

Communication Ports

Ethernet Port
(HCM720, HCM722)..... Standard Ethernet RJ45 connector.
10/100 Base T, half or full duplex

RS485 System Controller Port

Electrical Interface..... RS485
Baud Rate 38 400
Data Format 8 data bits, no parity, 1 stop bit
Communications Protocol Impro Secure Communications Protocol
Line Termination (RS485)..... Provision is made for line termination

RS485 Door Controller Port

Electrical Interface..... RS485
Baud Rate 38 400
Data Format 8 data bits, no parity, 1 stop bit
Communications Protocol Impro Secure Communications Protocol
Line Termination (RS485)..... Provision is made for line termination

Cluster Communications When the Cluster Controller has Expansion Modules plugged into its Cluster Connector.

S-Bus Host Port When remotely mounted Expansion Modules are connected to the Cluster Controller via S-Bus

Electrical Interface..... Propriety S-Bus
Baud Rate 9600
Encryption AES Encryption
S-Bus Addresses A maximum of 8 S-Bus addresses* may be connected to the S-Bus Host Terminals

NOTE: *Dual Device Expansion Modules (Such as the Wiegand Reader Module and the Antenna Reader Module) can take up to TWO Fixed Addresses each. Please consult the relevant Installation manual for information on how to avoid taking up two addresses in instances when only connecting one peripheral to a two-device Expansion Module.*

General

General Indicators (HCM720, HCM722)

Status LED

Power On	Continuous Red.
Communications Failure	Intermittent Flashing Red
Cluster Controller Fault	Continuous flashing Red

Data LED..... Green LED ON or flashing during any communication (Ethernet, RS485, Cluster or S-Bus)

Ethernet Port Diagnostic Indicators (HCM720, HCM722)

LINK LED Continuous Red with Ethernet Connected.

SPD LED Red LED ON for 100 MHz, OFF for 10 MHz

RS485 (SC and DC) Port Indicators

RX Green on while receiving data

TX Red on while sending data

BLANK SPACE

INSTALLATION INFORMATION

Accessories

Find the following when unpacking the CCM:

Plastic Housing (HCM720, HCM721)

The Cluster Controller is supplied in a Customisable Black, ABS Plastic housing with the following features/components:

- Housing, consisting of a Base (with the CCM PCB attached), a Cover and a selection of Cable Entry Gland Plates.
- The Cluster Controller PCB is fitted with a 3 V, CR2032, Lithium cell Battery with removable insulating battery tag.
- The Housing Base has:
 - Two slots to hold the User-Selectable Cable Entry Plates
 - Six knock-out Cable Entry Points
 - Four Drill-out Cable Entry Points
- The Housing Cover and Base are held together with two Allen Head Screws through the cover of the housing.
- Four Ziploc bags, containing the following:
 - Four Stand-Offs (for spacing the WRM away from the mounting surface) and a Cluster Connector Cover (for closing off the cluster connector when not in use.)
 - A 2mm Allen Key and a spare Hex Head Screw
 - Two extra gland plates
 - An extra Fixed Address Label, for installation site mapping

NOTE: *The installer needs to obtain fasteners (< 5 mm Diameter to fit through the supplied Stand-Offs) that are suitable for securing the Module to the mounting surface – these are NOT supplied in the kit.*

PCB Card for IPS Installation (HCM722, HCM723)

Included in the packaging is:

- Impro Cluster Controller PCB Card on a Base Plate.
- An extra Fixed Address Label, for installation site mapping
- An installed 3 V, CR2032, Lithium cell Battery with removable insulating battery tag

Communication Considerations

Ethernet (HCM720, HCM722)

Connect the Cluster Controller to an Ethernet Switch or Hub (or other network device); cable runs must conform to Ethernet cabling specifications.

NOTE: In Access Portal LITE systems, Cluster Controllers configured as Door Controllers must be connected to the LITE System Controller via RS485.

System Controller (SC) RS485 (For use IXP220 applications)

The RS485 communications distance between the Host Computer and the LAST System Controller in a cable run, MUST NOT exceed 1 km (1 090 yd.). Achieve this by using good quality screened, twisted 2-pair cable, with the screen EARTHED at one end.

Door Controller (DC) RS485

The RS485 communications distance between a System Controller and the LAST Door Controller in a cable run, MUST NOT exceed 1 km (1 090 yd.). Achieve this by using good quality screened, twisted 2-pair cable, with the screen EARTHED at one end.

Jumper Links

Long RS485 transmission lines or multiple “star” RS485 connections, may cause communication problems. Placing a Jumper Link across the jumper (See Figure 1 for position) in the LAST UNIT AT THE END OF THE CABLE RUN should solve the problem.

EARTH Connection

Connect the Cluster Controller to a good EARTH point. Using the S-Bus Host Port, connect the ETH Lead to the ‘ETH’ Terminal. Mains EARTH can be used, but electrical noise may exist.

NOTE: See DIP Switch settings (on page 10) to configure the Cluster Controller as either a Door Controller, OR as a System Controller to suite its application. Read more about these options under Cluster Controller Operating Modes” on page 9“

CAUTION: When using the Cluster Controller with FCC approved accessories, ensure that RS485 cables are routed through a separate grommet to the power cable. Also ensure that you use a CE approved Power Supply Unit.

Connecting Expansion Modules

Remember the following when installing the Cluster Controller – and its Expansion Modules:

Clustering

Clustering allows for the easy addition or replacement of Expansion Modules, it saves on wiring and requires only one DC Power Supply connection to supply the clustered Modules. Clustering also allows for high data transfer rates (115 200 Baud) between the Cluster Controller and the Expansion Modules.

The following applies:

- Up to EIGHT Expansion Modules may be plugged side-to-side and into the Cluster Connector on the right hand side of the Cluster Controller.
- The clustered Expansion Modules are powered and controlled via the Cluster Controller Cluster Connector.
- Clustering is recommended where **Offline Validation** is a high priority, as the Clustered Expansion Modules will have reliable access to the Tag Buffer and Memory on board the Cluster Controller.

S-Bus

S-Bus is useful when it would be convenient to install an Expansion Module some distance from the Cluster Controller. The following applies:

- The maximum S-Bus Cable length from the Cluster Controller to the Expansion Module is 150 m (490 ft.).
- The S-Bus cable should be dual core and at least 0.21 mm² (AWG24). Screened cable is recommended where interference rejection may be necessary in electrically noisy sites – and to provide SOME MEASURE of resistance to damage from nearby lightning strikes*. (Ground the Cluster Controller end of the Screen only, leaving the Device ends unconnected)
- Some expansion Modules can use up to 2 of the available quota of 8 S-Bus Fixed Addresses – see the relevant Expansion Module's Installation Manual for details.
- Remotely mounted Expansion Modules will also require suitable **Isolated DC Power supplies**, as they are no longer plugged into the Cluster Controller.
- In the event of the S-Bus cable breaking, operation of the affected Expansion Module/s will be suspended until the connection is restored. (*No offline validation*).

NOTE: **NOTHING can survive a direct lightning strike. Impro Technologies does NOT claim that its products are lightning proof.*

S-Bus “+” Power Terminal: 500mA Limit

“Unclustered”, remotely mounted Expansion Modules **MAY NOT** be powered from the S-Bus Host “+” Terminal. All such Expansion Modules should be provided with whatever Isolated DC Power Supply is necessary for the Expansion Module and its peripherals (see the relevant Installation Manuals).

The S-Bus Host “+” Terminal is intended for powering S-Bus Devices that require less than 500 mA – a good example would be the Impro (QR) Quad receiver.

Should you wish to power S-Bus Devices from the S-Bus Host “+” Terminal, the total current draw may not exceed 500 mA – and the cable core thickness used should be sized to prevent more than a 1V drop across the cable run.

The following table makes it easy to select a suitable cable gauge:

Conductor Size		Cable Length			
Area (mm ²)	AWG	25m (80 ft.)	50m (165 ft.)	100m (325 ft.)	150 m (490 ft.)
1.31	16	500 mA	500 mA	500 mA	490 mA
0.82	18	500 mA	500 mA	460 mA	310 mA
0.52	20	500 mA	500 mA	290 mA	190 mA
0.33	22	500 mA	370 mA	180 mA	120 mA
0.21	24	420 mA	230 mA	110 mA	70 mA

Table 1: Selecting cable for powering S-Bus Devices

A quick check may be performed with the system powered up – the voltage across the “+” and “-” terminals of the S-Bus Device in question should be at least 11V.

NOTE: *Measure the Device Supply Voltage at the Device – and NOT at the Cluster Controller end of the cable.*

Blank Space

Mounting the Cluster Controller

CAUTION: Make certain that you mount the Cluster Controller on a vibration-free surface.

NOTE: The Cluster Controller can be mounted onto virtually any surface, including metal.

- Survey the installation site and select a suitable location for the Cluster Controller and any clustered Expansion Modules. Consider the routing of all cables to and from the cluster and make allowance for possible expansion (more Modules) or alteration in the future.
- Remove the Housing Cover from the Cluster Controller, and holding the Housing Base in position (properly squared up); mark the position for mounting screws on the mounting surface.
- Use the Stand-Offs to provide space for cables behind the cluster, or to allow for an uneven mounting surface.
- Mount the CCM Housing Base firmly to the mounting surface using fasteners (not included) appropriate for the mounting surface material.
- Select the gland plates that best suit the installation and/or knock out the cable entry points as needed.
- Wire the Cluster Controller based on the typical wiring diagrams beginning on page 13.
- REMOVE the battery tag.
- Select the required Operating Mode using the DIP Switches (see page 8).
- Power up the Cluster Controller (and any Clustered Expansion Modules) by connecting the supply to the Cluster Controller Power + and – Terminals.
- Replace the Module Housing Covers and fasten closed with the two Allen head screws provided with each Module.
- Commission the newly installed hardware by via the System Software:
 - **Access Portal LITE:** Using an HTML 5 compliant browser, access the web application embedded in the System Controller Cluster Controller.
 - **Access Portal:** Go to the Site Host Computer and use the options available via the Access Control System Application.

NOTE: It is NOT necessary to disconnect the power to the Cluster Controller when adding or removing clustered Modules – they are “Hot-Swappable”

Cluster Controller Operating Modes

The Cluster Controller may be configured (see *DIP Switch Settings on page 10*) to operate in one of four different modes:

1. Door Controller Mode

Downstream Components	Limits	Fixed Addresses
Clustered Expansion Modules	Cluster power rail supports up to 8 Modules	Up to 16
S-Bus-coupled Devices	S-Bus limit of 8 Addresses	Up to 8
TOTAL Maximum:		24 Fixed Addresses

Table 2: Fixed Addresses handled by a Door Controller CCM

2. Access Portal LITE Mode

This mode allows for a Cluster Controller Module to function as a stand-alone controller for maximum of 16 Fixed addresses. The user will be able to manage and configure the system on any (HTML 5 Compliant) browser via the Ethernet Port, using the embedded web application within the Cluster Controller. (AP LITE Mode does NOT support IP communications with other modules, such as Door Controllers, or the legacy iTRT.)

Downstream Components	Limits	Fixed Addresses
Clustered Expansion Modules	Cluster power rail supports up to 8 Modules	Up to 16
S-Bus-coupled Devices	S-Bus limit of 8 Addresses	Up to 8
DC RS485: Door Controllers (with their Expansion Modules and all their attached S-Bus Devices)	Limited by the number of Fixed Addresses remaining from a Quota of 16	Whatever remains from 16
TOTAL Maximum:		16 Fixed Addresses

Table 3: Fixed Addresses handled by an Access Portal LITE CCM

3. IXP220 Mode

This mode allows the Cluster Controller to be used in an IXP220 System (configured as one of a number of networked controllers) to control a maximum of 64 fixed addresses each.

Downstream Components	Limits	Fixed Addresses
Clustered Expansion Modules	Cluster power rail supports up to 8 Modules	Up to 16
S-Bus-coupled Devices	S-Bus limit of 8 Addresses	Up to 8
DC RS485: Door Controllers (with their Expansion Modules and all their attached S-Bus Devices)	Limited by the number of Fixed Addresses remaining from a Quota of 64	Whatever remains from 64
TOTAL Maximum:		64 Fixed Addresses

Table 4: Fixed Addresses handled by an IXP220 CCM

4. Access Portal Pro Mode

This mode sets up the Cluster Controller to be used in an Access Portal Pro System (configured as one of a number of networked controllers) to control a maximum of 64 fixed addresses each.

Downstream Components	Limits	Fixed Addresses
Clustered Expansion Modules	Cluster power rail supports up to 8 Modules	Up to 16
S-Bus-coupled Devices	S-Bus limit of 8 Addresses	Up to 8
DC RS485: Door Controllers (with their Expansion Modules and all their attached S-Bus Devices)	Limited by the number of Fixed Addresses remaining from a Quota of 64	Whatever remains from 64

TOTAL Maximum: 64 Fixed Addresses

Table 5: Fixed Addresses handled by an Access Portal System Controller

Dip Switch Settings

NOTE: The DIP Switch Settings are only read on power-up. If any changes are made to the DIP Switch settings, the power to the Cluster Controller should be disconnected and then reconnected to register the new settings.







DIP-switch Position	Function MODE
0  DIP-switch 0 shows switches 2, 3 and 4 in the OFF position	Door Controller
1 	Access Portal LITE
2 	IXP220
3 	Access Portal Pro
4 	Reserved
5  Switches 2, 3 and 4 have no effect	Factory Default: Set DIP Switch 1 to ON , cycle power to the Module, wait for Controller restart (~20 seconds), and return DIP Switch 1 to OFF .

Table 6: MODE Select DIP-switch Settings

Recovering from invalid IP Address allocation

In the event that the Cluster Controller has been allocated an IP Address that falls outside of the system mask, option 5 in the table on page 10 will restore the factory default condition. In this state the Cluster Controller module will get a DHCP assigned address. If no address is assigned by a DHCP server, the module will revert to 192.168.100.1 with a subnet of 255.255.255.0.

NOTE: *Remember to cycle the power to the Cluster Controller to acknowledge the DIP Switch settings.*

REAL TIME CLOCK BATTERY - AND TIME SETTING

First Time Use

Be sure to locate and remove the removable Battery Tab during the installation process.

Replacement of the battery

1. Remove the Cluster Controller Housing Cover (two Allen head screws).
2. Remove power to the Cluster Controller by disconnecting the supply to the POWER "+" Terminal, insulating the end of the wire to prevent accidental shorting.
3. Using a small screwdriver, eject the Button Cell battery from its holder and replace it with a fresh 3 V, CR2032, Lithium cell Battery.

NOTE: *The Positive side of the battery must be on top – AWAY from the PCB.*

4. Restore power by reconnecting the supply to the POWER "+" Terminal.
5. Replace the Cluster Controller Housing Cover and Allen head screws.

ELECTRICAL CONNECTIONS

Key Component Positions

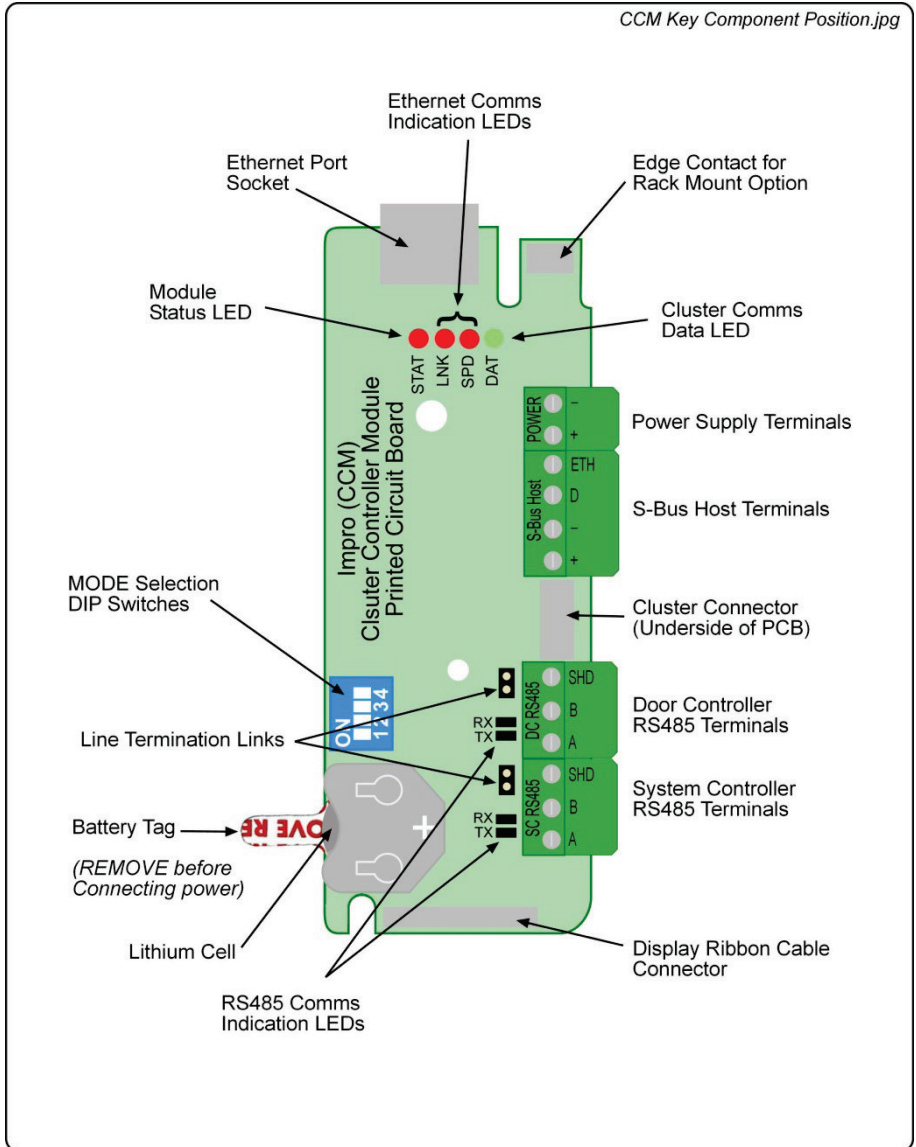


Figure 1: Impro Cluster Controller Key Component Positions

NOTE: The Ethernet Port Socket and associated indicator LEDs are only present on the HCM720 and HCM722 Models.

Cluster Controller Module as a Door Controller

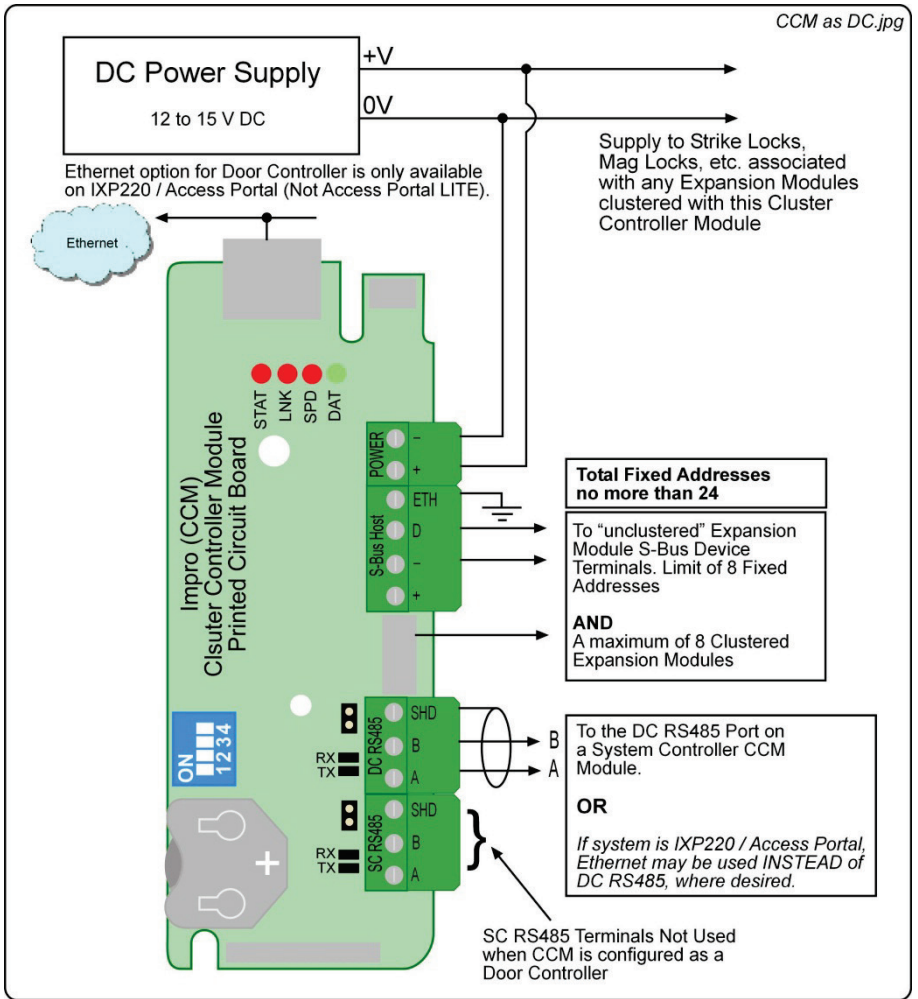


Figure 2: Cluster Controller Module as a Door Controller

Cluster Controller as an Access Portal LITE System Controller

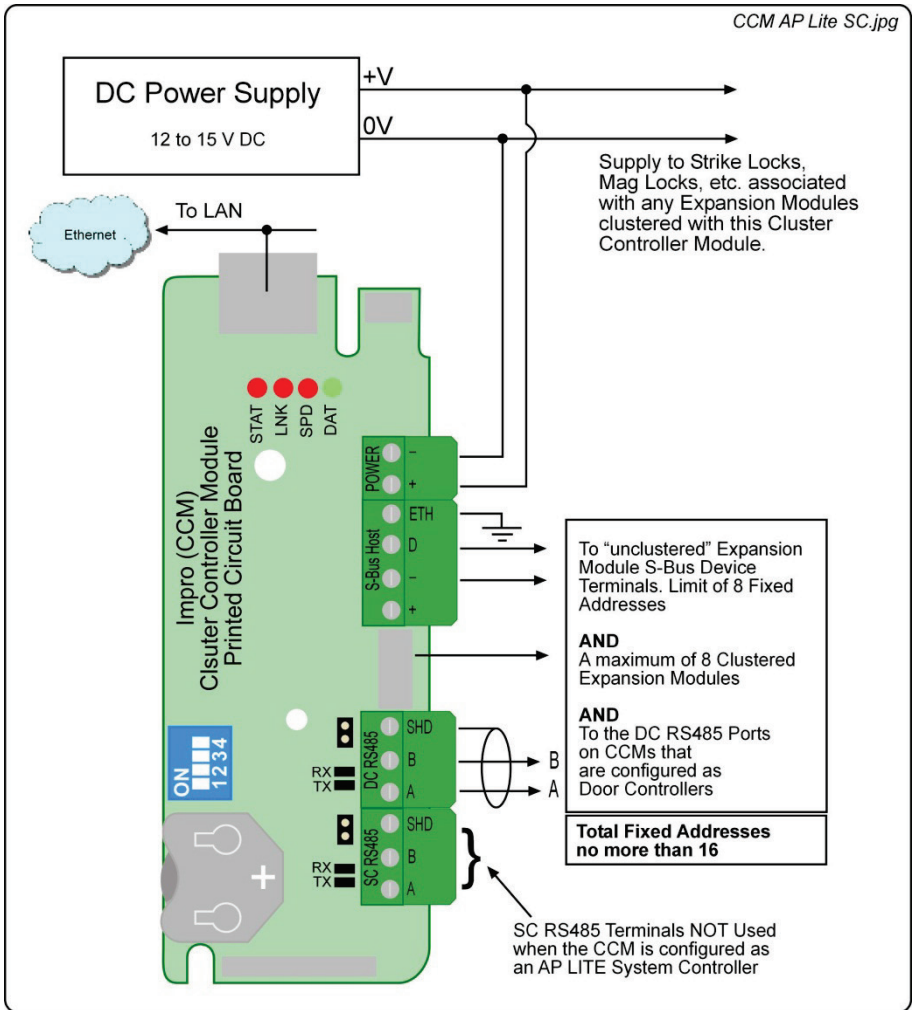


Figure 3: Cluster Controller as a System Controller in an AP LITE System

Cluster Controller in an IXP220 System

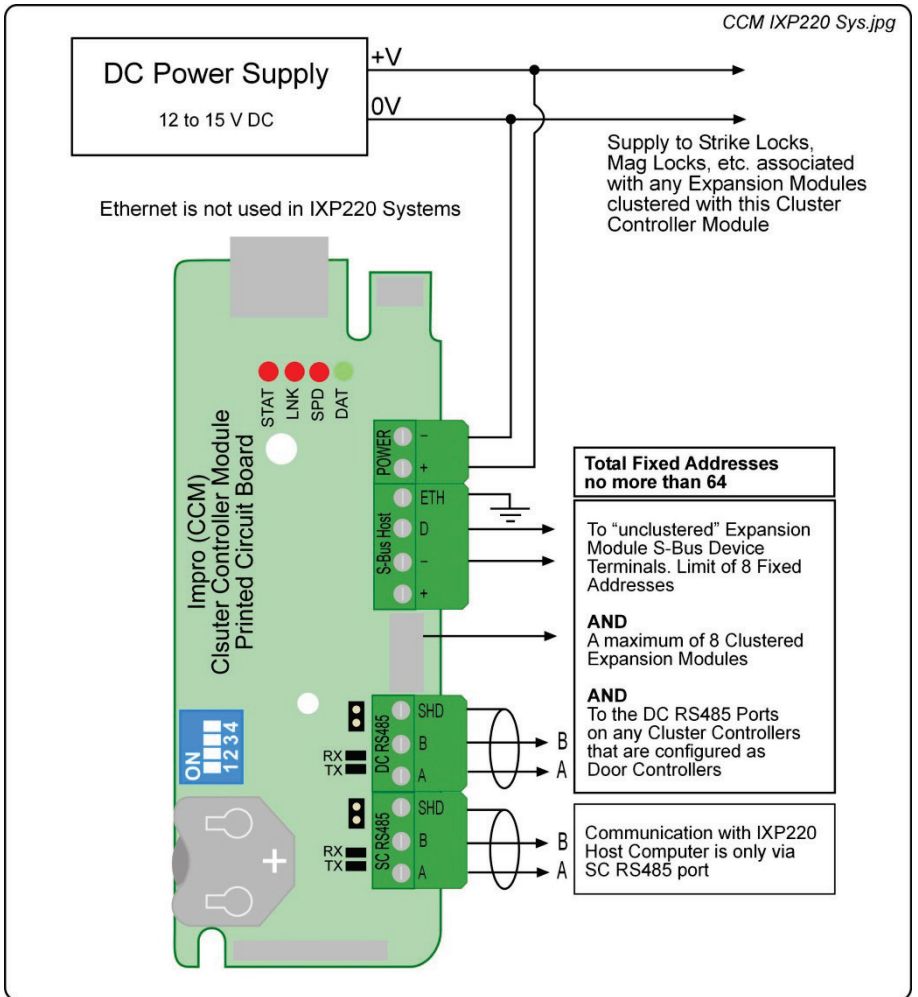


Figure 4: Cluster Controller in an IXP220 System

Cluster Controller in an Access Portal PRO System

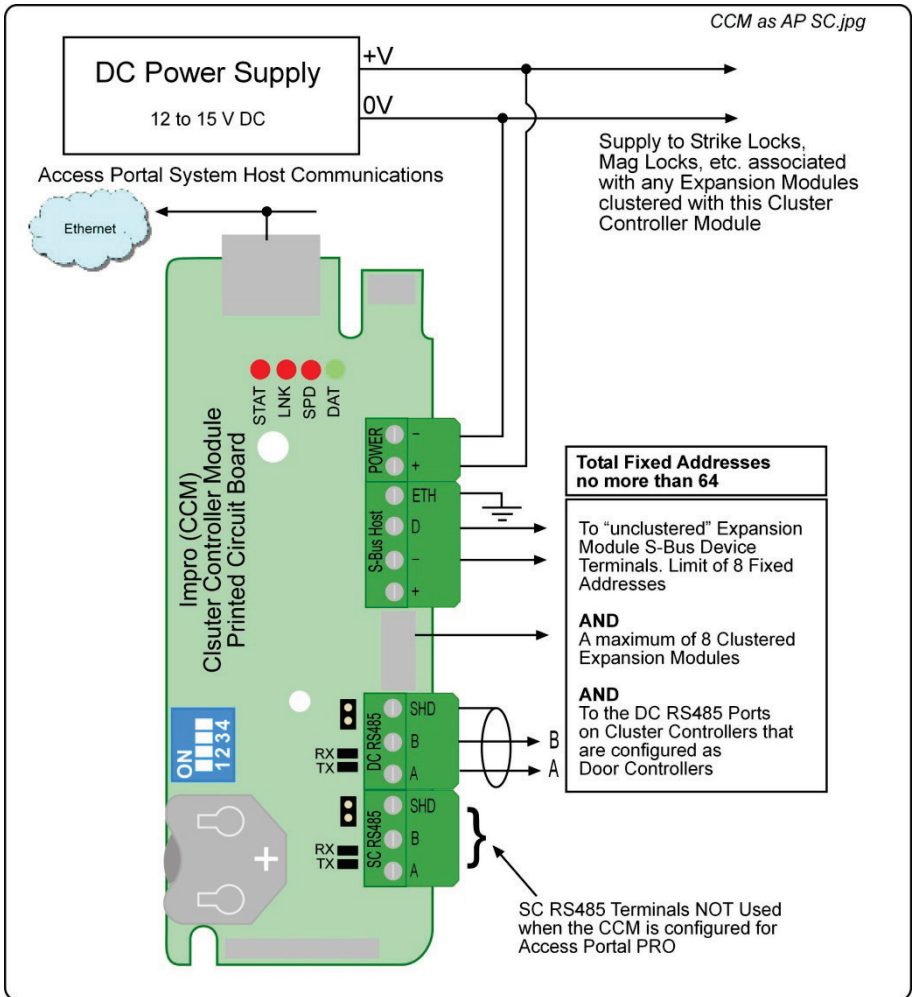


Figure 5: Cluster Controller in an Access Portal PRO System

Power-on Self-test

The Power-on Self-test tests the RAM and Flash Checksums.

If any parameter in the Self-test fails, the RED Status LED will keep flashing.

When the Cluster Controller passes the Self-test, the RED Status LED will stay on as long as the Cluster Controller is powered up.

Fixed Address Label

Once the Impro Cluster Controller is installed, sketch a rough site plan. Attach the loose (additional Fixed Address Label packaged with the Module) Fixed Address Label in the position of the Terminal on the sketched site plan. When the system installation is complete and all the units are represented on the site plan by their Fixed Address Labels, file the site plan for future reference.

GUARANTEE OR WARRANTY

This product conforms to our Guarantee or Warranty details placed on our Web Site, to read further please go to www.impro.net.

USER NOTES

USER NOTES

USER NOTES



This manual is applicable to the Impro Cluster Controller, HCM720-0-0-GB-00, HCM721-0-0-GB-00, HCM722-0-0-GB-00, HCM723-0-0-GB-00. (The last two digits of the Impro stock code indicate the issue status of the product).

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