



**MODEL NUMBERS:**

HCM720-0-0-NN-XX HCM721-0-0-NN-XX  
HCM722-0-0-NN-XX HCM723-0-0-NN-XX  
HCM724-0-0-NN-XX HCM726-0-0-NN-XX

# Cluster Controller

## Impro (CCM) Cluster Controller Module INSTALLATION MANUAL

### SPECIFICATIONS

The Cluster Controller provides all the Control, Communications, Tag Buffer and Memory required to run a Cluster of Expansion Modules, which are selected to suite the access control requirements.

#### Working Environment

**Plastic Module Housing**  
(HCM720,HCM721,HCM724,  
HCM726)

Designed to work in an indoor (dry) environment similar to IP20. The CCM is not sealed against water.

**PCB Card for small IPS Housing**  
(HCM722,HCM723)

Designed to work in an indoor (dry) environment similar to IP20. The CCM is not sealed against water.

#### Power

<b>Input Voltage</b> .....	12 V DC to 15 V DC, polarity sensitive	
<b>Power Requirements (at 12V DC)</b>	<b>Current (mA)</b>	<b>Power (W)</b>
Models with no Touch Screen	140	1.7
Models with Touch Screen	175	2.1

#### Real Time Clock (RTC) Backup Battery

Battery Type.....	1 x 3 V, CR2032, Lithium cell Battery.
Battery Life.....	1 Year with Power OFF, 5 years with Power ON, 5 years Storage with Battery Tab in place.

## Communication Ports

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<b>Ethernet Port (HCM720, HCM722, HCM724, HCM726)</b> .....	Standard Ethernet RJ45 connector. 10/100 Base T, half or full duplex
<b>RS485 System Controller Port</b>	
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

Electrical Interface .....	Remotely mounted Expansion Modules are connected to the Cluster Controller via S-Bus Proprietary 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

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### General Indicators

#### Status LED

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

<b>Data LED</b> .....	Green LED ON or flashing during any communication (Ethernet, RS485, Cluster or S-Bus)
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### Ethernet Port Diagnostic Indicators (HCM720, HCM722, HCM724, HCM726)

<b>LINK LED</b> .....	Continuous Red with Ethernet Connected.
<b>SPD LED</b> .....	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

### Touch-screen display (HCM724, HCM726)

Type	Back-lit TFT colour LCD
Size	71 mm (2.8")
Resolution	320 x 240
Touch Screen Technology	Resistive

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# INSTALLATION INFORMATION

## Accessories

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Find the following when unpacking the CCM:

### Plastic Housing (HCM720, HCM721, HCM724)

*NOTE: HCM724 includes a built-in LCD Touch Screen)*

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

### Plastic Housing with LCD Touchscreen for wide IPS Installation (HCM726)

This model comes pre-installed in an IPS Boxed Solution combination.

## Communication Considerations

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### Ethernet (HCM720, HCM722, HCM724, HCM726)

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

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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 (“D” and “-”) and at least 0.21 mm<sup>2</sup> (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: Reserved Status**

“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).

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## **Mounting the Cluster Controller (plastic housing, non-IPS installation)**

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**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 14.
- REMOVE the battery tag.
- Select the required Operating Mode using the DIP Switches (see page 11).
- 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 Web Application:** Using an HTML 5 compliant browser, access the web application embedded in the System Controller Cluster Controller.
  - **Access Portal LITE Touch Screen Menu:** Only available if the Cluster Controller has a touchscreen built into its cover (Models: X & Y) – use the built-in application via the touch screen.
  - **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

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The Cluster Controller may be configured (see *DIP Switch Settings on page 11*) 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
<b>TOTAL Maximum:</b>		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 OR the built-in touch screen, if fitted. (AP LITE Mode does NOT support IP communications with other modules, such as Door Controllers, or the legacy iTRT.)

In AP LITE Mode, a touchscreen-fitted CCM will default to touchscreen mode, and the AP LITE Web application only becomes accessible when the touchscreen has been locked – using the touchscreen menu.

The software instruction manuals for these two built-in applications may be downloaded from [www.impro.net](http://www.impro.net):

Access Portal LITE (Web Application) Manual: **HCM321-0-0-GB-XX**

AP LITE Touch Manual: **HCM322-0-0-GB-XX**

**NOTE:** *It is recommended that all AP LITE data is backed up using the Firmware Upgrade Tool.*

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
<b>TOTAL Maximum:</b>		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





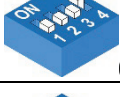

**Table 5: Fixed Addresses handled by an Access Portal System Controller**

*DIP Switch Settings follow on next page...*

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## 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  0000	Door Controller
1  0100	Access Portal LITE
2  0010	IXP220
3  0110	Access Portal Pro
4  0001	<i>Reserved</i>
5  1XXX	<b>*Factory Default:</b> Set DIP Switch 1 to <b>ON</b> , cycle power to the Module, wait for Controller restart (~20 seconds), and return DIP Switch 1 to <b>OFF</b> . (Switches 2, & 4 don't matter)

**Table 6: MODE Select DIP-switch Settings**

**NOTE:** *Defaulting the Cluster Controller will erase all Access Portal LITE data.*

*If the Cluster Controller is used in AP LITE mode, it would be wise to back up the AP LITE settings using the Firmware Update Tool.*

*This same Firmware Update Tool can be used to restore the AP LITE settings in the event that a Factory Default is performed – or if the Cluster Controller is replaced, for any reason.*

*If a static IP address was set up, this too will be restored – so the static address should be noted somewhere safe for future use.*

## 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 11 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 unplugging the POWER Terminal plug.
3. If the housing cover is fitted with an LCD display, unlock the FPC connector on the Cluster Controller PCB (by lifting the grey locking slider) and withdraw the display FCC cable.
4. 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.*

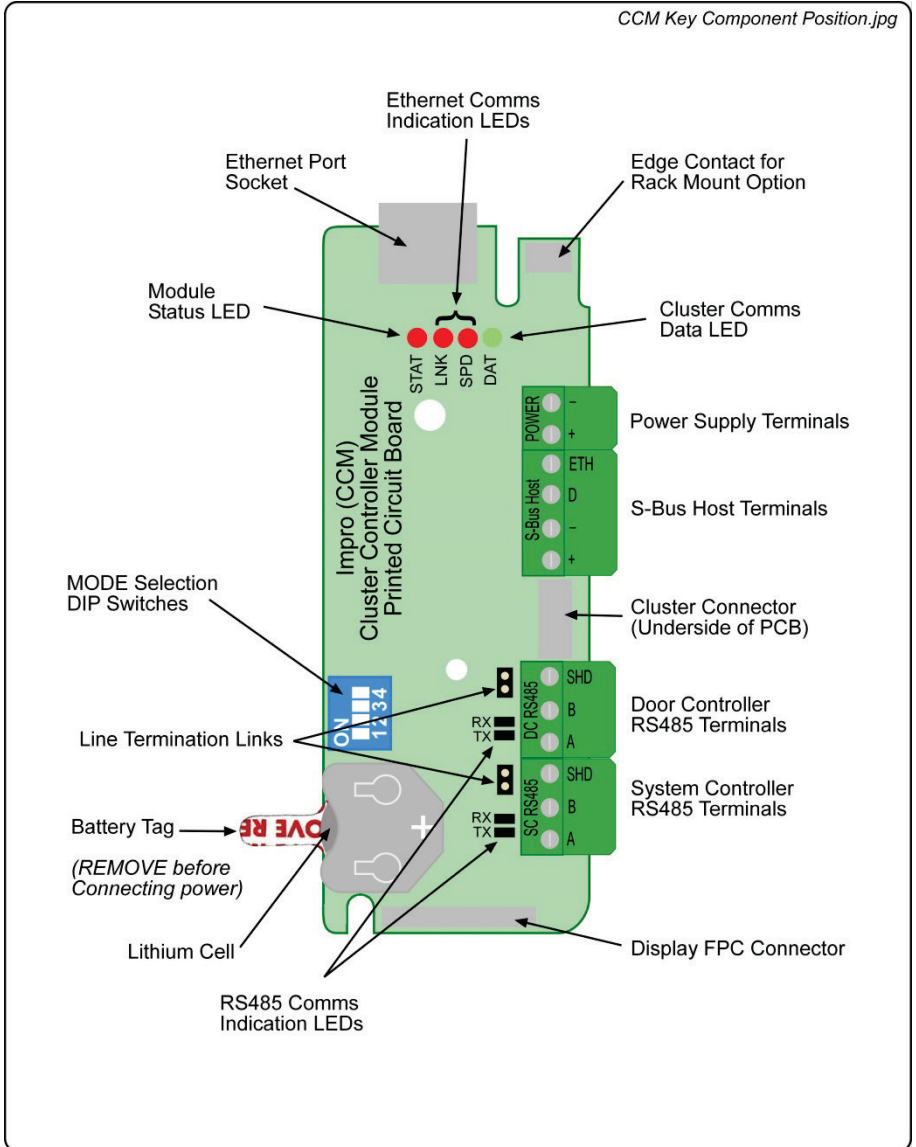
5. If you removed the display ribbon cable, replace it, ensuring that the grey locking slider is properly lifted before inserting the ribbon (blue stripe towards the centre of the PCB). With the ribbon cable properly inserted, slide the grey locking slider back down, ensuring that the slider is properly flat in position for a firm lock.
6. Restore power by plugging the POWER “+” Terminal plug back into its socket.
7. Replace the Cluster Controller Housing Cover and Allen head screws.

### Time setting

This is performed via the Access Control System Application in use, which could be Access Portal Pro, Access Portal LITE, or IXP220.

# ELECTRICAL CONNECTIONS

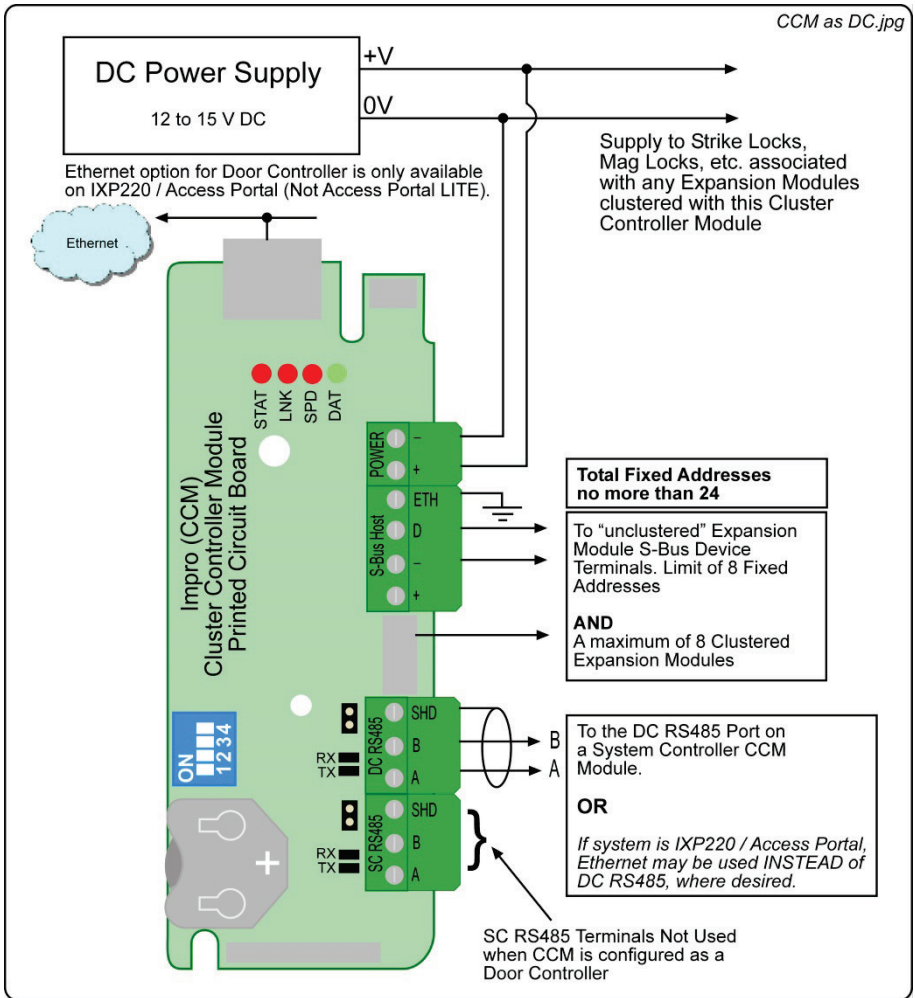
## Key Component Positions



**Figure 1: Impro Cluster Controller Key Component Positions**

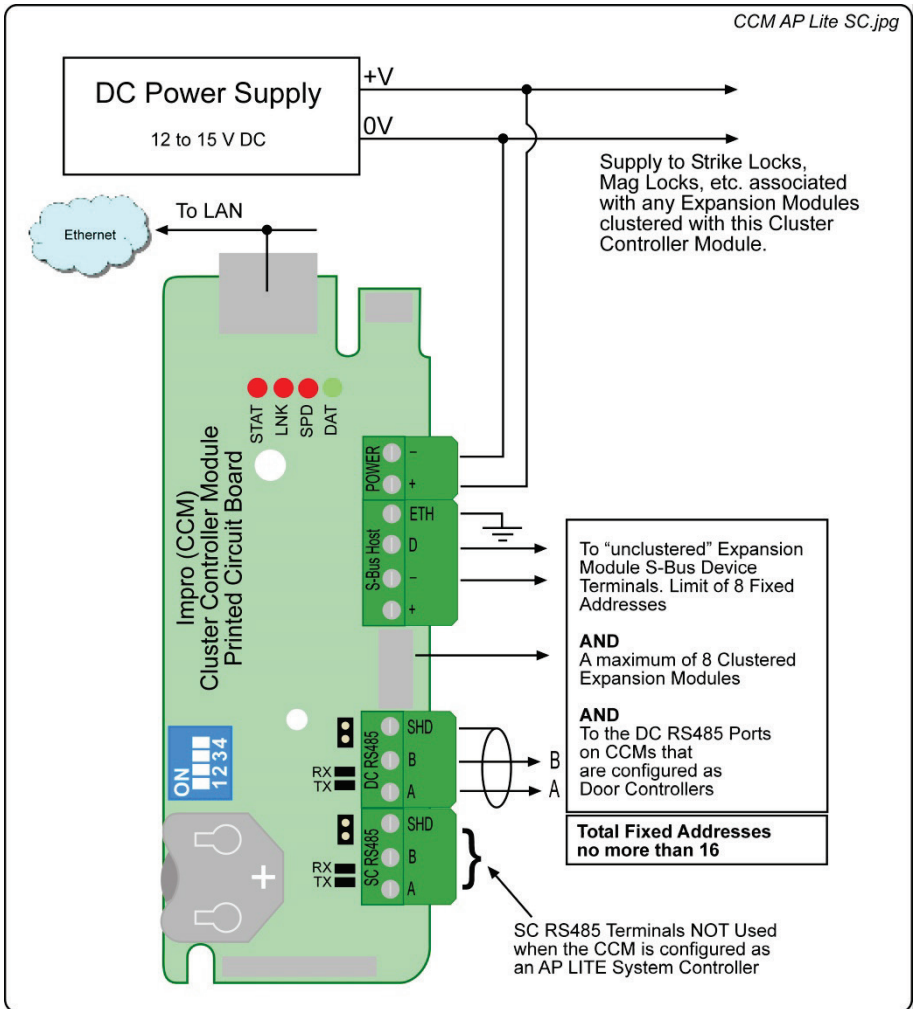
**NOTE:** The Ethernet Port Socket and associated indicator LEDs are only present on the HCM720 and HCM722 Models.

# Cluster Controller Module as a Door Controller



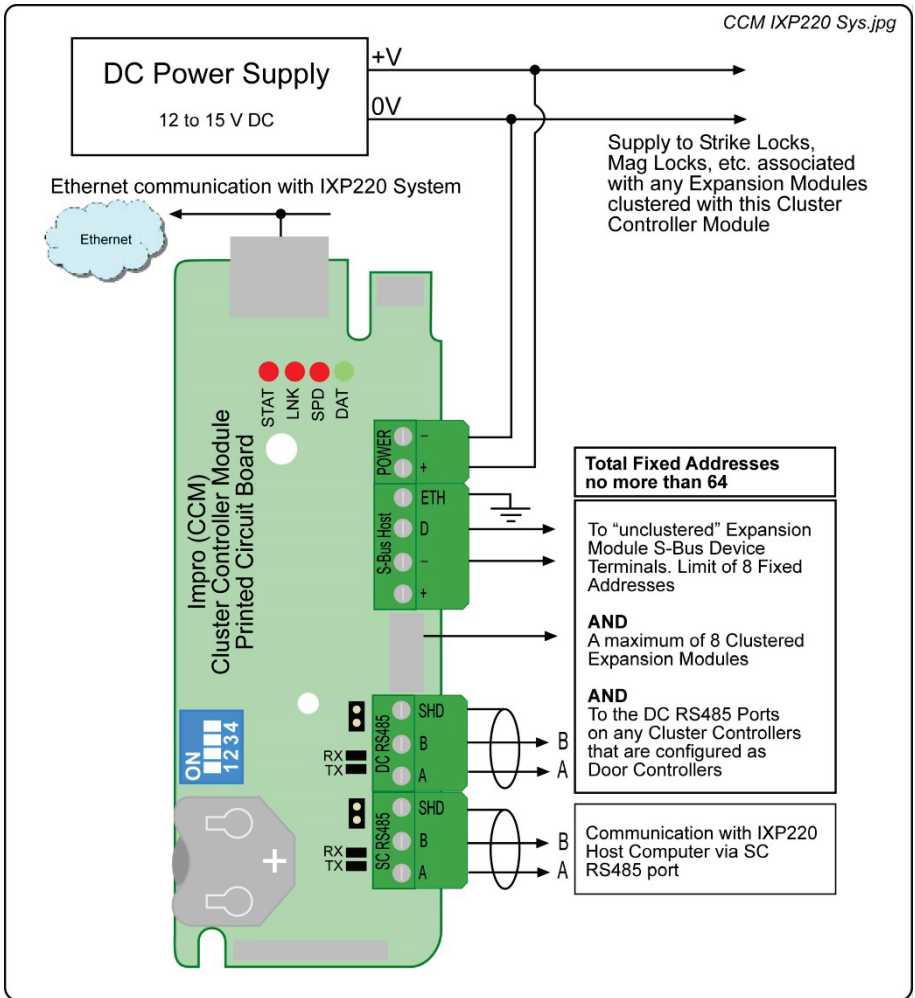
**Figure 2: Cluster Controller Module as a Door Controller**

# 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

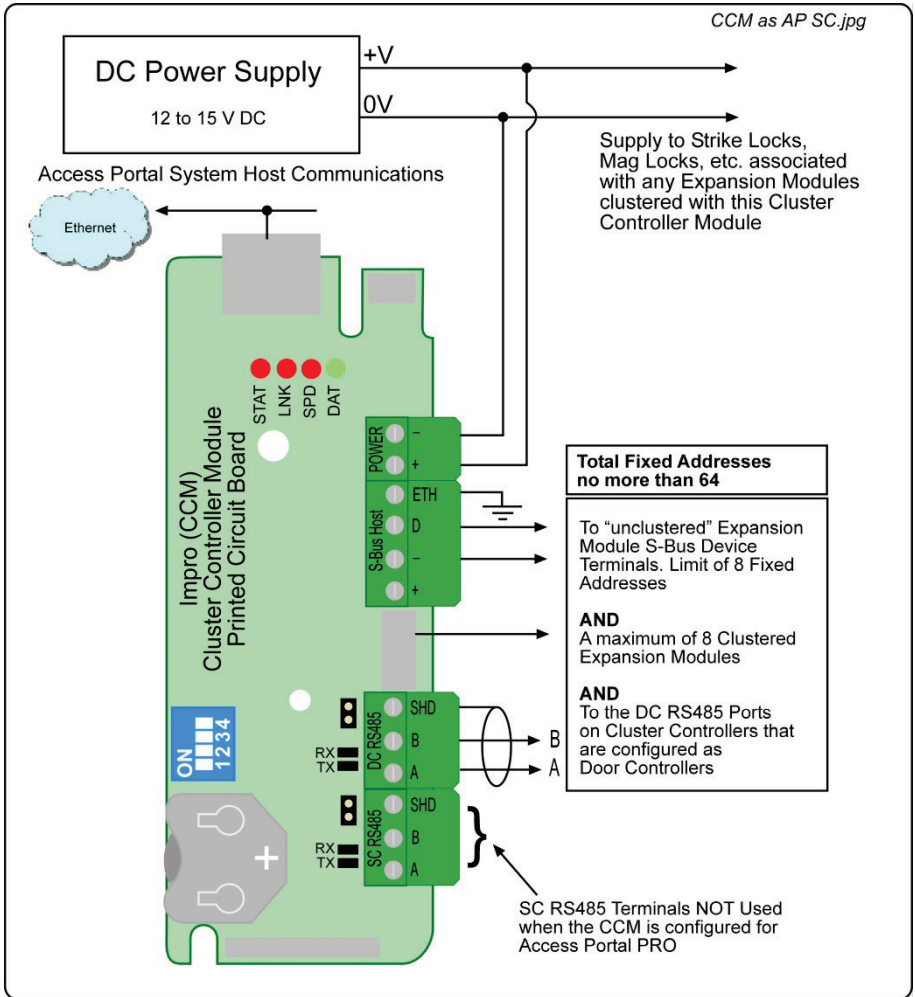


**Figure 4: Cluster Controller in an IXP220 System**

When configured for the IXP220 System, the Cluster Controller Module may be connected to the IXP220 System Computer via RS485 OR Ethernet



# Cluster Controller in an Access Portal PRO System



**Figure 5: Cluster Controller in an Access Portal PRO System**

## Power-on Self-test

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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

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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](http://www.impro.net).

## USER NOTES

## USER NOTES

**NOTE:** *This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.*



<p>This manual is applicable to the Impro Cluster Controller, HCM720-0-0-GB-XX, HCM721-0-0-GB-XX, HCM722-0-0-GB-XX, HCM723-0-0-GB-XX, HCM724-0-0-GB-XX, HCM726-0-0-GB-XX          (The last two digits of the Impro stock code indicate the issue status of the product).</p>			
HCM320-0-0-GB-04	Issue 05	Oct 2019	Impro\Access Portal\CCM Cluster Controller Module\English Manuals\LATEST ISSUE\conccm-insm-en-05.docx