Automation Products Series

Hardware Manual | Applied to Super HLX50 Series RTU

Super E50 User **Manual**

V1.6

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Before you start

Thank you for choosing automation products!

Digitron TECHNOLOGIES CO., LTD has successfully launched **Super E50** series and **Super32 L** series RTU products, which have been widely applied in automation fields. Automation products are highly reliable products with excellent performance which have been recogonized by experts and users worldwide.

This manual contains important information regarding installation and safe operation. Be sure to read this manual carefully before using it.

If you encounter any problems during the installation or operation of the unit, please check this manual first before you contacting your local dealer or representative. If you need further help, you can also contact our technical support department by email

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About the Manual

- ***Content***

The manual is applicable to SuperE50 RTU, including product installation, wiring, operation, specifications, etc.

- ***Product Installation***

Introduce product installation, safety, mounting, etc.

- ***Wiring of I/O***

Introduce wiring of I/O and communication ports, etc.

- ***Operation***

Introduce operation of power control, real-time clock, etc.

- ***Specifications***

Introduce specifications of the controller.

Potential Readers

Reading ***Super E50 User Manual*** requires some engineering knowledge. The manual is written for product installation and operation engineers, etc.

How to Use the Manual

If you use the SuperE50 RTU for the first time, please read through the manual. If you

are an experienced user, you can search corresponding information through chapters. The chapters of this manual are as followed:

Chapter 1. Overview

Chapter 2. Installing Super E50 System

Chapter 3. Checking Out and Troubleshooting Super E50 System

Appendix A Environmental Specifications

Appendix B Carrier Specifications

Appendix C I/O Module Specifications

Appendix D Controller Specifications

Appendix E System Power Supply Specifications

Appendix F Extension Module Specifications

Appendix G HC601 Module Specifications

Appendix H Control Network Sepecifications

Appendix I Bulk Power Specifications

Appendix J Cabinat and Enclosure Specifications

Appendix K Power and Grounding Notes

Appendix L Field Device Power Supply Guidelines

Appendix M Controller Redundancy

Appendix N Version

Other Help Information

- ***Electronic Manual***

While supplying products, we will also supply CD including Super E50 Series RTU software and documents etc., please install it on your computer for use.

- ***Technical Support***

For technical questions or problems you encountered in installation and operation, please contact your local dealers and representitives or contact our headquater in China directly.

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Contents

Chapter1 Overview

This chapter provides general information on the Super E50 system hardware.

1.1 The Super E50 System

The **Super E50** scalable process system consists of the following components:

- One or more I/O subsystems that process information from field devices
- One or more controllers that perform local control and manage data and communications between the I/O subsystem and the Control Network
- Power supplies
- One or more workstations that provide a graphical user interface to the process
- A Control Network that provides communication between system nodes

Fig. 1-1 Super E50 System Overview Diagram shows an overview diagram of the Super E50 system.

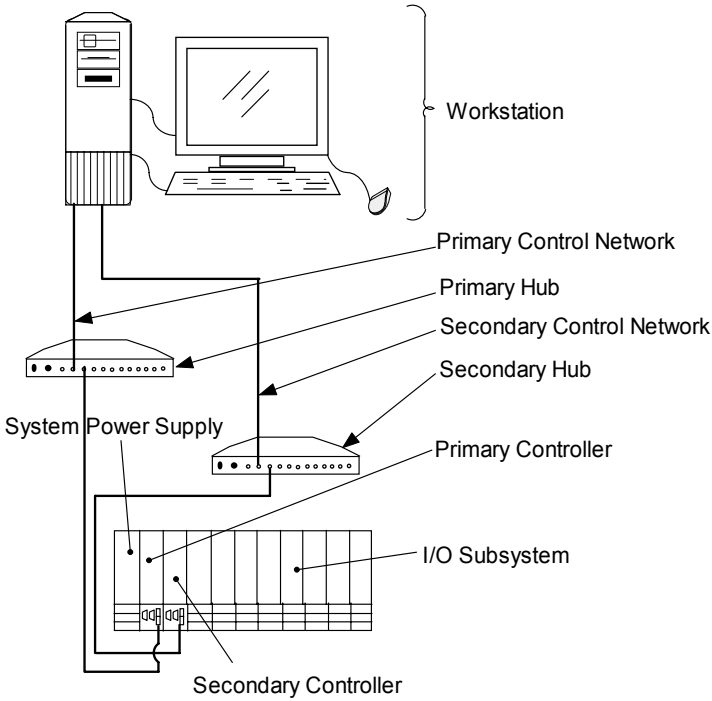


Fig. 1-1 ***Super E50*** *System Overview Diagram*

1.2 Super E50 Equipment

The Super E50 system uses DIN-rail mounted interconnecting carries. The carriers provide power and communication connections. The I/O subsystem, the controllers and the system power are modular, they simply plug onto the carriers for installation.

1.2.1 Super E50 Modular Carriers

There are six types of Super E50 modular carriers：

- Single modular carrier A (HC802, for the system power module)
- Single modular carrier B (HC805, for the controller module)
- Single modular carrier C (HC801, for the I/O subsystem modules)
- Single modular carrier D (HC803, for the extension module)
- Single modular carrier E (HC815, for the controller module)
- Double modular carrier A (HC805R, for the controller module redundancy)
- Double modular carrier B (HC806, for the flow computer module)
- Double modular carrier C (HC815R, for the controller module redundancy)

See the *Appendix B Carrier Specification* of this manual.

1.2.2 LocalBus

The LocalBus consists of the following components:

- Internal bus on the power / controller / associated I/O interface carriers
- LocalBus Connector J1,J2
- Extension cable

The LocalBus supplies power (5VDC) to the controller and the I/O subsystem and

provides communications connection between modules. The extension cable provides LocalBus connection between the one I/O subsystem and another I/O subsystem. The LocalBus, including all cabling, cannot be longer than 5m, as shown in Fig. 1-2.

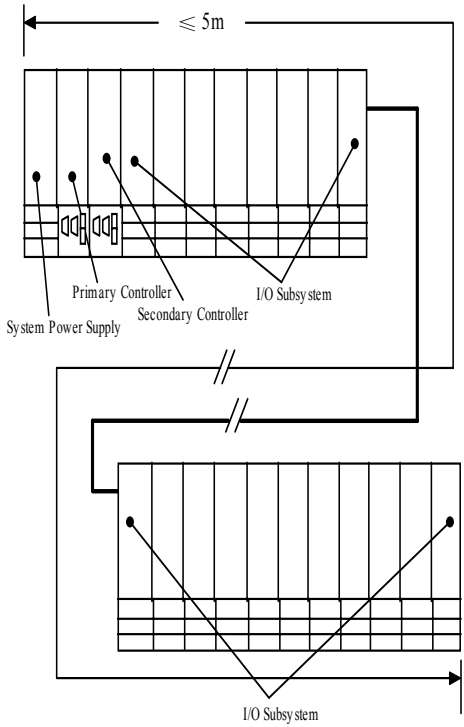


Fig. 1-2 LocalBus Example

1.2.3 Super E50 I/O Subsystem

The system can use the following types of I/O and communicationsmodules:

- Input

- AI，8-channel，4~20 mA
- DI，16-channel，0~24VDC / dry contact
- PI， 4-channel，5~24V，pulse
- RTD， 4-channel Pt100

■ Output

- AO，4-channel，4~20 mA
- DO，16-channel，12~24VDC，FET or transistor drain

■ Communication

- 2 RS232/RS485 and 1 RS485 , 3 communication channels in a module

1.2.4 Super E50 Controller

The controller performs local control and manages communication between the I/O subsystem and the Control Network. It mounts on the controller carrier, located on the right slot of the power carrier (slot 2). You can add an additional controller for controller redundancy.

1.2.5 Super E50 System Power

Super E50 system supports a system power supply (24VDC/5VDC).

The system power supply mounts on the leftmost slot of the carriers (slot1) and provide power to the controller and the I/O subsystem.

1.2.6 Field Devices Power

To minimize field wiring, you can connect 24VDC power source directly to the I/O modular carrier to provide power to field devices that are connected to some types of

I/O.

The power source can be a Super E50 Bulk Power Supply or your own source.

1.2.7 Uninterruptible Power Supply

The Uninterruptible Power Supply (UPS) backs up the Super E50 Controller or the Super E50 Workstation during short-term power outages. The UPS allows the controller or workstation to continue operating and to maintain current process data even when AC main power is down.

1.2.8 Super E50 Workstation and System Software

The workstation and system software provide a graphical user interface to help you configure your system, perform extensive diagnostic checks, operate your process, and gather reporting and historical data.

1.2.9 Super E50 Control Network

The Control Network is an isolated Ethernet local area network (LAN) that provides communication between the controllers and workstations. It uses standard Ethernet hubs for communications connections. An optional 10BaseT/100Base-TX Autosensing dual-speed hub can be added for networks with more than four workstation.

The Control Network is dedicated to the Super E50. A separate Ethernet interface is provided via the Super E50 Application Station to connect the Super E50 system to a plant-wide LAN.

The Control Network has been designed to be redundant for communications security. The secondary network is routed through a separate Ethernet network.

- Standard Category 5 shielded twisted pair (STP) wiring can be used for Control Network of distances less than 100m.
- A fiber-optic interface card and fiber-optic cable can be used to extend Control Network distances up to two kilometers for your Super E50 system.

- For applications that require longer Control Network distances,commercially available converters provide extended distance capability.

There are several possible Control Network layouts for various system sizes and requirements.

Fig. 1-4 Control Network Example(2 nodes) and Fig. 1-5 Control Network Example(8 nodes) show examples of Control Network layouts using STP wiring.

If your Super E50 system consists of one workstation and one controller only, you can connect the Super E50 network without using a hub.

Fig. 1-3 No Hub System Example shows an example of a no hub system.

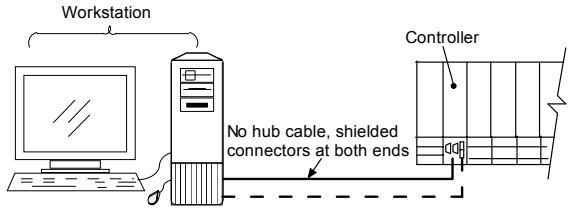


Fig. 1-3 No Hub System Example

Note: the no-hub cable is for systems with no Control Network Hub. Its wiring is different than that of the standard Ethernet cables used with Super E50 Control Network Hubs.

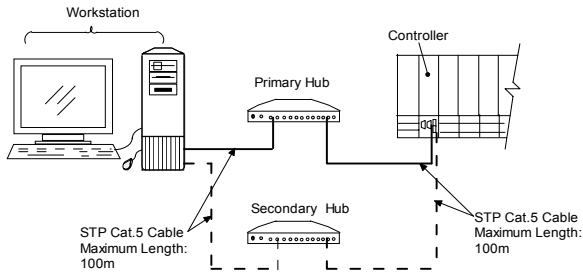


Fig. 1-4 Control Network Example(2 nodes)

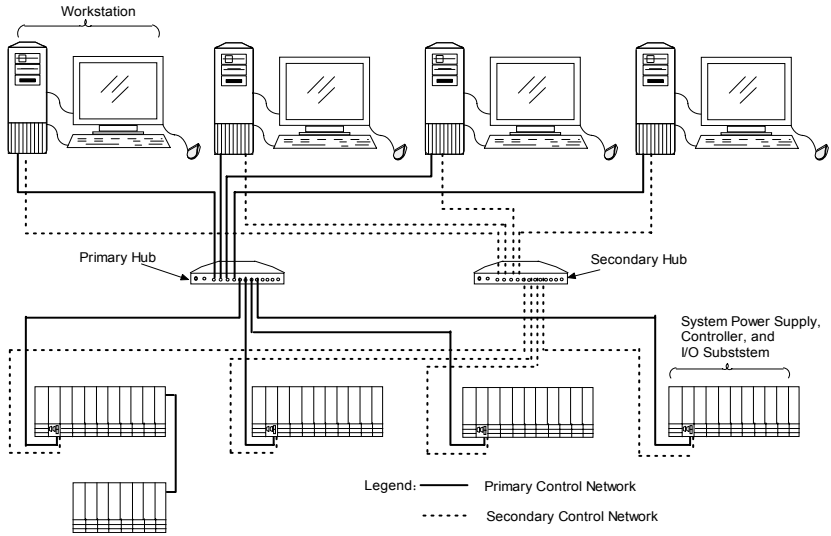


Fig. 1-5 Control Network Example(8 nodes)

1.2.10 Bulk Power Supplies

The bulk power supplies provide AC/24VDC@5A power to the system and field devices.

Chapter2 Installing Super E50 System

This chapter provides recommendations for system installation preparation, lists the required tools, provides a brief description of the steps required for system installation, and includes detailed instructions and diagrarms for system installation.

2.1 Installation Planning

2.1.1 References

- Appendix A – Environmental Specifications
- Appendix B – Carrier Specifications
- Appendix C – I/O module Specifications
- Appendix D – Controller Specifications
- Appendix E – System power Specifications
- Appendix F – Extension Module Specifications
- Appendix G –HC601 Module Specifications
- Appendix H –Control Network Specifications
- Appendix I – Bulk Power Supply specifications
- Appendix J – Cabinet and Enclosure specifications

- Appendix K – Power and Grounding Notes
- Appendix L– Field Devices Power Supply Guidelines
- Appendix M – Controller redundancy
- Appendix N – Version

2.1.2 Tools Required for Installation

You need the following tools to install a **Super E50** system:

- Standard electrical tools (voltmeter, wire cutter, wire stripper, pliers, screwdriver)
- Standard installation tools (screwdrivers, drill with standard bits)
- Ethernet cable tools (crimper, cable tester)

Please see the workstation instructions for information on the tools needed to install the workstation and its peripherals.

2.1.3 Wiring Guidlines

The power and grounding terminals and field termination points on the I/O subsystem and the system power supplies are designed to accept 2.5mm stranded or solid wire. To select wire, calculate the maximun current limit expected for each wire. Local electrical codes define the wire size required for a specific current.

Shielded twisted pair wiring is recommended for low-level signal wiring to reduce susceptibility to noise. You can order an I/O carrier with a shield bar (to terminate the shields from field wiring) or without a shield bar (where termination is not neccessary).

2.1.4 Torque Limits

When you install the DIN rails and Super E50 equipment, do not exceed the maximum torque limits for the mounting screws (listed in Table 2-1).

Table 2-1 Maximum Mounting Screw Torque Limits

Item	Torque Limit on Mounting Screw(s)
Bulk power supply	2.84Nm (25 in-lb)
DIN rail latching	1.32Nm (12 in-lb)
I/O terminal block field terminations	0.45Nm (4 in-lb)
I/O terminal block protection cover	0.11Nm (1 in-lb)
I/O card	0.11Nm (1 in-lb)
Controller	0.11Nm (1 in-lb)
System Power Supply	0.11Nm (1 in-lb)
Media Converter	0.11Nm (1 in-lb)

2.2 Getting Started with Super E50 Hardware

This section provides a brief description of the steps required for system installation. Specific information on installation steps 1-7 is incuded in this chapter. Specific information on step 8 is included in ***Chapter3 Checking Out and Troubleshooting***.

The appendices in this manual include product specifications and detailed information.

The following steps for installation are listed in the most common order. You can elect to perform these steps in another order that is more convenient for your project.

1. Intall the DIN rails and Super E50 Carriers.
   - Install the DIN rails.
   - Mount the power/controller carrier and I/O interface carriers on the DIN rails and connect them each other.

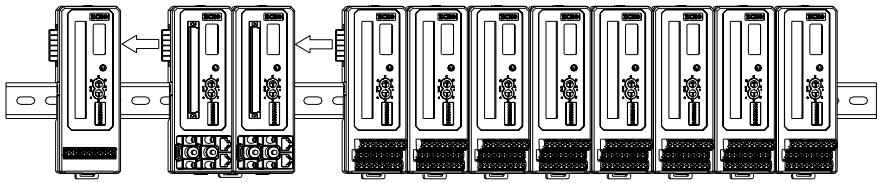


Fig. 2-1

2. Instal the Super E50 I/O modules.
   - Check if the key settings on the I/O module are corresponding with the keys settings on the I/O carrier;
   - Connect field wiring;
   - Mount the I/O modules on the I/O carriers.

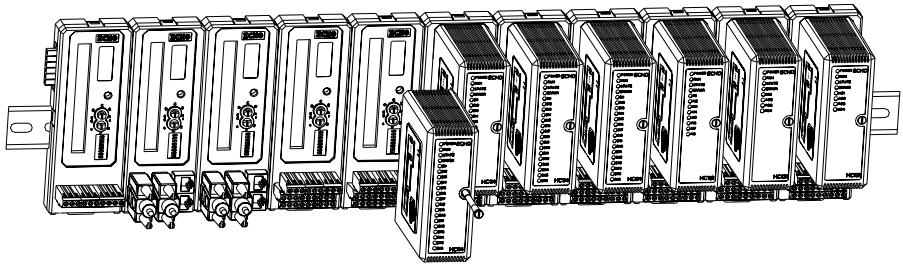


Fig. 2-2

3. Instal the Super E50 controller.

   - Mount the controller on the controller carrier.

Fig. 2-3

4. Install the Super E50 System Power Supply.

   - Mount the system power supply on the power carrier.
   - Connect the supply inputs.

Fig. 2-4

5. Install the Super E50 Workstation and Servers.
   - Follow the instructions supplied with your Workstation and Server;
   - Follow the instructions supplied with your printer and UPS.

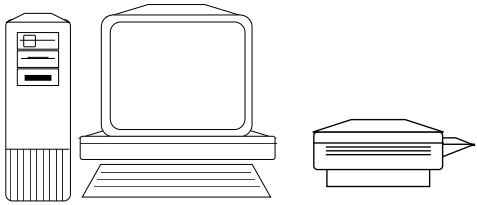


Fig. 2-5

6. Set the Super E50 Control Network.
   - Install the hub;
   - Install the network cables between nodes.

Fig. 2-6

7. Connect power to the system and power up.
   - Install the bulk power supply and connect the supply inputs;
   - Power up the system.

8. Check out the installation.
   - Check indicators on the devices;
   - Test field wiring connections;
   - Check cable connections;
   - Check power supply voltages.

9. Read the manual for information on the software applications for the Super E50 system.

2.3 Installing the System

2.3.1 Installing the DIN Rails and Carriers

The power carriers，controller carriers and I/O interface carriers mount on standard 7.5×35mm rails. DIN rails mount horizontally or vertically. Where possible mount DIN rails horizontally. Modules are easier to install on horizontally rails. Cooling is optimal when mounted horizontally.

2.3.1.1 DIN Rail Recommendations

Fig. 2-7 DIN rails installation horizontally shows suggested spacing for DIN rail installationg horizontally on your mounting surface.

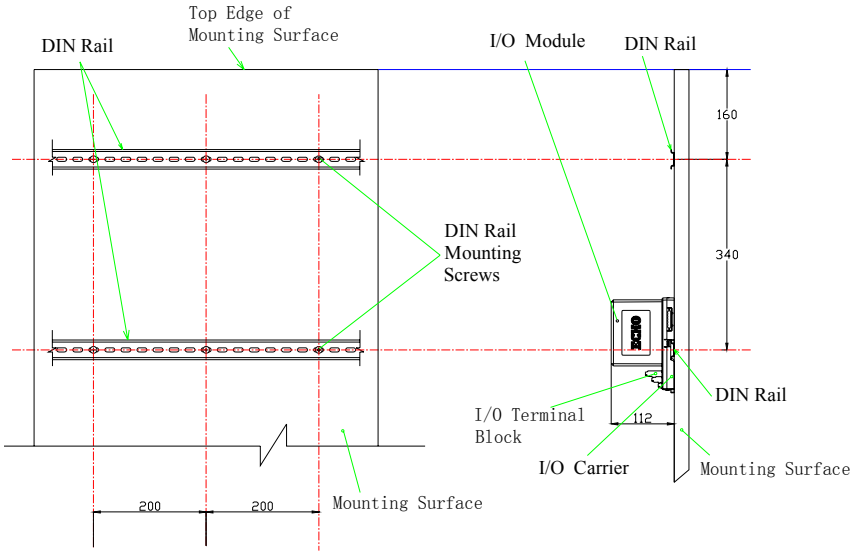


Fig. 2-7 DIN rails installation horizontally

Caution*: If vertically installs the DIN rail, it is need to mount the plug at the bottem of the DIN rail.*

2.3.1.2 To Install the Module Carrier

See Appendix B Carrier Specifications for information on the module carriers.

1. Mount the DIN rail at the appropriate location.
2. First of all , mount system power modular carrier, as shown below.

   Put the top edge of carrier buckle to the bottom edge of the DIN rail, and then push the carrier to make the carrier buckle moving round about till the carrier can be put flat on the DIN rail.

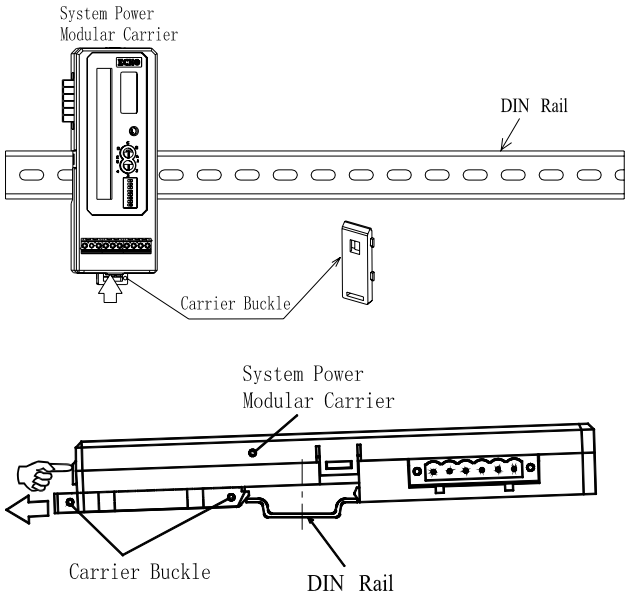


Fig. 2-8

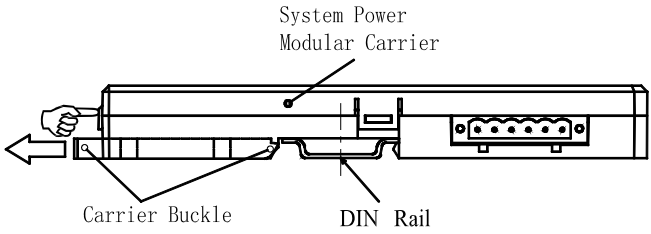


Fig. 2-9

Now, the carrier buckle should rebound, and lock the DIN rail. It indicates that the carrier has been installed successfully.

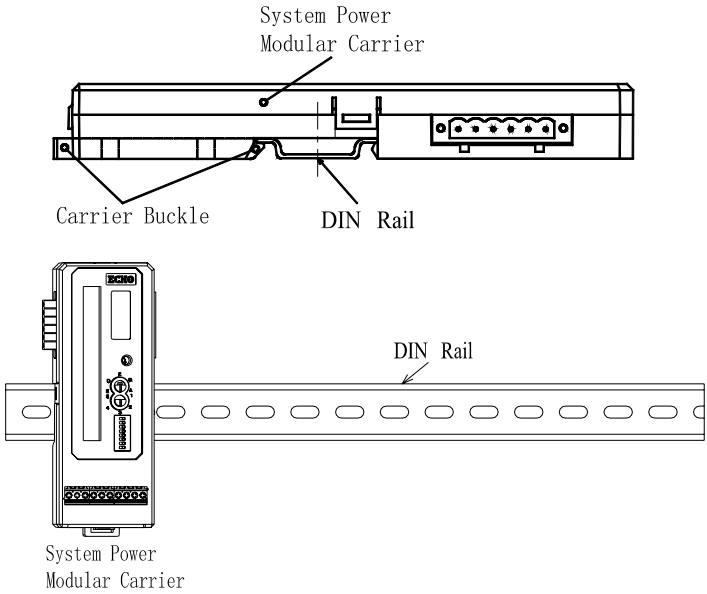


Fig. 2-10

3. In the same way, the controller module carrier can be installed on the DIN rail.

Then connect the controller module carrier and power carrier with their LocalBus connector J1, J2.

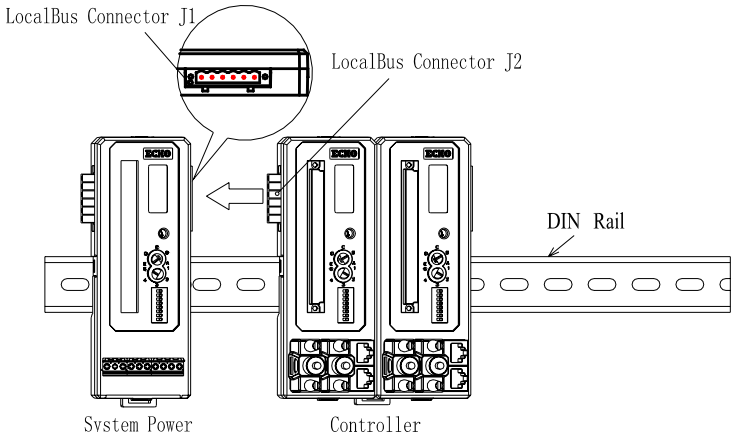


Fig. 2-11

4. Also in the same way, install and connect the I/O module carriers.

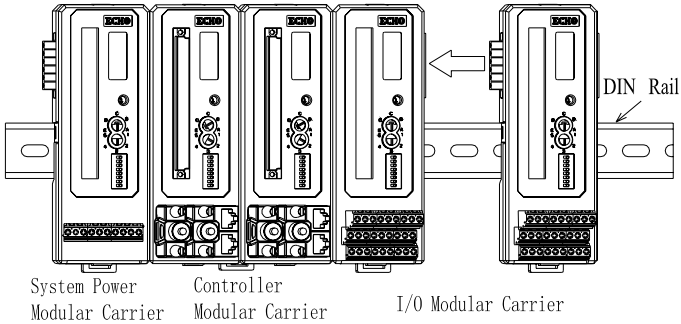


Fig. 2-12

5. Connecting the module carrier groups

If the I/O module carriers locate on the different DIN rails, the extension cable can

be used to connect the LocalBus. The connecting relationship is shown below.

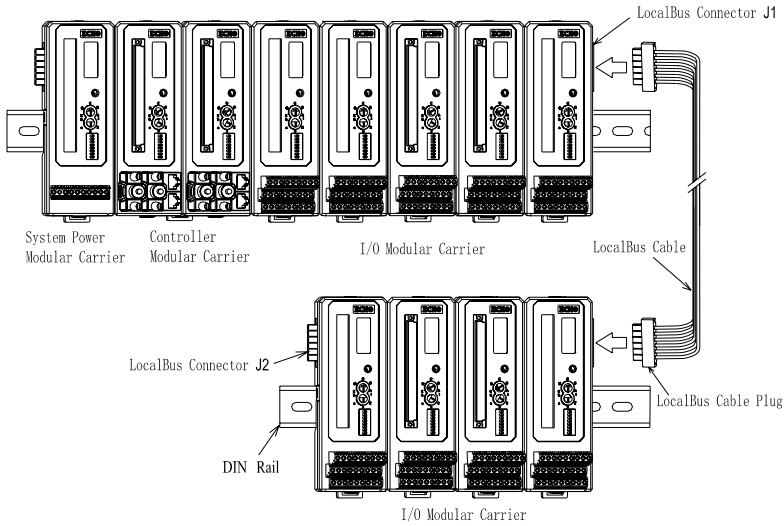


Fig. 2-13

Caution: *The LocalBus, including all cabling, cannot be longer than 5m.*

The port definition and wiring of the LocalBus connector on the module carrier can be found in Appendix B.9

Module LocalBus Connector .

2.3.1.3 To Uninstall Module Carrier

1. To disconnect the carrier form the carrier group, just pull the carrier's LocalBus connector J2 from LocalBus connector J1 of the carrier group.
2. Pull out the carrier buckle, and then remove the carrier form the DIN rail.

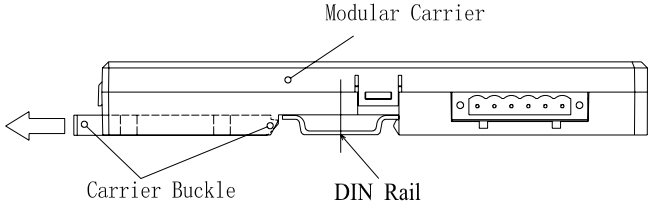


Fig. 2-14

2.3.2 Installing the I/O Module

See Appendix C I/O Module Specifications for information on the I/O module.

Refer to Fig. 2-15.

1. Locate the assigned slot on the I/O module carriers. Set the keys on the I/O module carrier to match the keys on the corresponding I/O module, see Appendix B.7 Keys Settings. Set the DIP switches on the I/O module carrier. See Appendix B.8 DIP Switch.
2. Align the Connect Module Plug on the I/O module with the Connect Modular Socket on the I/O module carrier and push to attach.
3. Tighten the mounting screw.

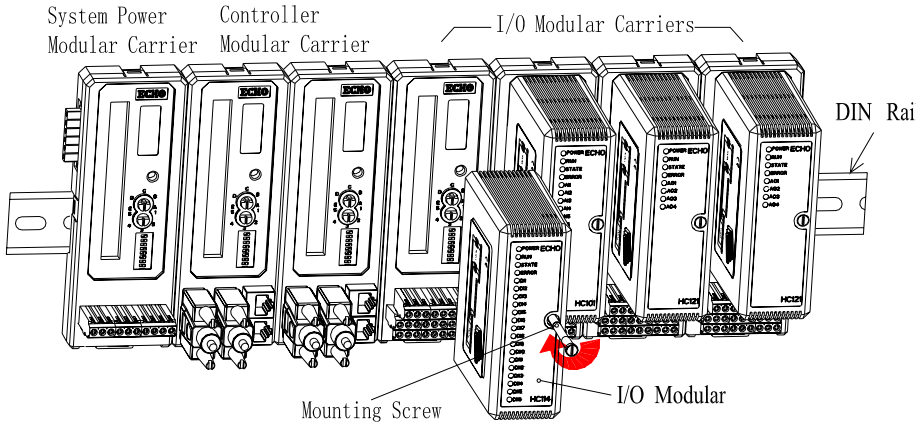


Fig. 2-15

> ***Caution:*** *Please check whether the keys settingss on the carrier match with the keys on the I/O module before install the module. See Appendix B.7 Keys Settings for information. Also check the DIP switch settings. See Appendix B.8 DIP Switch for d*etail.

2.3.3 Installing the Controller Module

The controller module (CPU module) is installed on the controller single module or double module carrier. In the redundancy designing, the primary controller module always lay on the left, and the secondary controller module lay on the right. See Appendix D Controller Module Specifications on primary controller and see Appendix M Controller Redundancy on secondary controller for detail.

Refer to Fig. 2-16.

1. Set the keys on the controller module carrier to match the keys on the corresponding controler module, see Appendix B.7 Keys Settings. Set the DIP switch of the terminal resistance on the controller module carrier. See Appendix B.8 DIP Switches.

2. Align the Connect Module Plug on the controller module with the Connect Modular Socket on the controller module carrier and push to attach.

3. Tighten the mounting screw.

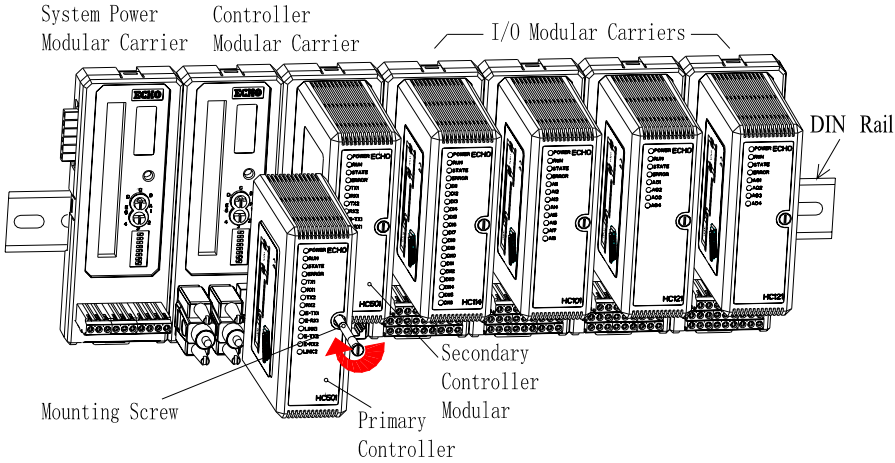


Fig. 2-16

2.3.4 Installing the System Power Supply

The external power provides 24VDC to the system power module, such as HC201 module that can supply 5VDC. 5VDC supply the controller and I/O module through the module LocalBus on the carrier group. Please refer to Appendix KPower and Grounding Notes to get the connecting and grounding of system power. See Appendix E System Power Specifications on system power module for detail.

Refer to Fig. 2-17.

1. Set the keys on the power module carrier to match the keys on the corresponding power module, see Appendix B.7 Keys Settings.
2. Align the Connect Module Plug on the power module with the Connect Modular Socket on the power module carrier and push to attach.
3. Tighten the mounting screw.

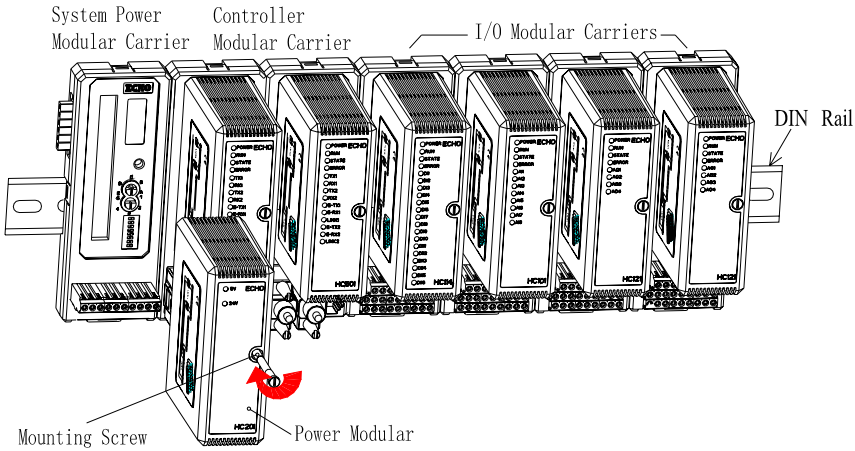


Fig. 2-17

2.3.5 Installing the Super E50 Workstation

To install the Super E50 workstation, connect the workstation components, install the Super E50 System Identifier (one per system), install the printer (if used), and install the UPS (if used). Connect the workstation and its associated peripherals to one power distribution and ground system.

After hardware installation, refer to the Release News on the Super E50 CD-ROM for information on installing Super E50 software on the workstation.

Refer to Fig. 2-18 Workstation Installation.

a) Connect monitor, keyboard, and mouse to the CPU. Refer to the documentation supplied with your workstation for details on the I/O ports.

b) Stick the Super E50 Lable to the lower right corner of the monitor faceplate.

c) Install printer and its driver follow the instruction.

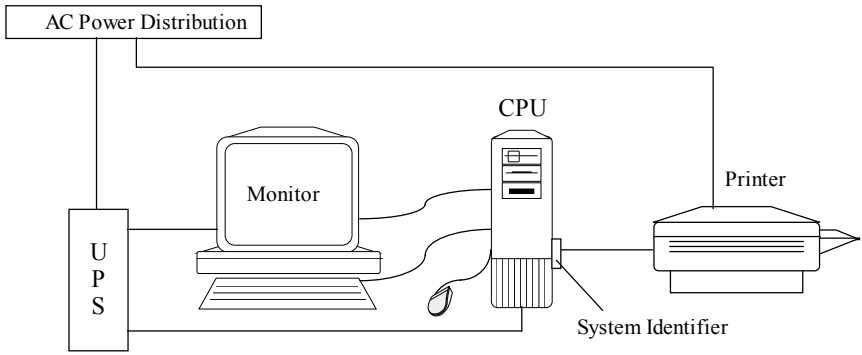


Fig. 2-18 Workstation Installation

2.3.6 Installing the Super E50 UPS

The Super E50 UPS backs up the Super E50 Workstation during short-term power. The UPS allows the workstation to continue operating and to maintain current process data even when AC main power is down.

The UPS must be mounted upright on a level surface, such as a floor or a work surface, for proper operation. The UPS is not rack-mountable or DIN rail-mountable.

We recommend that you use a separate UPS for each device to provide maximum backup time.

If you use UPS to provide backup for your workstation, follow the instruction included with the UPS to connect it to the UPS and to the monitor. See Appendix E.2 Uninterruptible Power Supply (UPS) for UPS specifications.

If you use the UPS to provide backup for your controller, see Appendix E.2 Uninterruptible Power Supply (UPS) for installation information.

2.3.7 Setting up the Super E50 Control Network

The standard Control Network is an isolated Ethernet local area network that provides communication between the controllers and the workstation. It uses one or more Ethernet hubs for communications connections. The Control Net is dedicated to Super E50 system; no other devices can be attached.

A separate Ethernet interface is provided through the Super E50 Application Station to connect the Super E50 system to a plant-wide LAN. To minimize the traffic on the plant-wide LAN, configure a router to filter the IP address.

Connection of any non-Super E50 equipment to the Super E50 Control Network can cause unpredictable operation of the system.

The Network has been disigned to be redundant for communications security. The secondary network is routed through a separate secondary Ethernet network.

There are several possible Control Network layouts for various system sizes and requirement.

Fig. 1-3 , Fig. 1-4 Control Network Example(2 nodes)

and Fig. 1-5 Control Network Example(8 nodes)

To set up the Control Network, install the hub and connect network communication cables between nodes (controllers and workstation).

The hubs can stand alone or can be linked to other hubs. Each hub is equivalent to a sigle IEEE 802.3 repeater. The number of hops that are allowed and the maximum distance between each hop varies with the type of hub and whether the link is 10Mbit or 100Mbit.

If your Super E50 system consists of one workstation and one controller only, you can connect the Super E50 network without using a hub. The cable must be routed directly from the workstaion to the controller.

Fig. 2-19 shows an example of a no hub system.

Fig.H- 2 Cable Pin Out for No Hub System shows the cable pinouts of no bub.

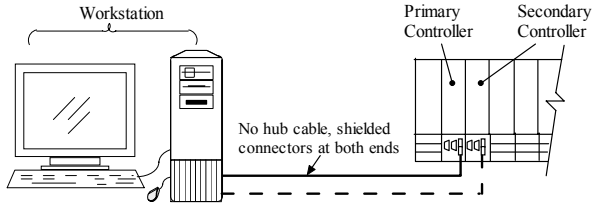


Fig. 2-19 No Hub System Example

Note: *The no- hub cable is for systems with no Control Network Hub. Its wiring is different than the standard Ethernet cables used with* ***Super E50*** *Control Network Hubs.*

2.3.7.1 Control Network Installation Requirements

The Control Network installer must observe the following requirements:

- All Cat5-Twisted Pair and fiber-optic cables should be made, installed, and tested by an experienced LAN installer.
- A Super E50 system can have a maximum of four repeater hops on the Control Network.
- For the Cat5 TP cables:
  - All cables are made from shielded Categoty 5 cable with a maximum length of 100m and an outside diameter of 0.89 to 0.99mm.
  - All cables are terminated with RJ-45 connectors to EIA/TIA568B pin outsides at both ends.
  - Cables used to cascade hubs have an unshielded connector on one end and an shielded connectoron the opposite end.
  - Unshieled RJ-45 connectors are used at all workstation connections.
  - Shielded RJ-45 connectors are used at all controller connections and all hub connections to nodes.
  - All cables are tested with the Microtest PentaScanner testing tool.
- For fiber-optic cables used with hub distance extenders:
  - All cables are made from 62.5/125 micron multimode, graded index, glass silica, fiber core cable with a maximum length of 2000m.
  - All cables are terminated with ST or SC connectors.
  - All cables are tested for attenuation with an optical time domain reflectometer. Cables should meet fiber-optic inter-repeater link standards.
- For fiber-optic cables used with media converters (multi-mode or single-mode) follow media media converter manufacturers'requirements.

2.3.7.2 To Install the Hub

Follow the instructions supplied with the hub.

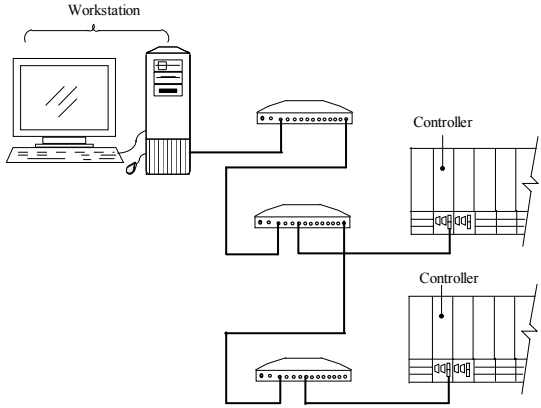


Fig. 2-20 Cascaded Hub Installation

2.3.7.3 To Install the Control Network Cables

1. Make and test the required Control Network cables.

The Cat5 cable test devices are used with the cable testing follow:

- Cable mapping
- Length
- Crosstalk
- Attenuation
- Attenuation-to-crosstalk ratio
- Impedance
- Loop resistance

- Capacitance

Caution: *Substandard cables can create serious communication problems.*

2. If you have a simplex Control Network, connect the unshielded end of a network cable to the Control Network Ethernet port on the back of the workstation and connect the shielded end of the cable to the primary hub.

Note*: For hub-to-hub connections, one end of the cable must have unshielded connectors.*

3. If you have a redundant Control Network, connect the unshielded end of a network cable to the primary Control Network Ethernet port on the back of the workstation and connect the shielded end of the cable to the primary hub as shown bellow. Connect another cable from the sencondary Control Network Ethernet port on the workstation to the secondary hub.

   It is helpful to identify the Control Network calbes with color-coded boots. company recommends the following convention: a yellow color-coded boot for the primary Control Network cable and a black color-code boot for the secondary Control Network cable.

4. Connect network cables from the hub(s) to the RJ-45 connectors on the bottom of each controller. The front connector is for the primary Control Network and the rear connector is for the secondary Control Network. Refer to Fig.B- 2 in Appendix B.2 Single Modular Carrier E（HC815）for port location.

2.3.7.4 Extending the Control Network

A fiber-optic interface on the 12-port or 24-port hub and fiber-optic cable can be used to extend Control Network distances for your Super E50 system. The maximum fiber-optic cable sigment length is 2000m.

See Appendix H Control Network Specifications for recommended fiber-optic cable specifications and media converter information.

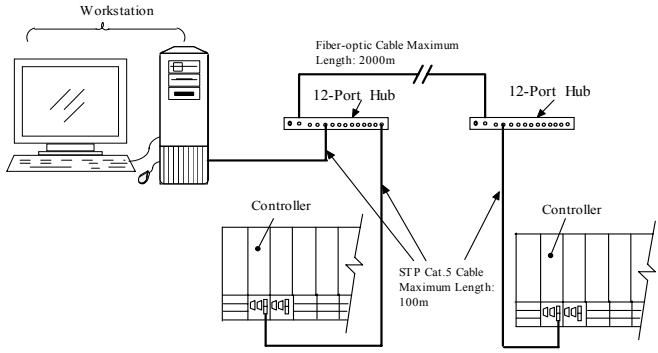


Fig. 2-21 Fiber-Optic Control Network Example

2.3.7.5 Connecting the Control Network to a Plant LAN

You can connect your system to a plant LAN to provide a gateway between the Super E50 Control Network and other networks. The only way to connect a plant LAN to the Super E50 system is through a Super E50 Application Station. To minimize the traffic on the plant-wide LAN, configure a router to filter the IP addresses.

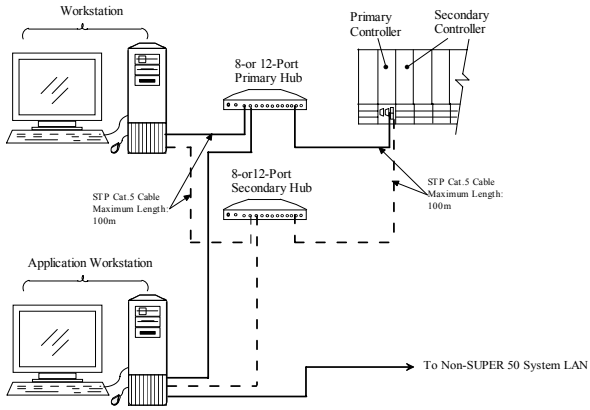


Fig. 2-22 Plant LAN Network Connections

2.3.8 Connecting Power to the System

A bulk power supply provides 24VDC to the system power module HC201 (24VDC/5V) and the field device.

2.3.8.1 To install a bulk power supply

1. Install the bulk power supply mounting plate. (The size of mounting plate is determined by the size of the bulk power supply in fact.) See Appendix J Cabinet and Enclosure Specifications for install station.
2. Mount the bulk power supply.
3. Connect the bulk power supply to input power distribution as shown in Fig. 2-23.

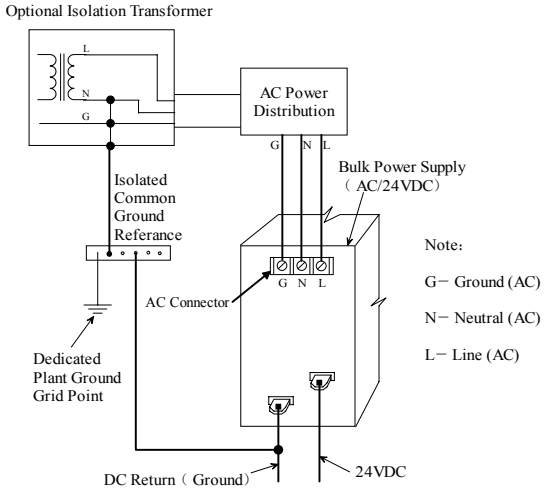


Fig. 2-23 Simplex Power and Ground Wiring Diagram fo Bulk Power Supply(AC/24VDC)

See Fig. K- 1 for system power supply and ground.

Chapter3 Checking Out and Troubleshooting

This chapter provides guidelines to help ensure that your system is installed properly and to help you troubleshoot hardware problems.

After you follow the installation steps, it is recommended that you check out the hardware to ensure a smooth startup. Follow these steps to check out your system:

1. Check the LED indicators on each device.
2. Test the field wiring connections.
3. Check the cable connections.
4. Check the power supply voltages.

More information on these steps is included in this chapter.

After checkout, startup the Super E50 software following the instructions in the manual software.

3.1 Checking Out System

3.1.1 Checking the LED indicators on Each Device

The LED indicators on the system devices show important basic operating data.

Use the following checklists to make sure your devices are working correctly.

Table 3-1 HC201 System spower Supply LED Checklist

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
24VDC (Red)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			AC/24VDC internal fault.	Contact technical service.
5VDC (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Power supply internal fault.	Contact technical service.

Table 3-2 HC501 Controller LED checklist

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault.	Contact technical service.
RUN (Green)	Flashing	Off	Module is running.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	User application program not run.	Not load program.
ERROR (Yellow)	Off	On	Module is not scaned by controller.	Check controller operation.
			Module self-test fault.	Contact technical service.
TX1 (Red)	On	Off	Controller is a Stand-by.	Work normally.
			Controller does not configure this port.	Configure this port.
			If configured this port, is communication fault.	Contact technical service.
RX1(Green)	On	Off	Ditto.	Ditto.
TX2(Red)	On	Off	Ditto.	Ditto.
RX2(Green)	On	Off	Ditto.	Ditto.
E-TX1 (Red)	On	Off	Controller is a Stand-by.	Work nomally.
			Controller dose not configure this port or reserve this function.	Configure this port.
			If configured this port, is communication fault.	Contact technical service.
E-RX1 (Green)	On	Off	Ditto.	Ditto.
LINK1 (Yellow)	Off	On	The communication faul t of the primary Control Network.	Check the cable of the primary Control Network and the connection of hubs.
E-TX2	On	Off	Controller is a Stand-by.	Work normally.

(Red)			Controller dose not configure this port or reserve this function.	Configure this port.
			If configured this port, is communication fault.	Contact technical service.
E-RX2 (Green)	On	Off	Ditto.	Ditto.
LINK2 (Yellow)	Off	On	The communication fault of the secondary Control Network.	Check the cable of the secondary Control Network and the connection of hubs.

Table 3-3 Media Converter LED Checklist

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
ERROR (Red)	Off	On	Network fault.	Contact technical service.
Pri. F Llink (Green)	On	Off	The connection of fibre-optic fault.	Check the connection of fiber-optic.
Pri. C Llink (Green)	On	Off	The connection of the twisted-pair cables is not correct.	Check cable pinouts refer to Fig.H- 1.
Sec. F Llink (Green)	On	Off	The connection of fibre-optic is not correct.	Check the connection of fiber-optic.
Sec. C Llink (Green)	On	Off	The connection of the twisted-pair cables is not correct.	Check cable pinouts refer to Fig.H- 1.

Table 3-4 ***HC101*** *AI Module LED Checklist*

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault.	Contact technical service.
RUN (Green)	Flashing	Off	Module is not scaned by controller.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	Module is not running.	Check the connection of power.
ERROR (Yellow)	Off	On	Module self-test fault or some components fault.	Contact technical service.
AI1~AI8 (Green)	On	Off	This channel does not connect to the external devices.	
			Over nominal signal range. See Appendix C.1.8 for technical specifications.	Check signals source and their connections.
			Internal fault.	Contact technical service.

Table 3-5 ***HC104 RTD*** *Module LED Checklist*

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault.	Contact technical service.
RUN (Green)	Flashing	Off	Module is not scaned by controller.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	Module is not running.	Check the connection of power.
ERROR (Yellow)	Off	On	Module self-test fault or some components fault.	Contact technical service.
RTD1~ RTD4 (Green)	On	Off	This channel does not connecte to the external devices.	
			Over nominal signal range. See Appendix C.2.10 for technical specifications.	Check signals and their connections.
			Internal fault.	Contact technical service.

*Table 3-6 **HC121** AO Module LED Checklist*

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault.	Contact technical service.
RUN (Green)	Flashing	Off	Module is not scaned by controller.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	Module is not running.	Check the connection of power.
ERROR (Yellow)	Off	On	Module self-test fault or some components fault.	Contact technical service.
AO1~AO4 (Green)	On	Off	There is not output loading.	Check output connection.
			Internal fault.	Contact technical service.

*Table 3-7 **HC112** DI Module LED Checklist*

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault.	Contact technical service.
RUN (Green)	Flashing	Off	Module is not scaned by controller.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	Module is not running.	Check the connection of power.
ERROR (Yellow)	Off	On	Module self-test fault or some components fault.	Contact technical service.
DI1~DI16	"On", input signal is higher than detection level; "Off", input signal is lower than detection level. See Appendix C.4.8 Specifications			

*Table 3-8 **HC133** DO Module LED Checklist*

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault.	Contact technical service.
RUN (Green)	Flashing	Off	Module is not scaned by controller.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	Module is not running.	Check the connection of power.
ERROR (Yellow)	Off	On	Module self-test fault or some components fault.	Contact technical service.
DO1~DO16 (Green)	"On", there has output signal; "Off", there has not output signal. See Appendix C.5.8 Specifications.			

*Table 3-9 **HC141** PI Module LED Checklist*

LED	Correct Operating Conditions	Fault Indications	Probable Cause	Corrective Action
POWER (Green)	On	Off	Power is not supplied to unit. Possible line power problem.	Check supply power and connections.
			Internal fault	Contact technical service.
RUN (Green)	Flashing	Off	Module is not scaned by controller.	Check supply power and bus connection, or resistance matching setting.
STATE (Red)	Flashing	Off	Module is not running.	Check the connection of power.
ERROR (Yellow)	Off	On	Module self-test fault or some components fault.	Contact technical service.
PI1~PI4	"On", there has input signal; "Off", there has not input signal. See Appendix C.6.8 Specifications.			

3.1.2 Testing the Field Wiring Connections

To troubleshoot field wiring connection problems, test access points are located on the I/O terminal blocks. The access point for each wire connection is located in the square hole above the corresponding field screw terminal. To contact the field signals, use a test probe at least 25mm long and 2mm or less diameter.

To determine the expected voltage levels for you application, refer to the:

- Wiring diagrams for the specific I/O card type in Appendix C.
- Connection information supplied with your field device.

Caution: *The test probe is not retained within the access hole. It can fall out and short across field wiring if it is not held in place.*

3.1.3 Checking the Communication Cable Connections

Use the Cat5 cables testing tool to test the cables to the specifications. The test equipment must be connected bo both ends of the cable. Make sure the cable passes each test.

3.1.4 Checking the Power Supply Voltages

When fault indications in Table 3-1 through Table 3-9 indicate that you need to check power supply and connections or check power voltages, verify that the voltages are in the proper range at all associated screw terminal connections. See Appendix K Power and Grounding Notes.

When fault indications in Table 3-1 through Table 3-10 indicate that you need to check output loading, verify that the voltages are in the proper range(±5%) at all associated screw terminal connections. Also, verify that the expected load is within the capacity of the unit by checking the calculations in Appendix K Power and Grounding Notes.

3.2 Getting Help

There are several ways to gather information about your Super E50 system.

3.2.1 Online Help

The online help feature of the Super E50 system gives you information on many topics.

3.2.2 Books Online

Books Online provides detailed information on installing, configuring, operating, and troubleshooting your Super E50 system.

3.2.3 World Wide Web Page

Informations and other associated messages are available on the **Super E50** World Wide Web page.

3.2.4 Manuals

Hardware manual is this book;

Software configure manual is *ESet2010 Manual*.

3.2.5 Technical Service

There are several options available for technical service, including help desk support, remote diagnosis, 24-hour emergency support, and software update service.

If the information presented in this manual does not solve your problem, contract Technical Support at one of the following numbers:

Sale Service:

Techincal Service:

Fax:

Make sure you have the following information ready before you call or include it in your fax:

- System Identification Number
- Software Version Number
- Description of the problem

Appendix A Environmental Specifications

All **Super E50** system products meet the appropriate European standards for Electromagnetic Compatibility and carry the CE mark.

The following tables list the environmental specifications for normal operation of

Super E50 system device: Table A- 1 lists temperature and relative humidity specifications. Table A- 2 lists airborne contaminants, vibration, and shock specifications.

Table A- 1 ***Super E50*** *System Environmental Specifications (1)*

Device	Operating Temperature	Storage Temperature	Relative Humidity
Workstation	10 ~ 35℃ maximum 10℃ change per hour	-20 ~ 60℃	20 ~ 80% RH non-condensing
System power supplies, controller and I/O module	-40℃ ~ 70℃	-50 ~80℃	5 ~ 95% RH non-condensing

Table A- 2 ***Super E50*** *System Environmental Specifications（2）*

Device	Airborne Contaminants	Vibration	Shock
Workstation		Botton only： 0.25g, 0-to-peak， 3~200Hz sweep at 2 octaves/min	Botton only: 1/2-sine pulse with ∆Velocity=20in/s,
System power supplies, controller, I/O module	ISA-S71.04-1985 Airbore Contaminants Class G2	1mm peak-to peak from 5 ~ 16Hz 0.5g from 16~150Hz	10g 1/2-sine wave for 11ms

Appendix B Carrier Specifications

B.1 Single Modular Carrier A (HC802)

Table B- 1 Single Modular Carrier A (HC802) Specifications

Item	Specification
Capacity	One system power supply

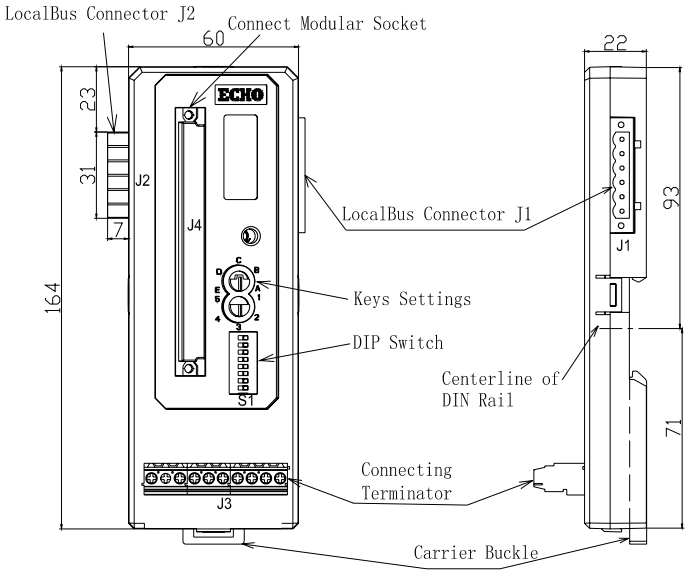


Fig.B- 1

B.2 Single Modular Carrier E (HC815)

Table B- 2 Single Modular Carrier E (HC815) Specifications

Item	Specification
Capacity	One controller module

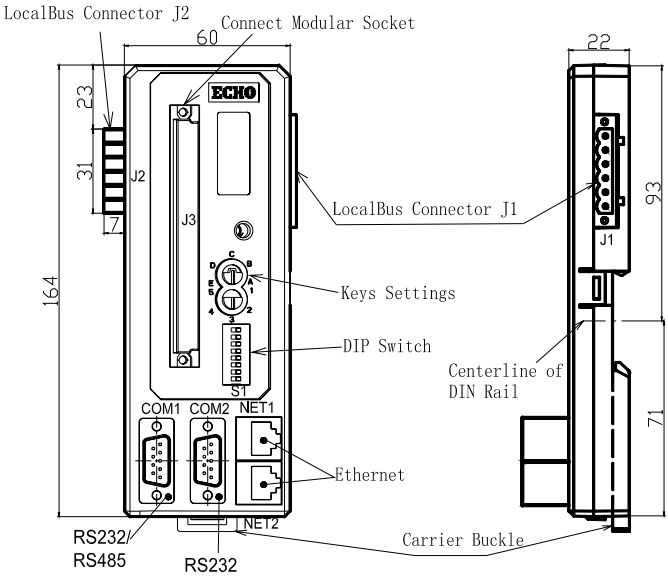


Fig.B- 2

B.3 Single Modular Carrier C (HC801)

Table B- 3 Single Modular Carrier C (HC801) Specifications

Item	Specification
Capacity	One I/O module

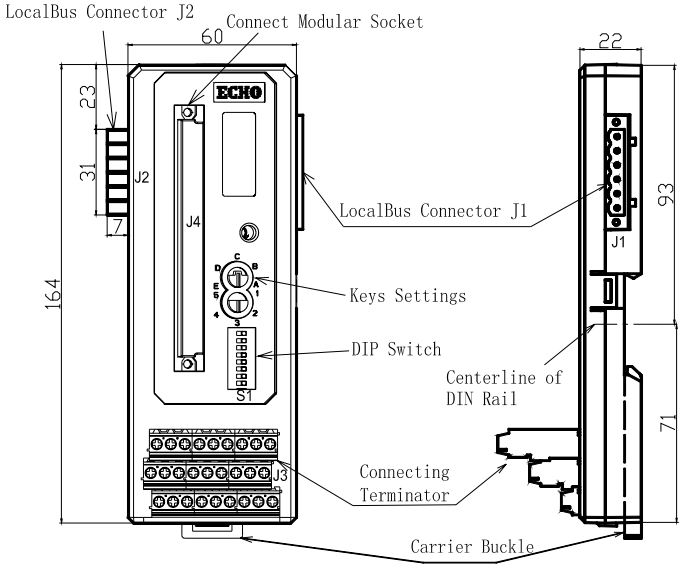


Fig.B- 3

B.4 Single Modular Carrier D (HC803)

Table B- 4 Single Modular Carrier D (HC803) Specifications

Item	Specification
Capacity	One extension module

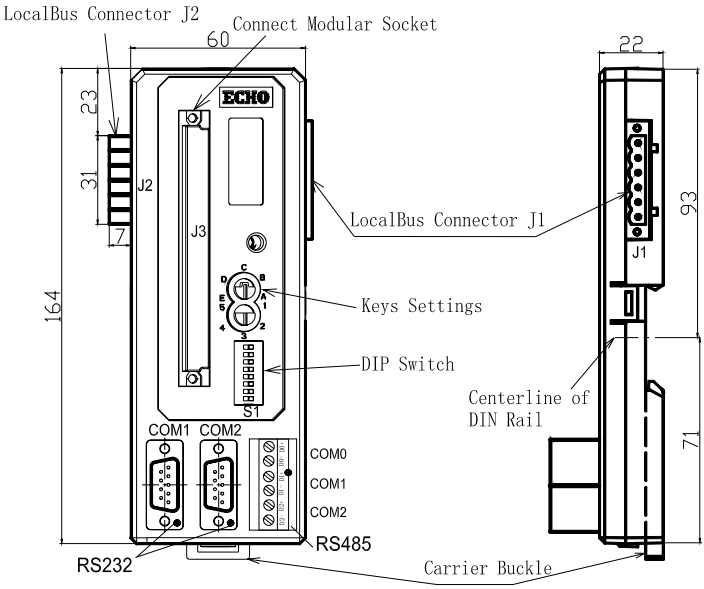


Fig.B- 4

B.5 Double Modular Carrier C (HC815R)

Table B- 5 Double Modular Carrier C (HC815R) Specifications

Item	Specification
Capacity	Two controller modules for redundance (primary, secondary)

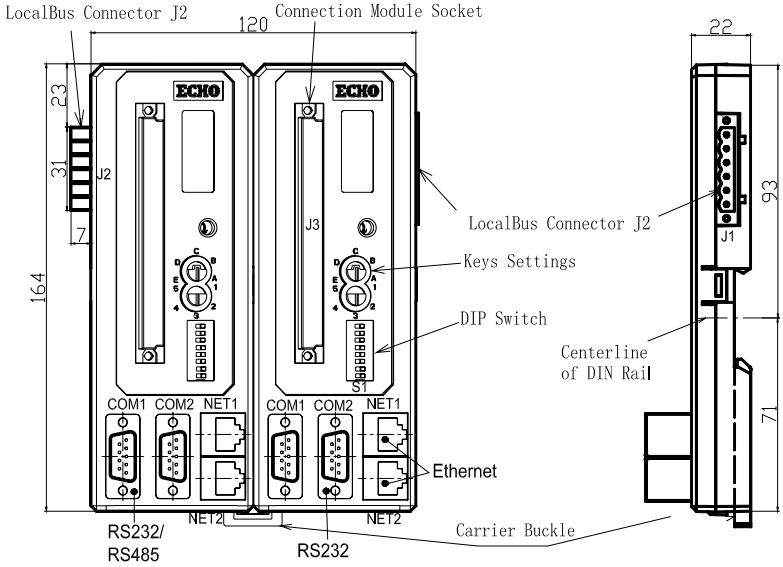


Fig.B- 5

B.6 Double Modular Carrier B (HC806)

Table B- 6 Double Modular Carrier B (HC806) Specifications

Item	Specification
Capacity	One controller module, one IO module

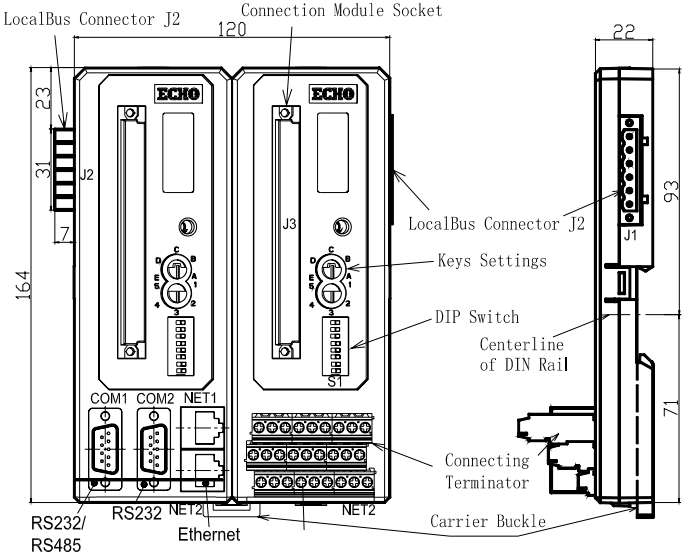


Fig.B- 6

B.7 Keys Settings

The two keys on the carrier should match with the other two keys on the installed module in order to install module on the carrier. The keys on the module are set at factory. Keys on different location correspond with different module types. You should not modify it. If you want to use others module carrier, you should change the keys on the carrier to match the corresponding module. Attention if you change the keys, the terminal definition of the carrier will be changed. The corresponding keys settings for

each module is shown below.

Table B- 7 Keys Settings for each Module

No.	Type	Description	Module Keying
1	HC201	Power Module (24VDC/5VDC)	**B1**
2	HC511	Primary Controller module	**E3**
3	HC511R	Secondary controller module	**D5**
4	HC101	8 AI	**A1**
5	HC104	4 RTD	**A3**
6	HC121	4 AO	**A2**
7	HC112	16 DI (common source)	**D3**
8	HC133	16DO ((common source)	**D4**
9	HC141	4 PI	**C1**
10	HC301	Extension module	**E1**
11	HC601	HC601controller module	**E2**
		HC601 IO module	**C3**

Fig.B- 7 shows the primary controller module key setting example.

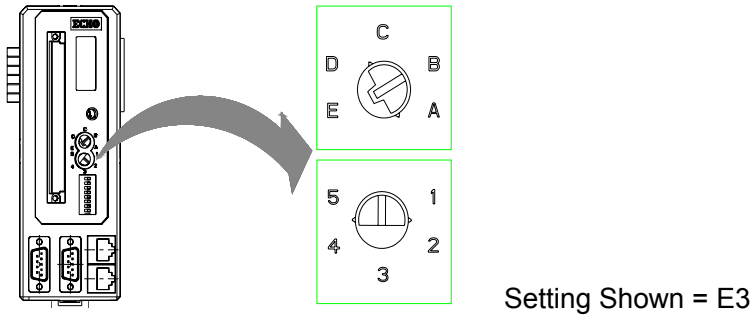


Fig.B- 7 Contrller Module Carrier Key Setting Example

B.8 DIP Switches

B.8.1 Single Modular Carrier C,D（HC801, HC803）

Set the module address and the terminal resistance on the module LocalBus by change the DIP switches on the Single Modular Carrier C,D（HC801, HC803）.

1. Setting module communication address fom 1 to 7 bits

Setting module communication address from 1 to 7 bits, range from 1 to 127. According to preconcert setting of communication address binary value, when set one bit of the DIP switch to “ON”, the corresponding binary value is “1”; when set one bit of the DIP switch to “OFF”, the corresponding binary value is “0”. The low bit of the DIP switch is corresponding to the low bit of the communication address binary value. The corresponding relation of module communication address binary bit and the DIP switch location is shown in Fig.B- 8 DIP Switches Settings of module communication address.

2. Setting terminal resistance by the 8th bit

Terminal resisitors between the module’s local bus are required because of the data transport quality. The head terminal resistor locate at the controller module carrier, and the tail terminal resistor locate at the last I/O module on the local bus.

To enable the terminal resisitors, dial the 8th bit to “ON“ position.

See Fig.B- 8 DIP Switches Settings of module communication address.

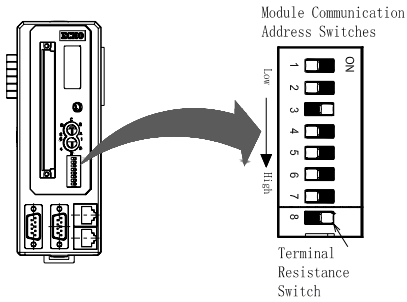


Fig.B- 8 DIP Switches Settings of module communication address

B.8.2 Double Modular Carrier C（HC815R）

Set Master/Slave Mode of the Controller Redundancy and the terminal resistance on the module LocalBus by change the DIP switches on the Double Modular Carrier A（HC805R）.

1. Setting Master/Slave Mode of the controller redundance by the 7th bit

Set Master/Slave Mode of the controller redundancy by the 7th bit.

When one of the 7th bit on the DIP Switches is set to “ON“ position (Maste Mode), the others must be set to “OFF“ (Slave Mode). .

2. Setting terminal resistance by the 8th bit

See B.8.1, about terminal resistance setting.

3. DIP Switches fom 1 to 6 bits are reserved.

B.8.3 Single Modular Carrier E（HC815）

Set the terminal resistance on the module LocalBus by change the DIP switches on the Single Modular Carrier B（HC805）.

1. Setting terminal resistance by the 8th bit

See B.8.1, about terminal resistance setting.

2. DIP Switches fom 1 to 7 bits are reserved.

B.8.4 Double Modular Carrier B（HC806）

B.8.4.1 Running in Super E50 System

When Double Modular Carrier B（HC806）running in Super E50 System, the DIP Switches setting on the controller module carrier see B.8.1, and the DIP Switches

setting on the I/O module carrier are no definition.

B.8.4.2 HC601 Running Oneself

When HC601 running oneself, the DIP Switches setting on the Double Modular Carrier B（HC806） are no definition.

B.8.5 Single Modular Carrier A (HC802)

Tthe DIP Switches setting on the Single Modular Carrier A（HC802） are no definition.

B.9 Module LocalBus Connector

B.9.1 Port Definition

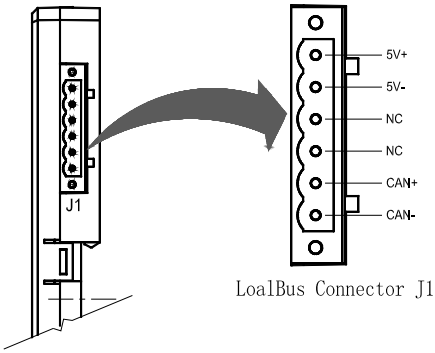


Fig.B- 9 Port Definition

B.9.2 Connection between the Carriers

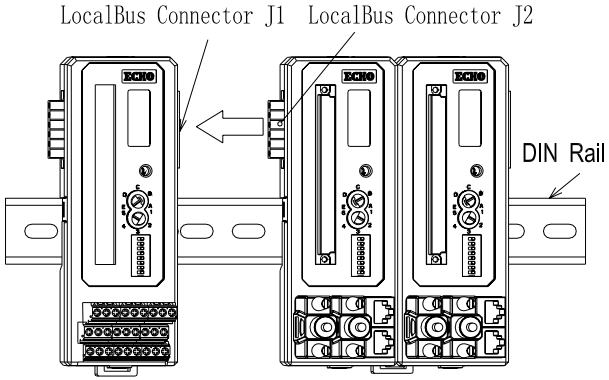


Fig.B- 10

B.9.3 Extension Cable to Connect

When I/O module carriers are in the different DIN rails, we use the extension cables to connect module LocalBus between the two groups of the carriers.

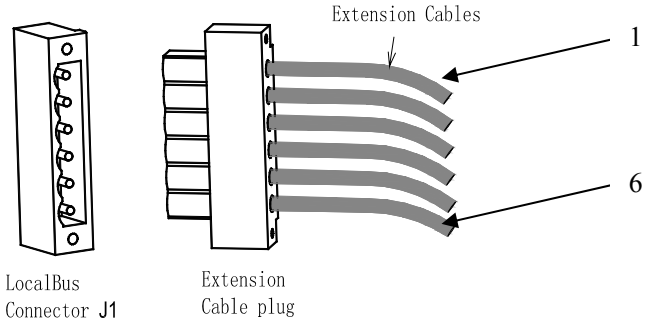


Fig.B- 11

Connection meanings:

1	＋5V
2	－5V
3	Reserved
4	Reserved
5	CAN＋
6	CAN－

Appendix C I/O Module Specifications

Super E50 I/O subsystem supports multiple types of I/O modules, including analog and discrete input and output modules, RTD input module, PI input module and plans to develop the HART input module and Profibus DP interface module etc.

Super E50 I/O subsystem consists of a connecting terminator that snaps onto the carrier to provide screw termination for field wiring and the actual I/O module which snaps over the terminator and onto the carrier. I/O module is hot swapable. The carrier can be installed conveniently onto the DIN rail. The field signals wiring can be connected to the connecting terminator.

C.1 HC101 (8AI) Module

HC101 module provides eight analog inputs, sharing a public input terminal (GND). **HC101** module use connecting terminator for field wiring.

External 24V power supplies power for input circuit. A wide range of voltages can be tolerated.

There are two kinds of transmitters: Active transmitter and Passive transmitter. Active transmitter is connected between the analog input and GND; Passive transmitter is connected to +24V and the analog input, to form a loop.

C.1.1 Panel and Dimension

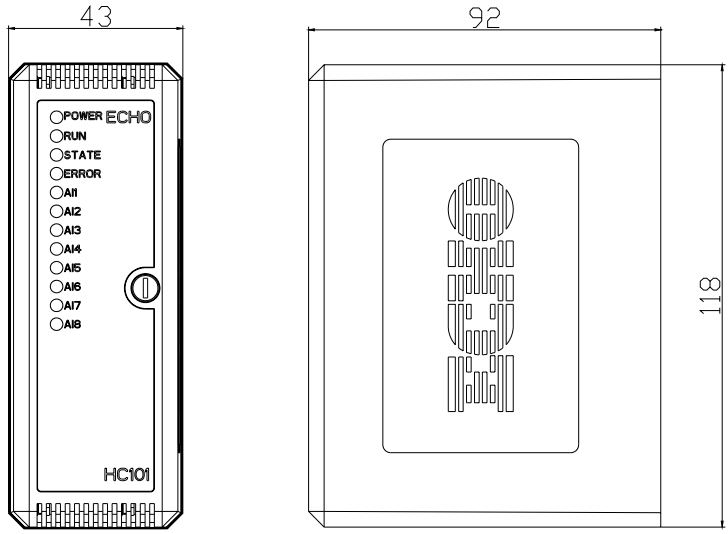


Fig.C- 1 ***HC101*** *Module Panel and Dimension*

C.1.2 Connecting Terminator

The connecting terminator is located at the Single Modular Carrier C (HC801). See Appendix B.3 Single Modular Carrier C（HC801）for detail.

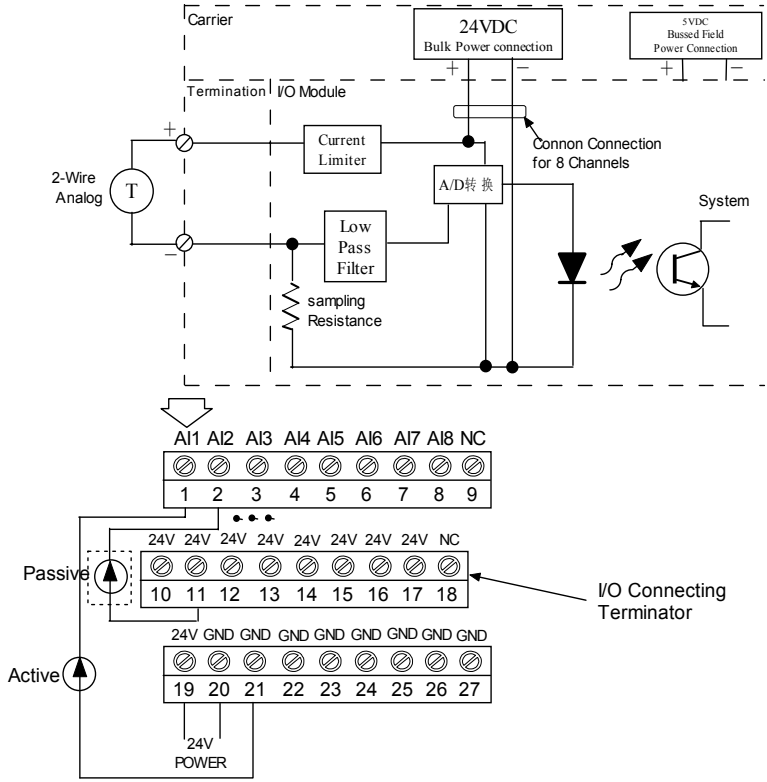


Fig.C- 2 ***HC101*** *Wiring Diagram*

C.1.3 Status Indicator LEDs

Table C- 1

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	”blinking” shows module communicates data with CPU module.
STATE	red	”blinking” shows module is running.
ERROR	yellow	“On” shows system error.
AI1	green	"On" shows the input current of channel 1 is more than 3.8 mA.
AI2	green	"On" shows the input current of channel 2 is more than 3.8 mA.
AI3	green	"On" shows the input current of channel 3 is more than 3.8 mA.
AI4	green	"On" shows the input current of channel 4 is more than 3.8 mA.
AI5	green	"On" shows the input current of channel 5 is more than 3.8 mA.
AI6	green	"On" shows the input current of channel 6 is more than 3.8 mA.
AI7	green	"On" shows the input current of channel 7 is more than 3.8 mA.
AI8	green	"On"shows the input current of channel 8 is more than 3.8 mA.

C.1.4 Power Supply

HC101 module operation power is 5V±0.1V@90mA, supplied by the module carrier.

The power supply of external analog channels is 24V±2V@80mA.

C.1.5 Module Address Settings

Each of I/O module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

C.1.6 Signal Register

CPU module reads the values of the AI signal registers (named slave registers in ESet tool) through LocalBus, after some settings in **ESet** tools. See ***ESet2010 Manual*** for

details.

Data from each AI channel of HC101 are placed in registers as below, the signal type is R_Input (read input register). The corresponding register addresses for each channel are shown below.

Table C- 2

AI channel	Registers of Current Standard Value	Registers of Current engineering Value
AI1	30001	30031
AI2	30002	30033
AI3	30003	30035
AI4	30004	30037
AI5	30005	30039
AI6	30006	30041
AI7	30007	30043
AI8	30008	30045

The specific operations of module configuration are shown in ***ESet2010 Manual***.

C.1.7 Data Format

The data format of **Super E50** system AI module is 16-bit un-signed。

HC101 module has a 16-bit, no- polarity A/D converter. There are a total of 65,535 sample points in the input signals.

The following table shows output data after A/D conversion.

Table C- 3

AI value (Current Type)	AI value (Voltage Type)	output data (Standard Value)
<4.000mA	<1.000V	<10000
4.000mA	1.000V	10000
8.000mA	2.000V	20000
12.000mA	3.000V	30000
16.000mA	4.000V	40000
20.000mA	5.000V	50000
20.500mA	5.125V	51250
>20.500mA	>5.125V	>51250

C.1.8 Specifications

Table C- 4

Item	Specification
Number of channels	8
Isolation	Each channel is optically isolated from system, verified by 1700VDC factory test.
Nominal signal range	4~20mA
Full signal range	1~22.5mA (over range test)
LED display range	0.38~23mA
Module power	5VDC ±2% @90mA
Field circuit power, per module	24VDC ±10%@80mA
Resolution	16 bits
Data update time	10ms
Output compliance	10ms
Transient protection	In each channel are equipped with transient suppression circuitry
Calibration	Has been calibrated in factory
Accuracy	±0.3%×full scale 25℃; ±0.5%×full scale the entire temperature range
Communication Interface	CAN Bus
Installation	Assigned slot of I/O carrier，fixed with screws
Terminal	3×9-bit，12～22AWG，contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% relative humidity, non-condensing

C.2 HC104 (4RTD) Module

HC104 module is intelligent 4-channel thermal resistance analog input module, used for dealing with the field thermal resistance input signal. **HC104** connects with Pt100 etc. temperature resistance, within the scope of 80.3 to 175.8Ω through configuration. Corresponding range of measuring temperature is -50℃ to 200℃。The I/O bus can be installed 32 **HC104** module, measuring 128 channels thermal resistance signal. All the inputs have transient protection and are separated with the internal operation power.

C.2.1 Panel and Dimension

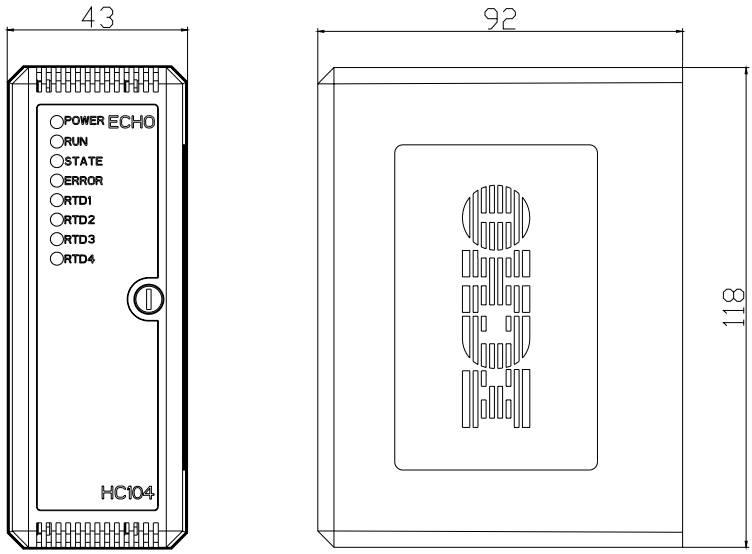


Fig.C- 3 ***HC104*** *Module Panel and Dimension*

C.2.2 Connecting Terminator

HC104 module provides 4-channel three-wire input RTD. External 24V power supples power for input circuit.

The connecting terminator is located at the Single Modular Carrier C (HC801). See Appendix B.3 Single Modular Carrier C（HC801）for detail.

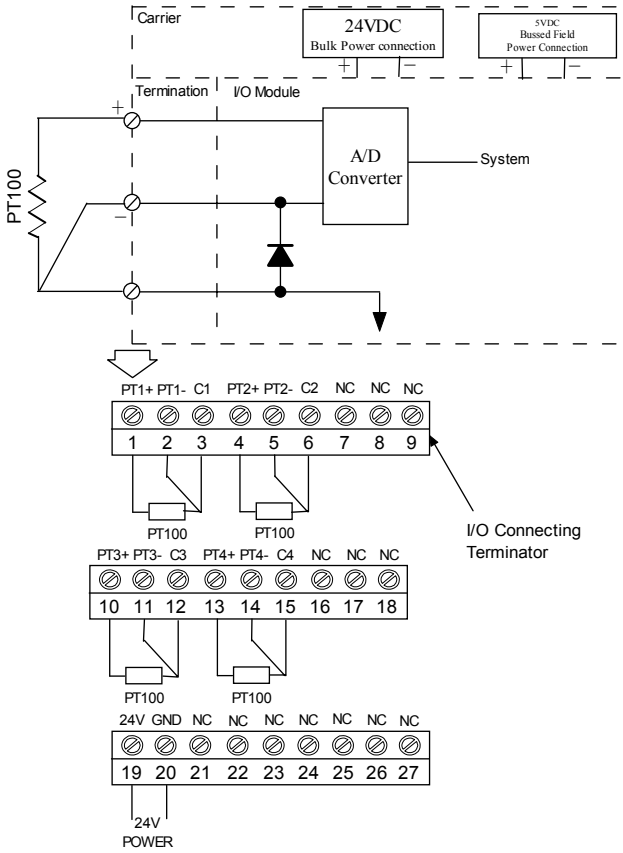


Fig.C- 4 ***HC104*** *Module Wiring Diagram*

C.2.3 Status Indicator LEDs

Table C- 5

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	”blinking” shows module is running.
STATE	red	”blinking” shows module communicates data with CPUmodule.
ERROR	yellow	"On" shows system error.
RTD1	green	"On" shows the resistance of channel 1 is between 80~175Ω.
RTD 2	green	"On" shows the resistance of channel 2 is between 80~175Ω.
RTD 3	green	"On" shows the resistance of channel 3 is between 80~175Ω.
RTD 4	green	"On" shows the resistance of channel 4 is between 80~175Ω.

C.2.4 Power Supply

HC104 module operation power is 5V±0.1V@85mA, supplied by the module carrier.

The power supply of external analog channels is 24V±2V@60mA.

C.2.5 Module Address Settings

Each of I/O module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

C.2.6 Signal Register

CPU module reads the values of the RTD signal registers (named slave registers in ESet tool) through LocalBus, after some settings in **ESet** tools. See ***ESet2010 Manual*** for details.

Data from each RTD channel of HC104 are placed in registers as below, the signal type is R_Input (read input register). The corresponding register addresses for each

channel are shown below.

Table C- 6

Channel No.	Register of Temperature standard value	Register of Resistance floating-point value	Register of Temperature floating-point value
Channel 1	30201	30231	30251
Channel 2	30202	30233	30253
Channel 3	30203	30235	30255
Channel 4	30204	30237	30257

The specific operations of module configuration are shown in ***ESet2010 Manual***.

C.2.7 Data Format

HC104 module has a 16-bit, no- polarity A/D converter. There are a total of 65,535 sample points in the input signals. The following table shows the output value of input signal after A/D conversion. -50~200℃ for example.

Table C- 7

Input resistance value(Ω)	Temperature standard value
80.30	10000
100.00	18000
138.50	34000
157.10	42000
175.80	50000

Note：*Temperature integer value has relationship with temperature range, the lower range is corresponding 10000, and the upperer range is corresponding* 50000.

C.2.8 Off-line Detection

HC104 module has the function of input thermal resistance disconnection detection.

When the signal is interrupted, the register values are as follows:

Table C- 8

Thermal Resistance State	Temperature Integer Value
Thermal resistance disconnected	0
PTn+ pin broken	About 14015
PTn- pin broken	0
Cn pin broken	0
n – 1,2,3,4	

The output value above the table in the actual use just provide partial the judgement about error. This can facilitate the missionary to judge the reasons for the failure.

C.2.9 Cautions

HC104 module acquisits the signal of resistance, when channel input is not receiving signals, the input resistance is in the vacant state, resulting in the acquisition of resistance uncertain. Sometimes the channel indicator will be bright. The phenomenon is normal, it's not a failure.

C.2.10 Specifications

Table C- 9

Item	Specification
Number of channels	4
Sensor Types	PT100
Full scale signal range	80.30~175.8Ω (-50~200℃)
Module power	5VDC ±2%@85mA
Field circuit power, per module	24VDC ±10%@60mA
Resolution	16 bits
Data update time	100ms
A/D isolation	500VAC
Transient protection	In each channel are equipped with transient suppression circuitry
Calibration	Has been calibrated in factory.
Accuracy	±0.3%×full scale （25℃）; ±0.6%×full scale the entire temperature range
Communication Interface	CAN Bus
Installation	Assigned slot of I/O carrier，fixed with screws
Terminal	3×9-bit，12～22AWG，contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% relative humidity, non-condensing

C.3 HC121 (4AO) Module

HC121 module is intelligent 4-channel 4~20mA analog output module. It outputs 4~20mA current signal with 16-bit resolution. The I/O bus can be installed 32 **HC121** module, measuring 128 channels contact signal. **HC121** module can controlle electric valve, motor controller, temperature controller, and other equipments which need the analog signal control.

The outputs are separated with the main logical power, and have transient protection.

Connecting a load resistance to output can obtain voltage output, the voltage range is determined by the load resistance.

C.3.1 Panel and Dimension

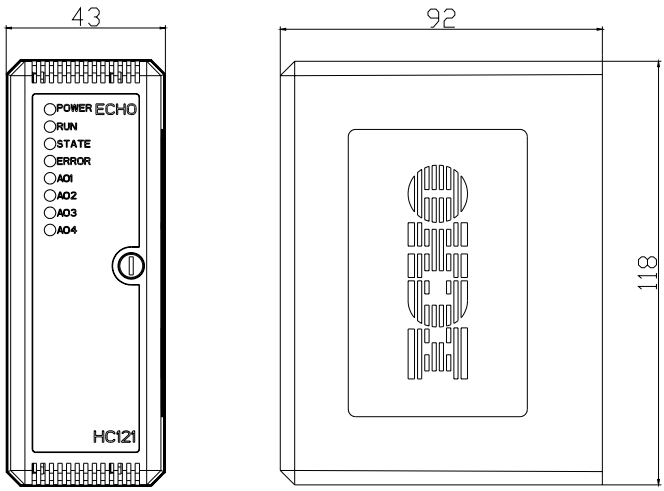


*Fig.C- 5 **HC121** Module Panel and Dimension*

C.3.2 Connecting Terminator

The connecting terminator is located at the Single Modular Carrier C (HC801). See Appendix B.3 Single Modular Carrier C（HC801）for detail.

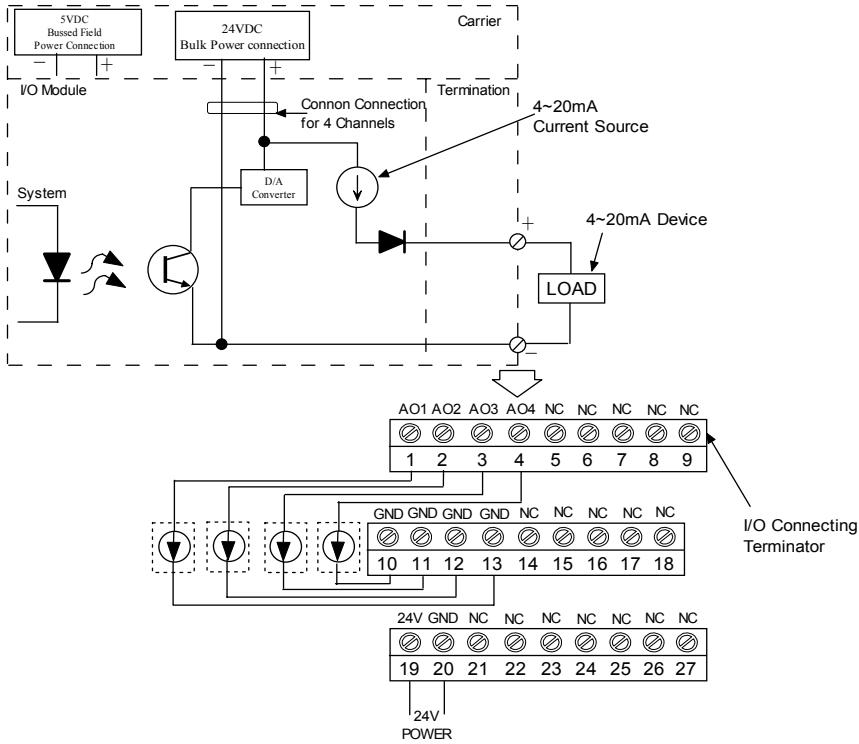


Fig.C- 6 ***HC121*** *Module Wiring Diagram*

C.3.3 Status Indicator LEDs

Table C- 10

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	”blinking” shows module communicates data with CPU module.
STATE	red	”blinking” shows module is running.
ERROR	yellow	“On” shows system error.
AO1	green	“On” shows load exists in channel 1, output is on.
AO2	green	“On” shows load exists in channel 2, output is on.
AO3	green	“On” shows load exists in channel 3, output is on.
AO4	green	“On” shows load exists in channel 4, output is on.

C.3.4 Power Supply

HC121 module 5V±0.1V@90mA operation power is supplied by the module carrier.

The power supply of output circuit is 12~24V.

C.3.5 Module Address Settings

Each of I/O module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

C.3.6 Signal Register

After some settings in **ESet** tools, the controller module writes the values to the AO signal registers (named slave registers in **ESet** tool) through localBus. See ***ESet2010 Manual*** for details.

Data of each AO channel are placed in registers as below, the signal type is R_Hold (read hold register). The corresponding register addresses for each channel are shown

below.

Table C- 11

AO Channel No.	Register of AO standard value
1	40001
2	40002
3	40003
4	40004

The specific operations of module configuration are shown in *ESet2010 Manual.*

C.3.7 Data Format

The output value of **HC121** module is a 16-bit unsigned data.

Table C- 12

Output standard value	Output current value
<10000	<4.000mA
10000	4.000mA
20000	8.000mA
30000	12.000mA
40000	16.000mA
50000	20.000mA

C.3.8 Specifications

Table C- 13

Item	Specification
Number of channels	4
Isolation	Each channel is optically isolated from system, verified by 1700VDC factory test.
Nominal signal range	4~20mA
Full signal range	1~22.5mA (over range test)
LED display range	0.38~23mA
Module power	5VDC ±2% @90mA
Field circuit power,per module	24VDC ±10%@80mA
Resolution	16 bits PWM Output
Data update time	100ms
Transient protection	In each channel are equipped with transie uppression circuitry
Output compliance	Load <700Ω
Calibration	Has been calibrated in factory
Accuracy	±0.3%×full scale 25℃ ±0.5%×full scale the entire temperature range
Communication Interface	CAN Bus
Installation	Assigned slot of I/O carrier，fixed with screws
Terminal	3×9-bit，12～22AWG，contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% relative humidity, non-condensing

C.4 HC112 (16DI) Module

HC112 module is intelligent 16-channel DI digital sampling module, used for dealing with the on-site level switching input signal. The I/O bus can be installed 32 HC112 module, measuring 512 channels contact signal. The 16 channels DI of **HC112** module is one group. In one group, the signal channels share a ground. All the inputs have transient protection and are separated with the main logical power.

LEDs on the module show the status of each input.

C.4.1 Panel and Dimension

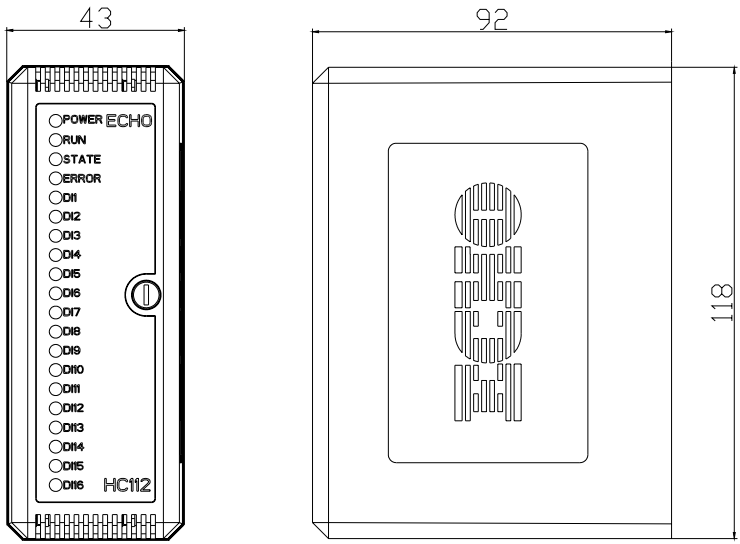


*Fig.C- 7 **HC112** Module Panel and Dimension*

C.4.2 Connecting Terminator

The connecting terminator is located at the Single Modular Carrier C (HC801). See Appendix B.3 Single Modular Carrier C（HC801） for detail.

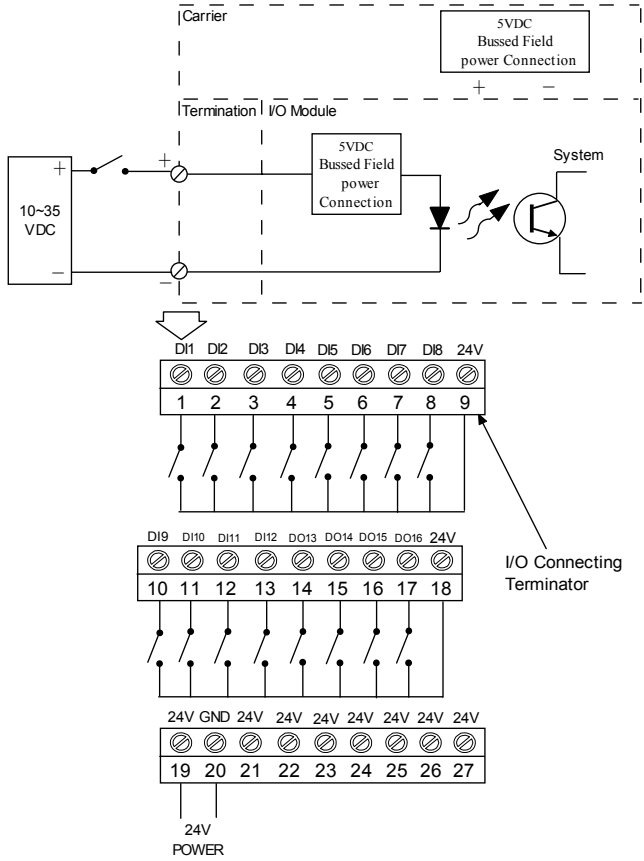


*Fig.C- 8 **HC112** Module Wiring Diagram*

C.4.3 Status Indicator LEDs

Table C- 14

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	”blinking” shows module communicates data with CPU module.
STATE	red	”blinking” shows module is running.
ERROR	yellow	“On” shows system error.
DI1	green	"On" shows the input voltage of channel 1 is greater than 8V
DI2	green	"On" shows the input voltage of channel 2 is greater than 8V
DI3	green	"On" shows the input voltage of channel 3 is greater than 8V
DI4	green	"On" shows the input voltage of channel 4 is greater than 8V
DI5	green	"On" shows the input voltage of channel 5 is greater than 8V
DI6	green	"On" shows the input voltage of channel 6 is greater than 8V
DI7	green	"On" shows the input voltage of channel 7 is greater than 8V
DI8	green	"On" shows the input voltage of channel 8 is greater than 8V
DI9	green	"On" shows the input voltage of channel 9 is greater than 8V
DI10	green	"On" shows the input voltage of channel 10 is greater than 8V
DI11	green	“On” shows the input voltage of channel 11 is greater than 8V
DI12	green	"On" shows the input voltage of channel 12 is greater than 8V
DI13	green	"On" shows the input voltage of channel 13 is greater than 8V
DI14	green	"On" shows the input voltage of channel 14 is greater than 8V
DI15	green	"On" shows the input voltage of channel 15 is greater than 8V
DI16	green	“On” shows the input voltage of channel 16 is greater than 8V

C.4.4 Power Supply

HC112 module 5V±0.1V@90mA operation power is supplied by the module carrier.

C.4.5 Module Address Settings

Each of I/O module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

C.4.6 Signal Register

CPU module reads the values of the DI signal registers (named slave registers in **ESet** tool) through LocalBus, after some settings in **ESet** tools. See ***ESet2010 Manual*** for details.

Data from each DI channel of HC112 are placed in registers as below, the signal type is R_State (read state register). The corresponding register addresses for each channel are shown below.

Table C- 15

Channel No.	1	2	3	4
Data register	10001	10002	10003	10004
Channel No.	5	6	7	8
Data register	10005	10006	10007	10008
Channel No.	9	10	11	12
Data register	10009	10010	10011	10012
Channel No.	13	14	15	16
Data register	10013	10014	10015	10016

The specific operations of module configuration are shown in ***ESet2010 Manual***.

C.4.7 Data Format

HC112 module collects DI signal, and store them to the register in BOOL data type, data:

Table C- 16

Input	Register data
＞8V	ON
＜3V	OFF

C.4.8 Specifications

Table C- 17

Item	Specification
Number of channels	16
Isolation	Each channel is optically isolated from system, verified by 1500VDC factory test.
Detection level for ON	8VDC ~ 26VDC
Detection level for OFF	3VDC
Input load	5mA@24VDC
Module power	5VDC ±2% @90mA
Field circuit power,per module	24VDC ±10%@100mA
Data update time	10ms
Frequency range of Input signal	0~30Hz
Transient protection	In each channel are equipped with transient suppression circuitry
Communication Interface	CAN Bus
Installation	Assigned slot of I/O carrier，fixed with screws
Terminal	3 × 9-bit， 12 ～ 22AWG， contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% relative humidity, non-condensing

C.5 HC133（16DO）Module

HC133 module is intelligent 16-channel FET digital output module; it constitutes a complete DO unit with the correlative relays, to provide passive-switch output signal and control the on/off and run/stop of the on-site equipments. The I/O bus can be installed 32 **HC133** module, measuring 512 channels contact signal.

Photoelectric isolation exists between **HC133** 16- channel FET output and logic power.

C.5.1 Panel and Dimension

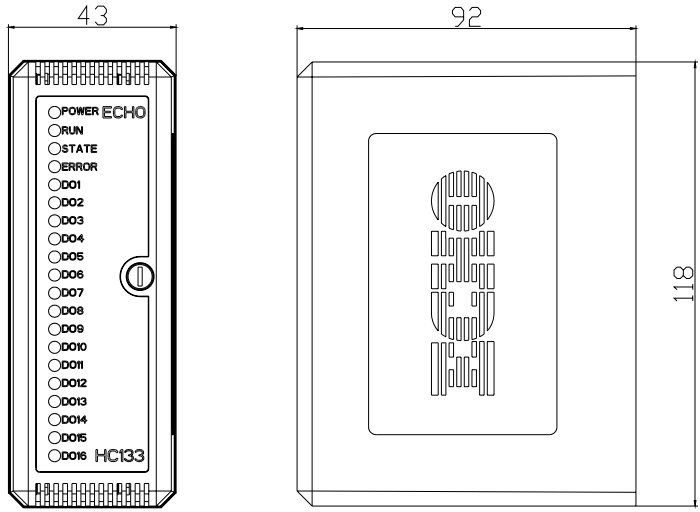


Fig.C- 9 HC133 Module Panel and Dimension

C.5.2 Connecting Terminator

The connecting terminator is located at the Single Modular Carrier C (HC801). See Appendix B.3 Single Modular Carrier C（HC801） for detail.

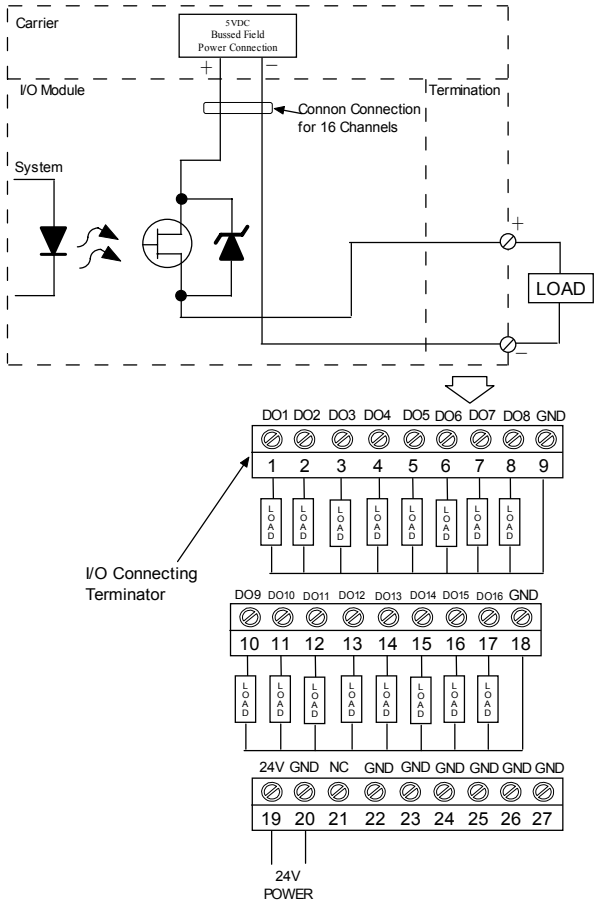


Fig.C- 10 ***HC133*** *Module Wiring Diagram*

C.5.3 Status Indicator LEDs

Table C- 18

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	”blinking” shows module is running.
STATE	red	”blinking” shows module communicates data with CPU module.
ERROR	yellow	“On” shows system error.
DO1	green	“On” shows channel 1’s output is “ON”.
DO2	green	“On” shows channel 2’s output is “ON”.
DO3	green	“On” shows channel 3’s output is “ON”.
DO4	green	“On” shows channel 4’s output is “ON”.
DO5	green	“On” shows channel 5’s output is “ON”.
DO6	green	“On” shows channel6’s output is “ON”.
DO7	green	“On” shows channel 7’s output is “ON”.
DO8	green	“On” shows channel 8’s output is “ON”.
DO9	green	“On” shows channel 9’s output is “ON”.
DO10	green	“On” shows channel 10’s output is “ON”.
DO11	green	“On” shows channel 11’s output is “ON”.
DO12	green	“On” shows channel 12’s output is “ON”.
DO13	green	“On” shows channel 13’s output is “ON”.
DO14	green	“On” shows channel 14’s output is “ON”.
DO15	green	“On” shows channel 15’s output is “ON”.
DO16	green	“On” shows channel 16’s output is “ON”.

C.5.4 Power Supply

HC133 module operation power is 5V±0.1V@95mA, supplied by the module carrier.

The external power supply is 24V±2V@12mA.

C.5.5 Module Address Settings

Each of I/O module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

C.5.6 Signal Register

CPU module writes the values to the DO signal registers (named slave registers in ESet tool) through LocalBus, after some settings in **ESet** tools. See ***ESet2010 Manual*** for details.

Data of each DO channel are placed in registers as below, the signal type is W_Coil (Write coil register). The corresponding register addresses for each channel are shown below.

Table C- 19

Channel No.	1	2	3	4
Data register	00001	00002	00003	00004
Channel No.	5	6	7	8
Data register	00005	00006	00007	00008
Channel No.	9	10	11	12
Data register	00009	00010	00011	00012
Channel No.	13	14	15	16
Data register	00013	00014	00015	00016

The specific operations of module configuration are shown in ***ESet2010 Manual.***

C.5.7 Data Format

HC133 module output DO signal, and store them to the register in BOOL data type, data:

Table C- 20

Register data	Output
ON	Output 12~24V
OFF	Output 0V

C.5.8 Specifications

Table C- 21

Item	Specification
Number of channels	16
Isolation	Each channel is optically isolated from system, verified by 1500VDC factory test.
Output range	12~24VDC
Output rating	Continuance 200mA per channel, 3.0A (max.) per module
Off state leakage	100mA (max.)
Module power	5VDC ±2% @95mA
Field circuit power, per module	24VDC±10% @12mA
Data update time	10ms
Transient protection	In each channel are equipped with transient suppression circuitry
Communication Interface	CAN Bus
Installation	Assigned slot of I/O carrier，fixed with screws
Terminal	3×9-bit，12～22AWG，contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% relative humidity, non-condensing

C.6 HC141 (4PI) Module

HC141 module is intelligent 4-channel pulse input module, used for dealing with the on-site pulse input signal. The I/O bus can be installed 16 **HC141** module, measuring 64 channels contact signal. The outputs are separated with the main logical power, and have transient protection.

LEDs on the module show the status of each input.

C.6.1 Panel and Dimension

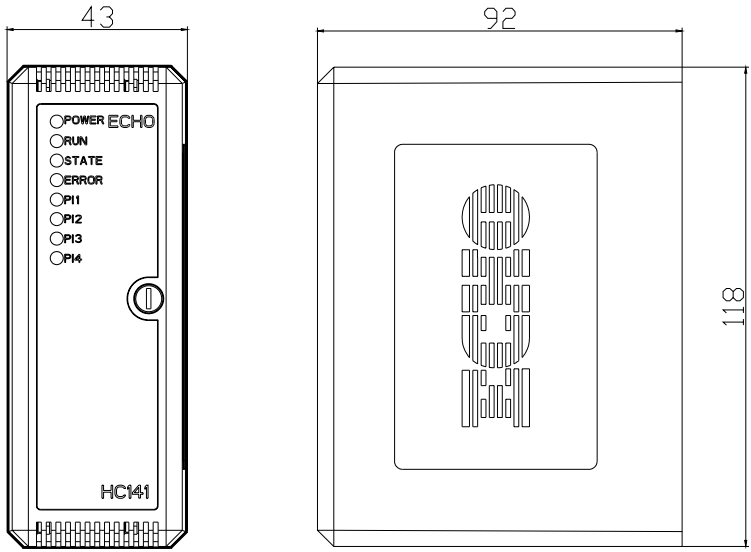


*Fig.C- 11 **HC141** Module Panel and Dimension*

C.6.2 Connecting Terminator

The connecting terminator is located at the Single Modular Carrier C (HC801). See Appendix B.3 Single Modular Carrier C（HC801） for detail.

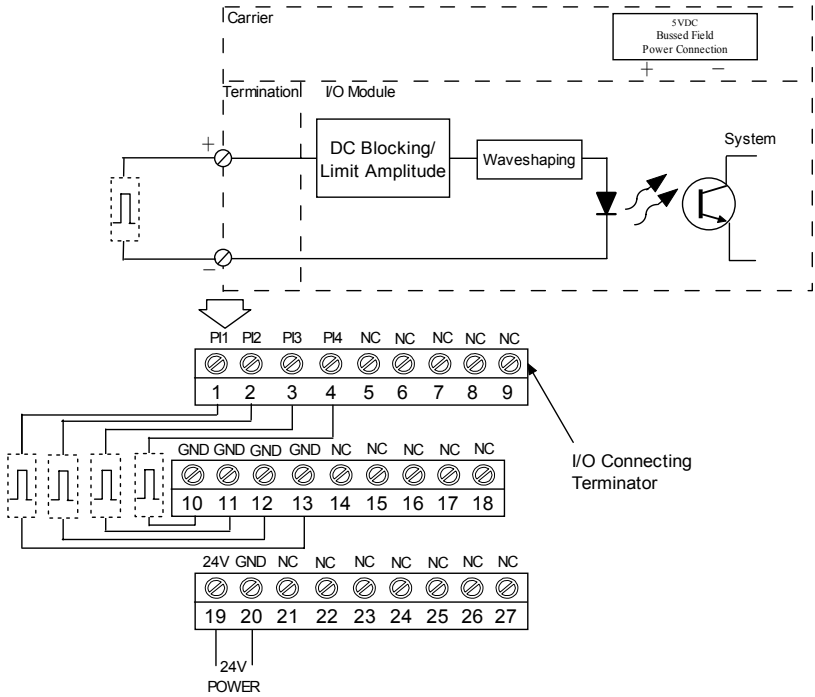


Fig.C- 12 ***HC141*** *Module Wiring Diagram*

C.6.3 Status Indicator LEDs

Table C- 22

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	”blinking” shows module is running.
STATE	red	”blinking” shows module communicates data with CPU module.
ERROR	yellow	“On” shows system error.
PI1	green	“On” shows channel 1 inputs signals.
PI2	green	“On” shows channel 2 inputs signals.
PI3	green	“On” shows channel 3 inputs signals.
PI4	green	“On” shows channel 4 inputs signals.

C.6.4 Power Supply

HC141 module operation power is 5V±0.1V@55mA, supplied by the module carrier.

The external power supply is 24V±2V@70mA.

C.6.5 Module Address Settings

Each of I/O module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

C.6.6 Signal Register

CPU module reads the values of the PI signal registers (named slave registers in **ESet** tool) through LocalBus, after some settings in ESet tools. See ***ESet2010 Manual*** for details.

Data from each PI channel of **HC141** are placed in registers as below, the signal type is R_INPUT (read input register). The corresponding register addresses for each

channel are shown below.

Table C- 23

PI Channel No.	Register of 32-bit counting value
PI1	30101
PI2	30103
PI3	30105
PI4	30107

The specific operations of module configuration are shown in ***ESet2010 Manual***

C.6.7 Data Format

The counting value of **HC141** module is a 32-bit unsigned number. The maximum counts can be up to 4294967295, 30101/3/5/7 for low data storage, 30102/4/6/8 for high data storage.

C.6.8 Specifications

Table C- 24

Item	Specification
Number of channels	4
Isolation	Each channel is optically isolated from system, verified by 1500VDC factory test.
Signal input type	Unipolar Pulse signal
Signal input range	5~26VDC
Signal inputfre quency	0~10KHz
Signal input current	>8mA
Input impedance	10KΩ
Module power	5VDC ±2% @85mA
Field circuit power,per module	24VDC ±10% @70mA
Data update time	10ms
Transient protection	Each channel is optically isolated from system, verified by 1500VDC factory test.
Communication Interface	CAN Bus
Installation	Assigned slot of I/O carrier，fixed with screws
Terminal	3×9-bit，12～22AWG，contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% relative humidity, non-condensing

C.7 Terminal Resistance

To ensure the transmission quality of data on the LocalBus, both ends of the bus should have terminal resistance. The start terminal resistance is located at the controller module carrier, and the end terminal resistance is located at the last I/O module carrier on the LocalBus.

Terminal resistance settings, see Appendix B.8 DIP Switches for detail.

Appendix D Controller Module Specifications

D.1 HC511 Controller Module

Alse call as CPU module which communicates with I/O module through bus completes logical scan, communication and redundance mission. I/O datas transfer through bus clock periods. **HC511** controller module is the coordinator of the I/O module in the **Super E50** system. It can perform the functions including datas collection, logic and process control for analog I/O signals, digital I/O signals and pulse input signals. According to the module configuration, set the period of scan in range 10ms~9h and CPU redundance function.

The LED on the module indicate the communication state, running state, fault state and so on.

D.1.1 Panel and Dimension

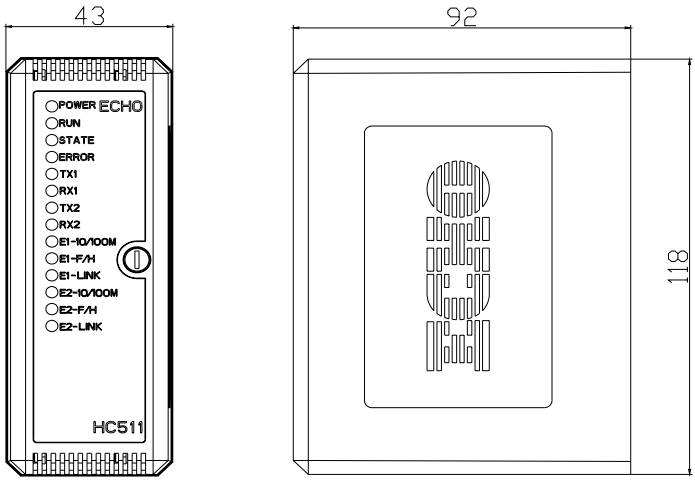


Fig.D- 1 ***HC511*** *Controller Module Panel and Dimension*

D.1.2 Communication Port

The communication ports are located at the Single Modular Carrier B (HC805) or Double Modular Carrier A（HC805R）. See Appendix B.2 Single Modular Carrier and B.5 Double Modular Carrier C（HC815R）for detail.

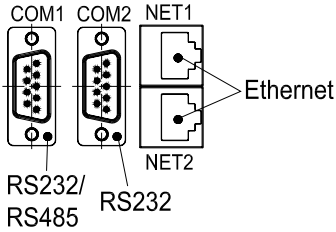


Fig.D- 2 ***HC511*** *Communication Port*

D.1.2.1 RS232 Port Definition

RS232 ports on **HC511** are the standard 9-pin connector (DB-9P) configured as DTE (Data Terminal Equipment). Data cable length is 15m in maximum. The DB-9P connector pin definition:

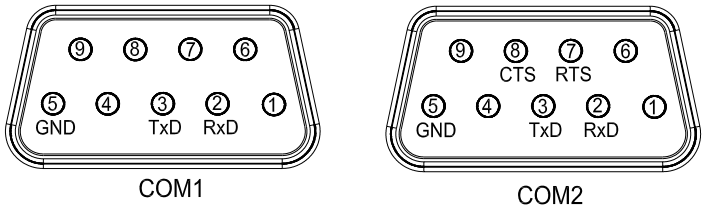


Fig.D- 3 RS232 port DB-9P

RS-232 serial port definition:

In the following table a MARK is a voltage of +3V or greater; a SPACE is a voltage of -3V or less.

Table D- 1

Pin	Type	Description
2 RXD	Input	The level is SPACE on standby and MARK for received data.
3 TXD	Output	The level is SPACE on standby and MARK for transmitted data.
5 GND		This pin is connected to the system ground..
7 RTS	Output	This pin is a MARK if full-duplex operation is selected for the port. This pin is set to a MARK just before and during transmission od data if half-duplex Operation is selected This pin is set to a SPACE when no data is being transmitted.
8 CTS	Input	This level must be a MARK for the communication port to transmit data.When the attached device does not provide this signal, the controller keeps the line at a MARK.

		When the attached device does provide this signal, It must set CTS to MARK to allow the controller to transmit data.

All RS232 wiring must use shielding cable. Shielding layer should be grounded. The DB-9P connector shell is a good ground point.

There are several ways for wiring RS-232 port to DTE and DCE. The simplest way needs only three wires: RXD、TXD and signal ground.

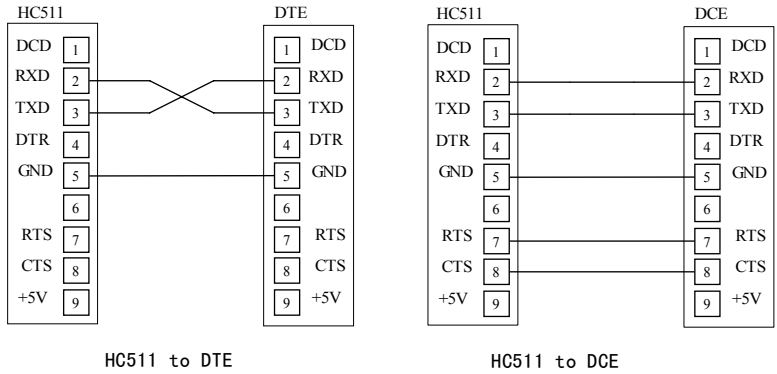


Fig.D- 4

D.1.2.2 RS485 Port Definition

The RS485 port on COM1of HC511 is standard 9-pin connector (DB-9P) configured as a DTE (Data Terminal Equipment). The RS485 port been connected to RS485 network operates mostly in two wire mode.

The DB-9P connector pin definition:

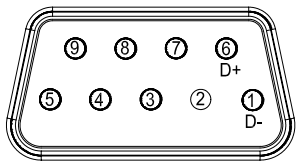


Fig.D- 5 RS485 port DB-9P

RS-485 pin defined as：

Pin	Fuction	Specification
Pin 6	D+	RS485+
Pin 1	D-	RS485-

Note: *COM1 is the common communication port for RS485/RS232. Only one function can be used when connecting serial communication equipment. Do not connect RS485 and RS232 communication equipment at the same time.*

D.1.2.3 Ethernet Port Definition

1、RJ-45 Connector of Ethernet

RJ-45 socket is the terminal of Ethernet. RJ-45 socket matches with its 8-pin connector, use 10 BASE-T standard unshielded twisted pair. Pin 1 and 2 send data, pin 3 and 6 receive data, pin 4, 5, 7, and 8 for standby.

2、RJ-45 Ports Pin Arrange

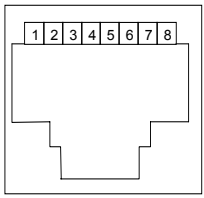


Fig.D- 6 RJ-45 connector of Ethernet

Ethernet interfaces use RJ45 socket. It's connected to the server by super five-kind twisted pair. Pin defined as:

Table D- 2

Pin	Specification
1:TD+	Transmit data＋
2:TD-	Transmit data－
3:RD+	Receive data＋
6:RD-	Receive data－

D.1.3 Status Indicator Leds

Table D- 3

LED	Color	Fuction
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	In redundancy system, "blinking"means the CPU module is the primary module, "off" means a standby module. In single-CPU system, "blinking" means the CPU module is running normally.
STATE	red	In redundancy system, "Blinking" means there is an application program running in the CPU module, "off " means no application progam running. In single-CPU system, " Blinking " means there is an application program running in the CPU module. " off " means no application progam running.
ERROR	yellow	“On” shows system error.
TX1	red	"On" when the COM1 is sending data.
RX1	green	"On" when the COM1 is receiving data.
TX2	red	"On" when the COM2 is sending data.
RX2	green	"On" when the COM2 is receiving data.
E1-10/100M	red	Speed for NET1 connection, "On" when the NET1 is 100Mpbs,. ”Off” when the NET1 is 10Mpbs
E1-F/H	Green	NET1 mode, half duplex or full duplex
E1-LINK	Flashing yellow	Transmitting or receiving data through NET1 port
E2-10/100M	red	Speed for NET2 connection, "On" when the NET2 is 100Mpbs,.

		”Off” when the NET2 is 10Mpbs
E2-F/H	Green	NET2 mode, half duplex or full duplex
E2-LINK	Flashing yellow	Transmitting or receiving data through NET2 port

D.1.4 Power Supply

HC511 module power is 5V±0.1V@250mA; supplied by the carrier.

Note!

Before connect to the power supply, please confirm the voltage is 5V. The internal circuitry of CPU module will be destroyed if exceed 5.5V, causing permanent damage.

D.1.5 Program Developmentand Download

CPU module control program development platform conforms to IEC61131-3 standard, supports five kinds of programming language: instruction List, structured text, Ladder Diagram, function block diagram and sequence chart. And provides a large number of customized function blocks to make control programming more convenient and faster. The edit, debug, compile and download of control program is specified in OpenPCS User Manual.

Afresh load the control program if needed. You can use the method listed below to minimize the system interferer.

- Load the control program compiled to slave CPU module and run it;
- Reset the master CPU module. At that time, the slave CPU module is switched to the master mode controls data collection ;
- Load the same control program to the master CPU module and run it;
- Reset the slave CPU module. At that time, the master CPU module is switched to the master mode controls data collection.

D.1.6 CPU Parameters Settings

In order to enable the CPU to work normally, we need to set up its parameters. Parameters are:

- Master, slave settings
- Ethernet IP, station No.
- registered IP settings
- real-time clock
- serial port parameters

Set as follows:

Connect to the server through Ethernet or RS232 port, run the configuration toos to set parameters. The first time configuration can only be done through the RS232 interface. And need to enter the serial port test state to set parameters. Specific operation is shown in ***ESet2010 Manual***.

D.1.7 Redundancy Settings

Use master/slave redundancy method to improve the reliability of system in field control.

Installing two HC511 modules on the end of the primary carrier, configuring them with the same parameters and implementing the same control program are form the redundancy configuration.

The two HC511 modules are divided into the master and the slave. The master participates in real-time operate. The slave copies the master datas at regular intervals. When the master faults, the slave will run as the master automatically, in order to ensure the system work normally. After power-up, the **HC511** auto-identify itself is single system or redundancy system. If it is the redundancy system, it is needed to configure module master /slave mode before use.

D.1.8 Real-time Clock

View and emendate HC511 clock through [controller debugging] tool of ESet, please refer to the relevant chapters of ESet Manual for specific operation.

Can also use function block in OpenPCS program to get clock or set clock. Please refer to the ***OpenPCS programming Manual***, CLOCK_GET and CLOCK_SET function block in Chapter 2 Customized Function Block.

D.1.9 Terminal Resistance

To ensure the transmission quality of data on the LocalBus, both ends of the bus should have terminal resistance. The start terminal resistance is located in the controller module carrier, and the end terminal resistance is located in the I/O module carrier.

Terminal resistance settings, see Appendix B.8 DIP Switches for detail.

D.1.10 Communication with I/O Module Configuration

In the field control system, should add I/O to controller in order to control the I/O modle datas collection. You can set the I/O sampling time and the data address based on your need. See ***ESet2010 Manual*** fo details.

D.1.11 Running and Maintenance

When disassemble **HC511**, can directly pull out **HC511** after loosening the screws.

If there is a special problem (such as maintenance) to disassemble the components of **HC511** module, attention should be paid to the re-installation of fixed screw.

D.1.12 Specifications

Table D- 4 Controller Specifications

Item	Specifications
Module power	5V±0.1V@250mA
Dissipationpower	1.3W
Communication Interface	2 Ethernet, 10M/100M RJ45 1 RS232, DB9-M 1 RS232 / RS485, DB9-M
Redundance Mode	Hot Redundance
Clock calendar	h/min/sec/year/month/ day/week
I/O capacity: Digital Input Digital output Analog Input Analog output Counting Input I/O modules up to	 512 512 256 128 128 48
Installation	Installed in the controller module carrier, fixed with screws.
Shape	118×43×92（mm）
Work temperature	-40~70℃
Work humidity	5~90% RH relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% RH relative humidity, non-condensing

Appendix E System Power Specifications

E.1 HC201 Power Module

Provide internal power to modules in the Super E50 system. When the number of the modules exceed the limit, it is suggested that increase the number of power module propriety.

E.1.1 Panel and Dimension

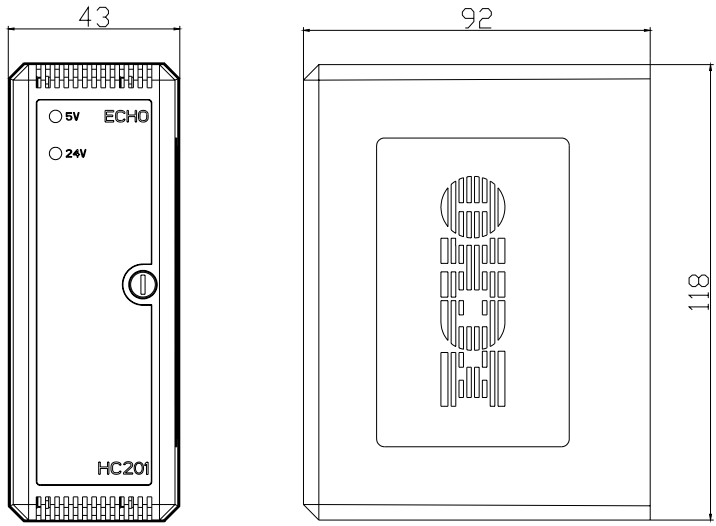


Fig.E- 1 System Power Module Panel and Dimension

E.1.2 Connecting Terminator

The connecting terminator is located at the Single Modular Carrier A (HC802). See Appendix B.1 Single Modular Carrier A (HC802) for detail.

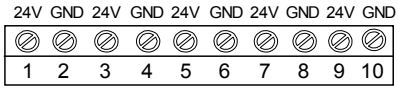


Fig.E- 2

E.1.3 Status Indicator LEDs

Table E- 1

LED	Color	Fuction
24VDC	red	”On” when 24VDC input is normal. ”Off” when 24VDC input is zero or abnormal.
5VDC	green	”On” when 5VDC input is normal. ”Off” when 5VDC input is zero or abnormal.

E.1.4 Specifications

Table E- 2 System Power Module Specifications

Item	Specifications
Input	24VDC±10%
Output	5VDC ±2%
Output current	3A
Input to Output Isolation	250VACrms
Holdup time	1.8ms
Installation	Power Carrier Slot（the first slot）
Terminal	9-bit，12～22AWG，contact current 15AMP
Shape	118×43×92（mm）
Work Temperature	-40~70℃
Work humidity	5~90% RH relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% RH relative humidity, non-condensing

E.2 Uninterruptible Power Supply (UPS)

The UPS must be mounted upright on a level surface, such as a floor or a work surface, for proper operation. The UPS is not rack-mountable or DIN rail-mountable.

If you do not require maximum backup time, one UPS can back up as four as controllers.

Install the UPS between the AC main power source and the bulk power supply, as shown below.

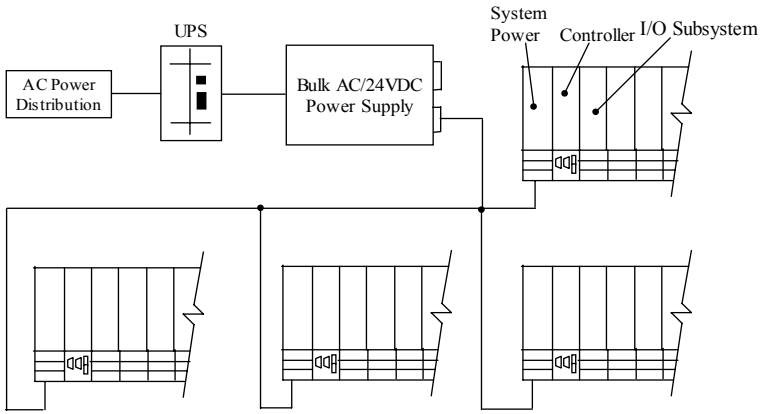


Fig.E- 3 UPS Installation for Conroller Power Backup

Note: *If you use the UPS as backup for your controller, only the system power isbackup; no field powerbackup is provided. If you require backup field power, you need additional UPSs to back up power.*

Appendix F Extension Module Specifications

F.1 HC301 Extension Module

The **HC301** module is used to extend the communication port of the **HC511** controller. Other instruments whiches accord with MODBUS protocol communicating with the **HC511** controller through the **HC301** module, finaly realize to transfer datas with the upper computer. The **HC301** is used as a medium. According to the module configuration, set the period of scan in range 10ms~9hour. HC301 modules can run synchronously on the bus.

The LED on the module indicate the communication state, running state, fault state and so on.

F.1.1 Panel and Dimension

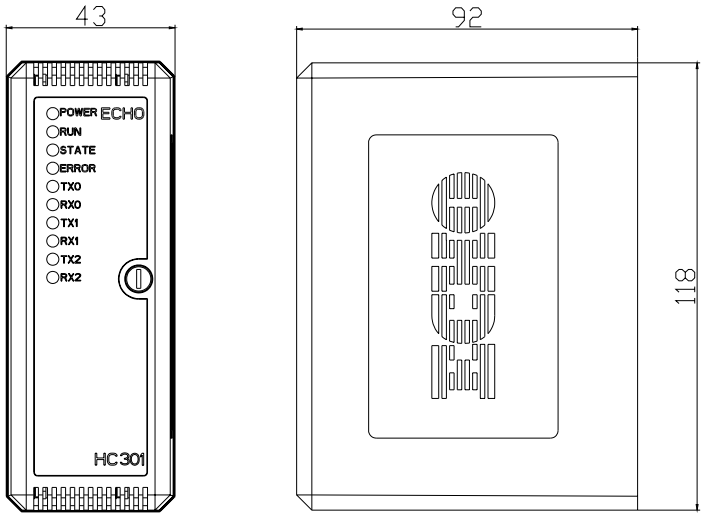


Fig.F- 1 ***HC301*** *Module Panel and Dimension*

F.1.2 Communication Port

The communication ports are located at the Single Modular Carrier D (HC803). See Appendix B.4 Single Modular Carrier D（HC803） for detail.

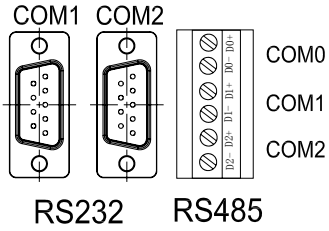


Fig.F- 2 ***HC301*** *Communication Ports*

F.1.2.1 RS232 Port Definition

There are 2 RS232 ports (COM1, COM2) on the **HC301**（see Fig.F- 2 HC301 Communication Ports）。

RS232 ports on HC301 are the standard 9-pin connectors (DB-9P) configured as DTE (Data Terminal Equipment). Data cable length is 15m in maximum. The DB-9P connector pin definition:

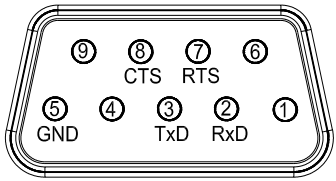


Fig.F- 3 RS232 port DB-9P

RS-232 serial port definition:

In the following table a MARK is a voltage of +3V or greater; a SPACE is a voltage of -3V or less.

Table F- 1

Pin	Type	Description
2 RXD	Input	The level is SPACE on standby and MARK for received data.
3 TXD	Output	The level is SPACE on standby and MARK for transmitted data.
5 GND		This pin is connected to the system ground..
7 RTS	Output	This pin is a MARK if full-duplex operation is selected for the port. This pin is set to a MARK just before and during transmission od data if half-duplex Operation is selected This pin is set to a SPACE when no data is being transmitted.
8 CTS	Input	This level must be a MARK for the communication port to transmit data.When the attached device does not

		provide this signal,the controller keeps the line at a MARK. When the attached device dose provide this signal,it must set CTS to MARK to allow the controller to transmit data.

All RS232 wiring must use shielding cable. Shielding layer should be grounded. The DB-9P connector shell is a good ground point.

There are several ways for wiring the RS-232 port to DTE and DCE. The simplest way needs only three wires: RXD、TXD and signal ground.

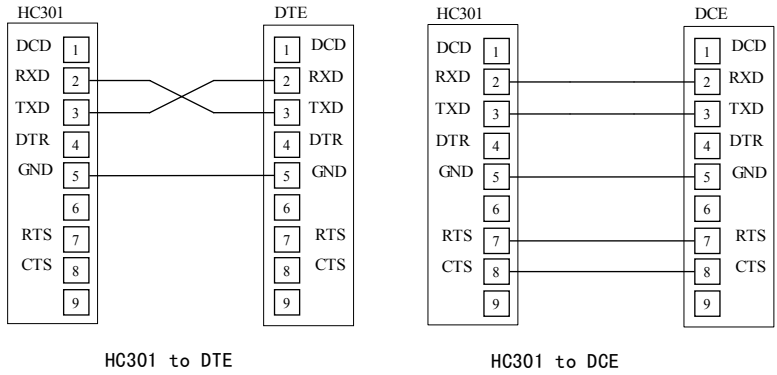


Fig.F- 4

F.1.2.2 RS485 Port Definition

There are 3 RS485 ports (COM0, COM1, COM2) on the **HC301**.

RS232 COM1 and RS485 COM1 are not used at the same time.

RS232 COM2 and RS485 COM2 are not used at the same time.

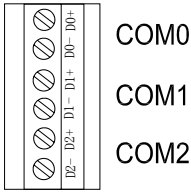


Fig. F- 5

F.1.3 Status Indicator LEDs

Table F- 2

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	"Blinking" means CAN communication.
STATE	red	"Blinking" means the module running normally
ERROR	yellow	“On” shows system error.
TX0	red	"On" when the COM0 is sending data.
RX0	green	"On" when the COM0 is receiving data.
TX1	red	"On" when the COM1 is sending data.
RX1	green	"On" when the COM1 is receiving data.
TX2	red	"On" when the COM2 is sending data.
RX2	green	"On" when the COM2 is receiving data.

F.1.4 Power Supply

HC301 module power is 5V±0.1@240mA, supplied by the carrier.

Note! *Before connect to the power supply, please confirm the voltage is 5V. The internal circuitry of CPU module will be destroyed if exceed 5.5V, causing permanent damage.*

F.1.5 Module Address Settings

Each of HC301 module, connected to the system, must have a unique I/O module communication address. The module address is set by the DIP switches which on the corresponding module carrier. See Appendix B.8 DIP Switches for detail.

F.1.6 Program Developmentand Download

If you want to modify program for especial need, please contact our company.

F.1.7 Terminal Resistance

To ensure the transmission quality of data on the CAN LocalBus, both ends of the bus should have terminal resistance.

Terminal resistance settings, see Appendix B.8 DIP Switches for detail.

F.1.8 Running and Maintenance

When disassemble **HC301**, can directly pull out HC301 after loosening the screws.

If there is a special problem (such as maintenance) to disassemble the components of the **HC301** module, attention should be paid to the re-installation of fixed screw.

F.1.9 Specifications

Table F- 3 HC301 Extension Module Specifications

Item	Specifications
Module power	5V±2%@240mA
Dissipationpower	1.3W
Communication Ports	1 RS485 (COM0) 2 RS232/RS485 (COM1, COM2)
Baud rates（bps）	4800~115200bps
Transmission mode	full-duplex or half-duplex
Communication Ports Capacity	1 RS232:：1 device 1 RS485：32 devicesr
Protocol	Modbus RTU/ASCII
Protocol mode	Master station or slave station
Installation	Assigned slot of the controller carrier，fixed with screws
Shape	118×43×92 (mm)
Work temperature	-40~70℃
Work humidity	5~90% RH relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95%RH relative humidity, non-condensing

Appendix G HC601 Module Specifications

HC601 Natural Gas Flow Computer is primarily composed of **HC601** controller module, **HC601** IO module and **HC806** Modular Carrier （Double Modular Carrier B）.

G.1 HC601 Module

G.1.1 Panel and Dimension

HC601 communication interface: 1RS232/RS485（COM1）, 1RS232（COM2）, 2 Ethernet（NET1，NET2）。

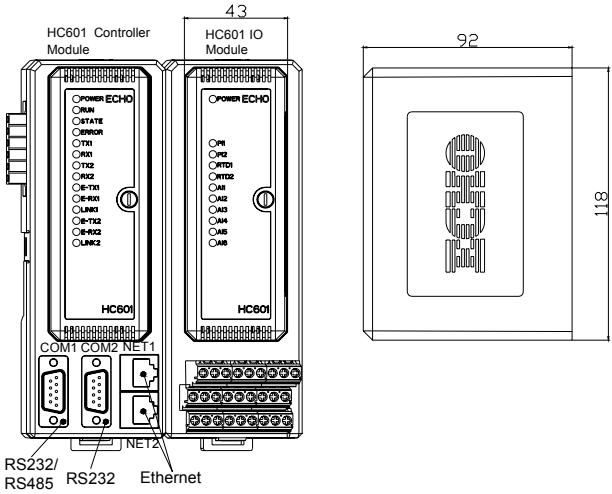


Fig.G- 1 ***HC601*** *Panel and Dimension*

G.1.2 RS232/RS485 Communication Ports

The COM1 on **HC601** provides RS232 or RS485 port and the COM2 on **HC601** provides RS232 port.

G.1.2.1 RS232 Port Definition

RS232 ports on **HC601** are the standard 9-pin connector (DB-9P) configured as DTE (Data Terminal Equipment). Data cable length is 15m in maximum. The DB-9P connector pin definition:

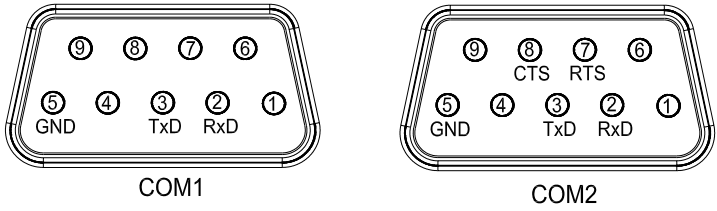


Fig.G- 2 RS232 port DB-9P

In the following table a MARK is a voltage of +3V or greater; a SPACE is a voltage of -3V or less.

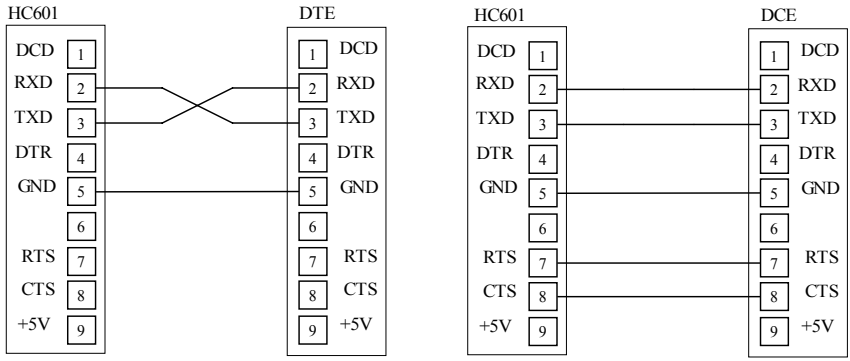
Table G- 1 RS-232 serial port definition

Pin	Type	Description
2 RXD	Input	The level is SPACE on standby and MARK for received data.
3 TXD	Output	The level is SPACE on standby and MARK for transmitted data.
5 GND		This pin is connected to the system ground..
7 RTS	Output	This pin is a MARK if full-duplex operation is selected for the port. This pin is set to a MARK just before and during transmission od data if half-duplex Operation is selected This pin is set to a SPACE when no data is being transmitted.
8 CTS	Input	This level must be a MARK for the communication port to transmit data.When the attached device does not provide this signal, the controller keeps the line at a MARK. When the attached device does provide this signal, It must set CTS to MARK to allow the controller to transmit data.

All RS232 wiring must use shielding cable. Shielding layer should be grounded. The DB-9P connector shell is a good ground point.

There are several ways for wiring RS-232 port to DTE and DCE. The simplest way

needs only three wires: RXD、TXD and signal ground.



HC601 与DTE　　HC601 与DCE

Fig.G- 3

G.1.2.2 RS485 Port Definition

The RS485 port on COM1of **HC601** is standard 9-pin connector (DB-9P) configured as a DTE (Data Terminal Equipment). The RS485 port been connected to RS485 network operates mostly in two wire mode.

The DB-9P connector pin definition:

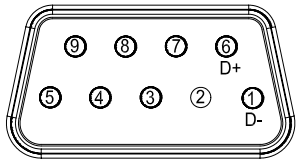


Fig.G- 4 RS485 port DB-9P

Table G- 2 RS-485 pin definition

Pin	Fuction	Specification
Pin 6	D+	RS485+
Pin 1	D-	RS485-

Note: *COM1 is the common communication port for RS485/RS232. Only one function can be used when connecting serial communication equipment. Do not connect RS485 and RS232 communication equipment at the same time.*

G.1.3 Ethernet Communication Port

It is recommended that the connecting cable of the Ethernet interface belong to category 5E cable. The protocols and communication parameters and indices of Ethernet interface have been shown in the table as follows. These parameters are set by [Controller Communication Setting] of ***Natural Gas Flow Computer*** tool software.

Table G- 3

Parameter	Engineering value
IP address setup	Set it up according to different demands, default as 192.168.100.75
Port number	Set it up according to different demands, default as 500
Physical address	XXX.XXX.XXX.XXX.XXX.XXX 6 integers, value range of each:0~255 For example 00-80-235-03-181-25
Protocol	Modbus TCP Modbus in TCP Modbus in UDP
Connecting device	Slave device
Network mask	Default value: no setup

G.1.3.1 Ethernet RJ-45 Connector

The receptacle (P8) of RJ-45 module is the connection terminal of Ethernet. The receptacle of RJ-45 module is matching with its 8-pin connector and adopts 10BASE-T Unshielded Twisted Paired. Pin 1 and pin 2 are used for transmitting data, pin 3 and pin 6 are used for receiving data, pin 4, 5, 7 and 8 are spare.

Ethernet RJ-45 connector has been shown in the figure as follows:

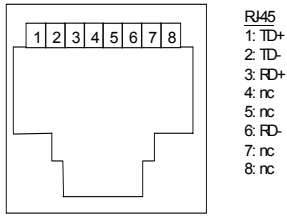


Fig.G- 5 The Ethernet RJ-45 Connector

The RJ - 45 port definition of Ethernet:

Table G- 4

Terminal	Function
1	Transmit data TD+
2	Transmit data TD-
3	Receive data RD+
4	NC
5	NC
6	Receive data RD-
7	NC
8	NC

G.1.3.2 Ethernet Cable

1. The Ethernet cable connected with PC and RJ-45 connector of controller is adopted 10BASE-T standard non- shielded twisted pair. The following figure

shows the array mode of the Ethernet cable.

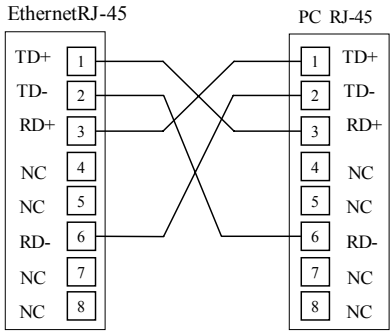


Fig.G- 6 Ethernet to PC

2. The Ethernet cable connected with Ethernet Switch machine and RJ-45 connector of controller is adopted 10BASE-T standard non- shielded twisted pair. The following figure shows the array mode of the Ethernet cable.

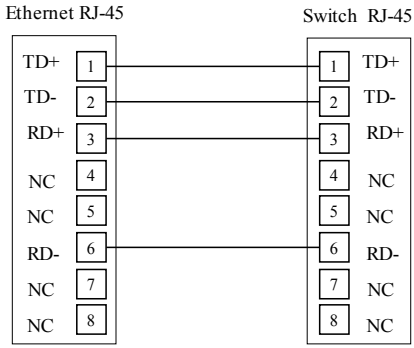


Fig.G- 7 Ethernet to Switch

G.1.4 IO Module Wiring Field

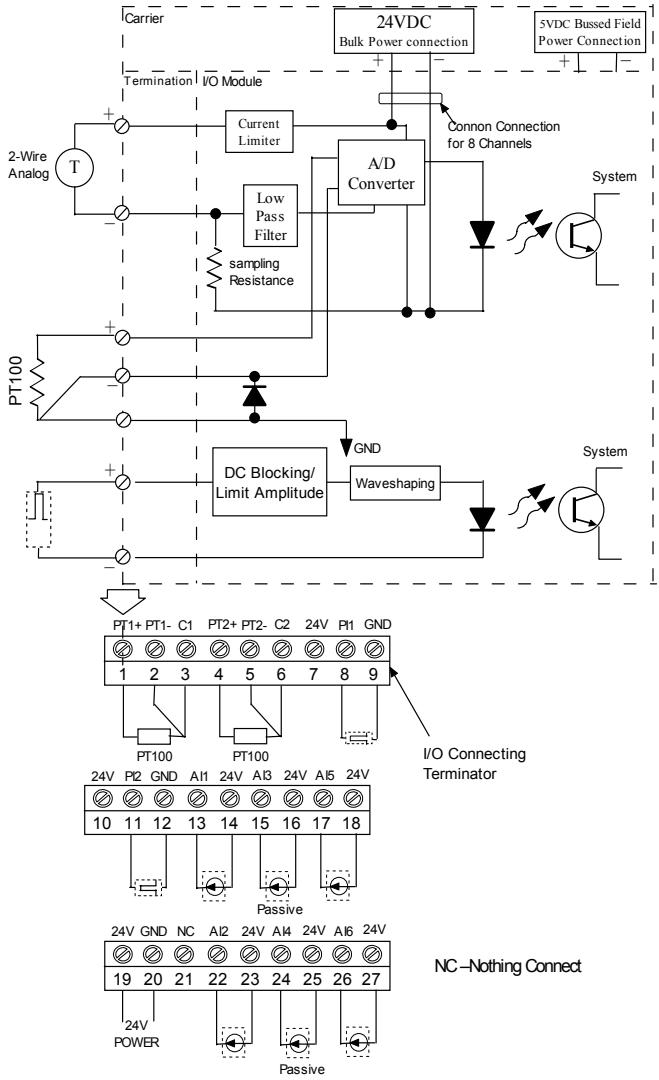


Fig.G- 8 IO Module Wiring Field

G.1.5 Status Indicator Leds

Table G- 5 HC601 Controller Module

LED	Color	Fuction
POWER	green	“On” shows the module power is on when insert to the carrier.
RUN	green	"blinking" means the CPU module is running normally.
STATE	red	" Blinking " means there is an application program running in the CPU module. " off " means no application progam running.
ERROR	yellow	“On” shows system error.
TX1	red	"On" when the COM1 is sending data.
RX1	green	"On" when the COM1 is receiving data.
TX2	red	"On" when the COM2 is sending data.
RX2	green	"On" when the COM2 is receiving data.
E-TX1	red	"On" when the NET1 is sending data.
E-RX1	green	"On" when the NET1 is receiving data.
LINK1	yellow	”On”， when NET1 disconnects with server, ”Off”， when NET1 connects with server.
E-TX2	red	"On" when the NET2 is sending data.
E-RX2	greem	"On" when the NET2 is receiving data.
LINK2	yellow	”On”，when NET2 disconnects with server, ”Off”，when NET2 connects with serve.

Table G- 6 ***HC601*** *IO Module*

LED	Color	Function
POWER	green	“On” shows the module power is on when insert to the carrier.
PI1	green	“On” shows channel PI1 inputs signals.
PI2	green	“On” shows channel PI2 inputs signals.
RTD1	green	"On" shows the resistance of channel RTD1 is between 80~175Ω.
RTD 2	green	"On" shows the resistance of channel RTD 2 is between 80~175Ω.
AI1	green	"On" shows the input current of channel AI1 is more than 3.8 mA.
AI2	green	"On" shows the input current of channel AI2 is more than 3.8 mA.
AI3	green	"On" shows the input current of channel AI3 is more than 3.8 mA.
AI4	green	"On" shows the input current of channel AI4 is more than 3.8 mA.
AI5	green	"On" shows the input current of channel AI5 is more than 3.8 mA.
AI6	green	"On" shows the input current of channel AI6 is more than 3.8 mA.
AI7	green	"On" shows the input current of channel AI7 is more than 3.8 mA.
AI8	green	"On"shows the input current of channel AI8 is more than 3.8 mA.

G.1.6 Power Supply

HC601 module power is 5V±0.1V@300mA; supplied by the carrier.

Note!

Before connect to the power supply, please confirm the voltage is 5V. The internal circuitry of CPU module will be destroyed if exceed 5.5V, causing permanent damage.

G.1.7 Specifications

Table G- 7 HC601 Controller Module Specifications

Item	Specifications
Module power	5V±0.1V@300mA
Dissipationpower	1.5W
Communication Interface	2 Ethernet, 10Mbps RJ45 1 RS232, DB9-M 1 RS232 / RS485, DB9-M
Clock calendar	h/min/sec/year/month/ day/week
I/O capacity: PI Input RTD Input Analog Input	 2 2 6
Installation	Installed in the HC806 Double modular Carrier, fixed with screws.
Shape	118×43×92（mm）×2 (Controller+IO Module)
Work temperature	-40~70℃
Work humidity	5~90% RH relative humidity, non-condensing
Storage temperature	-50~80℃
Storage humidity	5~95% RH relative humidity, non-condensing

Table G- 8 HC601 IO Module Specifications

Item	Specifications
Signal Input Type	AI
A/D Resolution	16 bits
Input Resistance	100KΩ nominal for 5VDC inputs 169Ω for 20mA inputs
Converter Type	Successive approximation
AI Channel Accuracy	±0.1%×full scale 25℃; ±0.2%×full scale the entire temperature range
Type	Single ended
Over Bound Voltage	115VAC（only 20mA current-resistor and transient suppressor are damaged. Continuous: 60% over scale sustained input signal.
Isolation	Each channel is optically isolated from system, verified by 1700VDC factory test.

Transient protection	In each channel are equipped with transient suppression circuitry
Reading Update Time	100ms
Response Time	20ms typical for 10％to 90％ signal change
Dissipationpower	100mA at 24VDC

Signal Input Type	PT100
Signal Input Range	80.30~175.8Ω
Resolution	16 bits
Data update time	100ms
Isolation	500VAC
Transient protection	In each channel are equipped with transient suppression circuitry
Calibration	Has been calibrated in factory
Accuracy	±0.3%×full scale 25℃; ±0.6%×full scale the entire temperature range

Signal Input Type	Sigle Polarity Pulse Signal
Signal Input Range	5~26VDC
Input Frequency	0~10KHz
Input Current	>8mA
Input Resistance	10KΩ

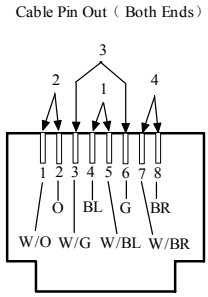
Appendix H Control Network Specifications

H.1 Fiber-Optic Media Converter

Table H- 1 Fiber-Optic Media Converter Specifications

Item	specification
LAN interface	Ethernet IEEE802.3
Port interface	10BaseT RJ45
Data rate	10MBPS
Fiber interface	10Base-FL
Fiber type	Multimode 62.5/125 microns
Dissipationpower	4W

H.2 Fiber Optic Specifications for Media Converters

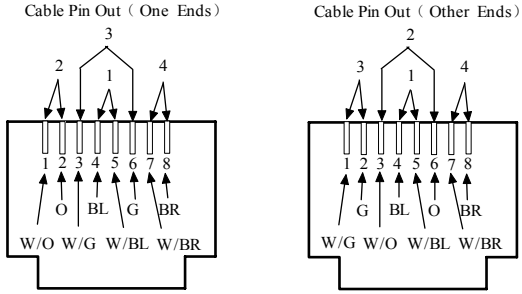


Cable Chromatogram:

1. W/O－White/Orange
2. O　－Orange
3. W/G－White/Green
4. BL　－Blue
5. W/BL－white/Blue
6. G　－Green
7. W/BR－White/Brown
8. BR　－Brown

Fig.H- 1 Control Network Cable Pin Out (Both Ends)

H.3 Cable for No Hub System



Cable Chromatogram:

1. W/O－White/Orange
2. O　－Orange
3. W/G－White/Green
4. BL　－Blue
5. W/BL－white/Blue
6. G　－Green
7. W/BR－White/Brown
8. BR　－Brown

Fig.H- 2 Cable Pin Out for No Hub System

H.4 Laying Out the Control Network

A detailed site plan is helpful to determine the best layout.

- The shortest route might not be the best because the cable must be protected

form corrosive materials or vapors, excessive moisture, impact or crushing damage, and electrical noise.

- Control room cabing can be run overhead or under the floor.
- It is recommended that the secondary control network cabling be routed differently than that of the primary network. This helps ensure uninterrupted communications if the primary network suffers physical damage.
- Use fiber-optic cable for all distance greater than 100m or between buildings or in areas that might have high electromagnetic interference.

H.5 Extending the Control Network with Media Converters

For longer control network distancees, media converters are used to connect 10BaseT copper cable to 10Base FL fiber-optic or 100BaseT copper cable to 100BaseFX fiber-optic cable. These compact devices are simple to use, easy to insatll, and require no software changes. All signal activity, including collision data, is detected in any combination of connected segments or devices.

Note: The media converters do not inflict any repeater (hop) dalay and are completely transparent to normal network operation. The media converters do not count as hops in the four-hop cascade limit for the Super E50 system.

Because the incoming signals from either medium are restored by the converters, the distance limitations imposed by the Super E50 system do not apply. Therefore, normal maximum media lengths can be achieved on both sides of the converters.

Caution: we recommended you do not use RJ-45 to 10BaseFL repeaters because each device adds one hop to your control network

When using fiber media converters to extend the distance between hubs, two converters are required per run of fiber optic cable: one to convert from10BaseT cable to fiber optic cable and one to convert from fiber optic cable back to 10BaseT cable. The maximum fiber optic cable distance possible for each segment varies with the hardware. Refer to the manufacturer's documentation for the maximum length for your applications.

Use shielded RJ-45 connectors at all media converter connections,except those that are connected to a Super E50 Control Network Hub. Use unshielded RJ-45 conncetors for all media converter connections to a Super E50 Control Network Hub.

Select the media converters that best meet your environmental, power, and reguatory requirments. Distances and cable requirements for media conterters vary from one manufacturer to another. Follow the documentation supplied with the media converters for installation and configuration.

H.6 Expanding the Control Network

A control network can be expanded in two ways: an increase in the number of ports, or an increase in the distance between devices. Both methods are achieved by adding hubs to the control network.

H.7 Installing the Control Network Cable

Use the following general guidelines for control network cable installation:

- Do not overstress the cable during installation. The maximum pull tension is 22.69kg. Refer to the manufacturer's documentation for Category 5 cable and fiber-optic.
- Do not bend the cable sharply. The recommended bend radius is 6.4cm loaded and 2.54cm unloaded. Refer to the manufacturer's documentation for Category 5 cable and fiber-optic.
- Leave some slack in the cable along its route. This allows for future minor changes.
- Use a grounded support wire to support the cable. Do not hang unsupported cable between suports. Secure the cable to permanent, non-vibrating supports only.
- Secure the cable firmly, but do not penetrate the cable's outer insulating cover. Do not use attachment devices that ground the cable shield.
- Install the color-coded boots, if used, to each end of the cable.

Appendix I Bulk Power Supply Specifications

I.1 AC/24VDC

Table I- 1 Bulk AC to 24VDC Power Supply Specifications

Item	Specification
AC input	120/230VAC nominal, 85~265VAC range, 47Hz~63Hz, single-phase
DC output voltage	24VDC
DC output power options	300W at 60℃
Input	5A
Inrush current	80A maximum (cold start only)
Hold-up time	20ms (from 85~265VAC input)
Output overvoltage	125% (±5%)
Power factor	0.98 at full rated load
Fuse protection	10A/250VAC , non-replaceable fuses. Note: the internal fuse is for an internal fault condition only.shorts and overload will not cause the fuse to fail.

Appendix J Cabinet and Enclosure Specifications

J.1 Selecting an Enclosure

To choose an enclosure for your Super E50 system, consider the following items:

- System environment
- Wire management
- Heat dissipation

Select the appropriate enclosure for your specific application.

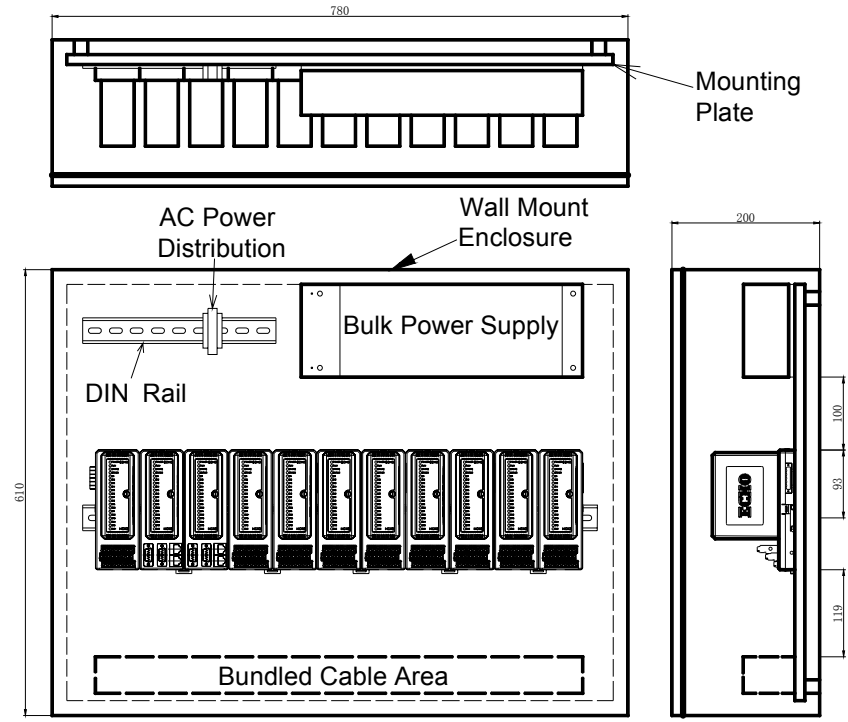


Fig. J- 1 Enclosure Example #1

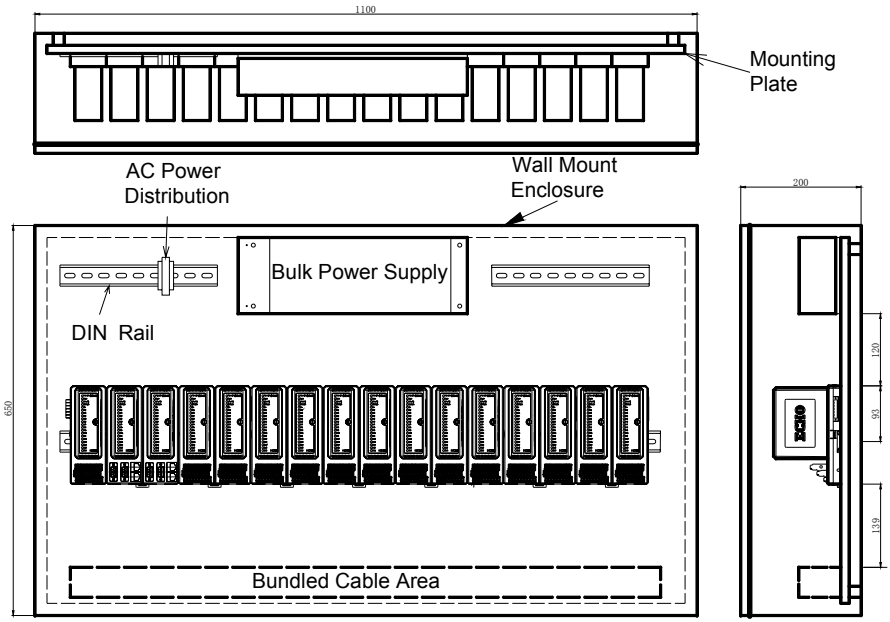


Fig.J- 2 Enclosure Example #2

The figures indicate areas available for wire management. You can access wiring throng conduited entries.

The enclosure must be designed to dissipate the heat generated within the enclosure properly and to maintain an ambient temperature in the enclosure that is below the rated temperature for any devices located in the enclosure. The information you need to properly design the enclosure includes:

- Maximum external ambient temperture for the application
- Ambient rating of any equipment mounted in the cabinet
- Power dissipation of each device

The internal temperature of the enclosure cannot exceed the rated temperature for any devices located in the enclosure.

J.2 Power Dissipation Consideration

The power dissipated within the enclosure generates heat. The enclosure supplier uses power dissipationg figures to determine the air flow requirements needed to maintain the allowable heat rise. As the internal heat rise increases, the allowable external ambient temperature decreases.

The power dissipation in an enclosure is dependent on the power requirements of the enclosed equipment, including the:

- Power required to operate devices in the enclosure
- Field power dissipation within the cabinet
- Power dissipated by the power supplies located in the enclosure

Power consumption for Super E50 products is listed in the specifications shown as below. To determine total power dissipation in an enclosure, sum the power requirements of all components to be mounted within the enclosure.

*Table J- 1 Maximum power dissipation for **Super E50** Products*

Product Type	Power (W)
HC511 CPU	1.3
HC101 8AI	2.5
HC104 4RTD	1.8
HC121 4AO	2.3
HC112 16DI	2.8
HC133 16DO	0.7
HC141 4PI	2.0
HC301 Extension Module	1.2
HC511R CPU （redundancy）	1.3
HC601	1.5
HC201 Power Module	15
AC/24VDC Power Supply	120

J.3 Enclosure Selection Procedure

Determine the allowable temperature rise by subtracting the expected ambient temperature from the lowest rated temperature of the components to be mounted in the enclosure.

Determine the power dissipation for the components to be mounted in the enclosure (see *Table J- 1 Maximum power dissipation for* ***Super E50*** *Products*)

Using the temperature rise and power dissipation information, the enclosure supplier can determine the encosure surface area and cooling options required for your appliction.

J.4 Example Enclosure Selection Calculations

Assume the system consists of the following components:

Table J- 2 Example Enclosure Components

Product Type	Quantity	Power Dissipation (W)
HC511 CPU	1	1.3
HC101 8AI	1	2.5
HC104 4RTD	1	1.8
HC121 4AO	2	2.3
HC112 16DI	2	2.8
HC133 16DO	1	0.7
HC141 4PI	1	2.0
HC201 Power Supply	1	15
Total power		38W

Assume ambient temperature is 35℃. The Super E50 components are rated for an ambient temperature of 60℃. Therefore, the enclosure design temperature rise must be less than 60-35=25℃ with 50W of heat dissipation within it.

If the surface area of the enclosure is insufficient to dissipate the heat, you can use cooling options such as fans or blowers to improve heat dissipation.

Note: *The actural temperature rise varies with layout, enclosure location, and other factors. If the application is critical or if the exact conditions are undetermined, follow your standard corporate/ plant safety standards. Cabinet manufacturers recinnebd a safety margin of 25%.*

Appendix K Power and Grounding Notes

K.1 Sizing Power Supplies

K.1.1 System Power Supply

The capability of system power **HC201** is 5VDC@3A. The **HC201** module provides power to module through LocalBus on carrier. Calculate the number of I/O module which be powered by one **HC201** module based on the actual configuration and the *Table K- 1*.

It is suggested that one **HC201** module provides power to eight I/O modules. If the number of I/O module is bigger than eight, you need to add a new **HC201** module to provide power.

*Table K- 1 System Power Supply（**HC201**）Sizing Calculations*

Product Type	Quantity	Amps Required for Each Device （5VDC）
HC511 CPU	1	245mA
HC101 8AI	1	85mA
HC104 4RTD	1	95mA
HC121 4AO	1	110mA
HC112 16DI	1	95mA
HC133 16DO	1	95mA
HC141 4PI	1	85mA
HC301	1	240mA

HC601	CPU	1	300mA
	IO		
Grand Total			

K.1.2 Bulk Power Supply（AC/24VDC）

The bulk power provides AC/24VDC power to the field devices and the HC201 modules. In general the field devices include of AI, AO and DI with low power consumption. If you want to provide power to the high voltage switch in the DO module, you should calculate the power carefully. According to the technical parameters supplied by manual factory, confirm the load value. To calculate the power supply capability, refer to the table below.

Table K- 2 Bulk Power Supply（AC/24VDC）Sizing Calculations

Product Type	Quantity	Amps Required for Each Device（24VDC）
HC101 8AI	1	90mA
HC104 4RTD	1	60mA
HC121 4AO	1	80mA
HC112 16DI	1	60mA
HC133 16DO	1	12mA
HC141 4PI	1	70mA
HC601	1	110mA
Grand Total		

K.2 Power Supply Mode

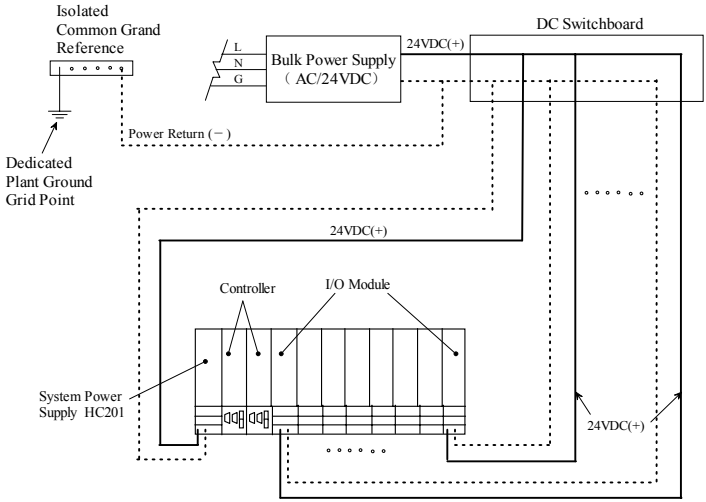


Fig. K- 1 Power Supply and Grounding

Appendix L Field Device Power Supply Guidelines

If you use **Supply E50** discrete inputs (isolated or dry contact) to sense a contact closure in a field device, use an are suppression device at the contact. This are suppression device can be an R-C snubber or a varistor, as shown in *Fig.L- 1* for isolated discrete inputs. See later in this section for *L.1 Sizing R-C Snubbers*.

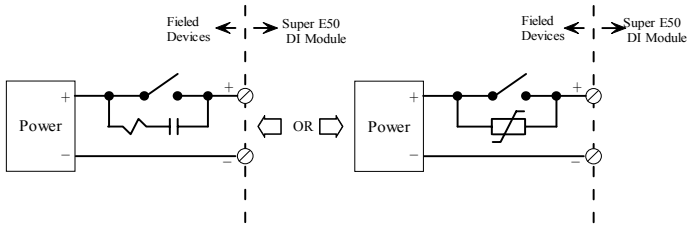


Fig.L- 1 Arc Suppression Device Examples for Contact Closure Detection (Isolated Discreted Inputs)

Table L- 1 Example R-C Values

Load from Input Module	R Value	C Value
24VDC	5K Ω	2.4 nF
230VAC	115 Ω	0.01nF

If you use **Super E50** isolated discrete inputs to sense solid state devices such as triacs, you may need to place some resistance in paralle with the input to avoid false

triggering due to leakage currents. Size the resistor so that the voltage level generated by leakage currents through the switch is less than the upper limit for OFF voltage at the input module. The resistor wattage must support the following calculation for dissipationg when the switch is ON:

$$W = V \bullet \frac{V}{R}$$

where V= voltage，R= resistance

You can use **Super E50** dry contact discrete inputs to sense a solid state device only if the leakage of the switch is less than the upper limit for OFF current of the input module. *Table L- 2* lists the upper limit of the OFF current for the **Super E50** input modules.

Table L- 2 OFF Current Limits for Input Module

Input Module Voltage Level	Upper Limit of OFF Current
24VDC	1mA
230VAC	0.28mA

If you use **Super E50** AC discrete outputs (high-side or isolated) to drive inductive loads such as relay coils, it is recommended that the kickback from the coil be suppressed at the coil with an R-C snubber or a varistor. *Fig.L- 2* is a wiring diagram example for a highi-side discrete output.

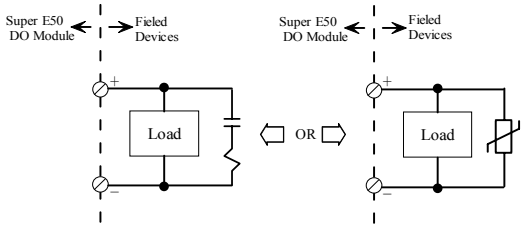


Fig.L- 2 Example for Driving Inductive Loads with AC Outputs (High-side Discrete Output)

If you use DC discrete outputs to drive inductive loads such as relay coils, it is

recommended that the kickback from the coil be suppressed at the coil by a parallel reverse-biased diode. *Fig.L- 3* is a wiring diagram example for a high-side discreted output.

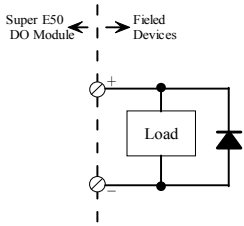


Fig.L- 3 Example for Driving Inductive Loads with DC Outputs (High-side Discrete Output)

If your field device has low current requirement, you can connect a loading resistor in paralled with your load to limit the effect of leakage currents on Super E50 discrete AC outputs. Size the resistor to provide a total load of 10mA and to handle the heat dissipation for this load. For example, a 12KΩ,2W resistor is appropriate for 120 VAC and a 23 KΩ,3W resistor is appropriate for 230 VAC.

L.1 Sizing R-C Snubbers

R-C (resistor-capacitor) snubbers are used to suppress arcing when a contact is opened or to suppress kickback when a coil is de-energized. Pre-assembled R-C snubbers are available in a variety of ratings. Because the resistor is in series with the capacitor, the wattage requirements are low (less than 0.25W).

Use the folowing calculations to size the R-C snubber that is appropriate for your application.

L.1.1 DC Applications

$$R = \frac{VDC}{I_{LOAD}}$$

$$C = I_{LOAD} \cdot 0.5 \frac{\mu F}{A}$$

For example, using a 24VDC source，and driving a 0..5A load:

$$R = \frac{24}{0.5} = 48\Omega$$

$$C = 0.5 \cdot 0.5 = 0.25 \mu F$$

L.1.2 AC Applications

$$R = 0.5 \cdot V_{rms}$$

$C = 0.005 \mu F$ for each 10V A of steady state load:

For example, using a 120VAC source and driving a 0.5A load:

$$R = 0.5 \cdot 120 = 60\Omega$$

$$C = (\frac{0.005}{10}) \cdot (120 \cdot 0.5) = 0.03 \mu F$$

Appendix M Controller Redundancy

M.1 Redundary Control Example

Super E50 supports redundant controllers. *Fig.M- 1* shows a simple system with redundant controllers and a redundant Control Network.

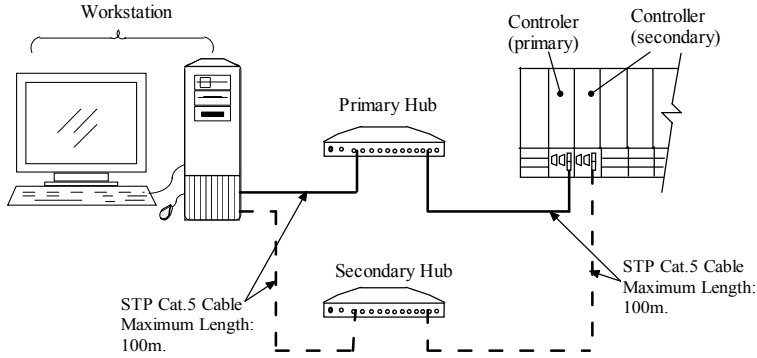


Fig.M- 1 Redundant Controller Network Example

When the system is working, if the primary computer fails, the secondary computer assumes control and starts to work as a primary computer. And when the previous primary computer returns to nomal, it will assume control again.

If the primary network fails, the secondary network assumes control and starts to work as a primary network. And when the previous primary network returns to nomal, it will

assume control of communication again.

If the primary CPU module fails, the secondary CPU module assumes control and starts to work as a primary CPU module. And when the previous primary CPU module returns to nomal, it will still work as a secondary module.

Appendix N Version

V1.0	2008.12.24	first edition
V1.1	2009 3.20	add HC301、HC803 module
V1.2	2009.5.21	add HC601、HC806 module
V1.3	2010.1.10	translate to English
V1.4	2011.12.26	revised B.8 DIP Switches
V1.5	2012.06.29	revised HC501 Panel and LED
V1.6	2012.11.22	HC501/HC501R Upgrade to HC511/HC511R