Genesis II Direct Digital Controller

INSTALLATION INSTRUCTIONS

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Some information in this document relates to products which are obsolete but still relevant for consumers who may have not upgraded their devices or who are using obsolete but still functional equipment.

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Genesis II Direct Digital Controller

INSTALLATION INSTRUCTIONS

Chapter 1 - Preliminary Information

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1-1 Introduction

This manual is intended to provide qualified technical personnel with complete and easy-to-follow instructions for the installation, checkout and commissioning of the Innotech Genesis II Direct Digital Controller and MPCII Mid Points Controller.

Although the intent of this manual is to simplify the installation task, instructions contained in this manual are based on the assumption that installation of a Genesis II System will be accomplished by technically qualified personnel. Also, these instructions presuppose that installation personnel are familiar with local regulations, codes and safety requirements.

Installers should familiarise themselves with the content of this manual before attempting installation of the Genesis II Direct Digital Controller or MPCII Mid Points Controller.

Throughout this manual there are icons to illustrate notes and points of caution, as illustrated below:

NOTE

Notes contain useful information, which should be read.

IMPORTANT

Important Notes contain information, which is important for ensuring success.

CAUTION

*Caution Notes contain critical information, which **MUST** be read.*

1-1.1 Systems Covered by this Manual

Systems are intended for use in a variety of applications, the systems are designed on a modular basis. Modularity provides the most economical and efficient means of adapting the system to the customer's specific requirements. Also, in seeking to improve customer satisfaction through product improvement, Innotech often provides updates and revisions to its Genesis product line. The modularity concept and equipment revisions result in a large array of different types of hardware available to the customer.

The manual covers the Genesis II System. This system is based on one or more controllers as the major control units interconnected with several ancillary units. These major control units included in this manual are:

- Genesis II Direct Digital Controller
- MPCII Mid Points Controller

For purposes of explanation, a System is defined as one or more controller units interconnected with various ancillary units for the purpose of performing specific functions. A Genesis II System consists of one or more Genesis II Direct Digital Controllers and/or MPCII Mid Points Controllers as the major control unit(s).

Some of the ancillary units included in the Genesis II System are (refer to the System Description Manual for descriptions of these units):

- Several types of Remote Expansion Module (REM)
- Miscellaneous Ancillary Units

The purpose of this manual is to provide clear and complete instructions for all phases of the installation of the units that comprise your Genesis II System. In order to provide the clearest instructions possible with minimum confusion, instructions in this manual are based on the following approach:

- For simplicity of explanation, installation instructions in this manual are based on the assumption the system to be installed is a typical Genesis II System containing a single Genesis II Direct Digital Controller and a selection of REMs.
- Specific information on the installation and wiring of ancillary units can be located in the Datasheet and Product Paperwork associated with each device.
- Basic electrical wiring information is provided in the Electrical Installation chapter, and wiring instructions for network systems is contained in the Network Installation chapter.

1-1.2 Scope of this Technical Manual

This technical manual contains:

Table 1-1: Document Chapters

Heading	Heading
Chapter 1 - Preliminary Information	Contains installation related information of a general nature such as general safety considerations and pre-installation requirements.
Chapter 2 - Mechanical Installation	Contains instructions and related data to facilitate the mechanical installation of components of the Genesis II System. It also includes information such as physical descriptions of the units, mounting dimensions and mechanical installation guidelines.
Chapter 3 - Electrical Installation	Contains electrical wiring information useful for installation of a basic “standalone” system. Chapter 3 is augmented by network wiring information in Chapter 5 - Network Installation. Appropriate references are provided between Chapter 3 and Chapter 5 for installation of network wiring.
Chapter 4 - Commissioning	Provides instructions for post-installation inspection and checkout of the Genesis II System, power application and initial setup of the various units that comprise the system.
Chapter 5 - Network Installation	Provides detailed information for interconnecting various units in a network configuration. This appendix should be used in conjunction with Chapter 3 when network installation is involved. The two electrical installation areas: Chapter 3 and Chapter 5 are purposely separated from each other in the interest of clarity and to simplify the use of this manual.

1-2 Special Considerations

The following precautions and installation considerations must be observed to ensure personal safety and to prevent damage to equipment:

- Local safety regulations, building codes and ordinances must be complied with during installation. In cases of conflict with procedures in this manual, contact Innotech or its authorised representative for clarification.
- To prevent damage to equipment, avoid applying electrical power to the equipment prior to checkout, unless specifically instructed to do so in this manual.
- The Genesis II System can be installed using common tools and test equipment. Only qualified personnel familiar with local codes and practices should install the system. Wiring should only be performed by someone knowledgeable of electronics and wiring installation practices. Refer to the appropriate documentation when installing items provided by other manufacturers.

1-3 Unpacking Instructions

The following unpacking instructions should be followed as soon as possible after the equipment is delivered to the installation site:

1. Carefully unpack each item and set packing materials aside for future use.
2. Check the inventory against the packing list to make sure nothing is missing.
3. Inspect each item for damage.
4. Report any shortages or damaged items.
5. Collect all factory inspection sheets and similar data; place in an equipment history file.
6. Any items which are not installed immediately should be carefully returned to its shipping container and stored in a safe place until it is time for it to be installed.

1-4 Installation Plans

The following installation data should be gathered and made available to the installation team:

- This technical manual.
- Computer-Generated Wiring Diagram: the Innotech Gen2Config software can be used to print a wiring diagram for the specific application. A copy of this wiring diagram is usually provided at the time of hardware delivery. Procedures for printing additional copies of the wiring diagram are contained in the Gen2Config Online Help.
- Computer-Generated Materials List: the Materials List is also provided at the time of hardware delivery. The list is printed out from the Innotech Gen2Config software. The Materials List shows all the items of hardware required for the specific application.
- For non-Innotech equipment, gather the manufacturer's installation-related data such as schematics, wiring diagrams, dimension diagrams, etc.
- Any other data source as it becomes known.

1-5 Tools and Test Equipment

No special tools are required for installation of the Genesis II Systems. Only common hand tools are needed. A high impedance digital Volt-Ohm-Milliammeter is the only item of electronic test equipment required.

Genesis II Direct Digital Controller

INSTALLATION INSTRUCTIONS

Chapter 2 - Mechanical Installation

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2-1 Introduction

This section of the manual contains instructions and related data to facilitate the installation of components of the Genesis II System.

It is recommended that the main units of the Genesis II System, such as the Genesis II Direct Digital Controller (DDC), MPCII Mid Points Controller and **standard** Innotech Remote Expansion Modules (REM) be mounted in steel cabinets to minimise the effects of electromagnetic interference (EMI).

Innotech Control Station Module REMs and Wireless Sensor REMs have specific recommendations for installation described in this section. Networking components, such as computers, printers and modems, should be installed in accordance with standard computer installation practises.

Because of the designed-in flexibility of the Genesis II System, digital controllers and associated devices can be installed in a wide variety of configurations, depending on the user's preference. For this reason it is not possible to include all the various installation configurations in this manual. Instead, this manual provides examples of installations that are considered typical.

Innotech recognises that the installation examples described in this manual may not be in total agreement with the user's requirements. However, information in this document should be used as a guide for all installations, regardless of whether the specific circumstances match the examples given. In all cases, installation personnel should familiarise themselves with the information contained in this section.

NOTE

If required, additional installation recommendations can be provided from Innotech Control Systems Australia upon request.

2-2 Physical Descriptions

The following paragraphs contain physical descriptions, including dimensions and installation-related information, for the main units of the Genesis II System. These paragraphs are intended to provide the installer with sufficient information to permit proper installation of the various units.

For units of equipment not included in the following paragraphs, refer to the appropriate product datasheet.

2-2.1 Genesis II Series Controllers

Controllers are the main processing units that provide overall control of the Genesis II Systems. Controllers are housed in a rectangular case made from flame retardant polycarbonate / ABS plastic listed under UL94-V0. The types of controller units included in this manual are:

- Genesis II Direct Digital Controller
- MPCII Mid Points Controller

2-2.1.1 Genesis II Direct Digital Controller

The Innotech Genesis II Direct Digital Controller is a state-of-the-art processing system that has the capability of controlling various types of industrial systems.

The Genesis II Direct Digital Controller is housed in a rectangular case suitable for Switchboard Mounting. The housing is made from flame retardant plastics recognised by UL as UL 94-V0. Refer to Figure 2-1.

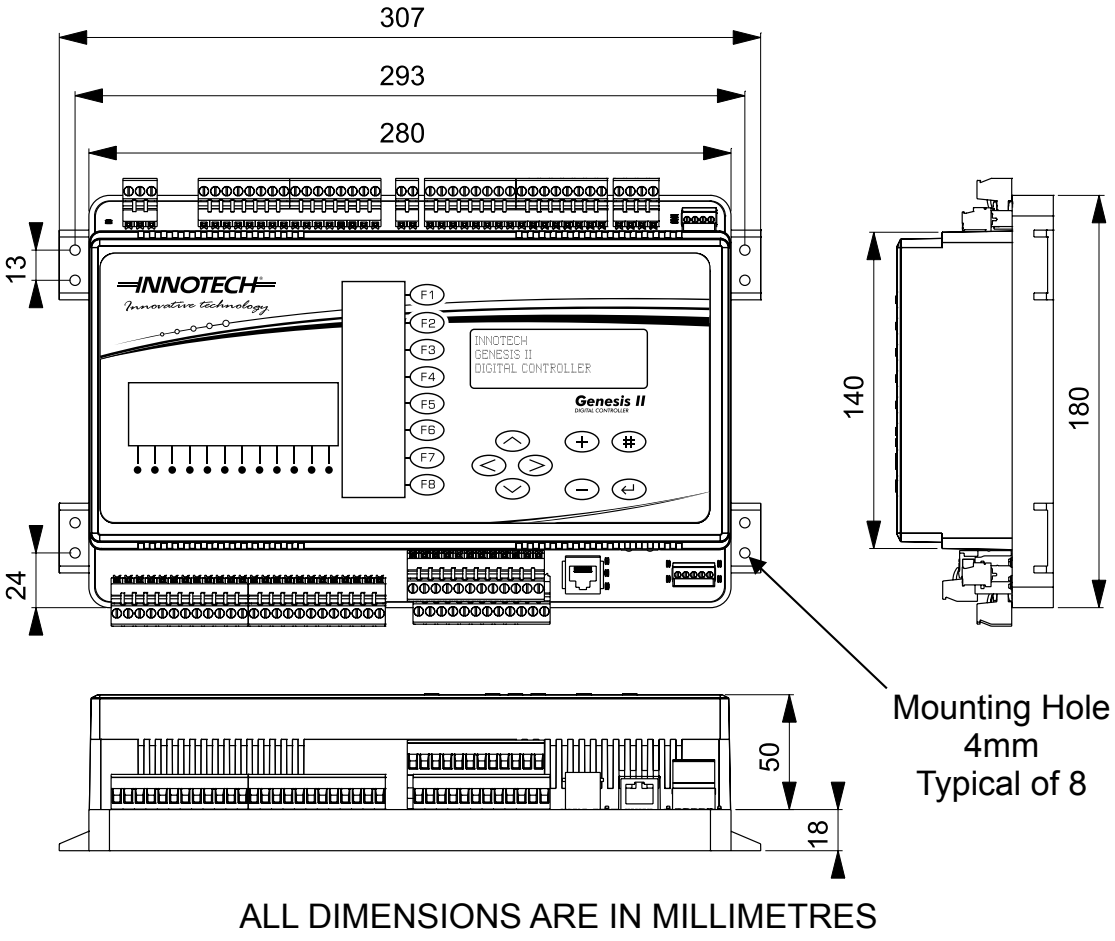

Figure 2-1: Genesis II Direct Digital Controller Dimensions

The unit's circuit boards are mounted inside the case, which consists of a base and a lid. The plastic base has eight mounting holes; each hole is 4mm in diameter. Not all of the eight holes are required for mounting, provided the unit is **securely** installed.

There are four slots in the bottom circuit board (motherboard), two slots at each end. These slots facilitate the clamping of the case's plastic lid to the motherboard. To remove the plastic lid from the motherboard, press firmly inwards at each end of the plastic lid, which disengages the clip-in fittings, and lift away simultaneously. Refer to Figure 2-2.

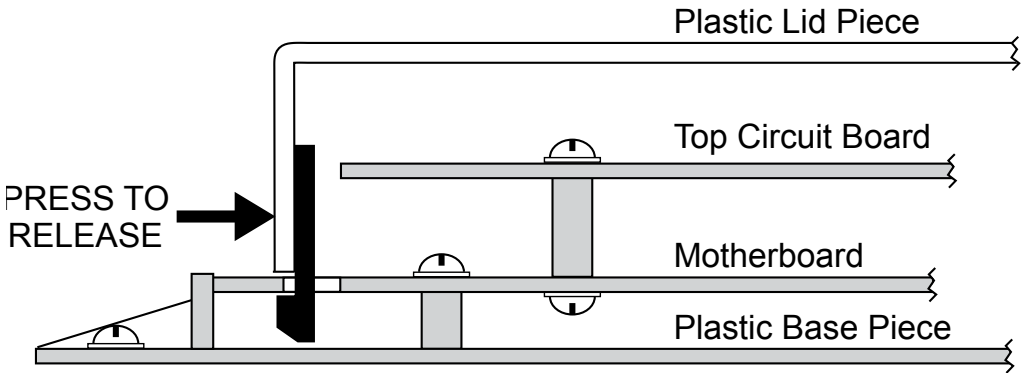

Figure 2-2: Genesis II DDC Plastic Lid Clamping Details

Installation of the plastic lid is similar to the removal procedure; insert the clip-in fitting at one end of the plastic lid into the slots provided on the motherboard. Then, clip the opposite end of the plastic lid into the slots at that end of the motherboard. Pressing the two ends of the plastic lid together can assist in the operation.

2-2.1.2 MPC II Mid Points Controller

The Innotech MPCII Mid Points Controller is a state-of-the-art processing system that has the capability of controlling various types of industrial systems. The MPCII Mid Points Controller can be used in a Genesis II System as the main controller.

It is housed in a case suitable for Switchboard Mounting. The housing is moulded from flame retardant plastics recognised by UL as UL 94-V0. The MPCII Mid Points Controller does not have any external controls or indicators. Refer to Figure 2-3.

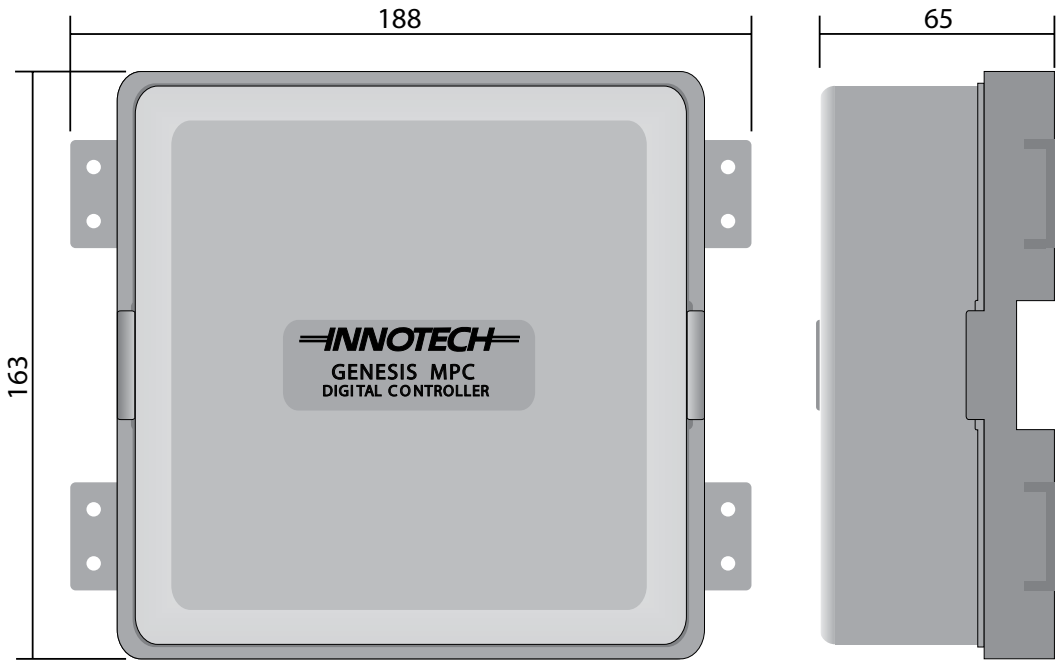

Figure 2-3: MPCII Mid Point Controller Dimensions

2-2.2 Remote Expansion Modules

Remote Expansion Modules increase the capability of a controller by allowing more input and output devices to be connected to it.

The term Remote Expansion Module (REM) is the collective term applied to several types of units used to configure the hardware to the customer's requirements. The following paragraphs contain wiring information for the following categories of REMs used in the Genesis II System:

- REM I/O Expansion Modules (2-2.2.1)
- REM Control Station Modules (2-2.2.2)
- REM Multi Zone Station Modules (2-2.2.3)
- REM Multipoint Modules (2-2.2.4)
- REM Wireless Sensor Modules (2-2.2.5)

The system imposes **restrictions** on the total number and types of REMs that can be used with a controller. These requirements are explained in section 2-4.1.

2-2.2.1 REM I/O Expansion Modules

REM I/O Expansion Modules increase the Input and/or Output capabilities of a Genesis II Series digital controller.

There are a total of six different REM I/O Expansion Modules.

- GENII AI REM Analogue Input Module
- GENII AO REM Analogue Out Module
- GENII DI REM Dry Contact Digital Input Module
- GENII DO REM Relay Output Module
- GENII IDI REM Opto Isolated Digital Input Module
- GENII PI REM Pulse Input Module

Common Enclosure Information

The above listed REM I/O Expansion Modules are housed in a rectangular case made from flame retardant polycarbonate / ABS plastic listed under UL94. (GENII AO REM is listed under UL94-VO)

Colour: Grey
Dimensions (max): 75mm(w) x 155mm(h) x 57mm(d)
Mounting: DIN Rail Mounted

The cable run between the digital controller and the REM I/O Expansion Modules should not exceed 600 metres. However, the maximum cable length can be increased through the use of Innotech Repeater IR11 module. (See 5-3.3.3 for more information)

Below is a schematic of the GENII AI REM Analogue Input Module. The above listed REM I/O Expansion Modules feature the same dimensions and similar appearance. Refer to Figure 2-4.

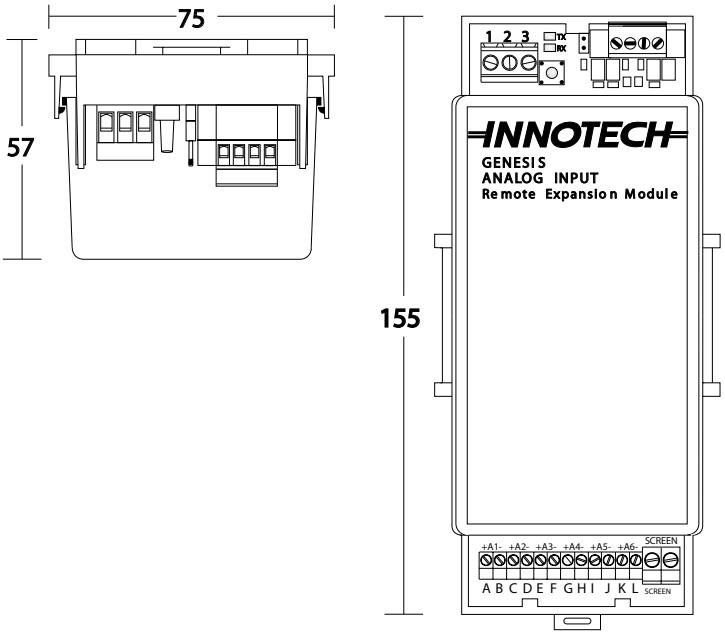

Figure 2-4: GenII AI REM Analogue Input Module

2-2.2.2 REM Control Station Modules

REM Control Station Modules are housed in a switchplate that mounts in **standard** electrical wall plates at a remote location. Mechanical installation instructions for the REM Control Station Modules are not applicable; electrical installation instructions for these modules are contained in the Electrical Installation Chapter.

There are a total of three different REM Control Station Modules.

- GENII CS REM Control Station Module
- GENII CSAH REM Control Station A/H Module
- GENII CSFCAH REM Control Station Fan Control, A/H Module

Common Enclosure Information

Colour: White
Mounting: Wall Mounted

The cable run between a digital controller and GENII CS REM Control Station Modules should not exceed 600 metres. However, the maximum cable length can be increased through the use of Innotech Repeater IR11 module. (See Paragraph 5-3.3.3 for more information)

Below is a schematic of the GENII CS REM Control Station Module. The above listed REM Control Station Modules feature the same dimensions and similar appearance. Refer to Figure 2-5.

Figure 2-5: GenII CS REM Control Station Module

2-2.2.3 REM Multi Zone Station Modules

REM Multi Zone Station Modules are housed in a switchplate that mounts in **standard** electrical wall plates at a remote location. Mechanical installation instructions for the REM Multi Zone Station Modules are not applicable; electrical installation instructions for these modules are contained in the Electrical Installation chapter.

There are a total of two different REM Multi Zone Station Modules.

- GENII MZS REM Multi Zone Station Module
- GENII MZSAH REM Multi Zone Station A/H Module

Common Enclosure Information

Colour: White
Mounting: Wall Mounted

The cable run between a digital controller and REM Multi Zone Station Modules should not exceed 600 metres. However, the maximum cable length can be increased through the use of Innotech Repeater IR11 module. Refer to Paragraph 5-3.3.3 for more information.

Below is a schematic of the GENII MZS REM Multi Zone Station Module. The above listed REM Control Station Modules feature the same dimensions and similar appearance. Refer to Figure 2-6.

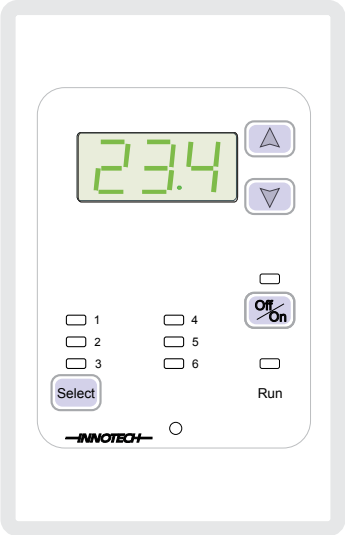

Figure 2-6: GenII MZS REM Multizone Station Module

2-2.2.4 REM Multipoint Modules

REM Multipoint Modules provide additional Analogue/Digital output capabilities for a Genesis II Series digital controller.

There are a total of three different REM Multipoint Modules.

- GENII MP405 REM Multipoint Module
- GENII MP423 REM Multipoint Module
- GENII MP432 REM Multipoint Module

Common Enclosure Information

The above listed REM Multipoint Modules are housed in a rectangular case suitable for DIN Rail mounting. The housing is moulded from flame retardant plastics recognised by UL as UL 94-V0.

Colour: Grey
Dimensions(max): 107mm(w) x 100mm(h) x 65mm(d)
Mounting: DIN Rail Mounted

The cable run between a digital controller and REM Multipoint Modules should not exceed 600 metres. However, the maximum cable length can be increased through the use of Innotech Repeater IR11 module. Refer to Paragraph 5-3.3.3 for more information.

Below is a schematic of the GENII MP405 REM Multi Zone Station Module. The above listed REM Multipoint Modules feature the same dimensions and similar appearance. Refer to Figure 2-7.

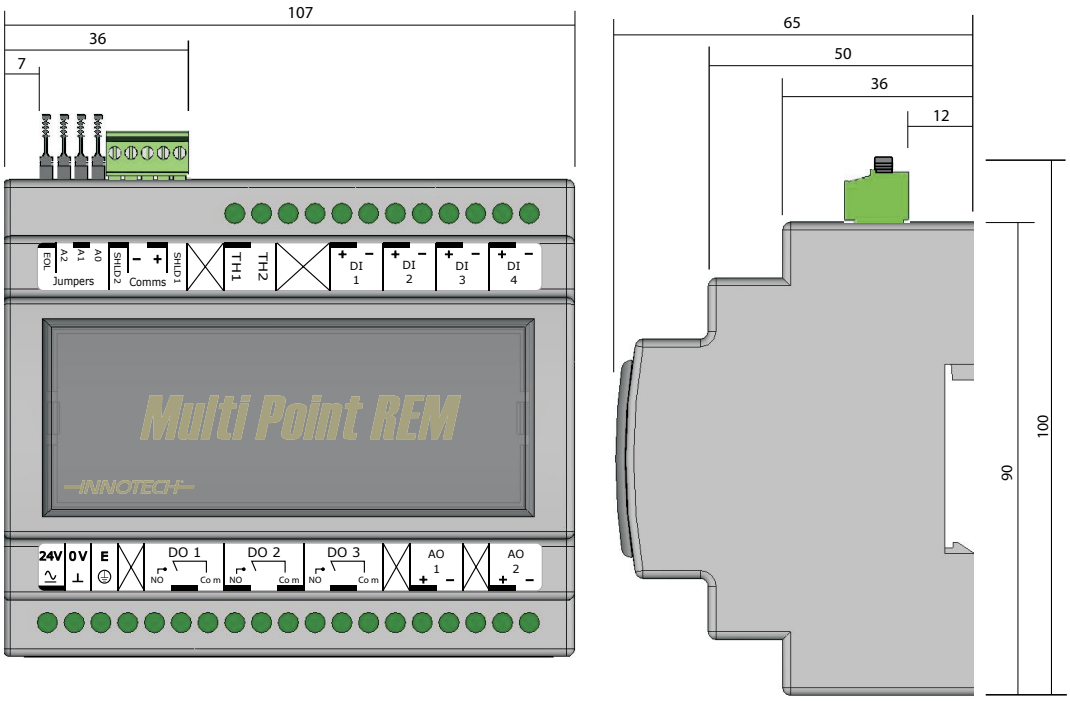

Figure 2-7: GenII MP405 REM Multipoint Module

2-2.2.5 REM Wireless Sensor Modules

Wireless Temperature Sensor REMs increase the capability of a Genesis II System by allowing wireless temperature sensor's to interface with the digital controller. The use of Wireless Temperature Sensor REMs is facilitated through the Wireless Module Interface, with connects directly to the REM socked on the digital controller.

GENII WMI Wireless Module Interface

The Wireless Module Interface can be located up to 600 metres from the host digital controller, however the cable length joining the GENII WMI to the controller must not exceed 600 metres. The maximum cable length can be increased through the use of Innotech Repeater IR11 module.

Up to 15 Wireless Temperature Sensor REMs can be wirelessly connected to a Wireless Module Interface, and can be located up to 20 metres from the Wireless Module Interface.

The GENII WMI Wireless Module Interface is housed in a rectangular case made from flame resistant Astrene M650 IR plastic in accordance with IEC695-2-1 (HD444-2-1) as of EN6355-1,A2 and IEC707 (AS/NZS2420).

Colour: Grey
Dimensions(max): 75mm(w) x 155mm(h) x 57mm(d)
Mounting: DIN Rail Mounted

The GENII WMI should be mounted within a 20 metre radius (depending on obstructions) of all SENRx modules (see below) from which it will be receiving data. The location should be dry, clean and free of excess vibration. Below is an image of the GENII WMI Wireless Module Interface. Refer to Figure 2-8.

IMPORTANT

Do not install the GENII WMI inside a fully enclosed metal switchboard, as this may interfere with quality of the wireless signal.

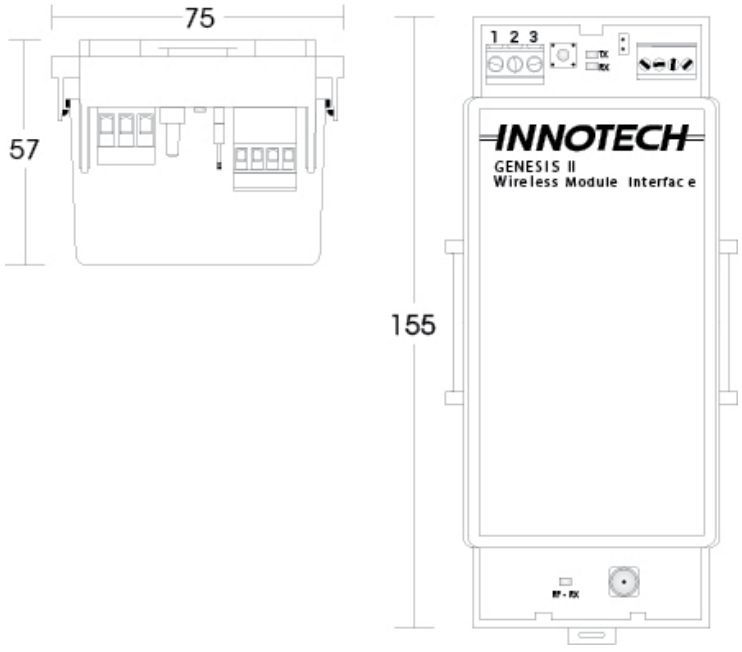

Figure 2-8: GenII WMI Wireless Module Interface

GENII SENRx Wireless Temperature Sensors
The GENII SENRx Wireless Temperature Sensors are housed in a square case manufactured from an ignition resistant grade of ABS, which meets the requirements of AS2420.

There are four models of the GENII SENRx modules:

- SENR1 Wireless Temperature Sensor
- SENR2 Wireless Temperature Sensor with Set Point
- SENR5 Wireless Temperature Sensor with After Hours
- SENR6 Wireless Temperature Sensor with Set Point and After Hours

Colour: Off white
Dimensions(max): 80mm(w) x 80mm(h) x 37mm(d)
Mounting: Wall Mounted

The GENII SENRx modules should be mounted within a 20 metre radius (depending on obstructions) of the GENII WMI Wireless Module Interface. The location should be dry, clean and free of excess vibration. Refer to Figure 2-9.

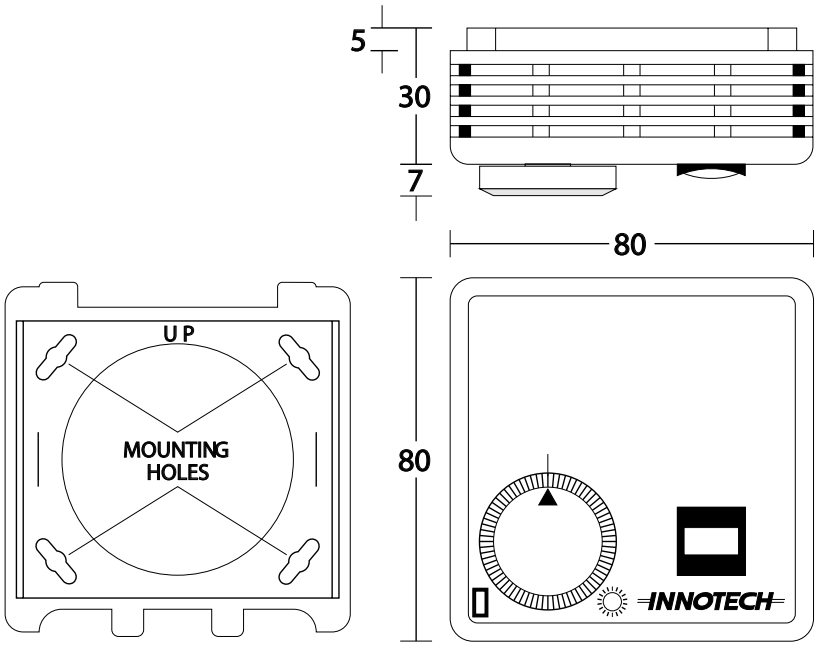

Figure 2-9: GenII SENRx Wireless Temperature Sensors

2-3 Installation Instructions

A steel enclosure is recommended to contain the system with the aim of minimizing EMI from surrounding equipment. To allow for the number of cables to enter and leave the enclosure, the minimum dimensions of slotted cable ducts should be 45mm x 45mm with 65mm clearance from the cable ducts to the terminals of the units.

The communications cable between the Genesis II Direct Digital Controller and REMs, or MPCII Mid Points Controller and REMS, is through the integrated RS485 REM Comms port in the digital controller.

NOTE

Unless otherwise noted, Installation Instructions are based on the assumption that the system to be installed is a local Genesis II System consisting of one Genesis II Direct Digital Controller and three types of REMs. Installation instructions for other types of hardware, such as the MPCII Mid Points Controller or GENII WMI Wireless Module Interface, is contained in section 2-4 - Difference Data.

2-3.1 DIN Rails

The DIN rail is an industry-standard item and is available from a large number of commercial sources. The rail is usually manufactured from galvanised steel and may be provided with a finish. It is typically available in 2 metre lengths. DIN rail cutters are available commercially and are recommended; however, for smaller installations, a hacksaw may be used to cut the rails to the required length.

Figure 2-10 shows the dimensions of a typical DIN rail section.

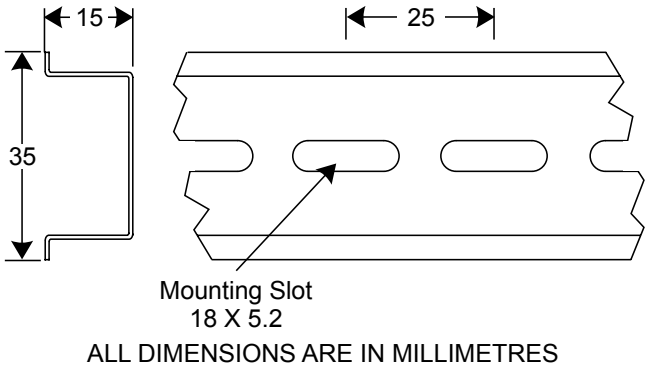

Figure 2-10: DIN Rail Dimensions

Figure 2-11 shows an example of a typical Genesis II System layout in an equipment enclosure.

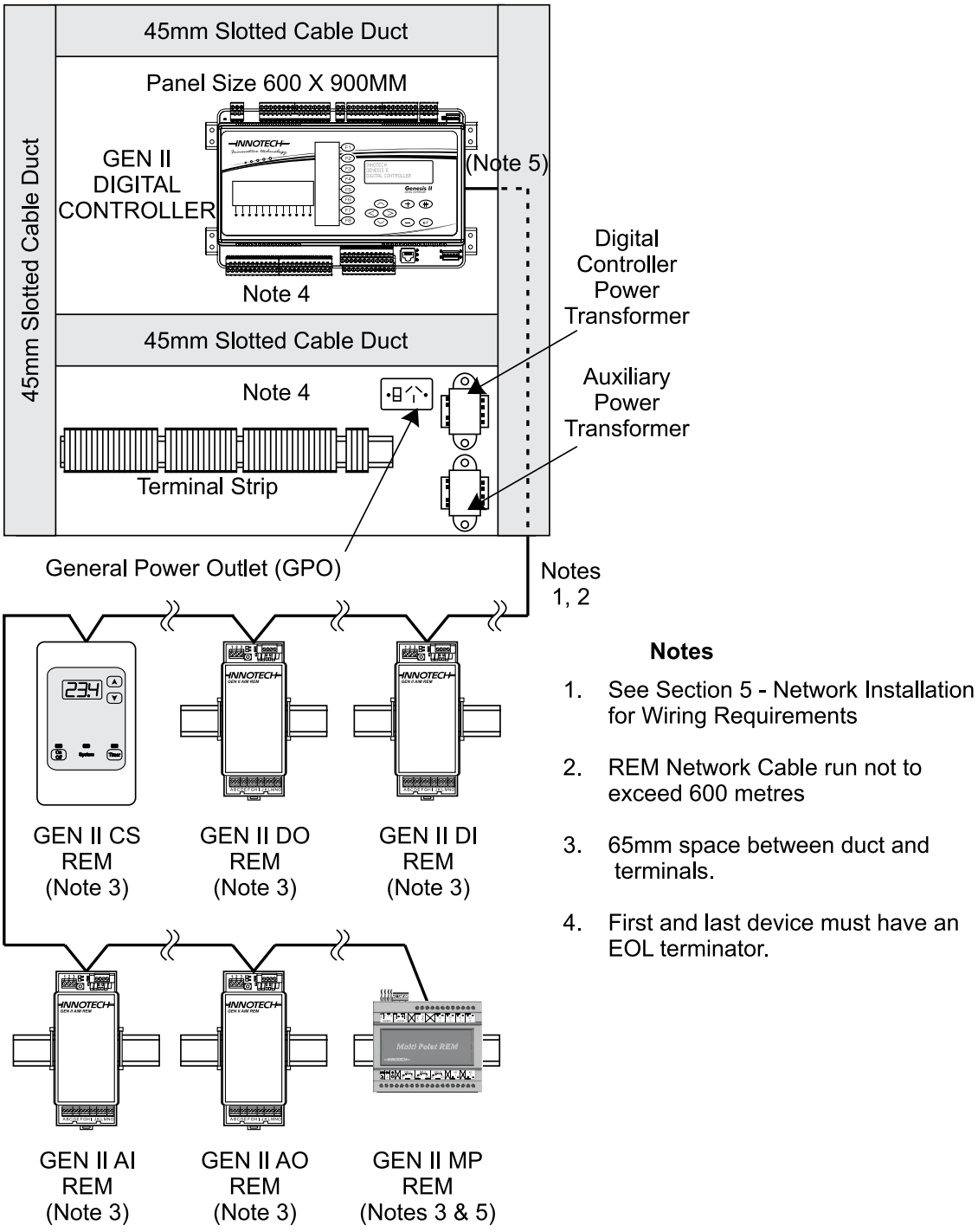

Figure 2-11: Typical Enclosure and Example Remote System Layout

2-3.2 General Installation Instructions

To ensure continued reliable operation of the Genesis II System, the following installation guidelines should be observed:

- The Genesis II Direct Digital Controller or MPCII Mid Points Controller should be installed in a position that provides easy access to the front panel and sufficient room for power, and input/output cabling. Also, the Digital Controller should be mounted such that the controls are in easy reach of the user. This requirement does not apply to the MPCII Mid Points Controller which has no external controls or indicators.
- Placement of the Genesis II Direct Digital Controller should take into account the **optimum viewing angle** of the Liquid Crystal Display (LCD), which is approximately 45° vertically and 90° horizontally (see Figure 2-12).
- Do not mount any unit of the system near high voltage, high current cables or sources of strong radio frequency emissions such as transmitter antenna cables.
- The ambient temperature of the digital controller and REMs at the installation site should not exceed the 0-40 °C temperature range.
- Mount the units in an area with minimum vibration and minimum exposure to mechanical damage.
- The REMs must be installed within 600 metres of the Genesis II Direct Digital Controller or MPCII Mid Points Controller.

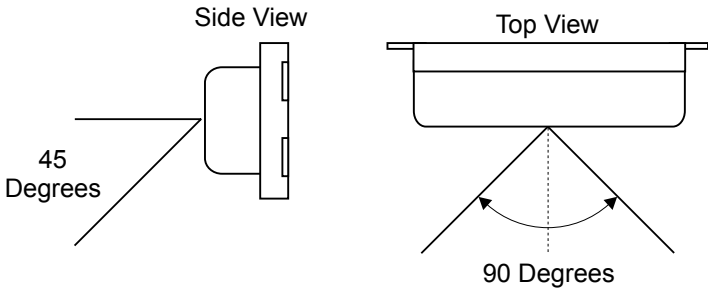

Figure 2-12: Genesis II DDC Optimum Display Viewing Angle

2-4 Difference Data

This paragraph contains difference data unique to installation of the MPCII Mid Points Controller, Genesis II System REMs and related devices. Installation instructions provided in Section 2-3 are applicable except where stated otherwise.

2-4.1 REM Limitations

The following limitations apply to the installation of REMs:

- A Genesis II Direct Digital Controller must have Version 4 firmware or greater installed to support REM Modules.
- For pre-version 5 controllers, a GENII RMI Remote Module Interface is required to connect REM Modules. Refer to datasheet DS15.01 GENII RMI Remote Module Interface for more information.
- Gen2Config v4.0 or greater must be used to configure a Genesis II Direct Digital Controller that has REM Modules connected to it.
- REM units designed for DIN rail mounting should be mounted on DIN rails in cabinets approved for switchgear or industrial control equipment, with the exception of the GENII WMI (See 2-4.2).

NOTE

Gen2Config V4.0 or greater automatically configures the Genesis II Series digital controller, and produces a printout which lists the types and quantities of REMs that can be used with a given Genesis II Series digital controller. The following information provides generalised REM type/quantity requirements that can be used for planning purposes.

- Up to 15 REMs can be connected to a single Genesis II Direct Digital Controller or MPCII Mid Points Controller, with one exception – the MP REMs. The MP REM can only be addressed between 1 and 8 and only 8 MP REMs can be used.

2-4.2 Installation of GENII WMI Wireless Module Interface

Follow the General Installation Guidelines (2-3.2) except:

- Do not install the GENII WMI inside a fully enclosed metal switchboard.
- The GENII WMI should be mounted within a 20 metre radius of all SENRx Modules from which it will be receiving data.

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Genesis II Direct Digital Controller

INSTALLATION INSTRUCTIONS

Chapter 3 - Electrical Installation

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3-1 Introduction

This section of the manual contains instructions and related data to facilitate the electrical installation of the Genesis II System. Because of the designed-in flexibility of the Genesis II System, it can be installed in a wide variety of configurations, depending on the user's preference. For this reason, it is not possible to include all the various installation configurations in this manual. Instead, this manual provides examples of typical installations.

Innotech recognises that the installation examples described in this manual may not be in total agreement with the user's requirements. However, information in this document should be used as a guide for all installations, regardless of whether the specific circumstances match the examples given. In all cases, installation personnel should familiarise themselves with the information contained in this section.

NOTE

If required, additional installation recommendations can be provided from Innotech Control Systems Australia upon request.

This section of the technical manual contains the following specific information:

- Electrical Installation Practices of a general nature
- Wiring information for digital controllers (Genesis II Direct Digital Controller, MPCII Mid Points Controller)
- Wiring information for Remote Expansion Modules

3-2 Electrical Installation Practices

This paragraph provides general information which is intended to assist qualified personnel installing the Genesis II Systems. More detailed information for wiring of controllers and expansion modules is contained in subsequent paragraphs. All wiring between the controller/expansion modules and system input/output devices, such as sensors, fans and compressors, must be in accordance with the instructions in the applicable instruction manual or datasheet.

CAUTION

Electrical power to the system must be turned off throughout the installation process. Do not apply power to any part of the system until ready for Commissioning (see Commissioning).

NOTE

If any data presented in this manual disagrees with information in the applicable instruction manual, information in the manufacturer's instruction manual takes precedence. Customers are encouraged to contact Innotech Control Systems Australia for further information or clarification of information presented herein via the contact details at the back of this document.

Cabling plays an important role in the installation of Genesis II Systems. The following general cabling guidelines should be observed:

- In all cases, use electromagnetic-shielded cable for sensor wiring.
- When necessary to protect cabling from physical damage, both shielding and physical protection may be provided by running the cable in a metal conduit. Alternatively, use steel wire armoured (SWA) cable, which also contains an electromagnetic shield.
- Avoid running cables in the vicinity of high voltage power cables or cables carrying switching voltages/currents. This especially applies to sensor signal cables.
- Interconnecting cables must have multi-strand conductors with a cross-sectional area of 1mm^2 for each conductor.
- The earth cable to a Genesis II System enclosures must be a minimum of 2.5mm^2, and wired in accordance with local electrical regulations.
- For Analogue Inputs to the controller, a 16 conductor (0.5mm^2) shielded cable is required.

Table 3-1 provides assistance in determining the cabling requirements for various installation configurations. It shows the dimensions, wire gauge designations and resistance values per unit length for common wire sizes. Use this table to determine specific cabling requirements for your installation.

Table 3-1: Nominal Resistance for Wire Sizes at 20°C

Conductor Area (mm^2)	Diameter (mm)	Nearest SWG or BWG	Nearest AWG	Ohms per 100 metres
0.5	0.80	21	20	3.44
1.0	1.13	18	17	1.72
1.5	1.38	17	15	1.15
2.0	1.60	16	14	0.86
2.5	1.78	15	13	0.69

NOTE

- *1. SWG = Standard Wire Gauge, BWG = British Wire Gauge, AWG = American Wire Gauge.*
- *2. All SWG, BWG and AWG numbers are for the largest wire if a direct equivalent to the mm^2 wire size is not available.*

3-3 Digital Controller Wiring

The following paragraphs contain input/output connection information for the Genesis II Direct Digital Controller and the MPCII Mid Points Controller. The GEN2Config Software, which is used to configure and program the digital controller, automatically produces a wiring diagram and materials list for the specific application. The wiring diagram and materials list can be easily printed and used for reference.

Below is an **example** of a typical computer-generated wiring diagram. A printout of the wiring diagram and materials list is usually provided at the time of hardware delivery. Refer to Figure 3-1.

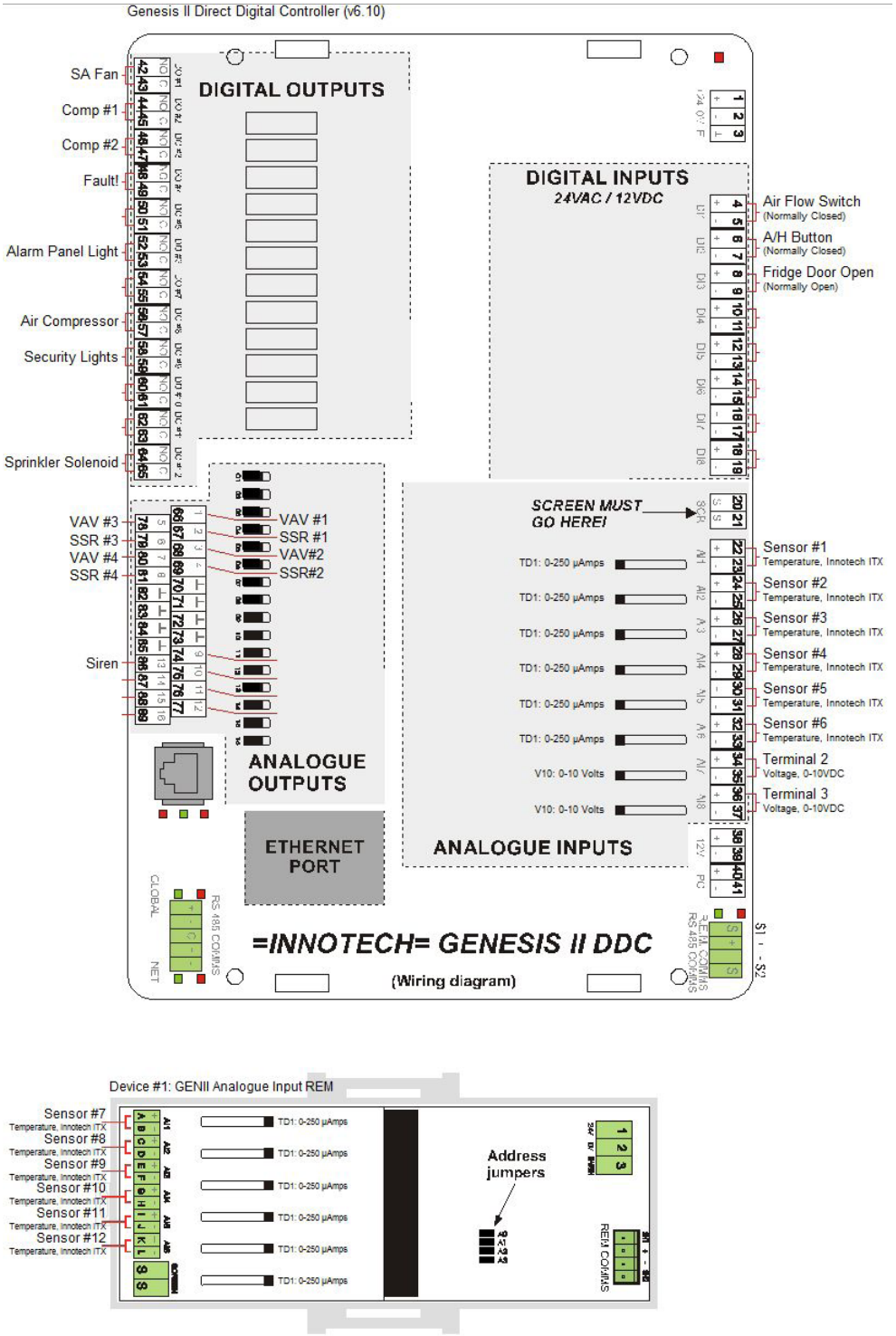

Figure 3-1: Computer Generated Wiring Diagram Example

3-3.1 Genesis II Direct Digital Controller

Figure 3-2 shows the input/output connection groups for the Genesis II Direct Digital Controller. The controller uses Phoenix type plug-in terminal strips located around the controller's perimeter. Both single row and double row terminals are used. Terminals are grouped by function as follows:

- Power Input (3-3.1.1)
- Digital Inputs (3-3.1.2)
- Digital Outputs (3-3.1.3)
- Analogue Inputs (3-3.1.4)
- Analogue Outputs (3-3.1.5)
- Pulse Input (3-3.1.6)
- Remote Expansion Modules (REM) Connector (3-3.1.7)
- RS232 Serial Communications (Comms) Port (Network Installation)
- Optional Ethernet Communications Port (Network Installation)
- Net & Global Commmunications (Comms, RS485) Terminal (Network Installation)

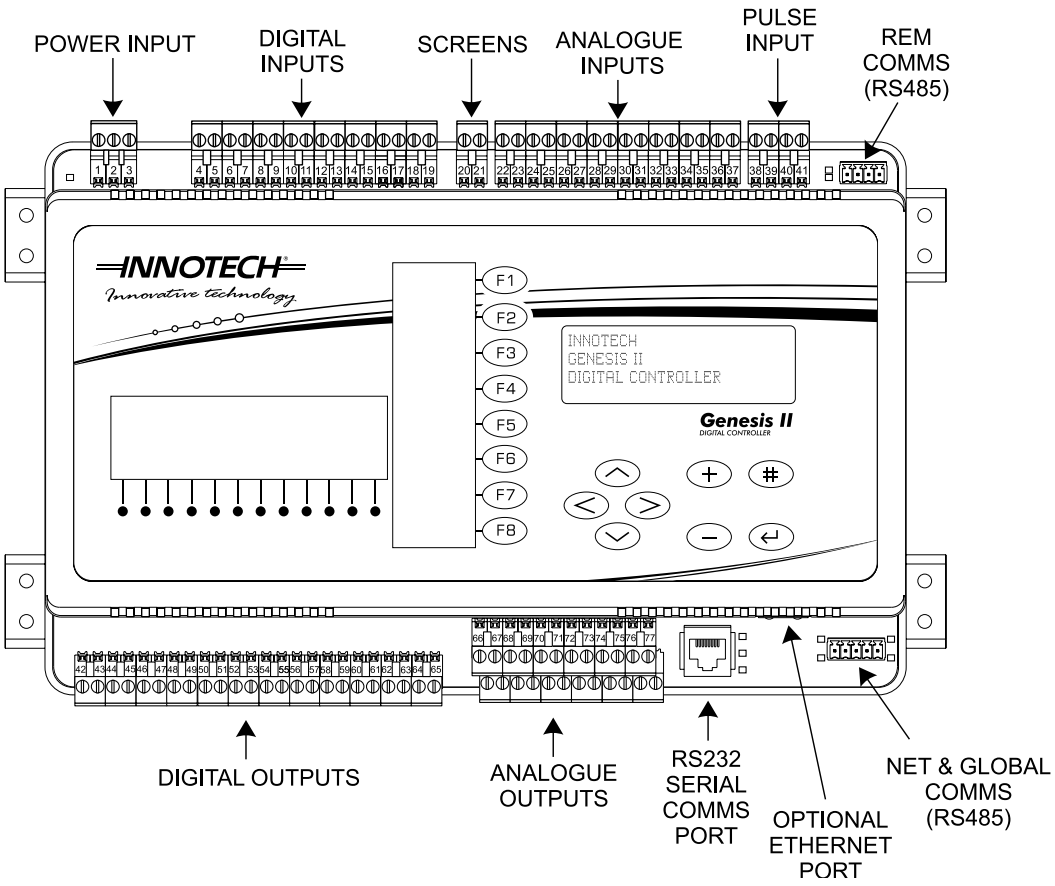

Figure 3-2: Genesis II DDC Input / Output Terminals

3-3.1.1 Power Input

The Genesis II Direct Digital Controller's power requirements are one of the following:

- 24VAC ±10%, 50/60 Hz, Power Consumption: 15 VA.
- 24VDC ±10%, Power Consumption: 8 Watts.

The operating voltage must meet the requirements of Safety Extra Low Voltage (SELV) to EN60730. The transformer used must be a safety transformer in compliance with EN60742 and be designed for 100% duty. It must also be sized and fused in compliance with local safety regulations.

A single transformer may be used to supply voltage to more than one unit (such as a Genesis II Direct Digital Controller and associated Remote Expansion Modules) providing the planned load is well within the transformer's rating. The transformer output terminal designated as AC Neutral must be solidly earthed to the enclosure's main earth link.

Power input terminals are Terminals 1, 2 and 3 and are detailed below in Table 3-2.

Table 3-2: Genesis II DDC Power Input Signal Conditions

Terminal	AC Supply	DC Supply
1	24VAC	+24VDC
2	0VAC (Neutral)	0VDC
3	Earth	Earth

NOTE

Resistance between Terminal 2 and Earth must be 3Ω or less.

3-3.1.2 Digital Inputs

The Genesis II Direct Digital Controller's eight Digital Input channels (Terminals 4 to 19) provide the capability of directly interfacing to digital input signal sources such as pushbutton switches and relay contacts.

Because each Digital Input channel is isolated, the power source for the signal must be external to the controller. This signal source can be AC or DC. If the source is AC, it can be provided by the auxiliary transformer.

Digital input signal power requirements are one of the following:

- 24VAC ±15%
- 24VDC ±15%

There are two terminals associated with each Digital Input channel. If an external DC signal source is used, the even-numbered (left) terminal must be wired as positive and the odd-numbered (right) terminal as negative.

Refer to Table 3-3 for Digital Input terminal number assignments. Signal names assigned to the terminals are DI 1+/- through to DI 8+/-. DI stands for Digital Input, the numeral value represents the channel number and the + or - sign indicates the signal polarity when using a DC signal power source.

Table 3-3: Genesis II DDC Input Signal Conditions

Positive Side		Negative Side	
Terminal	**Signal**	**Terminal**	**Signal**
4	DI 1+	5	DI 1-
6	DI 2+	7	DI 2-
8	DI 3+	9	DI 3-
10	DI 4+	11	DI 4-
12	DI 5+	13	DI 5-
14	DI 6+	15	DI 6-
16	DI 7+	17	DI 7-
18	DI 8+	19	DI 8-

3-3.1.3 Digital Outputs

Each of the Genesis II Direct Digital Controller's twelve digital output channels (Terminals 42–65) consists of a single-pole, double-throw (SPDT) relay. The two terminals assigned to each channel represent the associated relay's Normally Open (NO) and Common (COM) contacts.

Digital output relay contacts are rated at 24VAC, 2A. Good practice is to use pilot relays for the actual switching functions, particularly when it applies to inductive loads such as coils, solenoids and motors. This protects the relays of the Digital Output channel and has the advantage of allowing the pilot relays to be installed adjacent to the controlling switch-gear.

Refer to Table 3-4 for Digital Output terminal number assignments.

Table 3-4: Genesis II DDC Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	**Signal**	**Terminal**	**Signal**
42	DO 1 NO	43	DO 1 COM
44	DO 2 NO	45	DO 2 COM
46	DO 3 NO	47	DO 3 COM
48	DO 4 NO	49	DO 4 COM
50	DO 5 NO	51	DO 5 COM
52	DO 6 NO	53	DO 6 COM
54	DO 7 NO	55	DO 7 COM
56	DO 8 NO	57	DO 8 COM
58	DO 9 NO	59	DO 9 COM
60	DO 10 NO	61	DO 10 COM
62	DO 11 NO	63	DO 11 COM
64	DO 12 NO	65	DO 12 COM

3-3.1.4 Analogue Inputs

The Genesis II Direct Digital Controller's eight Analogue Input channels (Terminals 22-37) allow the direct interface of various analogue inputs, such as Thermistor, 0-10VDC, 0-5VDC and 4-20 mA signals. Each Analogue Input channel is configured to the type of input by the use of Analogue Input Signal Conditioners (AISCs). These are small plug inserts installed during system commissioning (see Commissioning).

IMPORTANT

Special consideration must be made when using loop-powered 4-20 mA inputs. As this type of input draws 20 mA from the Digital Controller, a maximum of two inputs of this type may be used. This type of input must not be used on Remote Expansion Modules.

NOTE

Terminals 20 and 21 are provided for terminating Analogue Cable Screens.

There are two terminals associated with each of the eight Analogue Input channels. Normally, the even-numbered (positive) terminal is used for the active Analogue Input signal from the sensor. The odd-numbered (negative) terminal is used to provide the stimulation for the sensor or a voltage reference (such as 0 Volts) for an active transducer.

Due to the sensitivity of the Analogue Input signals, screened cable must be used. The screens should be terminated at Terminals 20 or 21.

Refer to Table 3-5 for Analogue Input terminal number assignments. Signal names assigned to the terminals are AI1+/- through AI8+/-. AI stands for Analogue Input; the numeral represents the channel number. The + indicates the active signal and the - indicates the signal reference/return.

Table 3-5: Genesis II DDC Analogue Inputs

Active		Reference	
Terminal	**Signal**	**Terminal**	**Signal**
22	AI 1+	23	AI 1-
24	AI 2+	25	AI 2-
26	AI 3+	27	AI 3-
28	AI 4+	29	AI 4-
30	AI 5+	31	AI 5-
32	AI 6+	33	AI 6-
34	AI 7+	35	AI 7-
36	AI 8+	37	AI 8-

3-3.1.5 Analogue Outputs

Sixteen Analogue Output channels are provided. Each channel can be configured, through the Gen2Config software, to operate in either the Variable Mode or the Heat Valve Mode.

In the Variable Mode, the output is a voltage-analogue signal varying from 0 to +10 Volts with a maximum current rating of 5mA. In the Heat Valve Mode, the output signal consists of Pulse-Width Modulated (PWM), 0-10V, high-speed pulses at 5mA.

For a description of PWM as it applies to Heat Valve Operation, refer to the Innotech Genesis II Direct Digital Controller User Manual.

When using PWM outputs, up to three solid state relays, connected in series, may be used on each Heat Valve-configured analogue output channel. See Figure 3-3.

A maximum of eight Analogue Output channels can be applied to Heat Valve operation. For more than eight Heat Valve outputs, it is recommended that Models IHV4002 or IHV4004 for Heat Valves for Solid State Relays or IHV4212, IHV4224 or IHV4214 Staging Heat Valves for Solid State Relays be used. These heat valves are driven by the Digital Controller's Analogue Output channel in the Variable Mode.

For more information on these devices, refer to:

- Datasheet DS3.31 for Type IHV Heat Valves.
- Datasheet DS3.32 for Type IHV42 Heat Valves.

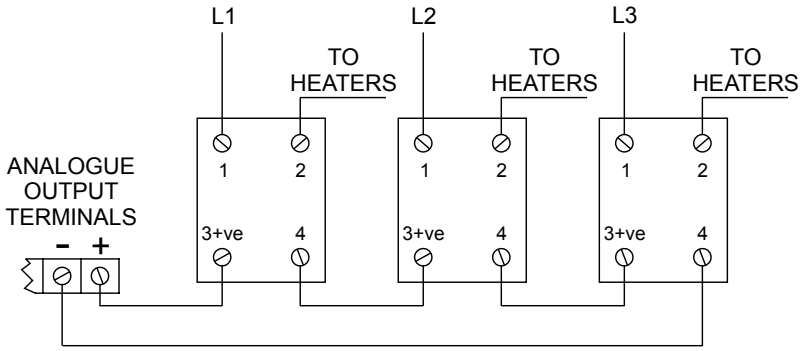

Figure 3-3: Genesis II DDC Driving Multiple Solid State Relays

Refer to Table 3-6 below for Analogue Output terminal numbers. There are 16 Analogue active signal terminals (AO1 through AO16), one for each channel and eight return (Common) terminals. The fewer number of Common terminals is intended to reduce the overall number of terminals.

Cable screening may be terminated into the Screens Terminals (20 and 21), space permitting. Alternatively, all cable screens can be combined by soldering within the slotted cable-routing ducts with a common 1mm^2 earth lead connected to Terminals 20 or 21.

Table 3-6: Genesis II DDC Analogue Outputs

Terminal	Signal	Terminal	Signal
66	AO1	78	AO5
67	AO2	79	AO6
68	AO3	80	AO7
69	AO4	81	AO8
70	Common	82	Common
71	Common	83	Common
72	Common	84	Common
73	Common	85	Common
74	AO9	86	AO13
75	AO10	87	AO14
76	AO11	88	AO15
77	AO12	89	AO16

3-3.1.6 Pulse Counter Inputs

A single, high-speed Digital Input is provided to facilitate the counting of rectangular wave signals (0-10VDC up to 0-24VDC, for pulse frequencies up to 1 kHz). Refer to Table 3-7 for terminal number assignments.

Terminals 38 and 39 provide 24VDC power to the pulse source, if required. Terminals 40 and 41 are the pulse-input terminals. The input is polarity sensitive so it is important that correct polarity be observed.

Table 3-7: Genesis II DDC Pulse Counter Input Terminals

Terminal	Signal
38	+24VDC to Pulse Signal
39	-24VDC to Pulse Signal
40	+ Pulse Input
41	- Pulse Input

3-3.1.7 REM Connector

The Genesis II Direct Digital Controller has the facility for I/O expansion using Remote Expansion Modules (REMs). Each REM provides an array of points which can be connected to a sub-network up to 600 metres in length.

The fifteen REMs can be made up of any mix of the available types with one exception - the MP REM. The MP REM can only be addressed between 1 and 8 and only 8 MP REMS can be used.

The REM connector is a 4 way terminal connection that provides access between the Genesis II Direct Digital Controller and the expansion modules.

The individual REMs are connected to the device by means of an RS485 Comms cabling arrangement, as explained in 3-4 - Wiring of Remote Expansion Modules.

3-3.2 MPCII Mid Points Controller

Figure 3-4 shows the input/output connection groups for the MPCII Mid Points Controller. The MPCII Mid Points Controller uses terminal strips located around the controller's perimeter. Terminals are grouped by function as follows:

- Power Input (3-3.2.1)
- Digital Inputs (3-3.2.2)
- Digital Outputs (3-3.2.3)
- Analogue Inputs (3-3.2.4)
- Analogue Outputs (3-3.2.5)
- Remote Expansion Modules (REM) Connector (3-3.2.6)
- RS232 Serial Communications (Comms) Port (Network Installation)
- Net & Global Communications (Comms, RS485) Terminal (Network Installation)

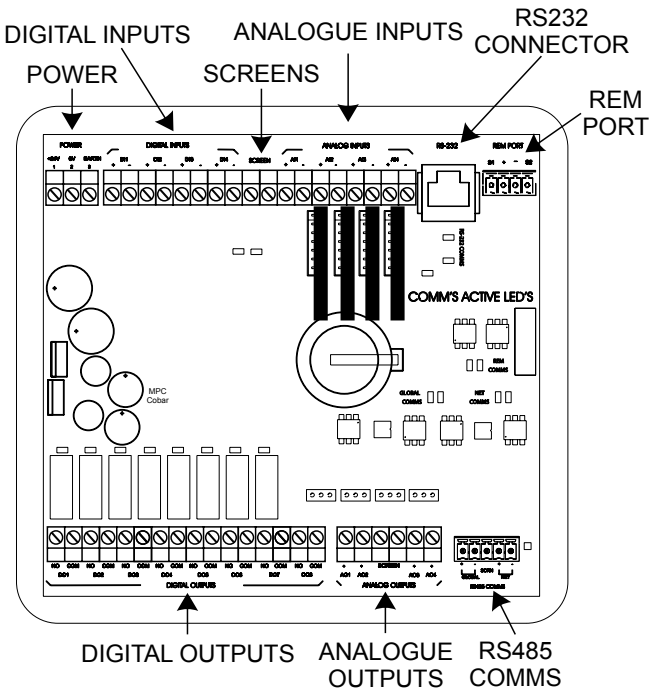

Figure 3-4: MPCII Mid Points Controller Input / Output Terminals

3-3.2.1 Power Input

The MPCII Mid Points Controller's power requirements are one of the following:

- 24VAC ±10%, 50/60Hz, Power Consumption: 7 VA
- 24VDC ±10%, Power Consumption: 4 Watts

The operating voltage must meet the requirements of Safety Extra Low Voltage (SELV) to EN60730. The transformer used must be a safety transformer in compliance with EN60742 and be designed for 100% duty. It must also be sized and fused in compliance with local safety regulations.

A single transformer may be used to supply voltage to more than one unit (such as a MPCII Mid Points Controller and associated Remote Expansion Modules) providing the planned load is well within the transformer's rating. The transformer output terminal designated as AC Neutral must be solidly earthed to the enclosure's main earth link.

Power input terminals are Terminals 1, 2 and 3 and are detailed below in Table 3-8:

Table 3-8: MPCII Mid Points Controller Power Input Signal Conditions

Terminal	AC Supply	DC Supply
1	24VAC	+24VDC
2	0VAC (Neutral)	-24VDC
3	Earth	Earth

NOTE

Resistance between Terminal 2 and Earth must be 3Ω or less.

3-3.2.2 Digital Inputs

The MPCII Mid Points Controller's four Digital Input channels (Terminals 4 to 11) provide the capability of directly interfacing to digital input signal sources such as pushbutton switches and relay contacts.

Because each Digital Input channel is isolated, the power source for the signal must be external to the controller. This signal source can be AC or DC. If the source is AC, it can be provided by the auxiliary transformer.

Digital input signal power requirements are one of the following:

- 24 VAC ±15%
- 12 VDC ±15%

There are two terminals associated with each Digital Input channel. If an external DC signal source is used, the even-numbered (left) terminal must be wired as positive and the odd-numbered (right) terminal as negative.

The MPCII Mid Points Controller's Digital Input terminals are not assigned numbers; however, each Digital Input terminal is clearly labelled as to its polarity and signal name. Signal names assigned to the terminals are DI 1+/- through DI 4+/-.

Refer to Table 3-9 for the MPCII Mid Points Controller's Digital Input Signal Conditions:

Table 3-9: MPCII Mid Points Controller Digital Input Signal Conditions

Positive Side		Negative Side	
Terminal	**Signal**	**Terminal**	**Signal**
DI 1	DI 1+	DI 1	DI 1-
DI 2	DI 2+	DI 2	DI 2-
DI 3	DI 3+	DI 3	DI 3-
DI 4	DI 4+	DI 4	DI 4-

3-3.2.3 Digital Outputs

Each of the MPCII Mid Points Controller's eight digital output channels consists of a single-pole, double-throw (SPDT) relay. The two terminals assigned to each channel represent the associated relay's Normally Open (NO) and Common (COM) contacts.

Digital output relay contacts are rated at 24VAC, 2A (to be supplied by a Class 2 Transformer).

Good practice is to use pilot relays for the actual switching functions, particularly when it applies to inductive loads such as coils, solenoids and motors. This protects the relays of the Digital Output channel and has the advantage of allowing the pilot relays to be installed adjacent to the controlling switch-gear.

The MPCII Mid Points Controller's Digital Output terminals are not assigned numbers; however, each Digital Output terminal is clearly labelled as to its polarity and signal name. Signal names assigned to the terminals are DO 1(NO/COM) through DO 8(NO/COM).

Refer to Table 3-10 for Digital Output terminal number assignments:

Table 3-10: MPCII Mid Points Controller Digital Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	**Signal**	**Terminal**	**Signal**
DO 1	DO 1 NO	DO 1	DO 1 COM
DO 2	DO 2 NO	DO 2	DO 2 COM
DO 3	DO 3 NO	DO 3	DO 3 COM
DO 4	DO 4 NO	DO 4	DO 4 COM
DO 5	DO 5 NO	DO 5	DO 5 COM
DO 6	DO 6 NO	DO 6	DO 6 COM
DO 7	DO 7 NO	DO 7	DO 7 COM
DO 8	DO 8 NO	DO 8	DO 8 COM

3-3.2.4 Analogue Inputs

The MPCII Mid Points Controller's four Analogue Input channels allow the direct interface of various analogue inputs, such as Thermistor, 0-10VDC, 0-5VDC and 4-20mA signals. Each Analogue Input channel is configured to the type of input by the use of Analogue Input Signal Conditioners (AISCs). These are small plug inserts installed during system commissioning (Mechanical Installation).

There are two terminals associated with each of the four analogue input channels. Normally, the even-numbered (positive) terminal is used for the active Analogue Input signal from the sensor. The odd-numbered (negative) terminal is used to provide the stimulation for the sensor or a voltage reference (such as 0 Volts) for an active transducer.

Due to the sensitivity of the Analogue Input signals, screened cable must be used. The screens should be terminated at the Screen Terminals, located between the Digital Input and Analogue Input terminals on the MPCII Mid Points Controller.

The MPCII Mid Points Controller's Analogue Input terminals are not assigned numbers; however, each Analogue Input terminal is clearly labelled as to its polarity and signal name. Signal names assigned to the terminals are AI 1+/- through AI 4+/-.
Refer to Table 3-11 for Analogue Input terminal number assignments.

IMPORTANT

Special consideration must be made when using loop-powered 4-20mA inputs. As this type of input draws 20mA from the Digital Controller, a maximum of two inputs of this type may be used. This type of input must not be used on Remote Expansion Modules.

NOTE

Screen Terminals, located between the Digital Input and Analogue Input terminals on the MPCII Mid Points Controller, are provided for terminating Analogue Cable Screens.

Table 3-11: MPCII Mid Points Controller Analogue Inputs

Active		Reference	
Terminal	Signal	Terminal	Signal
AI 1	AI 1+	AI 1	AI 1-
AI 2	AI 2+	AI 2	AI 2-
AI 3	AI 3+	AI 3	AI 3-
AI 4	AI 4+	AI 4	AI 4-

3-3.2.5 Analogue Outputs

The MPCII Mid Points Controller has four Analogue Output channels. Each channel can be configured, through the Gen2Config Software, to operate in either the Variable Mode or the Heat Valve Mode.

In the Variable Mode, the output is a voltage-analogue signal varying from 0 to +10 Volts with a maximum current rating of 5mA. In the Heat Valve Mode, the output signal consists of Pulse-Width Modulated (PWM), 0-10V, high-speed pulses at 5mA.

For a description of PWM as it applies to Heat Valve Operation, refer to the Innotech MPCII Mid Points Controller User Manual.

When using PWM outputs, up to three solid state relays, connected in series, may be used on each Heat Valve-configured analogue output channel. See Figure 3-5.

For more than four Heat Valve outputs, it is recommended that Models IHV4002 or IHV4004 Heat Valves for Solid State Relays be used. These heat valves are driven by the Digital Controller's Analogue Output channel in the Variable Mode.

For more information on these devices, refer to:

- Datasheet DS3.31 for Type IHV Heat Valves
- Datasheet DS3.32 for Type IHV42 Heat Valves

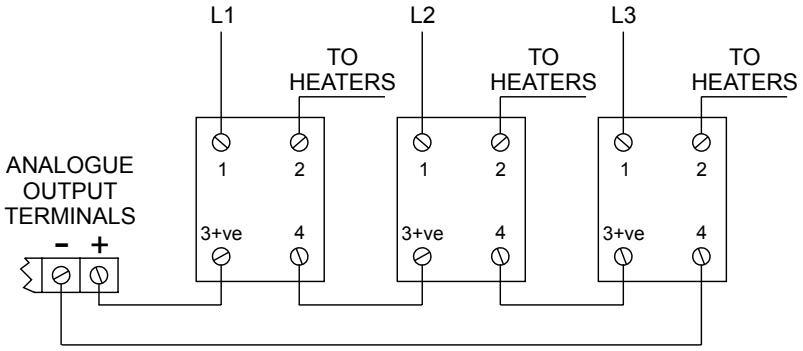

Figure 3-5: MPCII Mid Points Controller Driving Multiple Solid State Relays

There are four analogue active signal terminals (AO1 through AO4), one for each channel and two return (Common) terminals. The fewer number of Common terminals is intended to reduce the overall number of terminals.

Cable screening may be terminated into the provided Analogue Output Screens, space permitting. Alternatively, all cable screens can be combined by soldering within the slotted cable-routing ducts with a common 1mm^2 earth lead connected to the Analogue Output Screens.

Refer to Table 3-12 for Analogue Output terminal number assignments:

NOTE

Screen Terminals, located between the Analogue Output terminals AO 2 and AO 3 on the MPCII Mid Points Controller, are provided for terminating Analogue Output Cable Screens.

Table 3-12: MPCII Mid Points Controller Analogue Outputs

Terminal	Signal	Terminal	Signal
AO 1	AO 1+	38	AO 1-
AO 2	AO 2+	39	AO 2-
Screen	Common	40	Common
Screen	Common	41	Common
AO 3	AO 3+	42	AO 3-
AO 4	AO 4+	43	AO 4-

3-3.2.6 REM Connector

The MPCII Mid Points Controller has the facility for I/O expansion using Remote Expansion Modules (REMs). Each REM provides an array of points which can be connected to a sub network up to 600 metres in length.

The fifteen REMs can be made up of any mix of the available types with one exception - the MP REM. The MP REM can only be addressed between 1 and 8 and only 8 MP REMS can be used.

The REM connector is a 4 way terminal connection that provides access between the MPCII Mid Points Controller and the expansion modules.

The individual REMs are connected to the device by means of an RS485 Comms cabling arrangement, as explained below in 3-4 Wiring of Remote Expansion Modules.

3-4 Wiring of Remote Expansion Modules

The following paragraphs contain wiring information for the following types of Remote Expansion Modules (REMs) used in the Genesis II System:

Communication between the Genesis II Direct Digital Controller or MPCII Mid Points Controller and REMs is by way of a RS485 cable connected between the dedicated REM network socket on the digital controller and the REM network.

The method for connecting the modules to electrical power and to the RS485 Comms cable system is similar for most of the different types of modules, except where otherwise noted. The following two paragraphs provide detailed instructions for connecting electrical power and the RS485 system, respectively.

3-4.1 REM Power Connections

Power requirements are 24VAC, ±10% at 50/60 Hz. Refer to the appropriate paragraph below for the physical location of the power connection block within each type of REM. At the power connection block, the 24VAC power terminals are:

- Terminal 1 = 24VAC Supply
- Terminal 2 = 0VAC Supply
- Terminal 3 = Earth

Terminal 3 is for the protection of the RS485 Comms circuitry and must be connected to a good, electrically bonded earth. This may be the earth bus bar of the switchboard or the point that connects the chassis of the equipment the module is located in. This connection is independent of and in addition to the earthed AC Neutral at Terminal 2.

CAUTION

Do not connect Terminal 3 to Terminal 2.

3-4.2 REM Comms Connections

The RS485 Comms link between the Genesis II Direct Digital Controller and REMs, or the MPCII Mid Points Controller and REMs, is designed to allow reliable communications over long distances in electrically adverse signal conditions.

The following guidelines, which are common to all REMs, should be followed when installing the RS485 Comms network:

- Cables used for RS485 Comms must be shielded, single twisted pair, 120 Ohms characteristic impedance with 36 to 45 picoFarads per metre capacitance between conductors.
- The RS485 Comms cable must be organised as a bus topology. See 5-3.3 for a description of bus topology. To connect a module to the RS485 cable, the cable is cut at the point the module is to be connected. Then, the two new cable ends are wired into the module. The two shields are then terminated at terminals marked SHLD1 and SHLD2 respectively. "Stub" connections are not allowed in the bus topology configuration.
- The cable run between the digital controller and any other REM must not exceed 600 metres in length.

On most units, the RS485 Comms connection block contains four terminals. The four terminals on the standard RS485 connection block are:

- **S1** Screen of Cable Number 1
- **+** Positive Comms Line
- **-** Negative Comms Line
- **S2** Screen of Cable Number 2

The four-terminal arrangement accommodates the use of one or two RS485 Comms cables. A single cable connection is used when the module is located at the end of the network and two cable connections are used when the REM is connected to a point in the cable network other than the end.

An End of Cable Jumper plug near the RS485 connection block provides the proper termination impedance for the Comms line. If only single RS485 Comms cable is connected to the module, the End of Cable Jumper must be installed. If two cables are fitted, the End of Cable Jumper must be removed.

IMPORTANT

The RS485 Comms System will not function properly if the connection polarities are incorrect. Ensure correct polarity of the connections throughout the length of the Comms Cable.

Figure 3-6 shows how to connect a two-cable Comms network to a module. If the module has only one RS485 Comms cable connected to it, the cable screen must be connected to S1. If two Comms cables are fitted, the screen of the second cable must be connected to the S2 terminal. Screens must not be connected to each other.

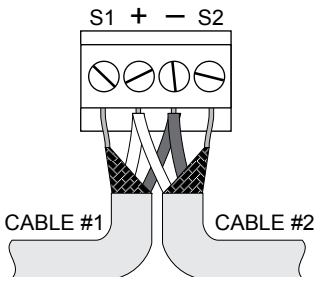

Figure 3-6: RS485 Comms Cable Connections

3-4.3 GENII AI REM Analogue Input Module

The GENII AI REM Analogue Input Module (Figure 3-7) is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 4 VA maximum.

The GENII AI REM provides for six analogue inputs from field equipment. Each Analogue Input circuit has a socket for fitting an Analogue Input Signal Conditioner (AISC), which defines the input type and range selection. Installing the AISCs is part of the commissioning process and is explained in the Commissioning chapter.

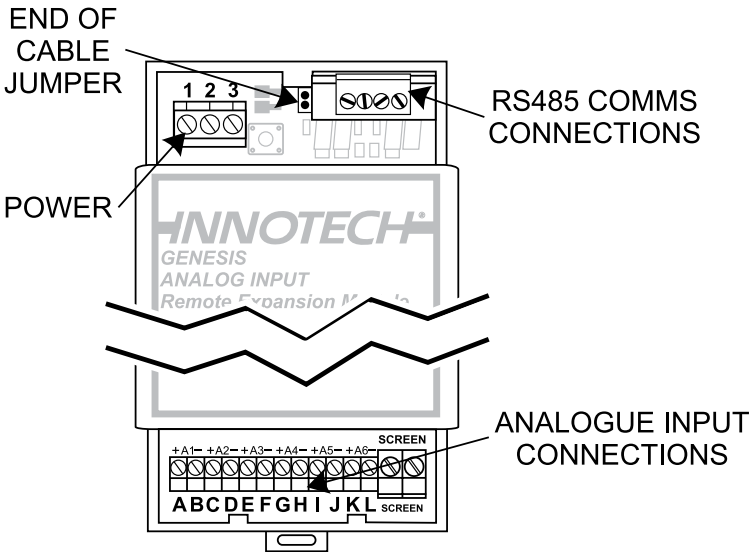

Figure 3-7: GenII AI REM Analog Input Module

The RS485 Comms connection block is in the upper right section of the module and the End of Cable Jumper is next to it.

Analogue Input terminals for the GENII AI REM are listed in Table 3-13. Analogue Input cables should be run using twisted pair, shielded cable. The screens are to be connected to either of the two terminals marked SCREEN.

Table 3-13: GenII AI REM Analog Input Signal Conditions

Active		Reference	
Terminal	**Signal**	**Terminal**	**Signal**
A	AI 1+	B	AI 1-
C	AI 2+	D	AI 2-
E	AI 3+	F	AI 3-
G	AI 4+	H	AI 4-
I	AI 5+	J	AI 5-
K	AI 6+	L	AI 6-
Screen	Common Screens	Commons Screens	Commons Screens

3-4.4 GENII AO REM Analogue Output Module

The GENII AO REM Analogue Output Module (Figure 3-8) is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 4VA maximum.

The GENII AO REM provides up to five Analogue Outputs to be connected to field equipment. Jumpers on the board allow for either Linear 0-10V (maximum load 2mA) or PWM 10Vpp (maximum load 2mA) output settings for each channel.

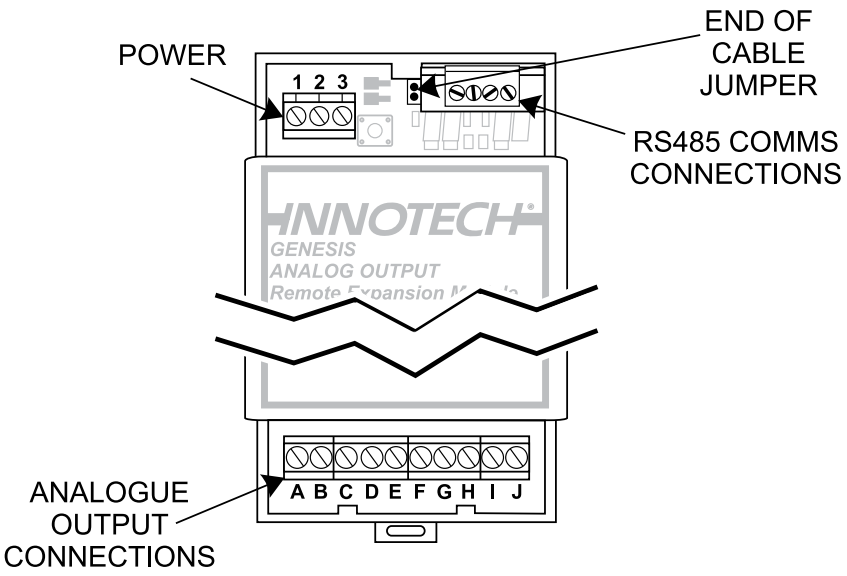

Figure 3-8: GENII AO REM Analogue Output Module

The RS485 Comms connection block is in the upper right section of the module and the End of Cable Jumper is next to it.

Analogue Output terminals are located at the bottom of the module; output signal connections are listed below in Table 3-14. Analogue Output cables should be run using twisted pair shielded cable. The screens should be connected to the signal's negative output terminal (B, D, F, H or J) in each case.

Table 3-14: GENII AO REM Analogue Output Signal Conditions

Terminal	Signal	Terminal	Signal
A	AO 1+	B	AO 1-
C	AO 2+	D	AO 2-
E	AO 3+	F	AO 3-
F	AO 4+	H	AO 4-
I	AO 5+	J	AO 5-

3-4.5 GENII DI REM Digital Input Module

The GENII DI REM Digital Input Module (Figure 3-9) is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 4VA maximum.

The GENII DI REM provides 8 dry contact closure switches (inputs provide 5VDC that is shorted to common when the input is closed) to sense contact closures from field equipment.

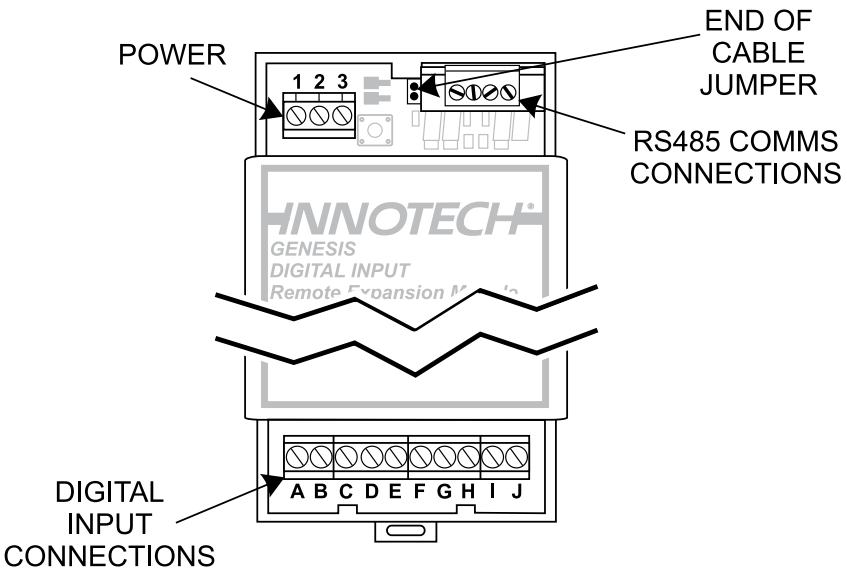

Figure 3-9: GENII DI REM Digital Input Module

The RS485 Comms connection block is in the upper right section of the module and the End of Cable Jumper is next to it.

Digital Input terminals are located at the bottom of the module; input signal connections are listed in Table 3-15.

Table 3-15: GENII DI REM Digital Input Signal Conditions

Terminal	Signal
A	DI 1+
B	DI 2+
C	DI 3+
D	DI 4+
E	DI 5+
F	DI 6+
G	DI 7+
H	DI 8+
I	Common
J	Common

3-4.6 GENII DO REM Relay Output Module

The GENII DO REM Relay Output Module (Figure 3-10) is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 4VA maximum.

The GENII DO REM provides 5 Relay Outputs (2A @ 24VAC – Normally open contacts) to control or switch field equipment.

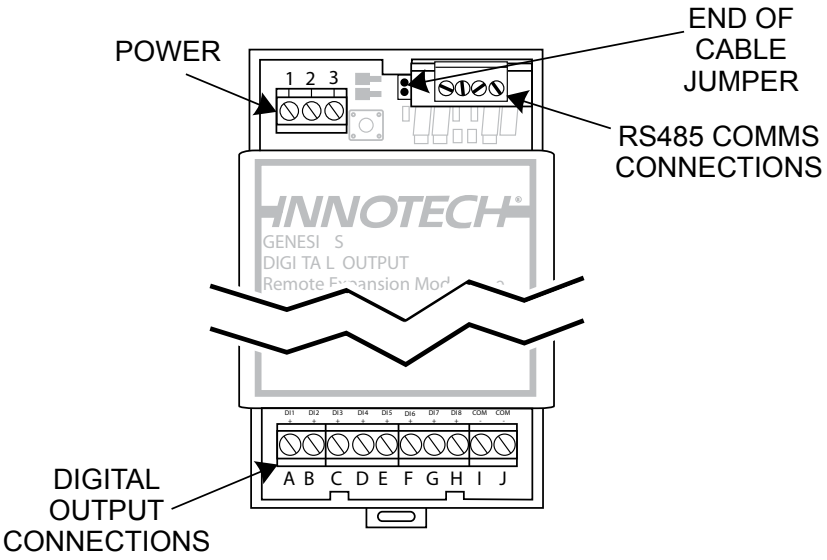

Figure 3-10: GENII DO REM Relay Output Module

The RS485 Comms connection block is in the upper right section of the module and the End of Cable Jumper is next to it.

Digital Output terminals are located at the bottom of the module; input signal connections are listed in Table 3-16.

Table 3-16: GENII DO REM Relay Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	**Signal**	**Terminal**	**Signal**
A	NO Relay 1	B	COM Relay 1
C	NO Relay 2	D	COM Relay 2
E	NO Relay 3	F	COM Relay 3
G	NO Relay 4	H	COM Relay 4
I	NO Relay 5	J	COM Relay 5

3-4.7 GENII IDI REM Opto Isolated Digital Input Module

The GENII IDI REM Opto Isolated Digital Input Module (Figure 3-11) is powered by 24VAC ±10% @ 50/60Hz. Power Consumption is 4VA maximum.

The GENII IDI REM provides 5 opto isolated digital inputs to sense signals from field equipment. The voltage detection range is 12 to 24 volts AC or DC.

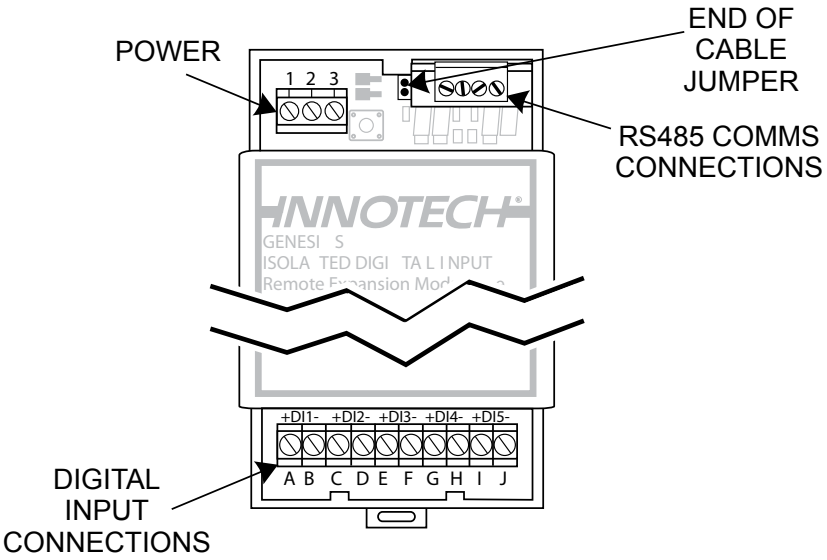

Figure 3-11: GENII IDI REM Opto Isolated Digital Input Module

Table 3-17: GEN II IDI REM Opto Isolation Digital Input Signal Conditions

Active		Reference	
Terminal	**Signal**	**Terminal**	**Signal**
A	DI 1 +	B	DI 1 -
C	DI 2 +	D	DI 2 -
E	DI 3 +	F	DI 3 -
G	DI 4 +	H	DI 4 -
I	DI 5 +	J	DI 5 -

3-4.8 GENII PI REM Pulse Input Module

The GENII PI REM Pulse Input Module (Figure 3-12) is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 4 VA maximum.

The GENII PI REM provides 5 opto isolated digital inputs to sense pulsed signals from field equipment. The voltage detection range is 12 to 24VDC. The GENII PI REM detects pulses with a minimum on time of 20ms, with a minimum off time of 20ms, which gives a maximum of 25 pulses per second.

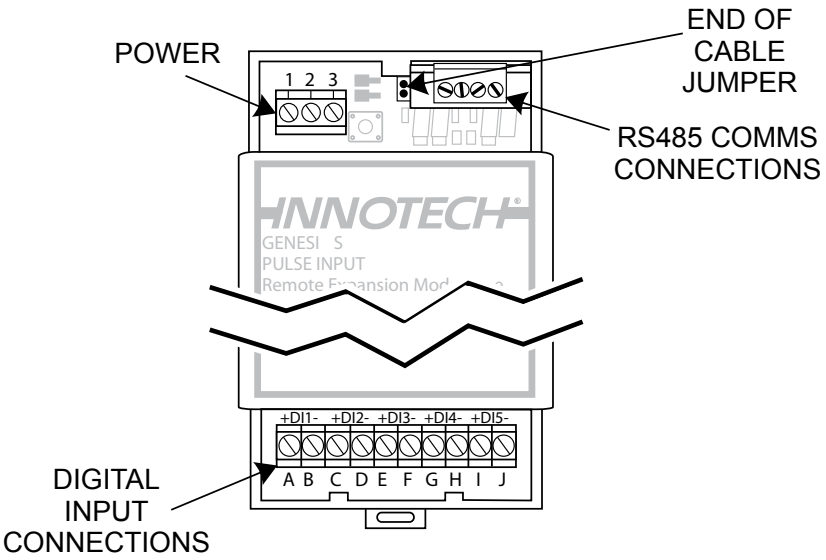

Figure 3-12: GENII PI REM Pulse Input Module

The RS485 Comms connection block is in the upper right section of the module and the End of Cable Jumper is next to it.

Digital Input terminals are located at the bottom of the module; input signal connections are listed in Table 3-18.

Table 3-18: GENII PI REM Pulse Input Signal Conditions

Active		Reference	
Terminal	**Signal**	**Terminal**	**Signal**
A	DI 1 +	B	DI 1 -
C	DI 2 +	D	DI 2 -
E	DI 3 +	F	DI 3 -
G	DI 4 +	H	DI 4 -
I	DI 5 +	J	DI 5 -

3-4.9 GENII MZS REM Multi Zone Station Module

The GENII MZS REM Multi Zone Station Module (Figure 3-13) is powered by 24VAC ±10% @ 50/60Hz. Power Consumption is 3VA maximum.

The GENII MZS REM mounts into a standard electrical wall plate. The only connections to the GENII MSZ REM are 24VDC power and the RS485 Comms link. Locations of electrical terminals are shown in Figure 3-13, which is a rear view of the module.

When all connections have been made, protect the module from dirt and moisture by covering it with plastic but do not mount the module in the wall plate until commissioning is completed. This is to allow addresses to be set as part of the commissioning process.

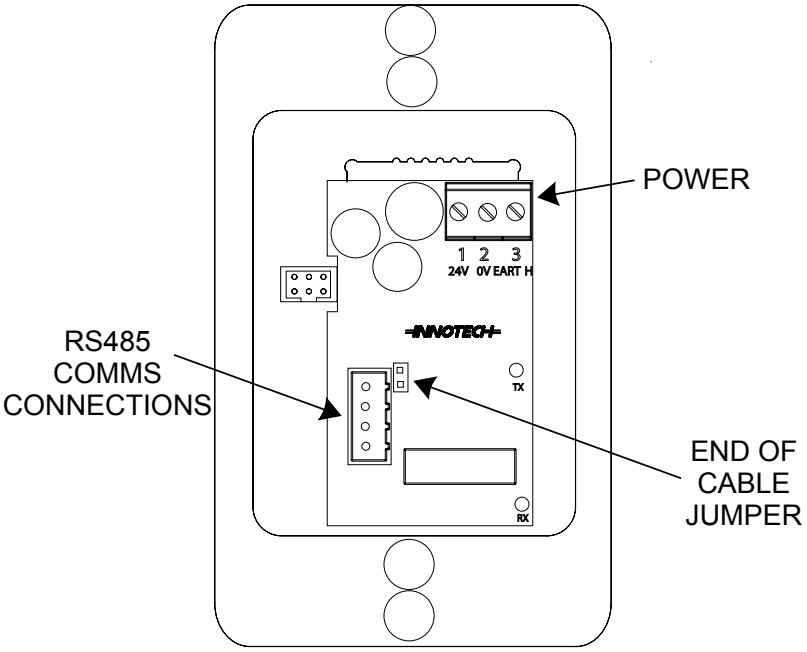

Figure 3-13: GENII MZS REM Multizone Station Module

3-4.10 GENII MZSAH REM Multi Zone Station A/H Module

The GENII MZSAH REM Multi Zone Station A/H Module is powered by 24VAC ±10% @ 50/60Hz. Power Consumption is 3VA maximum.

The GENII MZSAH REM mounts into a standard electrical wall plate. The only connections to the GENII MZSAH REM are 24VAC power and the RS485 Comms link. Locations of electrical terminals are shown in Figure 3-14, which is a rear view of the module.

When all connections have been made, protect the module from dirt and moisture by covering it with plastic but do not mount the module in the wall plate until commissioning is completed. This is to allow addresses to be set as part of the commissioning process.

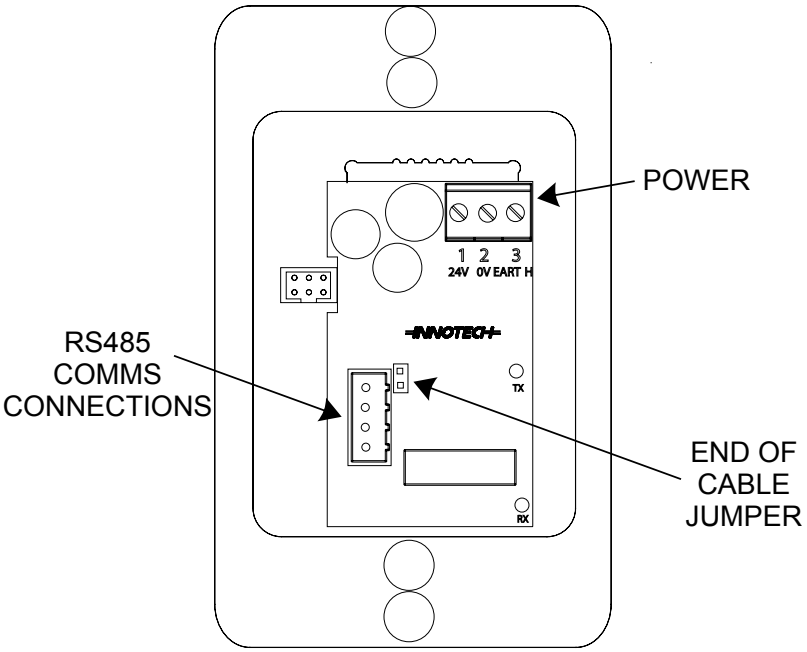

Figure 3-14: GENII MZSAH REM Multizone Station A/H Module

3-4.11 GENII CS REM Control Station Module

The GENII CS REM Control Station Module is powered by 24VAC ±10% @ 50/60Hz. Power Consumption is 3 VA maximum.

The GENII CS REM mounts into a standard electrical wall plate. The only connections to the GENII CS REM are 24VAC power and the RS485 Comms link. Locations of electrical terminals are shown in Figure 3-15, which is a rear view of the module.

When all connections have been made, protect the module from dirt and moisture by covering it with plastic but do not mount the module in the wall plate until commissioning is completed. This is to allow addresses to be set as part of the commissioning process.

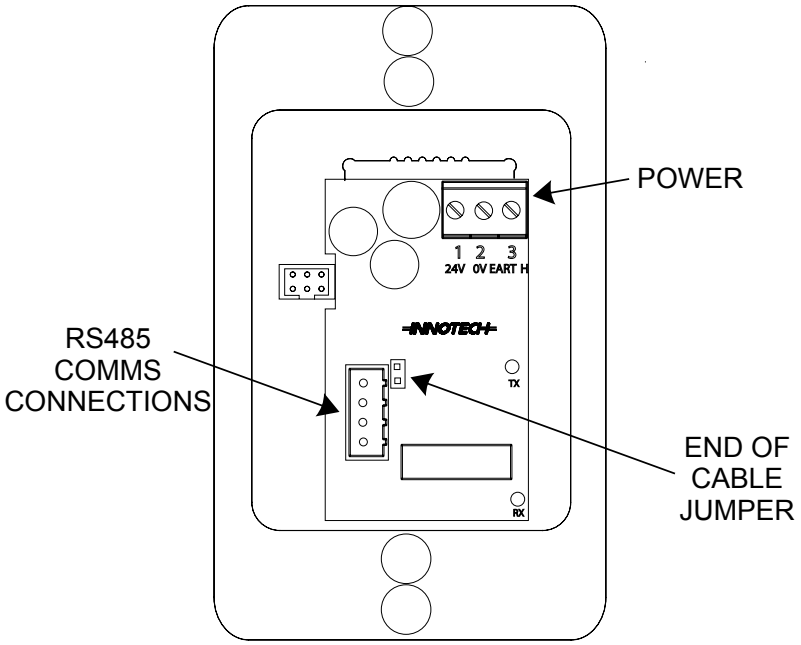

Figure 3-15: GENII CS REM Control Station Module

3-4.12 GENII CSAH REM Control Station A/H Module

The GENII CSAH REM is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 3VA maximum.

The GENII CSAH REM mounts into a standard electrical wall plate. The only connections to the GENII CSAH REM are 24VAC power and the RS485 Comms link. Locations of electrical terminals are shown in Figure 3-16, which is a rear view of the module.

When all connections have been made, protect the module from dirt and moisture by covering it with plastic but do not mount the module in the wall plate until commissioning is completed. This is to allow addresses to be set as part of the commissioning process.

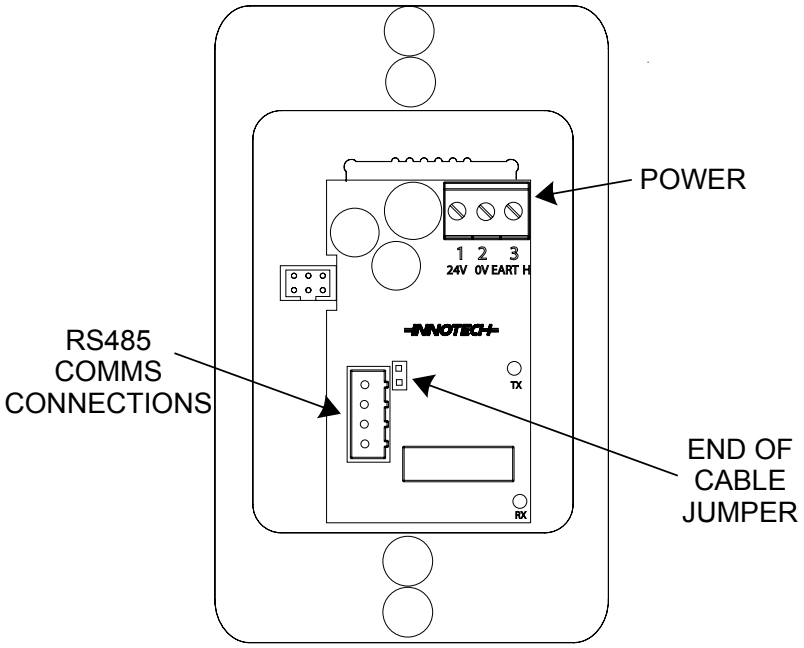

Figure 3-16: GENII CSAH REM Control Station A/H Module

3-4.13 GENII CSFCAH REM Control Station Fan Control A/H Module

The GENII CSFCAH REM Control Station Fan Control, A/H Module is powered by 24VAC ±10% @ 50/60 Hz. Power Consumption is 3VA maximum.

The GENII CSFCAH REM mounts into a standard electrical wall plate. The only connections to the GENII CSFCAH REM are 24VAC power and the RS485 Comms link. Locations of electrical terminals are shown in Figure 3-17, which is a rear view of the module.

When all connections have been made, protect the module from dirt and moisture by covering it with plastic but do not mount the module in the wall plate until commissioning is completed. This is to allow addresses to be set as part of the commissioning process.

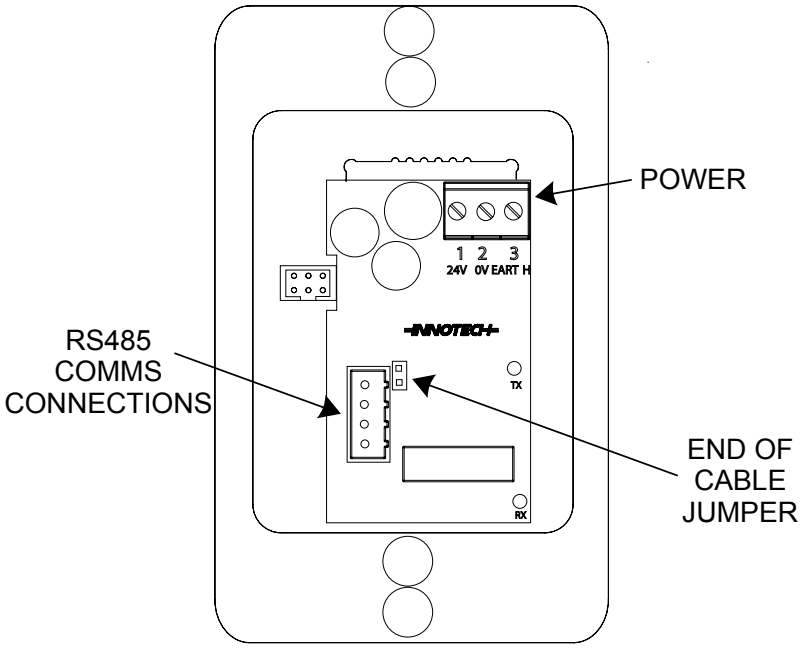

Figure 3-17: GENII CSFCAH REM Control Station Fan Control, A/H Module

3-4.14 GENII MP405 REM Multipoint Module

The Innotech GENII MP405 REM Multipoint Module is a remote expansion device that has both input and output expansion capabilities. The GENII MP405 REM provides relay outputs for distributed control, digital inputs for status detection and Thermistor inputs for temperature measurement.

The GENII MP405 REM (Figure 3-18) is powered by 24VAC ±10% @ 50/60 Hz, or powered by 24VDC ±15%. Power Consumption is 4VA maximum.

Inputs:

- 10 kΩ thermistor temperature sensor.
- 4 x 24VAC or DC Isolated switched contact digital inputs.

Outputs:

- 5 x 24VAC or DC Relay Outputs, Normally Open contacts. Rated at 16 Amp Resistive, 6 Amp Inductive.

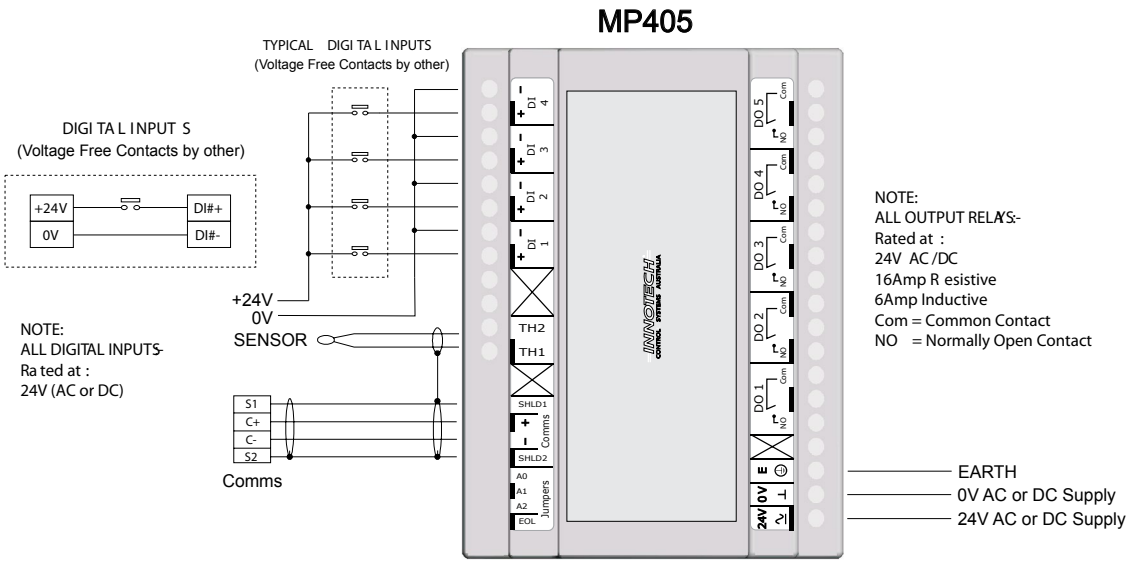

Figure 3-18: GENII MP405 REM Multipoint Module

The RS485 Comms connection block is in the lower-left section of the module (as illustrated above) and the End of Cable Jumper is next to it.

IMPORTANT

The unit must be powered down before jumpers are altered. Anti-static precautions should be taken when changing addresses or adding or removing cabling from the terminals.

I/O Terminal Connections for the GENII MP405 REM Multipoint Module are listed in Table 3-19 and Table 3-20.

Table 3-19: GENII MP405 REM Input Signal Conditions

Signal	Positive Terminal	Negative Terminal
Thermistor	TH1	TH2
Digital Input 1	DI 1+	DI 1-
Digital Input 2	DI 2+	DI 2-
Digital Input 3	DI 3+	DI 3-
Digital Input 4	DI 4+	DI 4-

Table 3-20: GENII MP405 REM Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	Signal	Terminal	Signal
DO 1	NO Relay 1	DO 1	COM Relay 1
DO 2	NO Relay 2	DO 2	COM Relay 2
DO 3	NO Relay 3	DO 3	COM Relay 3
DO 4	NO Relay 4	DO 4	COM Relay 4
DO 5	NO Relay 5	DO 5	COM Relay 5

3-4.15 GENII MP414 REM Multipoint Module

The Innotech GENII MP414 REM Multipoint Module is a remote expansion device that has both input and output expansion capabilities. The GENII MP414 REM provides relay outputs for distributed control, digital inputs for status detection and Thermistor inputs for temperature measurement.

The GENII MP414 REM (Figure 3-19) is powered by 24VAC ±10% @ 50/60Hz, or powered by 24VDC ±15%. Power Consumption is 4 VA maximum.

Inputs:

- 10 kΩ thermistor temperature sensor.
- 4 x 24VAC or DC Isolated switched contact digital inputs.

Outputs:

- 4 x 24VAC or DC Relay Outputs, Normally Open contacts. Rated at 16 Amp Resistive, 6 Amp Inductive.
- 1 x Analogue Output, 0-10VDC ±0.05V into > 2 kΩ load.

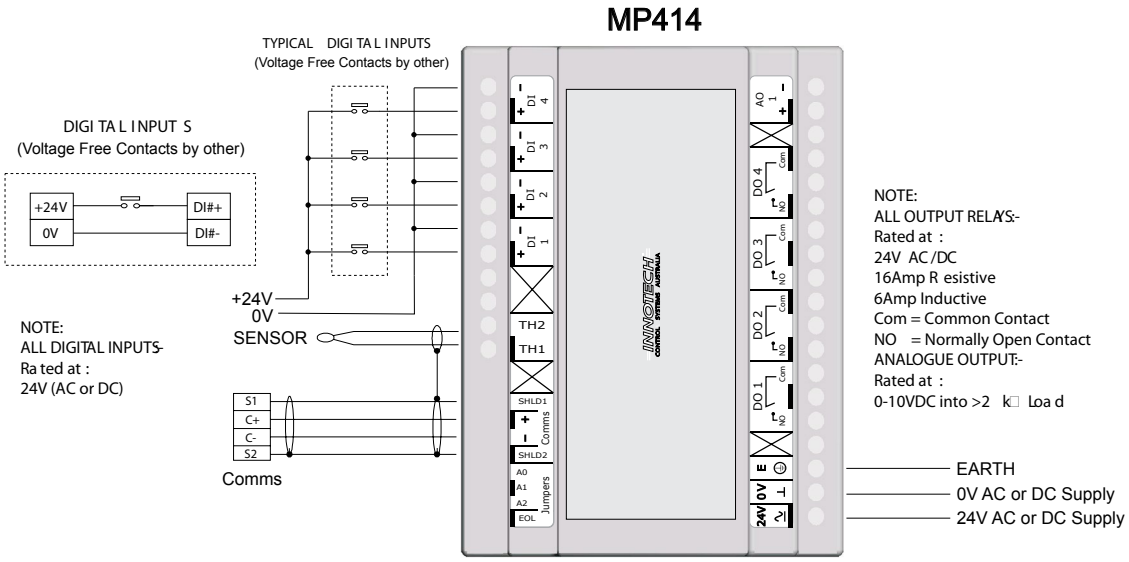

Figure 3-19: GENII MP414 REM Multipoint Module

The RS485 Comms connection block is in the lower-left section of the module (as illustrated above) and the End of Cable Jumper is next to it.

IMPORTANT

The unit must be powered down before jumpers are altered. Anti-static precautions should be taken when changing addresses or adding or removing cabling from the terminals.

I/O Terminal Connections for the GENII MP414 REM Multipoint Module are listed in Table 3-21 and Table 3-22.

Table 3-21: GENII MP414 REM Input Signal Conditions

Signal	Positive Terminal	Negative Terminal
Thermistor	TH1	TH2
Digital Input 1	DI 1+	DI 1-
Digital Input 2	DI 2+	DI 2-
Digital Input 3	DI 3+	DI 3-
Digital Input 4	DI 4+	DI 4-

Table 3-22: GENII MP414 REM Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	Signal	Terminal	Signal
DO 1	NO Relay 1	DO 1	COM Relay 1
DO 2	NO Relay 2	DO 2	COM Relay 2
DO 3	NO Relay 3	DO 3	COM Relay 3
DO 4	NO Relay 4	DO 4	COM Relay 4
AO 1	AO 1+	AO 1	AO 1- & Screen

3-4.16 GENII MP423 REM Multipoint Module

The Innotech GENII MP423 REM Multipoint Module is a remote expansion device that has both input and output expansion capabilities. The GENII MP423 REM provides relay outputs for distributed control, digital inputs for status detection and Thermistor inputs for temperature measurement.

The GENII MP423 REM (Figure 3-20) is powered by 24VAC ±10% @ 50/60 Hz, or powered by 24VDC ±15%. Power Consumption is 4 VA maximum.

Inputs:

- 10 kΩ thermistor temperature sensor.
- 4 x 24VAC or DC Isolated switched contact digital inputs.

Outputs:

- 3 x 24VAC or DC Relay Outputs, Normally Open contacts. Rated at 16 Amp Resistive, 6 Amp Inductive.
- 2 x Analogue Output, 0-10V DC ±0.05V into > 2 kΩ load.

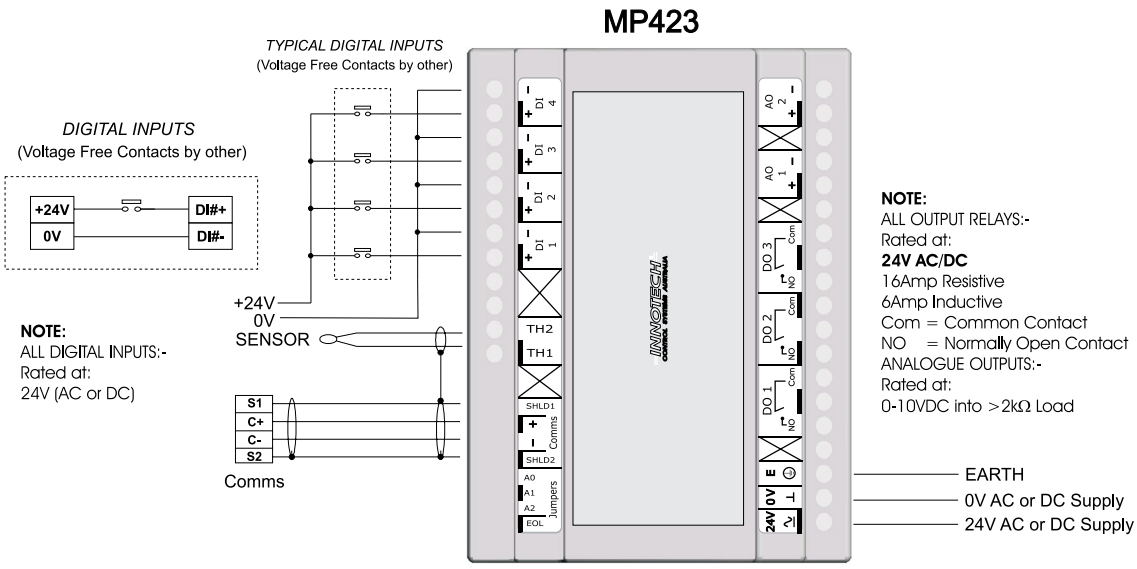

Figure 3-20: GENII MP423 REM Multipoint Module

The RS485 Comms connection block is in the lower-left section of the module (as illustrated above) and the End of Cable Jumper is next to it.

IMPORTANT

The unit must be powered down before jumpers are altered. Anti-static precautions should be taken when changing addresses or adding or removing cabling from the terminals.

I/O Terminal Connections for the GENII M423 REM Multipoint Module are listed in Table 3-23 and Table 3-24.

Table 3-23: GENII MP423 REM Input Signal Conditions

Signal	Positive Terminal	Negative Terminal
Thermistor	TH1	TH2
Digital Input 1	DI 1+	DI 1-
Digital Input 2	DI 2+	DI 2-
Digital Input 3	DI 3+	DI 3-
Digital Input 4	DI 4+	DI 4-

Table 3-24: GENII MP423 REM Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	Signal	Terminal	Signal
DO 1	NO Relay 1	DO 1	COM Relay 1
DO 2	NO Relay 2	DO 2	COM Relay 2
DO 3	NO Relay 3	DO 3	COM Relay 3
AO 1	AO 1+	AO 1	AO 1- & Screen
AO 2	AO 2+	AO 2	AO 2- & Screen

3-4.17 GENII MP432 REM Multipoint Module

The Innotech GENII MP432 REM Multipoint Module is a remote expansion device that has both input and output expansion capabilities. The GENII MP432 REM provides relay outputs for distributed control, digital inputs for status detection and Thermistor inputs for temperature measurement.

The GENII MP432 REM (Figure 3-21) is powered by 24VAC ±10% @ 50/60Hz, or powered by 24VDC ±15%. Power Consumption is 4 VA maximum.

Inputs:

- 10kΩ thermistor temperature sensor.
- 4 x 24VAC or DC Isolated switched contact digital inputs.

Outputs:

- 2 x 24VAC or DC Relay Outputs, Normally Open contacts. Rated at 16 Amp Resistive, 6 Amp Inductive.
- 3 x Analogue Output, 0-10VDC ±0.05V into > 2 kΩ load.

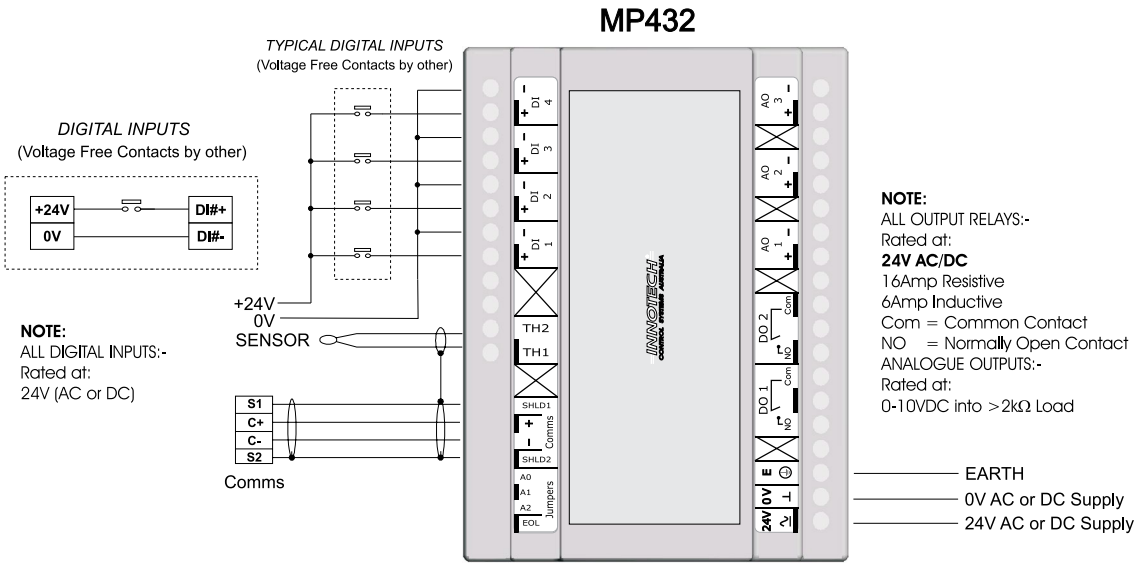

Figure 3-21: GENII MP432 REM Multipoint Module

The RS485 Comms connection block is in the lower-left section of the module (as illustrated above) and the End of Cable Jumper is next to it.

IMPORTANT

The unit must be powered down before jumpers are altered. Anti-static precautions should be taken when changing addresses or adding or removing cabling from the terminals.

I/O Terminal Connections for the GENII M432 REM Multipoint Module are listed in Table 3-25 and Table 3-26.

Table 3-25: GENII MP432 REM Input Signal Conditions

Signal	Positive Terminal	Negative Terminal
Thermistor	TH1	TH2
Digital Input 1	DI 1+	DI 1-
Digital Input 2	DI 2+	DI 2-
Digital Input 3	DI 3+	DI 3-
Digital Input 4	DI 4+	DI 4-

Table 3-26: GENII MP432 REM Output Signal Conditions

Normally Open (NO)		Common (COM)	
Terminal	Signal	Terminal	Signal
DO 1	NO Relay 1	DO 1	COM Relay 1
DO 2	NO Relay 2	DO 2	COM Relay 2
AO 1	AO 1+	AO 1	AO 1- & Screen
AO 2	AO 2+	AO 2	AO 2- & Screen
AO 3	AO 3+	AO 3	AO 3- & Screen

3-4.18 GENII WMI Wireless Module Interface

The Innotech GENII WMI Wireless Module Interface is a remote expansion for the Genesis II Direct Digital Controller or MPCII Mid Points Controller. The GENII WMI provides an interface to the SENRx series of wireless temperature sensors.

The GENII WMI (Figure 3-22) is powered by 24VAC ±10% @ 50/60Hz. Power Consumption is 4 VA maximum.

There are no inputs or outputs on a GENII WMI. It is designed to receive the input data from any SENRx modules located up to 20 metres away (depending on obstructions).

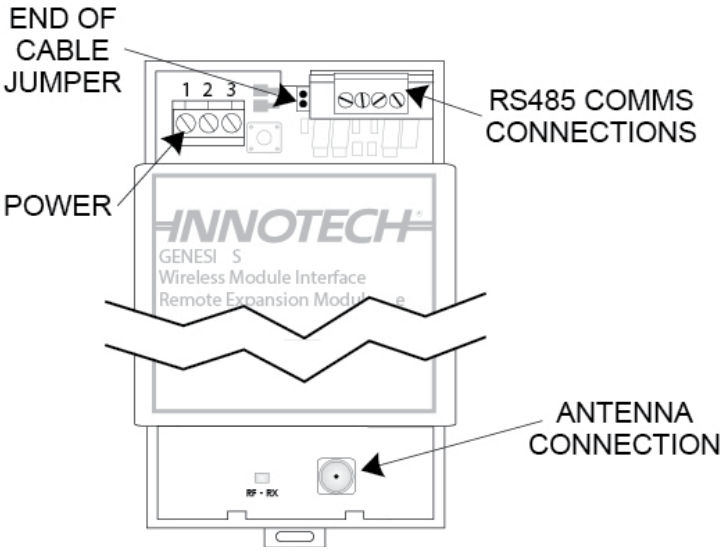

Figure 3-22: GENII WMI Wireless Module Interface

The RS485 Comms connection block is in the upper right section of the module and the End of Cable Jumper is next to it (Figure 3-22).

The Cable run between the Genesis II Direct Digital Controller and GENII WMI, or MPCII Mid Points Controller and GENII WMI, should not exceed 600 metres. The Comms wiring requires cable especially suited for RS485. Other shielded cable is not suitable and may cause spasmodic Comms failures.

The GENII WMI should be mounted within a 20 metre radius (depending on obstructions) of all SENRx modules from which it will be receiving data (Figure 3-23). The location should be dry, clean and free of excess vibration.

GENII WMI modules operate within the 2.4-2.5 GHz worldwide unlicensed Industrial-Scientific-Medical (ISM) frequency band.

There are four jumpers located in a row on the GENII WMI, labelled F0, F1, F2 and F3. These select the frequency channel to use within the 2.4-2.5 GHz range. Typically, these jumpers need only be changed if multiple GENII WMIs are used, or in areas with poor reception or strong interference.

IMPORTANT

- *The unit must be powered down before jumpers are altered. Anti-static precautions should be taken when changing addresses or adding or removing cabling from the terminals.*
- *The frequency jumpers on the GENII WMI must exactly match the frequency jumpers on any SENRx modules to be communicated with.*

3-4.19 SENRx Series Wireless Temperature Sensors

The Innotech SENRx Series Wireless Temperature Sensors are remote expansion devices for the Genesis II range of digital controllers. There are four unique models in the SENRx series:

- **SENR1:** Temperature Sensor, Low Battery Indicator.
- **SENR2:** Temperature Sensor, Low Battery Indicator, Set Point Adjustment.
- **SENR5:** Temperature Sensor, Low Battery Indicator, After Hours Button.
- **SENR5:** Temperature Sensor, Low Battery Indicator, Set Point Adjustment, After Hours Button.

The SENRx Series Wireless Temperature Sensors (Figure 3-23) are powered by 3.6VDC ½AA Lithium Battery. Battery life is 12 months minimum.

There are no inputs or outputs on a SENRx Series Wireless Temperature Sensor. They are designed to send the output data to a GENII WMI Wireless Module Interface located up to 20 m away (depending on obstructions).

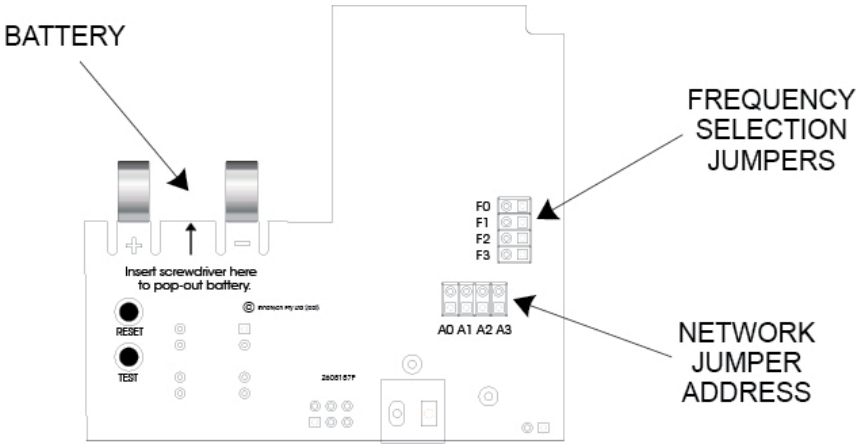

Figure 3-23: SENRx Wireless Temperature Sensor (Back View)

SENRx modules should be mounted within a 20 m radius (depending on obstructions) of the GENII WMI Wireless Module Interface in a dry and clean location free of excess vibration.

To remove the battery from a SENRx module, simply insert a flat screwdriver underneath the battery between the two clips and lever the battery out (Figure 3-23). When re-inserting the battery, press and hold the “RESET” button. Release the “RESET” button after the battery is located back in the clips.

There are two sets of four jumpers located on the back of the SENRx module (Figure 3-23). The set of jumpers closest to the battery are labelled A0, A1, A2 and A3. These set the network address of the SENRx module in the same manner as GENII REM products.

Directions for setting the address are shown in the wiring diagram generated by the GEN2Config software. The jumpers located on the far right of the SENRx module are labelled F0, F1, F2 and F3. These select the frequency channel to use within the 2.4-2.5 GHz range. Typically, these jumpers need only be changed if multiple Wireless Module Interfaces are used or in areas with poor reception or strong interference. The frequency jumpers on the SENRx module must exactly match the frequency jumpers on the GENII WMI module to be communicated with.

IMPORTANT

If any jumpers on a module need to be changed, the unit must be powered down before the jumpers are altered. This can be achieved by removing the battery as described above. Antistatic precautions should be taken when changing jumpers or removing the battery.

Genesis II Direct Digital Controller

INSTALLATION INSTRUCTIONS

Chapter 4 - Commissioning

INNOTECH®

4-1 Introduction

The commissioning phase begins upon completion of the mechanical and electrical installation of the system and is the phase in which the user makes the system ready for operation. The commissioning process consists of performing the following procedures, which are explained elsewhere in this section:

- Inspect the Installation
- Check Input and Output Wiring
- Install Analogue Input Signal Conditioners (AISCs)
- Set Jumpers (such as address jumpers and end-of-cable termination jumpers)
- Apply Partial Power
- Load Software and Configure the Controller(s)
- Initial Tests
- Final System Checkout

CAUTION

To prevent injury to personnel and damage to equipment, all electrical power must be off before starting the commissioning process this includes power to the Genesis units and power to input and output circuits and equipment. When working with live power ensure that all electrical safety standards for work on live electrical systems meet local regulatory requirements. Do not apply power to any unit or circuit until instructed to do so by procedures in this section.

4-1.1 Inspect the Installation

Referring to Chapters 2, 3 and 5, inspect the entire system for correct mechanical, electrical and network installation. Correct any discrepancies noted. Inspection should include the factors listed in the following paragraphs, as a minimum.

4-1.1.1 Mechanical Inspection

Ensure that all units and enclosures are free of debris such as dust, metal chips, moisture, etc. That may have been deposited during installation. Clean as necessary.

- Ensure all covers are properly installed. Exceptions are the CS REM Control Station Module and MZS REM Multi Zone Station Module, which should be covered by plastic at this time (see 3-4.9 to 3-4.13).
- Ensure all units and DIN-rails are solidly mounted.
- Check cable ducts. Ensure they are placed so that cables entering and leaving the ducts do not make overly tight bends.
- Make sure all units are located to provide safe access for operation and maintenance.
- Make sure all units are located where they are not subject to temperature extremes beyond the 0 - 40°C range.
- Make sure all units are located as far as practical from high current or high voltage cables or sources of RF emissions.
- Ensure if wireless sensors are used that a GEN II WMI wireless module interface (WMI) is connected to and no further than 500 metres from the Genesis II Direct Digital Controller or MPCII Mid Points Controller and that each wireless sensor is no further than 20 metres from the WMI.
- Do not install the WMI inside a fully enclosed metal switch board.

4-1.1.2 Electrical Inspection

- Make sure all sources of electrical power, including power to ancillary items are off.
- Check all input and output connections against the computer-generated wiring diagram supplied for your installation.
- Ensure all connections are in accordance with the wiring diagram and that connections are solidly made.
- Ensure all enclosures are solidly earthed.
- Check all input and output cabling; ensure cabling requirements of Section 3 - Electrical Installation are met.
- Make sure all cables, especially analogue input cables, are routed clear of high current, high voltage or high speed switching current cables and other sources of interference.
- If using Remote Expansion Modules (REMs) make sure the cable run between does not exceed 600 metres in length.
- Inspect all cables running external to the enclosure. Ensure they are free from potential mechanical damage, such as impacts and chafing.

Cabling plays an important role in the installation of Genesis II Systems. The following general cabling guidelines should be observed:

- In all cases, use electromagnetic-shielded cable for sensor wiring.
- When necessary to protect cabling from physical damage, both shielding and physical protection may be provided by running the cable in a metal conduit. Alternatively, use steel wire armoured (SWA) cable, which also contains an electromagnetic shield.
- Avoid running cables in the vicinity of high voltage power cables or cables carrying switching voltages/currents. This especially applies to sensor signal cables.
- Interconnecting cables must have multi-strand conductors with a cross-sectional area of 1mm^2 for each conductor.
- The earth cable to Genesis II enclosures must be 2.5mm^2.
- For analogue inputs to the controller, a 16 conductor (0.5mm^2) shielded cable is required.

Table 3-1 provides assistance in determining the cabling requirements for various installation configurations. It shows the dimensions, wire gauge designations and resistance values per unit length for common wire sizes. Use Table 3-1 to determine specific cabling requirements for your installation.

4-1.2 Check Input and Output Wiring

The purpose of checking the input and output wiring is two-fold. Firstly, the wiring is checked to verify that it is connected properly, thus ensuring proper operation of the system. Secondly, the wiring is also checked to ensure the absence of any external voltages that could damage a Genesis unit. The following paragraphs contain instructions for checking inputs and outputs.

4-1.2.1 Checking Power Inputs

Power inputs must be checked to ensure that the applied voltage is of the proper level and, in the case of DC power inputs, of the correct polarity. Table 4-1 shows the input voltage specifications for the various types of units. Most units operate on 24VAC 10%, 50/60 Hz.

Controllers can be provided with an optional 24VDC ±10% power capability. Procedures for checking the 24VAC and 24VDC units are similar, except that: for 24VAC units, AC Neutral must be at earth potential and connected to Terminal 2. For 24VDC units, Terminal 1 must be positive and Terminal 2 negative.

Table 4-1: Genesis II System Power Inputs

Unit	Operating Voltage	
	24VAC ±10%	**24VDC** ±10%
GENII DDC Digital Controller	Yes	Yes
MPCII Mid Points Controller	Yes	Yes
GENII AI REM Analogue Input Module	Yes	No
GENII AO REM Analogue Output Module	Yes	No
GENII DI REM Dry Contact Digital Input Module	Yes	No
GENII DO REM Relay Output Module	Yes	No
GENII IDI REM Opto-Isolated Digital Input Module	Yes	No
GENII PI REM Pulse Input Module	Yes	No
GENII MZS REM Multi Zone Station Module	Yes	No
GENII MZSAH REM Zone Control Station Module A/H	Yes	No
GENII CS REM Control Station Module	Yes	No
GENII CSAH REM Control Station A/H Module	Yes	No
GENII CSFAH REM Control Station with 3 Speed Fan, A/H Module	Yes	No
GENII MP4xxx REM Multipoint Module	Yes	See Note
GENII WMI Wireless Module Interface	Yes	No
SENRx Wireless Temperature Sensor REM	Yes	No

NOTE

Optional 24VDC supply is available but tolerance is ±15%.

Check 24VAC and 24VDC inputs as follows:

1. Ensure power to the unit is turned off.
2. For 24VAC units, ensure the AC Neutral is connected to Terminal 2 and the resistance between Terminal 2 and the enclosure's main earth link is 3.0 Ohms, or less.
3. Disconnect the power lead from Terminal 1 (Figure 4-1).
4. Connect a digital volt-ohm-meter red (+) test lead to the disconnected power lead and the black (-) test lead to Terminal 2.
5. Set the voltmeter to the proper range to measure 24 Volts.
6. Turn on the power.
7. The voltmeter should read 24 Volts ±10%. For 24VDC units, make sure the power lead going to Terminal 1 is positive and Terminal 2 is negative.
8. Ensure measurement is in DC and not AC voltage.
9. Turn off the power.
10. Disconnect the digital voltmeter and reconnect the wire to Terminal 1.
11. Repeat Steps 1 through 9 for the other 24-Volt units. For units not included in this manual, refer to the appropriate product datasheet.

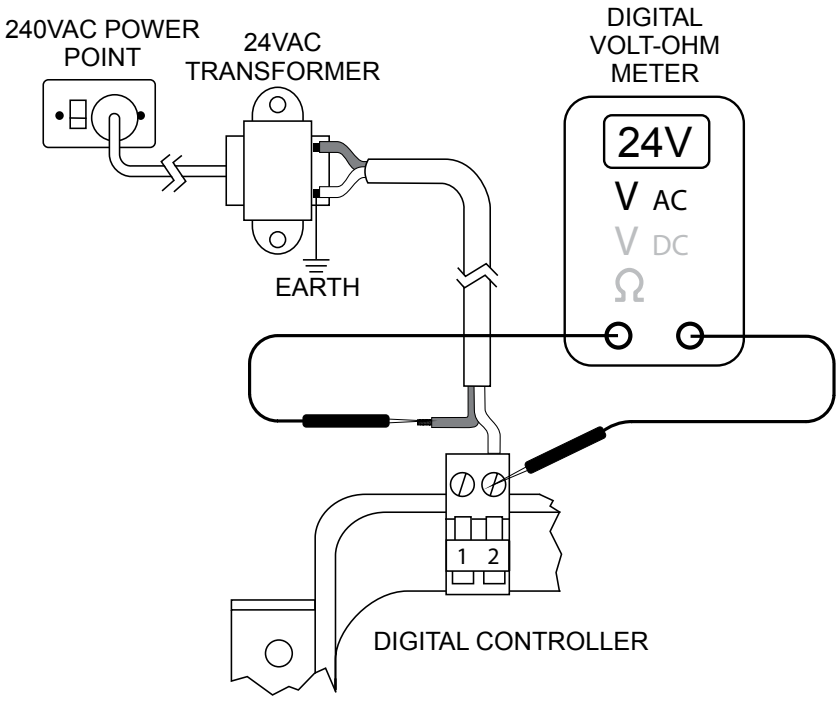

Figure 4-1: Checking Power Input

4-1.2.2 Checking Digital Input Wiring

Digital input wiring to controllers and digital input expansion modules should be checked to ensure the following conditions:

- The digital signal source voltage is within the correct range. Refer to Table 4-2 for digital input signal source specifications for the various digital input units.
- The signal polarity is correct for digital input signals with DC sources
- Wiring to the signal actuator (switch, relay contacts, contact points, etc.) is correct

4-1.2.3 - External-Source Digital Inputs contains procedures for checking most Genesis REMs except for the GENII DI REM Dry Contact Digital Input Module. Whereas most Genesis units use external source digital input signals, the DI REM signals are dry contact (voltage free) inputs. Procedures for checking voltage-free digital inputs are contained in 4-1.2.4 - Internal-Source Digital Inputs.

Table 4-2: Digital Input Signal Voltages

Unit	Signal Voltage
GENII DDC Digital Controller	24VAC/24VDC ±15%
MPCII Mid Point Controller	24VAC/12VDC ±15%
GENII PI REM Pulse Input Module	12 - 24VDC
GENII IDI REM Opto-Isolated Digital Input Module	12 – 24VAC/VDC
GENII DI REM Dry Contact Digital Input Module	Not Applicable
GENII MP REM Multipoint Module	24VAC/24VDC ±15%

4-1.2.3 External-Source Digital Inputs

The following procedures for checking digital input wiring are specifically for the Genesis II Digital Controller. However, they also apply to the other units listed in Table 4-2 except for the GENII DI REM.

Refer to the Electrical Installation chapter for digital input terminal numbers for the various Genesis units.

Figure 4-2 is a schematic representation of a typical Digital Controller installation containing AC- and DC-powered digital inputs and how the wiring can be checked using a digital voltmeter. Use Figure 4-2 for reference when performing the following procedures:

1. Ensure power to the Digital Controller is turned off.
2. Set the digital voltmeter range to read at least 25 Volts.
3. Connect the voltmeter to the first digital input channel (Terminals 4 and 5 for the Genesis II Digital Controller). Observe polarity, ensuring the red (+) test lead is connected to the positive terminal (4) and the black (-) test lead is connected to the negative terminal (5).
4. Ensure the voltmeter reads Zero Volts. If the reading is other than Zero Volts it indicates the input is driven by Normally Closed contacts or the input is not wired correctly.

CAUTION

Avoid risk of electrical shock observe all local electrical safety requirements when performing the nest step.

5. With the voltmeter still connected, manually close the input contacts. If it is not possible to close the circuit manually, connect a jumper wire across the contacts at the switching device, as shown in Figure 4-2.
6. Ensure the voltmeter indicates the proper signal voltage as listed in Table 4-2.
7. Ensure that the voltmeter indicates the correct polarity. The unit will not operate properly if the signal polarity is incorrect.
8. Release the manually closed contacts or remove the temporary jumper from the switch contacts.
9. Repeat Steps 3 through 7 for the remaining digital input channels.

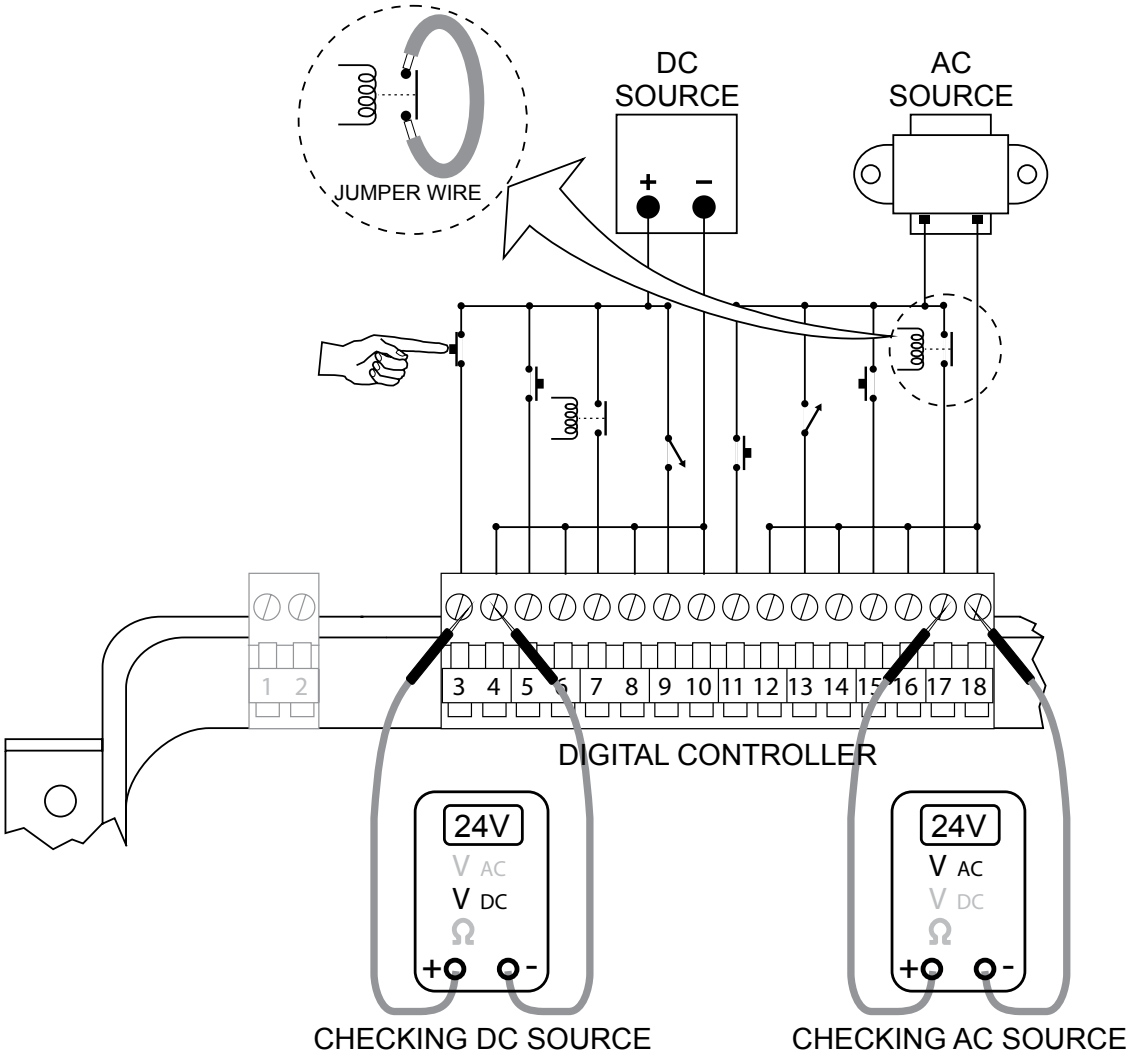

Figure 4-2: Checking Digital Input Wiring

4-1.2.4 Internal-Source Digital Inputs

The GENII DI REM provides eight dry contact (voltage-free) inputs to sense contact closure from field equipment. The eight digital inputs are connected to terminals A through H (see Figure 4-3). Contacts I and J are signal common terminals. The REM provides 5VDC between each input and common. This voltage is shorted to common when the switch is closed. Check the digital input wiring as follows:

1. Tag and disconnect the RS485 Comms cable(s) from the RS485 Comms Connector at the upper-right corner of the REM. The cable shields may be left connected if desired.
2. Apply 24VAC operating power to the GENII DI REM. Power off other units.
3. Set the digital voltmeter range to read at least 5.0VDC.
4. Connect the voltmeter between the first digital input channel (Terminal A) and the associated switch common (Terminal I or J). Observe polarity, ensuring the red (+) test lead is connected to Terminal A and the black (-) test lead is connected to the switch common terminal.
5. Observe the voltmeter. It should indicate 5VDC with the input switch open.

CAUTION

Avoid risk of electrical shock observe all local electrical safety requirements when performing the nest step.

6. Manually close the input switch. If that is not practical, connect a short jumper wire across the contacts.
7. Observe the voltmeter. It should indicate 0VDC with the input switch closed.
8. Release the manually-closed contacts. If a jumper wire was used in Step 6, remove the jumper wire.
9. Repeat Steps 4 through 8 for the remaining digital input channels.
10. Remove operating power from the REM.
11. Reconnect the RS485 cable that was disconnected in Step 1.

CAUTION

- *Digital outputs are controlled by relays within the associated Genesis unit. These relays are connected to the external circuits that can contain up to 24VAC.*
- *Procedures in this manual require checking these circuits with power applied. To avoid death or serious injury by electrical shock, use extreme caution when working with energised circuits and follow precautions in this manual.*
- *Checks are to be performed only by qualified, licensed electricians who are familiar with local safety procedures. Under no circumstances should anyone other than a qualified electrician perform these checks.*

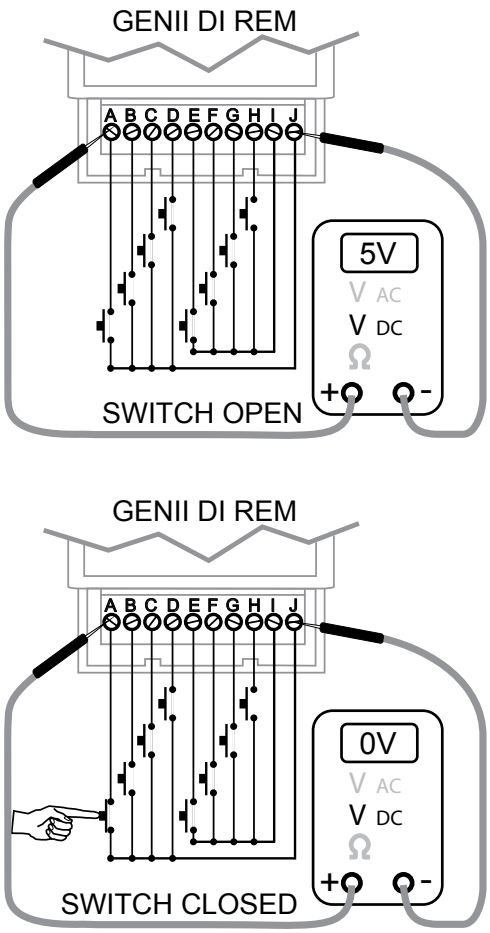

Figure 4-3: Checking Dry Contact Inputs

4-1.2.5 Checking Digital Output Wiring

Digital outputs of the various units are interfaced through relays, each having single-pole changeover contacts.

The following units contain only Normally Open (NO) digital output contacts in each digital output channel:

- GENII DDC Digital Controller
- MPCII Mid Points Controller
- GENII DO REM Relay Output Module
- GENII MP REM Multipoint Module

Relay contacts in all units with digital outputs are rated at 24VAC, 2 A with the exception of the MP REM Multipoint Modules which are rated at 240 AC, 16 A. For this reason, the presence of lethal voltages at the relay contacts should be anticipated. Even though good wiring practice is to use lower voltage pilot relays when controlling higher voltage equipment, this practice can not be guaranteed and it is possible that the relay contacts will carry dangerous voltages. For this reason, it is important that only a qualified electrician, familiar with safety practices, check the digital output wiring.

Before checking the digital output circuits, it is important to ensure that there are no short circuits in the external wiring which could cause the contact current to exceed the rated amount. Current in excess of this through the relay contacts will result in permanent damage to the unit.

Following is a general description of the process for safely checking digital output circuits. Specific procedures for checking the wiring are provided toward the end of this paragraph (see Figure 4-4).

With power applied to the digital output circuits, but not to the Genesis unit, the output circuits are checked for operation. Devices connected between the NO and C terminals should be de-energised. If the operational status cannot be determined by observation (indicator lamp on/off, fan running/ not running, etc.) a voltmeter is placed across the device to determine whether or not it is energised.

The output circuits are then checked for the opposite condition. For circuits using the NO contacts, a jumper wire is temporarily connected between the NO and C terminals; the associated device is checked to make sure it is energised.

IMPORTANT

Before performing the following procedures ensure there are no short circuits in the digital output wiring which could cause the relay contact current to exceed the maximum amperes, excess relay contact current will cause permanent and irreparable damage to the unit.

The following are procedures for checking digital output wiring; refer to the Electrical Installation chapter for output terminal numbers for the applicable Genesis units:

1. Ensure there is no operating power applied to the Genesis unit to be checked nor is power applied to any of the digital output circuits.
2. Start at the first device connected to the NO contacts. If the device cannot be checked for operation by simple observation, connect a digital voltmeter across it. Set the voltmeter range for the expected voltage.
3. Apply operating power to the output device.
4. Determine that the device is de-energised, either by direct observation of the device itself or by checking that the volt-ohm-meter indicates an open circuit.
5. Remove operating power from the output device.
6. Temporarily connect a jumper wire between to NO and C contacts. Ensure that the jumper wire is of adequate size to temporarily carry the load.
7. Apply operating power to the output device.
8. Determine that the device is energised, either by direct observation of the device itself or by checking that the voltmeter indicates full operating voltage.
9. Remove operating power from the output device.
10. Remove the jumper wire connected in Step 6.
11. Repeat Step 2 through Step 10 for the remaining output devices connected to the NO contacts.

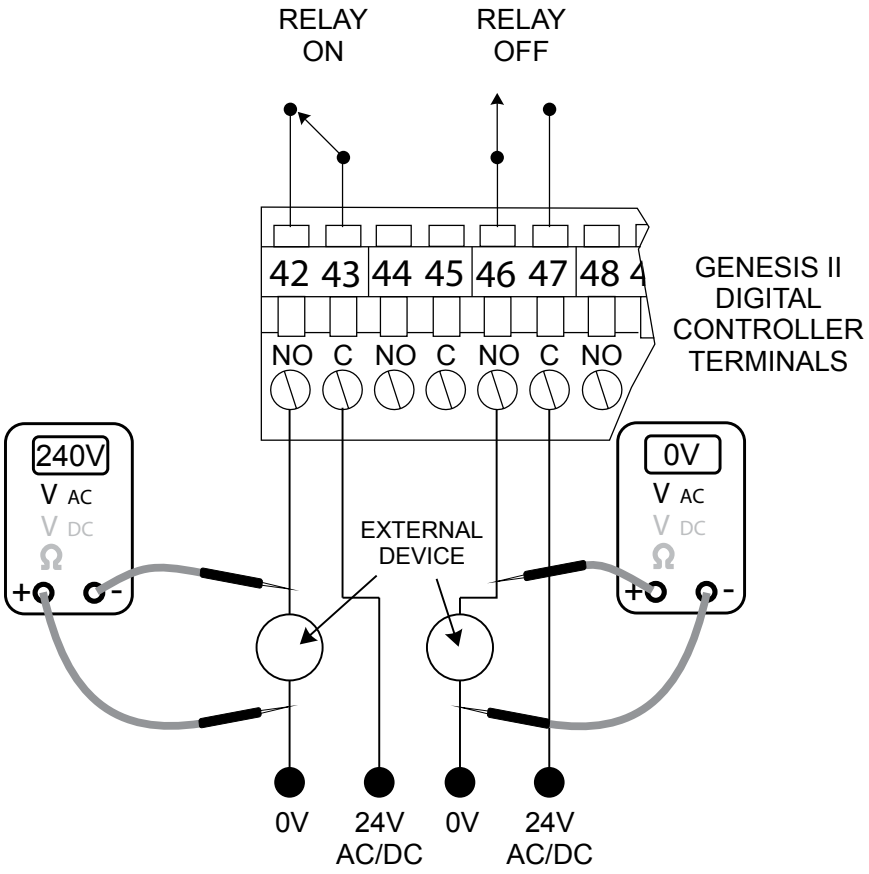

Figure 4-4: Checking Digital Output Wiring

4-1.2.6 Checking Analogue Input Wiring

The analogue input wiring for the following Genesis units should be checked as part of the commissioning process:

- GENII DDC Digital Controller
- MPCII Mid Points Controller
- GENII AI REM

Checking analogue input wiring requires special consideration due to the wide variety of analogue input devices that may be used in the system. Some input devices function as signal voltage sources; some devices function in the loop current mode and others provide resistive inputs to the Genesis unit. For this reason there is no single procedure that can be used on all analogue inputs.

Procedures presented in this manual are based on identifying the type of Analogue Input Signal Conditioner (AISC) assigned to each analogue input channel. Since each analogue input device requires a specific AISC type to match the signal to the Genesis unit, the type of AISC assigned to an analogue input channel indicates the type of input signal and the range. The various types of AISCs are listed in Table 4-3 along with the type of analogue signal and the range. Reference to the paragraph containing the instructions for checking the input wiring is also provided in Table 4-3.

NOTE

Current value is determined by measuring voltage across a resistor in series.

Table 4-3: Analogue Input Checks

AISC Model	Input Type	Parameter Measured	Expected Value	Reference Paragraph
DO5	Digital	Voltage	0 or 5VDC	4-1.2.7
D33	Digital	Voltage	0 or 10VDC	4-1.2.7
IO5	0 - 5mA Passive	Current (see Note)	0 - 5mA	4-1.2.8
I20	4 - 20mA Passive	Current (see Note)	4 - 20mA	4-1.2.8
P20	Loop Powered	Inspect Wiring	N/A	4-1.2.8
TD1	Current Loop	Current (see Note)	0- 250µA	4-1.2.8
TD2	0 - 500µA	Current (see Note)	0 - 500µA	4-1.2.8
TH1	Thermistor	Resistance	0 - 1kΩ	4-1.2.9
TH2	Thermistor	Resistance	0 - 2kΩ	4-1.2.9
TH3	Thermistor	Resistance	0 - 3.8kΩ	4-1.2.9
TH4	Thermistor	Resistance	0 - 8.2kΩ	4-1.2.9
TH5	Thermistor	Resistance	0 - 16.2kΩ	4-1.2.9
TH6	Thermistor	Resistance	0 - 33.3kΩ	4-1.2.9
TH7	Thermistor	Resistance	0 - 68.1kΩ	4-1.2.9
TH8	Thermistor	Resistance	0 - 121kΩ	4-1.2.9
TH9	Thermistor	Resistance	0 - 221kΩ	4-1.2.9
V05	Voltage	Voltage	0 - 5VDC	4-1.2.7
V10	Voltage	Voltage	0 - 10VDC	4-1.2.7

For example, an analogue input channel that has Model TH2 AISC assigned receives its input from a thermistor device; the input circuit is checked by measuring its resistance, which should be between 0 and 2k. Procedures for checking the resistance are contained in section 4-1.2.9.
The type of AISC for each analogue input channel is determined when the system configuration is established by the Genesis Configuration Software prior to delivery. The configuration software automatically generates a Materials List and a Wiring Diagram, which are delivered with the system. The Materials List shows the number of AISCs by type but does not show which analogue input channels they are assigned to. The Wiring Diagram (Figure 4-5) identifies the AISC type for each analogue input channel.

When an Analogue Input Module REM is used, the output of the REM is connected to one of the controller's analogue input channels. When checking the analogue connection between the GEN II AI REM and a controller, ensure the cable is wired in accordance with the Electrical Installation chapter and is free of potential physical damage. Ensure also that the cable is routed outside of the cable ducts.

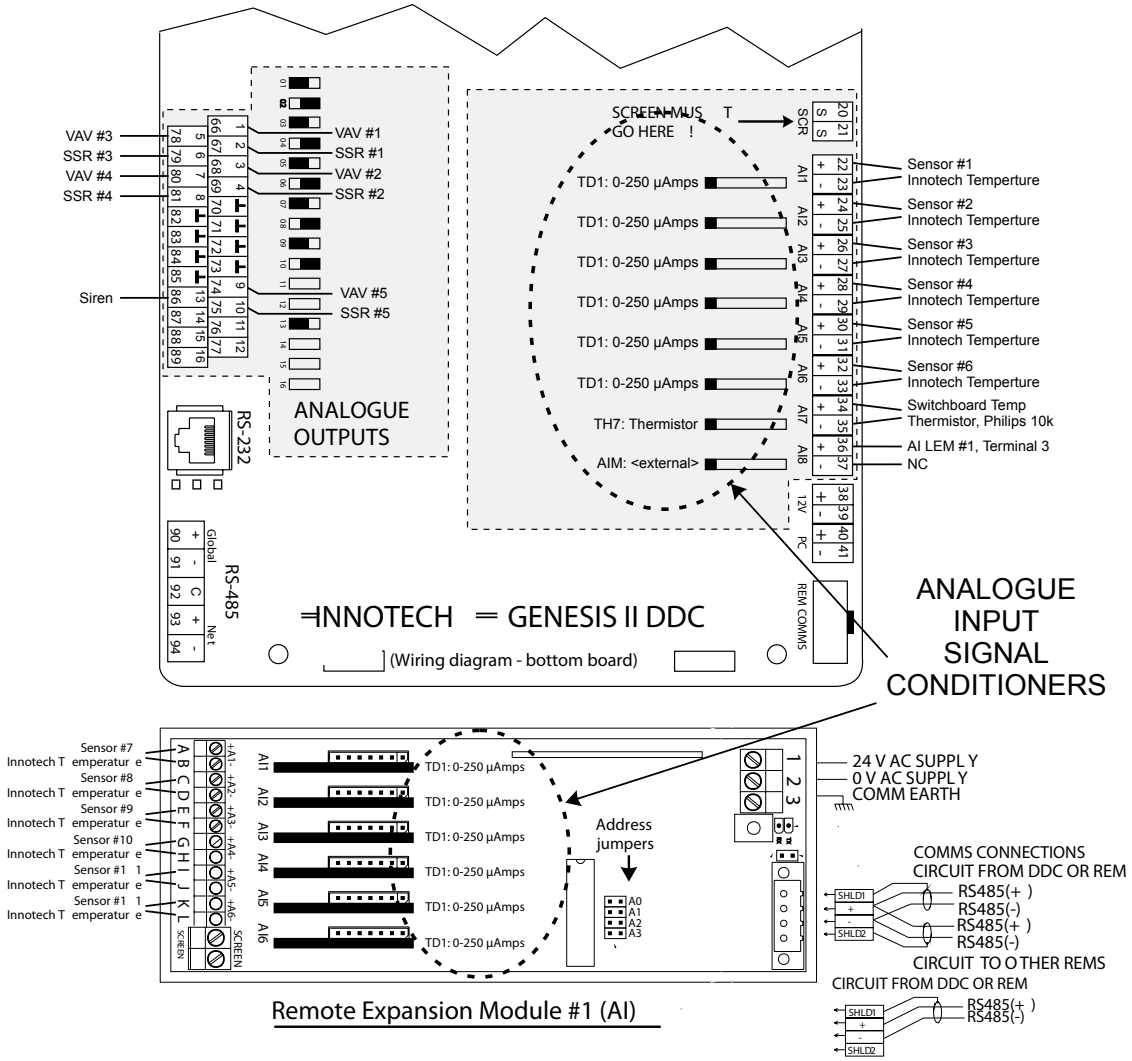

Figure 4-5: Analogue Input Signal Conditioner (AISC) Locations

4-1.2.7 Voltage Checks

IMPORTANT

The wiring checks in the following paragraphs are performed with AISCs removed. The units are delivered with their AISCs removed. Do not install the AISCs until all wiring checks are completed.

This paragraph contains procedures for checking analogue inputs associated with AISC Models D05, D33, V05 and V10. Note from Table 4-3 that inputs associated with Digital AISC D05 will be either Zero Volts OR 5VDC but not between the two extremes. The same is true for AISC D33 except that the voltage range is Zero OR 10VDC.

Note also that inputs associated with AISC Models V05 (0 – 5VDC) and V10 (0 – 10VDC) may be at any value within the ranges noted.

IMPORTANT

Ensure that no AC voltage is present on either terminal. AC voltage at the input terminals can cause damage to the unit also the unit will not operate properly if the analogue input signal polarity is incorrect.

Procedures for performing voltage checks are:

1. Ensure all AISCs have been removed and no power is applied to the Genesis II Digital Controller.
2. Connect a digital voltmeter to the input terminals; set the voltmeter to indicate VAC. Ensure there is no AC voltage present on either terminal. If AC voltage is measured, check the analogue input wiring for faults/errors.
3. Set the digital voltmeter to indicate VDC. Set the range for the expected voltage value shown in Table 4-3.
4. Connect the voltmeter across the analogue input terminals observing polarity. If necessary, reduce the voltmeter range to obtain an accurate reading.
5. Ensure the measured voltage is within the expected range and of the correct polarity. If not, check the analogue input wiring for faults/errors
6. Repeat Steps 2 through 5 for the remaining inputs associated with the AISC models noted above.

4-1.2.8 Current Checks

This paragraph contains procedures for checking analogue inputs associated with AISC Models I05, I20, P20, TD1 and TD2.

CAUTION

Procedures in this paragraph require connecting a 500 Ohm resistor across the analogue input terminals and measuring the resultant voltage. Although 500 Ohms is suitable in most cases, some applications may require a higher value of resistance to avoid damage to circuits. Always ensure that a suitable resistor is used.

Analogue inputs associated with the I05, I20, TD1 and TD2 AISCs are checked by measuring voltage across a resistance connected in series with the current source. A 500 Ohm resistance is normally suitable for this procedure.

The matrix below lists the expected voltages to be measured across a 500 Ohm resistance for the various values of input current. For other resistor values use Ohm's Law (V=IR) to determine the voltage.

AISC	INPUT CURRENT	VOLTAGE ACROSS 500 ohms
I05	0 – 5 mA	0 – 2.5VDC
I20	4 – 20 mA	2 – 10VDC
TD1	0 – 250 A	0 – 0.125VDC
TD2	0 – 500 A	0 – 0.25VDC

Inputs associated with the P20 AISC are 4 – 20 mA loop-powered inputs. These inputs **cannot** be conveniently checked in the same manner as the other current inputs without applying power to the Genesis II Digital Controller before it is safe to do so. Loop powered input wiring is checked by using a voltmeter to ascertain that there is no stray voltage present at the input terminals. The input wiring is then visually inspected for proper connection.

The following are procedures for performing current checks:

1. Ensure all AISCs have been removed and no power is applied to the Genesis II Digital Controller.
2. For analogue inputs associated with P20 AISCs go to Step 9.
3. Temporarily connect a 500-Ohm (or suitable value) resistor across the terminals of the first current input channel to be checked.
4. Set a digital voltmeter to indicate VDC. Set the range for the expected voltage value shown in the matrix above.
5. Connect the voltmeter across the analogue input terminals observing polarity. If necessary, reduce the voltmeter range to obtain an accurate reading.
6. Ensure the measured voltage is within the expected range and of the correct polarity. If not, check the analogue input wiring for faults/errors.
7. Remove the temporary resistor connected in Step 3. above. Repeat Steps 2 through 7 for the remaining inputs associated with the AISC models noted above.
8. To check inputs for the P20 type AISC, connect a digital voltmeter across the input terminals. **Do not connect a resistor across the terminals**. Reduce the voltmeter range to the lowest setting practical. If voltage is present at the input terminals, it indicates a fault or improper wiring of the input circuit.
9. Visually inspect the wiring of the P20 type analogue input. Ensure that all wiring conforms to the associated wiring diagram. Ensure correct polarity is maintained throughout.

4-1.2.9 Resistance Checks

This paragraph contains procedures for checking analogue inputs associated with AISC Models TH1 through TH9. Checking these inputs consists of performing a simple continuity/resistance check.

Procedures for performing voltage checks are:

1. Ensure all AISCs have been removed and no power is applied to the Genesis II Digital Controller.
2. Set a digital volt-ohm-meter to indicate Ohms. Set the ohmmeter range to the resistance value shown in Table 4-3.
3. Connect the volt-ohm-meter across the analogue input terminals.
4. Ensure the measured resistance is within the expected range. If it is not, check the analogue input wiring for faults/errors
5. Repeat Steps 2 through 4 for the remaining inputs associated with AISC Models TH1 through TH9.

4-1.2.10 Checking Analogue Output Wiring

Analogue output wiring is checked for the following reasons:

- To ensure the analogue output terminals are free of any external voltage
- To check continuity through the external analogue circuit
- To ensure the resistance of the external analogue circuit is sufficient to avoid overloading the analogue output circuit.

The following procedures apply to analogue outputs of the GENII DDC Digital Controller, MPCII Mid Points Controller, GENII AO REM Analogue Output Module and the GENII MP REM Multipoint Module. Refer to the Electrical Installation chapter for analogue output terminal numbers for the applicable Genesis units.

Procedures for performing Analogue Output wiring checks are:

1. Ensure the operating power to the unit is off.
2. Turn on the excitation and operating power for the digital inputs, digital outputs and, as applicable, the analogue inputs. The reason for this step is to detect the presence of voltages at the analogue output terminals that may be caused by “sneak” circuits or wiring errors.
3. At the analogue output terminal, disconnect the active signal wire for the first analogue output.
4. Connect a digital voltmeter between the disconnected signal wire and the common terminal.
5. The voltmeter should indicate Zero Volts. Set the voltmeter range as low as possible to ensure there is no voltage present.
6. Set the volt-ohm-meter to the Ohms range. The volt-ohm-meter should indicate a minimum resistance of 2,000 or 5,000 Ohms (See note below). A reading of Infinite Ohms indicates an open circuit condition that should be corrected.
7. Disconnect the meter and reconnect the signal wire disconnected in Step 3.
8. Repeat Step 3 through Step 7 for the remaining analogue outputs.
9. Turn off any power applied in Step 2.

NOTE

The analogue output circuit resistance for the Genesis II Digital Controller and the MPCII Mid Points Controller should be at least 2,000 Ohms. The circuit resistance for the GENII AO REM should be at least 5,000 Ohms.

4-1.3 Install AISCs

Analogue Input Signal Conditioners (also referred to as Input Straps in some other Innotech documents) are insert plugs used to configure the Genesis II unit’s input to match the analogue input device. All units having analogue inputs require an AISC for each input channel; these units are:

- Genesis II Digital Controller
- MPCII Mid Points Controller
- GENII AI REM Analogue Input Module

With all power off, and using the computer-generated wiring diagram (Figure 4-5) as a guide, insert each AISC module into its assigned slot. The modules are keyed to prevent them from being plugged-in backwards. When all AISCs are installed, double-check the installation. The system will not operate correctly with an AISC plugged into the wrong slot.

4-1.4 Set Jumper Plugs

Various jumper plugs throughout the system must be set properly before power can be applied to the system.

There are 4 categories of jumper plug:
Address Plugs set the address of each Remote Expansion Module

- Analogue Output plugs are used to select either Variable or Heat Valve Mode of operation for analogue outputs. Refer to section 3-3.1.5 for a definition of Variable and Heat Valve Modes.
- End-of-Cable jumpers provide the proper termination impedance for the RS485 Comms Cable. It is installed in the last unit of the cable run
- Frequency Plugs set the frequency of each wireless Remote Expansion Module or Interface

The computer-generated wiring diagram (Figure 4-5) shows the locations and required settings for each address jumper and analogue output jumper.

Table 4-4 is provided as an aid for properly setting the various jumper plugs. The table lists the required jumper setting, the types of jumper plugs and the reference paragraph containing instructions for setting them for each Genesis II unit.

Table 4-4: Units Requiring Jumper Settings

Terminal	Address	End of Cable	Analogue Output	Frequency
See Paragraph:	4-1.4.1	4-1.4.2	4-1.4.3	4-1.4.4
GENII DDC Digital Controller			Yes	
MPCII Mid Points Controller			Yes	
GENII AI REM	Yes	Yes		
GENII AO REM	Yes	Yes	Yes	
GENII DI REM	Yes	Yes		
GENII DO REM	Yes	Yes		
GENII IDI REM	Yes	Yes		
GENII PI REM	Yes	Yes		
GENII MZS REM	Yes	Yes		
GENII MZSAH REM	Yes	Yes		
GENII CS REM	Yes	Yes		
GENII CSAH REM	Yes	Yes		
GENII CSFCAH REM	Yes	Yes		
GENII MP REM	Yes			
GENII MP405 REM	Yes			
GENII MP414 REM	Yes			
GENII MP423 REM	Yes			
GENII MP432 REM	Yes			
GENII WMI				Yes
SENRx	Yes			Yes

4-1.4.1 Address Jumpers

Locations and settings of address jumpers are shown on the computer-generated wiring diagram provided with the system hardware. Figure 4-6 shows a portion of a typical computer-generated wiring diagram. Address jumper connectors are A0, A1, A2 and A3. Open jumper connectors are shown in grey on the wiring diagram. Connectors shown in black require a jumper to be installed. Address jumpers must be properly set on all REMs except for those which are wireless in order for the system to operate correctly.

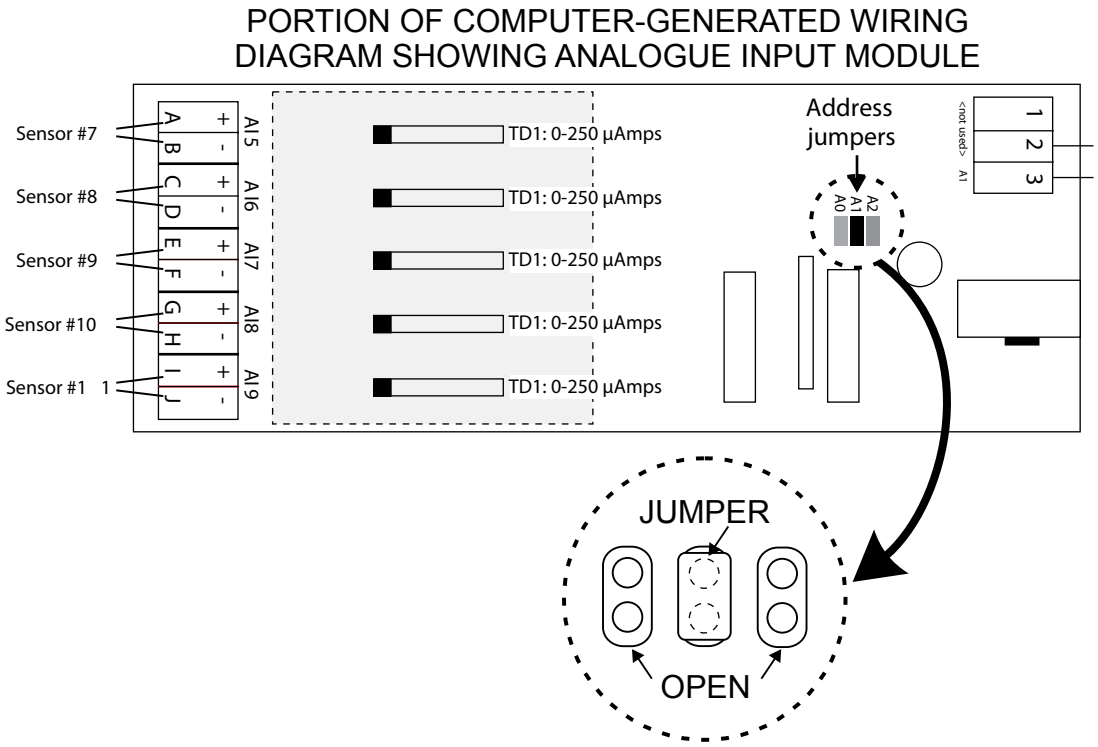

Figure 4-6: Address Jumpers, Typical Settings

4-1.4.2 End of Cable Jumpers

Although the locations of End-of-Cable jumpers are not shown on the computer-generated wiring diagram, they are easily located close to the unit's RS485 Comms connector. Figure 4-7 shows the location of the End-of-Cable jumper for a GENII AI REM unit. Jumpers for other units are similarly placed. The rule for installing an End-of-Cable jumper is:

- If only one cable is connected into an RS485 Comms connector, a jumper must be installed in that unit.
- If two cables are connected to the same RS485 Comms connector, the jumper plug must be left open.

All units along the RS485 Comms network should be carefully checked to ensure that jumpers are installed only in the last unit in the network.

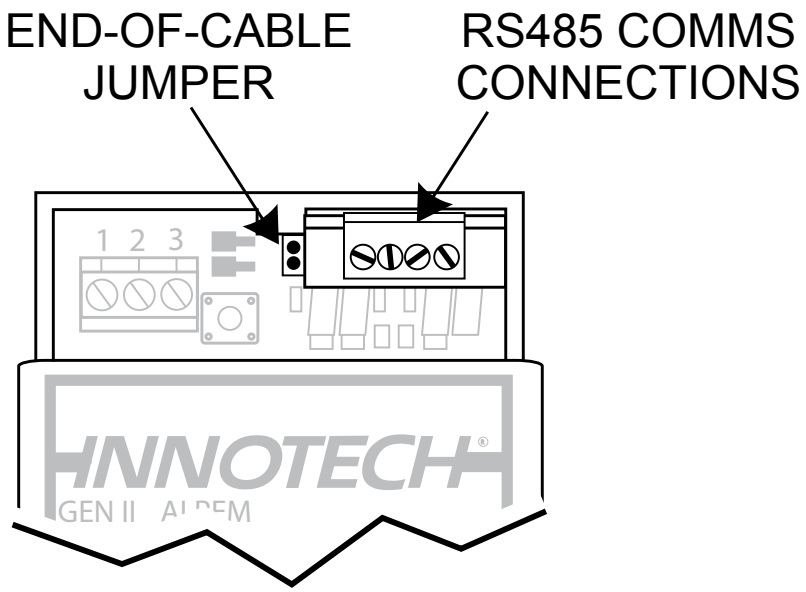

Figure 4-7: End of Jumper, Typical Location

4-1.4.3 Analogue Output Jumpers

An analogue output jumper plug arrangement is provided for each analogue output channel. The three-pin jumper sockets will accept a shorting plug between the centre pin and either of the outside pins. Depending upon which pair of pins the jumper is connected to, the analogue output is configured for either the Variable Mode or the Heat Valve Mode. For inactive analogue output channels, the jumper is not installed in either position. In such cases the jumper plug can be conveniently stored in the unit by inserting only one end of the plug into the socket.

The computer-generated wiring diagram shows the location and jumper position for each analogue output in the system. Figure 4-8 shows a portion of a typical wiring diagram centred on a Genesis II Digital Controller's analogue output jumpers. The figure shows how the jumpers are configured for the Variable and Heat Valve Modes of operation.

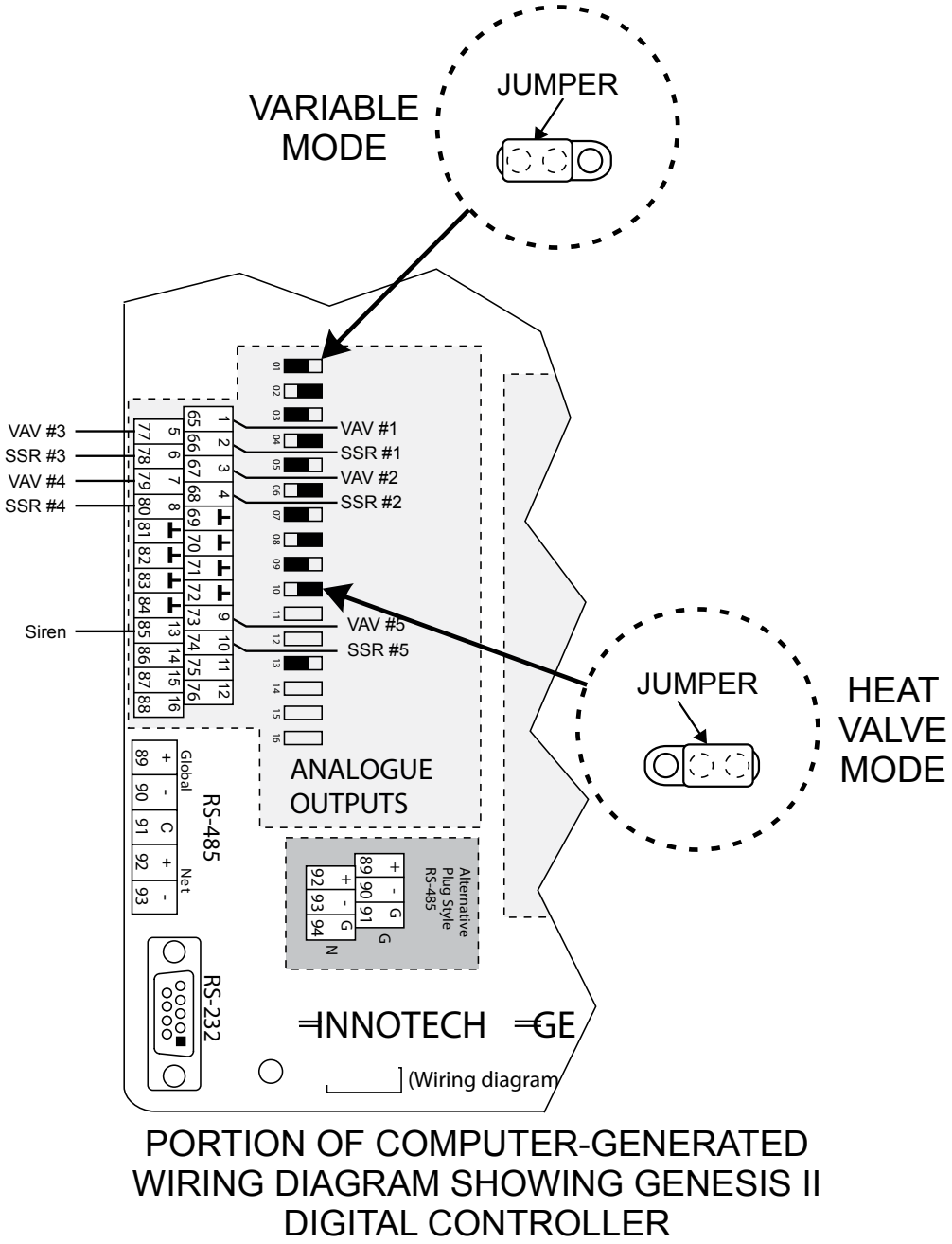

Figure 4-8: Setting Analogue Output Jumpers

4-1.4.4 Frequency Jumpers

The GENII WMI Wireless Module Interface provides an interface to the SENRx series of wireless temperature sensors. There are four user selectable frequency jumpers for configuration. To enable correct communication over a wireless frequency, the settings of these jumpers must be matched.

Locations and settings of frequency jumpers a fare shown on the datasheets for each of these products. Figure 4-9 shows a portion of a the GENII WMI datasheet, and Figure 4-10 shows an image of the SENRx series of wireless temperature sensors.

Frequency jumper connectors are F0, F1, F2 and F3. Frequency jumpers must be set properly on all wireless REMs.

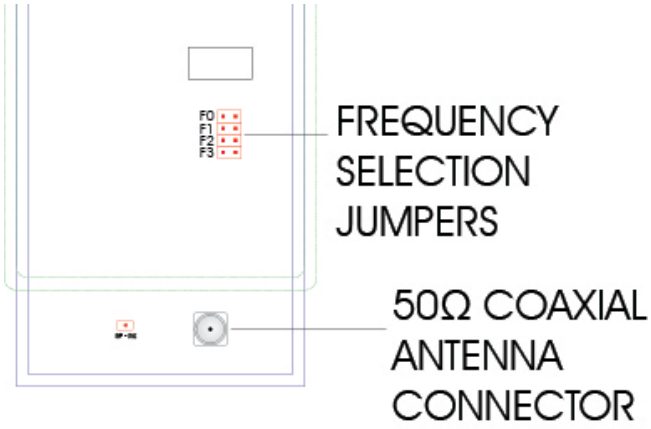

Figure 4-9: Setting Frequency Jumpers on the GENII WMI

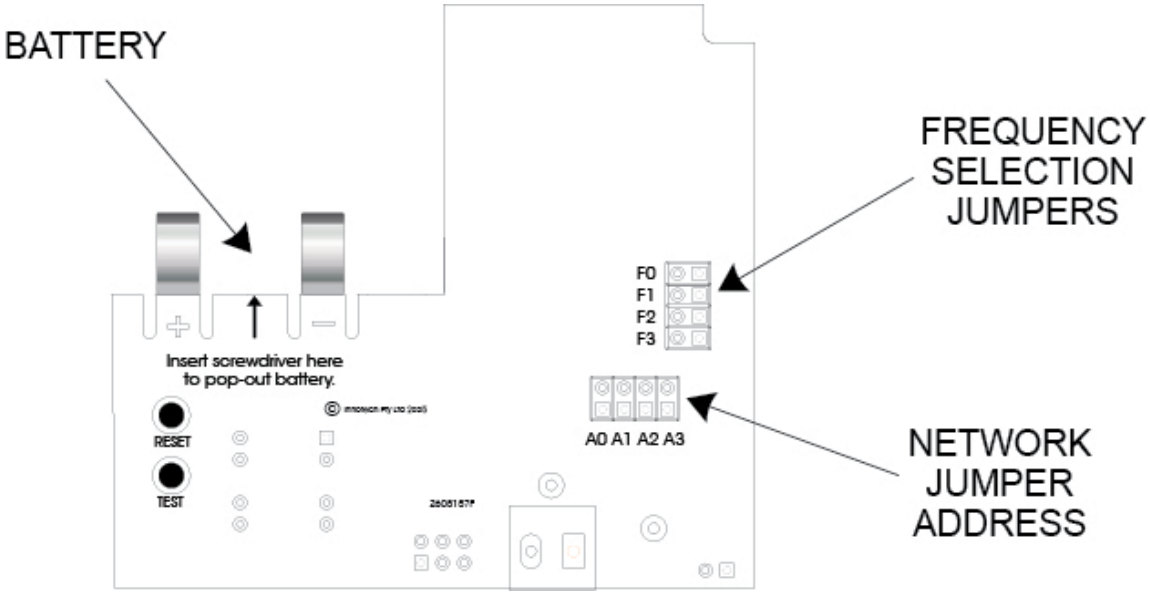

Figure 4-10: Setting Frequency Jumpers on the SENRx Module

4-1.5 Load Software and Configure the Controller(s)

The Innotech configuration software program was prepared for your Genesis System at the factory before delivery of the system. The software contains all the data for internally configuring the controller(s) to perform the specific functions for which it was intended. Until the controller is configured, it can not accept input signals or produce outputs.

To configure the controller(s), a Windows-based PC and the applicable version of the Innotech Gen2Config program are required. A software disk is provided with the Genesis hardware at delivery. The disk contains a program called Gen2Works, which is a collection of several Innotech programs, including Gen2Config. The other software programs supplied in Gen2Works are for the purpose of enhancing operation and de-bugging of the system. But it is the Gen2Config software that is required for commissioning the system.

4-1.5.1 - Loading Gen2Works contains instructions for loading the Gen2Works software into your PC. 4-1.5.2 - Configuring a Controller explains how to configure the controller using the Gen2Config program.

NOTE

- *The instructions in the next two paragraphs are generalised procedures based on the assumption the operator is familiar with operation of a PC in a Windows environment.*
- *Loading the Gen2Works software requires entry of an Activation Key. The Activation Key is a password provided by Innotech to permit access to the Gen2Works software. If an Activation Key has not been provided, contact Innotech Control Systems at the contact details shown on the last page of this manual. Note that the Activation Key is only effective for one session. If Setup is to be run at a later date, a new Activation Key is required.*

4-1.5.1 Loading Gen2Works

To load Gen2Works into the PC:

1. Insert the Gen2Works CD 1 into the appropriate CD or DVD drive.
2. Windows auto run should start the installation process or open the Windows explorer dialog in the location of the CD, from here select setup. If however the auto run does not open the CD go to step 3 otherwise skip it.
3. Click on Run and type “<CD Drive Letter>:\setup” (where the drive letter is which ever letter corresponds to your PC’s CD drive e.g. “D”) in the Run dialogue box, then click on OK.
4. Gen2Works will display a Product Activation dialogue box with a block requesting entry of the Activation Key.
5. Enter the Activation Key, then click OK.
6. The Gen2Works software will begin to load. Follow instructions on the screen to complete the installation process.

4-1.5.2 Configuring a Controller

The following is the procedure for configuring a controller:

1. Turn off the electrical power to the controller.
2. Connect to the controller via an RS232 cable, RJ45 or over a connected Innotech network.
3. Turn on the computer and allow it to boot-up. Turn on the controller's operating power.
4. Using standard Windows procedures, open the Gen2Config folder.
5. Click on the Gen2Config icon to open the Gen2Config program. The Gen2Config screen is displayed.
6. At the upper-left corner of the Gen2Config window, select File and then Open. The Open File dialog box is displayed showing the configuration files that can be selected. Configuration files are indicated by the file extension: ".g4c".
7. Select the configuration file for the controller to be configured then click OK. The window for the selected configuration is displayed. The window will show the block diagram representing the controller's configuration.
8. At the top of the window select Communicate and then Transfer to DDC. The Gen2Config software begins to automatically transfer the configuration data to the controller by way of iComm (Communications server used by Innotech software to communicate with Innotech digital controllers)
9. Follow instructions given on the screen.
10. It is safe to exit the Gen2Config program at this point.
11. If the next commissioning step: Initial Tests is to be performed soon, leave the controller and the PC turned on. Otherwise, remove operating power from the controller and PC if an appreciable delay is expected before performing initial tests.

NOTE

The following procedures are limited to the steps necessary to configure the controller. For more detailed information on the operation of the Gen2Con software refer to the Innotech Genesis II Digital Controller User Manual.

4-1.6 Initial Tests

Initial tests of the system involve the use of the Gen2Mon software to perform a thorough check of the system. The basic approach to performing these tests is to use the software to apply simulated inputs to the controller and to check the effect on the output circuits. The following paragraphs describe the Gen2Mon software and the checks to be performed as part of initial tests.

4-1.6.1 Gen2Mon Software

Initial tests of the system are simplified by use of the Gen2Mon monitoring and debugging utility software. This software allows the operator to trace the flow of control and to view the various values within a configuration residing in a controller. With Gen2Mon, each controller can be monitored one at a time in real time. Therefore, what appears on the screen is what is actually happening inside the controller. Gen2Mon must have a constant connection to the controller to be able to operate. This connection is either through a controller network, the RS232 serial port or the RJ45 ethernet port.

The Gen2Mon allows the operator to monitor any output value from any block in the configuration. Also, Gen2Mon has a Simulation Mode that allows the operator to control the values of any, or all, of the controller's input blocks. In this manner, the action of a sensor or switch can be simulated to determine how the rest of the configuration reacts to the input.

Detailed procedures for operation of the Gen2Mon Software is beyond the scope of this technical manual. Refer to the Innotech Genesis II Digital Controller User Manual.

4-1.6.2 Performing Initial Tests

Because of the Genesis II System's flexibility, the various configurations can be vastly different from each other. For this reason, it is not practical to provide detailed procedural instructions for performing initial tests that apply to all configurations. However, this paragraph describes the general methodology for performing the initial tests.

Initial tests using the Gen2Mon Software are divided into three separate phases; these tests should be performed on each controller in turn:

- In the first phase of testing, power is removed from all output circuits and the Gen2Mon software is used to monitor the states and input/output values of the various configuration blocks using variable input stimuli. This phase serves two purposes: It checks the configuration of the controller and it helps to familiarise the operator with the operation of the system.

- In the second phase of testing, the controller's primary output circuits, such as motor controllers and relay circuits are energised but the output machinery (fans, pumps, compressors, etc.) are de-energised. In this phase, the controller inputs are stimulated just enough to cause the output circuits to operate or change state. This phase checks the operation of the output control circuits without operating the plant machinery.

- In the third phase, the primary output control circuits as well as the plant machinery are energised. In this phase the controller inputs are carefully stimulated just enough to briefly test the operation of the plant machinery. This phase should involve the minimum of controller input stimulation required to operate the machinery.

4-1.6.3 First Phase Testing

Perform the first phase of initial tests of the system as follows:

1. Turn off all electrical power to the Genesis II System.
2. Connect the controller to the PC by finding it on a connected network, connecting an RS232 cable between the controller's RS232 connector and the computer's serial port or by connecting an RJ45 cable between the controller's RJ45 connector and the computer's.
3. Turn on the computer and allow it to boot-up. Turn on the controller's operating power. All output circuits should be de-energised at this time.
4. Using standard Windows procedures, open the Gen2Mon folder.
5. Click on the Gen2Mon icon to open the Gen2Mon program. The Gen2Mon screen is displayed.
6. In the Simulation Mode, carefully adjust the controller's input parameters, such as temperature, pressure, switch position, etc. Adjust the values within normal and practical operating limits and just enough to verify that a realistic change in output is produced.
7. When all inputs and outputs have been checked, return the input parameters to their original settings. The first phase is completed.

CAUTION

Operation of the GEN2MON software in the simulation mode presents a serious risk to the system. In the simulation mode, the operator is actually forcing values into the controller, therefore, it is possible to overcome any of the natural safeguards which may be in place to protect the plant. When in simulation mode, exercise great care in adjusting values. The software is a powerful facility and should not be used carelessly.

4-1.6.4 Second Phase Testing

Perform the second phase of initial tests of the system as follows:

1. Turn on operating power to the primary output circuits such as pilot relays, motor controllers and heat valves.
2. Ensure that operating power to plant machinery (compressors, fans, etc.) is turned off.
3. In the Simulation Mode, observing the CAUTION noted above, carefully adjust the controller's input parameters. Adjust the values within normal and practical operating limits and just enough to verify operation of the primary output circuits.
4. When all outputs have been checked for proper operation, return the input parameters to their original settings. The second phase is completed.

4-1.6.5 Third Phase Testing

Perform the third phase of initial tests of the system as follows:

1. Turn on operating power to the plant machinery in accordance with the manufacturers' instruction manuals.
2. In the Simulation Mode, observing the CAUTION noted previously, carefully adjust the controller's input parameters. Adjust the values within normal and practical operating limits and just enough to verify control and operation of the plant machinery.
3. When items of plant machinery have been checked for proper operation, return the input parameters to their original settings. The third phase is completed.
4. Exit the Gen2Mon program.
5. Turn off operating power to the entire Genesis System and the PC.
6. Disconnect the RS232 cable between the PC and the controller, if RS232 was not used to connect to the device skip this step.
7. Repeat procedures in Paragraphs 4-1.6.3 through 4-1.6.5 for the other controllers.

4-1.7 Final System Check

Final check of the system involves checking the operation of the system, performing any necessary adjustments and verifying that the system functions properly under normal operating conditions. The following are the procedures for performing final system checkout:

1. Apply normal operating power to the entire system in accordance with the applicable manufacturers instruction manuals.
2. Allow adequate time for the various units to stabilise. Unless specified otherwise in the applicable instruction manuals, allow approximately one hour for the circuits to stabilise.
3. Carefully check each unit of the system for proper operation. If necessary, the Gen2Mon software may be used in the Monitor Mode (NOT in the Simulation Mode) to check proper operation within the controller.
4. Check manufacturers' recommended adjustments and settings to ensure all units are set-up for optimum function.
5. At the controller enter final operational preferences such as schedules, passwords, flash watches, etc.
6. The system is ready for operation.

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Genesis II Direct Digital Controller

INSTALLATION INSTRUCTIONS

Chapter 5 - Network Installation

INNOTECH®

5-1 Overview

Due to their flexibility, the Genesis II Direct Digital Controller and MPCII Mid Points Controller, and associated REMs, can be connected in any of several equipment configurations based on the system's operational requirements.

In the simplest configuration, a single digital controller unit acts as a standalone controller for the unit. More complex installations use multiple digital controllers, with REMs, and share data between themselves and/or a computer.

In these applications, communication between the digital controllers is facilitated by a Global Points link bus system and communication with computers is by standard RS485 network (Ethernet Connection option available for Genesis II Direct Digital Controller).

Refer to the Innotech Website for the current models of Genesis products and the most recent datasheets.

NOTE

For advanced information on networking entire Innotech Systems, including integration with MAXIM series devices, refer to DS99.04 Installation Manual for Innotech Device Network Cabling.

5-2 Genesis II Products

The Genesis II System products which can be connected to the serial Comms are:

- Genesis II Digital Controller
- GENII MPI Modem and Printer Interface
- GENII IR11 Innotech Repeater
- GENII IR12 Innotech Repeater
- GENII CONV232 RS232 to RS485 Isolated Converter
- GENII WMI Wireless Module Interface
- MPCII Mid Points Controller
- All Genesis II Remote Expansion Modules (REMs)

5-2.1 Definitions

5-2.1.1 Net Comms

Net Comms provides a means to configure or monitor Digital Controllers from a PC at a speed of 57,600 (default) or 9,600 baud rates.

A local PC can be connected to the Net Comms via one of the following:

- with a CONVUSB USB-RS485 Converter, connected to the local PC with a USB connector
- with a CONV232 RS485-RS232 Converter, connected to the local PC with a RJ45 connector
- with a GENII MPI Modem Printer Interface connected by RS232 Serial link to the PC with DB9 connector
- through the optional Ethernet Port on the Genesis II Direct Digital Controller, via a Local Area Network connection, or through direct connection using an Ethernet Crossover Cable

Caution must be exercised if a PC and an MPI or more than one PC is directly connected to the Net Comms. Only one of these can be active at a time or there will be a conflict between them causing the data to be corrupted. This can be prevented by allowing other PC's to communicate through a common iComm server.

Isolated local access to an individual Digital Controller can be made via its RS232 RJ45 connector. The Digital Controller is disconnected from the RS485 Net Comms when this connection is activated. The PC cannot access the Net Comms via this RS232 connection.

5-2.1.2 Global Comms

The Global Points network provides a means for control data to be shared among Digital Controllers on an Innotech network. The speed of the communication is relative to programmed Net Comms speed, being either 38,400 or 4,800.

NOTE

Global Comms can be monitored from an iComm connection through the use of the Innotech NetScan application. Refer to the NetScan help documentation for more information.

5-2.1.3 Ethernet Comms

The Genesis II Direct Digital Controller has an optional Ethernet port, which when connected to an active local area network, enables a PC to configure and monitor the Digital Controller and connected devices. By default, the Genesis II Direct Digital Controller, with optional Ethernet Port, is configured as DHCP Enabled.

When connected to a Local Area Network with a DHCP Server, the digital controller's IP Address will be managed automatically. However, this value can be configured to be static through the Human Machine Interface (HMI), or through the use of the Innotech EtherMate software application.

NOTE

Refer to DS 99.05 Ethernet Setup Manual for Innotech Device Communications for specific information on the Ethernet setup of Genesis II Direct Digital Controllers.

5-3 Installation

It is not possible to cover all the situations that may be encountered in the wide range of installations found in the field. The following examples are provided as a guide to assist in deciding the best method of connection for a Genesis II System Installation.

Some situations require additional care to avoid hazardous situations. These may be covered by legislation or regulations such as those set by Telecommunications Authorities, Electrical Wiring Rules and Local Authorities.

Products of the Genesis II System product line are designed to comply with the Safety Extra Low Voltage standards and, therefore, any wiring connected to these products should also comply with these standards if the product compliance is to be maintained.

Communication links between equipment located within different electrical switchboards should be electrically isolated from one another. The voltages at the earth connections at the switchboards will usually have a small difference under normal conditions but, if a fault occurs on equipment connected to one switchboard, the voltage difference can increase dangerously. If a non-isolated communications link is used, this voltage difference can cause a large current to flow through the communications cable and the integrated circuits (ICs) connected to it. An isolated connection will block the current, but it would have to withstand the full supply voltage for up to several seconds.

NOTE

For detailed installation information, including installation on a system incorporating Innotech MAXIM series devices, refer to DS 99.04 Installation Manual for Innotech Device Network Cabling.

5-3.1 Network Specifications

The network type and baud rate determine the maximum recommended cable specifications. For cable runs longer than the recommended lengths an Innotech Repeater IR11 or IR12 should be used.

Repeaters may also be required if the number of devices connected to a network segment exceeds the maximum allowable number of devices for the specific network.

NOTE

For specific instructions for the network installation of Innotech Devices, refer to DS 99.04 Installation Manual for Innotech Device Network Cabling.

5-3.2 Cable Specifications

Innotech recommends the use of cables specifically designed for RS485 networks. There are many cables on the market that meet the specifications for RS485 networks.

Best reliability is achieved through a cable consisting of 2 individually shielded twisted pairs of low capacitance. Such cables also provide excellent mechanical strength and lowest electrical resistance, which is beneficial for maximum length cable runs.

Some CAT6 cable types may also be suitable in certain applications. Care should be taken when using CAT6 for Primary Networks as they frequently omit shielding. CAT6 cables should be shielded in order to provide reliable communications.

Any cable that meets or exceeds all the stated specifications is suitable for use:

- 2 twisted pairs
- Minimum conductor cross section AWG24 (0.205 mm^2)
- Stranded core type is recommended (7 strands of 0.193 mm)
- Conductor Foil screened cable with a wire drain
- Less than 50 pf capacitance per metre between conductors
- Less than 80 pf capacitance per metre between conductors and screen
- Impedance 100 – 120 Ohms
- Sheath thickness 0.8 mm 240 V rated
- Equivalent to the Belden Part #8102

5-3.3 Wiring Topology

Installation of Primary devices on a Genesis Network must adhere to the Bus topology. A Bus Topology is produced by connecting from one device to the next and then onto the next. Refer to Figure 5-1 below.

A simple means to identify if bus topology is used is to check that:

- There are TWO end connections
- Any joining is made between TWO cable ends only

Furthermore, there are a number of rules which apply to the comms connection of a Primary Network:

1. The screen must be continuous.
2. Only one point earthed on the screen.
3. Even if a network has a device with a soft earth, one hard earth is still required on that network.
4. The Net and Global networks should have the same length cable run and path.
5. If a repeater is installed, each side of that repeater is a separate network and each requires a bonded earth connection on the screen.
6. Using isolated devices, devices with isolated comms cards or using an isolated MPI does not alter any of these rules.
7. There are no End of Line termination (EOL) requirements on the primary network.

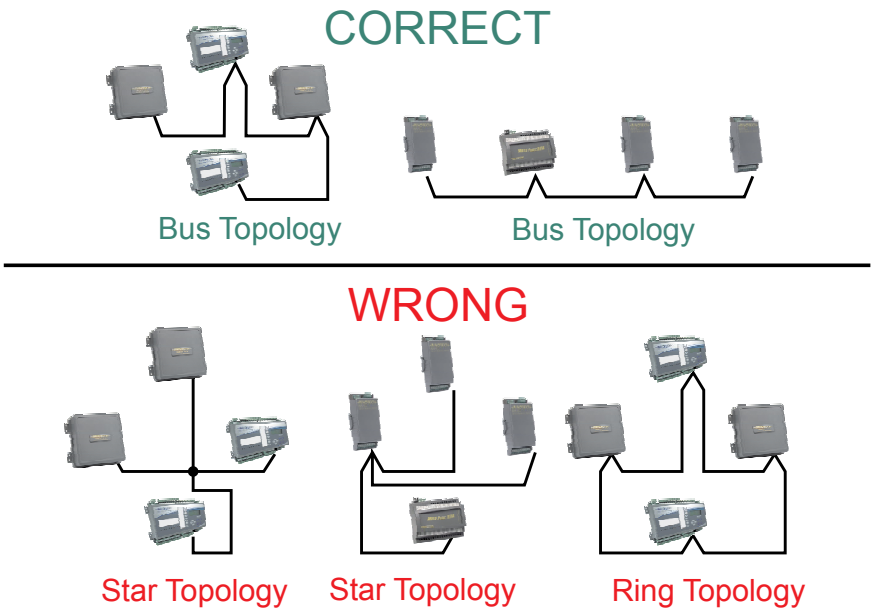


Figure 5-1: Correct and Incorrect Bus Topology

5-3.3.1 Adding Modules to the Comms Link

To insert another module into the Comms link, make a looping connection through it as in Example A of Figure 5-2 below. Alternatively, use a Innotech Repeater IR11 or IR12 to branch off to the new module as in Example B of Figure 5-2.

Note that the four devices and Port 1 of the Repeater Module are connected in bus topology. Port 2 of the Repeater Module and the added device form a separate network linked by the electronics within the Repeater Module. Always maintain bus topology on the network when adding another module to the network.

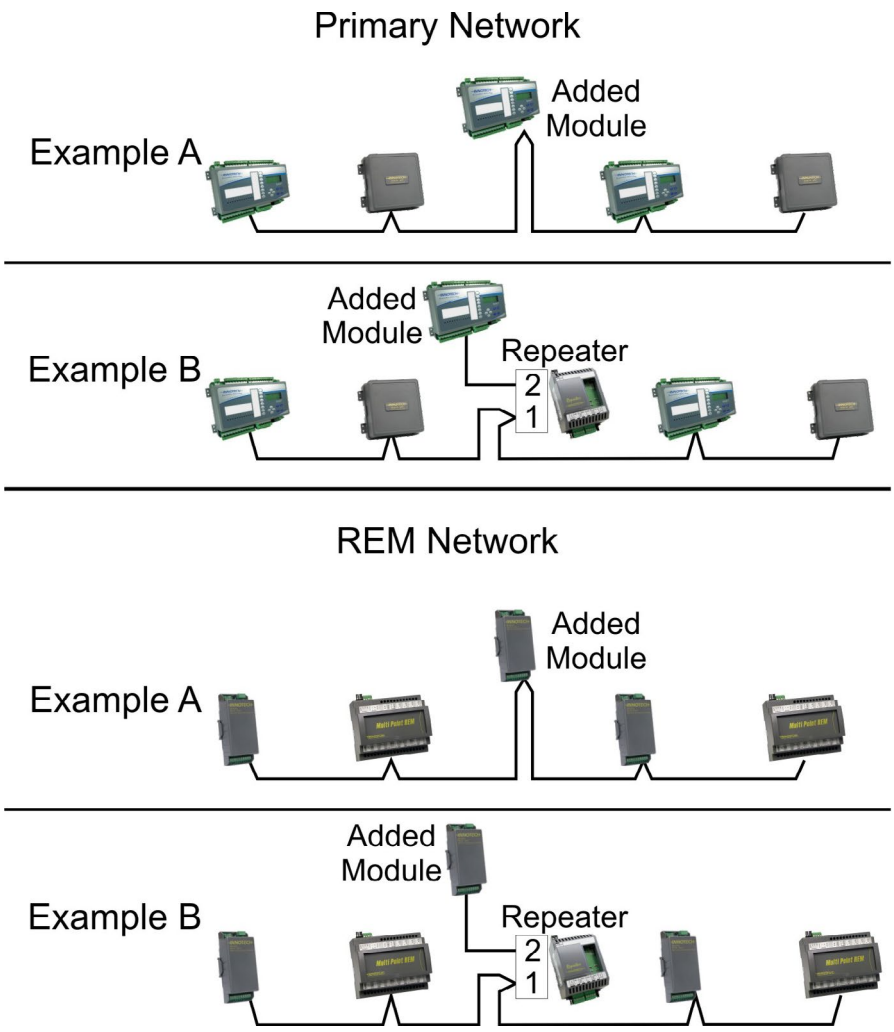


Figure 5-2: Adding Modules to a Network

5-3.3.2 Linking Networks in Different Locations

When linking networks in different buildings, or when linking modules supplied from different switchboards, isolation must be provided to eliminate earth loops.

To expand an REM network, use an Innotech Repeater IR11 as described below in section 5-3.3.3.

To expand a Primary Network, use an Innotech Repeater IR12 as described in subsection 5-3.3.4.

5-3.3.3 Innotech Repeater IR11 on a REM Network

The Innotech Repeater IR11 is a single channel repeater designed to expand a Sub System Network or REM network. It runs off either a 24VAC or DC power supply. A typical example of how the IR11 can be incorporated into an Sub System Network or REM network is given in Figure 5-3.

5-3.3.4 Innotech Repeater IR12 on a Primary Network

The Innotech Repeater IR12 is a dual channel repeater designed to expand both NET and GLOBAL comms networks. It runs off either a 24VAC or DC power supply. A typical example of how the IR12 can be incorporated into a Primary Network is given in Figure 5-4.

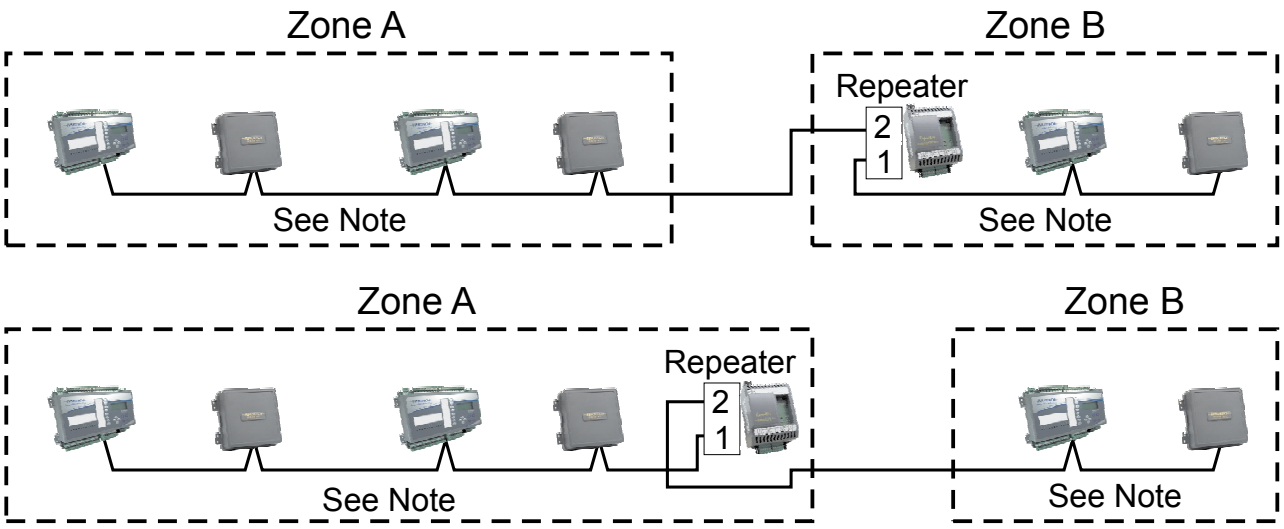


Figure 5-3: Linking Networks in Different Locations

NOTE

Maximum Cable length is 400 metres at 57,600 Baud Rate (Default) and 1,000 metres at 9,600 Baud Rate.

5-3.3.5 Multiple Network Arrangement

Figure 5-4 shows a multiple network arrangement consisting, effectively, of four separate networks. Each is wired in a bus topology and each could be up to 400 metres long (at the default 57,600 Baud Rate) or 1,000 metres long (at the optional 9,600 Baud Rate).

The networks are linked by the electronics in the Innotech Repeater IR12 module. The GENII MPI Modem and Printer Interface does not need to be an isolated version but it should be noted that the Comms cable connecting the Innotech Repeater IR12 module will be earthed through the MPI via the PC and the printer.

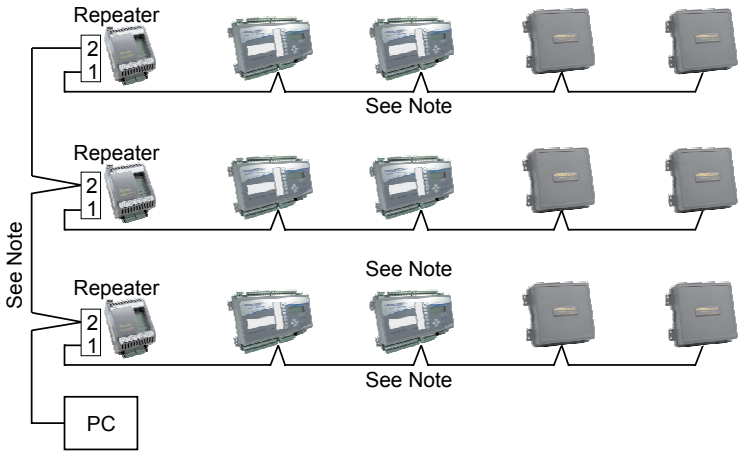


Figure 5-4: Multi-Network Arrangement

NOTE

Maximum Cable length is 400 metres at 57,600 Baud Rate (Default) and 1,000 metres at 9,600 Baud Rate.

5-3.4 REM Network End of Line Termination (EOL)

All REM's have EOL jumpers and these must be fitted correctly. See the Figure 5-5 through to Figure 5-8. There are many variations to network layouts the following four examples provide a guide to correct jumper application.

Example Figure 5-5:
This example shows a Genesis II Direct Digital Controller with a straight forward network of REMs.

NOTE

Both ends must have EOL jumpers fitted.

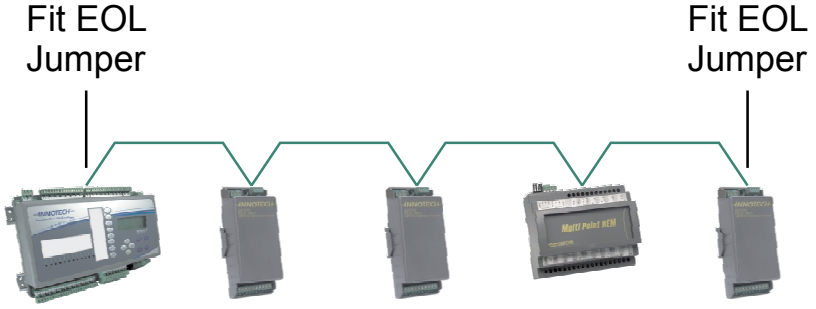


Figure 5-5: Example of a Simple REM Network

Example Figure 5-6:
This example shows a Genesis II Direct Digital Controller with a network of REMs and an Innotech Repeater IR11 fitted. Once a Repeater is installed there are effectively two individual networks and each must have their EOL jumpers fitted as required, as illustrated at Example 1 in Figure 5-5.

NOTE
Both ends must have EOL jumpers fitted.

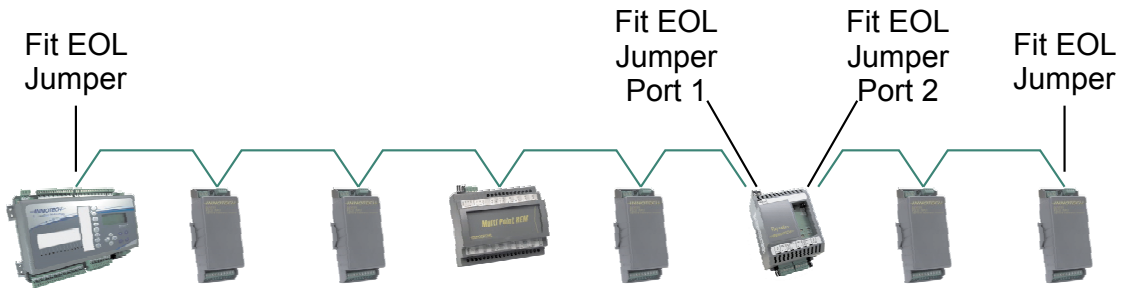


Figure 5-6: Example of REM Network with an Innotech Repeater IR11

Example Figure 5-7:
This example shows a Genesis II Direct Digital Controller with a network of REMs. In this example, the digital controller is in the middle of the run.

NOTE
Both ends must have EOL jumpers fitted.

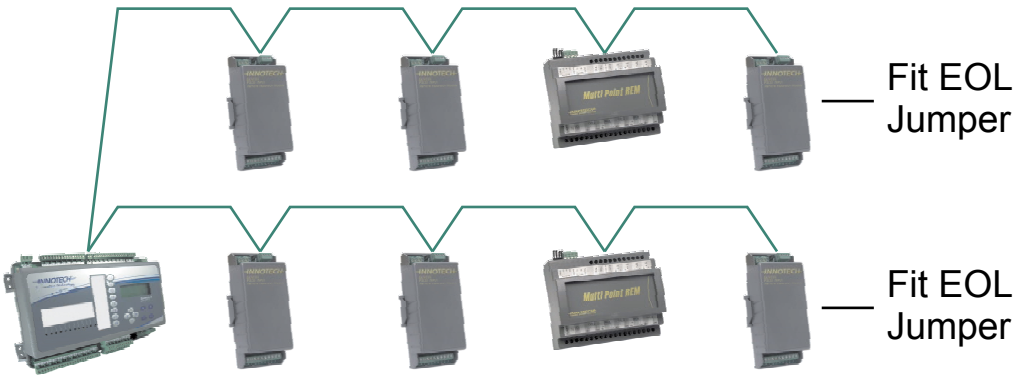


Figure 5-7: REM Network with Digital Controller in the middle of a run

Example Figure 5-8:
This example shows a Genesis II Direct Digital Controller with a network of REMs, where there is a Innotech Repeater IR11 located in the middle of a run.

NOTE
The Innotech Repeater IR11 has the EOL jumper fitted on Port 1 but not Port 2.

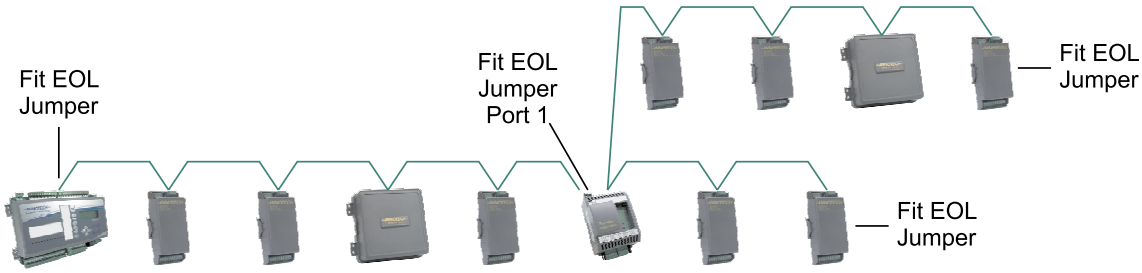


Figure 5-8: REM Network with Innotech Repeater IR11 in the middle of a run

5-3.5 Genesis II System Comms Wiring Considerations

The maximum number devices that can be connected on one section of Comms cable is 31. This limit is set by the characteristics of the RS485 ICs. To increase the number of nodes or devices on a system, an Innotech Repeater IR11 or IR12 should be used (Figure 5-9).

The maximum length of Comms cable for the **Primary Network** is 400 metres (at default 57,600 Baud Rate) or 1000 metres (at optional 9,600 Baud Rate). This limit is determined by the characteristics of the RS485 ICs and by the characteristics of the cable. To increase the maximum cable length on a system, an Innotech Repeater IR12 should be used.

The maximum length of Comms cable for the **REM Network** is 600 metres. To increase the maximum cable length on a system, an Innotech Repeater IR11 should be used.

In practice, the maximum length of cable is determined by the quality of the signals. The signal will be degraded by using cable which does not meet the RS485 cable specification and by installing the cable in locations where it is subject to interference from other cables and equipment. In severe cases, it may not be possible to have 31 nodes on one section of cable, or to match the defined maximum cable length.

The two ports on an Innotech Repeater IR11 or IR12 module reside on different sections of the system and each section can have up to the maximum of 31 nodes. With a one repeater, a total of 62 nodes can be connected on the system. A repeater can be connected at any point on the network providing bus topology is maintained. Multiple repeaters can be used, with the maximum number of Genesis II System devices allowed being 128

NOTE
The maximum number includes the number of Repeater Modules used in the system.

NOTE

The maximum possible number of devices on one section of cable is 31. Through the use of Innotech Repeaters, the maximum Genesis II System Devices allowed on a network is 128.

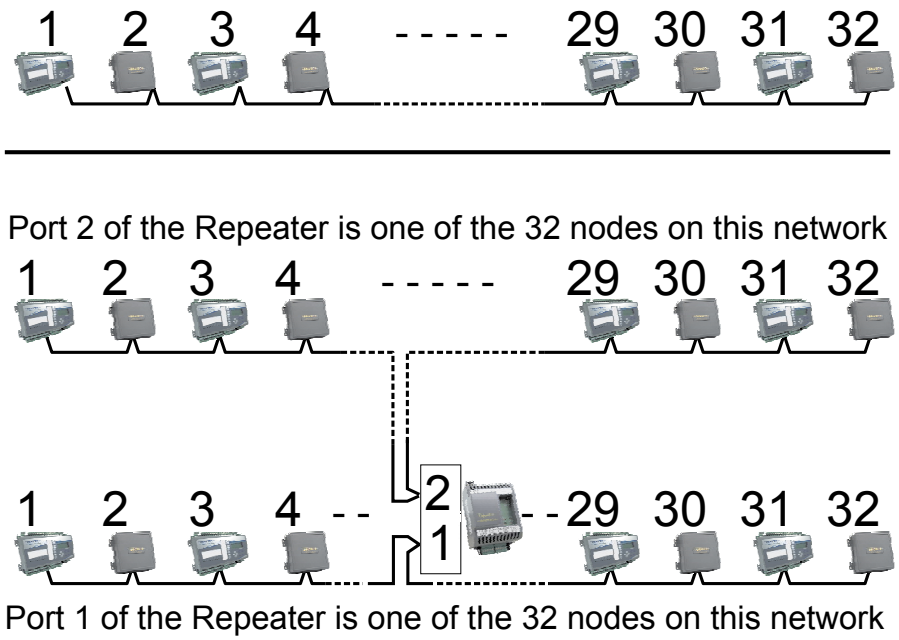


Figure 5-9: Use of Repeaters to expand the Primary Network

NOTE

The maximum possible number of devices on one section of cable is 31. Through the use of Innotech Repeaters, the maximum Genesis II System Devices allowed on a network is 128.

5-3.5.1 Genesis II Comms Wiring Connections

There are a number of rules that apply to the comms connection of a Genesis II System network:

1. The screen must be continuous.
2. Only one point earthed on the screen.
3. Even if a network has a number of devices with a soft earth, one hard earth is still required on that network.
4. The Net and Global networks should have the same length cable run and path.
5. If a Innotech Repeater is installed, each side of that repeater is a separate network and each requires a bonded earth connection on the screen.
6. Using isolated devices, devices with isolated comms cards or using an isolated MPI does not alter any of these rules.
7. There are no End of Line termination (EOL) requirements on the primary network.

5-3.5.2 Continuous Screen

The screen on a primary network needs to be continuous. That means it remains unbroken along its entire length. As there is one 'S' terminal on a typical primary network device both the Global and Net screens are to be connected to this tie terminal.

Refer to Figure 5-10 and Figure 5-11 for examples of Genesis II Direct Digital Controller / MPCII Mid Points Controller Comms Terminal connections.

5-3.5.3 Primary Network Connections

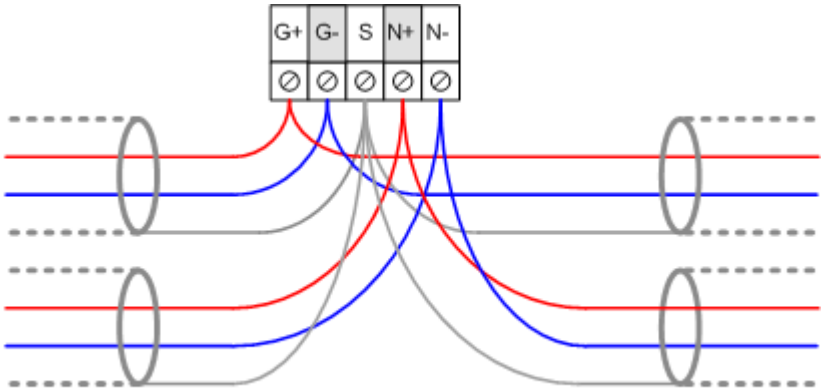


Figure 5-10: Example of Comms Screen Connection

When there is more than one connection point to earth the screen becomes a conductor and no longer performs correctly. Care should be taken to ensure only one bonded earth point is ever connected on a primary network Refer Section 5-3.5.4 for details on use of a Repeater in a primary network.

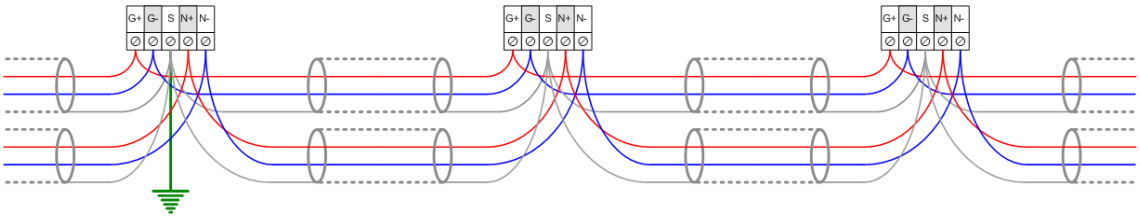


Figure 5-11: Typical Comms Network Connections

When other controllers ,such as Viewports or converters, are added to the Primary Network they must be installed in a manner that does not interrupt the integrity of the Primary Network. A lot of current devices will have the soft earth option and are fully isolated from the factory. There is no issue mixing the current style earth connection with previous models of hardware on the Primary Network if the following rules are applied.

These HMIs and converters will be referred to as soft earth devices with respect to comms screen termination. For any soft earth type device connected to a primary network there are some general rules for connection.

1. Do not break the continuity of the screen.
2. Use the 'S1' terminal for both the entering and leaving screen termination.
3. You must earth the system at a single bonded earth point. This is regardless of the number of soft earth points connected.
4. Attempt to ensure the net and global networks are the same length and follow the same path.

Regardless of the type of isolation used in either the current model devices (all now standard with fully isolated soft earth) or older series controllers (plug-in optional isolation card), there is no effect on the Primary Network earth requirements. The isolation is not on the Primary Network, but between the Primary Network and the power supply of only that respective controller. All network rules apply as stated.

There are three types of **Earth** referred to in this document:

1. Bonded, hard or clean.
2. Soft.
3. Floating.

These definitions are listed below in relation to the Innotech networks.

1. A bonded, hard or clean earth is defined as a low impedance earth point with little or no chance of conducted noise either already present or likely to be created when bonded to a circuit. For Innotech's reference we also explicitly mean there is no potential difference to true earth.
2. A soft earth is where there is a path to earth via a circuit. This provides a tie to earth so potential differences are minimised. This path has higher impedance than a bonded earth. This does force strong earth currents, i.e. leakage currents from large AC motors, to remain on the proper heavy gauge earth wires, while leaving the soft earth paths unaffected. So whilst having multiple earth connections we have not created any effective earth loops. Soft earth is often used in 24V supplied devices. The 'tie to earth' is in fact a 'tie to 0V' because there is no dedicated earth terminal available. It is therefore expected that the 0V is earthed near the supply transformer.
3. Floating simply means that there is no path to an Earth point at all provided by the device, not even a soft earth path. A floating device has no earth.

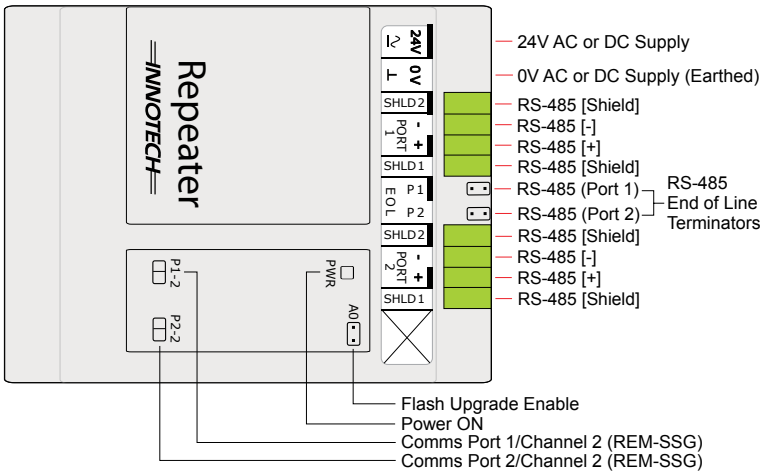
5-3.5.4 Innotech Repeater Modules

The Innotech Repeater modules IR11 and IR12 (Figure 5-12) can be used with both the Genesis II Direct Digital Controller and MPCII Mid Points Controller. The repeater's function is to rebuild each data byte before retransmitting it.

When a repeater is added to a network it effectively creates two separate networks.

This means users must apply all the rules to each side of the repeater as if they were actually two completely separate networks. All primary network rules apply without variation. All repeaters do have Soft Earth features. They do not negate the need for a hard earth on either side of the repeater network sections. It is not recommended to earth both ports (1 & 2) right at the repeater as this would defeat some of the advantages of the port isolation. Port 2 (remote port) should always be earthed on the remote side.

IR11 Single Channel Innotech Repeater Module



IR12 Dual Channel Innotech Repeater Module

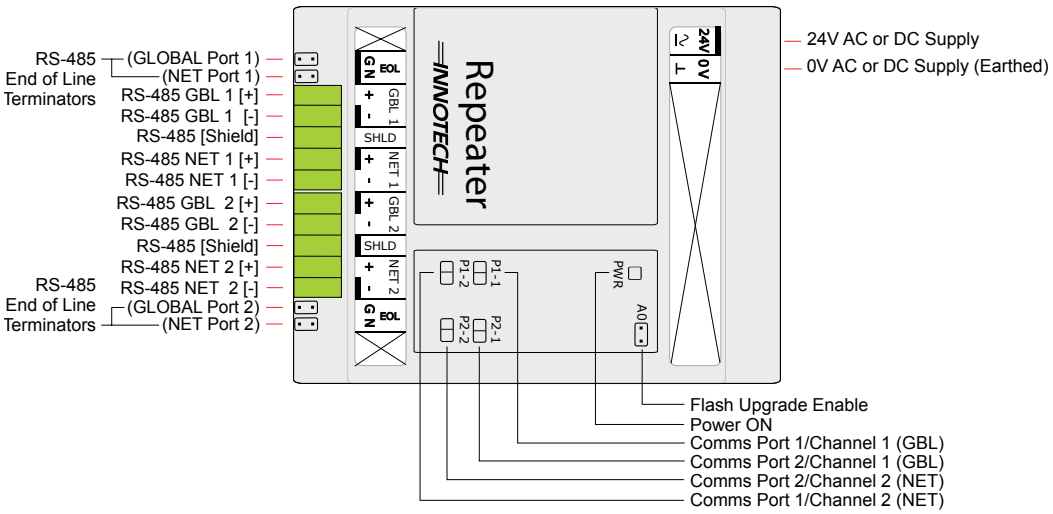


Figure 5-12: Innotech Repeater IR11 and IR12

Neither the Innotech Repeater IR11 or IR12 have a separate earth terminal as it is a 24VAC powered device; however, the 24 V supply must be earthed on the 0 V side for safety and to make use of the Soft Earth feature.

The IR12 is the current dual channel and dual baud rate repeater. The IR11 is the current single channel dual baud rate repeater. The IR12 and IR11 are fully isolated and both Port 1 and Port 2 offer the same level of protection. That means that both Ports 1 & 2 can be used for the remote site connection.

NOTE

The earth on the Innotech Repeater IR12 must be connected to the soft earth terminal.

Refer to Figure 5-13 below for a common networking example, using the Innotech Repeater IR12 Module.

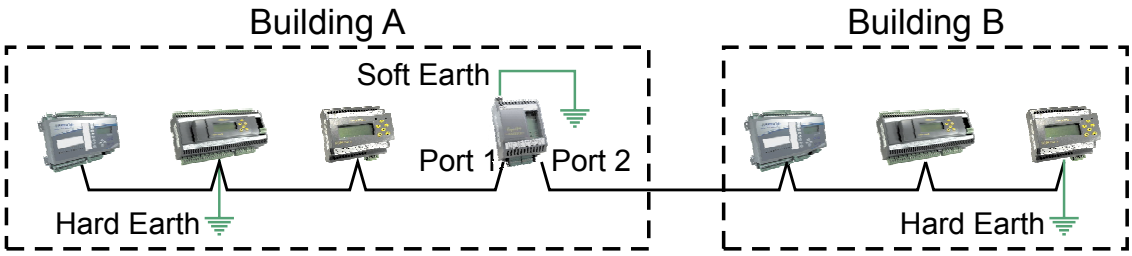


Figure 5-13: Networking and Earthing the Innotech Repeater IR12

5-3.5.5 GENII MPI Modem Printer Interface

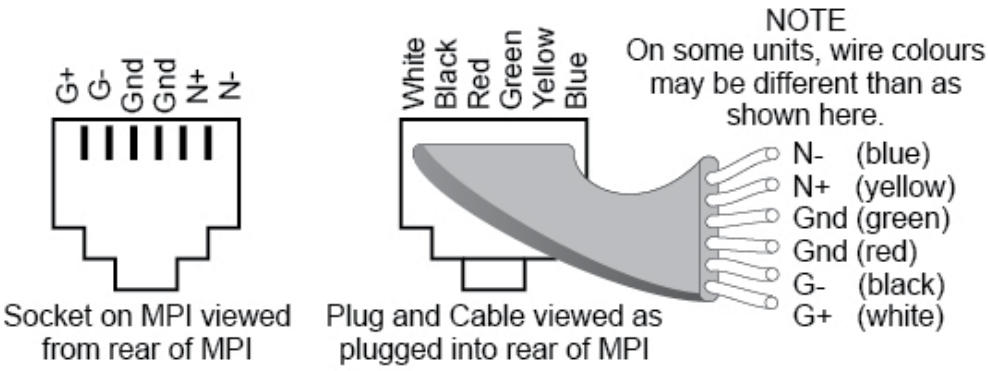
The GENII MPI Modem and Printer Interface can be used with both the Genesis II Direct Digital Controller and MPCII Mid Points Controller.

The MPI is supplied with a double insulated plug pack, which isolates the MPI power supply from the electrical earth. However, when a printer or PC is connected to the MPI it will be connected to the electrical earth via the printer and/or PC cables. See Figure 5-14.

The Comms is connected to the MPI via the RJ11 socket on the rear of the MPI. The top portion of Figure 5-14 shows the socket connections and the cable as supplied. The standard order for conductor colours is shown, but they may change and, therefore, should always be checked before connecting.

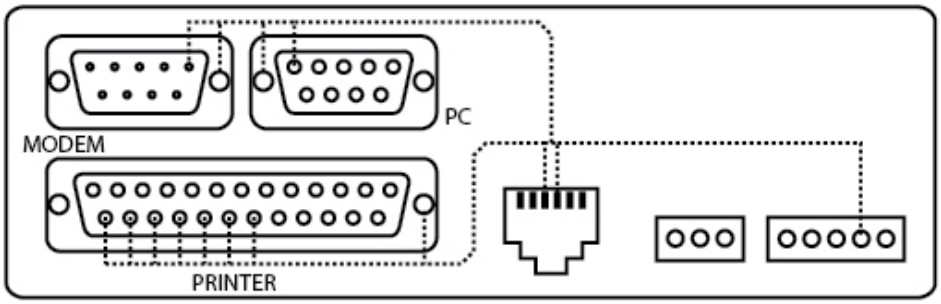
To isolate the screen of the Comms cabling from electrical earth at a non-isolated MPI, do not connect the two GND conductors of the flat MPI cable to the screen(s) of the Comms cables at the wall connection. This is not an isolated connection for the data conductors.

To provide isolation for the data conductors, an MPI fitted with RS485 isolation ICs must be used. The two GND conductors should be connected to the screen(s) of the Comms cable when an isolated MPI is used. Connecting the screen(s) of the Comms cable(s) completes the internal overvoltage protection on the MPI data connections.



COMMS CABLE CONNECTION ON MPI

A non-isolated MPI has the three DB connector shells and the pins shown connected to COMMON. When a Printer or PC is connected, the RS485 Comms is earthed.



An isolated MPI has the three DB connector shells and the pins shown connected to COMMON. When a Printer or PC is connected, the RS485 Comms are NOT earthed.

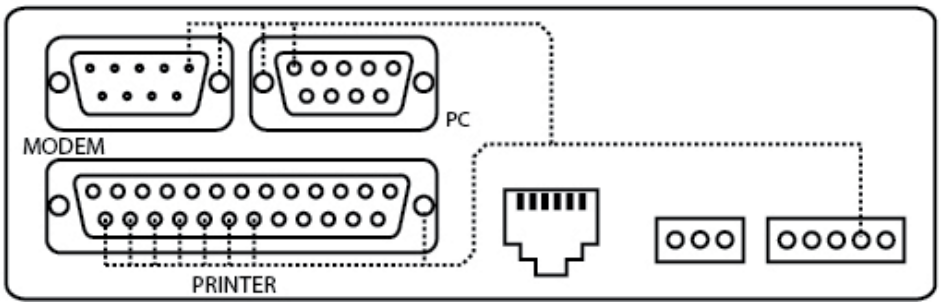


Figure 5-14: GENII MPI Modem and Printer Interface

CAUTION

Section 5-3.5.6 below, and their referenced figures, describe improper earth connection condition that could lead to severe electrical shock damage to equipment. Read and understand these paragraphs thoroughly before making any comms connections.

5-3.5.6 Hazardous Earth Connections

When the Digital Controllers are supplied and earthed from two different switchboards, a hazardous situation can be created. One earth connection is at the local switchboard and the second earth connection is by way of the screen of the Comms cable (Figure 5-15, below). In the event of a fault, there could be full supply voltage difference between the two earth connections. This can destroy the RS485 ICs and anyone touching the screen can receive a severe electric shock. The RS485 ICs in the three Digital Controllers in Control Panel No.2 will be damaged if the voltage difference exceeds the ratings of the ICs. Because of this hazard, this arrangement of connection should not be used.

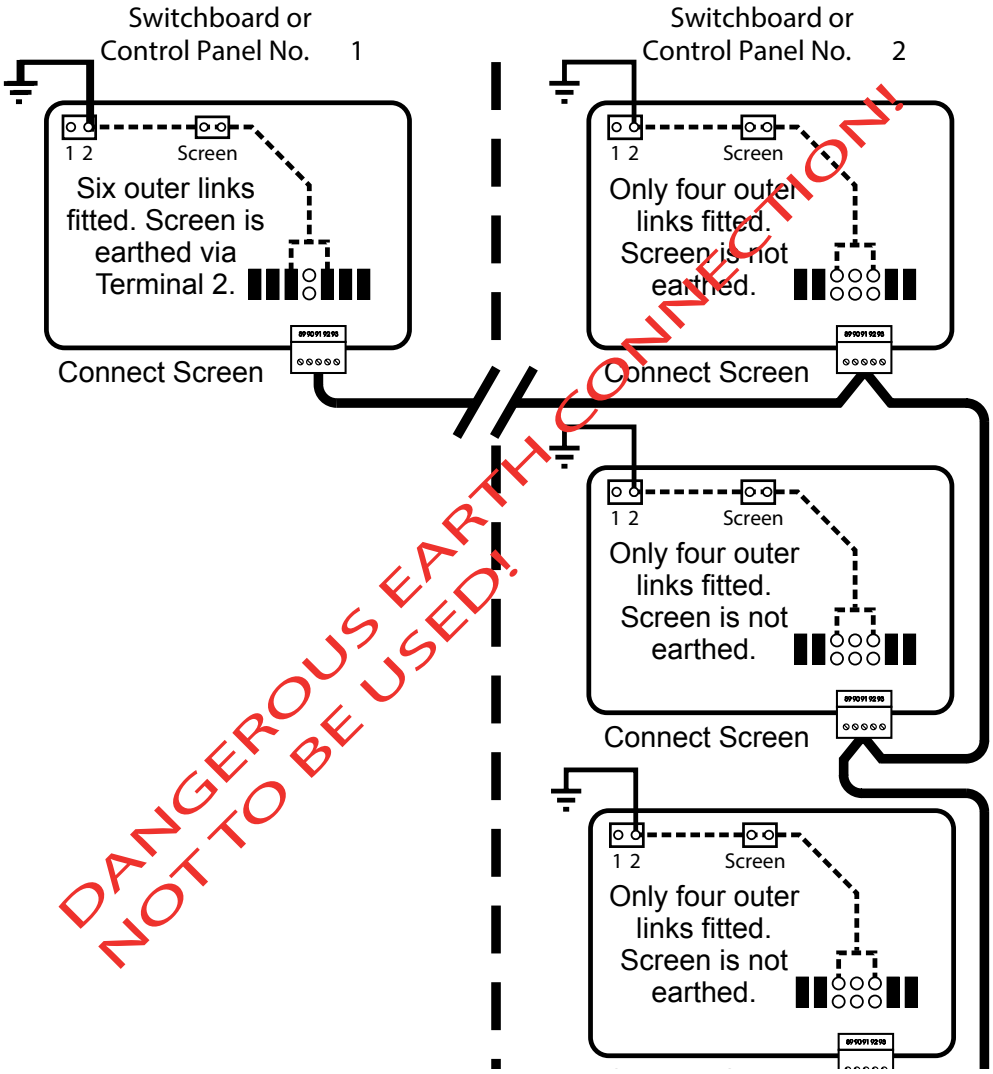


Figure 5-15: Hazardous Connection Example, Circuit 1

Figure 5-16 below shows a wiring arrangement that is slightly better. The earthing point for the screen is at the first Digital Controller in a group located together and supplied from one switchboard. It gives better protection to the greater number of Digital Controllers. This arrangement does not remove the hazard that the screen voltage at point A in the figure is not at the earth voltage of that Digital Controller. Nor does it remove the possibility of damage to the RS485 ICs if the voltage difference exceeds the voltage ratings of the IC.

If the three Digital Controllers in Control Panel No. 2 are solidly bonded together and to earth, then it is possible that only the RS485 IC in the Digital Controller in Control Panel No. 1 will be damaged.

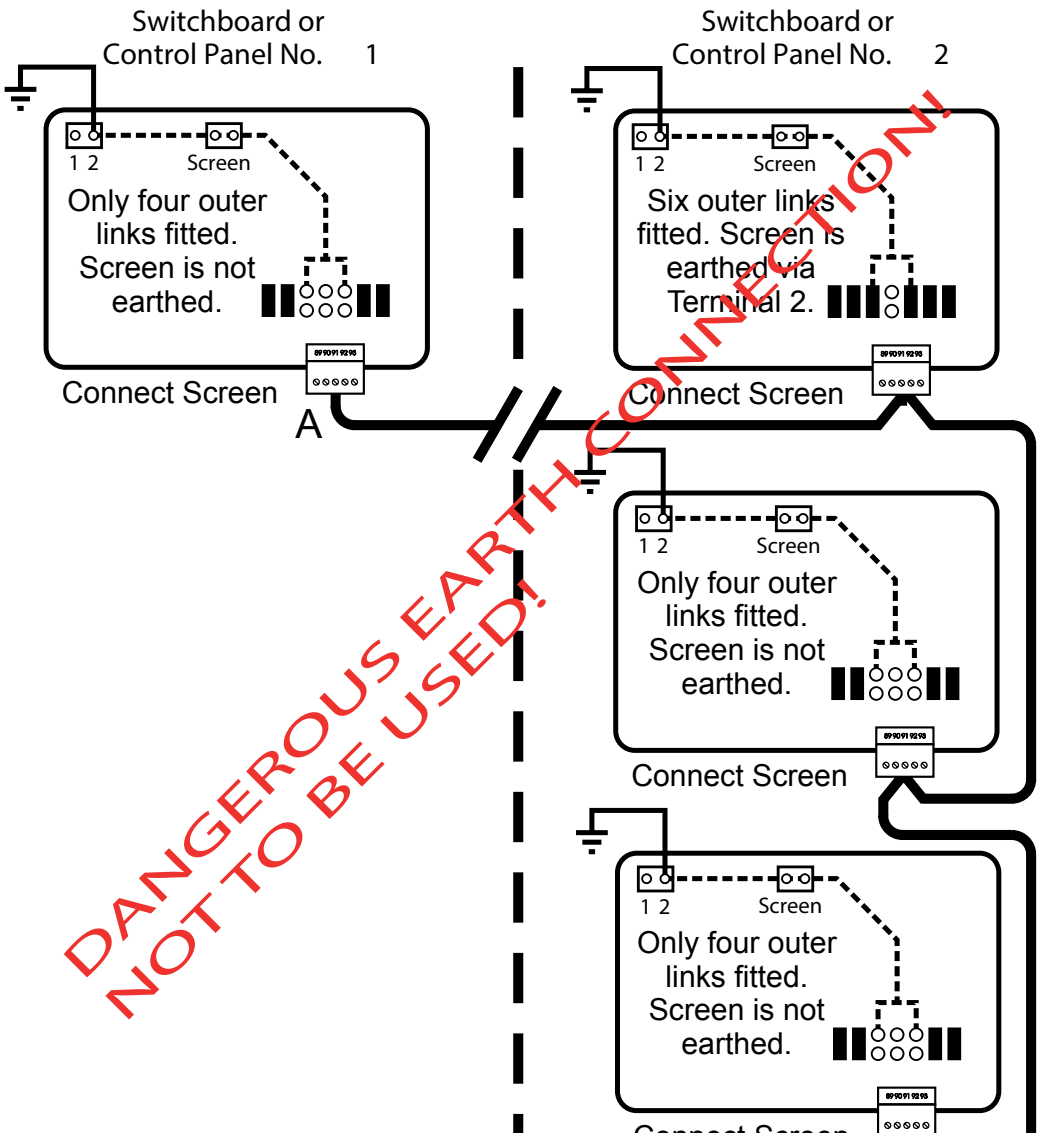


Figure 5-16: Hazardous Connection Example, Circuit 2

5-3.5.7 GENII MPI with Non-Isolated Comms.

When using a GENII MPI Modem and Printer Interface which has standard RS485 ICs, the RS485 connection is not isolated. Connecting a printer or a PC to the MPI will earth it. To prevent earth loops all other devices on that section of Comms cable must isolate the screen from the electrical earth.

Figure 5-17 below shows one local and three remote Genesis II non-isolated Digital Controllers, all of which have only the four outer links fitted. In this situation it is better to fit GENII 485I Isolated RS485 Comms cards to the three remote Digital Controllers.

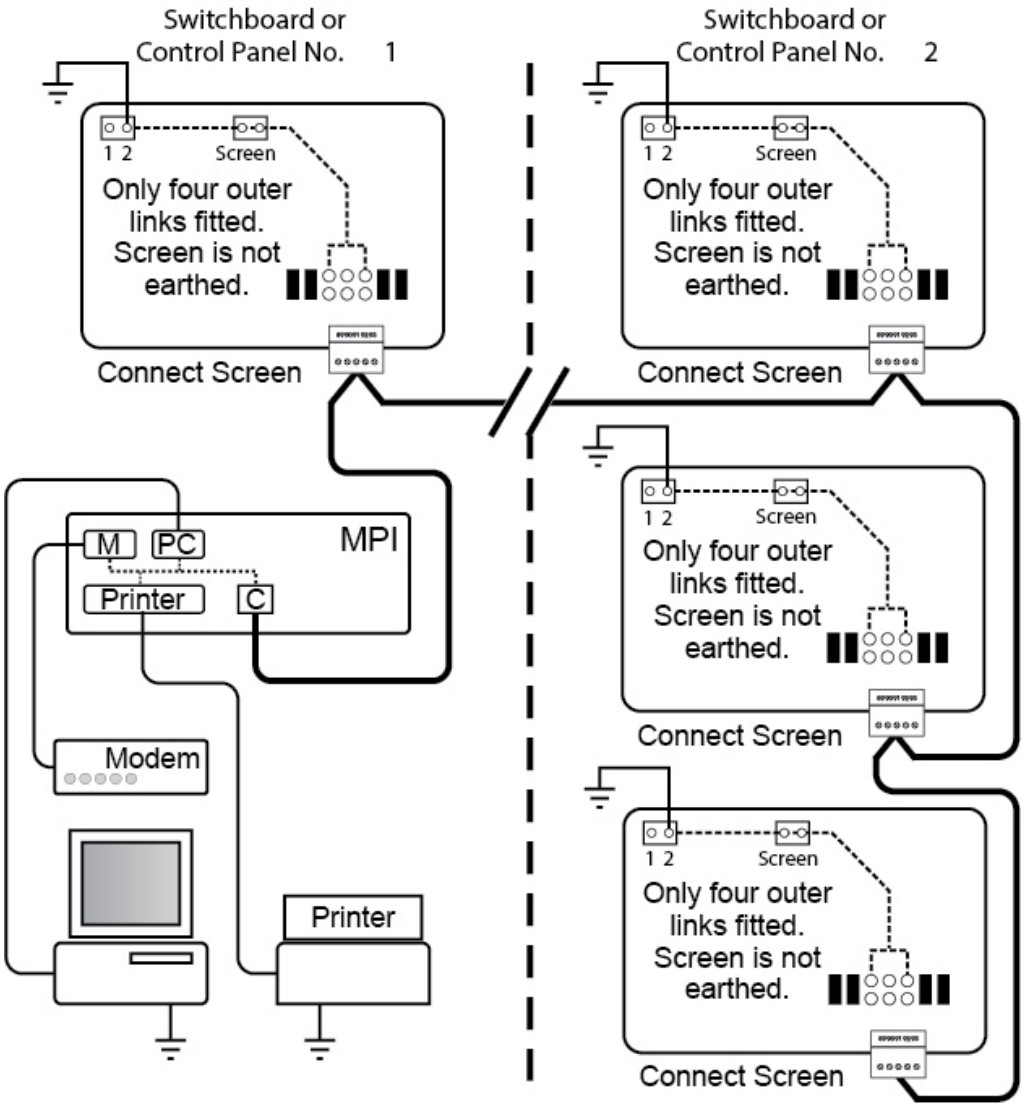


Figure 5-17: Use of GENII MPI, Circuit 1

A better solution is to use an MPI that has RS485 isolation ICs and to fit a GENII 485I Isolated RS485 Comms card to the local Digital Controller and earth the screen at the first Digital Controller in Control Panel No. 2, as shown in Figure 5-18 below.

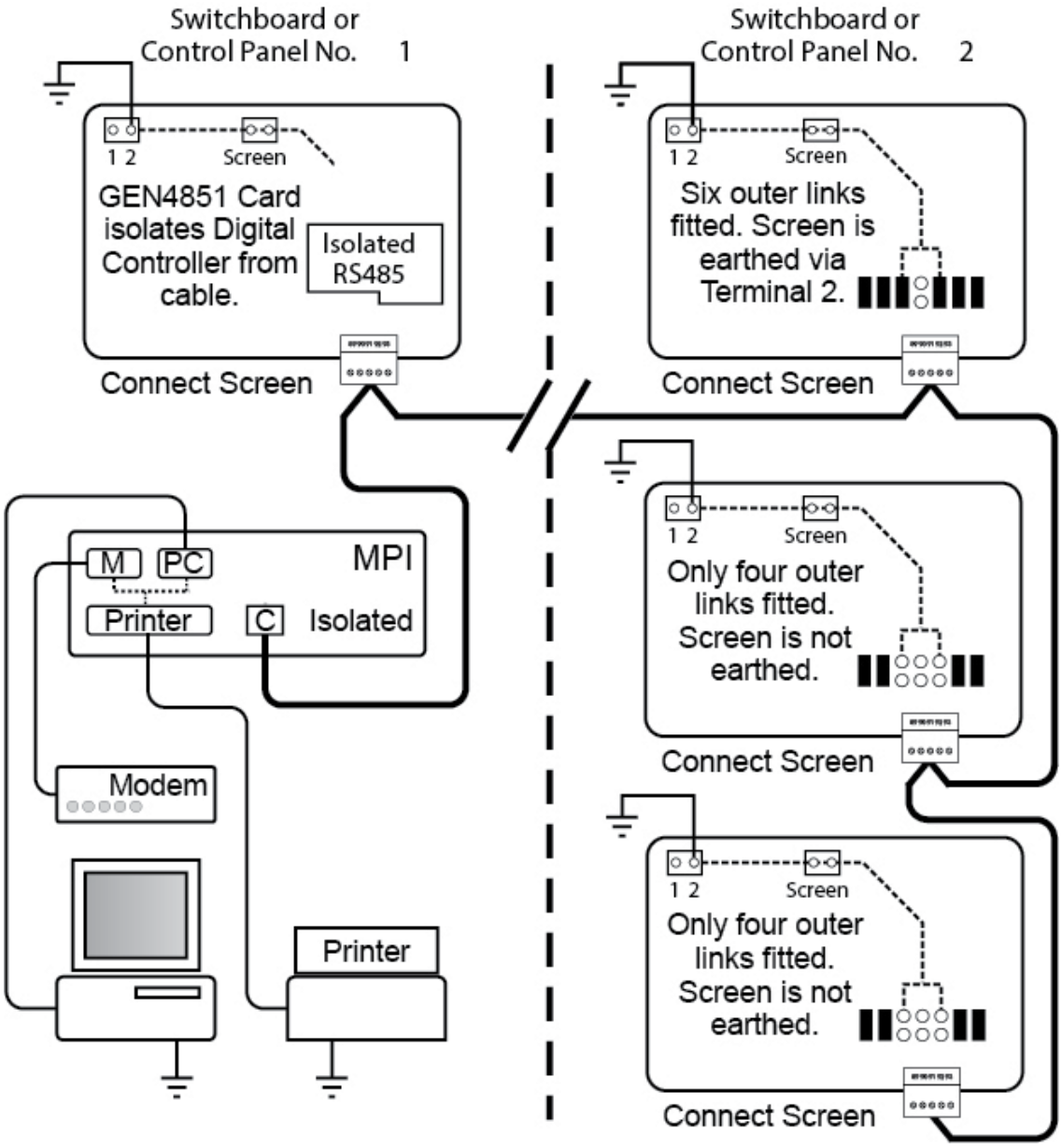


Figure 5-18: Use of GenII MPI, Circuit 2

5-4 Cable Connection Procedures

This paragraph contains general procedures for the connection of Comms cables and checks to ensure there are no hazardous voltages present.

The ideal situation would be that the voltages measured between the data conductors, between the data conductors and the screen and between the data conductors, the screen and the earthed parts of a device were 0VAC and 0VDC. In practice this will not be the case. These measurements should be made before connecting any Comms cables to ensure that these voltages are within the specified ratings of the RS485 ICs.

It is important to test all data conductors and the screen because only one conductor may be faulty if the cable was damaged during installation.

The measured AC voltage is the RMS (effective) value but the ICs are subjected to the peak value of voltages. Therefore, the AC values in the tests must be less than the DC values.

The following procedures should be performed in the order shown before application of power to the system:

1. Ensure there are no network cables connected to any device.
2. Connect the supply conductors to all devices, ensuring that, where it is specified, the electrical earth is connected to the device.
3. Ensure that no conductors or screens of the network cables are in contact with any device or any metal.
4. Select the network device that is to be the earthing point for the network cables.
5. Before connecting the network cable to the selected device, check if there is a voltage difference between the test points on the cable and the device as shown in Figure 5-19 through to Figure 5-21, as appropriate.
6. If the voltages are less than the values shown in Figure 5-19 through to Figure 5-21, then connect the network cable(s), including the screen to the device selected in Step 4, above.
7. For looping connections, test the two cables separately before connecting them.
8. Go to the device to be connected to the other end of the section of network cable.
9. Before connecting the network cable to this next device, check if there is a voltage difference between the test points on the cable and the device as shown in Figure 5-19 through to Figure 5-21, as appropriate.
10. If the voltages are less than the values shown in Figure 5-19 through to Figure 5-21, then connect this section to the device. If the cable is looping onto the next device, test the next section of network cable before connecting the cables.
11. A resistance check between the screen and a point connected to the electrical earth can confirm the integrity of the screen at each stage of the connection process.
12. Continue testing and connecting one section at a time, moving away from the earthing point.

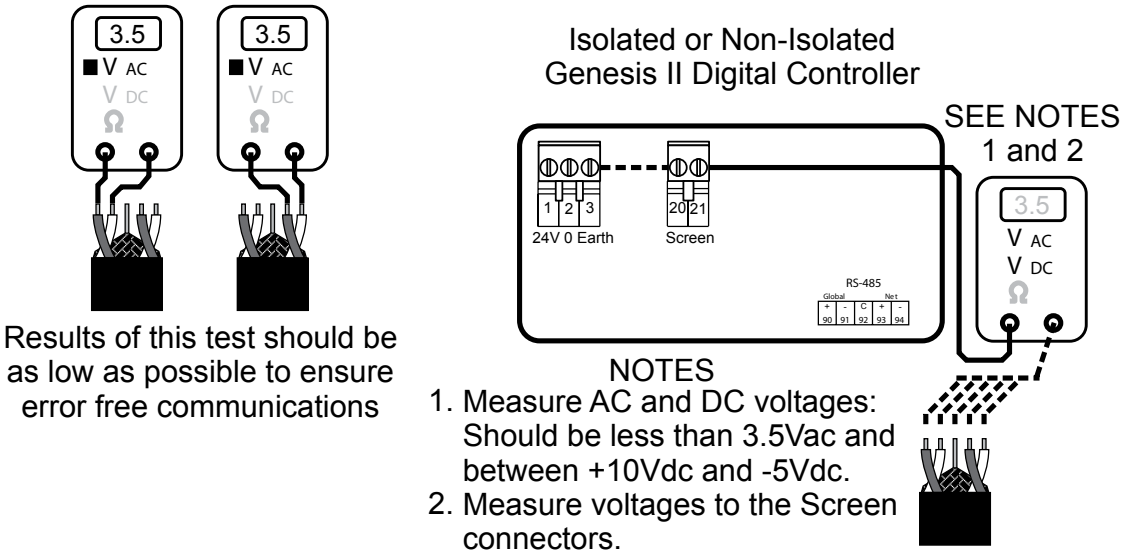


Figure 5-19: Voltage Check, Isolated/Non-Isolated Digital Controller

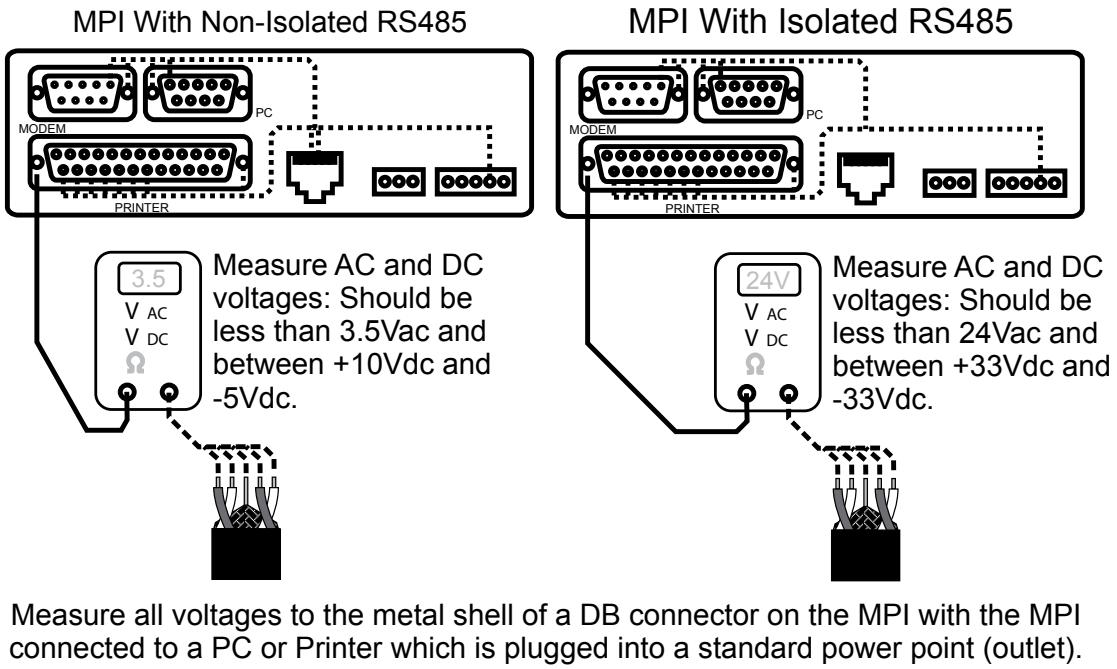


Figure 5-20: Voltage Check, GENII MPI with Isolated/Non-Isolated RS485

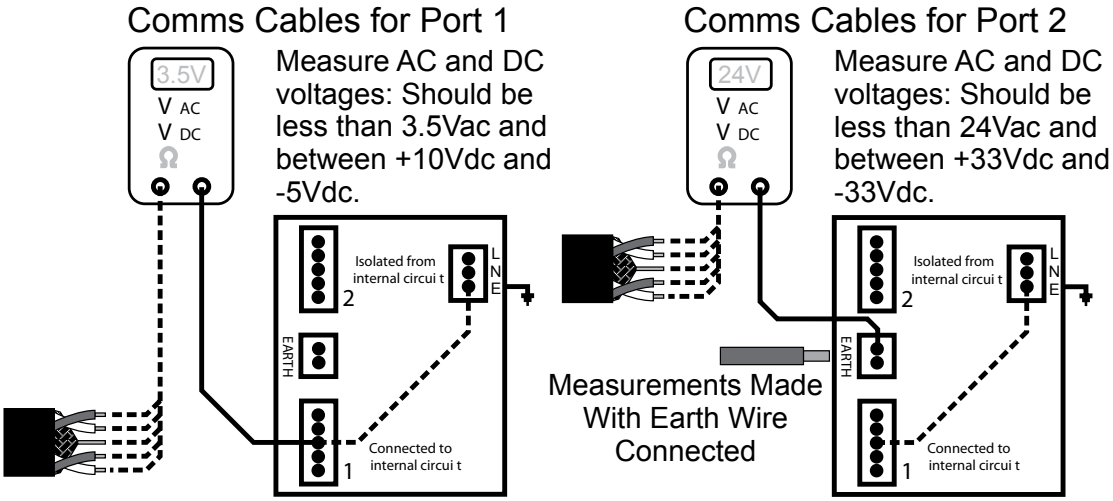


Figure 5-21: Voltage Check, Innotech Repeater

Innotech Support

Innotech provides technical information on the Web to assist you with using its products.
At www.innotech.com.au, you can find technical manuals, user instructions, and data sheets for all our products.

For direct product support or product information, contact your local distributor, or an Innotech representative.

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