offset, gain and nonlinearity errors are recorded during a one time factory calibration procedure. These measurements provide error compensation during normal operation. The slave does automatic recalibration during normal operation to compensate for component aging and temperature drift. No user calibration is ever required.

- Engineering units conversion to degrees C or F is automatically calculated on all input signals that are thermocouple or RTD types. These conversions correct for nonlinearities in the conversion to temperature units using industry standard linearization tables.

- The slave scales the block output value to engineering units for low and high level voltage inputs. Input type and zero and span values are specified in function code 216.

- Thermocouple inputs have cold junction compensation. Each termination device has a built-in cold junction reference. The cold junction reference applied to thermocouple inputs may be this built-in reference or it may be a remote reference read from another input from this or another slave.

- The slave compensates for lead wire resistance in the connection between the thermocouple, RTD or low level voltage input signals.

- The IMASI03 can be removed or installed without turning off power to the system.

## *SPECIFICATIONS*

| | |
|---|---|
| **Power Consumption** | |
| | + 5 VDC typical 300 mA, maximum 450 mA<br>+ 15 VDC typical 130 mA, maximum 150 mA<br>- 15 VDC typical 35 mA, maximum 50 mA |
| **Analog Input Types** | |
| Analog Input Channels | 16 independently configured channels |
| Thermocouples | Type E, J, K, L, N (14 AWG), N (28 AWG), R, S, T, U<br>Chinese type E and Chinese type S |
| 3-Wire RTD | 100 Ohm platinum: U.S. Lab. Standard<br>100 Ohm platinum: U.S. Industry Standard<br>100 Ohm platinum: European Standard<br>120 Ohm nickel<br>10 Ohm copper<br>Chinese 53 Ohm copper |
| Millivolt | -100 mV to +100 mV, o to 100 mV |
| High Level | 1-5 VDC, 0-5 VDC, 0-10 VDC<br>-10 VDC to +10 VDC, or user specified range<br>within -10 VDC and +10 VDC |
| Current | 4-20 mA, system or external powered. |
| **High Level Voltage Analog Accuracy** | |
| 4-20 mA Current Inputs | Add 0.025% to high level voltage analog error values |

25$^{o}$ C Ambient Operating Temperature
Power Supplies at Nominal Values
Zero Lead Wire Resistance
Full Scale Range (FSR) = 20.0 V

| Resolution | Error (Two Standard Deviations From Mean) | | Typical Noise (Reading Stability) | |
|---|---|---|---|---|
| **Bits** | **± Percent FSR** | **± Millivolts** | **± Percent FSR** | **± Millivolts** |
| 16 | 0.05 | 10 | 0.02 | 4 |
| 18 | 0.04 | 8 | 0.015 | 3 |
| 20 | 0.03 | 6 | 0.0125 | 2.5 |
| 22 | 0.02 | 4 | 0.005 | 1 |
| 24 | 0.015 | 3 | 0.0025 | 0.5 |

## *SPECIFICATIONS (continued)*

**Low Level Voltage Analog Accuracy**

25° C Ambient Operating Temperature
Power Supplies at Nominal Values
Zero Lead Wire Resistance
Full Scale Range (FSR) = 200.0 mV

| Resolution | Error (Two Standard Deviations From Mean) | | Typical Noise (Reading Stability) | |
|---|---|---|---|---|
| Bits | ± Percent FSR | ± Millivolts | ± Percent FSR | ± Millivolts |
| 16 | 0.05 | 100 | 0.03 | 60 |
| 18 | 0.03 | 60 | 0.025 | 50 |
| 20 | 0.025 | 50 | 0.02 | 40 |
| 22 | 0.025 | 50 | 0.015 | 30 |
| 24 | 0.025 | 50 | 0.01 | 20 |

**Resistance Analog Accuracy**

25° C Ambient Operating Temperature
Power Supplies at Nominal Values
Zero Lead Wire Resistance
Full Scale Range (FSR) = 500 Ohms

| Resolution | Error (Two Standard Deviations From Mean) | | Typical Noise (Reading Stability) | |
|---|---|---|---|---|
| Bits | ± Percent FSR | ± Ohms | ± Percent FSR | ± Ohms |
| 16 | 0.1 | 0.5 | 0.06 | 0.3 |
| 18 | 0.075 | 0.375 | 0.06 | 0.3 |
| 20 | 0.07 | 0.35 | 0.03 | 0.3 |
| 22 | 0.06 | 0.3 | 0.03 | 0.15 |
| 24 | 0.05 | 0.25 | 0.03 | 0.15 |

| | |
|---|---|
| **Cold Junction Reference Accuracy** | ± 0.5° C |
| **Software Temperature Linearization Accuracy** | ± 0.1° C |

## *SPECIFICATIONS (continued)*

| | |
|---|---|
| **Maximum Lead Wire Resistance Effect** | |
| Voltage Input | |
| Uncompensated | 1 microvolt of error per Ohm of lead wire resistance |
| Compensated | 0.1 microvolt of error per Ohm of lead wire resistance |
| 3-Wire Resistance Inputs | |
| Uncompensated | 0.020 Ohms of error per Ohm of lead wire resistance |
| Compensated | 0.008 Ohms of error per Ohm of lead wire resistance |
| **Resolution** | Programmable, 16 to 24 bits, in steps of two over full scale resolution |

| Resolution (Bits of A/D) | Resolution (Percent of A/D Span) | Typical A/D Conversion Times Per Channel |
|---|---|---|
| 16 | 0.0015 | 30 ms |
| 18 | 0.00038 | 175 ms |
| 20 | 0.000095 | 175 ms |
| 22 | 0.000024 | 450 ms |
| 24 | 0.000006 | 2000 ms |

| | |
|---|---|
| **Temperature Effect** | |
| (0 - 70° C) | ± 0.003% of full scale range per degree C maximum |
| **Power Supply Effect** | |
| Over Operating Range (± 15 Volt Supplies) | ± 0.003% of full scale range per Volt maximum |
| **Input Setting** | |
| Time | 0.5 seconds to within 1% after full scale step change |
| **Input Impedance** | 10 MOhm minimum |
| **Common Mode Isolation** | |
| Continuous AC Voltage (Absolute Maximum) | 250 VRMS |
| Channel/Channel (Absolute Maximum) | 250 VRMS |
| 50/60 Hz Rejection (Minimum) | -110 dB |

## *SPECIFICATIONS (continued)*

| | |
|---|---|
| **Normal Mode Rejection** | |
| Peak or Continuous Voltage (Absolute Maximum) | ± 15 VDC |
| 50/60 Hz AC Rejection (Minimum) | -80 dB |
| **Environment** | |
| Electromagnetic | No values available at this time. |
| Radio Frequency Interference | Keep cabinet doors closed. Do not use communication equipment closer than 2 meters from the cabinet. |
| Ambient Temperature | 0 to 70$^{o}$ C (32 to 158$^{o}$ F) |
| Relative Humidity | 5% to 95% up to 55$^{o}$ C (131$^{o}$ F) (noncondensing)<br>5% to 45% at 70$^{o}$ C (158$^{o}$ F) (noncondensing) |
| Atmospheric Pressure | Sea level to 3 km (1.86 miles)<br>(86 kPa to 108 kPa) |
| Air Quality | Noncorrosive |
| **Mounting** | Occupies a single slot in a standard INFI 90 Module Mounting Unit (MMU). |
| Shipping Weight | 1.146 kg (2.5 lb) |
| Container Size | 27.94 cm x 35.56 cm x 5.54 cm (11 in. x 14 in. x 3 in.) |
| **Certification** | CSA certified for use as process control equipment in an ordinary (nonhazardous) location.<br>Complies with IEEE-472 Surge withstand test. |

**NOTE:** Absolute maximum ratings indicate limits beyond which damage to the device may occur and device operation is not guaranteed.

Specifications are subject to change without notice.