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INSTALLATION INSTRUCTIONS

for

Innotech Genesis Systems

EDITION: 011100

PROPRIETARY

TRADEMARK

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SECTION 1- PRELIMINARY INFORMATION

1-1. INTRODUCTION.

This manual is intended to provide qualified technical personnel with complete and easy-to-follow instructions for installation, checkout and commissioning of the various devices in the Innotech Genesis Systems. 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 System is will be accomplished by technically qualified personnel. Also, these instructions presuppose that installation personnel are familiar with local regulations, codes and safety requirements.

NOTE

Installers should familiarise themselves with the content of this manual before attempting installation of the Genesis System.

1-1.1. SYSTEMS COVERED BY THIS MANUAL Because Innotech Genesis 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 systems covered in this manual are the Genesis I and the Genesis II Systems. These systems are 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 I Digital Controller
- Genesis II Digital Controller
- Genesis II Mid Points Controller (GENII MPC)

For purposes of explanation within this manual, a System is defined as one or more controller units interconnected with various ancillary units for the purpose of performing specific functions. A Genesis I System contains one or more Genesis I Digital Controllers as the control unit(s). A Genesis II System consists of one or more Genesis II Digital Controllers and/or GENII MPCs as the major control unit(s). Some of the ancillary units included in the Genesis Systems are (refer to the System Description Manual for descriptions of these units):

- Several types of Local Expansion Module (LEMs)
- Several types of Remote Expansion Module (REMs)
- Genesis II Multipoint Module (GENII MP REM)
- Remote Module Interface (RMI)
- Miscellaneous Ancillary Units described in the individual Data Sheets in Appendix B.

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 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 Digital Controller and the three types of LEMs. Installation information for other configurations, such as a Genesis I System or a Genesis II System controlled by a GENII MPC is also provided as additional data.
- Instructions for REMs and RMIs are the same as for LEMs, except where otherwise noted. Difference data, if required, is included in each section.
- Data Sheets in Appendix B of this manual contain information needed for installation of miscellaneous ancillary units. Separate instructions for these units are not provided in the main part of the manual unless the data is not available on the Data Sheets.
- Basic electrical wiring information is provided in Section 3 and wiring instructions for network systems is contained in Appendix A.

1-1.2. SCOPE OF THIS TECHNICAL MANUAL. This technical manual contains:

- SECTION 1 – PRELIMINARY INFORMATION
- SECTION 2 – MECHANICAL INSTALLATION
- SECTION 3 – ELECTRICAL INSTALLATION
- SECTION 4 – COMMISSIONING
- APPENDIX A – NETWORK INSTALLATION
- APPENDIX B – GENESIS SYSTEM DATA SHEETS

This section of the manual contains installation-related information of a general nature such as general safety considerations and pre-installation requirements.

Section 2 contains instructions and related data to facilitate the mechanical installation of components of the Genesis System. Section 2 includes such information as physical descriptions of the units, mounting dimensions and mechanical installation guidelines.

Section 3 is the ELECTRICAL INSTALLATION section and contains electrical wiring information useful for installation of a basic “stand-alone” system. Section 3 is augmented by network wiring information in Appendix A. Appropriate references are provided between Section 3 and Appendix A for installation of network wiring.

Section 4, the COMMISSIONING Section, provides instructions for post-installation inspection and checkout of the Genesis System, power application and initial set-up of the various units that comprise the system.

Appendix A. provides detailed information for interconnecting various units in a network configuration. This appendix should be used in conjunction with Section 3 when network installation is involved. The two electrical installation areas: Section 3 and Appendix A are purposely separated from each other in the interest of clarity and to simplify use of the manual.

Individual systems may include hardware items that are not represented in this manual. In such cases, data sheets for the items are included in Appendix B. The contents of Appendix B are different for each system configuration. Appendix B in your technical manual contains only data sheets, if any, that are applicable to your system.

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 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:

a. Carefully unpack each item and set packing materials aside for future use.

b. Check the inventory against the packing list to make sure nothing is missing.

c. Inspect each item for damage.

d. Report any shortages or damaged items.

e. Collect all factory inspection sheets and similar data; place in an equipment history file.

f. Any items that are not to be installed immediately should be carefully returned to its shipping container and stored in a safe place until 8t 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 Genesis configuration 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 Innotech Genesis II Direct Digital Controller User Manual.

- Computer-Generated Materials List – the Materials List is also provided at the time of hardware delivery. The list is printed out from the configuration software as is the wiring diagram described above. 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 Systems. Only common hand tools are needed. A high impedance digital Volt-Ohm-Milliammeter is the only item of electronic test equipment required

SECTION 2- MECHANICAL INSTALLATION

2-1. INTRODUCTION.

This section of the manual contains instructions and related data to facilitate the installation of components of the Genesis I or Genesis II System. Because of the physical similarities of the two systems, instructions contained in this section apply equally to the Genesis I and Genesis II Systems, except where otherwise noted.

It is recommended that the main units of the Genesis System, such as the Digital Controller, Mid Points Controller, Local Expansion Modules, and Remote Expansion Modules be mounted in steel cabinets to minimise the effects of electromagnetic interference (EMI). Network components, such as PCs, printers and modems, should be installed in accordance with standard computer installation practises.

Because of the designed-in flexibility of the Genesis Systems, they 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 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 data sheet in Appendix B.

2-2.1. CONTROLLERS. Controllers are the main processing units that provide over-all control of the Genesis I or Genesis II systems. The types of controller units included in this manual are:

- Genesis II Digital Controller
- Genesis I Digital Controller
- Genesis II Mid Points Controller (GEN II MPC)

2-2.1.1. Genesis II Digital Controller. The Genesis II Digital Controller is used only with a Genesis II System. The controller's case is made of ignition-resistant grade ABS plastic which meets the Fire Rating requirements of AS420. The unit's electronic circuit boards are housed in a two-piece plastic case consisting 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, providing 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 plastic lid to the motherboard. To remove the plastic lid from the motherboard, press firmly inwards at each end of the plastic lid-piece to disengage the clip-in fitting and lift away simultaneously (see Figure 2-1). 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.

The Digital Controller's outline dimensions are shown in Figure 2-2.

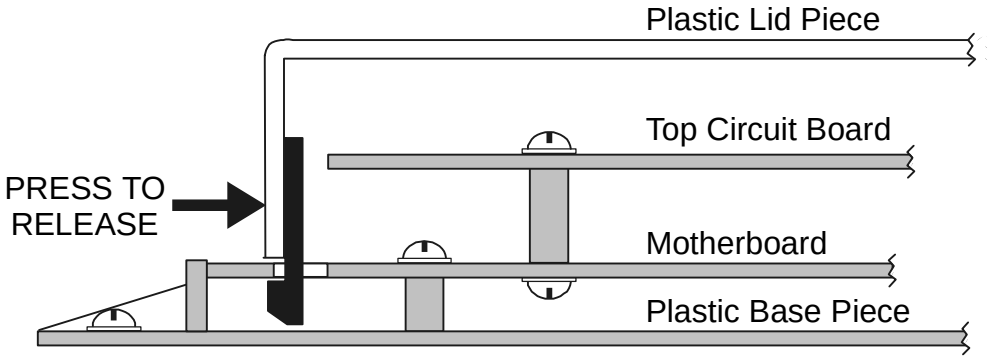

Figure 2-1. Digital Controller Plastic Lid Clamping Details.

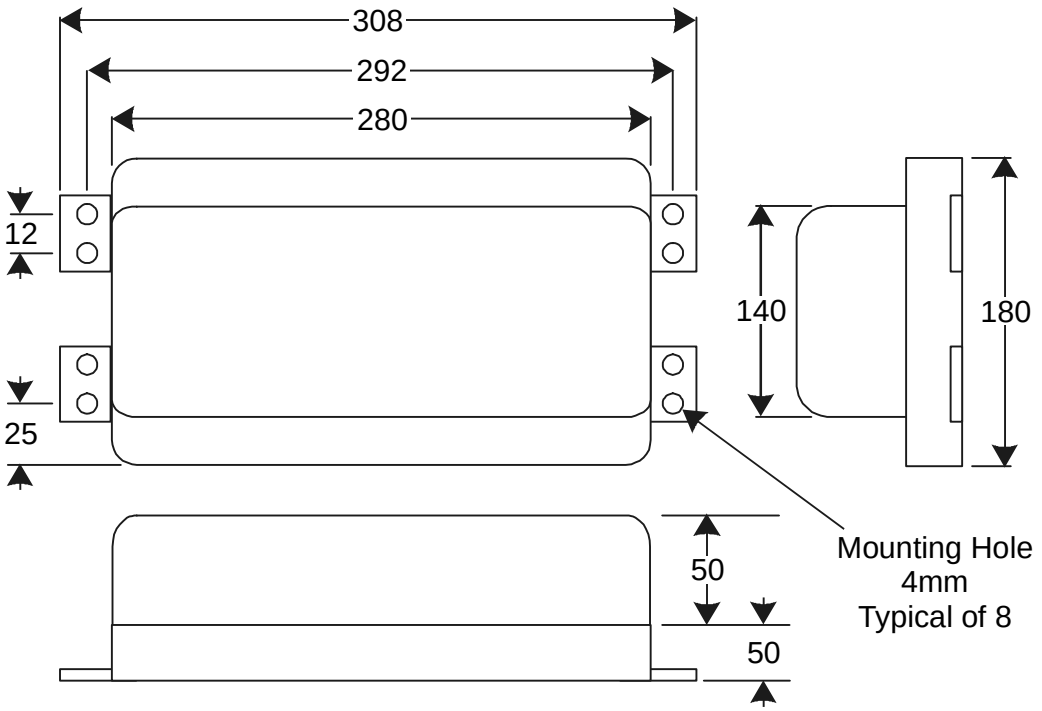

Figure 2-2. Digital Controller Dimensions.

2-2.1.2. Genesis I Digital Controller. The Genesis I Digital Controller is used only in Genesis I Systems. The main physical difference between the Genesis I and Genesis II controllers is that the Genesis I Digital Controller does not contain a display or operator's keyboard as does the Genesis II controller. This means that, unlike the Genesis II Digital Controller, providing access to controls and indicators is not a consideration when installing the Genesis I Digital Controller. The Genesis I and Genesis II Digital Controllers are similar in all other respects, including dimensions.

2-2.1.3. Genesis II Mid Points Controller. The GENII MPC Mid Points Controller module (Figure 2- 3) is a state-of-the-art processing system that performs the same controller functions as a digital controller. The GEN II MPC can be used in a Genesis II System as the main controller or as a supporting controller. It is designed for DIN Rail-mounting inside a control panel. The MPC does not have external controls or indicators.

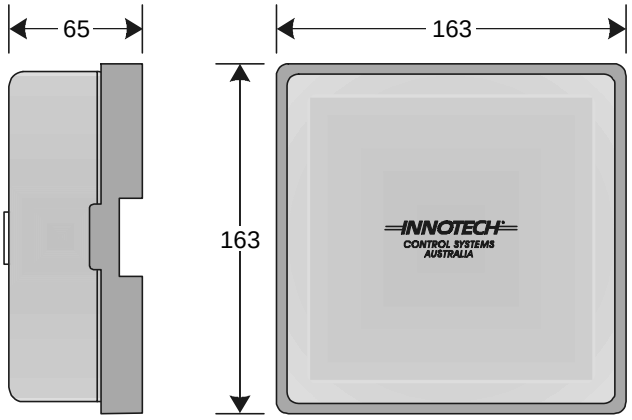

Figure 2-3. Genesis II Mid Points Controller.

2-2.2. EXPANSION MODULES. Expansion modules increase the capability of a controller by allowing more input and output devices to be connected to it. The following paragraphs describe two classes of expansion modules: Local Expansion Modules and Remote Expansion Modules.

2-2.2.1. Local Expansion Modules. The term: Local Expansion Module (LEM) is the collective name applied to the following types of units used to configure the hardware to the customer's requirements.

- Analogue Input Module (AIM)
- Digital Input Module (DIM)
- Digital Output Module (DOM)

Up to eight LEMs can be included in the system in any combination. They are designed for easy mounting on standard DIN Rails. A typical LEM is shown in Figure 2-4. The LEM shown in Figure 2-4 is a Digital Input Module; however the three types of LEM are similar in appearance and are identical in their dimensions.

There are restrictions on how far apart the LEMs can be from each other and from the controller; these requirements are explained in Paragraph 2-3.

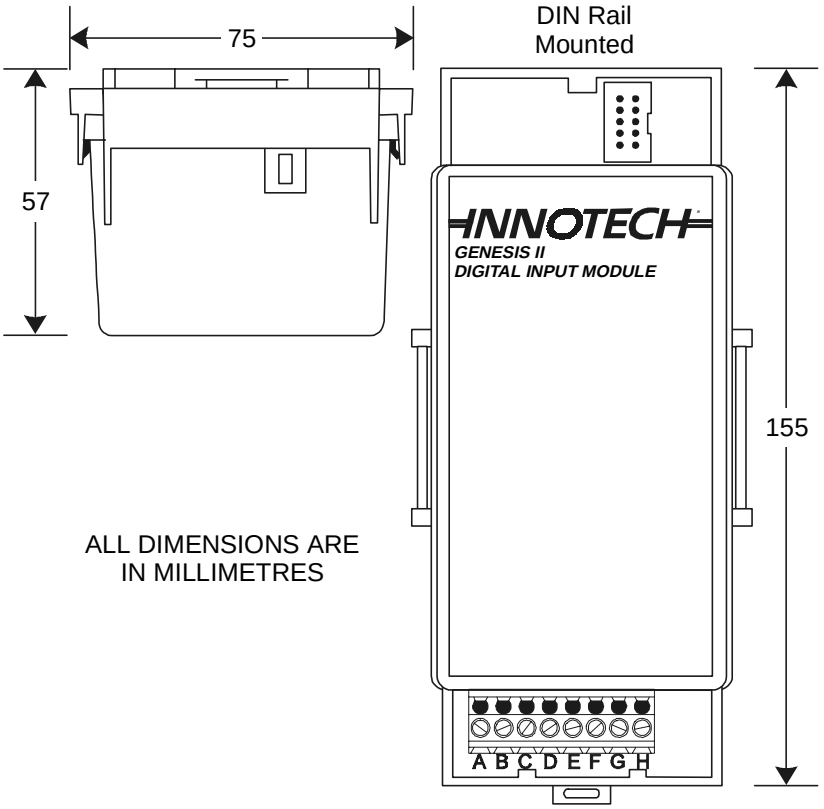

Figure 2-4. Typical Local Expansion Module.

2-2.2.2. Remote Expansion Modules. The term: Remote Expansion Module (REM) is the collective nomenclature applied to the several types of units used to configure the hardware to the customer's requirements. The REMs listed below are similar in appearance and of the same approximate dimensions as the LEMs and perform the same basic functions as the LEMs, but from a greater distance. However, REMs and LEMs cannot be used together with the same Digital Controller or GENII MPC.

- GENII AI REM Analogue Input Module
- GENII AO REM Analogue Output Module
- GENII DI REM Digital Input Module
- GENII OPTO DI REM Opto-Isolated Digital Input Module
- GENII DO REM Digital Output Module (Also called a Relay Output Module)

Figure 2-5 shows a typical REM; the example shown is GENII AI REM. REMs are DIN Rail-mounted.

In addition to the types of REMs listed above and represented by Figure 2-5, there are three additional types of REMs or REM-related modules described in the following paragraphs:

- GENII RMI Remote Module Interface
- GENII CS REM Control Station Module
- GENII MP REM Multipoint Module

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

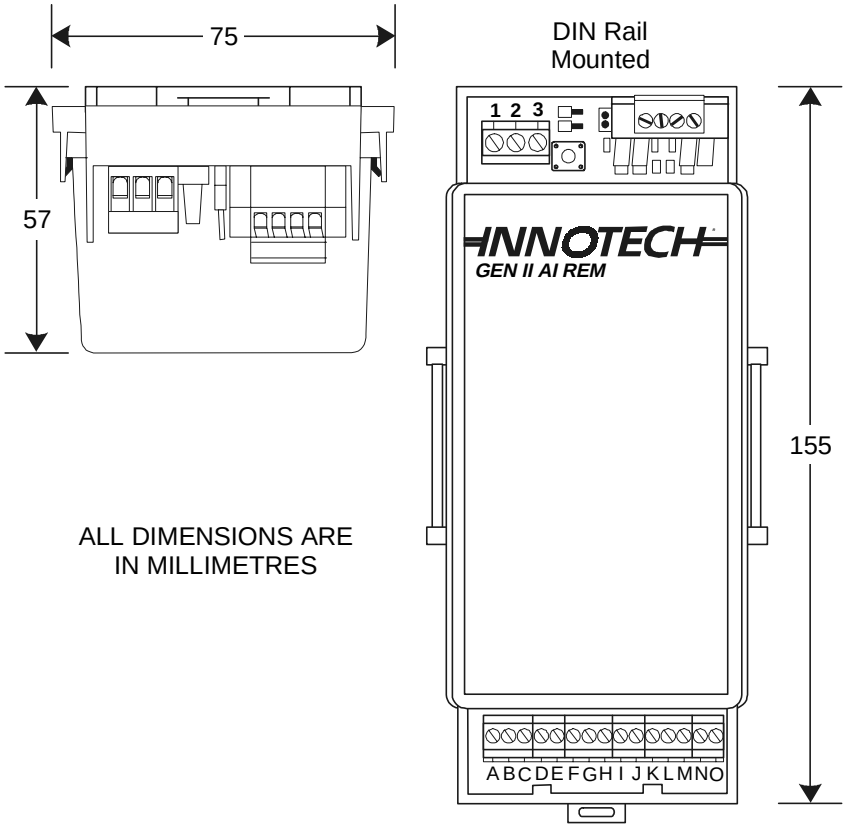

Figure 2-5. Typical Remote Expansion Module.

2-2.2.2.1. Remote Module Interface. The GENII RMI Remote Module Interface (Figure 2-6) provides an interface between the Genesis II Digital Controller or GENII MPC and the REMs. The Remote Module Interface is DIN rail-mounted close to the controller and the REMs are installed at remote locations. Installation instructions for the GENII RMI and the REMs are contained in Paragraph 2-4.

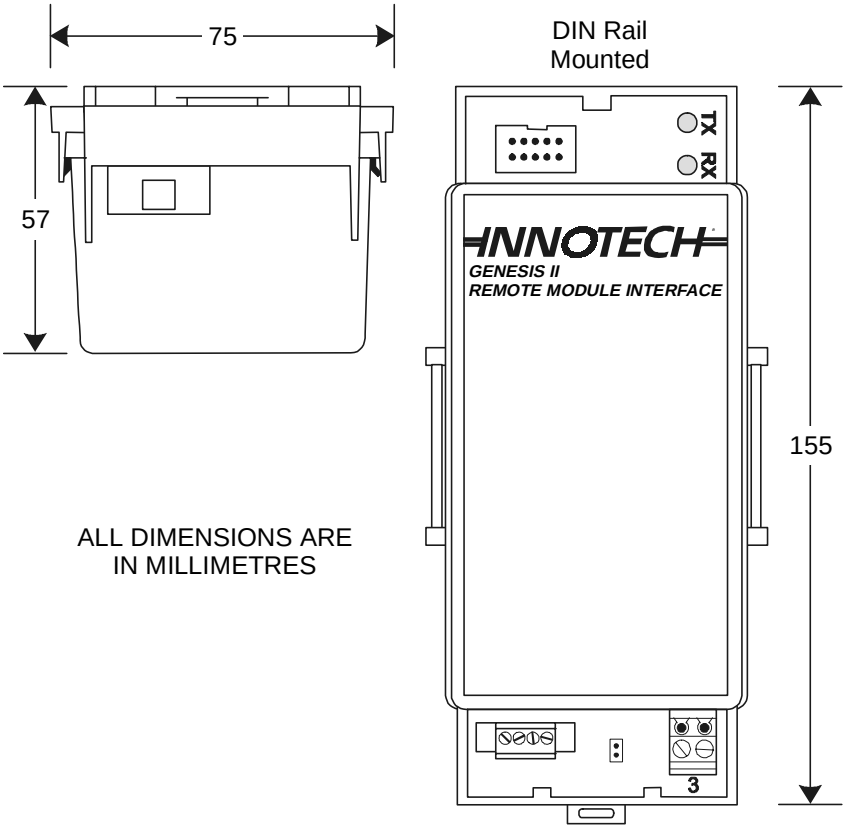

Figure 2-6. GENII RMI Remote Module Interface.

2-2.2.2.2. Control Station Module. The GENII CS REM Control Station Module (Figure 2-7) is housed in a switch plate that mounts in a standard electrical wall plate at a remote location. Mechanical installation instructions for the GENII CS Module are not applicable; electrical installation instructions for the module are contained in Section 3.

Figure 2-7. GENII CS Control Station Module.

2-2.2.2.3. Multipoint Module. The GENII MP REM Multipoint Module is a DIN Rail-mounted device that provides input/output expansion capability for the associated Genesis II Digital Controller or GENII MPC. It is designed to be located at a remote location. The GENII MP REM is enclosed in a square case made of flame-resistant Astrene M650 IR plastic. It is identical in appearance and dimensions to the GENII MPC (Figure 2-3).

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 Digital Controller and three types of LEMs. Installation Instructions for other types of hardware, such as: Genesis I Digital Controllers, GENII MPCs, and REMs are contained in Paragraph 2-4 - Difference Data.

2-3. INSTALLATION INSTRUCTIONS.

A steel enclosure is recommended to contain the system with the aim of minimising EMI from surrounding equipment. To facilitate the number of cables entering and leaving 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.

Where LEMs are used, every effort should be made to locate these units adjacent to the controller to minimise problems with connecting cables due to the critical lengths and segregation requirements.

The communications cable between the Digital Controller and the LEMs is an Innotech-manufactured item; part number GenII LEM Cable. The cable is made in 150mm segments; therefore, it is important that the LEMs are located as close as possible to the Digital Controller and placed side-by-side on the DIN rail.

Figure 2-8 shows an example of a typical Genesis System layout in an equipment enclosure.

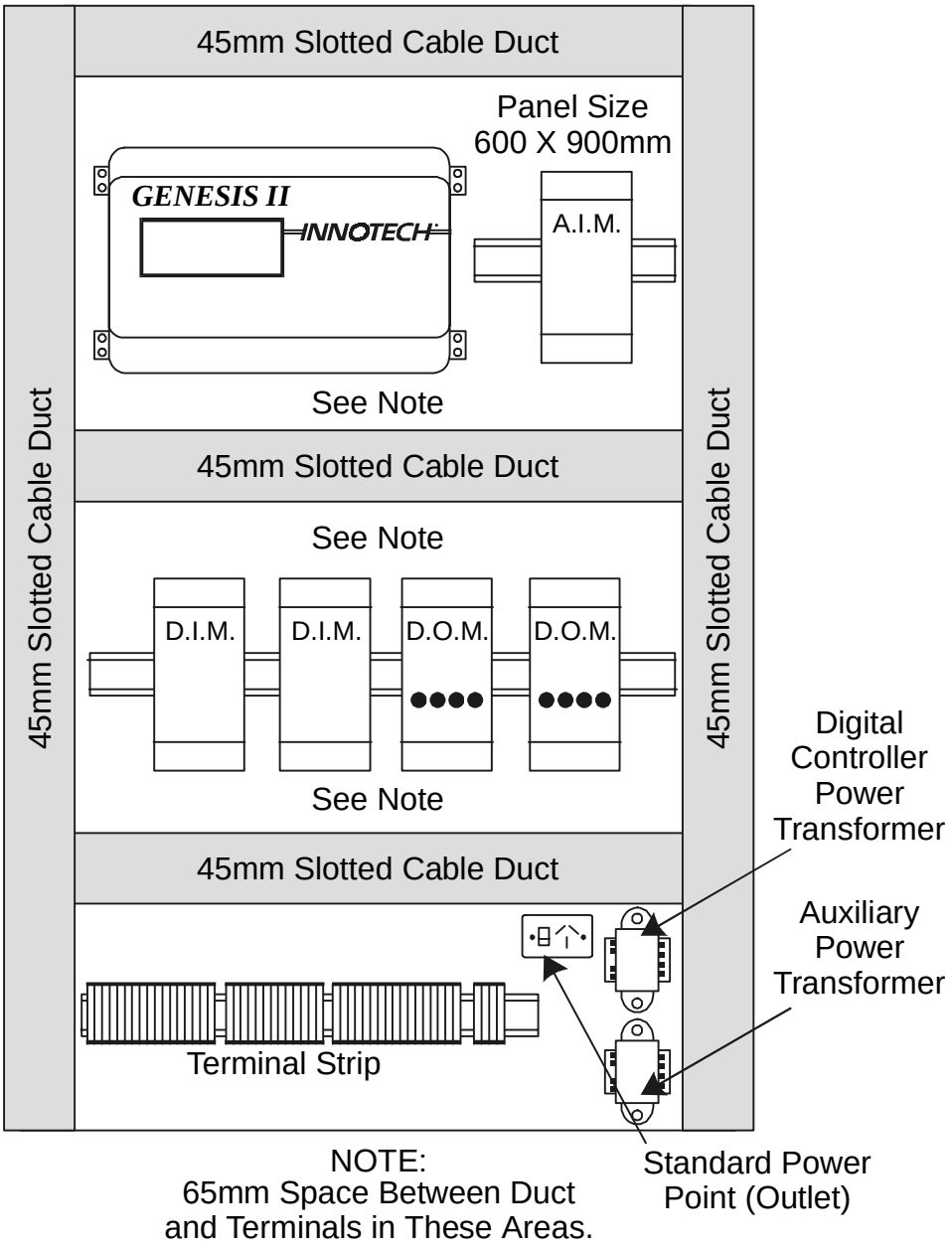

Figure 2-8. Typical Enclosure Layout.

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 2-9 is provided to assist in planning layout of the LEMs; the figure shows the dimensions of a typical DIN rail section.

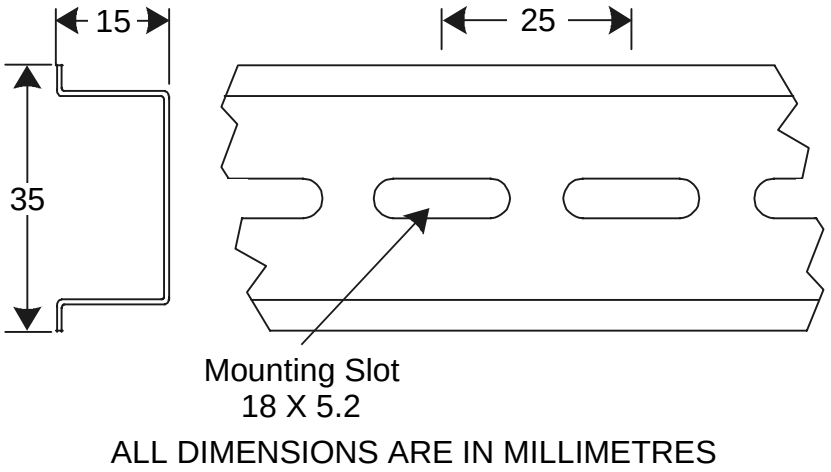

Figure 2-9. DIN Rail Dimensions.

2-3.2. INSTALLATION GUIDELINES. To ensure continued reliable operation of the Genesis II System, the following installation guidelines should be observed:

- The Genesis II Digital 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.
- Install LEMs as close as possible to the Digital Controller and side-by-side on the DIN rail. Refer to Paragraph 2-3 and Figure 2-8.
- Placement of the Genesis II Digital Controller should take into account the optimum viewing angle of the Liquid Crystal Display (LCD), which is approximately 45^{o} vertically and 90^{o} horizontally (see Figure 2-10).
- 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 LEMs at the installation site should not exceed the 0-40ºC temperature range. Ideally, the installation site should have a stable ambient temperature close to 20^{o}C.
- Mount the units in an area with minimum vibration and minimum exposure to mechanical damage.

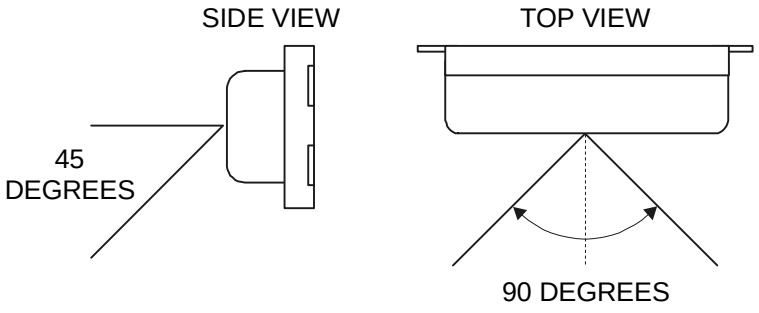

Figure 2-10. Digital Controller Display, Viewing Angles.

2-4. DIFFERENCE DATA.

This paragraph contains difference data unique to installation of the Genesis I Digital Controller, the GENII MPC, Genesis II REMs and related devices. Installation Instructions provided in Paragraph 2-3 are applicable except where stated otherwise.

2-4.1. REM LIMITATIONS. The following limitations apply to the installation of REMs:

- LEMs and REMs cannot be used with the same Digital Controller or GENII MPC.
- REMs can only be used with Genesis II Digital Controllers that have been upgraded to Version 4.0 firmware.

NOTE

The Version 4.0 Configuration Software automatically configures the Digital Controller and produces a printout which lists the types and quantities of REMs that can be used with a given Digital Controller. The following information provides generalised REM type/quantity requirements that can be used for planning purposes.

- Only one GENII RMI Remote Module Interface can be used with a Genesis II Digital Controller or GENII MPC. It must be installed adjacent to the digital controller/MPC
- Up to 15 REMs can be connected to a single GENII RMI. However, each REM has a Resource Count that represents its requirements for controller resources. In no case can the Resource Count for a Digital Controller/GENII MPC exceed 36. Refer to Table 2-1 for a list of REM Resource Counts.
- The REMs must be installed within 500 metres of the RMI.

Table 2-1. REM Resource Counts.

TYPE OF REM	RESOURCE COUNT
GENII AI Analogue Input Module	6
GENII AO Analogue Output Module	3
GENII DI Digital Input Module	1
GENII OPTO DI Opto Isolated Digital Input Module	1
GENII DO Digital Output Module	1
GENII CS Control Station Module	4
GENII MP Multipoint Module	3

NOTE: The following examples illustrate the maximum number of REMs allowed per digital controller or MPC:

a. 3 AIMs (3 x 6), 3 AOMs (3 x 3), 4 DIMs (4 x 1), 5 DOMs (5 x 1) = 36 (Maximum allowed Resource Count)

b. 5 DIMs (1 x 5), 5 OPTO DIs (1 x 5), 5 DOMs (1 x 5) = Resource Count 15 but maximum number of REMs allowed is 15

2-4.2. TYPICAL INSTALLATION. Figure 2-11 shows an example of a typical installation using REMs.

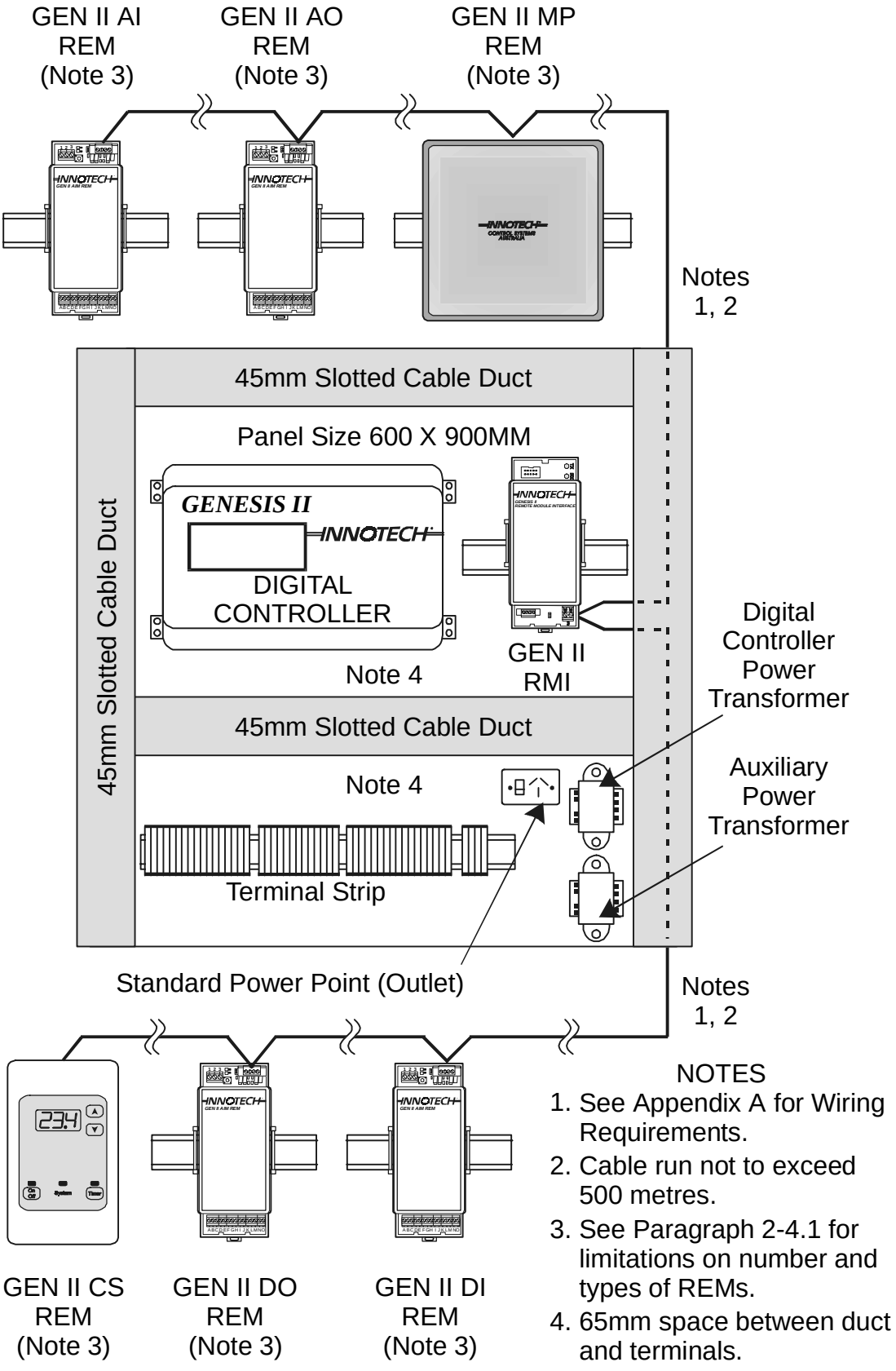

Figure 2-11. Typical Remote System Layout.

2-4.3. ADDITIONAL INSTALLATION GUIDELINES. For installation of the Genesis II Digital Controller or GENII MPC system with REMs, observe the applicable installation guidelines in Paragraph 2-3.2 and the following specific guidelines:

- Although the Genesis II Digital Controller should be mounted in a location providing easy access to operating controls and indicators, this requirement does not apply to the Genesis I Digital Controller and GENII MPC which have no external controls or indicators.
- Ensure the Digital Controller has been upgraded to Version 4.0 firmware to support the REMs.
- Install the GENII RMI on a DIN rail mounting adjacent to the Digital Controller or GENII MPC. The cable between the RMI and the Digital Controller/MPC must not exceed 1 metre in length.
- The Digital Controller/MPI can have only one GENII RMI connected to it.
- Local Expansion Modules cannot be connected to a Digital Controller/MPC that has a GENII RMI module connected to it.
- REMs should be mounted in locations such that the cable run between the GENII RMI and the REMs does not exceed 500 metres in length.
- REM units should be mounted on DIN rails in cabinets approved for switchgear or industrial control equipment.
- Ensure that the types and quantities of REMs assigned to a controller are in accordance with Paragraph 2-4.1.

SECTION 3- ELECTRICAL INSTALLATION

3-1. INTRODUCTION.

This section of the manual contains instructions and related data to facilitate the electrical installation of the Genesis I or Genesis II System. Because of the electrical similarities of the two systems, instructions contained in this section apply equally to the Genesis I and Genesis II Systems, except where otherwise noted.

Because of the designed-in flexibility of the Genesis 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 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 obtained 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 controllers (Genesis I and II Digital Controllers and Genesis II Mid Points Controller)
- Wiring information for expansion modules (Local Expansion Modules and Remote Expansion Modules)

3-2. ELECTRICAL INSTALLATION PRACTICES.

This paragraph provides general information useable to qualified personnel installing the Genesis 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, compressors, must be in accordance with the instructions in the applicable instruction manual or data sheet.

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 SECTION 4).

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. Use the address or phone/fax number shown on the cover of this instruction manual.

Cabling plays an important role in the installation of the Genesis 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.

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

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

3-3. CONTROLLER WIRING.

The following paragraphs contain input/output connection information for the Genesis II Digital Controller, the Genesis II Mid Points Controller and the Genesis I Digital Controller. The Genesis II Configuration Software, which is used to configure and program the controller,

automatically produces a wiring diagram and materials list for the specific application. The wiring diagram and materials list can be easily printed out and used for reference. Figure 3-1 shows a typical computer-generated wiring diagram. A printout of the wiring diagram and materials list is usually provided at the time of hardware delivery.

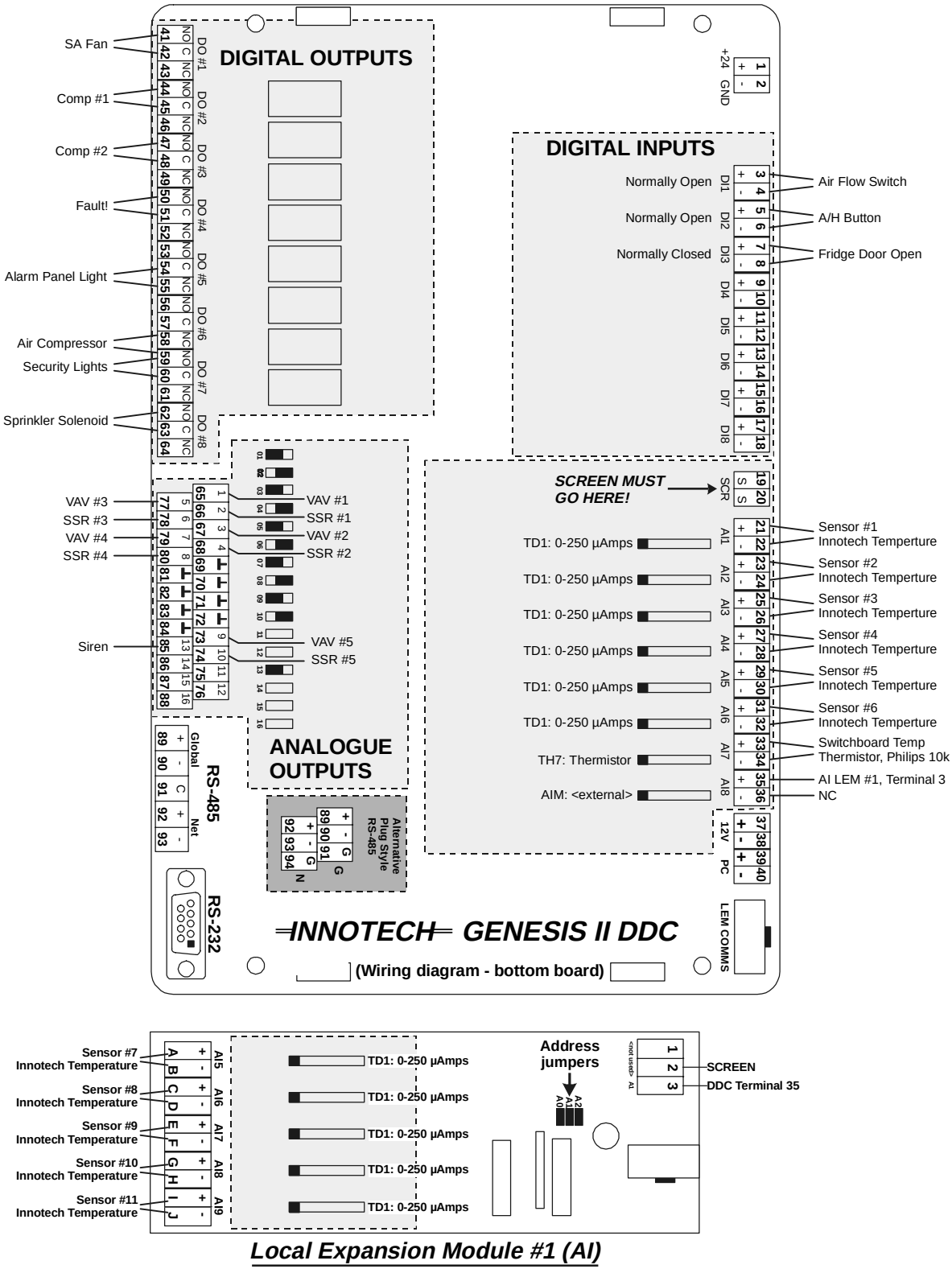

Figure 3-1. Computer-Generated Wiring Diagram, Example.

3-3.1. GENESIS II DIGITAL CONTROLLER. Figure 3-2 shows the input/output connection groups for the Genesis II 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(Paragraph 3-3.1.1)
- Digital Inputs (Paragraph 3-3.1.2)
- Digital Outputs (Paragraph 3-3.1.3)
- Analogue Inputs (Paragraph 3-3.1.4)
- Analogue Outputs (Paragraph 3-3.1.5)
- Pulse Counter Inputs (Paragraph 3-3.1.6)
- Local/Remote Expansion Modules (LEM/REM) Connector (Paragraph 3-3.1.7)
- RS485 Communications (Comms) Terminals (Appendix A)
- RS232 Connector (Appendix A)

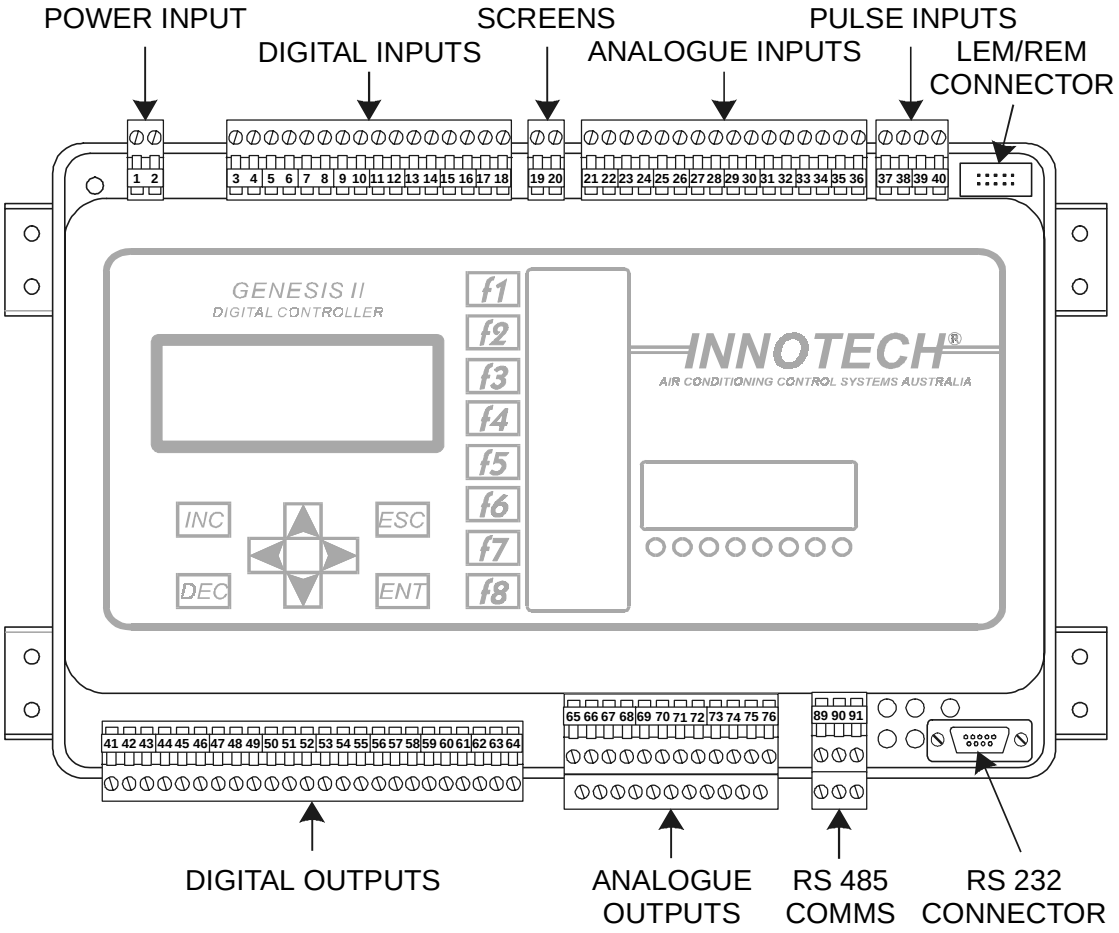

Figure 3-2. Genesis II Digital Controller Input/Output Terminals.

3-3.1.1. Power Input. The Genesis II Digital Controller power requirements are:

- 24Vac ±10%, 50/60Hz at 1.0A, or
- 24Vdc ±10%, at 0.75A (Factory Modification is Required)

For 24Vac supply voltages, a safety transformer with a nominal rating of 30VA must be used for the Digital Controller. The transformer must be in compliance with EN60742, designed for 100% duty 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 Digital Controller and associated 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 and 2 and connected as follows:

Terminal	AC Supply	DC Supply
1	24Vac	+24Vdc
2	0Vac (Neutral)	-24Vdc

Note: Resistance between Terminal 2 and earth must be 3 Ohms, or less

3-3.1.2. Digital Inputs. The Genesis II Digital Controller's eight digital input channels (Terminals 3–18) 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. Signal power requirements are:

- 24Vac ± 15%, or
- 24Vdc ± 15% (Factory Modification Required)

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

Refer to Table 3-2 for digital input terminal number assignments. Signal names assigned to the terminals are DI1+/– through DI8+/–. DI stands for Digital Input, the numeral represents the channel number and the + or – indicates the signal polarity when using a DC signal power source.

Table 3-2. Genesis II Digital Controller Digital Inputs.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
POSITIVE SIDE		**NEGATIVE SIDE**	
3	DI1+	4	DI1–
5	DI2+	6	DI2–
7	DI3+	8	DI3–
9	DI4+	10	DI4–
11	DI5+	12	DI5–
13	DI6+	14	DI6–
15	DI7+	16	DI7–
17	DI8+	18	DI8–

3-3.1.3. Digital Outputs. Each of the Genesis II Digital Controller's eight digital output channels (Terminals 41–64) consists of a single-pole, double-throw (SPDT) relay. Three terminals assigned to each channel represent the associated relay's Normally Open (NO), Common (C) and Normally Closed (NC) contacts.

Digital output relay contacts are rated at 240Vac, 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 switchgear.

Refer to Table 3-3 for digital output terminal number assignments.

Table 3-3. Genesis II Digital Controller Digital Outputs.

TERMINAL	SIGNAL	TERMINAL	SIGNAL	TERMINAL	SIGNAL
NORMALLY OPEN (NO)		**COMMON (C)**		**NORMALLY CLOSED (NC)**	
41	DO1NO	42	DO1C	43	DO1NC
44	DO2NO	45	DO2C	46	DO2NC
47	DO3NO	48	DO3C	49	DO3NC
50	DO4NO	51	DO4C	52	DO4NC
53	DO5NO	54	DO5C	55	DO5NC
56	DO6NO	57	DO6C	58	DO6NC
59	DO7NO	60	DO7C	61	DO7NC
62	DO8NO	63	DO8C	64	DO8NC

3-3.1.4. Analogue Inputs. The Genesis II Digital Controller's eight analogue input channels (Terminals 21-36) 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 (Section 4).

CAUTION

SPECIAL CONSIDERATION MUST BE MADE WHEN USING LOOP-POWERED 4-20MA INPUTS. BECAUSE 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 LOCAL OR REMOTE EXPANSION MODULES.

NOTE

Terminals 19 and 20 (Figure 3-2) are provided for terminating analogue cable screens.

There are two terminals associated with each of the eight analogue input channels. Normally, the odd-numbered (positive) terminal is used for the active analogue input signal from the sensor. The even-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 19 or 20.

Refer to Table 3-4 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 3-4. Genesis II Digital Controller Analogue Inputs.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
ACTIVE		REFERENCE	
21	AI1+	22	AI1–
23	AI2+	24	AI2–
25	AI3+	26	AI3–
27	AI4+	28	AI4–
29	AI5+	30	AI5–
31	AI6+	32	AI6–
33	AI7+	34	AI7–
35	AI8+	36	AI8–

3-3.1.5. Analogue Outputs. Sixteen analogue output channels are provided. Each channel can be configured, through the Genesis II Configuration 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 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 Data Sheet DS3.31 for Type IHV Heat Valves.

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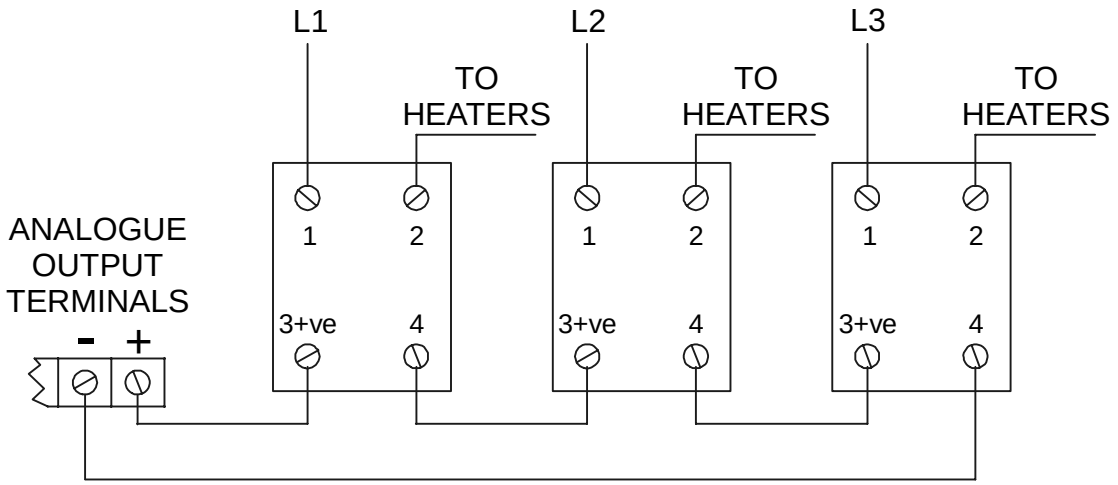


Figure 3-3. Driving Multiple Solid-State Relays.

Refer to Table 3-5 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 (19 and 20), 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 19 or 20.

Table 3-5. Genesis II Digital Controller Analogue Outputs.

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

3-3.1.6. Pulse Counter Inputs. A single, high-speed digital input is provided to facilitate the counting of rectangular wave signals (0-12Vdc, from DC up to 25kHz). Refer to Table 3-6 for terminal number assignments. Terminals 37 and 38 provide 12Vdc power to the pulse source, if required. Terminals 39 and 40 are the pulse-input terminals. The input is polarity sensitive so it is important that correct polarity be observed.

Table 3-6. Pulse Counter Input Terminals.

TERMINAL	SIGNAL
37	+12Vdc to Pulse Source
38	–12Vdc to Pulse Source
39	+ Pulse Input
40	– Pulse Input

3-3.1.7. LEM/REM Connector. The LEM/REM connector is a 10-pin ribbon cable connector that provides access between the Digital Controller and the expansion modules.

NOTE

When expansion modules are used with a Digital Controller, LEMs and REMs must not be mixed. Modules used may be either LEMs or REMs, but not both.

Connectors along the cable are spaced at 150mm intervals; therefore it is critical that the LEMs are located as close as possible to the Digital Controller and to each other.

REMs access to the Digital Controller is through a GENII RMI Remote Module Interface Unit. The RMI is installed close to the Digital Controller and connects to it by a short

ribbon cable at the LEM/REM Connector. The individual REMs are connected to the RMI by means of an RS 485 Comms cabling arrangement as explained elsewhere in this section.

3-3.2. GENESIS II MID POINTS CONTROLLER. Figure 3-4 shows the input/output connection groups for the Genesis II Mid Points Controller (MPC). The MPC uses terminal strips located around the controller's perimeter. Terminals are grouped by function as follows:

- Power (Paragraph 3-3.2.1)
- Digital Inputs (Paragraph 3-3.2.2)
- Digital Outputs (Paragraph 3-3.2.3)
- Analogue Inputs (Paragraph 3-3.2.4)
- Analogue Outputs (Paragraph 3-3.2.5)
- REM/LEM Connector – same as for the Digital Controller. See Paragraph 3-3.1.7.
- RS485 Comms Terminals (Appendix A)
- RS232 Connector (Appendix A)

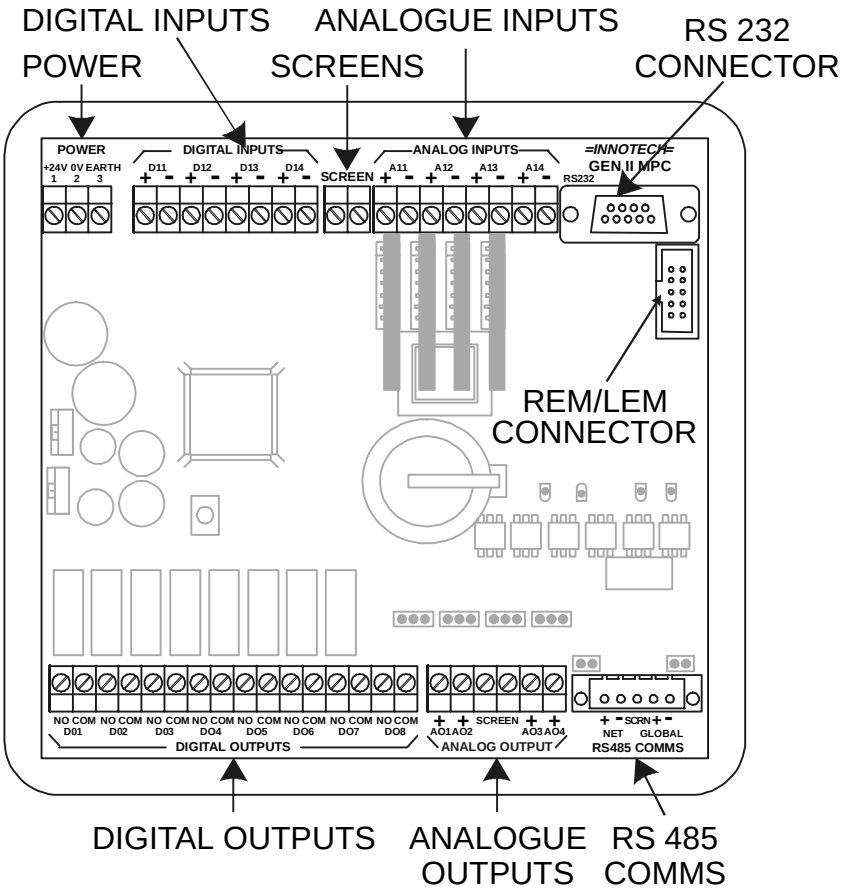


Figure 3-4. Genesis II MPC Input/Output Terminals.

NOTE

Because much of the MPC's input/output connection information is similar to that of the Genesis II Digital Controller, the following paragraphs make frequent reference to related paragraphs in the Genesis II Digital Controller section. Therefore, readers should familiarise themselves with the types of data contained in Paragraph 3-3.1 and its subparagraphs before reading further.

3-3.2.1. Power Input. The Genesis II MPC power requirements are the same as for the Genesis II Digital Controller, except that the MPC contains a third power terminal (Terminal 3) which is an earth connection point. This is an independent earth connection point and is in addition to the earthed AC Neutral at Terminal 2. Refer to Paragraph 3-3.1.1.

3-3.2.2. Digital Inputs. The Genesis II MPC's digital input channel wiring information is similar to that of the Genesis II Digital Controller, except that the MPC has four digital input channels. Refer to Paragraph 3-3.1.2.

The MPC's digital input terminals are not assigned terminal numbers; however each terminal is clearly labelled as to its polarity and signal name. Signal names assigned to the terminals are DI1+/– through DI4+/–.

3-3.2.3. Digital Outputs. The Genesis II MPC's digital output wiring information is similar to that of the Genesis II Digital Controller (refer to Paragraph 3-3.1.3), with the following exceptions:

- The NC output relay contacts are not used. Only the C and NO contacts of the eight digital output relays are represented at the output terminals.
- Terminal numbers are not assigned, however terminals are clearly labeled as to signal name: DO1(NO)/(C) through DO8(NO)/(C).

3-3.2.4. Analogue Inputs. The Genesis II MPC's analogue input channel wiring information is similar to that of the Genesis II Digital Controller, except that the MPC has four analogue input channels. Refer to Paragraph 3-3.1.4.

The MPC's analogue input terminals are not assigned terminal numbers; however, each terminal is clearly labelled as to its polarity and signal name. Signal names assigned to the terminals are AI1+/– through AI4+/–.

CAUTION

SPECIAL CONSIDERATION MUST BE MADE WHEN USING LOOP-POWERED 4-20MA INPUTS. BECAUSE THIS TYPE OF INPUT DRAWS 20MA FROM THE MPC, A MAXIMUM OF TWO INPUTS OF THIS TYPE MAY BE USED. THIS TYPE OF INPUT MUST NOT BE USED ON LOCAL OR REMOTE EXPANSION MODULES.

NOTE

Two terminals, located between the Digital and Analogue Input terminal groups (Figure 3-4), are provided for terminating cable screens.

3-3.2.5. Analogue Outputs. The Genesis II MPC's analogue output wiring information is similar to that of the Genesis II Digital Controller (refer to Paragraph 3-3.1.5), with the following exceptions:

- The MPC only uses four analogue output channels: AO1 through AO4.
- Terminal numbers are not assigned, however terminals are clearly labeled as to signal name: The two centre terminals of the group of six analogue output terminals are the signal return (Common) connection points.

3-3.3. GENESIS I DIGITAL CONTROLLER. Figure 3-5 shows the input/output connection groups for the Genesis I Digital Controller. The controller uses Phoenix type plug-in terminal strips located around the controller's perimeter. Terminals are grouped by function as follows:

- Power – Same as for Genesis II Digital Controller; see Paragraph 3-3.1.1.
- Digital Inputs – Same as for Genesis II Digital Controller; see Paragraph 3-3.1.2.
- Digital Outputs (Paragraph 3-3.3.1)
- Analogue Inputs (Paragraph 3-3.3.2)
- Analogue Outputs (Paragraph 3-3.3.3)
- Local Expansion Module (LEM) Connector (Paragraph 3-3.3.4)
- RS485 Comms Terminals (Appendix A)
- RS232 Connector (Appendix A)

3-3.3.1. Digital Outputs. The Genesis I Digital Controller's digital output wiring information is similar to that of the Genesis II Digital Controller (refer to Paragraph 3-3.1.3), except that the NC output relay contacts are not used. Only the C and NO contacts of the eight digital output relays are represented at the output terminals. Refer to Table 3-7.

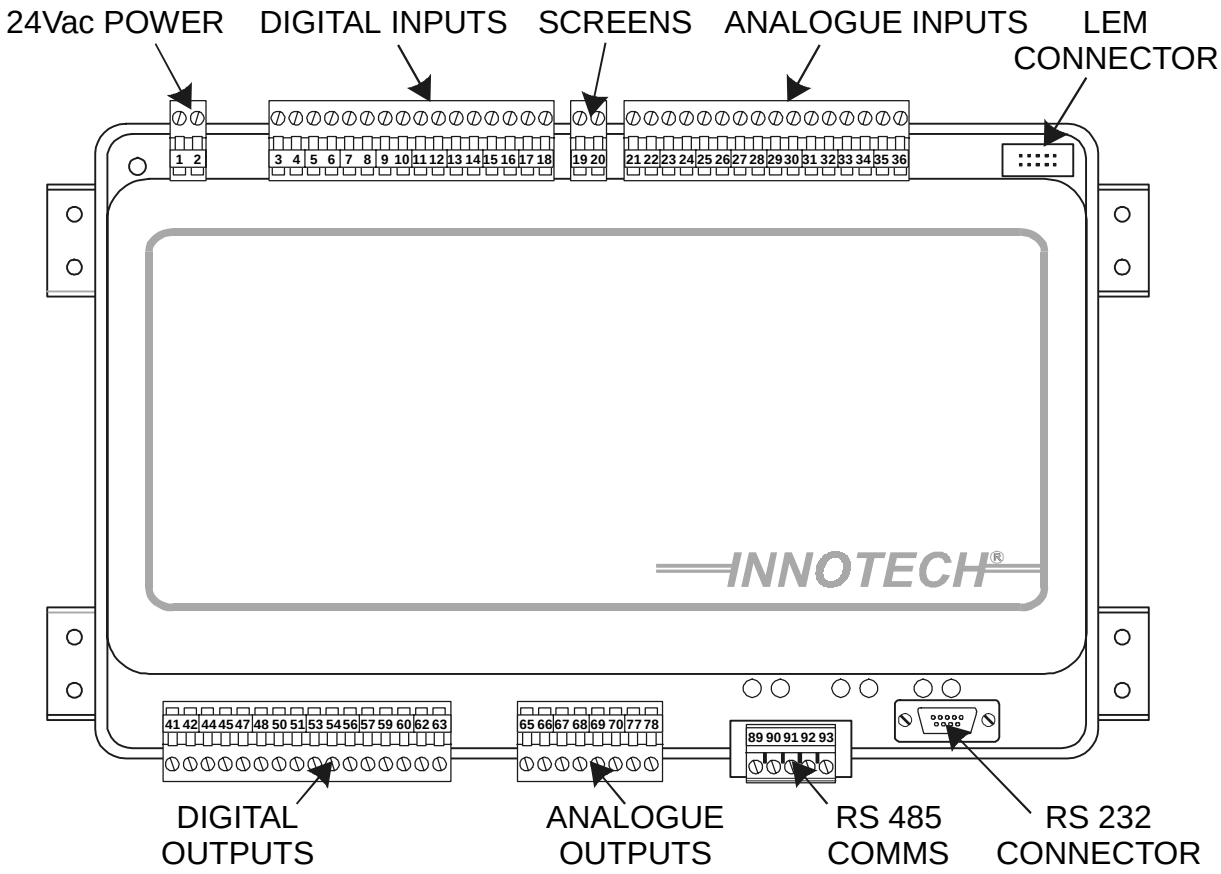


Figure 3-5. Genesis I Digital Controller Input/Output Terminals.

Table 3-7. Genesis I Digital Controller Digital Outputs.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
NORMALLY OPEN (NO)		COMMON (C)	
41	DO1NO	42	DO1C
44	DO2NO	45	DO2C
47	DO3NO	48	DO3C
50	DO4NO	51	DO4C
53	DO5NO	54	DO5C
56	DO6NO	57	DO6C
59	DO7NO	60	DO7C
62	DO8NO	63	DO8C

Note: Terminals 43, 46, 49, 52, 55, 58, 61 & 64 not used.

3-3.3.2. Analogue Inputs. The Genesis I Digital Controller's analogue input requirements are the same as for the Genesis II Digital Controller, except that inputs are factory-set to customer requirements. In the Genesis I Digital Controller, the AISCs are not field-replaceable as they are in Genesis II. The type of inputs that can be factory-configured are:

- GENII AIM AISC – Analogue Input Module AISC
- GENII DO5 – D05 Digital AISC
- GENII I05 – 0-5mA Passive AISC
- GENII I20 – 0-20mA Passive AISC
- GENII TH1 – Thermistor, Type 1 AISC
- GENII TH9 – Thermistor, Type 9 AISC
- GENII V05 – 0-5Vdc AISC
- GENII V10 – 0-10Vdc AISC

3-3.3.3. Analogue Outputs. The Genesis I Digital Controller's analogue input requirements are the same as for the Genesis II Digital Controller, except that the Genesis I Controller uses only six analogue output channels. Refer to Table 3-8 for a list of analogue output terminals.

Table 3-8. Genesis I Digital Controller Analogue Outputs.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
65	AO1	69	Common
66	AO2	70	Common
67	AO3	77	AO5
68	AO4	78	AO6

Note: Terminals 71 through 76 not used.

3-3.3.4. LEM Connector. The LEM connector is a ribbon cable connector that provides access between the Genesis II Digital Controller and local expansion modules. Connectors along the cable are spaced at 150mm intervals; therefore it is critical that the LEMs are located as close as possible to the Digital Controller and to each other.

3-4. WIRING OF EXPANSION MODULES.

The following paragraphs provide wiring information for local expansion module and remote expansion modules. LEMs and REMs can be used with Genesis I Digital Controllers, Genesis II Digital Controllers or Genesis II MPCs. Controllers used with REMs must have Version 4 Firmware installed to support the REM. In no case may LEMs and REMs be used with the same controller

3-4.1. LOCAL EXPANSION MODULES. Genesis I and II Systems use three types of LEMs:

- GENII AIM Analogue Input Module
- GENII DIM Digital Input Module
- GENII DOM Digital Output Module.

Each type of LEM provides four additional signal channels for the controller. The Genesis II Digital Controller can use up to eight LEMs, in any combination, thus achieving 32 extra signal channels.

There are critical requirements for the physical placement of the LEMs; refer to Section 2. When installing the LEM cable between the controller and the LEMs, observe the following precautions:

- The LEM cable should be run external of cable ducts.
- A maximum of 300mm of LEM cable is allowed between LEMs. The overall cable length must not exceed 1.5 metres.
- Ensure the LEM cable plug is inserted into the keyed sockets on the controller and LEMs in the correct orientation.

3-4.1.1. AIM Analogue Input Modules. Each AIM (Figure 3-6) occupies one of the controller's analogue input channels; however, each AIM has five analogue input channels, thus providing the controller with an overall increase of four channels per AIM.

The AIM does not require power terminals since operating power is supplied from the controller by way of the LEM cable.

The AIM requires an AISC for each input channel to determine the signal type for each input. An AISC (Part Number GENII AIM AISC) at the AIM's input to the controller is also required. AISCs are not provided with the AIM and must be ordered separately. The computer-generated materials list shows the number of AISCs, of each type required for the controller and the AIM. The computer-generated wiring diagram shows the locations of the AISCs. Installation of the AISCs is part of the commissioning process and instructions are provided in Section 4.

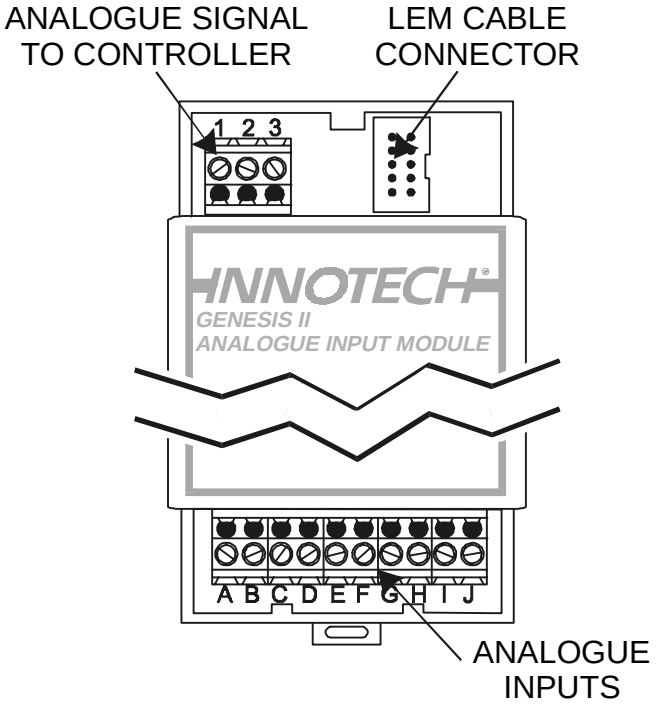


Figure 3-6. Analogue Input Module.

Three terminals on the upper left side of the AIM are for the analogue cable to the controller. Terminal 1 is not internally connected to the AIM and may be used as a tie point

or to terminate cable screens. Terminal 2 is the GND terminal for the analogue signal to the controller; the cable screen and the screens from the four local analogue inputs should terminate at this point. Terminal 3 connects to the appropriate + analogue input terminal on the controller. The exact input terminal on the controller is indicated on the computer-generated wiring diagram.

Analogue input terminals for the AIM are listed in Table 3-9.

Table 3-9. Analogue Input Module Input Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
ACTIVE		**REFERENCE**	
A	AI1+	B	AI1–
C	AI2+	D	AI2–
E	AI3+	F	AI3–
G	AI4+	H	AI4–

Particular care must be exercised in protecting the analogue signals from electromagnetic interference of all types and in ensuring the proper termination of analogue cable screens. Screens of input and output analogue signal cables and the analogue signal return lead to the controller should be tied together at Terminal 2. Screening integrity must be maintained at the input terminals of the module and not at entry points to the enclosure or at universal terminal strips. Figure 3-7 provides an example of cable screen termination for an installation containing two Analogue Input Modules and a Genesis II Digital Controller.

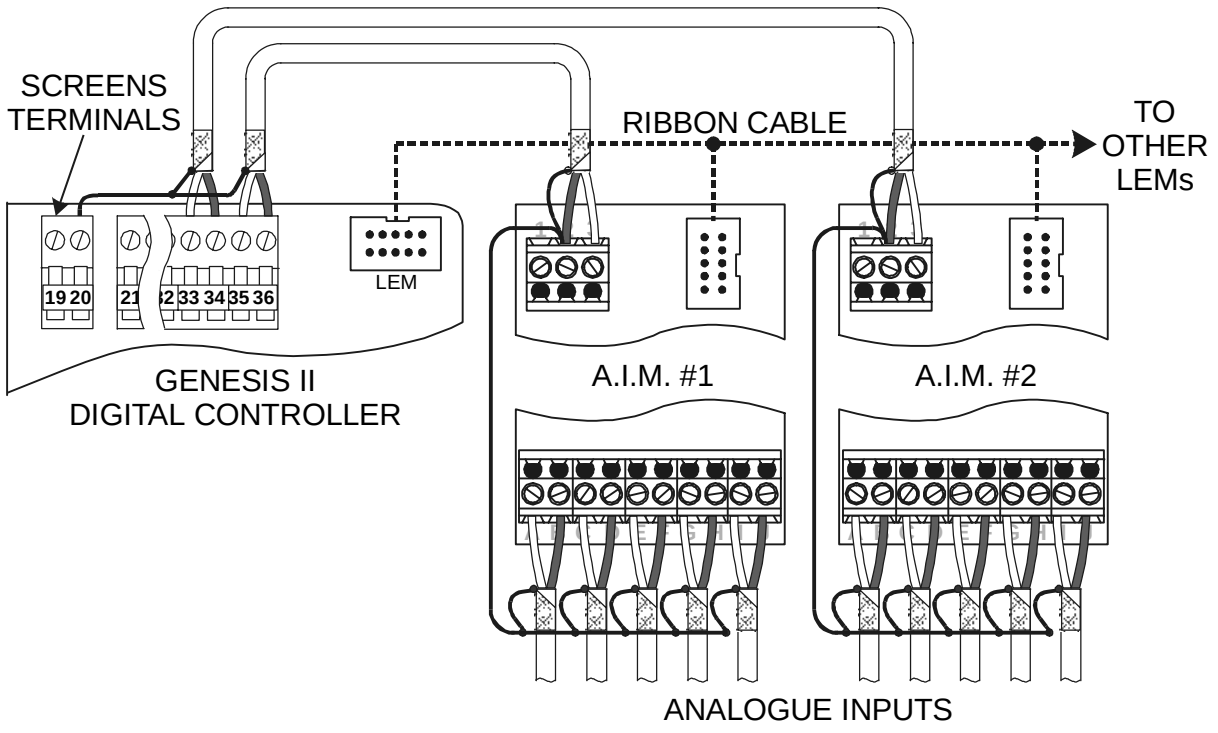


Figure 3-7. Analogue Input Module Wiring, Example.

CAUTION

LOOP POWERED 4-20MA INPUTS MUST NOT BE USED WITH THE GEN II ANALOGUE INPUT MODULE.

3-4.1.2. DIM Digital Input Modules. Each DIM (Figure 3-8) provides an expansion capability of four additional digital input channels. The DIM does not have power terminals since operating power is supplied from the controller by way of the LEM cable.

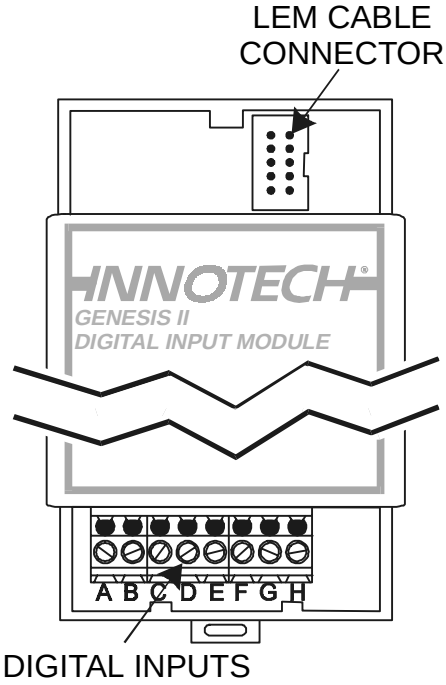


Figure 3-8. Digital Input Module.

Digital input terminals for the DIM are listed in Table 3-10. It should be noted that digital input signals must have an amplitude of 24Vac/Vdc powered from an external source. If the input signals are from a DC source, ensure the correct polarity of connections as listed in Table 3-10. Avoid running the signal cable through ducts where adjacent cables may be connected to digital or other switching devices.

Table 3-10. Digital Input Module Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
ACTIVE		**REFERENCE**	
A	DI1+	B	DI1–
C	DI2+	D	DI2–
E	DI3+	F	DI3–
G	DI4+	H	DI4–

3-4.1.3. DOM Digital Output Modules. Each DOM (Figure 3-8) provides an additional four channels of digital outputs, each having voltage-free SPDT output relay contacts. The relay contacts are rated at 240Vac, 2A.

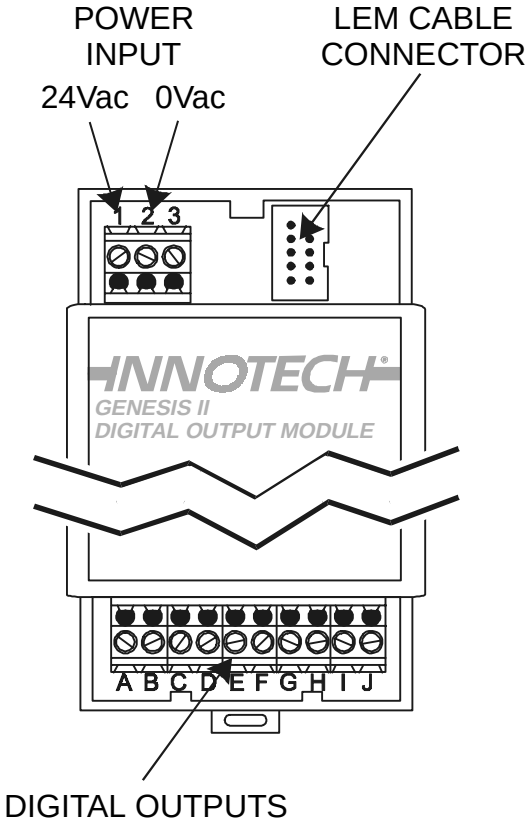


Figure 3-9. Digital Output Module.

A 24Vac supply is required to power the module and can be taken from the transformer serving the controller. The supply for relay contacts may be provided by the auxiliary transformer, thus leaving the controller's transformer dedicated to control functions within the enclosure.

Digital output contacts for the DOM are listed in Table 3-11.

Table 3-11. Digital Output Module Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL	TERMINAL	SIGNAL
NORMALLY OPEN (NO)		**NORMALLY CLOSED (NC)**		**COMMON (C)**	
A	Relay 1	B	Relay 1	C	Relay 1
D	Relay 2	E	Relay 2		Relay 2
F	Relay 3	G	Relay 3	H	Relay 3
I	Relay 4	J	Relay 4		Relay 4

3-4.2. REMOTE EXPANSION MODULES. The following paragraphs contain wiring information for the following types of REMs used in the Genesis II System:

- GENII RMI Remote Module Interface
- GENII AI REM Analogue Input Module
- GENII AO REM Analogue Output Module
- GENII DI REM Opto Isolated Digital Input Module
- GENII DI REM Dry Contact Digital Input Module
- GENII DO REM Relay Output Module
- GENII CS REM Control Station Module
- GENII MZS REM Multi Zone Station Module
- GENII MP REM Multipoint Module.

The RMI functions as a bridge between the controller and the other REMs. Communication between the controller and the RMI is by way of a ribbon cable connected to the controller's LEM/REM Connector. Communication between the RMI and the other REMs is by way of a standard RS485 Comms cable 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.

3-4.2.1. REM Power Connections. Electrical power requirements and connections for all remote expansion modules, except the RMI and MP REMs, are the same. Power requirements and connection information for the RMI and MP REMs are explained in Paragraphs 3-4.2.3 and 3-4.2.11 respectively. Information in this paragraph is for all other REMs.

Power requirements are 24Vac, ±10% at 50/60Hz. 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.

3-4.2.2. RS485 Comms Connections. The RS485 Comms link between the RMI and the other LEMs is designed to allow reliable communications over long distances in electrically adverse signal conditions.

The following guidelines, which are common to the RMI and 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 Paragraph A-4.1 in Appendix A 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 RMI and any other REM must not exceed 500 metres in length.

On most units, the RS485 Comms connection block contains four terminals. The exception is the MP module, which has three terminals and is explained in Paragraph 3-4.2.11. 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 RMI 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.

CAUTION

THE RS485 COMMS SYSTEM WILL NOT FUNCTION PROPERLY IF THE CONNECTION POLARITIES ARE NOT CORRECT. ENSURE CORRECT POLARITY OF THE CONNECTIONS THROUGHOUT THE LENGTH OF THE COMMS CABLE.

Figure 3-10 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.

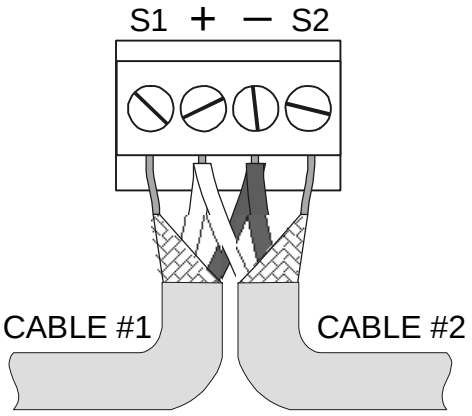


Figure 3-10. RS485 Comms Cable Connections.

3-4.2.3. RMI Remote Module Interface. The RMI (Figure 3-11) provides an interface between the controller and the other REMs. It is connected to the controller by way of the LEM/REM Connector and uses an RS485 link to communicate with the REMs. The RMI is designed to be located within 100mm of the controller. A controller can have only one RMI connected to it.

The RMI does not have a power connection block because the module receives 5Vdc operating power from the controller through the LEM Cable.

The 10-pin ribbon cable plug for connecting the RMI to the controller is at the upper left side of the module.

The four-terminal connector block at the lower left corner of the module is the RS485 Comms cable connection block. The End of Cable Jumper is to the right of the RS485 connection block.

Terminal 3 in the lower right corner of the RMI is an earth connection point that provides protection for the Comms cable and screens on the RMI. Connect the electrical earth cable between Terminal 3 and a solid earth. This may be the earth bus bar of the switchboard cabinet or the cable that earths the frame of the equipment the RMI is installed in. Only one of the RMI's two earth terminals need be used; the two terminals are connected to each other.

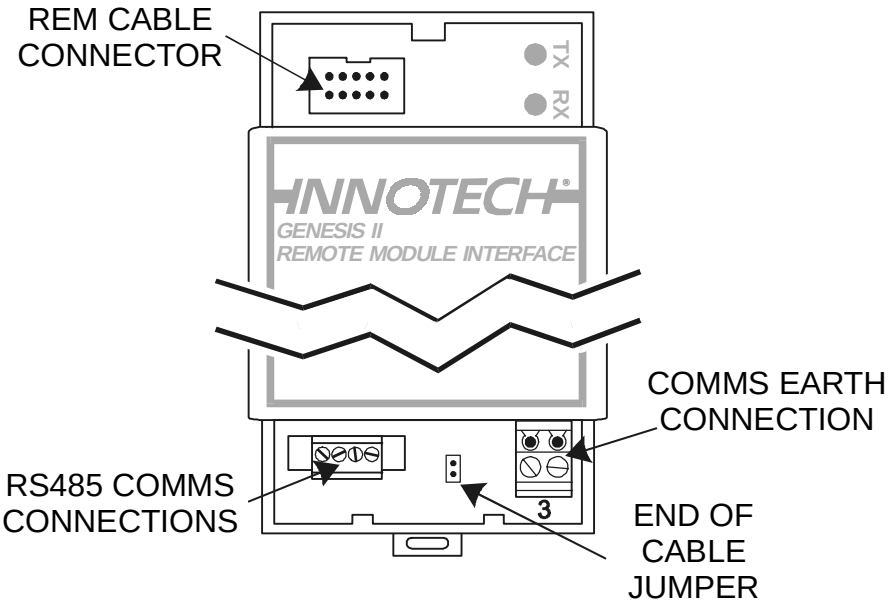
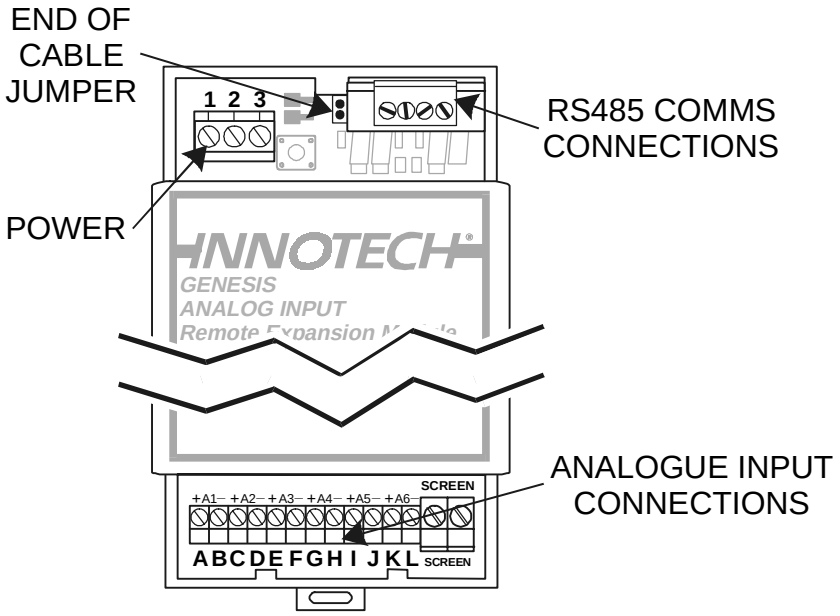


Figure 3-11. RMI Remote Module Interface.

3-4.2.4. AI REM Analogue Input Module. The AI REM (Figure 3-12) is powered by 24Vac ±10% at 4VA maximum. It provides for six analogue inputs from field equipment. Each analogue input circuit has a socket for fitting an AISC, which defines the input type and range selection. Installing the AISCs is part of the commissioning process



and is explained in Section 4.

Figure 3-12. AI REM Analogue 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 AI REM are listed in Table 3-12. 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 3-12. AI REM Analogue Input Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
ACTIVE		REFERENCE	
A	AI1+	B	AI1–
C	AI2+	D	AI2–
E	AI3+	F	AI3–
G	AI4+	H	AI4–
I	AI5+	J	AI5–
K	AI6+	L	AI6–
SCREEN	Common Screens		

3-4.2.5. AO REM Analogue Output Module. The AO REM (Figure 3-13) provides up to five analogue outputs. Analogue output terminals are located at the bottom of the module; output signal connections are listed in Table 3-13. 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.

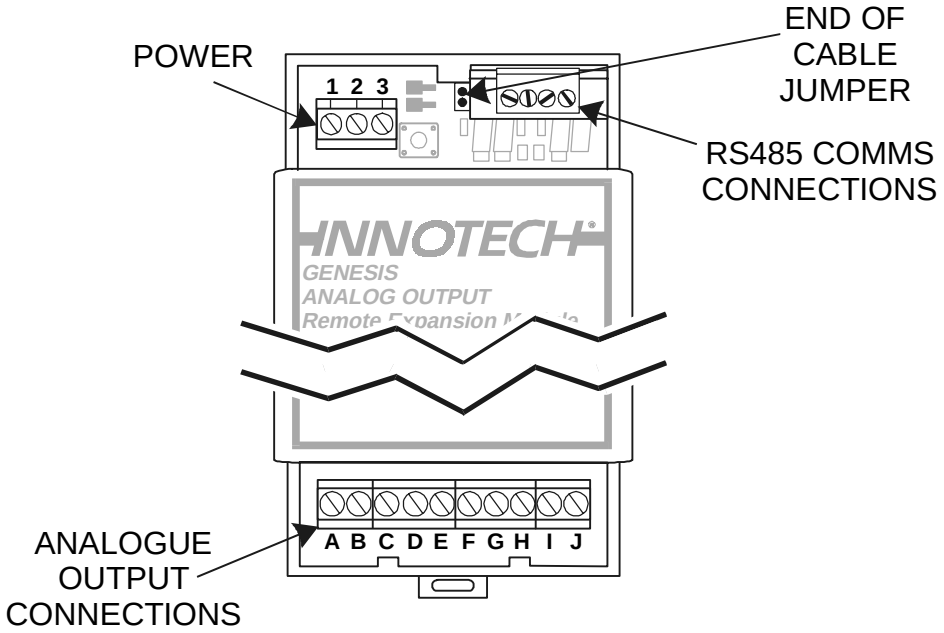


Figure 3-13. AO REM Analogue Output Module.

Table 3-13. AO REM Analogue Output Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
A	AO1+	B	AO1- & Screen
C	AO2+	D	AO2- & Screen
E	AO3+	F	AO3- & Screen
G	AO4+	H	AO4- & Screen
I	AO5+	J	AO5- & Screen

3-4.2.6. IDI REM Opto Isolated Digital Input Module. The IDI REM provides five isolated digital inputs to sense signals from field equipment. The IDI REM is similar, in appearance and terminal layout, to the AO REM.

Digital input terminals are located at the bottom of the module; input signal connections are listed in Table 3-14.

Table 3-14. IDI REM Digital Input Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
ACTIVE		REFERENCE	
A	DI1+	B	DI1–
C	DI2+	D	DI2–
E	DI3+	F	DI3–
G	DI4+	H	DI4–
I	DI4+	J	DI4–

3-4.2.7. DI REM Dry Contact Digital Input Module. The DI REM provides eight 5Vdc digital inputs for sensing switch and relay closures. The DI REM is similar, in appearance and terminal layout, to the AO REM.

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

Table 3-15. DI REM Digital Input Signal Connections.

TERMINAL	SIGNAL
A	DI1+
B	DI2+
C	DI3+
D	DI4+
E	DI5+
F	DI6+
G	DI7+
H	DI8+
I	Common
J	Common

3-4.2.8. DO REM Relay Output Module. The DO REM provides five normally open relay outputs. Output relay ratings are 240Vac at 2A. The DO REM is similar, in appearance and terminal layout, to the AO REM.

Relay output terminals are located at the bottom of the module; signal connections are listed in Table 3-16.

Table 3-16. DO REM Relay Output Signal Connections.

TERMINAL	SIGNAL	TERMINAL	SIGNAL
NORMALLY OPEN (NO)		COMMON (C)	
A	Relay 1	B	Relay 1
C	Relay 2	D	Relay 2
E	Relay 3	F	Relay 3
G	Relay 4	H	Relay 4
I	Relay 5	J	Relay 5

3-4.2.9. CS REM Control Station Module. The CS REM mounts into a standard electrical wallplate. The only connections to the CS module are 24Vdc 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.

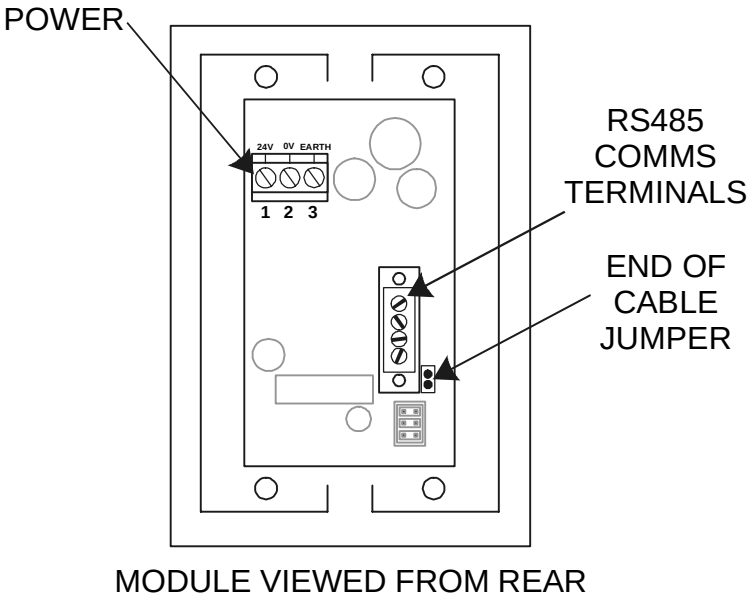
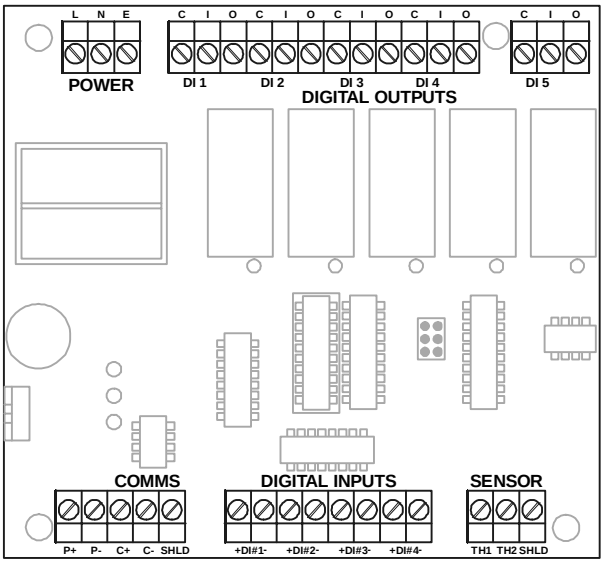


Figure 3-14. CS REM Control Station Module.

3-4.2.10. MZS REM Multi Zone Station Module. The MZS REM is similar to the CS REM in appearance and locations of connection points. Power and RS485 connection requirements are the same as for the CS REM.

3-4.2.11. MP REM Multipoint Module. The MP REM (Figure 3-15) is a remote expansion device that has both input and output expansion capabilities. The MP REM provides relay outputs for distributed control, digital inputs for status detection and thermistor inputs for temperature measurement. This module is mainly used in applications requiring remote control of fan/coil units using relay outputs for fan control and a thermistor for measuring air temperature.



MODULE VIEWED FROM THE REAR

Figure 3-15. MP REM Multipoint Module.

POWER and DIGITAL OUTPUTS terminals are arranged across the top edge of the module's main circuit board. COMMS, DIGITAL INPUTS and SENSOR inputs are arranged along the bottom edge of the board.

Power requirements are 240Vac, ±10% at 50/60Hz. Power consumption is 7VA maximum. The three terminals of the POWER connector block are

- L = 240Vac Supply
- N = Neutral
- E = Earth

The DIGITAL OUPUTS (relay) terminals are listed in Table 3-17. Relay contacts are rated at 2 Amperes.

Table 3-17. MP REM Output Relay Connections.

RELAY	COMMON CONTACT	NOT CONNECTED	NORMALLY OPEN
Relay 1	DI1 C	DI1 I	DI1 O
Relay 2	DI2 C	DI2 I	DI2 O
Relay 3	DI3 C	DI3 I	DI3 O
Relay 4	DI4 C	DI4 I	DI4 O
Relay 5	DI5 C	DI5 I	DI5 O

The group of five terminals at the lower left of the module serves two separate functions. The two terminals on the left of the group (P+ and P-) provide a 12Vdc source for digital input signals (Figure 3-16). The three terminals on the right side of the group are the COMMS cable connections:

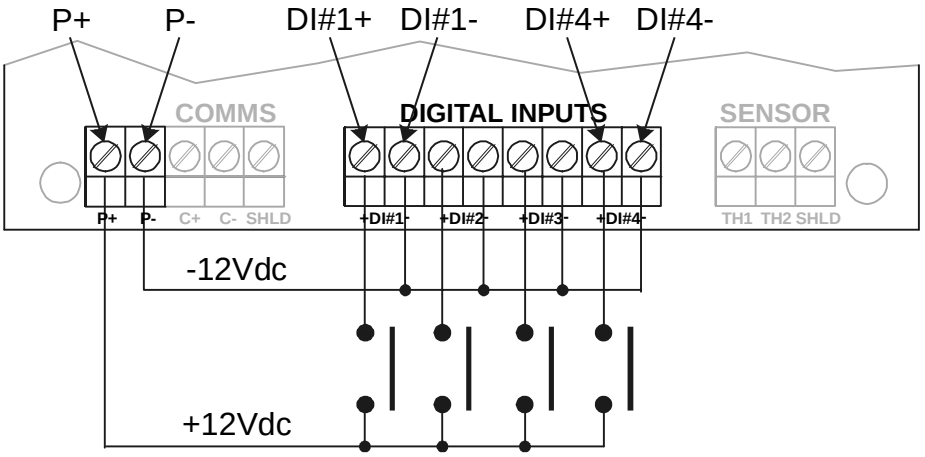
- C+ = RS 485 (+) Signal
- C- = RS 485 (-) Signal
- SHLD = Comms cable shield

The MP REM accepts up to four isolated, switched-contact, digital inputs. Refer to Table 3-18 for DIGITAL INPUT signal terminal identification. The digital inputs can use the P+ and P- terminals as a 12Vdc signal-source or, alternatively, an external 24Vac source can be used. Figure 3-16 shows how the digital inputs can be wired in either of the two configurations.

Table 3-18. MP REM Digital Input Signal Connections.

SIGNAL	POSITIVE TERMINAL	NEGATIVE TERMINAL
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-

Input from a single 10kΩ thermistor temperature sensor connects to the SENSOR connection block at the lower right corner of the module. The two sensor leads connect to Terminals TH1 and TH2. The thermistor cable screen connects to the SHLD terminal.



USE TERMINALS P+ AND P- FOR 12Vdc SIGNAL SOURCE

OR

USE AN EXTERNAL 24Vac SOURCE

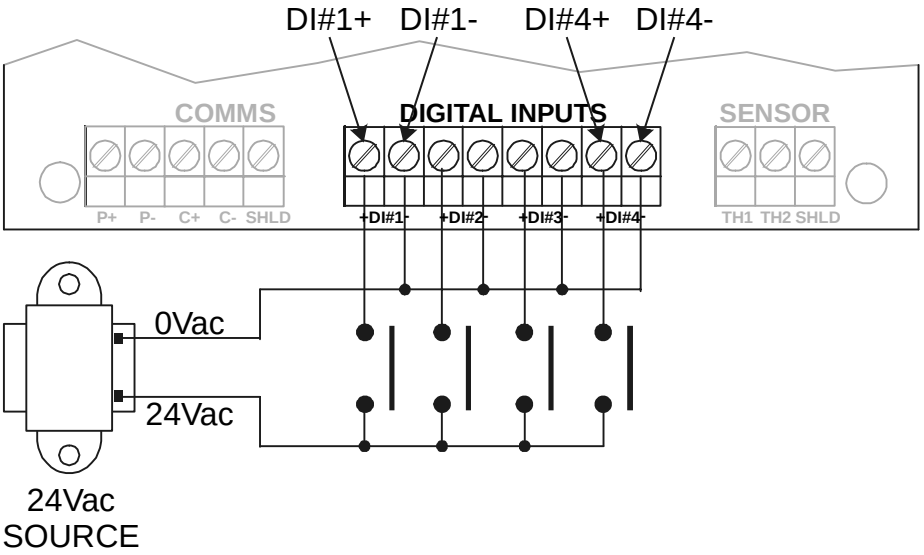


Figure 3-16. MP REM, Digital Input Wiring.

SECTION 4- COMMISSIONING

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.

WARNING

TO PREVENT INJURY TO PERSONNEL AND DAMAGE TO EQUIPMENT, ALL ELECTRICAL POWER MUST BE OFF BEFORE STARTING THE COMMISSIONING PROCESS. THIS INCLUDES POWER TO GENESIS UNITS AND POWER TO INPUT AND OUTPUT CIRCUITS AND EQUIPMENT. 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 Sections 2 and 3 (and Appendix A, as appropriate), inspect the entire system for correct mechanical and electrical installation. Correct any discrepancies noted. Inspection should include the factors listed in the following paragraphs, as a minimum.

4-1.1.1. Mechanical Inspection. Inspect for the following:

- 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 Paragraphs 3-4.2.9 and 3.4.2.10).
- 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.

4-1.1.2. Electrical Inspection. Inspect for the following:

- 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 are met.
- Make sure all LEM and RMI ribbon cables are run outside of the enclosure cable ducts.
- 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 the Remote Module Interface (RMI) and REMs does not exceed 500 metres in length.
- Inspect all cables running external to the enclosure. Ensure they are free from potential mechanical damage, such as impacts and chafing.

4-1.2. CHECK INPUT AND OUTPUT WIRING. The purpose of checking the input and output wiring is two-fold. The wiring is checked to verify that it is connected properly, thus ensuring proper operation of the system. 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%, 50/60Hz. 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.

Two units: the GENII RPTR Repeater Module and the GENII MP REM Multipoint Module use 240Vac input power. Since these units are powered directly from standard power points, it is not necessary to check their power inputs unless a fault in the power mains is suspected. Suspected power mains problems should be referred to a qualified electrician.

Some Local Expansion Modules and Remote Expansion Modules receive their operating power from the associated controller through the LEM/RMI ribbon cable (See Table 4-1). It is not necessary to check voltage for these units. However, the LEM/RMI Cable should be inspected to ensure it is undamaged and the connectors are firmly seated.

Table 4-1. Genesis System Power Inputs.

UNIT	OPERATING VOLTAGE		
	24Vac ±10%	**24Vdc ±10%**	**240Vac**
GENESIS II Digital Controller	✓	Note 1	✖
GENESIS I Digital Controller	✓	Note 1	✖
GENII AIM Analogue Input Module (LEM)	Note 2		
GENII DIM Digital Input Module (LEM)	Note 2		
GENII DOM Digital Output Module (LEM)	✓	✖	✖
GENII RPTR Repeater Module	✖	✖	✓
GENII MPC Mid Points Controller	✓	Note 1	✖
GENII RMI Remote Module Interface	Note 2		
GENII AI REM Analogue Input Modula	✓	✖	✖
GENII AO REM Analogue Output Module	✓	✖	✖
GENII IDI REM Opto-Isolated Digital Input Module	✓	✖	✖
GENII DI REM Dry Contact Digital Input Module	✓	✖	✖
GENII DO REM Relay Output Module	✓	✖	✖
GENII CS REM Control Station Module	✓	✖	✖
GENII MP REM Multipoint Module	✖	✖	✓
GENII MZS REM Multi Zone Station Module	✓	✖	✖

NOTES:
1. Optional 24Vdc supply is available.
2. Unit receives operating power from the controller by way of the LEM/RMI Cable.

WARNING

THE POWER INPUT TO THE GENII MP REM MULTIPOINT AND GENII RPTR MODULES IS 240VAC. TO PREVENT PERSONAL INJURY OR DEATH FROM ELECTRICAL SHOCK, DO NOT ATTEMPT TO PERFORM THE FOLLOWING PROCEDURES ON THE MP REM AND RPTR MODULES. SINCE THESE MODULES PLUG INTO STANDARD ELECTRICAL POWER POINTS, A VOLTAGE CHECK AT THE UNIT IS UNNECESSARY UNLESS A POWER MAINS FAILURE IS SUSPECTED. SUSPECTED POWER MAINS FAILURES SHOULD BE REFERRED TO A QUALIFIED ELECTRICIAN.

Check 24Vac and 24Vdc inputs as follows:

a. Ensure power to the unit is turned off.

b. 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.

c. Disconnect the power lead from Terminal 1 (Figure 4-1).

d. Connect a digital voltmeter red (+) test lead to the disconnected power lead and the black (-) test lead to Terminal 2.

e. Set the voltmeter to the proper range to measure 24 Volts.

f. Turn on the power.

g. 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.

h. Turn off the power.

i. Disconnect the digital voltmeter and reconnect the wire to Terminal 1.

j. Repeat Steps a. through i. for the other 24-Volt units.

For units not included in this manual, refer to the appropriate data sheet in Appendix B.

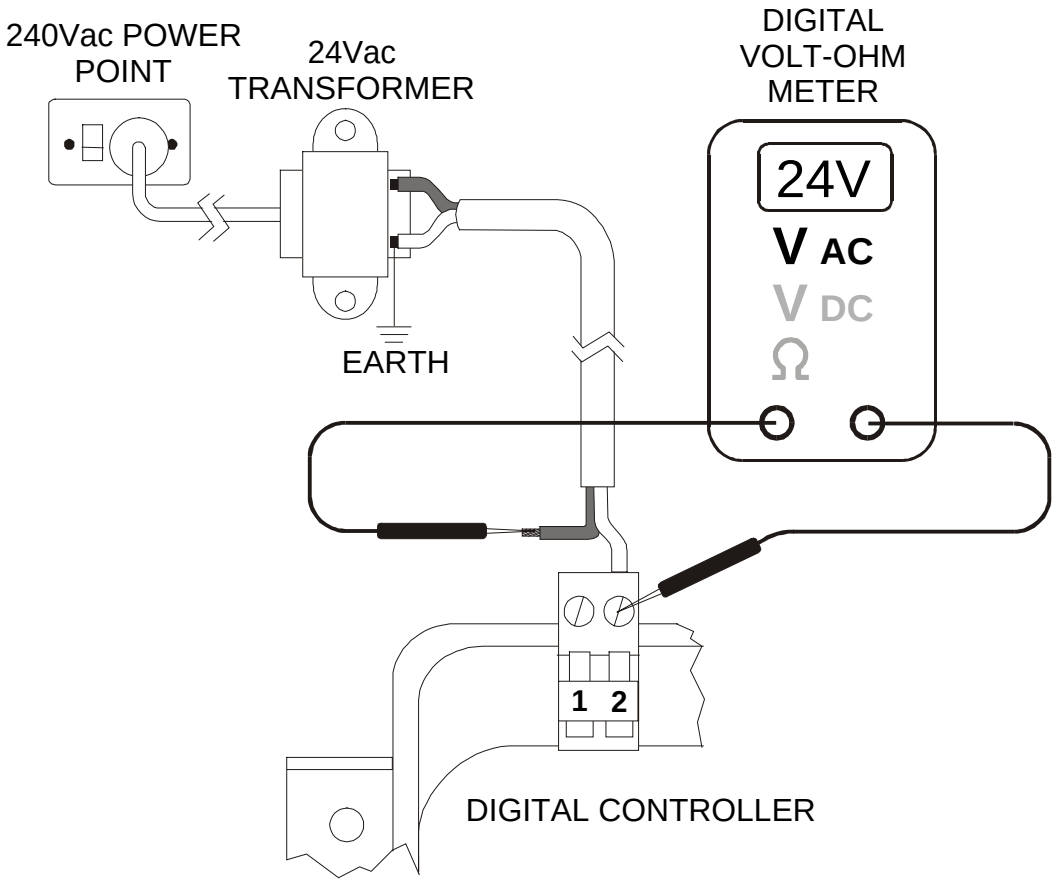


Figure 4-1. Checking Power Input.

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

Paragraph 4-1.2.2.1 contains procedures for checking most Genesis units 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 Paragraph 4-1.2.2.2.

Table 4-2. Digital Input Signal Voltages.

UNIT	SIGNAL VOLTAGE
GENESIS II Digital Controller	24Vac/24Vdc ±15%
GENESIS I Digital Controller	24Vac/24Vdc ±15%
GENII DIM Digital Input Module (LEM)	24Vac/24Vdc ±25%
GENII MPC Mid Points Controller	24Vac/12Vdc ±15%
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%

4-1.2.2.1. 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 Section 3 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:

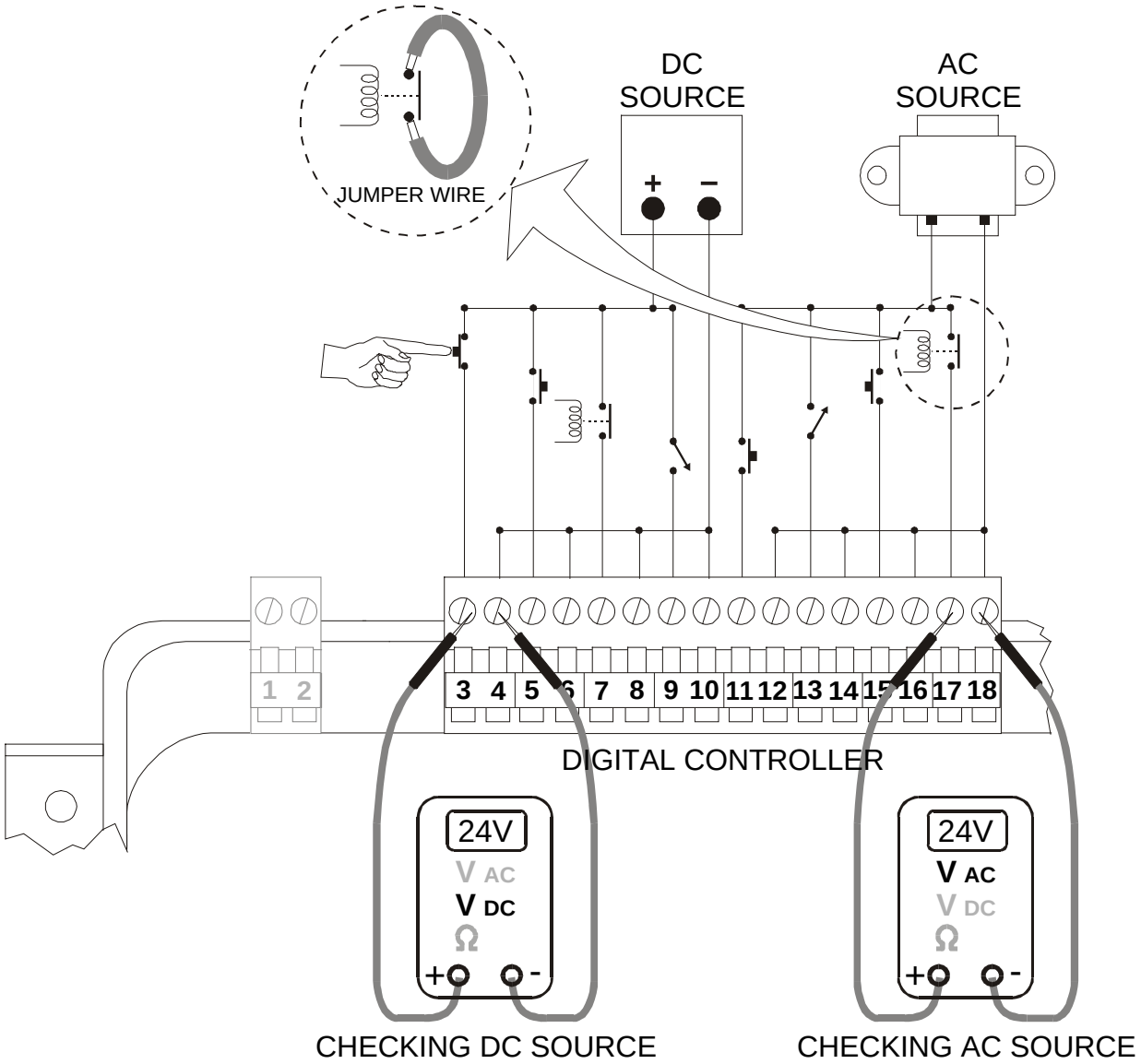


Figure 4-2. Checking Digital Input Wiring.

NOTE

The following procedures assume the digital inputs are driven by Normally Open contacts. For digital inputs driven by Normally Closed contacts, the voltage indications should reverse.

a. Ensure power to the Digital Controller is turned off.

b. Set the digital voltmeter range to read at least 25 Volts.

c. Connect the voltmeter to the first digital input channel (Terminals 3 and 4 for the Genesis II Digital Controller). Observe polarity, ensuring the red (+) test lead is connected to the positive terminal (3) and the black (-) test lead is connected to the negative terminal (4).

d. 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.

WARNING

AVOID RISK OF ELECTRICAL SHOCK. OBSERVE ALL LOCAL ELECTRICAL SAFETY REQUIREMENTS WHEN PERFORMING THE NEXT STEP.

e. 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.

f. Ensure the voltmeter indicates the proper signal voltage as listed in Table 4-2. Ensure that the voltmeter indicates the correct polarity. The unit will not operate properly if the signal polarity is incorrect.

g. Release the manually closed contacts or remove the temporary jumper from the switch contacts.

h. Repeat Steps c. through g. for the remaining digital input channels.

4-1.2.2.2. 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:

a. 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.

b. Apply 24Vac operating power to the GENII DI REM. Power to all other units should be off.

c. Set the digital voltmeter range to read at least 5.0Vdc.

d. 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.

e. Observe the voltmeter. It should indicate 5Vdc with the input switch open.

WARNING

AVOID RISK OF ELECTRICAL SHOCK. OBSERVE ALL LOCAL ELECTRICAL SAFETY REQUIREMENTS WHEN PERFORMING THE NEXT STEP.

f. Manually close the input switch. If that is not practical, connect a short jumper wire across the contacts.

g. Observe the voltmeter. It should indicate 0Vdc with the input switch closed.

h. Release the manually-closed contacts. If a jumper wire was used in Step f., remove the jumper wire.

i. Repeat Steps d. through h. for the remaining digital input channels.

j. Remove operating power from the REM.

k. Reconnect the RS485 cable that was disconnected in Step a.

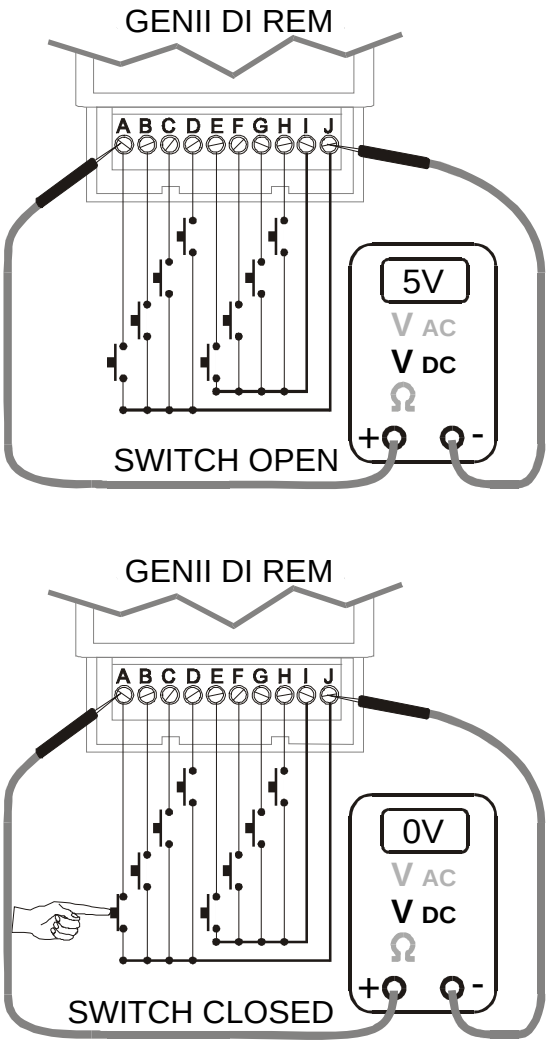


Figure 4-3. Checking Dry Contact Inputs.

WARNING

DIGITAL OUTPUTS ARE CONTROLLED BY RELAYS WITHIN THE ASSOCIATED GENESIS UNIT. THESE RELAYS ARE CONNECTED TO EXTERNAL CIRCUITS THAT CAN CONTAIN UP TO 240Vac. 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.

4-1.2.3. Checking Digital Output Wiring. Digital outputs of the various units are interfaced through relays, each having single-pole changeover contacts.

The Genesis II Digital Controllers and the Digital Output Module (DOM) LEMs are provided with both Normally Open (NO) and Normally Closed (NC) contacts in each digital output channel. The following units contain only NO digital output contacts:

- Genesis I Digital Controller
- GENII MPC Mid Points Controller
- GENII MP REM Multipoints Module
- GENII DO REM Relay Output Module

Relay contacts in all units with digital outputs are rated at 240Vac, 2A. 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 2A. Current in excess of 2A 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 NC and C terminals should be operating and devices connected to 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 NC contacts, the wire going the C terminal is temporarily disconnected and the associated device is checked to make sure it is de-energised. 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.

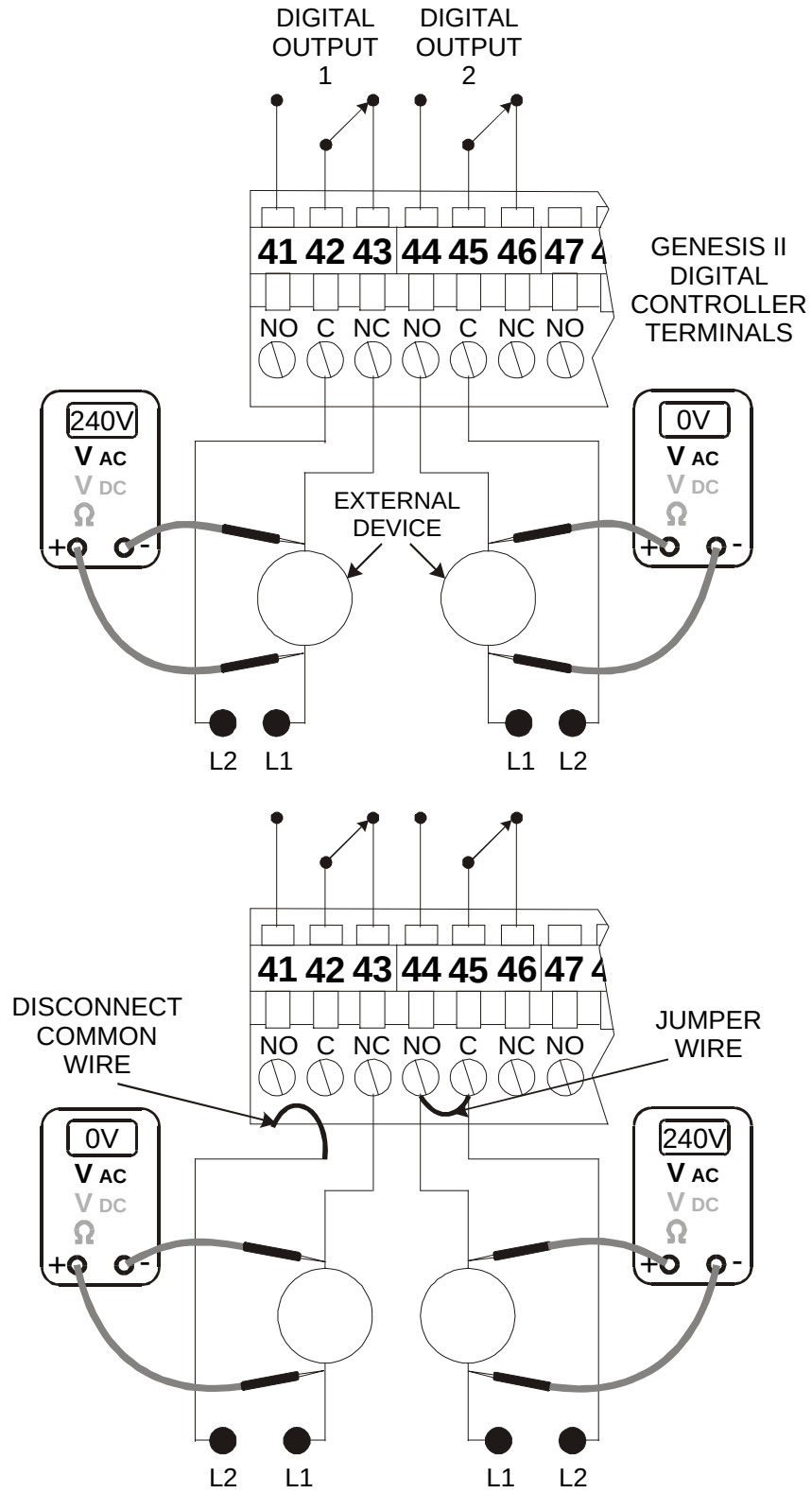


Figure 4-4. Checking Digital Output Wiring.

CAUTION

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 2 AMPERES. EXCESS RELAY CONTACT CURRENT WILL CAUSE PERMANENT AND IRREPARABLE DAMAGE TO THE UNIT.

Following are the procedures for checking digital output wiring; refer to Section 3 for output terminal numbers for the applicable Genesis units:

a. 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.

b. If the unit to be checked does not use NC relay contacts, go Step m.

c. Start at the first device connected to the NC 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.

d. Apply operating power to the output device.

e. Determine that the device is energised, either by direct observation of the device itself or by checking that the voltmeter indicates full operating voltage.

f. Remove operating power from the output device.

g. Temporarily disconnect the wire connected to the C contact.

h. Apply operating power to the output device.

i. Determine that the device is de-energised, either by direct observation of the device itself or by checking that the voltmeter indicates Zero Volts.

j. Remove operating power from the output device.

k. Reconnect the Common wire disconnected in Step g.

l. Repeat Step c. through Step k. for the remaining output devices connected to the NC contacts.

m. 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.

n. Apply operating power to the output device.

o. Determine that the device is de-energised, either by direct observation of the device itself or by checking that the voltmeter indicates Zero Volts.

p. Remove operating power from the output device.

q. 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.

r. Apply operating power to the output device.

s. Determine that the device is energised, either by direct observation of the device itself or by checking that the voltmeter indicates full operating voltage.

t. Remove operating power from the output device.

u. Remove the jumper wire connected in Step q.

v. Repeat Step m. through Step u. for the remaining output devices connected to the NO contacts.

4-1.2.4. Checking Analogue Input Wiring. The analogue input wiring for the following Genesis units should be checked as part of the commissioning process:

- Genesis II Digital Controller
- Genesis I Digital Controller
- GENII MPC Multi Points Controller
- GENII AIM LEM
- 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. 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 2kΩ. Procedures for checking the resistance are contained in Paragraph 4-1.2.4.3.

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.

Table 4-3. Analogue Input Checks.

AISC MODEL	INPUT TYPE	PARAMETER MEASURED	EXPECTED VALUE	REFERENCE PARAGRAPH
AIM AISC	From AIM LEM	Inspect Wiring	N/A	4-1.2.4
DO5	Digital	Voltage	0 or 5Vdc	4-1.2.4.1
D33	Digital	Voltage	0 or 10Vdc	4-1.2.4.1
I05	0 – 5mA Passive	Current (See Note)	0 – 5mA	4-1.2.4.2
I20	4 – 20mA Passive	Current (See Note)	4 – 20mA	4-1.2.4.2
P20	Loop Powered	Inspect Wiring	N/A	4-1.2.4.2
TD1	Current Loop	Current (See Note)	0 – 250μA	4-1.2.4.2
TD2	0 - 500μA	Current (See Note)	0 – 500μA	4-1.2.4.2
TH1	Thermistor	Resistance	0 – 1kΩ	4-1.2.4.3
TH2	Thermistor	Resistance	0 – 2kΩ	4-1.2.4.3
TH3	Thermistor	Resistance	0 – 3.8kΩ	4-1.2.4.3
TH4	Thermistor	Resistance	0 – 8.2kΩ	4-1.2.4.3
TH5	Thermistor	Resistance	0 – 16.2kΩ	4-1.2.4.3
TH6	Thermistor	Resistance	0 – 33.2kΩ	4-1.2.4.3
TH7	Thermistor	Resistance	0 – 68.1kΩ	4-1.2.4.3
TH8	Thermistor	Resistance	0 – 121kΩ	4-1.2.4.3
TH9	Thermistor	Resistance	0 – 221kΩ	4-1.2.4.3
V05	Voltage	Voltage	0 – 5Vdc	4-1.2.4.1
V10	Voltage	Voltage	0 – 10Vdc	4-1.2.4.1

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

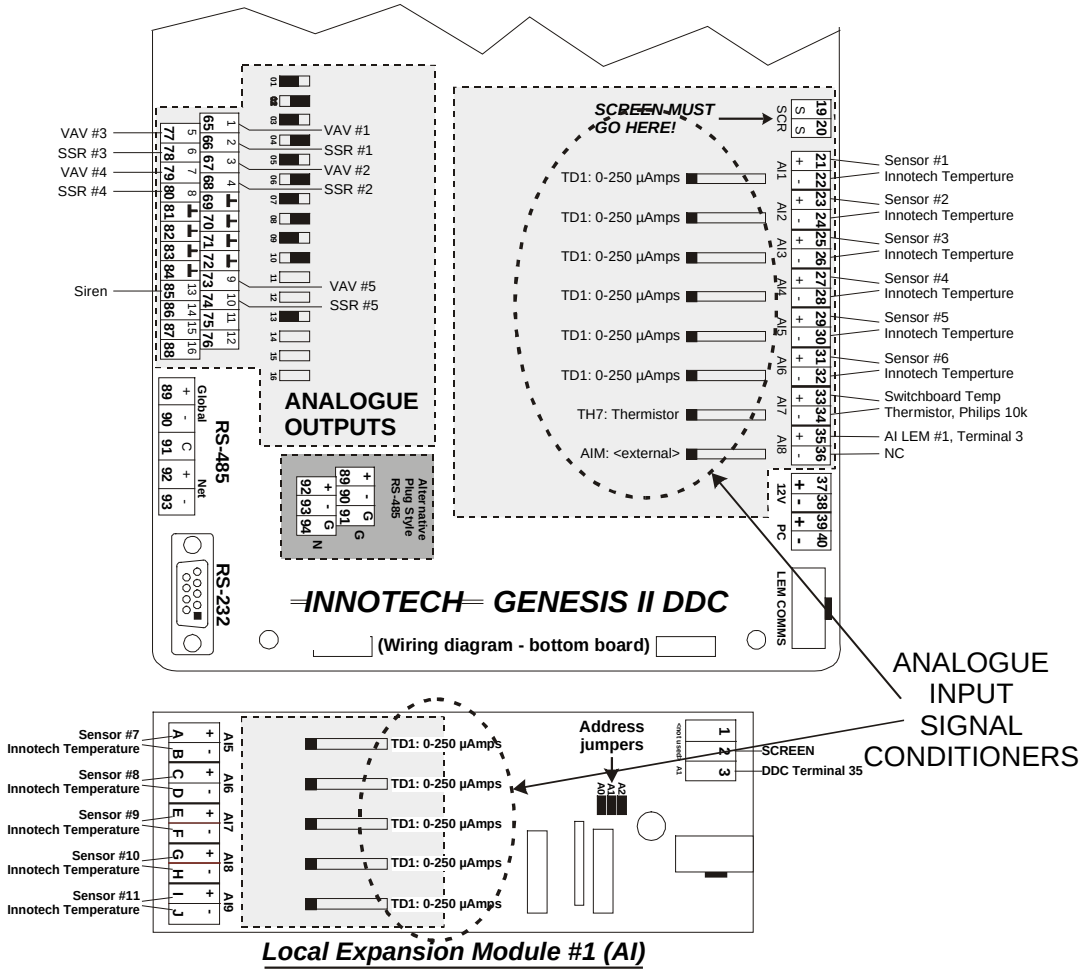


Figure 4-5. AISC Locations.

When an Analogue Input Module LEM is used, the output of the LEM is connected to one of the controller's analogue input channels. Because the cable between the LEM and the controller is very short, this connection is checked by visual inspection. When checking the analogue connection between the AIM LEM and a controller, ensure the cable is wired in accordance with Section 3 and is free of potential physical damage. Ensure, also, that the cable is routed outside of the cable ducts.

NOTE

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

4-1.2.4.1. Voltage Checks. 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.

Procedures for performing voltage checks are:

CAUTION

ENSURE THAT NO AC VOLTAGE IS PRESENT ON EITHER TERMINAL. AV VOLTAGEAT THE INPUT TERMINALS CAN CAUSE DAMAGE TO THE UNIT. ALSO, THE UNIT WILL NOT OPERATE PROPERLY IF THE ANALOGUE INPUT SIGNAL POLARITY IS INCORRECT.

a. Ensure all AISCs have been removed and no power is applied to the Genesis unit.

b. 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

c. Set the digital voltmeter to indicate Vdc. Set the range for the expected voltage value shown in Table 4-3.

d. Connect the voltmeter across the analogue input terminals observing polarity. If necessary, reduce the voltmeter range to obtain an accurate reading.

e. Ensure the measured voltage is within the expected range and of the correct polarity. If not, check the analogue input wiring for faults/errors

f. Repeat Steps b. through e. for the remaining inputs associated with the AISC models noted above.

4-1.2.4.2. 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 (E=IR) to determine the voltage.

AISC	INPUT	VOLTAGE

	CURRENT	ACROSS 500Ω
I05	0 – 5mA	0 – 2.5Vdc
I20	4 – 20mA	2 – 10Vdc
TD1	0 – 250μA	0 – 0.125Vdc
TD2	0 – 500μA	0 – 0.25Vdc

Inputs associated with the P20 AISC are 4 – 20mA loop-powered inputs. These inputs CANNOT be conveniently checked in the same manner as the other current inputs without applying power to the Genesis unit 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.

Following are procedures for performing current checks:

a. Ensure all AISCs have been removed and no power is applied to the Genesis unit.

b. For analogue inputs associated with P20 AISCs go to Step i.

c. Temporarily connect a 500-Ohm (or suitable value) resistor across the terminals of the first current input channel to be checked.

d. Set a digital voltmeter to indicate Vdc. Set the range for the expected voltage value shown in the matrix above.

e. Connect the voltmeter across the analogue input terminals observing polarity. If necessary, reduce the voltmeter range to obtain an accurate reading.

f. Ensure the measured voltage is within the expected range and of the correct polarity. If not, check the analogue input wiring for faults/errors

g. Remove the temporary resistor connected in Step c. above.

h. Repeat Steps b. through g. for the remaining inputs associated with the AISC models noted above.

i. 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.

j. 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.

4-1.2.4.3. 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:

a. Ensure all AISCs have been removed and no power is applied to the Genesis unit.

b. Set a digital ohmmeter to indicate Ohms. Set the ohmmeter range to the resistance value shown in Table 4-3.

c. Connect the ohmmeter across the analogue input terminals.

d. Ensure the measured resistance is within the expected range. If it is not, check the analogue input wiring for faults/errors

e. Repeat Steps b. through d. for the remaining inputs associated with AISC Models TH1 through TH9.

4-1.2.5. 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 Genesis II Digital Controller, Genesis I Digital Controller, GENII MPC Mid Points Controller and the GENII AO REM Analogue Output Module. Refer to Section 3 for analogue output terminal numbers for the applicable Genesis units:

a. Ensure the operating power to the unit is off.

b. 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.

c. At the analogue output terminal, disconnect the active signal wire for the first analogue output.

d. Connect a digital voltmeter between the disconnected signal wire and the common terminal.

e. The voltmeter should indicate Zero Volts. Set the voltmeter range as low as possible to ensure there is no voltage present.

f. Set the voltmeter to the Ohms range. The Ohmmeter should indicate a minimum resistance of 2,000 or 5,000 Ohms (See Note below). A reading of Infinity Ohms indicates an open circuit condition that should be corrected.

NOTE

The analogue output circuit resistance for the Genesis I and II Digital Controllers and the GENII MPC should be at least 2,000 Ohms. The circuit resistance for the GENII AO REM should be at least 5,000 Ohms.

g. Disconnect the meter and reconnect the signal wire disconnected in Step c.

h. Repeat Step c. through Step g. for the remaining analogue outputs.

i. Turn off any power applied in Step b.

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 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
- Genesis I Digital Controller
- GENII MPC Mid Points Controller
- GENII AIM Analogue Input Module (LEM)
- 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. The jumper plugs are of three categories:

- Address Plugs set the address of each Local or Remote Expansion Module.
- Analogue Output plugs are used to select either Variable or Heat Valve Mode of operation for analogue outputs. Refer to Paragraph 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.

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 each Genesis unit requiring a jumper setting, the types of jumper plugs and the reference paragraph containing instructions for setting them.

Table 4-4. Units Requiring Jumper Settings.

JUMPER TYPE:	ADDRESS	END-OF-CABLE	ANALOGUE OUTPUT
See Paragraph:	**4-1.4.1**	**4-1 .4.2**	**4-1.4.3**
GENESIS II Digital Controller	✖	✖	✓
GENESIS I Digital Controller	✖	✖	✓
GENII MPC Mid Points Controller	✖	✖	✓
GENII AIM LEM	✓	✖	✖
GENII DIM LEM	✓	✖	✖
GENII DOM LEM	✓	✖	✖
GENII RMI	✓	✓	✖
GENII AI REM	✓	✓	✖
GENII AO REM	✓	✓	✓
GENII IDI REM	✓	✓	✖
GENII DI REM	✓	✓	✖
GENII DO REM	✓	✓	✖
GENII CS REM	✓	✓	✖
GENII MP REM	✓	✖	✖
GENII MZS REM	✓	✓	✖

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 and A2. 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 set properly on all LEMs and REMs in order for the system to operate correctly.

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.

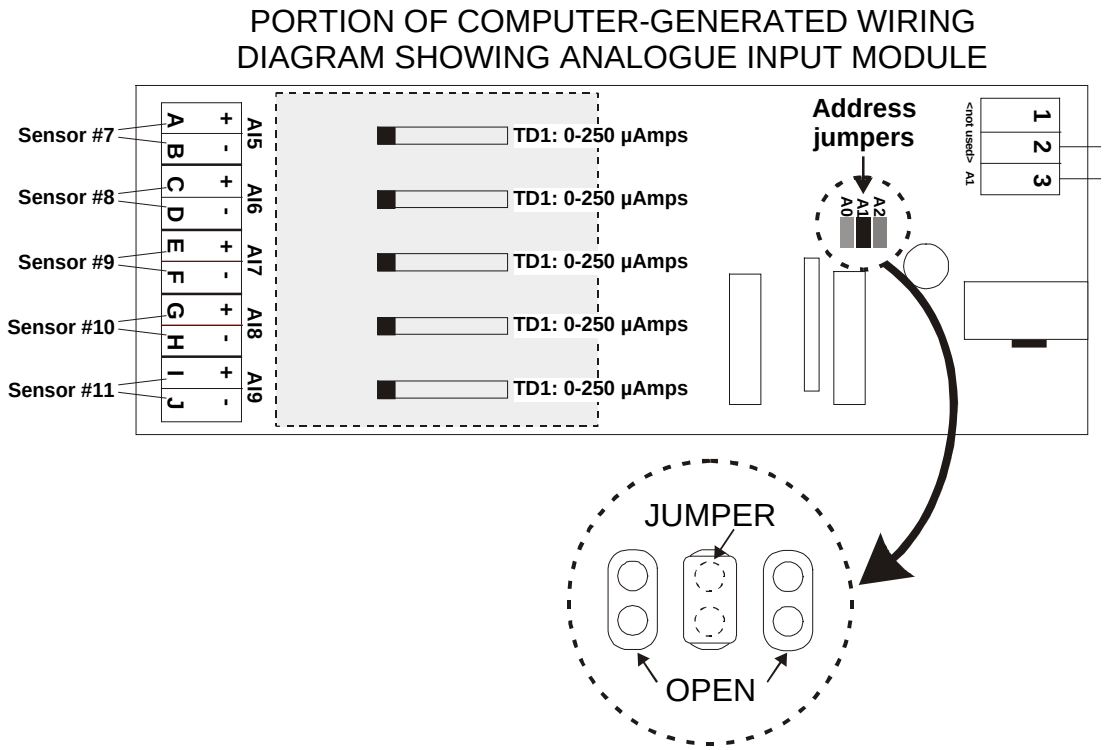


Figure 4-6. Address Jumpers, Typical Settings.

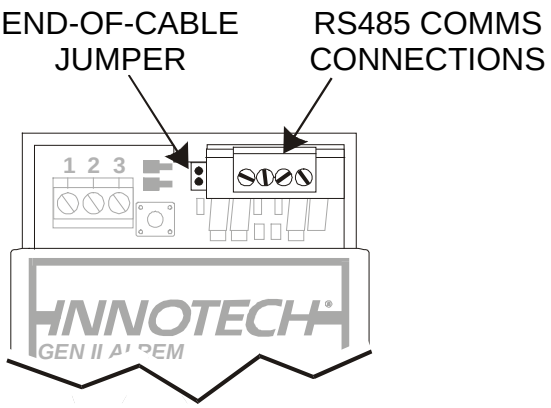
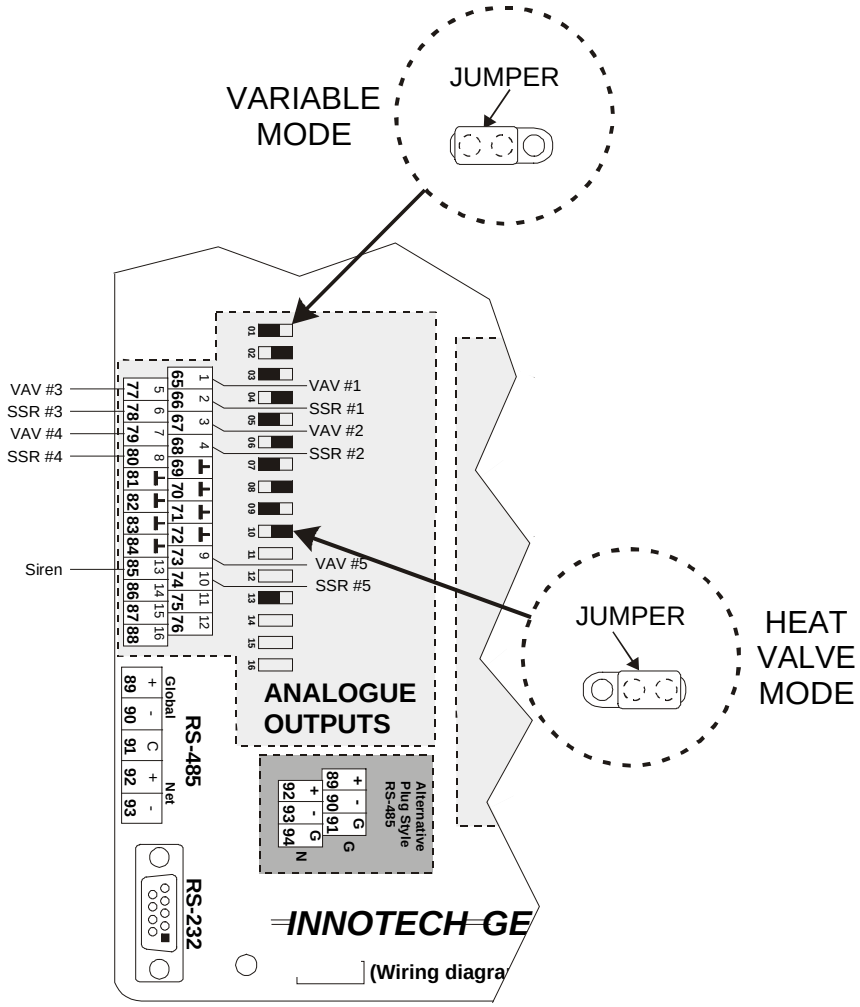


Figure 4-7. End-of-Cable Jumper, Typical Location.

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.



PORTION OF COMPUTER-GENERATED WIRING DIAGRAM SHOWING GENESIS II DIGITAL CONTROLLER

Figure 4-8. Setting Analogue Output Jumpers.

4-1.5. APPLY PARTIAL POWER. After all input and output wiring has been checked and all jumpers properly set, apply normal operating power to the controller unit(s) (Genesis I and Genesis II Digital Controllers and/or GENII MPC Mid Points Controller. At this time, do not apply power to any other circuits or modules.

Check for signs of malfunction, such as blown fuses, tripped circuit breakers, smoke or heat. If problems occur, remove the power and correct the problem as necessary.

4-1.6. 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.

Paragraph 4-1.6.1 contains instructions for loading the Gen2Works software into your PC and Paragraph 4-1.6.2 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.

NOTE

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 address/phone numbers shown on the cover 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.

4-1.6.1. Loading Gen2Works.

To load Gen2Works into the PC:

a. Insert the Gen2Works Disk 1 into the A: Drive.

b. Click on Run and type “A:\setup” in the Run dialogue box, then click on OK.

c. Gen2Works will display a Product Activation dialogue box with a block requesting entry of the Activation Key.

d. Enter the Activation Key, then click OK.

e. The Gen2Works software will begin to load. Follow instructions on the screen to complete the load.

4-1.6.2. Configuring a Controller.

Following is the procedure for configuring a controller:

a. Turn off the electrical power to the controller and the PC.

b. Connect an RS232 cable between the controller’s RS232 connector and the computer’s serial port.

c. Turn on the computer and allow it to boot-up. Turn on the controller's operating power.

NOTE

The following procedures are limited to the steps necessary to configure the controller. For more detailed information on the operation of the zGen2Con software refer to the Innotech Genesis II Direct Digital Controller User Manual.

d. Using standard Windows procedures, open the Gen2Cfg.320 folder. Note that the extension ".320" refers to the current software revision and is subject to change as revisions are made to the software.

e. Click on the Gen2Cfg icon to open the Gen2Con program. The Gen2Cfg screen is displayed.

f. At the upper-left corner of the Gen2Cfg 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: ".c2f".

g. 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.

h. At the top of the window select Communicate and then Transfer to DDC. The Gen2Cfg software begins to automatically transfer the configuration data to the controller by way of the Gen2DDE.320 software (DDE = Dynamic Data Exchange). Follow instructions given on the screen.

i. It is safe to exit the Gen2Cfg program at this point.

j. 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.

4-1.7. INITIAL TESTS. Initial tests of the system involve the use of the Gen2Mon software to perform a thorough checkout 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.

4-1.7.1. 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 or through the RS232 serial 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 Direct Digital Controller User Manual.

4-1.7.2. Performing Initial Tests. Because of the Genesis System's designed-in 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.

4-1.7.2.1. First Phase Testing. Perform the first phase of initial tests of the system as follows:

a. Turn off all electrical power to the Genesis system and the PC to be used for testing.

b. Connect an RS232 cable between the controller's RS232 connector and the computer's serial port.

c. 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.

d. Using standard Windows procedures, open the Gen2Mon.320 folder. Note that the extension ".320" refers to the current software revision and is subject to change as revisions are made to the software.

e. Click on the Gen2Mon icon to open the Gen2Mon program. The Gen2Mon screen is displayed.

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.

f. 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.

g. When all inputs and outputs have been checked, return the input parameters to their original settings. The first phase is completed.

4-1.7.2.2. Second Phase Testing. Perform the second phase of initial tests of the system as follows:

a. Turn on operating power to the primary output circuits such as pilot relays, motor controllers and heat valves.

b. Ensure that operating power to plant machinery (compressors, fans, etc.) is turned off

c. 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.

d. When all outputs have been checked for proper operation, return the input parameters to their original settings. The second phase is completed.

4-1.7.2.3. Third Phase Testing. Perform the third phase of initial tests of the system as follows:

a. Turn on operating power to the plant machinery in accordance with the manufacturers' instruction manuals.

b. 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 control and operation of the plant machinery.

c. When items of plant machinery have been checked for proper operation, return the input parameters to their original settings. The third phase is completed.

d. Exit the Gen2Mon program.

e. Turn off operating power to the entire Genesis System and the PC.

f. Disconnect the RS232 cable between the PC and the controller.

g. Repeat procedures in Paragraphs 4-1.7.2.1 through 4-1.7.2.3 for the other controllers.

4-1.8. FINAL SYSTEM CHECKOUT. Final checkout 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. Following are the procedures for performing final system checkout:

a. Apply normal operating power to the entire system in accordance with the applicable manufacturers' instruction manuals.

b. 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.

c. 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.

d. Check manufacturers' recommended adjustments and settings to ensure all units are set-up for optimum function.

e. At the controller enter final operational preferences such as schedules, passwords, flash watches, etc.

f. The system is ready for operation.

APPENDIX A- NETWORK INSTALLATION

A-1. OVERVIEW.

The Innotech Genesis group of products uses serial communications (Comms) via standard RS485 physical networks to communicate data between themselves and to PCs connected to the network. The layout of the cables and the methods of connecting them are set out in this section.

A-2. GENESIS I AND GENESIS II PRODUCTS.

The Genesis I and Genesis II products that can be connected to the serial Comms are:

- Genesis I Digital Controller
- Genesis II Digital Controller
- GENII MPI Modem and Printer Interface
- GENII RPTR Repeater Module,
- GENII CONVERTER RS232 to RS485 Isolated Converter
- GENII 485I Isolated RS485 Comms
- GENII POLY SWITCH RS485 Protection Plug.
- GENII RMI Remote Module Interface
- Genesis II Mid Points Controller (MPC)
- All Genesis II Remote Expansion Modules (REMs)

The Genesis I Digital Controller, Genesis II Digital Controller, GENII MPI and GENII RPTR have two serial networks: Net Comms and Global Points.

A-2.1. NET COMMS. Net Comms provides a means to configure or monitor Digital Controllers from a PC at a speed of 9600 baud. A local PC can be connected to the Net Comms via an MPI or via an RS232 to RS485 converter. A PC with a modem at a remote location can access this network through the telephone system via a modem connected to an MPI on the Net Comms.

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.

Local access to an individual Digital Controller can be made via its RS232 DB9 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.

A-2.2. GLOBAL POINTS. The Global Points network provides a means for control data to be shared among the Digital Controllers and a GENII MPI at a data speed of 4800 baud. There is no facility to connect a PC to the Global Points network through a Digital Controller or GENII MPI. If it is necessary to monitor the Global Points traffic, a GENII CONVERTER can be used to connect to the Global Points Comms cable and use the Genesis Global Points Monitor software to view the data.

A-2.3. GENII RS485I ISOLATED RS485 COMMS. The GENII RS485I Isolated RS485 Comms Card is an optional daughter board that can be plugged onto the bottom board of a Genesis II Digital Controller to isolate the Digital Controller from the RS485 communications cable.

A-3. GENESIS I AND GENESIS II CABLE SPECIFICATIONS.

The cable should be designated as suitable for use in RS485 serial communications. It is recommended that the cable to be used for Net Comms and Global Points with the Genesis I and Genesis II controllers be a dual twisted pair cable with each pair preferably having their own shielding. A single shielded twisted pair cable can be used if only the Net Comms or the Global Points are connected. If the Comms cable is to be run in contact with power cabling, the voltage rating of the sheathing must comply with the ratings for a power cable. The cable characteristics as specified by the manufacturer should be as follows:

- Shielded, dual-twisted-pair (Two shielded, single-twisted-pair cables can be used if necessary)
- 7 x 0.2mm^2 conductors
- 120 Ohms characteristic impedance
- Sheath thickness 0 to 3mm.
- 36 to 42 picoFarads per metre capacitance between conductors
- 65 to 76 picoFarads per metre capacitance between one conductor and all other conductors and shield
- Sheathing to meet the necessary voltage rating, if required.

A-4. INSTALLATIONS.

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 and layout and to illustrate the differences between the Genesis I and Genesis II products.

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. Much of the Genesis product line is designed to comply with the 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 supplied from 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.

The Genesis I Digital Controller cannot be isolated from the RS485 communications cable. This places some restrictions on its application. If isolation is required, it must be provided by a GENII RPTR Repeater Module.

A-4.1. GENESIS II COMMS WIRING TOPOLOGY. Bus topology is produced by connecting from one device to the next and then on to the next (Figure A-1). A simple means to identify if bus topology is used is to check that:

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

Three or more cable ends at a joint indicates it is Star topology. The total continuous length of cable in one section is 1000 metres maximum. In the Star Topology, note that a joint in each of the diagrams has three or more cable ends joined together. In the ring topology, note that there are no end connections.

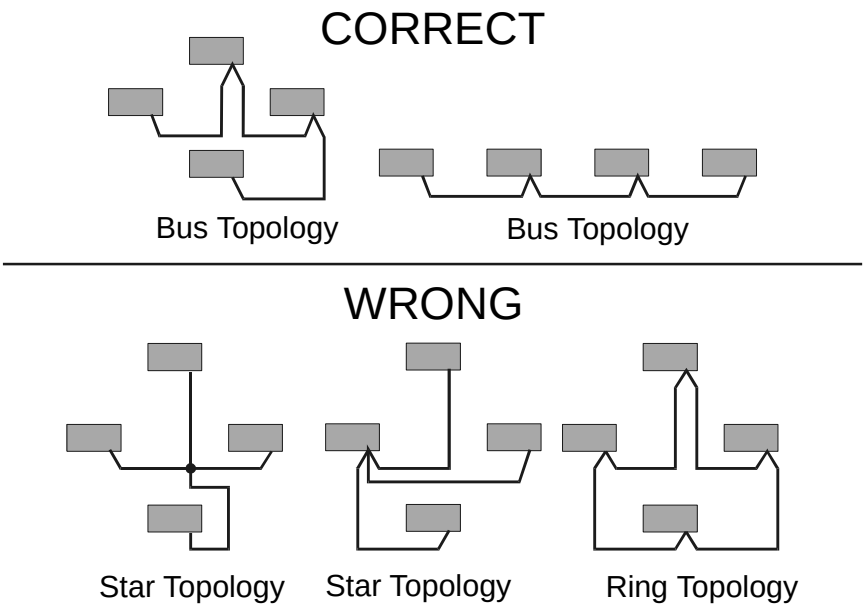


Figure A-1. Correct and Incorrect Bus Topology.

A-4.1.1. 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 A-2. Alternatively, use a GENII RPTR Repeater Module to branch-off to the new module as in Example B of Figure A-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.

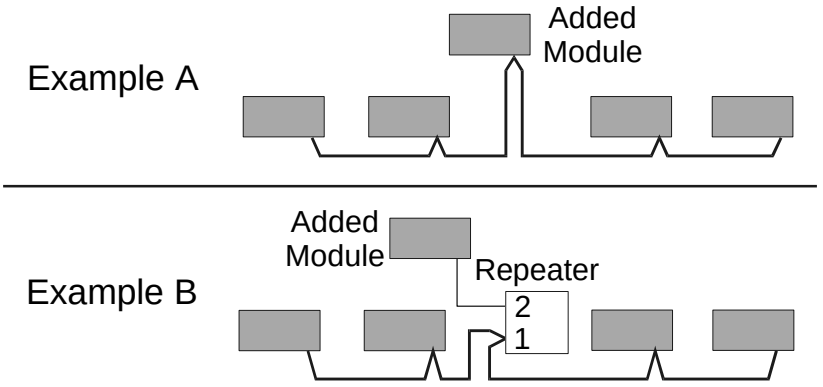


Figure A-2. Adding Modules to a Network.

A-4.1.2. 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. Use a GENII RPTR Repeater Module to isolate the networks (Figure A-3). Note that the cable going to the more remote zone is always connected to Port 2 of the Repeater Module.

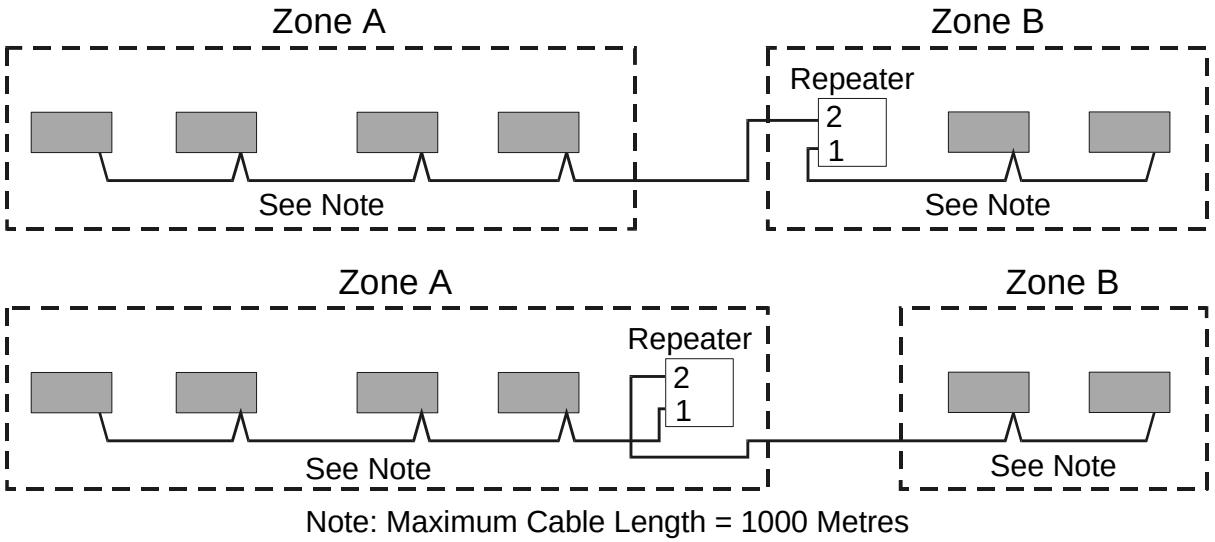


Figure A-3. Linking Networks in Different Locations.

A-4.1.3. Multi-Network Arrangement. Figure A-4 shows a multi-network arrangement consisting, effectively, of four separate networks. Each is wired in a bus topology and each could be up to 1000 metres long. The networks are linked by the electronics in the Repeater Modules. 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 Ports 2 of the Repeater Module will be earthed through the MPI via the PC and the printer. The correct port of the Repeater Modules must be used to maintain the integrity of isolation between sections.

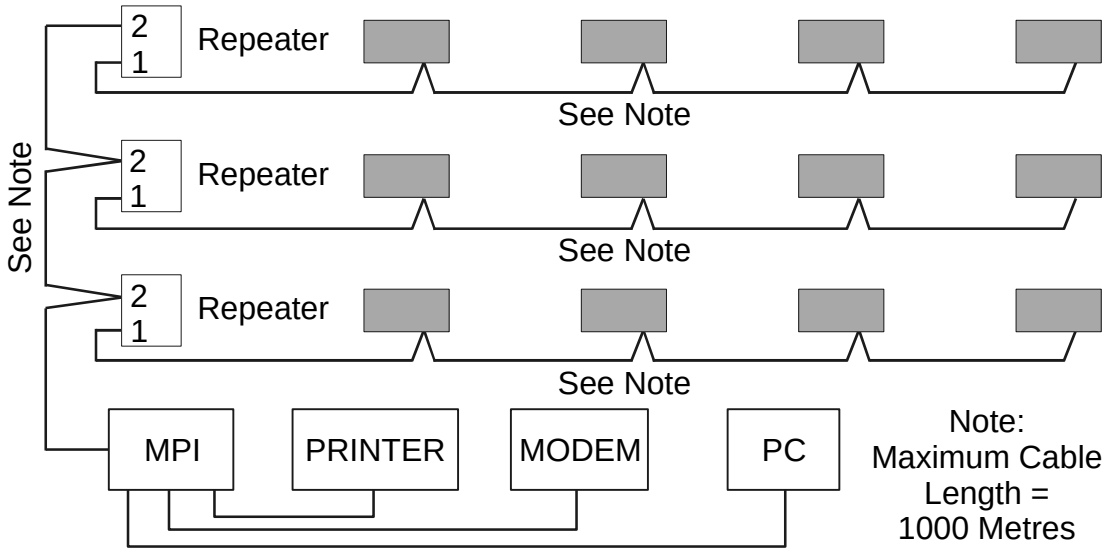


Figure A-4. Multi-Network Arrangement.

A-4.2. GENESIS COMMS WIRING CONSIDERATIONS. The maximum number of nodes or devices that can be connected on one section of Comms cable is 32. This limit is set by the characteristics of the RS485 ICs.

The maximum length of Comms cable is 1000 metres. This is determined by the characteristics of the RS485 ICs and by the characteristics of the cable. 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 32 nodes on one section of cable.

A node is any Genesis product with an RS485 connection. These devices are listed in Paragraph A-2.

To increase the total number of nodes on a system, a GENII RPTR Repeater Module must be used (Figure A-5). The two ports on a Repeater Module reside on different sections of the system and each section can have up to the maximum of 32 nodes. With 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.

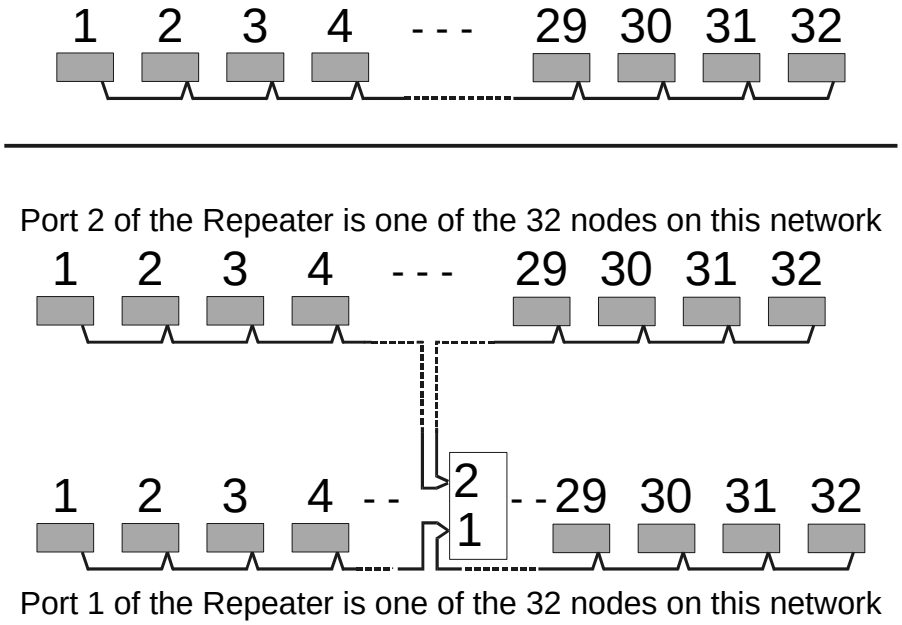


Figure A-5. Network Nodes Considerations.

A-4.2.1. Genesis Comms Wiring Connections. Figure A-6 illustrates the arrangements for connecting the data conductors and screen for the Comms cable to Genesis products.

It is most important that the two conductors of a twisted pair be correctly identified. Take extra care with cable that has two twisted pairs with only an overall screen. If a conductor from one twisted pair is “paired” with a conductor from the other twisted pair, the two data streams will interfere with each other. This may cause complete failure of the RS485 communications.

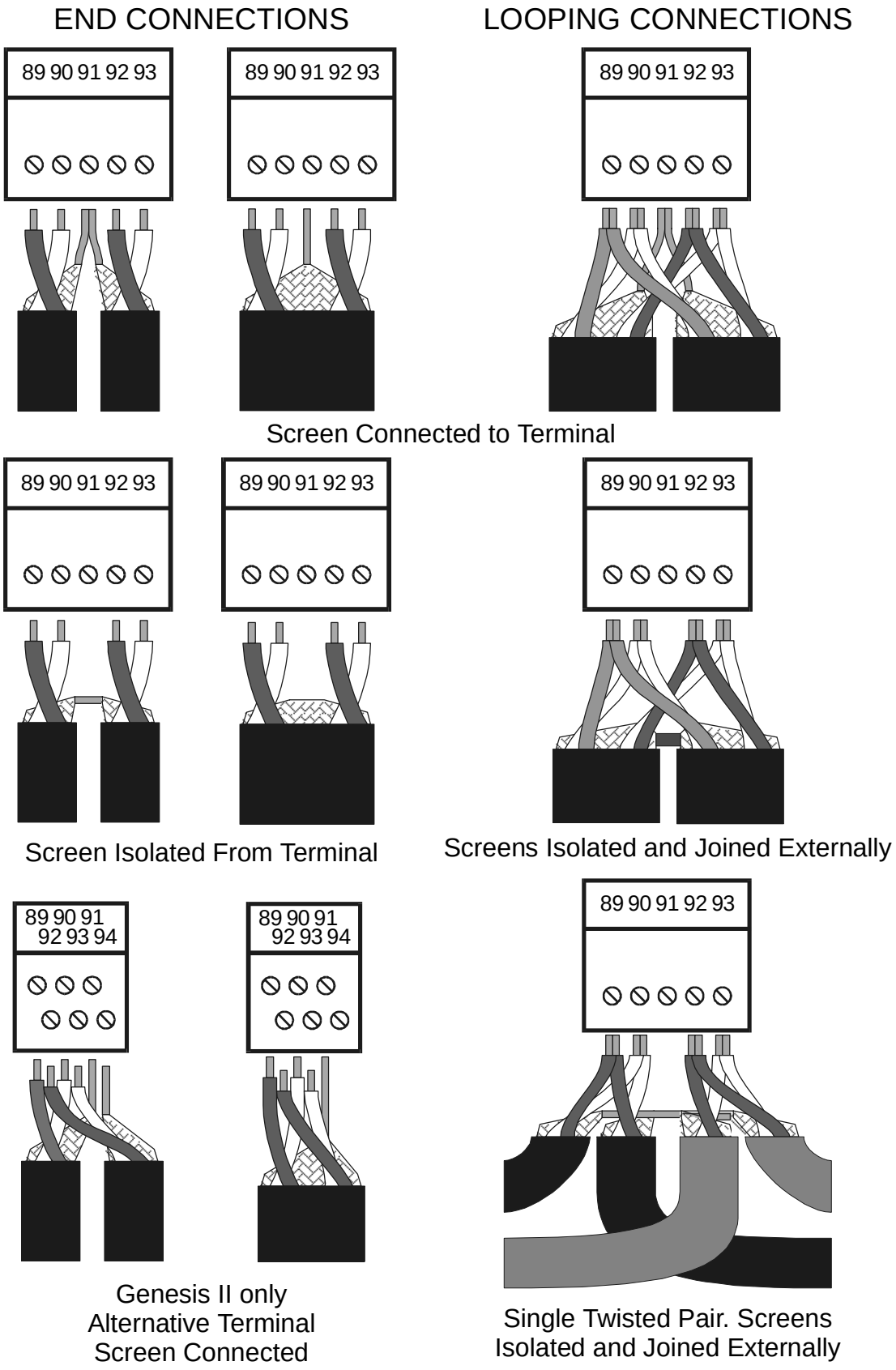


Figure A-6. Genesis Comms Wiring Connections.

A-4.2.2. Genesis I Connections. The Common connection provided by the tracks on the printed circuit board permanently links the following points:

- Terminal 2 (the Zero Volts of the AC supply)
- Terminals 19 and 20 (the connections for the screens of the analogue inputs)
- Terminal 91 (the connection for the screen of the Comms cable)
- The shell and Pin 5 of the DB9 connector for RS232.

If the screen of the Comms cable is connected into Terminal 91, the screen will be earthed via the earth connection on Terminal 2. To isolate the screen at a Genesis I Digital Controller, the screen must not be connected to Terminal 91. To maintain the continuity of the screen, it has to be joined externally from the Genesis I Digital Controller. Refer to Figure A-7.

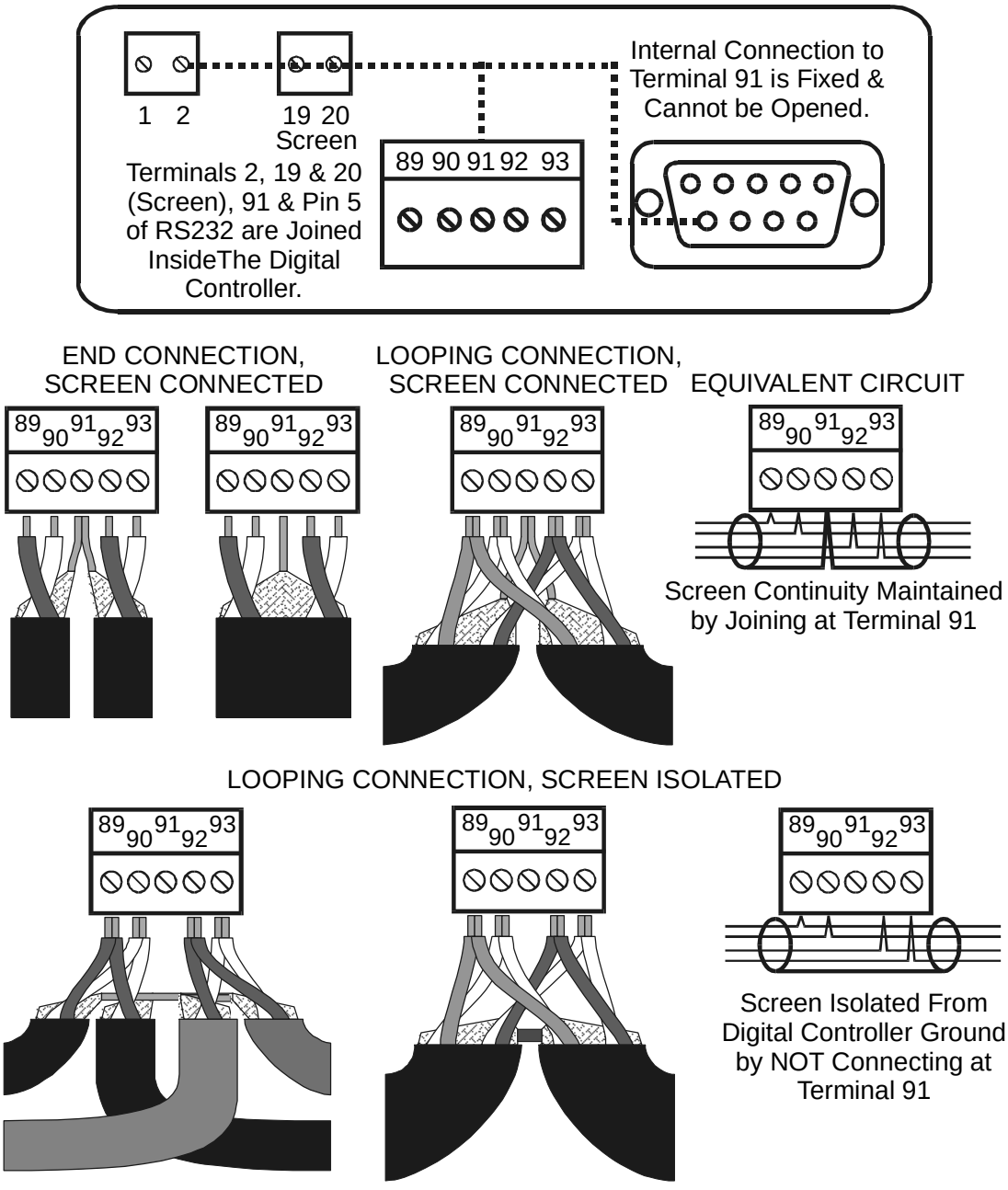
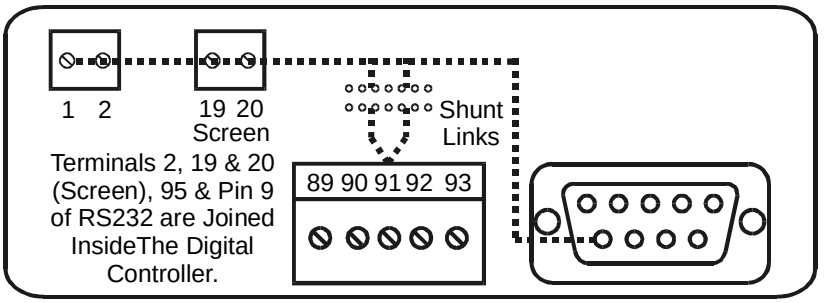


Figure A-7. Genesis I Connections.

A-4.2.3. Genesis II Connections. The Common connection provided by the tracks on the printed circuit board permanently link the following points:

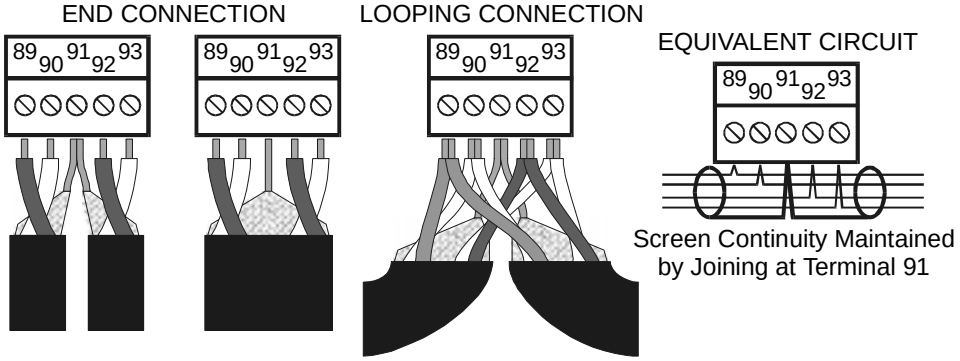
- Terminal 2 (the Zero Volts of the AC supply),
- Terminals 19 and 20 (the connections for the screens of the analogue inputs),
- The shell and Pin 5 of the DB9 connector for RS232.

Terminal 91 (the connection for the screen of the Comms cable) is not permanently connected to Common of the Digital Controller. It can be linked to Common by two shunts as shown in Figure A-8. These shunts are located on the bottom printed circuit board under the edge of the top board. On Genesis II Digital Controllers, the screen(s) of the Comms cable(s) can always be connected or joined in Terminal 91 because it can be isolated from the Common of the Digital Controller by removing the two shunts. To check that the screens are isolated, only the two outer shunts on each side should be fitted. The alternative terminal layout can be found on older versions of the printed circuit board. The terminal numbering is the same.



Terminal 91 Screen Connection.
If Shunt Links 3 or 5 are Fitted, Terminal 91 is connected to Terminal 2 and Screen.

NOTE: ON GENESIS II ALWAYS CONNECT THE SCREEN(S) TO TERMINAL 91
AND USE SHUNT LINKS 3 & 5 TO CONNECT OR ISOLATE THE SCREEN.



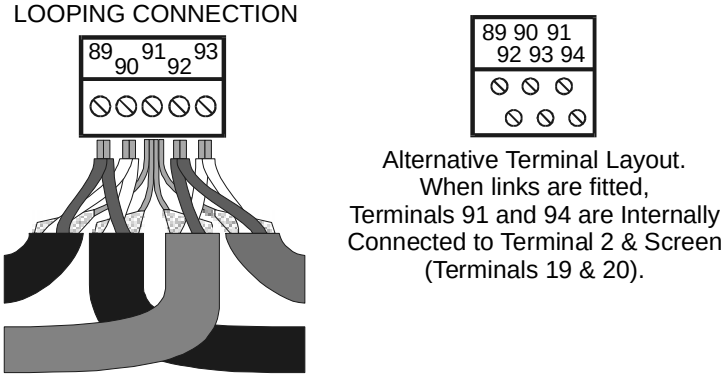


Figure A-8. Genesis II Connections.

A-4.2.4. GENII POLY SWITCH Board. The GENII POLY SWITCH RS485 Protection Plug board can only be used on Genesis II Digital Controllers. The POLY SWITCH board does not provide fully isolated data lines. It isolates the screen of the Comms cables from the Common on the Digital Controller.

The POLY SWITCH board provides a level of protection against some types of over-voltage. It protects the RS485 ICs if 24Vac is applied to the Comms Terminals 89 to 93. To fit a POLY SWITCH board (See Figure A-9):

a. Ensure that the power to all the connections to the Digital Controller is turned off.

b. Remove all shunts from the dual 14-way pin strip on the bottom printed circuit board.

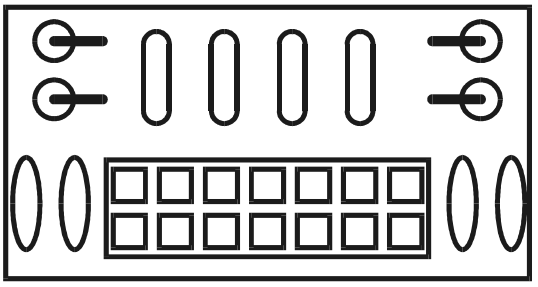
c. Turn the POLY SWITCH Board so that all the components and the socket are facing to the bottom printed circuit board.

d. Fit the POLY SWITCH Board onto the 14-way pin strip, making sure that the pin strip and the socket are properly aligned.

e. Do not remove the two shunt links from the other pin strips on the bottom printed circuit board.

NOTE

The screen links are open on a POLY SWITCH board.



Turn the Poly-Switch Board over so components face bottom board and socket is toward bottom edge of bottom board. Fit socket onto strip.

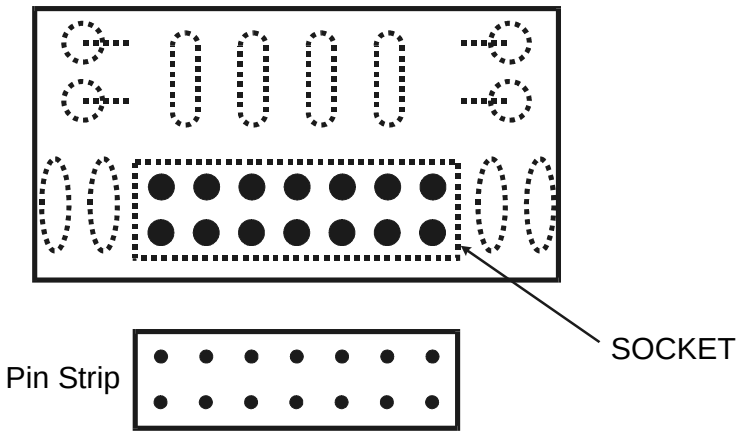


Figure A-9. Genesis II POLY SWITCH Board.

A-4.2.5. GENII 485I Isolated RS485 Comms Card. The GENII 485I Isolated RS485 Comms card can only be used on Genesis II Digital Controllers. It provides galvanic isolation of the data lines of both the Net Comms and the Global Points and the screen connection at Terminal 91. To fit a GENII 485I card (See Figure A-10):

a. Ensure that the power to all Digital Controller connections is turned off.

b. Remove the top printed circuit board (six screws).

c. Remove all shunt links from the dual 14-way pin strip and the two shunt links from the seven- and two-way pin strips on the bottom printed circuit board.

d. Turn the GENII 485I card over so that all the components and sockets are facing the bottom printed circuit board.

e. Fit the GENII 485I card onto the two-way pin strip, then onto the seven- way vertical pin strip and then onto the lower seven pins of the dual 14-way pin strip.

f. Refit the top printed circuit board of the Digital Controller.

g. Check that all the pins are in the correct position in all the sockets on the GENII 485I card.

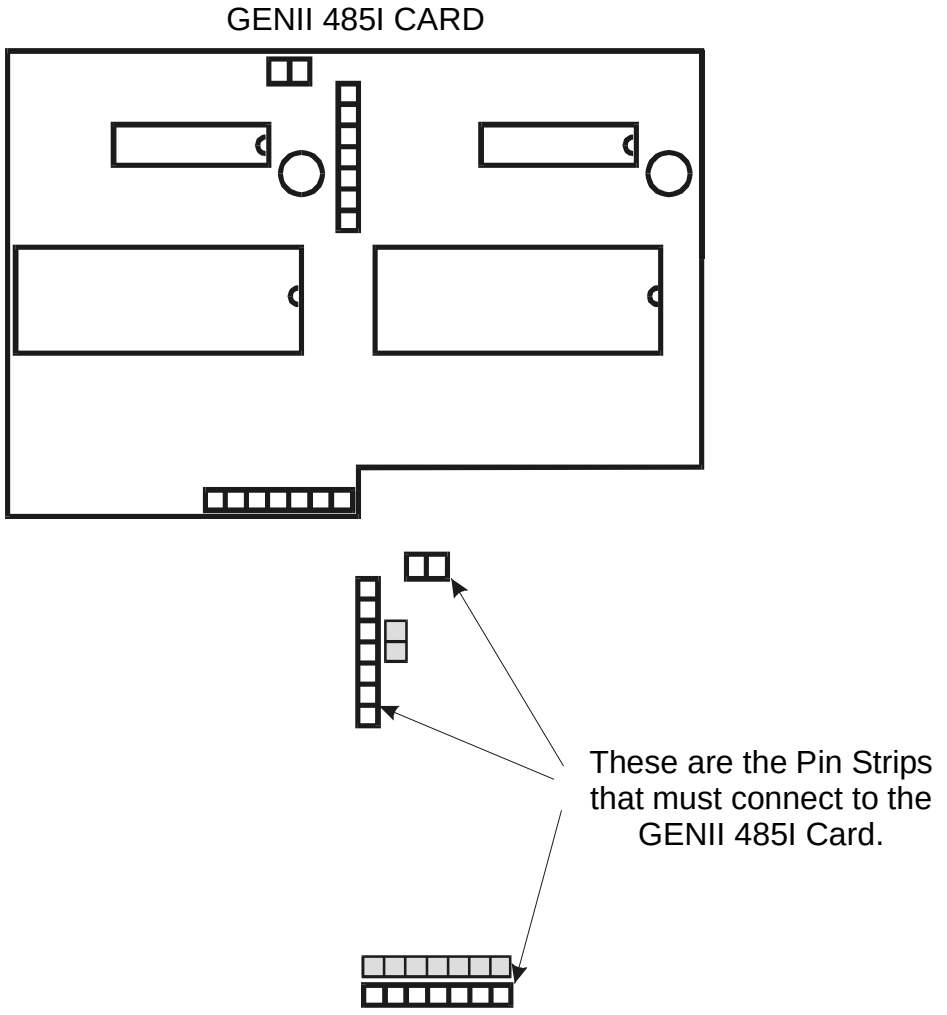


Figure A-10. GENII 485I Isolated RS485 Comms Card.

A-4.2.6. GENII RPTR Repeater Module. The Repeater Module (Figure A-11) can be used with both the Genesis I and Genesis II Digital Controllers. The repeater's function is to rebuild each data byte before re-transmitting it.

There are two earth connections on the Repeater Module. The electrical earth must be connected at the E Terminal as it provides a creepage barrier for the mains voltage connection at the L and N Terminals. The earth (E) associated with the 240Vac supply also earths the data rebuilding circuitry, which is connected with Port 1. Port 1 should always be connected to the local devices (the devices that share the same supply and electrical earth). The other EARTH is for the over-voltage-limiting device connected to Port 2. This device limits the Port 1 screen voltage above earth to 36 Volts.

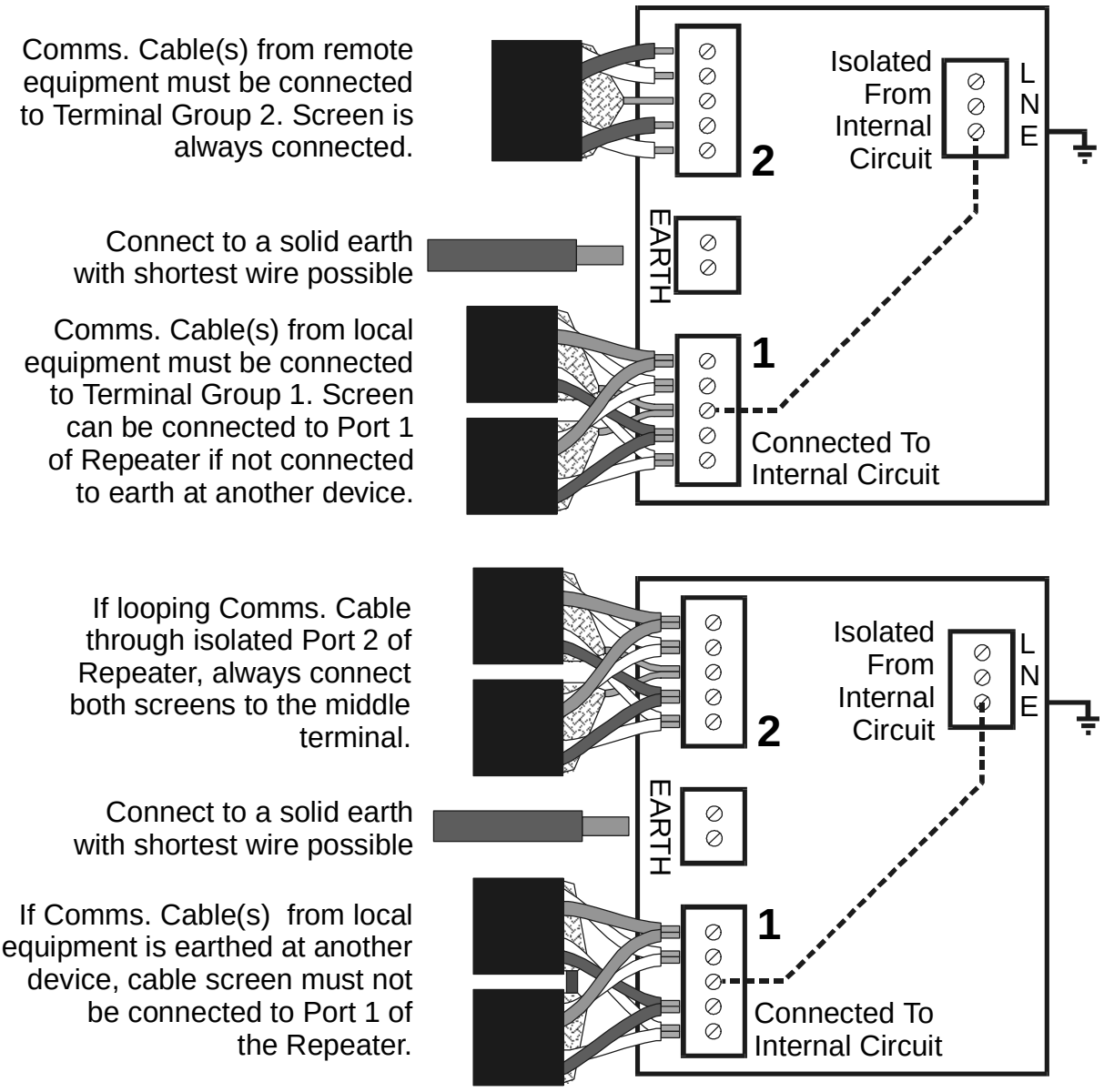


Figure A-11. GENII RPTR Repeater Module Connections.

WARNING

IF THE EARTH TERMINAL IS NOT CONNECTED TO THE ELECTRICAL EARTH, THE CABLE CONNECTED TO PORT 2 CAN REACH DANGEROUSLY HIGH VOLTAGES.

Port 2 should be connected to the remote devices - the devices supplied from a different switchboard.

If the Comms cable connection to Port 1 is an end connection and the Repeater Module is not the earth point for the screen, the screen of the Comms cable must not be connected to the terminal. If the Comms cable is looped through Port 1 and the repeater is not the earth point for the screen, the screens of the two Comms cables will have to be joined but not connected into the terminal.

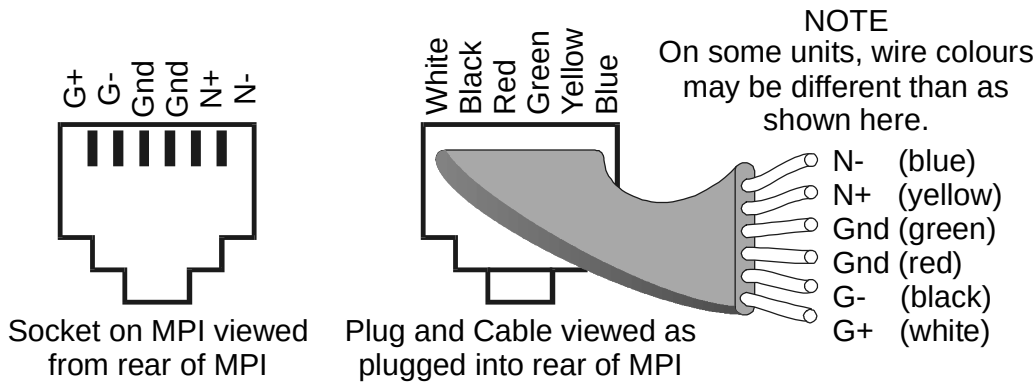
Because Port 2 is isolated, the screen(s) of the Comms cable(s) can always be joined in the terminal.

A-4.2.7. GENII MPI Modem and Printer Interface. The GENII MPI Modem and Printer Interface can be used with both the Genesis I and Genesis II Digital Controllers. The MPI is supplied with a double insulated plug pack, which isolates the MPI power supply from the electrical earth. But, 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 A-12

The Comms is connected to the MPI via the RJ11 socket on the rear of the MPI. The top portion of Figure A-12 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.

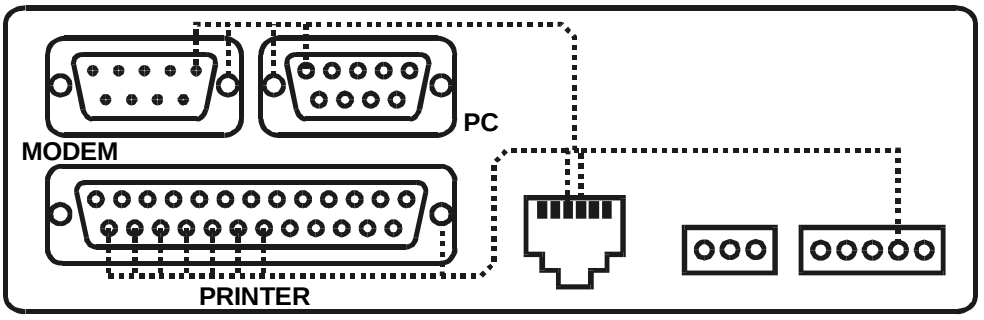
To isolate the screen of the Comms cabling from electrical earth at a non-isolated MPI, do not connect the two GND conductors of the flat MPI cable to the screen(s) of the Comms cables at the wall connection. This is not an isolated connection for the data conductors.

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 over-voltage 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.

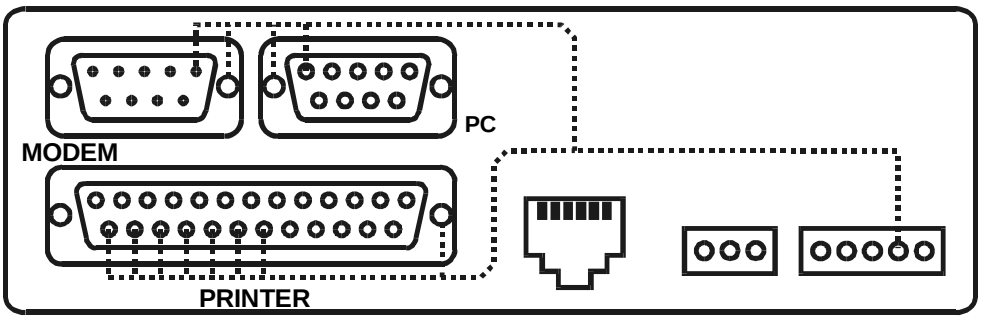


Figure A-12. GENII MPI Modem and Printer Interface.

A-4.2.8. Genesis I Non-Isolated Comms. Because Genesis I Digital Controllers do not have links between the RS485 ICs and the Comms terminals, the Comms terminals are permanently connected to the Digital Controller Common and to Terminal 2. Therefore, the screen(s) of the Comms cable(s) must be connected to Terminal 91 of only one Digital Controller, as shown in the Figure A-13.

At looping connections the screens must be joined externally as shown in Figure A-13. The screen must not be connected to the terminal at an end connection that is not the earthing point for the screens.

For Digital Controllers supplied from one switchboard or mounted in one control panel, the screen is earthed at one Digital Controller only.

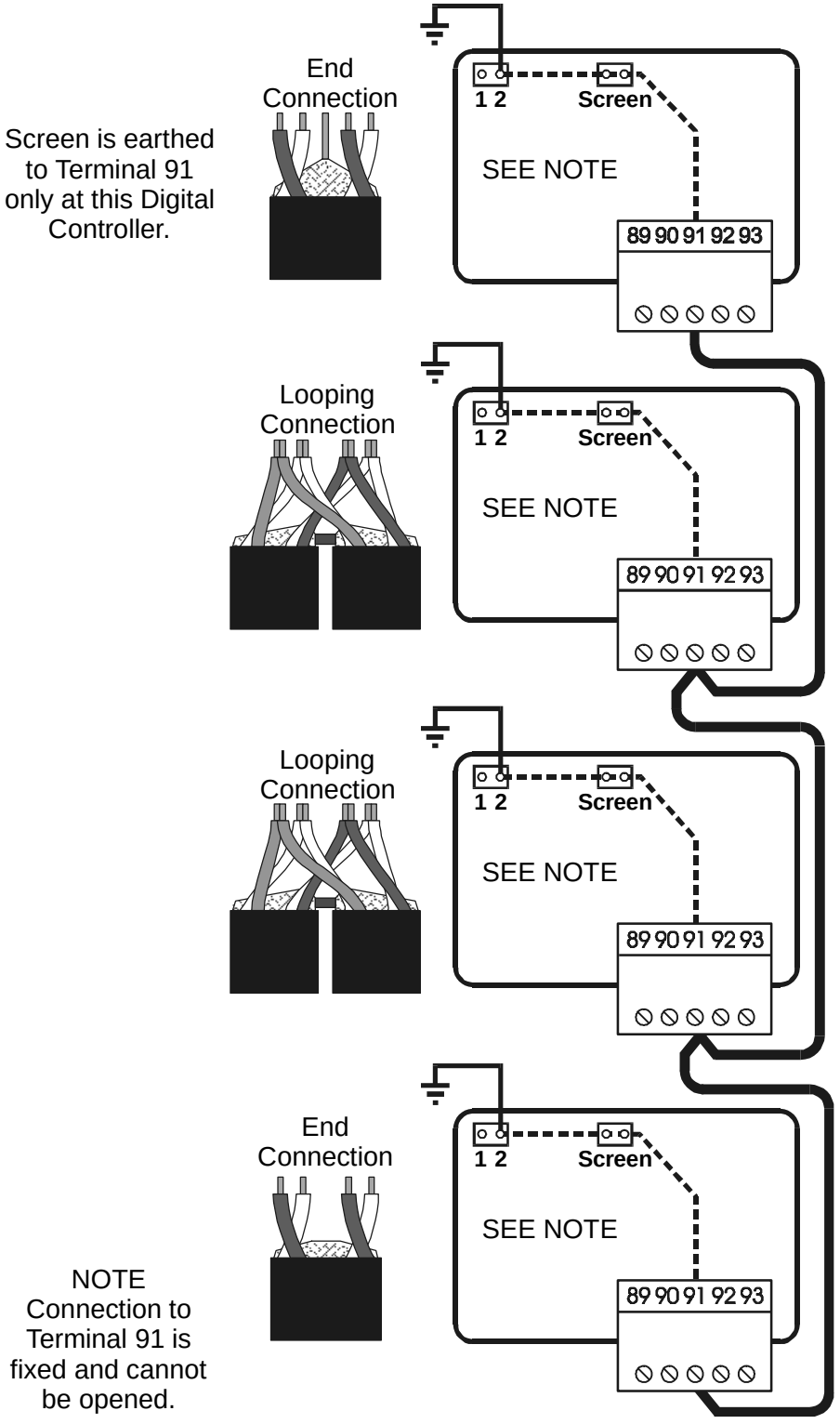


Figure A-13. Genesis I Non-Isolated Comms.

A-4.2.9. Genesis II Non-Isolated Comms. If all the devices on the Genesis II network are supplied from the same switchboard, they will be connected to the same electrical earth. Therefore, the Common connection of these Digital Controllers should be at the same voltage and within the rated voltage of the RS485 ICs.

The Genesis II has links that allow the screen connection of the RS485 Comms cable to be disconnected from the Common of the Digital Controller. Therefore, the screen(s) of the RS485 cable(s) can be joined in the Comms terminals of the Digital Controllers and still be isolated if only the four outer links are fitted. This is shown in Figure A-14 with the screen earthed at Digital Controller Number 2 because it has six links fitted.

Any of the Digital Controllers can be selected as the one that is used to earth the screen, but it is best to choose the Digital Controller that will provide the most effective earth.

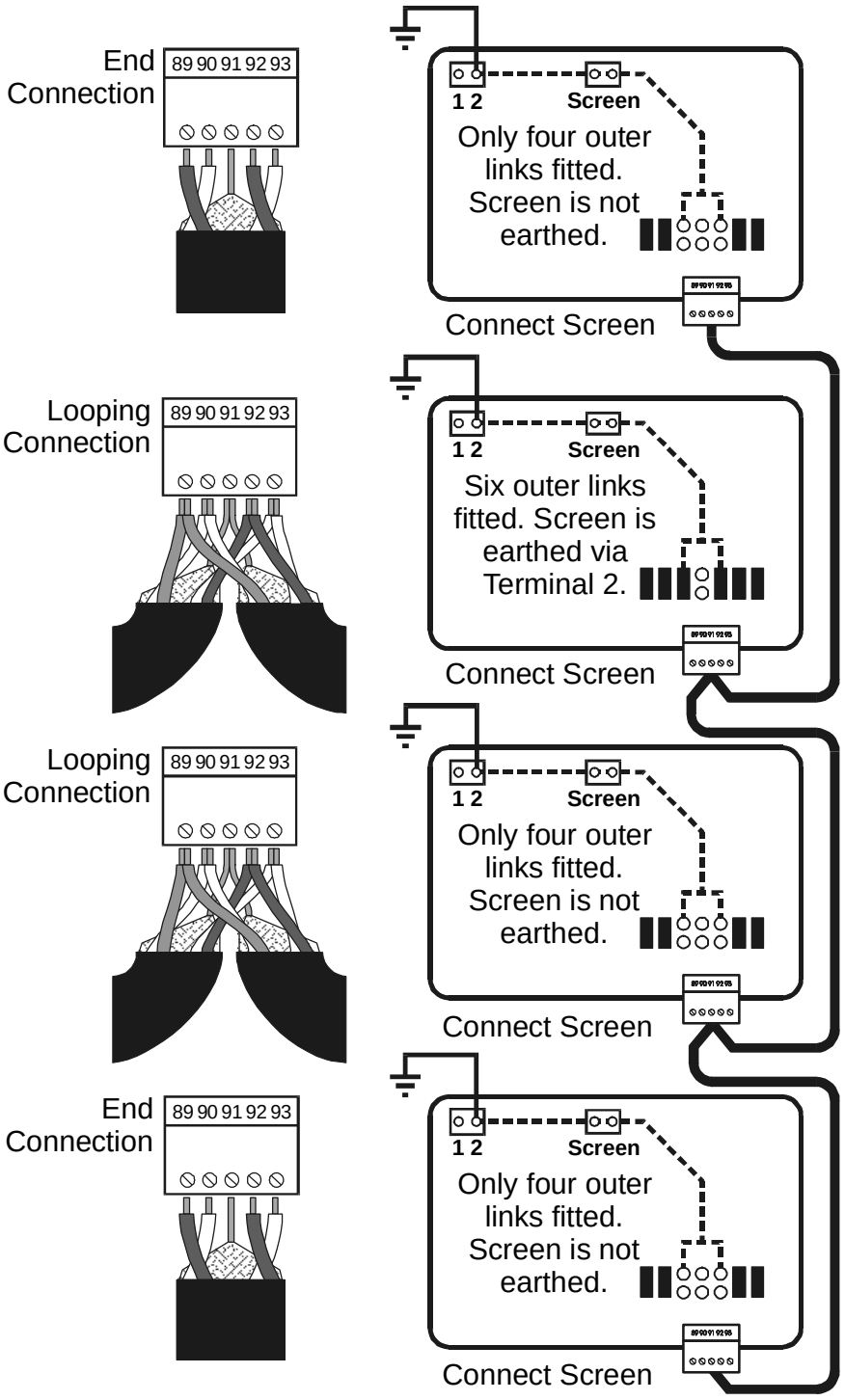


Figure A-14. Genesis II Non-Isolated Comms.

WARNING

PARAGRAPHS A-4.2.9.1 AND A-4.2.9.2, BELOW, AND THEIR REFERENCED FIGURES DESCRIBE IMPROPER EARTH-CONNECTION CONDITIONS THAT COULD LEAD TO SEVERE ELECTRICAL SHOCK OR DAMAGE TO EQUIPMENT. READ AND UNDERSTAND THESE PARAGRAPHS THOROUGHLY BEFORE MAKING ANY COMMS CONNECTIONS.

A-4.2.9.1. 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 A-15). 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.

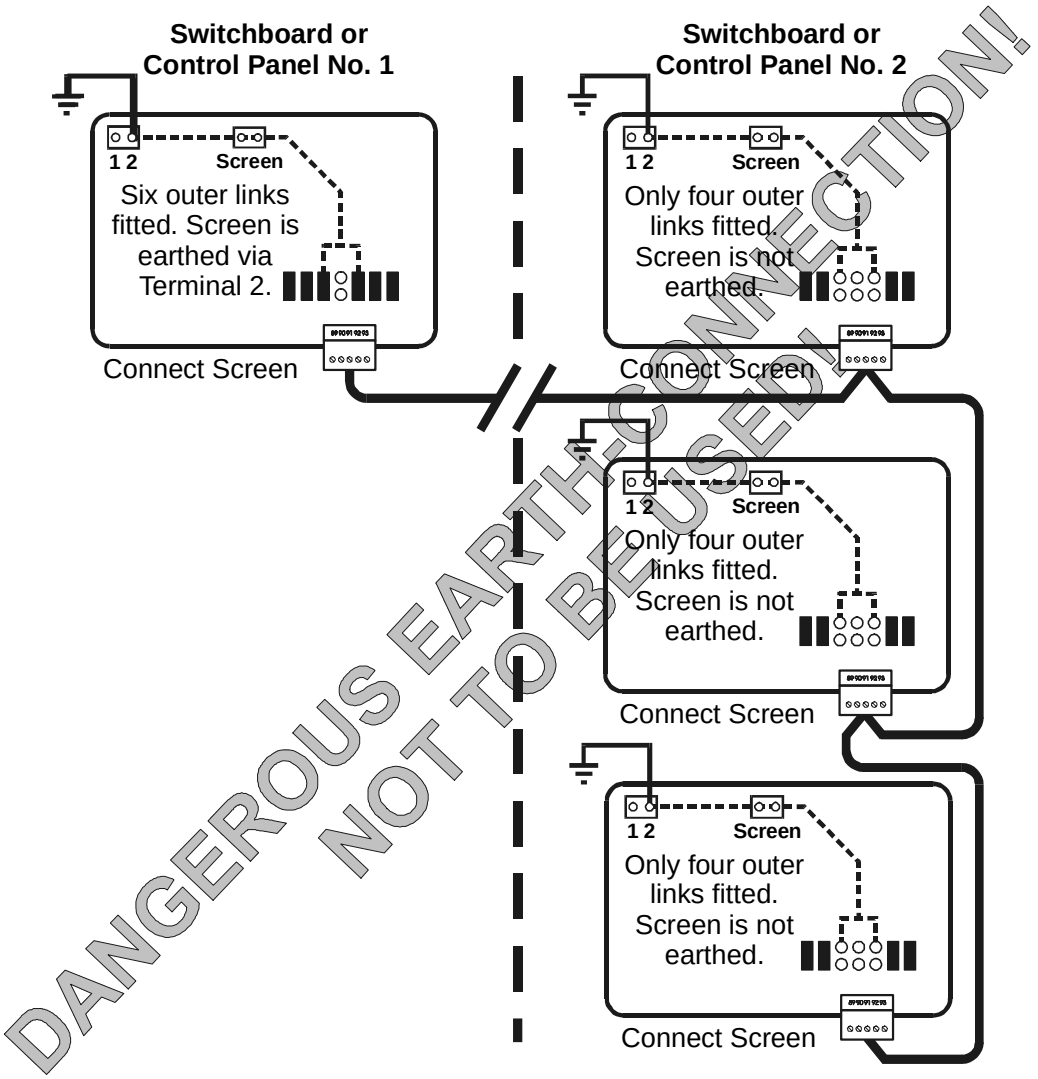


Figure A-15. Hazardous Connection Example, Circuit 1.

Figure A-16 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.

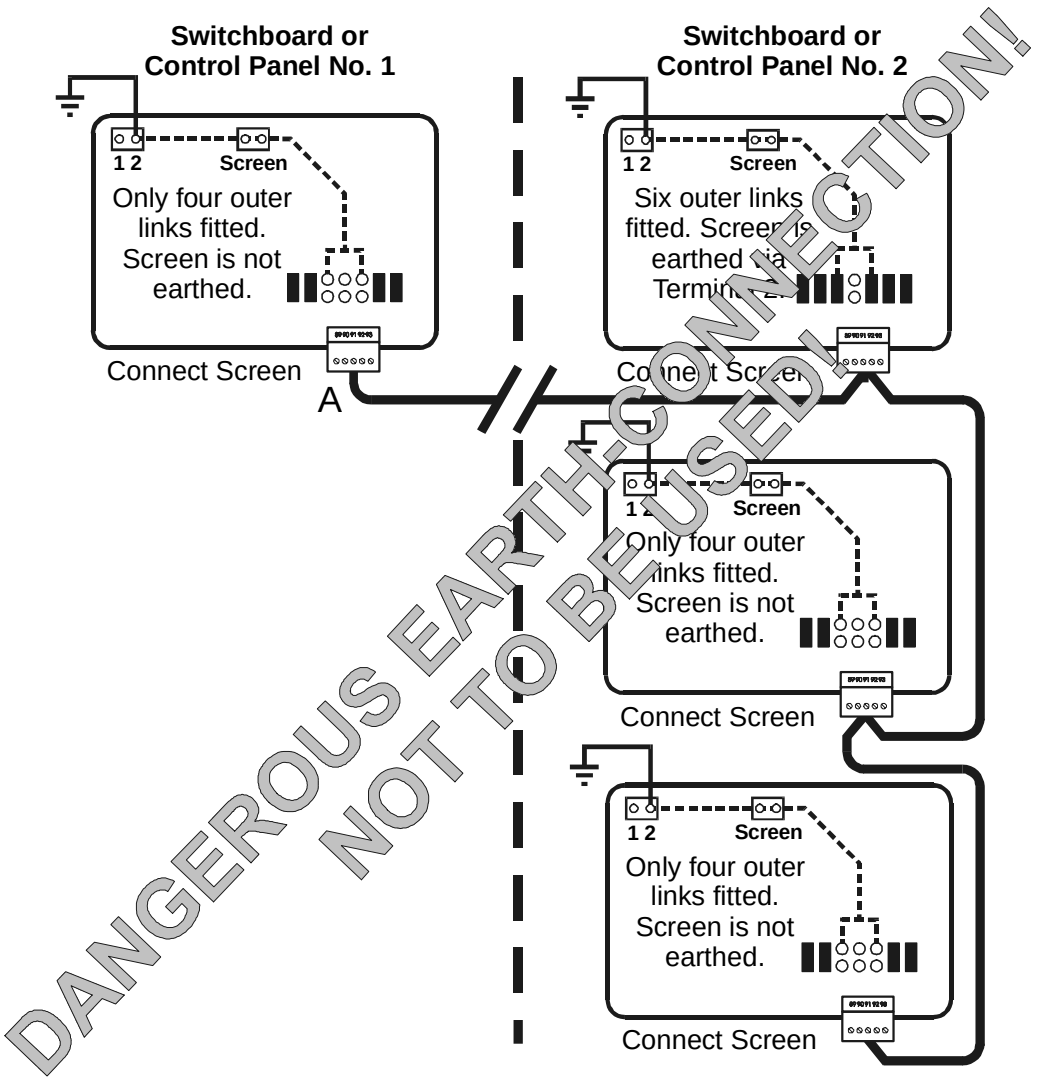


Figure A-16. Hazardous Connection Example, Circuit 2.

A-4.2.9.2. Use of GENII POLY SWITCH Boards. The GENII Poly Switch Boards provide some protection from over-voltage and voltage spikes. To achieve the maximum benefit, Poly Switches should be fitted to all Digital Controllers in a network. Fitting Poly Switches to all Digital Controllers results in the screen(s) being unearthed because the Poly Switches do not link the screen Terminal 91 to the Common and Terminal 2. An external earth must be fitted to Terminal 91 of the Digital Controller where the screens are to be earthed.

When the Digital Controllers are supplied from two different switchboards (Figure A-17), the hazardous situation is still a possibility in the event of a fault. The Poly Switches may protect the RS485 ICs providing that the voltage differences are not excessive. Fitting the screen earth at the single Digital Controller is not the preferred location.

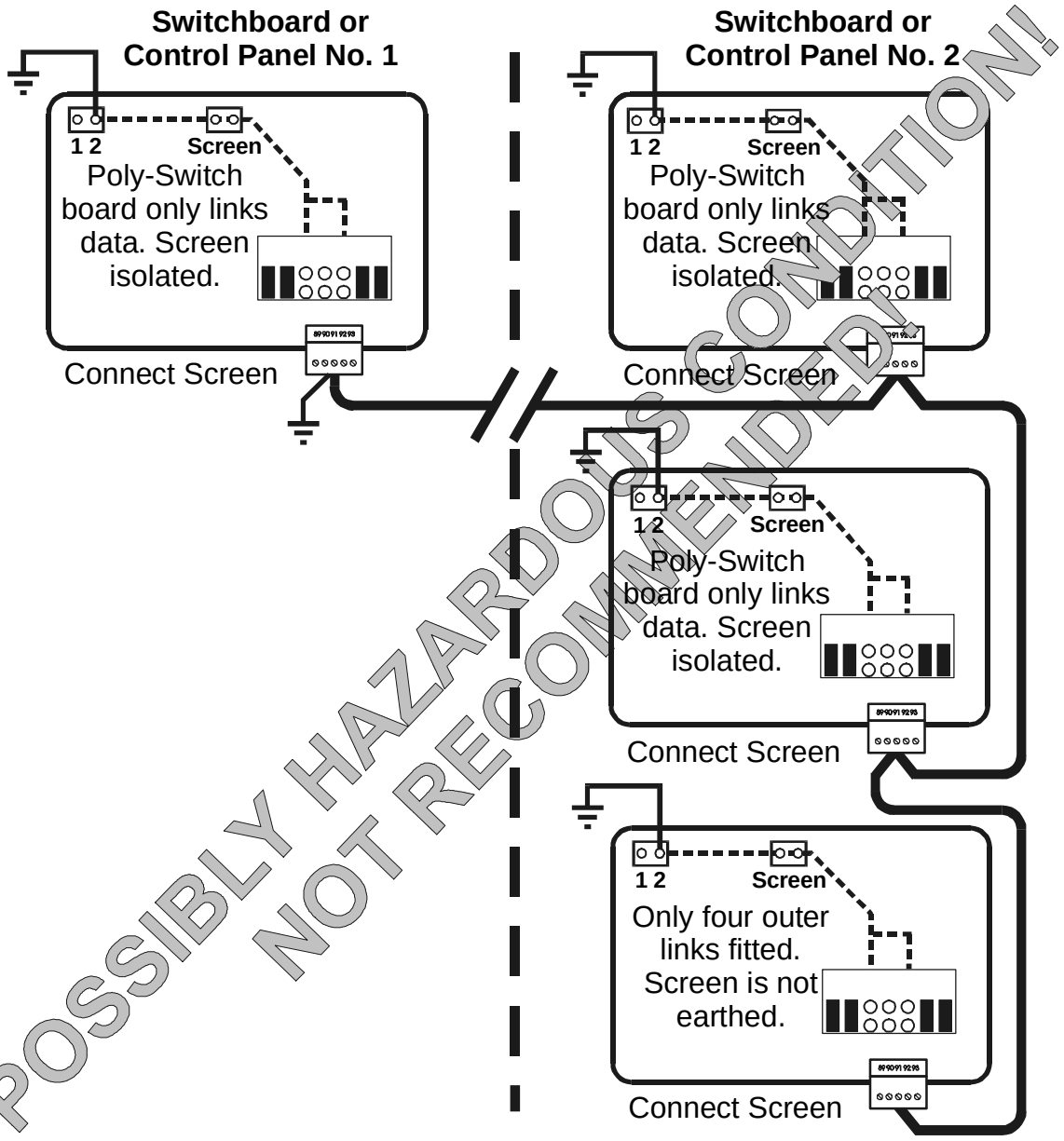


Figure A-17. Use of GENII Poly Switch Boards, Circuit 1.

Figure A-18 shows the preferred connection point for the screen earth. Fitting it on the screen terminal of one of a group of Digital Controllers gives optimum protection to the greater number of Digital Controllers. The earthing point for the screen is at the first Digital Controller in a group located together and supplied from one switchboard. This preferred connection point does not remove the hazard that the screen voltage at point A of Figure A-18 is not at earth voltage.

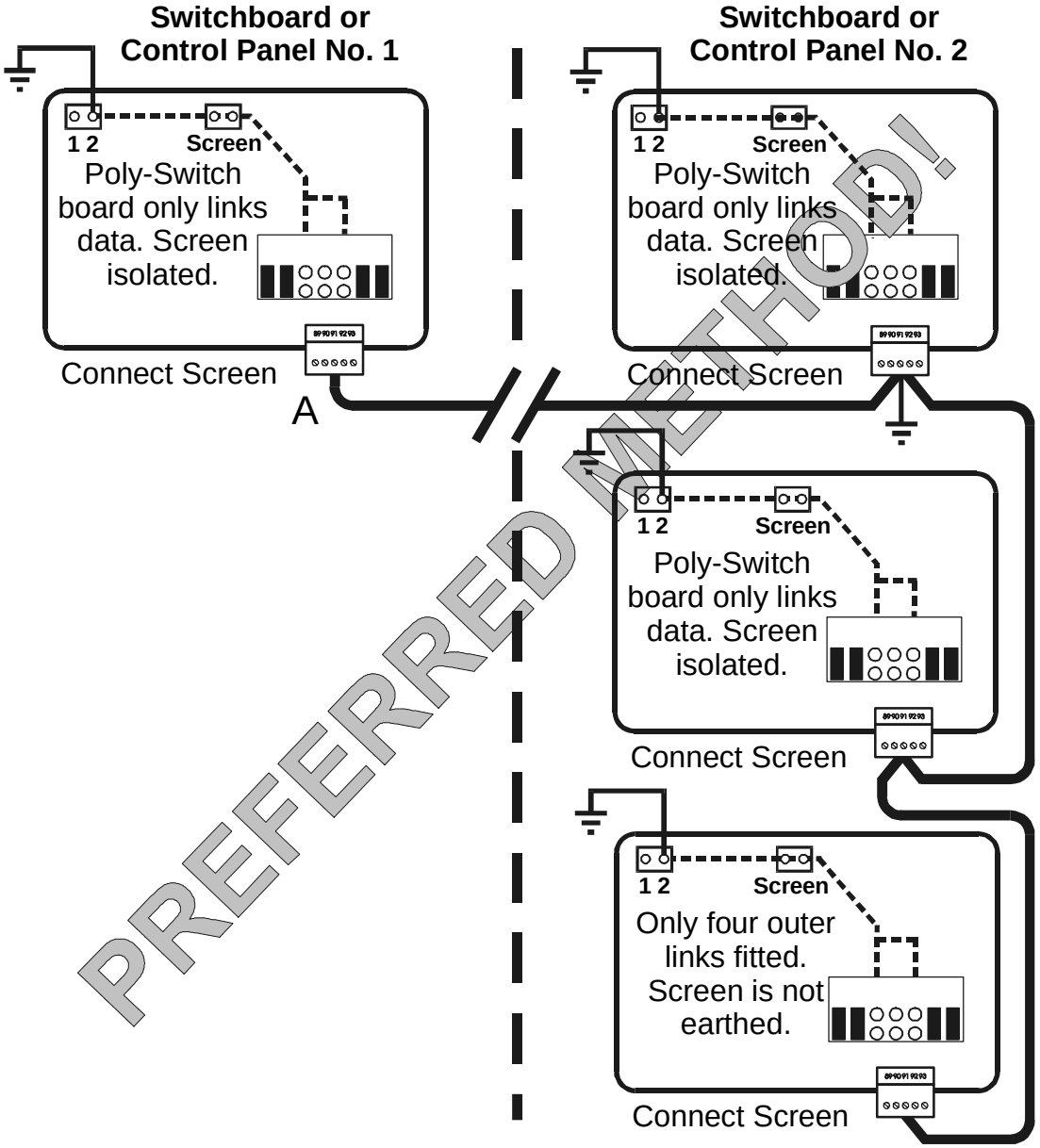


Figure A-18. Use of GENII Poly Switch Boards, Circuit 2

WARNING

ALTHOUGH AN IMPROVEMENT OVER PREVIOUS EARTH-CONNECTION METHODS, THE CIRCUITS DESCRIBED IN PARAGRAPH A-4.2.10 STILL DO NOT REMOVE THE ELECTRICAL SHOCK HAZARD DESCRIBED IN THE PREVIOUS PARAGRAPH.

A-4.2.10. Genesis II Isolated Comms. To remove the possibility of damaging the RS485 ICs, a GENII 485I Isolated RS485 Comms Card should be used. This card electrically isolates the screen and signal wires from all circuitry on the Digital Controller. It does not remove the electric shock hazard of the voltage difference between the screen, which is earthed, in Control Panel No. 2 and the earth in Control Panel No. 1. Note that the screen is earthed at one point only: the top Digital Controller in Control Panel No. 2.

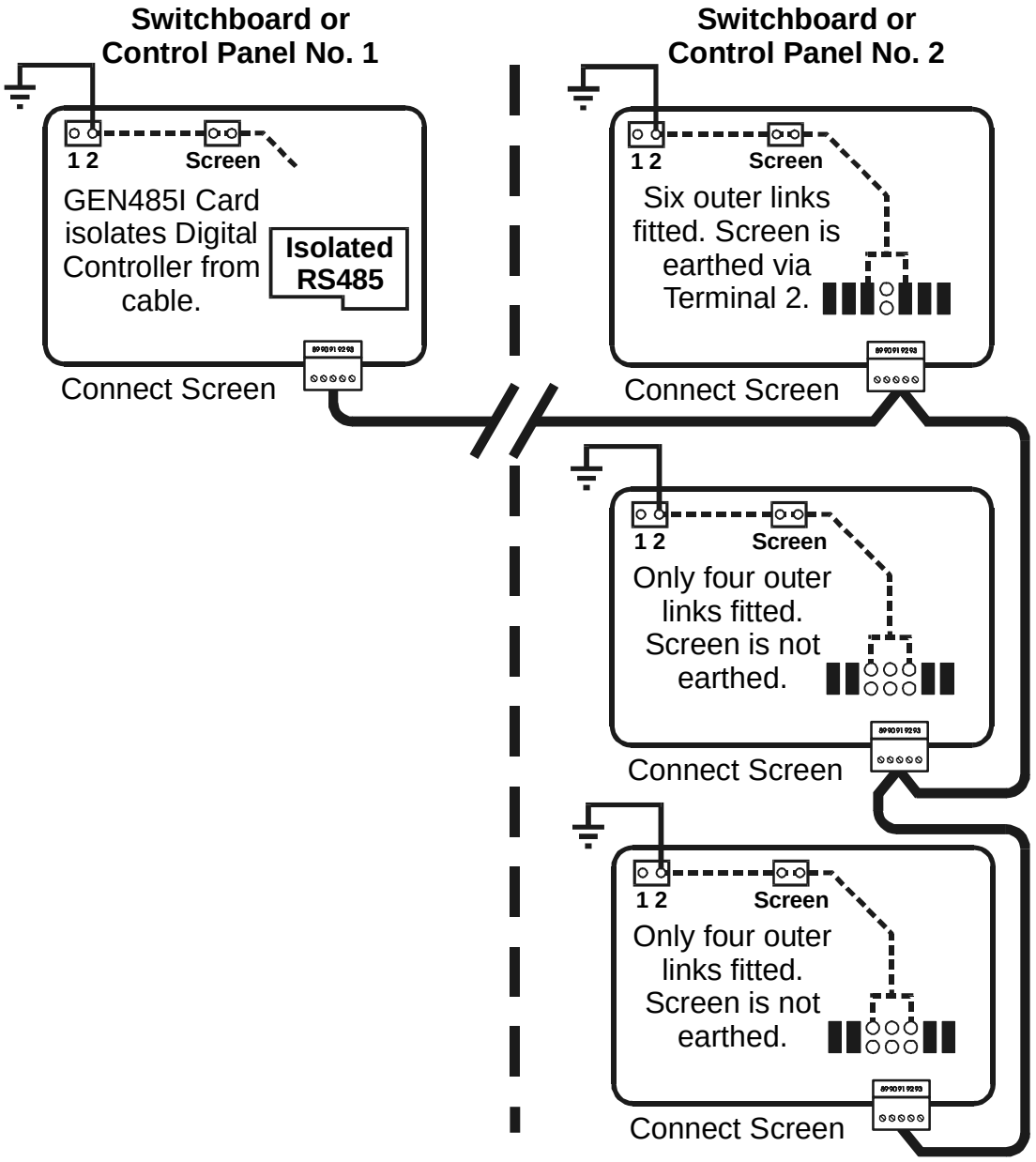


Figure A-19. Use of GENII 485I Card, Circuit 1.

Figure A-20 shows the same arrangement as that shown in Figure A-19 but with the screen earthed in Control Panel No. 1 and GENII 485I cards fitted to all other Digital Controllers. This provides the same degree of isolation but is more expensive because three isolator cards are needed. All Digital Controllers remote from the point where the screen is earthed must be fitted with GENII 485I cards. This does not remove the hazard of the earth voltage in Control Panel No. 1 being present on the screen of the Comms cable in Control Panel No. 2.

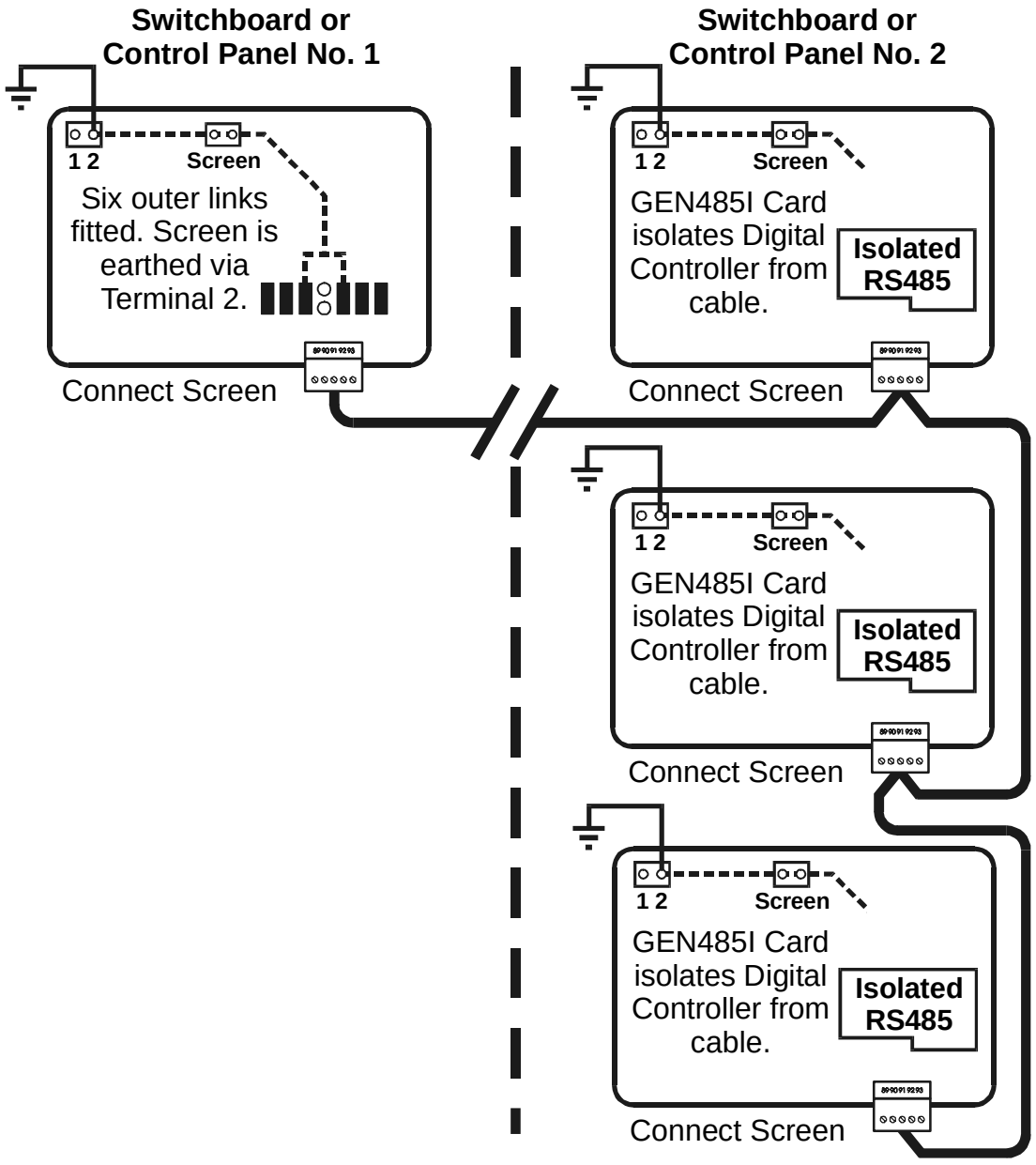


Figure A-20. Use of GENII 485I Card, Circuit 2.

A-4.2.11. Genesis II Comms. Isolated by Repeater. A GENII RPTR Repeater Module provides electrical isolation for all data conductors and for the screen of the Comms cable connected to Port 2 (Figure A-21). Therefore, Port 2 must be used to connect the Comms cable going to the remote devices. The screen of the cable connected to Port 2 should be earthed at a device in Control Panel No. 2. Preferably, the earthing point should be at the first device that the cable connects to in Control Panel No. 2.

If the screen is earthed by a local device, then the screen should not be connected to the SHLD terminal of Port 1; this is to prevent an earth loop.

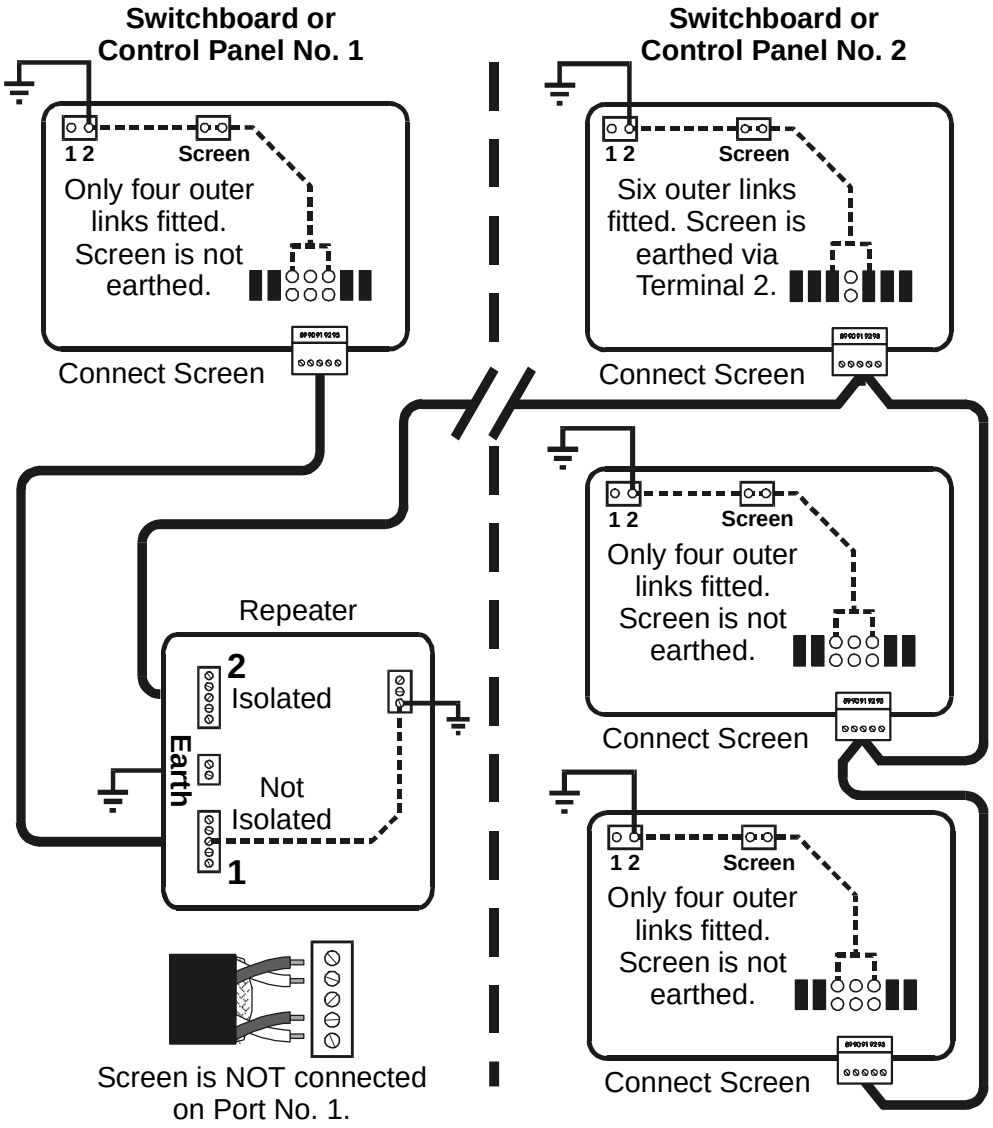


Figure A-21. Use of GENII RPTR Repeater Module, Circuit 1.

If the screen is connected to the SHLD terminal of Port 1 of the Repeater Module, then the connection of all other devices should ensure that the screen is isolated from the electrical earth. See Figure A-22.

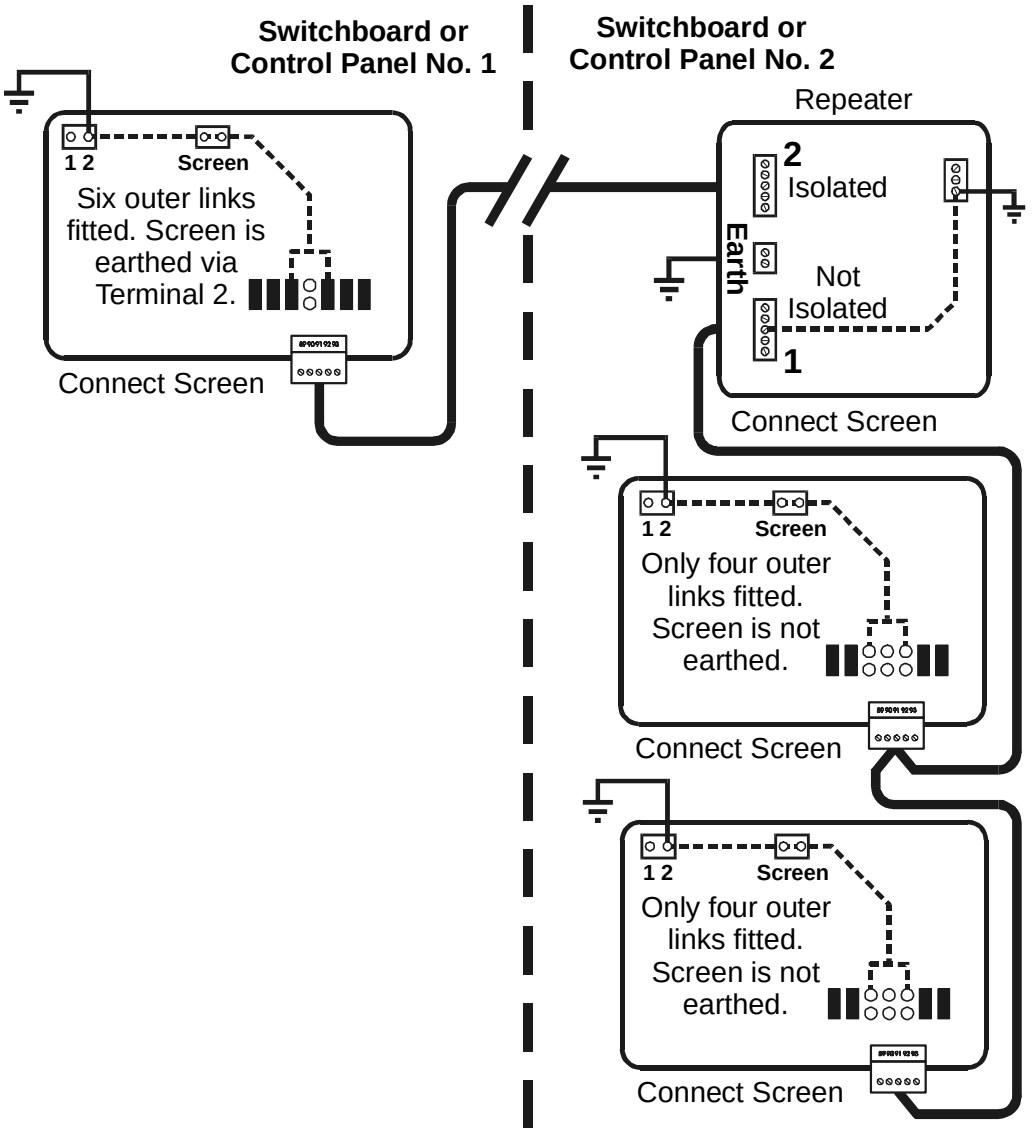


Figure A-22. Use of GENII RPTR Repeater Module, Circuit 2.

A-4.2.12. 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 A-23 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.

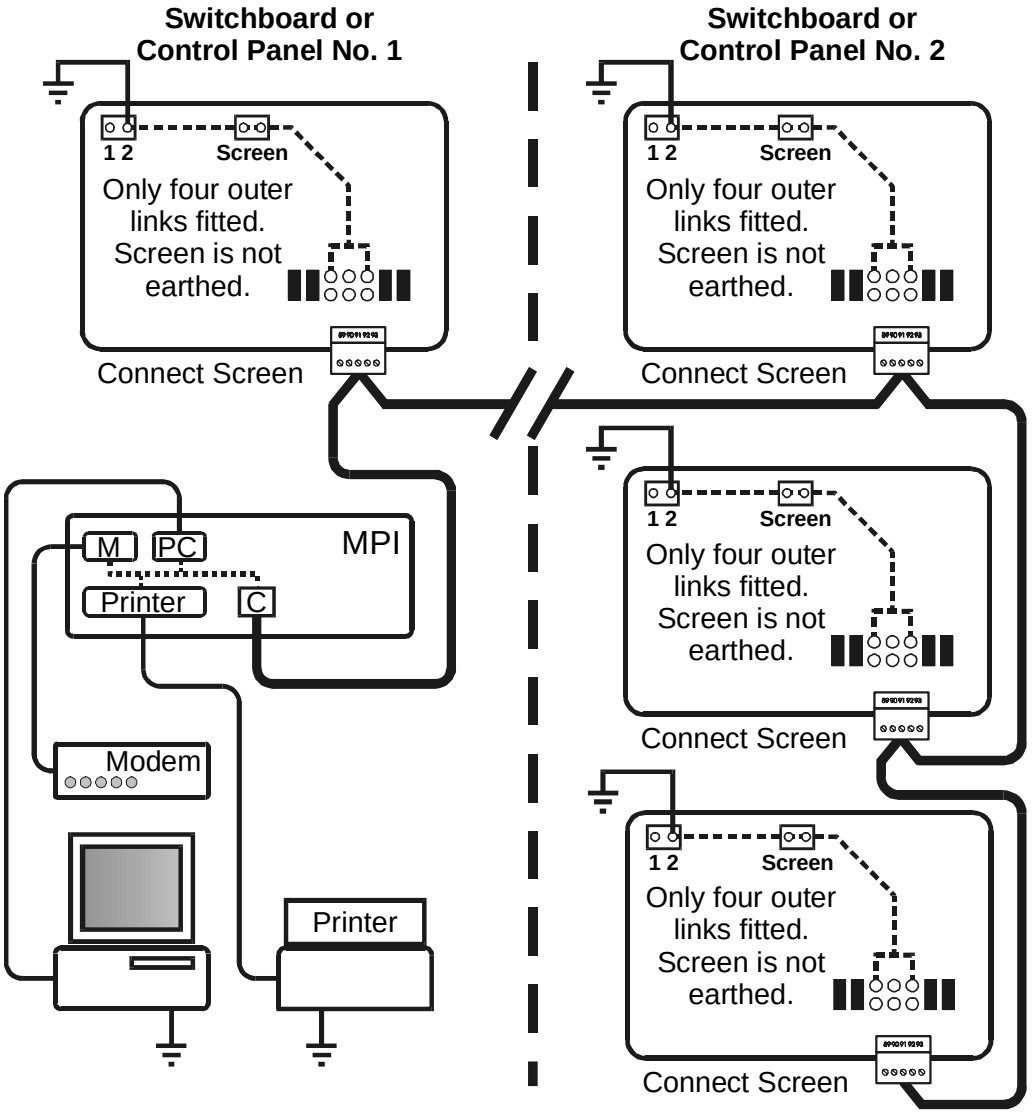


Figure A-23. Use of GENII MPI, Circuit 1.

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 A-24.

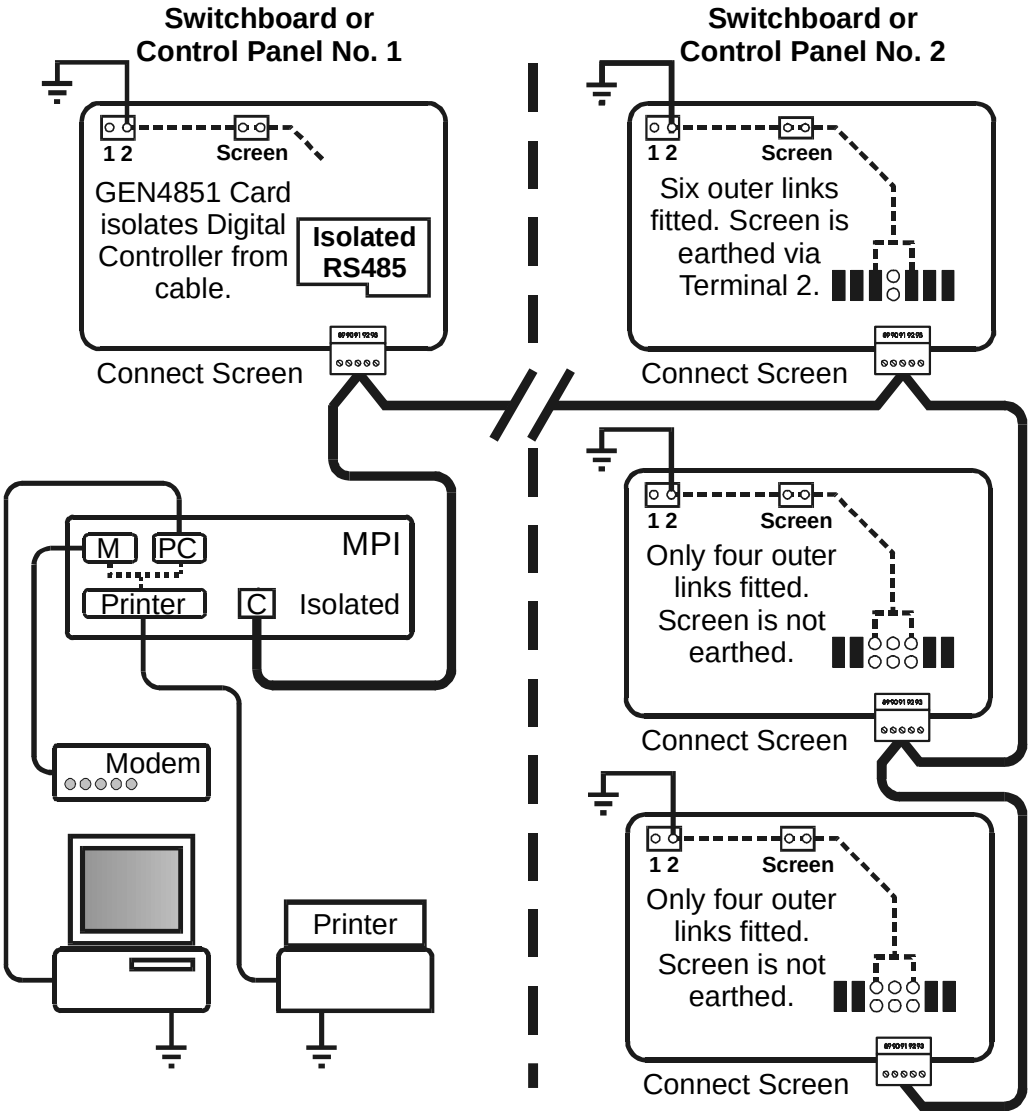


Figure A-24. Use of GENII MPI, Circuit 2.

A-4.3. CABLE CONNECTION PROCEDURES. This paragraph contains general procedures for connection of Comms cables and for 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:

a. Ensure there are no network cables connected to any device.

b. Connect the supply conductors to all devices, ensuring that, where it is specified, the electrical earth is connected to the device.

c. Ensure that no conductors or screens of the network cables are in contact with any device or any metal.

d. Select the network device that is to be the earthing point for the network cables.

e. 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 Figures A-25 through A-27, as appropriate.

f. If the voltages are less than the values shown in Figures A-25 through A-27, then connect the network cable(s), including the screen to the device selected in Step d., above.

g. For looping connections, test the two cables separately before connecting them.

h. Go to the device to be connected to the other end of the section of network cable.

i. 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 Figures A-25 through A-27, as appropriate.

j. If the voltages are less than the values shown in Figures A-25 through A-27, 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.

k. 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.

l. Continue testing and connecting one section at a time, moving away from the earthing point.

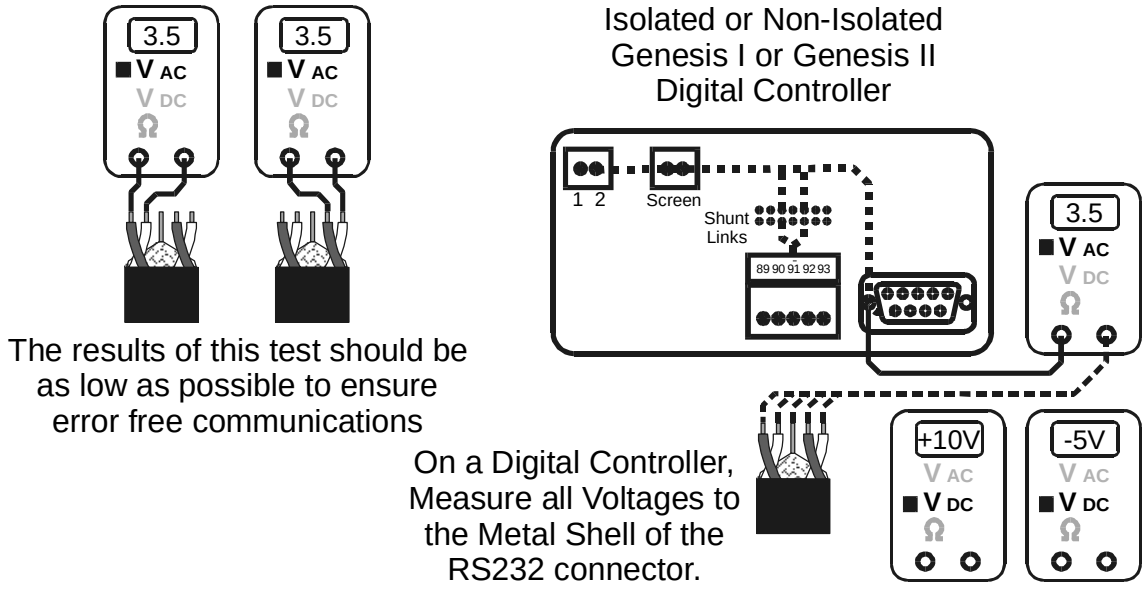


Figure A-25. Voltage Check, Isolated/Non-Isolated Digital Controller.

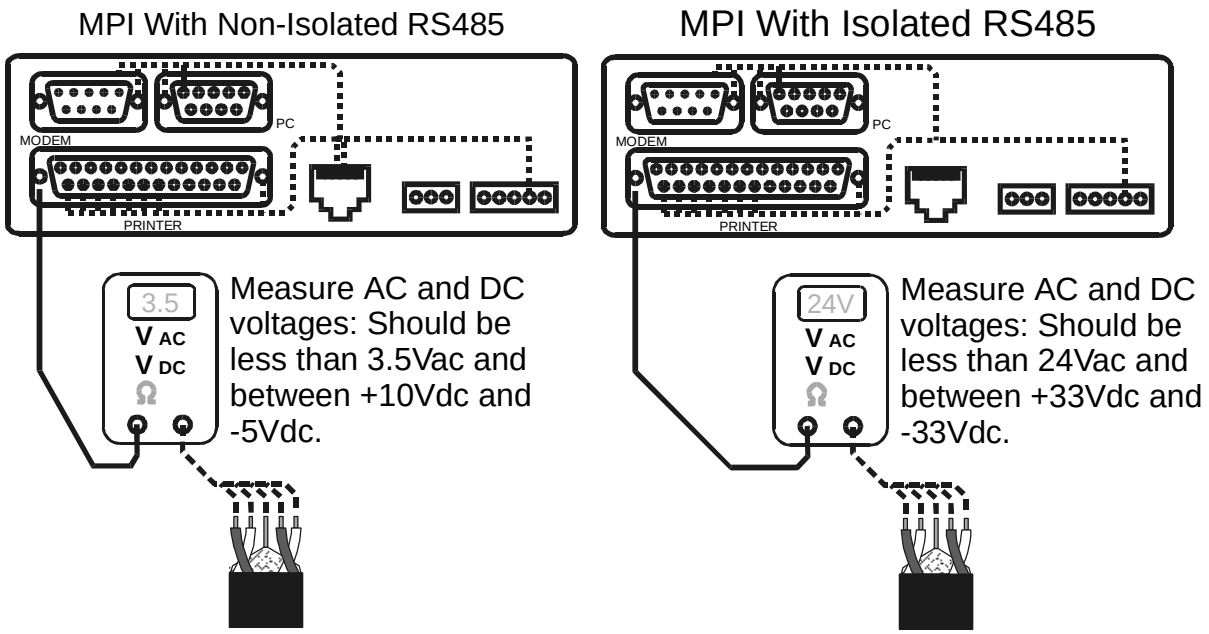


Figure A-26. Voltage Check, GENII MPI with Isolated/Non-Isolated RS485.

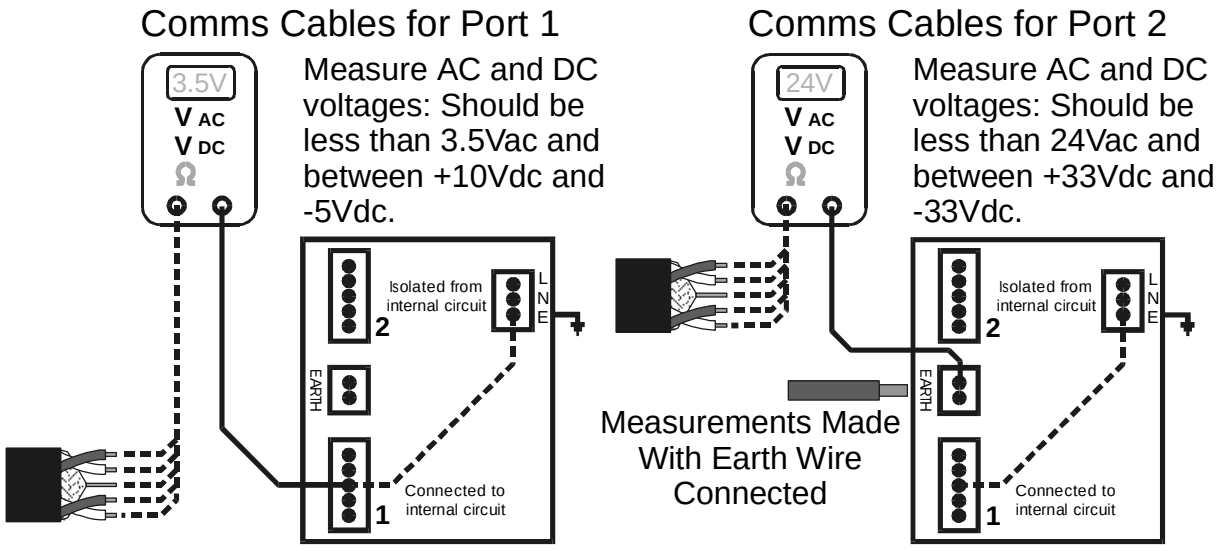


Figure A-27. Voltage Check, GENII RPTR Repeater Module.

APPENDIX B- DATA SHEETS

B-1. INTRODUCTION.

This appendix contains information in the form of the most recent data sheets for various items of Innotech hardware and software. These data sheets are mainly intended to provide installation information for miscellaneous ancillary units not covered elsewhere in this manual. The specific data sheets in this appendix have been selected for inclusion based on the configuration of your Genesis System.

Listed below is an index of the complete of line data sheets produced by Innotech. Those data sheets selected for inclusion in this appendix are identified by a tick mark in the box to the right of the product description.

DATA SHEET	TYPE	PRODUCT	
		Detectors	
DS 1.0		General Information	☐
DS 1.11	ITW400n	Wall Mounted Detectors	☐
DS 1.12	ITD4001	Duct Mounted Detector	☐
DS 1.13	ITI4x0n	Immersion Detectors	☐
DS 1.14	ITW4201	Wall Mounted Detector with Display	☐
DS 1.15	SENWX	Wall Mounted Temperature Detectors	☐
DS 1.16	SENDX	Duct Detector	☐
DS 1.17	SENFX	Immersion Detector	☐
DS 1.21	ITW52	Wall Mounted Temperature Detector with Display	☐
		Controllers	
DS 2.0		General Information	☐
DS 2.01	IAP4012	Actuator Package Controller	☐
DS 2.11	ITC4001	Temperature Controller	☐
DS 2.12	ITC4701	Temperature Controller for Cooling Applications	☐
DS 2.13	ITC 4801	Temperature Controller for Heating Applications	☐
DS 2.21	IIC4001	4-20mA Current Loop Controller	☐
DS 2.22	IIC4n01	4-20mA Single Term Current Loop Controllers	☐
DS 2.25	IVC4001	Voltage Controller	☐
DS 2.26	IVC4n01	0-10V Single Term Voltage Controllers	☐
DS 2.31	IHC4001	Humidity Controller	☐
DS 2.32	IPH40hd	Package Humidity Controller	☐

Controllers - Continued

DS 2.41	IDC4001	Differential Controller	☐
DS 2.51	IPC40hc	Package Controller	☐
DS 2.61	IMC40hc	Modular Controllers – Relay Output	☐
DS 2.62	IMC42hc	Modular Controllers – Heat Valve Output	☐
DS 2.63	IMC43hc	Modular Controllers – Economy Cycle	☐
DS 2.64	IMC50hc	Modular Controllers – External Set Point	☐
DS 2.65	IMC52hc	Modular Controllers - Heat Valve Set Point	☐
DS 2.66	IMC53hc	Modular Controllers – Economy Cycle	☐
DS 2.70	MS01-01	3-Speed Fan. 1 Cool & 1 Heat Controller	☐
DS 2.71	MS1-03	1-Speed Fan. 2 Cool & 2 Heat Controller	☐
DS 2.72	MS1-05	3-Speed Fan. 1 Cool & 1 Heat Controller	☐
DS 2.83	IWPx0hc	Electronic Controller	☐
DS 2.84	IWCx001	Electronic Controller	☐
DS 2.85	IMT	Modular Thermostat	☐
DS 2.91	ES3-1	Ecostat 3 Controller	☐
DS 2.92	ES3-2	Ecostat 3 Controller	☐
DS 2.93	ES3-3	Ecostat 3 Controller	☐
DS 2.94	ES3-49	Ecostat 3 Controller	☐
DS 2.95	ES3-3-1	Ecostat 3 Controller	☐
DS 2.96	ES3-1-1	Ecostat 3 Controller	☐
DS 2.97	ES3-4	Ecostat 3 Controller	☐

Controlled Output Devices

DS 3.01	IAR4012	Actuator Staging Relays	☐
DS 3.11	IPR400n	Package Relays	☐
DS 3.12	IPR420n	Delayed Package Relays	☐
DS 3.21	ISR400n	Staging Relays	☐
DS 3.22	ISR420n	Delayed Staging Relays	☐
DS 3.31	IHV400n	Heat Valves	☐
DS 3.32	IHV420n	Heat Valve-Staged Output	☐
DS 3.51	IFR4xxx	Fault Relays	☐

Displays			
DS 4.11	IDD4001	Digital Display	☐
DS 4.21	IDW400n	Wall Displays	☐
DS 4.22	IDW4x12	Wall Displays with Remote Set Point Adjust	☐
DS 4.31	IDS40nn	Switchboard Displays	☐
DS 4.32	IDS4212	Multipoint Temperature Display	☐
DS 4.41	IDD5001	Digital Display	☐
DS 4.51	IDW	Wall Display	☐
DS 4.61	IDS50	Switchboard. Digital Display	☐
DS 4.62	IDS5212	Multipoint Temperature Display	☐
Signal Adaptors			
DS 5.11	IMF4x0n	Multifunction Modules	☐
DS 5.21	IAS40nn	Average Signal Selectors	☐
DS 5.31	IHS40nn	High Signal Selectors	☐
DS 5.32	IHS4207	High Signal Selector with Relay Output	☐
DS 5.41	ILS40nn	Low Signal Selectors	☐
DS 5.51	ISM4x0n	Signal Modifiers	☐
Miscellaneous Products			
DS 8.11	IPS40nn	12 and 24V Power Supplies	☐
DS 8.12	IPS41nn	3-13V Adjustable Power Supply	☐
DS 8.21	IRA400n	Remote Adjusters	☐
DS 8.31	IMP400n	Manual Positioners	☐

Genesis Hardware		
DS GENESIS II	GENESIS II Digital Direct Controller	☐
DS GENESIS I	GENESIS I Digital Direct Controller	☐
DS AIM	GENII AIM Analogue Input Module	☐
DS DIM	GENII DIM Digital Input Module	☐
DS DOM	GENII DOM Digital Output Module	☐
DS MPI	GENII MPI Modem and Printer Interface	☐
DS MPI ISOL	GENII MPI Modem and Printer Interface with Isolated RS485 Comms	☐
DS 4851	GENII 485I Isolated RS485 Comms	☐
DS RPTR	GENII RPTR Repeater Module	☐
DS POLY CHIP	GENII POLY CHIP RS485 Protection Plug	☐
DS GEN II CONVERTER	GENII RS232 to Isolated RS485 Converter	☐
DS GEN II RMI	GENII RMI Remote Module Interface	☐
DS AI REM	GENII AI REM Analogue Input Module	☐

Genesis Hardware - Continued		
DS AO REM	GENII AO REM Analogue Output Module	☐
DS DI REM	GENII DI REM Dry Contact Digital Input Module	☐
DS DO REM	GENII DO REM Relay Output Module	☐
DS IDI REM	GENII IDI REM Opto Isolated Digital Input Module	☐
DS CS REM	GENII CS REM Control Station Module	☐
DS MZS REM	GENII MZS REM Multi Zone Station Remote Expansion Module	☐
DS MP REM	GENII MP REM Multipoint Module	☐
DS MPC	GENII MPC Mid Points Controller	☐

Genesis II Software		
DS CON	GEN2CONFIG Graphical Configuration Utility	☐
DS MON	GEN2MON Monitoring and Debugging Utility	☐
DS SUPER	GEN2SUPERVISOR Monitoring Utility	☐
DS SIM	GEN2SIMULATOR Software Simulator	☐
DS INNOGRAPH	INNOGRAPH Data Log Graphing and Analysis Tool	☐
DS ALERT	GEN2ALERT Alarm Monitoring Utility	☐
DS EASY	GEN2EASYBILL Time-Charging Facility	☐
DS XTRACT	GEN2XTRACT Data Log Extraction Utility	☐
DS DDE	GEN2DDE Dynamic Data Exchange Server	☐

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