Model 9600
AIM/ICB System

09/92

Setup Manual

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The information in this manual describes the product as accurately as possible, but is subject to change without notice.

Printed in the United States of America.

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There are no schematics in this manual.

1. Introduction

This manual, which is limited to common hardware considerations, includes the recommended procedures for installing a Slave module on the Instrument Control Bus and some technical details on the Bus. Individual modules are covered in more detail in the module's User's Manual. Note that a complete system requires appropriate software, such as Genie-PC. For details on software operation please refer to the software manual.

2. Installation

Each AIM/ICB System must have one Master Unit and can have up to 11 Slave Units. Each Slave Unit is configured with a unique bus address. The Model 554 RPI's address is set with internal DIP switches. For other presently available Slave Units, the address is set with a 16-position rotary switch which is accessible through a hole in the unit's side cover.

After you've set and made a note of the address for each unit, install it in a NIM Bin that can supply +6 volts, such as the Canberra Model 2100. The Master Unit is connected to its Slave Units with Model C1560 cable, which is a 20-pin ribbon cable with twelve connectors. The physical position of the Master and Slave Units in the BIN and with respect to each other is unimportant as far as ICB communication is concerned and any connector in the cable can be left unconnected without needing a terminator.

It should be noted that you can mix standard NIM and ICB control modules in a system. For example, you can use a Model 9641 ICB HVPS to supply bias voltage in a setup that is used to characterize NaI detectors which uses a standard ADC and Amplifier, such as Models 8701 and 2012.

2.1. Typical Installation

Figure 2.1 shows a typical setup, where a Model 556 AIM is the Master Unit and the Models 9635, 9615 and 9645 are the Slave Units.

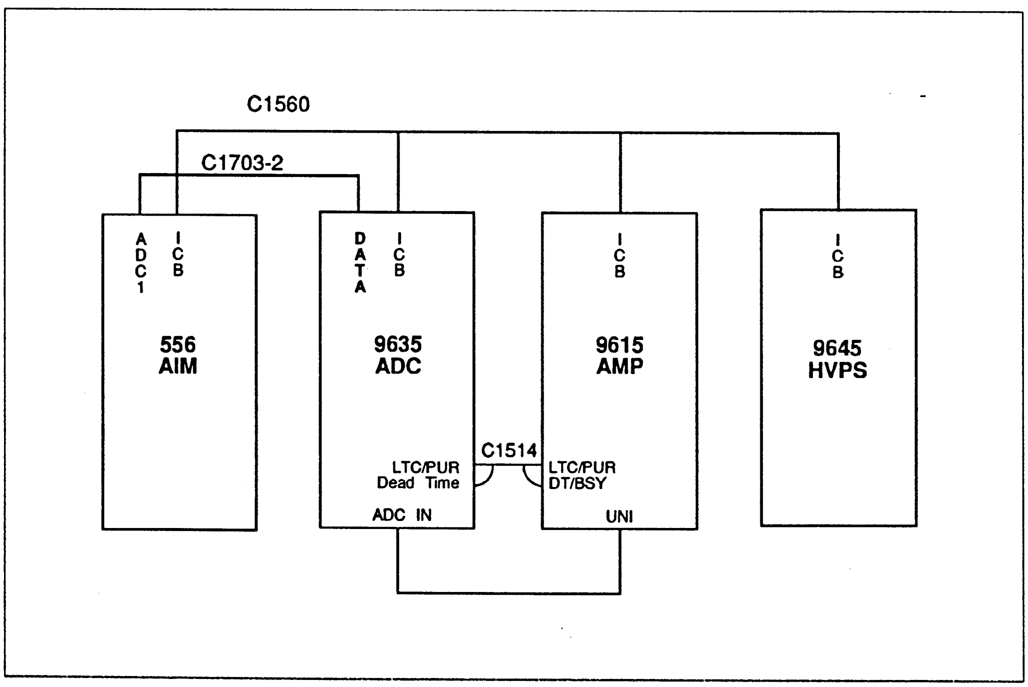

Figure 2.1 Typical ICB Bus Installation

The Master Unit doesn't need an ICB address, but each of the Slave Units does need its own unique address, which is set by changing the module's address switch. The address switch is an internal rotary switch which is adjusted by inserting a small screwdriver through the hole in the module's side cover and moving the rotary address switch to any one of its sixteen possible positions, 0-F. Please remember not to set two Slave Units in the same system to the same address.

For instance, the 9645 might be set for address 0, the 9615 for address 1 and the 9635 for address 2. It is important to record each unit's address because the addresses are required when configuring the controlling software.

The next step is to install the four units into a 2100 NIM Bin. The four units are connected using the C1560 cable supplied with the AIM. This cable connects to the 20-pin ribbon cable connector on the rear panel of each unit. One connector should be skipped when connecting to the 9615, which will allow you to reach the 9615's SHAPING switch. The 9615 and 9645 can now be connected to the detector. The 9635 is connected to the AIM, ADC1 or ADC2 connector, using the C1703-2 cable supplied with the AIM.

If a second ADC is added to the AIM, it would be connected to unused connectors on the first system's ICB cable. Again module addresses must be unique and not used by any of the modules installed earlier.

If another AIM is added it provides a new ICB. Modules on this bus can have addresses chosen without regard to those in another ICB.

Set the 9615's shaping time by manually moving the unit's rear panel SHAPING switch to the desired setting.

Any unused portion of the C1560 cable can be removed by cutting the ribbon cable after the last used connector.

2.2. System Operation

Because this is a networked system you must enter several items in the software's configuration.

- When an MCA is being defined, the physical configuration of each module must be entered . For the AIM, the factory-set Station Address, the hexidecimal number printed on the AIM's front panel, must also be entered.

- You will also need to define both the number of ADCs connected to the AIM and the total amount of memory available for the ADCs. You can choose 64K of memory and later assign a fraction of that memory to individual detectors.

Other modules are configured by:

- Selecting the module type: either a generic manual module or specific programmable module.

- Entering the programmable module's ICB address, which is the setting of the module's rotary address switch.

For the ICB modules, jumpers and most switches have been replaced with software controls. These control settings are saved and are loaded into the module each time it is initialized. Some parameters are set only as part of the configuration because they aren't normally changed; for example, the polarity of the amplifier's input signal. Other parameters, such as Amplifier Gain and ADC Lower Level Discriminator, can be changed by using the ADJUST function in the MCA View Control Window.

It is important to be aware that the configuration isn't verified until the software tries to use a networked module. If verification detects a wrong address or module type in the configuration, an error message will be posted. Please refer to the User's Manual for your software for error messages, and for installation and operational details.

3. Technical Information

The Instrument Control Bus (ICB) is a simple 8-bit bus which allows intelligent devices (for example, the AIM) to control external devices such as multiplexers and programmable front-end equipment. The ICB is designed to enable simple interfaces to be constructed using only low-power SSI and MSI circuits.

The basic characteristics of the ICB are:

Maximum Length	90 cm (36 in.)
Maximum number of devices . .	12 (1 Master, 11 Slaves)
Cable used	20-pin ribbon, daisy-chained (C1560)
Bus width	8 address/data bits, 4 control bits
Bandwidth	125 Kbytes/second

Transfers on the ICB Bus follow a non-interlocked protocol with all timing controlled by an intelligent device, called the Master Unit. The Master always controls the bus; there can be only one Master per bus. The only action on the ICB which can be initiated by a Slave Unit is assertion of the service request line.

3.1. ICB Signals

The ICB consists of 8 bidirectional and 4 unidirectional signals on a 20-conductor ribbon cable. Address, data, and control information are carried by the signals, which are grouped as follows:

Control Signals

These active low signals include the Address Strobe (AS*), Data Strobe (DS*), and Write Enable (WE*). All three signals are outputs from the Master.

Address/Data Signals

Eight bidirectional positive true lines carry address and data information between the Master and the Slave Units.

Service Request Signal

This active low common service request line enables devices to request service from the Master, which must then poll the Slaves to determine which device made the request.

Bus Transactions

The two possible bus transactions (READ and WRITE) and timing are shown in Figure 3.1. Basically, the Master starts a cycle by outputting the desired address and WE* signal. Once the setup time requirement has been met, AS* is asserted; Slave devices strobe the address and WE* at that time. If the cycle is a READ cycle (WE* false), the addressed Slave device puts its data on the data lines when DS* is asserted and removes it when DS* is removed. The Master will strobe the data when removing DS* and will remove AS* shortly afterwards. If the cycle is a WRITE cycle (WE* true), the Master will assert the data lines as soon as the address hold time requirement has been met; the addressed Slave device strobes the data lines on the trailing edge of DS*.

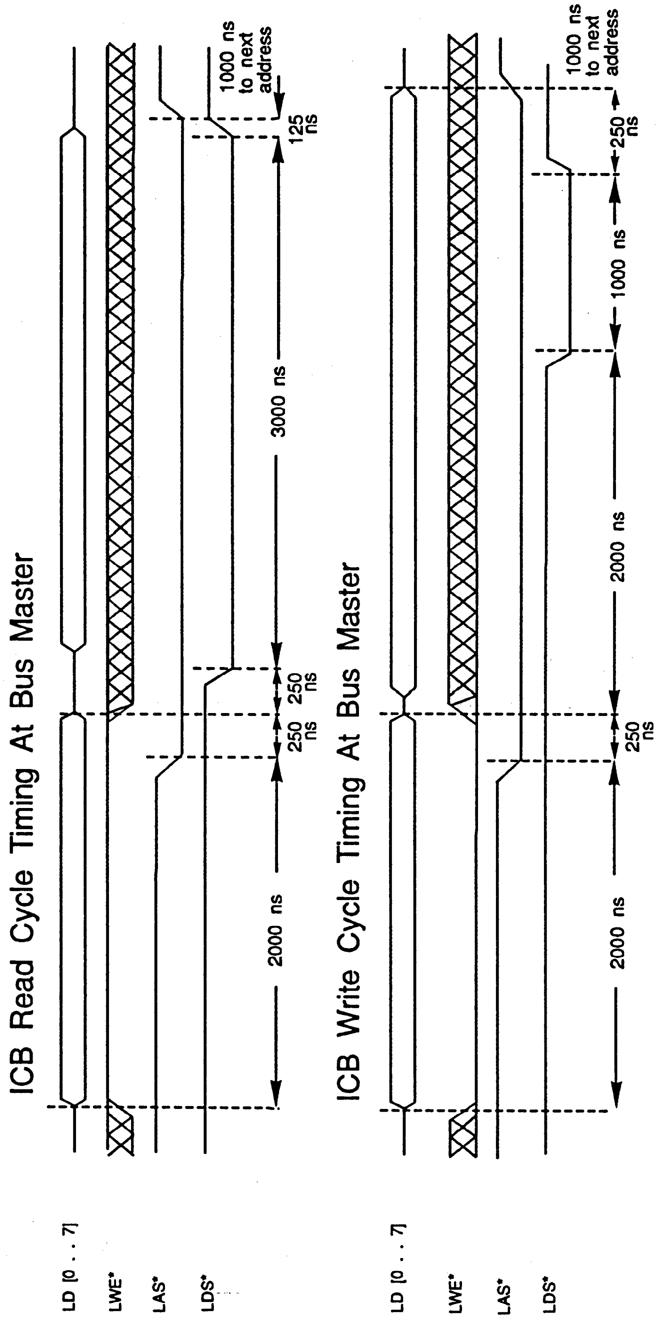

Figure 3.1 Read and Write Timing Diagrams

The Master separates all bus cycles by a minimum of 1000 ns to allow bus lines to settle.

Service Request can be asserted at any time by a Slave device. It remains asserted until explicitly turned off by a command from the Master.

All signal levels on the ICB are driven and received by low-power Schottky (LS and ALS) buffers, with the exception of the Service Request drivers on the Slaves, which are open-collector drivers. High logic levels are boosted in the Master by 1k Ohm resistors between each signal and +5 volts. 33 Ohm series resistors are put on all lines driven by a device, i.e., all lines (except Service Request) on the Master, and the data lines and Service Request on Slave devices. The signal lines are not terminated. A maximum of 11 Slave devices may be connected to the ICB, with a maximum total cable length of 36 inches. The maximum of 12 total devices is due to the physical limitation of a standard NIM BIN.

From the Master's viewpoint, the ICB appears to be 256 8-bit I/O registers. Each Slave device is assigned 16 contiguous addresses.

The purpose of the registers is to allow a computer to program parameters and read back status. In the case of an AIM networked system, the Master communicates via the Ethernet link to the AIM which provides translation to the ICB protocol.

The starting address for each Slave Unit's register block is defined by an Address Selector switch in each module. To allow access to individual modules, each Slave on the same ICB daisy chain must have a unique address.

Programmed into each module at the factory is an Identifier and serial number. The Identifier informs the computer of the module's type. The serial number is provided for data tracking.

3.2. Ready LED Operation

Each Slave module, with the exception of the RPI module, provides status information via the Front Panel Ready LED. The Ready LED has four possible states. The meaning of each state is defined below.

LED Is Off

An Off LED is the initial state when the module is first powered up. It indicates that the module either cannot be, or has not been, accessed via the ICB interface.

LED Is Red

A Red LED indicates that the module has failed its internal power on diagnostics. This state may not be supported by all modules.

LED Is Green

A Green LED indicates that the module has passed its power on diagnostics, where applicable, and the application program has confirmed that the module is as expected (i.e. correct type and serial number and any non-programmable parameter is set properly).

LED is Yellow

A Yellow LED indicates that the application program was unable to verify the module's serial number, type, configuration or non-programmable parameters.

3.3. ICB Interface Connector

This 20-pin ribbon connector (Table 3.1) provides all the necessary signals for connection of the Instrument Control Bus (ICB). Negative true signals are shown with a trailing asterisk (LWE*); all other signals are positive true.

Table 3.1 ICB Connector Signals

Pin	Signal	Pin	Signal
1	GND	2	LD0
3	LD1	4	GND
5	LD2	6	LD3
7	GND	8	LD4
9	LD5	10	GND
11	LD6	12	LD7
13	GND	14	LWE*
15	GND	16	LDS*
17	GND	18	LAS*
19	GND	20	LSRQ*

3.4. Interface Signal Functions

This section describes the function of each interface signal in detail (Table 3.2). All input and output signals are TTL compatible.

Unless otherwise noted, the input signal levels are:

Low = 0 to 1.0 volts
High = 2.0 to 5.0 volts

And the output signal levels are:

Low = 0 to 0.5 volts
High = 3.0 to 5.0 volts

All input and output signals considered to be a logic 1 for a high voltage level unless the signal name is followed by an asterisk (LWE*), in which case the signal is considered to be a logic 1 for a low voltage level. The direction of the signal is referenced to the Master.

Table 3.2 Interface Signals

Signal	Pin	Description
LD0	2	INPUT/OUTPUT: Address/Data line 0 (LSB)
LD1	3	INPUT/OUTPUT: Address Data line 1
LD2	5	INPUT/OUTPUT: Address/Data line 2
LD3	6	INPUT/OUTPUT: Address/Data line 3
LD4	8	INPUT/OUTPUT: Address/Data line 4
LD5	9	INPUT/OUTPUT: Address/Data line 5
LD6	11	INPUT/OUTPUT: Address/Data line 6
LD7	12	INPUT/OUTPUT: Address/Data line 7 (MSB)
LWE*	14	OUTPUT (Write Enable): This signal is active when the ICB Master is writing to the ICB.
LDS*	16	OUTPUT (Data Strobe): Used to latch the data into a Slave during a write cycle or gate the data from a Slave onto the bus during a read cycle.
LAS*	18	OUTPUT (Address Strobe): Used to latch the address which the ICB Master is accessing into the Slave Unit.
LSRQ*	20	INPUT (System Request): This signal is set when a Slave requires service from the ICB Master.
GND	1, 4, 7, 10, 13, 15, 17, 19	DC common for all interface signals.