

# Network Control Unit Network Expansion Unit

	Page	3
<b>Introduction</b>		<b>3</b>
● <i>Application Overview</i>		3
- Network Control Module with Direct Control		*3
- NCM-Only		*3
- Direct Control, without the NCM		*3
● <i>Theory of Operation</i>		*4
- N1 Communications		*4
- N2 Communications		*4
- L2 Communications		5
- NT and Integrated RS-232 Communications		5
- Submodule Communications		*5
- Network Expansion Unit		6
- Power		*6
- Field Sensors		6
<b>Installation</b>		<b>7</b>
● <i>Planning Considerations</i>		7
- Space and Load-Bearing Requirements		*7
- Environment		7
- Power		8
● <i>Design Considerations</i>		*8
- Configuration Options		*8
- NCU Versus NEU		10
- NCM-Only Base Frame Versus Standard Base Frame		*10
- Determining the Number of NCU/NEU Units and Types of Modules Needed		*11
● <i>Installation Guides</i>		12
- Mounting Enclosures		*12
- Mounting the Base Frame		*14
- Conduit Entry		*15

\* Indicates those sections where changes have occurred since the last printing.

## Installation (Cont.)

- *Mounting the Optional Network Terminal Cradle Kit* 17
  - Cradle Mounting Applications 19
  - Mounting the Cradle Onto a 2-Slot or 5-Slot Base Frame 20
  - Mounting the Cradle onto the Cover of an EWC200 or EWC500 22
  - Wall Mounting the Cradle Box (for EWC100 Enclosures or Remote Applications) 23
  - Seating and Removing the NT 24
- *Mounting the Optional Table Top Modem* 27
- *Wiring Details* \*28
  - Wiring to the Terminal Blocks 30
  - Power Connection 32
  - Connecting Network Lines to the NCU/NEU \*33

## Commissioning Procedures 35

- *Overview* 35
- *Tools Required* 35
- *Inspect Wiring Installation* \*36
- *Install Function Modules* 37
- *Install Power Supplies* 39
- *Install Electronic Modules* \*42

## Troubleshooting Procedures 45

- *Troubleshooting* 45
  - Preventive Maintenance \*45
  - Replaceable Parts \*46
  - Power Assembly (TBP) 47
  - Communications Board (TBC) \*48
  - Field Terminal Block \*51
  - Preload Resistor \*51
  - Troubleshooting the Backplane (Motherboard) 52
- *Repairs* 53
  - Replacing the Power Assembly \*53
  - Replacing the Communication Board \*55
  - Replacing the Field Terminal Blocks \*57
  - Replacing the Preload Resistors \*59
- *Ordering Information* 61

\* Indicates those sections where changes have occurred since the last printing.

# Introduction

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## **Application Overview**

The Network Control Unit (NCU) is a field panel housing electronic modules, terminal blocks, and signal conditioners (pneumatic, line-voltage, and electronic) all inside a single enclosure.

The NCU is configured to suit a particular application by selecting various control, point interface, and processor modules, and installing them into an appropriate base frame. There are three general application configurations.

## **Network Control Module with Direct Control**

The NCU contains the user-programmable main processor—the Network Control Module (NCM)—for supervisory functions over all devices on the local bus, and a combination of the optional Digital Control Module and Point Multiplex Modules to directly control field devices that wire to the NCU termination blocks. This application installs all models of the NCM (101, 102, 401, 200) into standard 1-Slot, 2-Slot, or 5-Slot base frames.

## **NCM-Only**

When an application requires the NCM to supervise devices along a trunk, but does not require direct wiring to field devices or the flexibility of interchanging other electronic modules (DCM, XMs), a simpler, streamlined NCM-Only base frame is available. This base frame requires an N1 direct-connect NCM (i.e., the NCM200). Application examples include migration connections (S2, JC/85 Gateway) or when the NCM200 is supervising an application specific controller, such as the fire and safety IFC-2020, security IAC-600, HVAC controllers (AHU, VAV, etc.) or Intelligent Lighting Controller.

## **Direct Control, Without the NCM**

As a means to expand the object and control loop capacity of an NCU, this application of the field panel—the Network Expansion Unit (NEU)—is identical to the NCU, except that it lacks an NCM. The NEU provides an intelligent, remote panel to house XMs in the standard 1-Slot base frame or a DCM / XM combination in the standard 2-Slot or 5-Slot base frames. The DCM and XMs directly control field devices, then connect back to an NCU over the local N2 Bus.

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**Theory of Operation**

The block diagrams of NCU operation (Figure 1, 1-Slot, 2-Slot, 5-Slot models; Figure 2, NCM-Only model) illustrate the functions and operations of the NCU components.

For the 1-Slot, 2-Slot, and 5-Slot models, the base frame (1) in Figure 1 provides the physical connection between the network communication buses, external power, and field wiring to the various plug-in modules that monitor and control points.

For the NCM-Only model (Figure 2), the base frame connects the external power, the NCM200, and the terminations for the local N2 and L2 buses.

**N1 Communications**

The N1 LAN provides ARCNET™-compatible communications, including Dynamic Data Access™, between NCUs (2) and the Operator Workstation (3). For standard 1-Slot, 2-Slot, and 5-Slot base frames, the N1 LAN cable attaches to the NCU at the Communications Terminal Board (4), which provides two coaxial connectors to allow the network to connect in a daisychain fashion. The N1 LAN signals are routed via the base frame to the factory-installed N1 daughterboard in NCM101s and NCM401s. The NCM102, used in standalone applications, does not contain the N1 interface.

*N1 Communications to NCM200*

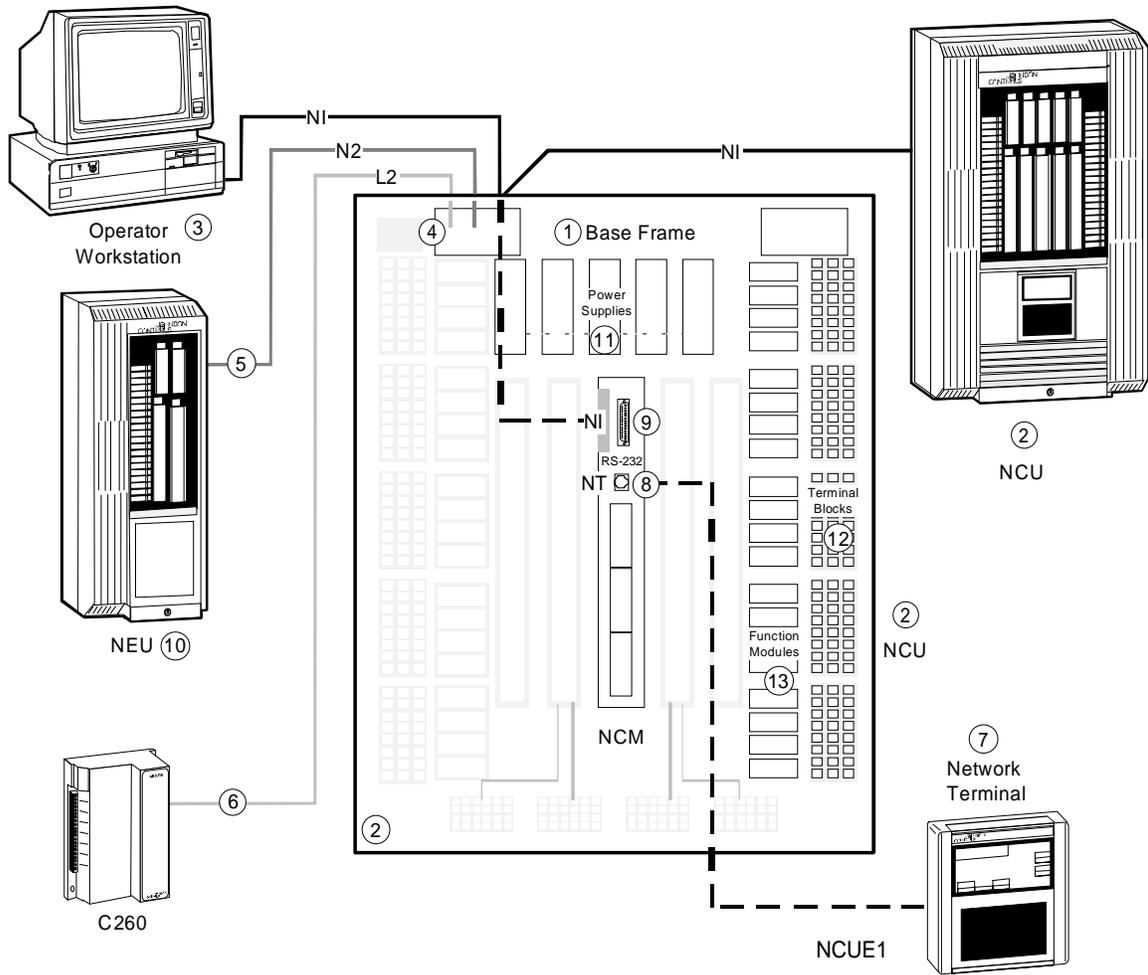
The NCM200 contains an integrated N1 circuit and makes the N1 connection at the base of the NCM200 module, whether the NCM200 is installed in a standard base frame or in the NCM-Only base frame.

**N2 Communications**

For the 1-Slot, 2-Slot, and 5-Slot base frames housing an NCM 101, 102, or 401, the N2 is an optional local bus (5) that is enabled by the use of an N2 submodule in the NCM. N2 bus circuitry is integrated into the NCM200.

Whether the NCM is installed in a 1-Slot, 2-Slot, 5-Slot, or NCM-Only base frame, the N2 field terminations are made at the Communications Terminal Board.

When using the N2 network, the NCM exchanges information with the DCMs and XMs (in 2- or 5-Slot base frame applications), NEUs, and application specific controllers (i.e., IFC-2020 Intelligent Fire Controller™, IAC-600 Intelligent Access Controller, HVAC, or lighting controllers). The NEUs and ASCs wire in a daisychain fashion to the Communications Terminal Board on the base frame. The N2 continues internally within the base frame, on which all the installed electronic modules connect. (Regardless of the NCU or NEU in which they are installed, the DCMs and XMs are individually addressable devices.) The N2 Bus is optically isolated within each module.



**Figure 1: Diagram of NCU Operation**

**L2 Communications**

The L2 Bus is an optional local bus (6) dedicated to C210 and C260 controllers. It is enabled by the use of the L2 Submodule installed in the NCM (all models). L2 field terminations are made at the Communications Terminal Board.

**NT and Integrated RS-232 Communications**

An NCM can also transmit information to the Network Terminal (7) via its built-in NT port (8). An Operator Workstation (or other RS-232 device) can connect to the NCU at the NCM's integrated RS-232 port (9).

**Submodule Communications**

RS-232 devices, (e.g., Operator Workstation or printer) connect to the NCM via modem or RS-232 submodules. Migration capabilities (JC/85 Gateway and S2 on the NCM101, 102, 401; Gateway, S2, and the Network Port application on the NCM200), as well as the Operator Terminal application, also connect to the NCU via an RS-232 submodule installed in the NCM.

**Network Expansion Unit**

The NEU (10) functions as a remote mounting platform for DCMs and XMs, and as a node on the N2; supervisory control is directed by the Network Control Module in the NCU. The NEU is an XM in a standard 1-Slot base frame, and a DCM or XM in a 2-Slot or 5-Slot base frame.

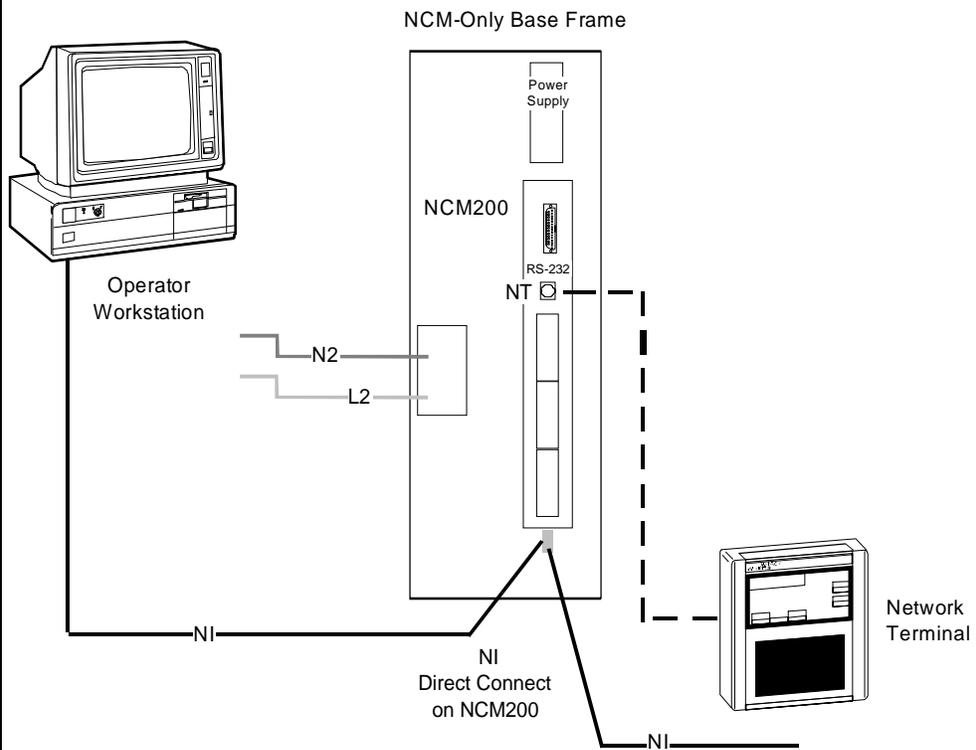
**Power**

External line-voltage is brought into a power termination area in an upper corner of each base frame. Power is routed through the base frame to the individual Power Supplies (11) to service each module. The modular power supplies are switch-set (120/240) and are interchangeable. They regulate voltage and provide control logic features such as powerfail warnings and a line frequency clock (50/60 Hz).

**Field Sensors**

For 1-Slot, 2-Slot, and 5-Slot base frames, field sensor connections are made via terminal blocks (12) on the base frame. Each slot on the base frame that accepts DCM or XM electronic modules has dedicated terminal blocks to connect allowable combinations of inputs/outputs. The terminal blocks connect either directly to the electronic modules or through Function Modules (13), which condition signals between electronic modules and their field devices.

Since field devices are not expected to be wired to the simplified NCM-Only base frame, there are no field-device terminal blocks or function module slots.



**Figure 2: Diagram of NCU With NCM-Only Base Frame**

# Installation

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## **Planning Considerations**

To reduce the risk of fire or electric shock, the NCU/NEU must be installed in environments that are relatively free of conductive contaminants, such as normal cooking vapors and carbon dust.

## **Space and Load-Bearing Requirements**

- Select a wall space or area with sufficient room to mount the enclosure and install conduits. The load-bearing capacity of the wall must also be able to support the unit. The following chart indicates the dimensions of an enclosure-with-cover with a typical base frame inside, as well as the fully loaded configuration weight:

EWC100 with NCM-Only base frame	- 10 W x 28 in. H, 27 lb
EWC100 with 1-Slot base frame	- 10 W x 28 in. H, 34 lb
EWC200 with 2-Slot base frame	- 16 W x 38 in. H, 63 lb
EWC500 with 5-Slot base frame	- 26 W x 46 in. H, 110 lb

## **Environment**

- The ambient temperature limits for the NCU/NEU (32° to 122° F, 0° to 50° C) are based on convection cooling, as normally installed. Lower temperatures can be accommodated by means of field-installed enclosure heaters. Higher temperatures can be tolerated with some additional forced cooling.
- Ambient humidity must range within 10 - 90% RH (non-condensing).
- Dusty air in a manufacturing environment has no effect on the NCU's operation or reliability.



**WARNING:** To reduce the risk of fire or electric shock, the NCU/NEU must be installed in environments that are relatively free of conductive contaminants, such as normal cooking vapors and carbon dust.

- Shielded cables are required only when the NCU/NEU is mounted in close proximity to Radio Frequency transmitters (500 to 1000 watts or larger), airport control towers, and hospital nuclear or electronic imaging equipment (e.g., operating room, imaging lab).
- The NCU/NEU can operate while withstanding vibrations of 5 to 60 Hz of up to .5G, and shocks of up to 2G lasting 10 mS. Nonetheless, mount the unit on as stable a surface as possible.

## Power

- The NCU/NEU requires 120 VAC at 50/60 Hz from a single phase 15 amp circuit. Switches on the individual Power Supply Modules also accommodate a 230 VAC international circuit (United Kingdom: 240 VAC, 50 Hz, at 15 amps; Continental European: 220 VAC, 50 Hz, at 16 amps).
- Select a power circuit free of heavy equipment loads (e.g., large multiphase induction motors).
- Ground the base frame with the green-wire earth ground. Conduits leading to the panel must also be referenced (grounded) to the green-wire earth ground. Use a grounding bushing to tie the conduits together.
- A built-in surge protection clamp on the power box is rated to protect against a 6 kV pulse (IEEE 587 standard). External surge protection is unnecessary, except in cases of extreme lightning or high-voltage environments.

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## Design Considerations

This section addresses the decisions to consider when determining whether you need an NCU or an NEU, and whether an NCM-Only base frame is suitable. Next it explains how to calculate the necessary units and how to configure the modules inside the units.

## Configuration Options

Figure 3 indicates the module configuration options for the 1-Slot, 2-Slot, and 5-Slot base frame models.

Note: The NCM-Only base frame accepts only an N1 direct-connect NCM (the NCM200) and a Power Supply Module.

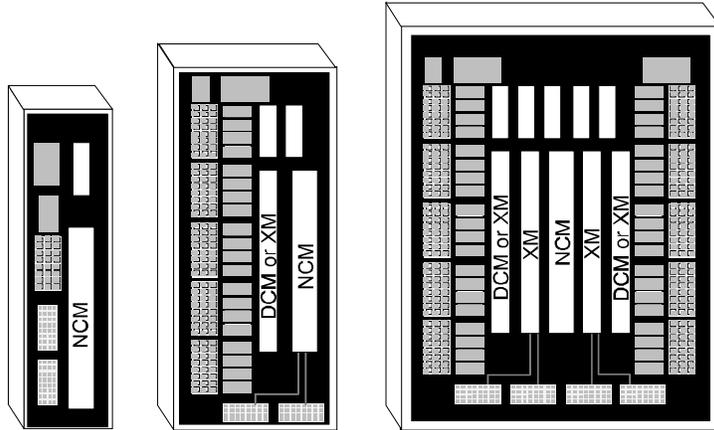
Use these references to estimate the point capacity for each option:

DCM	10 analog/binary inputs (except when using an IBN FM, which accepts two independent binary signals per input slot)
	10 analog/binary outputs (except when using an OAP FM, which requires two FM slots per output)
XBN	32 binary inputs
XRM	8 binary inputs, 8 binary momentary outputs
XRE	8 binary inputs, 8 binary electrically-maintained outputs
XRL	8 binary inputs, 8 binary latched outputs
NCU	NCM101, 102: 250 to 300 objects (memory dependent, varies with configuration)
NCM200:	Refer to the <i>NCM200 Technical Bulletin</i> .
C210/C260	Maximum number of controllers on L2 Bus is 63.

Note: Fire management, access control, Gateway, and S2 Migration capacities are listed in the *NCM Technical Bulletin*.

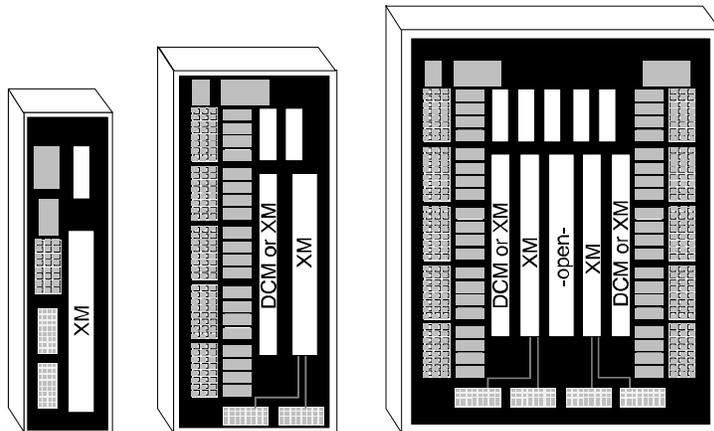
**Network Control Unit**

<b>EWC100</b>	<b>EWC200</b>	<b>EWC500</b>
NCM	NCM XM	NCM 2 DCM (or fewer) 2 XM (or fewer)
	NCM DCM	NCM DCM 3 XM (or fewer)
		NCM 4 XM (or fewer)



**Network Expansion Unit**

<b>EWC100</b>	<b>EWC200</b>	<b>EWC500</b>
XM	2 XM (or fewer)	[open slot] 2 DCM (or fewer) 2 XM (or fewer)
	XM DCM	[open slot] DCM 3 XM (or fewer)
		[open slot] 4 XM (or fewer)



**Figure 3: Configuration Options for the Standard NCU/NEU**

*Configuration Notes:*

- Each I/O point used in a DCM requires a function module (maximum of 20).
- Point Multiplex Modules placed in slots 1 or 5 require IUN Function Modules to interface input signals (8 IUN FMs for XBNs, 4 IUN FMs for XRL / XRE / XRM).s).
- The output function module OAP requires two contiguous FM slots for installation. A support bridge between FM slots 2 - 3 and 6 - 7 prevents an OAP installation in these slots.
- You can mix and match auxiliary gear with application specific controllers *and* Metasys base frames inside a single enclosure. Also, when you require additional space inside an enclosure, mount the base frame inside a larger enclosure (e.g., 1-Slot inside an EWC200, 2-Slot inside an EWC500 enclosure). For further enclosure options, see the Application Note *NCU/NEU Enclosures With Covers*, document number 636-315.3.

**NCU Versus NEU**

These considerations will help in deciding whether to use an additional NCU or an NEU:

- Always use an NEU unless local operator I/O is necessary (NT or Operator Workstation), or the capacity of the existing NCU is exceeded.
- If space is confined, and the need for supervisory control and local operator I/O is unnecessary (e.g., to instrument a fan system), a 2-Slot NEU containing a DCM and an XM is a compact solution: to add an NCM requires expanding to a 5-Slot base frame.

**NCM-Only Base Frame Versus Standard Base Frame**

These considerations will in deciding whether to use a standard 1-Slot base frame or the simpler NCM-Only base frame (this model comes without field terminal blocks or backplane connections to XMs or DCMs):

- If an NCM is needed to control a separate trunk (such as the N2 or L2), but connections to field devices via terminal blocks are not necessary, the NCM-Only base frame provides a more streamlined alternative.
- The NCM-Only base frame requires installation of an NCM200 due to the direct N1-coaxial connection on the bottom of the NCM200. *For the NCM200, N1 connections are not made on the Communications Terminal Board.* N2/L2 connections are made at a communication board modified for use with the NCM-Only base frame.
- You can house the NCM-Only base frame inside an EWC100.

**Determining the  
Number of NCU/NEU  
Units and Types of  
Modules Needed**

1. Catalog the points by location.
2. List the control loops.
3. Assign the control loops to fit into DCMs. First configure the analog inputs, then the outputs. Note that a control loop must use inputs and outputs from the same DCM.
4. Configure miscellaneous analog inputs into DCMs.
5. Select function modules appropriate to the controlled devices.
6. Try to configure the binary points into any remaining input slots of the DCM. Choose function modules to accommodate the binary points.
7. If the binary input demand is greater than the remaining DCM capacity, use Point Multiplex Modules (XM). Choose the XM fulfilling the point number and type demand: XBN (32 inputs); XRL (8 inputs/8 latched outputs); XRE ( 8 inputs/8 electrically-maintained outputs); XRM (8 inputs/8 momentary outputs).

## Installation Guides

This section details how to mount the enclosure and base frame, and then how to land conduits. To mount the optional Network Terminal Cradle or optional Table Top Modem, refer to the following guidelines.

### Mounting Enclosures

These steps are the general procedure for mounting any size enclosure-with-cover. The instructions describe mounting the enclosure on a wall, the most common location. However, any free-standing structure that meets the stability and load bearing specifications is sufficient.

1. Attach the anchor bolt to the wall 67.5 inches above the floor. This recommended height provides an optimal line-of-vision to the panel, component LEDs, and switches.

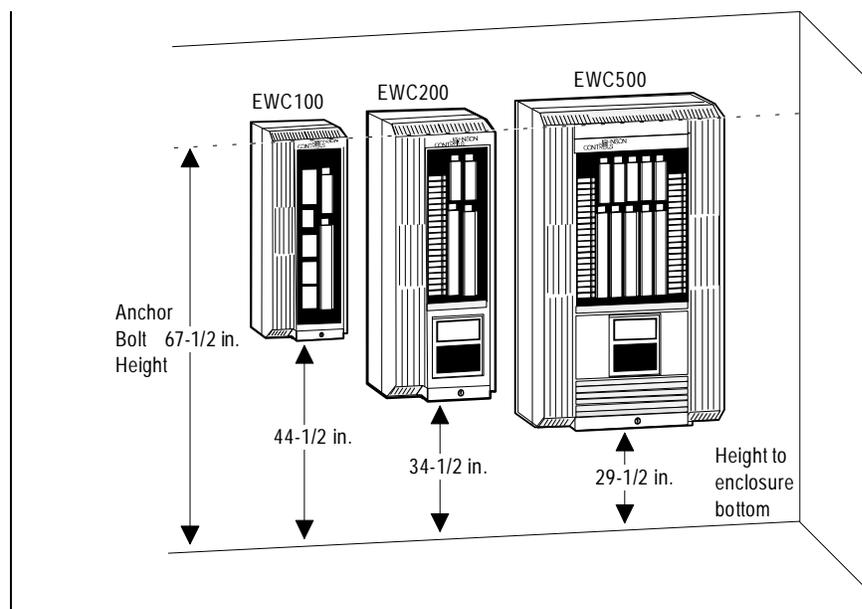


Figure 4: Attaching Anchor Bolt per Recommended Wall Height

2. Hang the enclosure by inserting the keyhole over the anchor bolt.

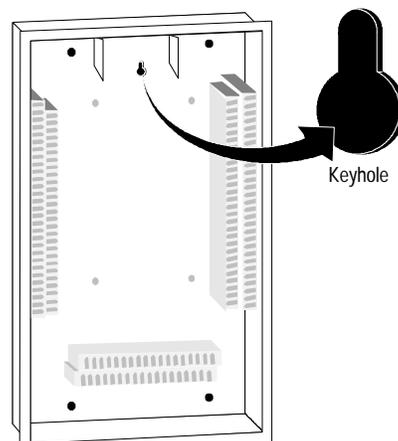


Figure 5: Hang Enclosure on Keyhole

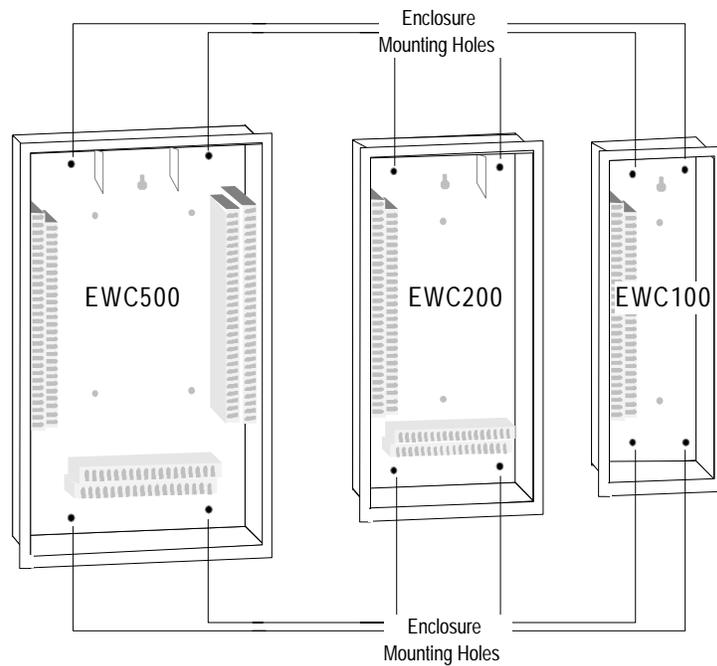
3. Level the enclosure. Using the drilled mounting holes as a template, mark the mounting hole locations. Lift the enclosure off the wall.
4. Select appropriate fasteners to support a fully loaded and wired base frame. Listed below are typical fully loaded weights for each base frame size inside an enclosure-with-cover. Drill the enclosure mounting holes (0.32 in.) to accommodate the selected fasteners.

NCM-Only base frame in EWC100 - 27 lb

1-Slot base frame in EWC100 - 34 lb

2-Slot base frame in EWC200 - 63 lb

5-Slot base frame in EWC500 - 110 lb



**Figure 6: Mounting Holes on the NCU/NEU Enclosures**

5. Secure the enclosure to the wall. Washer positions are molded on the inside of the enclosure.

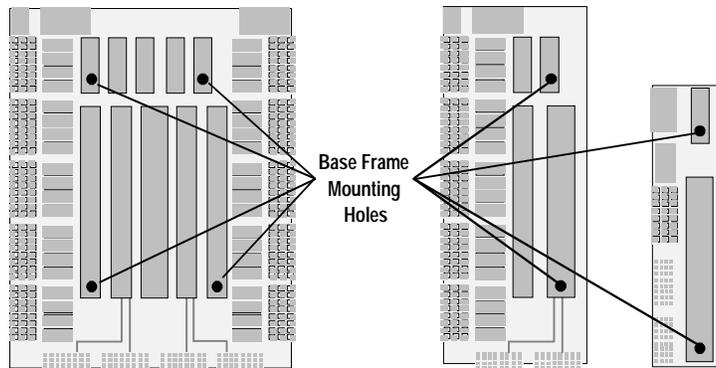
## Mounting the Base Frame

Before mounting the base frame, clean out any debris in the enclosure that gathered from fastening it to the wall. Either vacuum the inside of the enclosure or wipe it with a damp cloth.

A 5-Slot base frame by itself weighs 31 pounds (2-Slot = 21, 1-Slot = 14, NCM-Only = 12); plan for adequate help to hold and steady it until the mounting screws are secure.

1. The 5-Slot base frame includes four mounting bolts (1/4 x 5/8 in.). Align the base frame on the bosses (reinforced protrusions) and secure the mounting bolts through the base frame enclosure into the wall.

Note: The 1-Slot, NCM-Only, and 2-Slot base frames use only two mounting bolts.

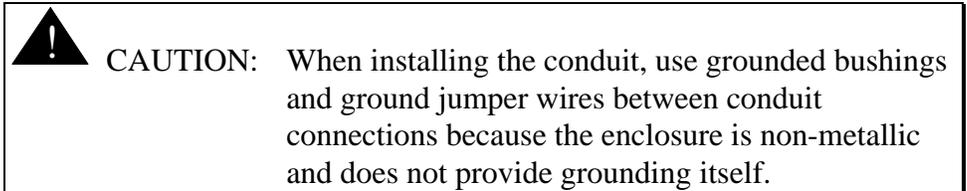


**Figure 7: Bolt Holes for Mounting Base Frames**

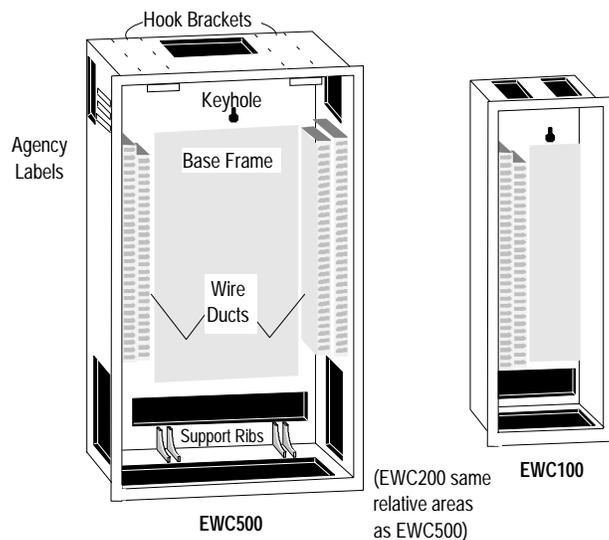
## Conduit Entry

Select and holesaw entrances (or use a Greenlee punch) for incoming conduits. Hole sizes and conduit anchoring must conform to National Electric Codes and local regulations.

Note: Conduit fittings must have a 1/2 in. reach for a 1/4 in. enclosure wall. A sample fitting for a 1/2 in. diameter EMT is the Midwest Electric 450 series non-insulated straight connector, along with a Midwest GLL series grounding bushing.



1. The only limitations to conduit entry are those practical for wiring convenience. In general, the conduits should penetrate the top and bottom of the enclosure, or into the sides or rear of the enclosure's lower one fourth.



**Figure 8: General Areas for Conduit Entry into Enclosures**

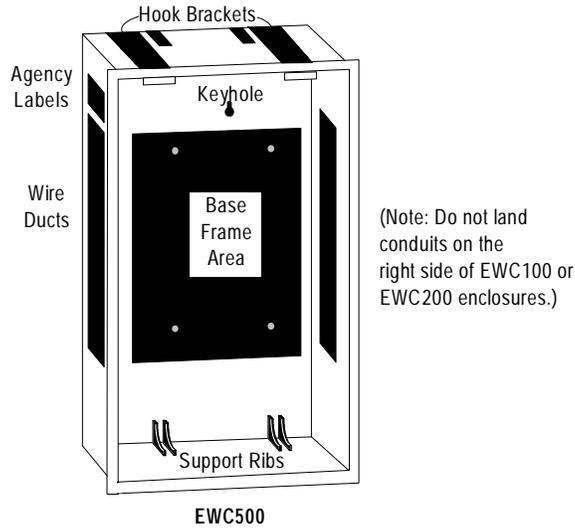
Specifically, *avoid* routing the conduit as follows (Figure 8):

- through hook brackets on top
- through support ribs around mounting holes
- within 1/2 inch of the keyhole
- into the base frame
- into the wire ducts

- into the three agency labels at the upper left side

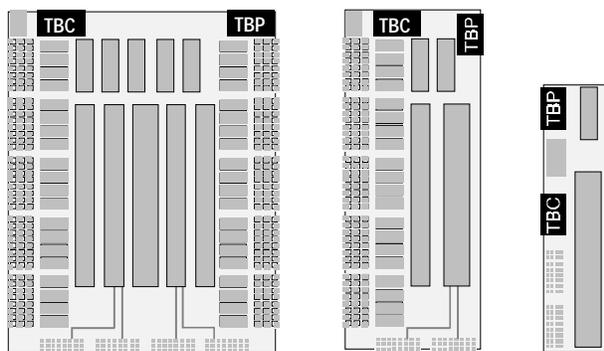
Note: For EWC100 and EWC200 enclosures, do not land conduits on the right side of the base frame, which necessitates looping the wires across or around the main modules.

**Avoid these locations for conduit entrances.**



**Figure 9: Locations to Avoid Conduit Entrances**

2. Route the power source wires to the power assembly (TBP assembly) placed as shown in Figure 10.
3. If the system uses N1, N2, or L2 networks, route the cables to the TBC board. (N1 to the NCM200 routes to bottom of NCM200 module.)



**Figure 10: TBP and TBC Board Locations on Base Frames**

4. Route the device conduits into any appropriate entry area. The wire guides may be moved to accommodate landing a conduit.
5. Clean out the panel and enclosure.

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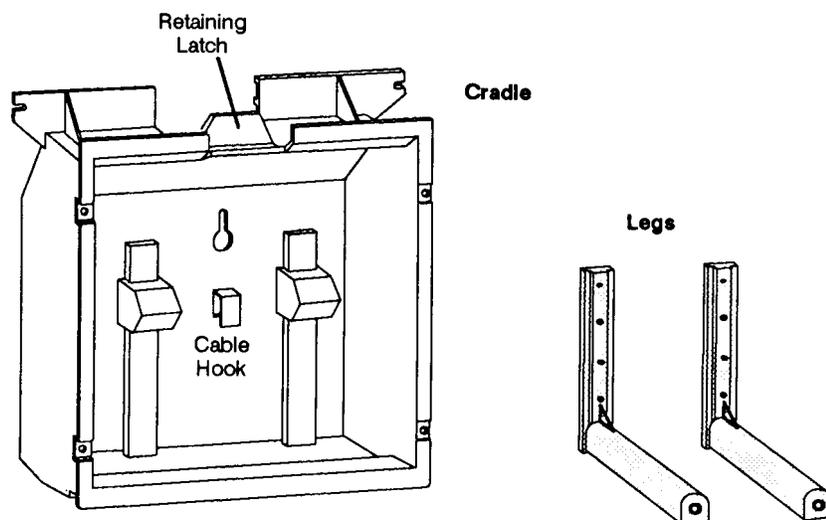
***Mounting the  
Optional Network  
Terminal Cradle  
Kit***

The cradle is an optional kit to provide a convenient holder for the Network Terminal (NT). It installs on NCU/NEU panels, either on the base frame inside EWC200 or EWC500 enclosures, or onto the covers for those enclosures. Alternatively, to store the NT next to EWC100 enclosures or remote jacks, install the cradle directly onto the wall.

- The NT remains functional while stored in the cradle.
- When mounted inside an NCU enclosure, the NT in the cradle can be secured against removal.
- One cradle may be sufficient as a storage unit for several panels; the operator can simply unplug the NT from one jack and carry it among various NCUs.

The Cradle Kit includes the following components:

- NT cradle (9.75 H x 9.25 W x 4.5 in. D, structural foam)
- 4 cradle legs (5.5 H x .75 W x 3.75 in. D, structural foam)
- 10 machine screws for standard mounting to base frame (No. 8 x 32 x 1/2)
- 4 self-threading screws for alternative mounting to inside cover (No. 6 plastite)



**Figure 11: Cradle and Legs**

At the top of the cradle is a latch that secures the NT into the cradle. When the access door is closed, the latch cannot deflect upwards and release the NT (Figure 12). Only an operator with a key to the access door can open that door, which then allows deflection of the latch and release of the NT. (See Figure 13.) NTs in wall-mounted cradles can be removed at any time.

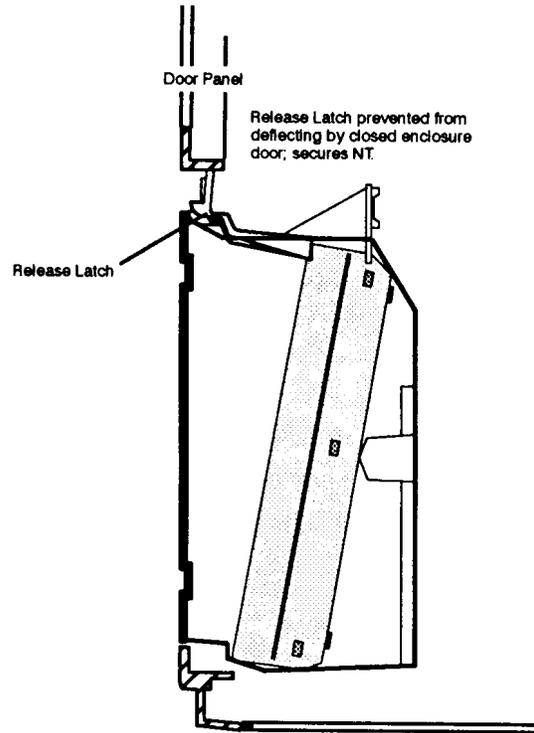


Figure 12: NT Secured Inside Cradle with Access Door Closed

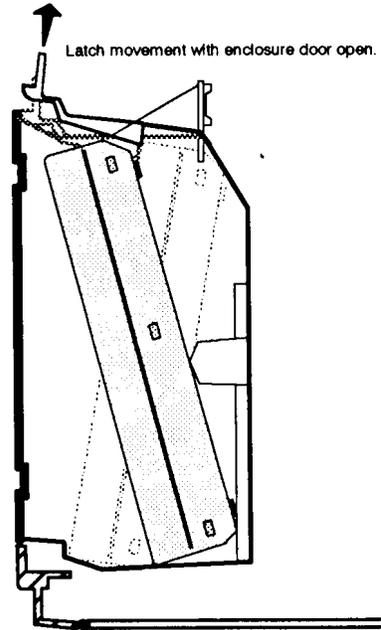


Figure 13: NT Allowed to be Removed with Access Door Open

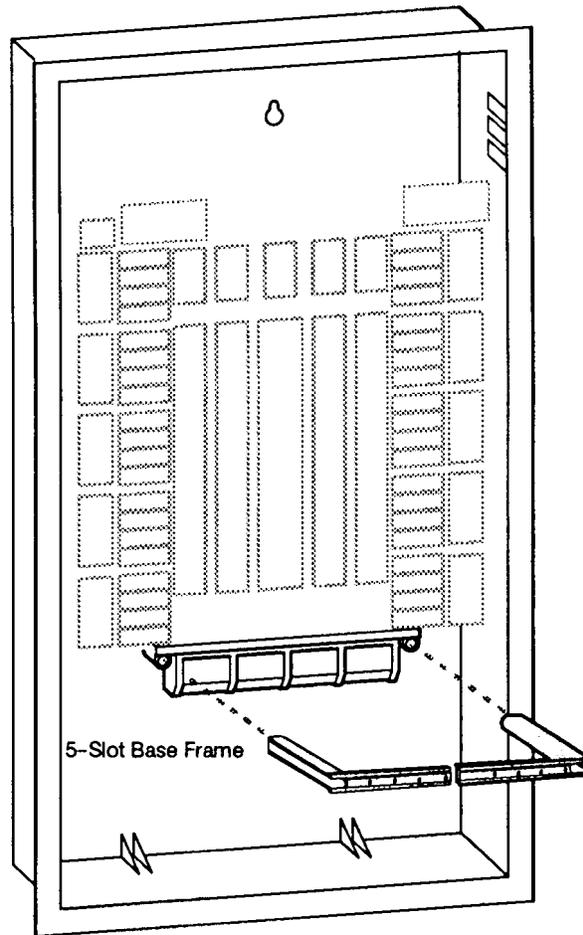
**Cradle Mounting Applications**

**Table 1: Cradle Mounting Applications**

<p><b>Mounted to Base Frame</b></p>	<p>Functions with the cover removed to allow easy use of NT during commissioning, startup, and rewiring.</p> <p>Locking the access door secures the NT inside the cradle.</p> <p>Note: With the cradle installed on the base frame, the horizontal terminal blocks are not accessible to change wiring connections.</p>
<p><b>Mounted to Enclosure Cover</b></p>	<p>Allows securable NT storage for enclosures housing smaller-sized base frames (e.g., 2-Slot base frame inside an EWC500 enclosure).</p> <p>Allows securable NT storage with 1-Slot base frames (when used with an EWC200 or EWC500 enclosure).</p>
<p><b>Mounted on Wall</b></p>	<p>Provides NT storage to 1-Slot base frame and enclosure configuration.</p> <p>Provides convenient NT storage near remote jacks for remote Network Terminal applications.</p>

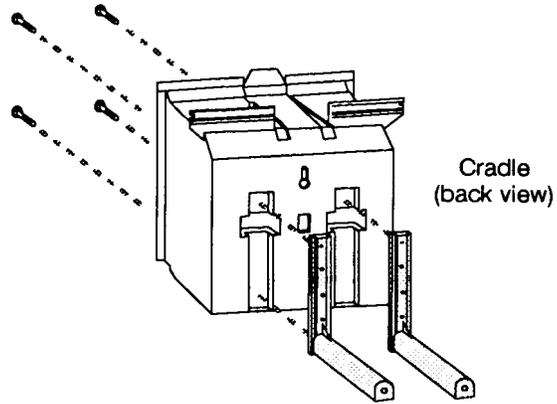
**Mounting the Cradle  
Onto a 2-Slot or  
5-Slot Base Frame**

1. Remove the blank-off panel from inside the enclosure cover. The blank-off panel is a compound plastic part that occupies the opening where the cradle normally sits. To remove the panel, unfasten the four screws.
2. Using one No. 8 machine screw per leg, securely fasten two legs onto the leg bosses at the bottom of the base frame.



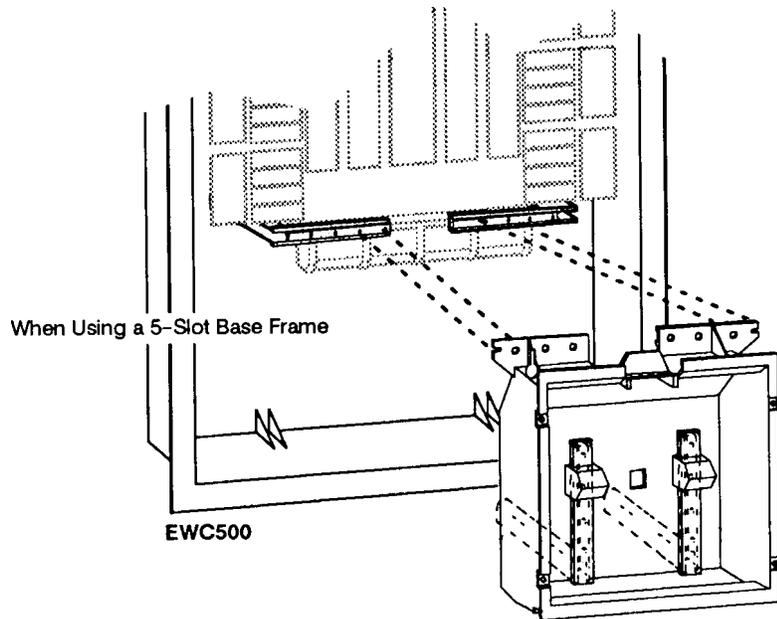
**Figure 14: Install Legs onto Base Frame**

3. Attach the other two legs to the vertical channels of the cradle. Drive the screws from inside the cradle. These two legs offset the cradle from the enclosure wall; they do not screw into the base frame itself.



**Figure 15: Attach Remaining Legs to Cradle**

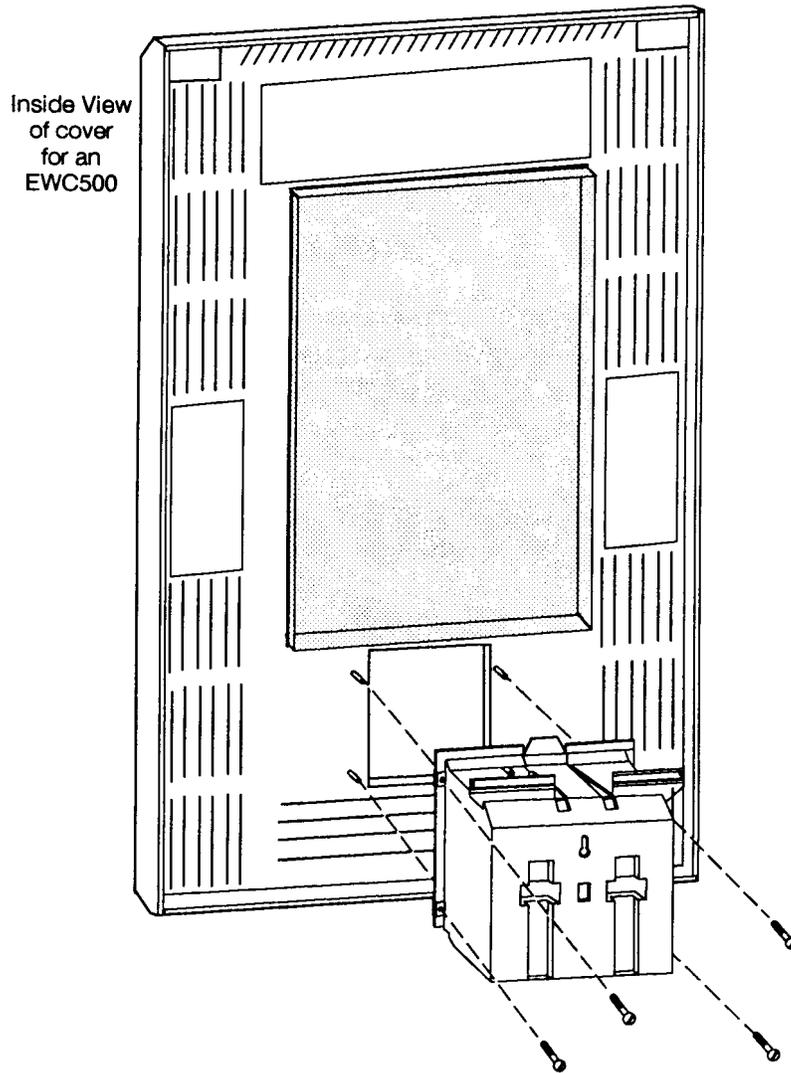
4. Position the cradle to align its mounting holes with the corresponding holes on the two legs already fastened to the base frame. (The hole alignment is different between the 2- and 5-Slot models.) Securely fasten the box to the legs.



**Figure 16: Fasten the Cradle to the Base Frame-Mounted Legs**

**Mounting the Cradle onto the Cover of an EWC200 or EWC500**

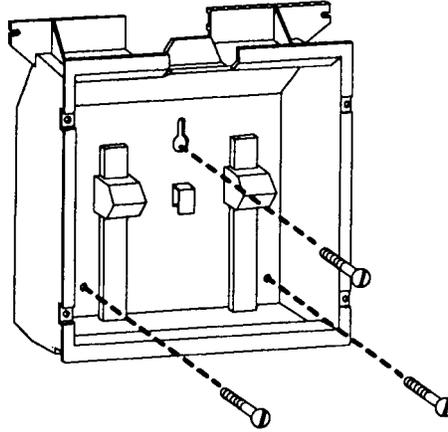
1. Remove the cover from the enclosure box.
2. Remove the blank-off panel from the access opening. The blank-off panel is a compound plastic part that occupies the opening where the cradle normally sits. To remove the panel, unfasten the four screws.
3. Using the four No. 6 plastite screws, mount the cradle box over the access opening on the inside of the enclosure cover. The mounting holes align over the inside cover bosses. None of the legs that come with the kit are used when attaching the cradle box directly onto the enclosure cover.



**Figure 17: Fasten the Cradle to the Enclosure Cover**

**Wall Mounting the  
Cradle Box (for  
EWC100 Enclosures  
or Remote  
Applications)**

1. After driving a No. 10 screw (not included with components) into the wall, hang the cradle by its upper keyhole over the screwhead. Level the cradle.
2. Secure the cradle with two screws, fastened through the appropriate holes to form a triangular mounting pattern.

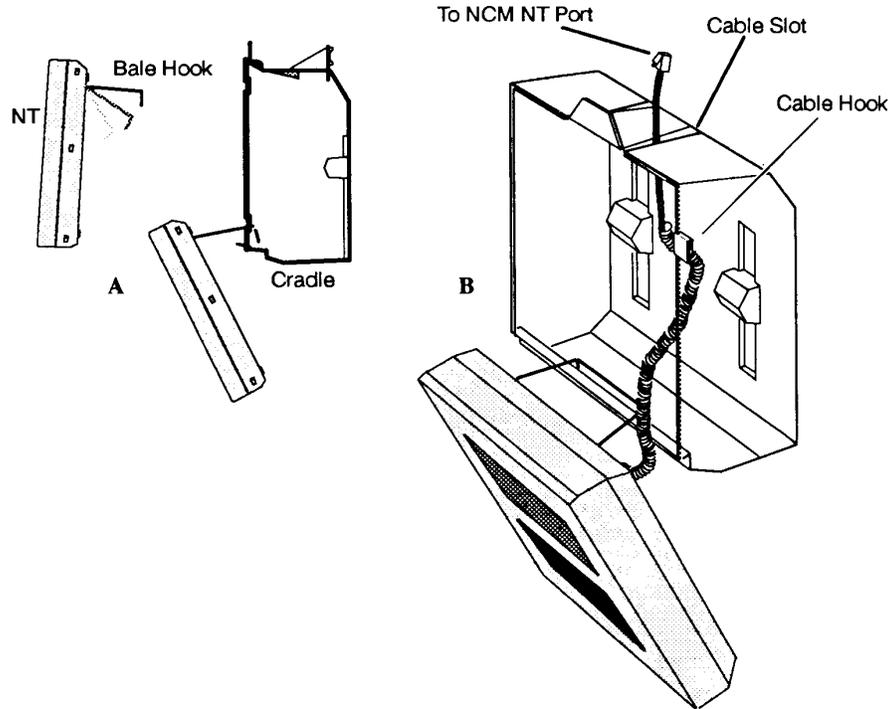


**Figure 18: Securing the Cradle to the Wall**

**Seating and  
Removing the NT**

*Connecting the NT Cable to the NCM*

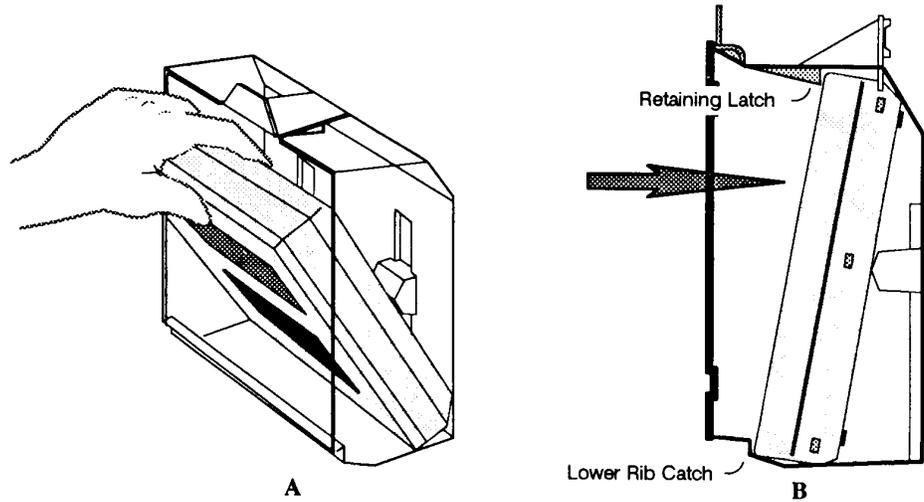
1. Swing out the bale hook from the back of the NT and hook it over the lower rib on the cradle (part A of Figure 19).
2. Feed the flat part of the NT cable up through the channel at the top of the cradle and into the NCM NT port (part B of Figure 19).
3. Loop the coiled part of the cable over the cable hook on the back wall of the cradle. Then seat the NT into the cradle, as shown in Figure 20.



**Figure 19: Connecting the NT Cable to the NCM NT Port**

*Seating the Network Terminal into the Cradle*

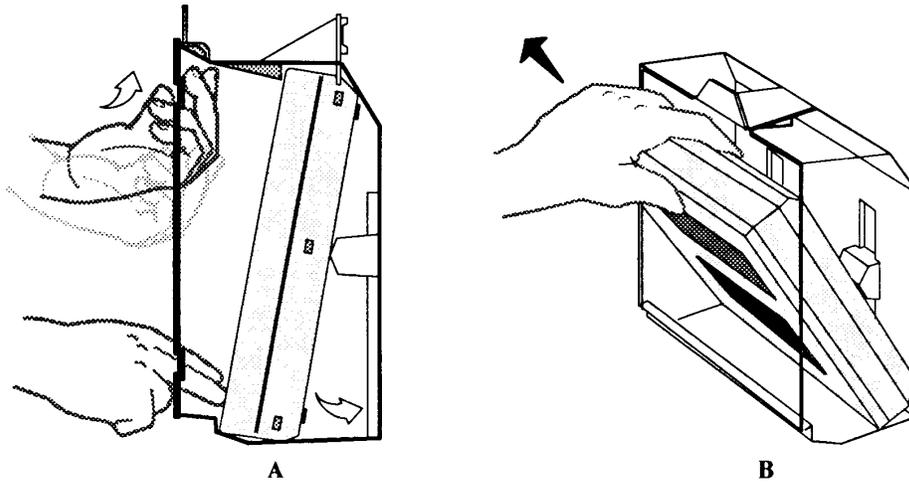
1. Unlock and open the access door.
2. Drop the NT into the cradle, looping the coiled cable over the cable hook. Then pivot the NT back until it snaps into place and is held by the retaining latch.



**Figure 20: Placing the NT into the Cradle**

*Removing the Network Terminal from the Cradle*

1. Unlock and open the access door.
2. Lift the retaining latch on the cradle as you push the bottom half of the NT inwards. This causes the NT to pivot its top half out, where it may be lifted from the cradle.



**Figure 21: Removing the NT from the Cradle**

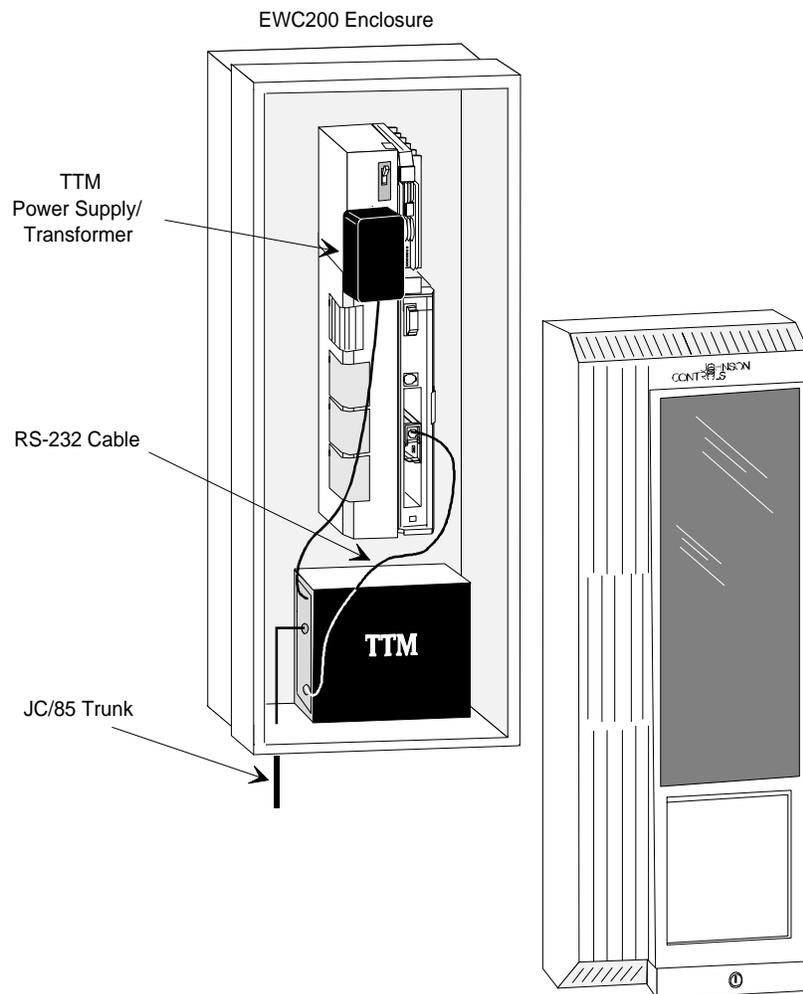
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**Mounting the  
Optional Table Top  
Modem**

The S2 Migration NCM connection to the JC/85 trunk is from the RS-232 submodule to the trunk's Table Top Modem (TTM). There are four versions of the TTM, which externally are the same. For information about their internal differences, wiring pinouts, and ordering, refer to the *NCM Technical Bulletin*.

Mount the TTM in the most suitable manner for the specific location. One possibility for mounting the TTM is illustrated in Figure 22.

Rest the TTM on the bottom of an EWC200 enclosure (take out the wire duct and guide) and connect the TTM's power supply to the topmost outlet of the base frame's 120 VAC outlet. Plugging into the topmost outlet avoids interference with the heat sink. In this configuration, the TTM occupies the space where the NT normally sits.

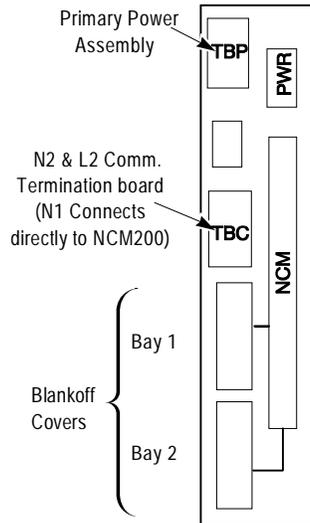


**Figure 22: Mounting Option for the Table Top Modem**

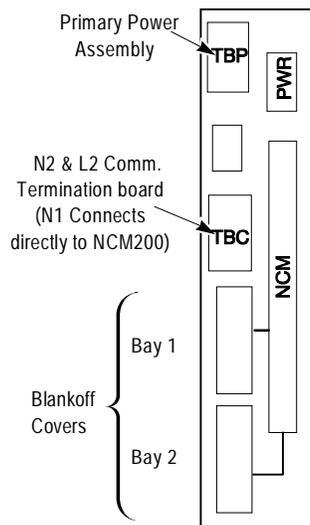
**Wiring Details**

This section details connections to the terminal block assemblies (TBF), power connection board (TBP), and network connection board (TBC).

The next four figures illustrate the position and the numbering pattern of the electrical components (including the major modules) for each of the base frames.



**Figure 23: Electrical Components for 1-Slot Base Frame**



**Figure 24: Electrical Components for NCM-Only Base Frame**

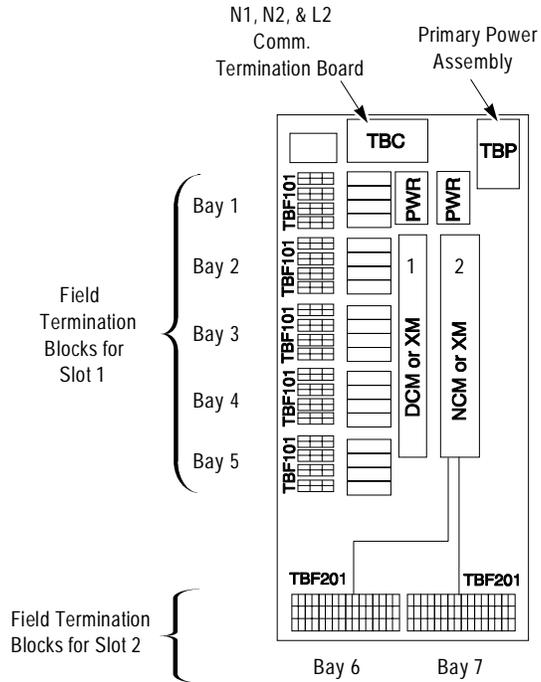


Figure 25: Electrical Components for 2-Slot Base Frame

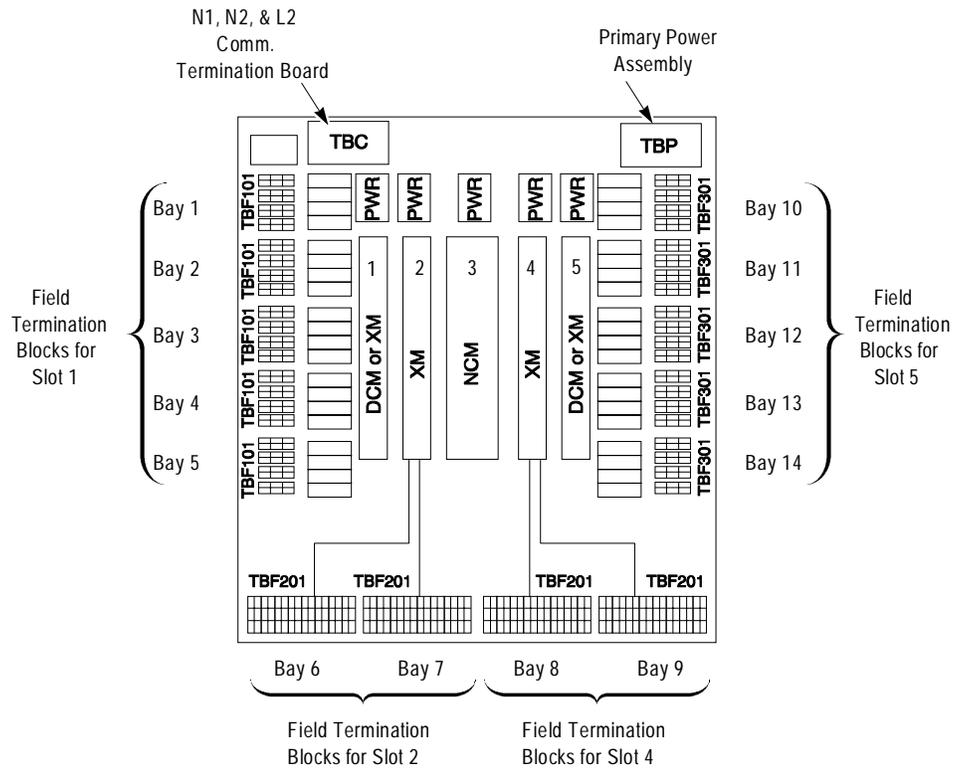


Figure 26: Electrical Components for 5-Slot Base Frame

## Wiring to the Terminal Blocks

Terminal blocks connect field devices to electronic modules in associated slots. There are three kinds of terminal block assemblies. The assemblies are grouped into bays of the base frame. There are no terminal blocks on the NCM-Only base frame.

### *TBF101*

These terminal block assemblies require FMs to both interface signals to the DCM and to input signals to the XMs. TBF101 blocks are positioned in the bays which run along the left edge of the 2- and 5-Slot base frames, where they connect to a module in slot 1 (Figures 25 and 26).

### *TBF201*

These terminal block assemblies do not use FMs to interface the signals. There are three positions for the TBF201 field terminal blocks: for 1-Slot base frame, the blocks are in bay numbers 1 and 2 on the left side of the unit (Figure 23).

For 2- and 5-Slot base frames, the TBF201 field terminal blocks are in bays 6 and 7, horizontally positioned along the bottom (left-bottom for 5-Slot). These blocks connect to an XM in the number 2 slot (Figures 25 and 26).

For a 5-Slot base frame, TBF201 field terminal blocks are also in bay numbers 8 and 9, horizontally positioned along the right bottom. These blocks connect to an XM in the number 4 slot (Figure 26).

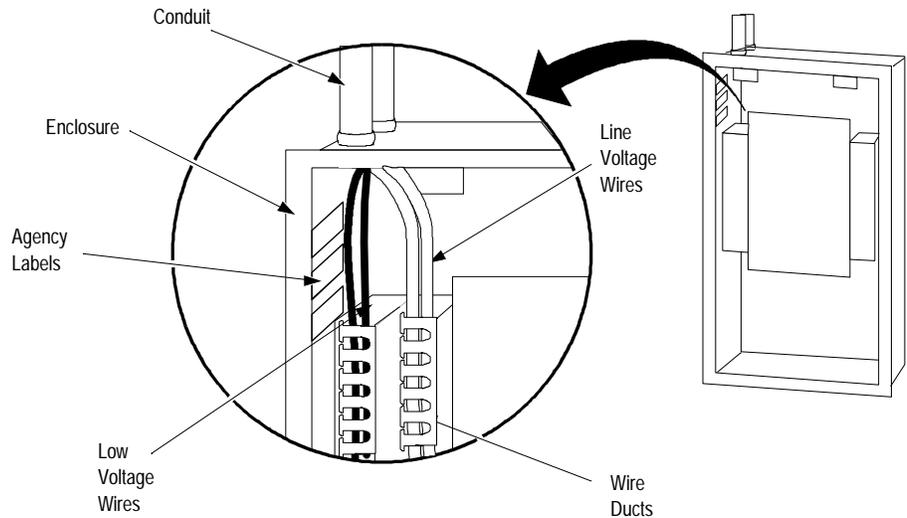
### *TBF301*

These terminal block assemblies require FMs both to interface signals to the DCM and to input signals to the XMs. TBF301 blocks are positioned in the bays which run along the right edge of the 5-Slot base frame, where they connect to a module in slot 5 (Figure 26).

Separate line- and low-voltage wires as they route through the enclosure to the field terminal blocks (Figure 27).

- Dress line-voltage wires through the inner channel of the wire ducts.
- Dress low-voltage lines through the outer channel of the wire ducts.

For information about wiring devices to individual terminal blocks, refer to the specific function module or point multiplex module technical bulletins in this manual.



**Figure 27: Dressing Line- and Low-Voltage Wires to Terminal Blocks**

## Power Connection

Connect wires to field devices and to the NCU/NEU according to the National Electrical Code and local regulations. The line-voltage is distributed internally to each power supply throughout the base frame. To connect incoming power:

1. Cut power at the circuit panel and turn the power box switch to Off.
2. If Power Supply Modules are installed, switch each of them to Off.
3. Lift the cover off the TBP panel, then wire the power connections to the TBP terminal nuts, making sure to attach the green wire to the ground terminal.

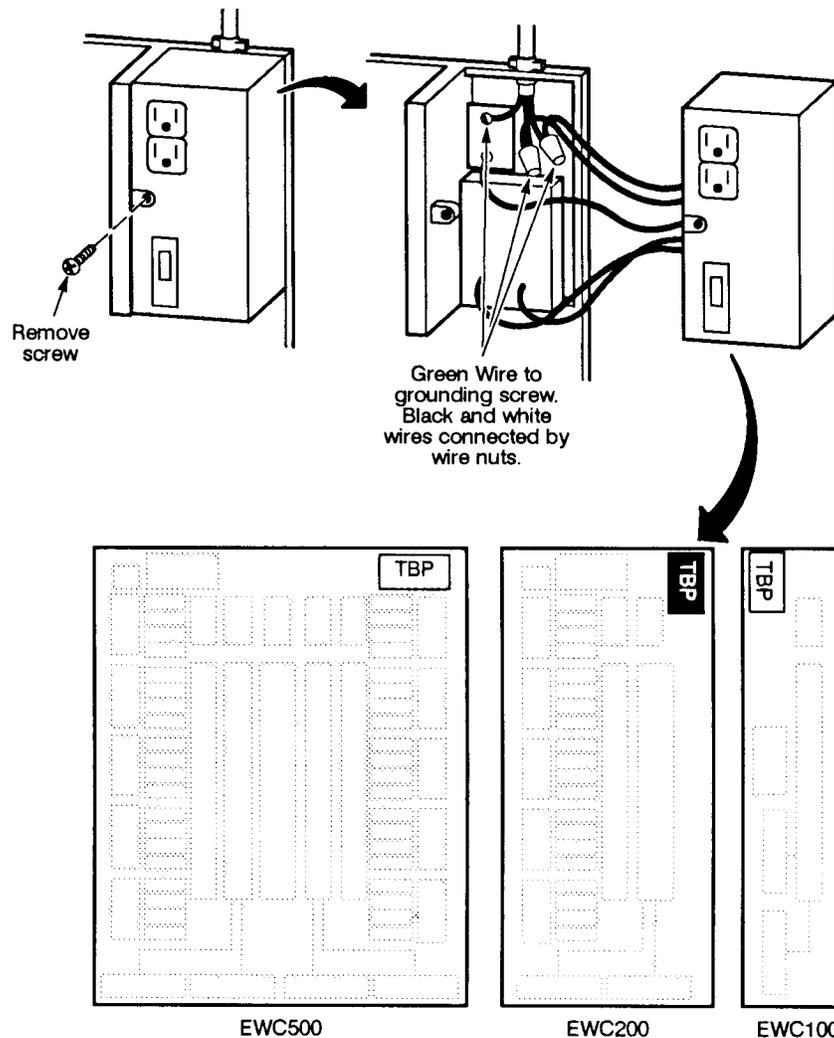


Figure 28: Connecting Power to the NCU/NEU

4. Replace the cover on the TBP panel.
5. Turn the circuit breaker back On, then switch the power box to On.

## Connecting Network Lines to the NCU/NEU

The figure below details the N1 LAN, N2 Bus, and L2 Bus terminations on the standard Communications Terminal Board (TBC), and the N2/L2 terminations on the board modified for use on the NCM-Only base frame.

The TBC on the NCM-Only base frame does not have an N1 connection; instead, connect the N1 coaxial cable directly to the bottom of the NCM200. Make sure that all metal connectors (plug, “T,” barrel, bulkhead, or EOL cap) used to make the N1 connection are insulated from ground or other metallic objects. This will ensure that no false connections or shorts are created when making N1 connections to the NCM200. Accomplish this by black-taping the T-connector and EOL cap (if used), or by using a plastic clip-on shroud to insulate the exposed metal.

For specific information about connecting networks, see these documents:

- **N1 Termination**—To connect the NCU/NEU to various network topologies, refer to the *N1 LAN Technical Bulletin* in this manual.
- **N2 Termination**—For instructions on wiring devices to the N2 Bus, and for determining which End-of-Line switches are set, refer to the *N2 Bus Technical Bulletin* in this manual.
- **L2 Bus (for C210 and C260 Applications Specific Controllers)**—For instructions on wiring devices to the L2 Bus, refer to either the *C210* or *C260 Technical Bulletins* in this manual.

Note: For instructions about fire management, access control, Gateway, and S2 network connections to Metasys, refer to the *NCM Technical Bulletin* document in this manual.

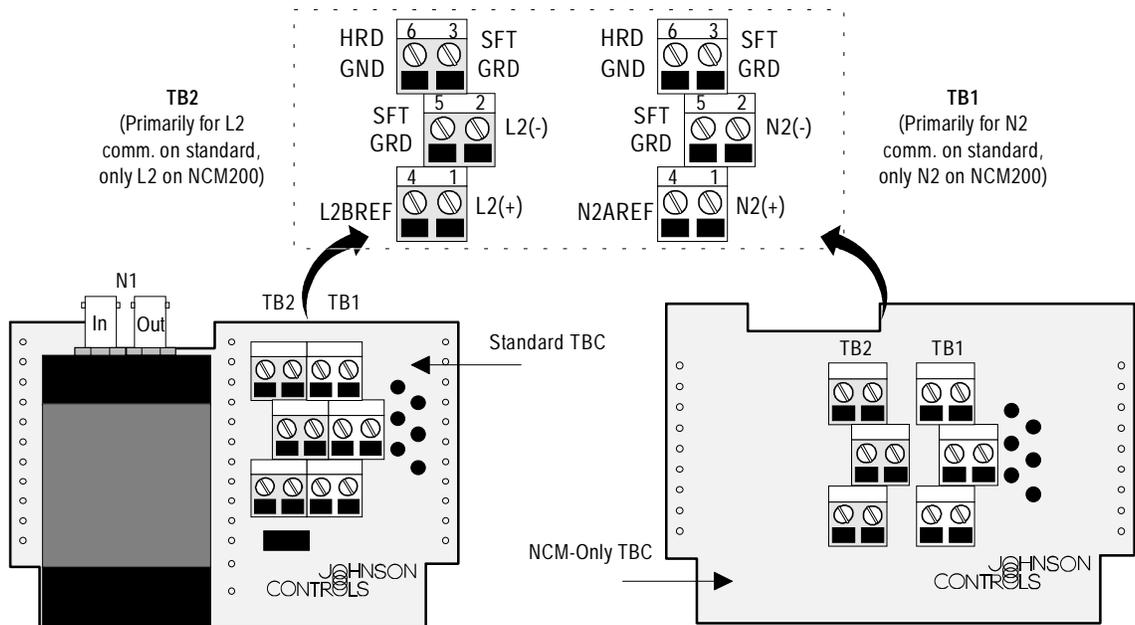


Figure 29: Connections to the Communications Terminal Boards



# Commissioning Procedures

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## *Overview*

Commissioning the Network Control Unit/Network Expansion Unit begins after mounting the enclosure and base frame, terminating the communication and power wires, and making all the field connections. Use this document in conjunction with the *System Commissioning Guide*.

The commissioning procedure is as follows:

1. Inspect wire, cable, and pneumatic tube installation.
2. Install function modules into their designated slots.
3. Install Power Supply Modules and test for power connections.
4. Install the electronic modules (NCM, DCM, XM) into their designated slots.
5. Check system-level operation of the electronics.

---

## *Tools Required*

- digital voltmeter/ohmmeter
- AC outlet tester

No special tools are needed to insert modules into an NCU/NEU slot. They simply plug into the base frame.

The following sections detail procedures for each step above.

---

**Inspect Wiring  
Installation**

Before installing any electronic modules or power supplies in the NCU/NEU, inspect wire installation on the panel:

1. Apply power to the panel and check the AC line-voltage condition with the AC voltage tester. Ensure that none of the following are present:
  - hot and neutral reversed
  - open ground
  - open neutral
  - open hot
  - hot and ground reversed
2. Verify AC power wired to the panel is between 102 VAC and 130 VAC.
3. Turn Off the power switch on the NCU/NEU.
4. Visually inspect the panel for nicked, loose, or broken wires, stray wire strands, or loose screw terminals. Check the wire insulation to ensure both that it has not been stripped back so far as to cause a short, and that it is not tucked under the screw terminal.
5. If an external N2 Bus is on the system, ensure the proper polarity of the network via the wire color code (i.e., trace each wire color of the N2 Bus to check that the same color of wire enters and exits a screw terminal).
6. If an external L2 Bus is on the system, ensure the proper polarity of the network via the wire color code.
7. For 1-Slot, 2-Slot, and 5-Slot base frames containing a 100 series NCM, if only one coaxial cable attaches to the TBC (Communications) board, verify that a 93 ohm terminator cap is placed on the rightmost BNC connector.  
  
When an NCU contains an NCM200, if that NCM is at the end of the line, verify that the terminator cap is placed at the open end of the “T” connector.

## Install Function Modules

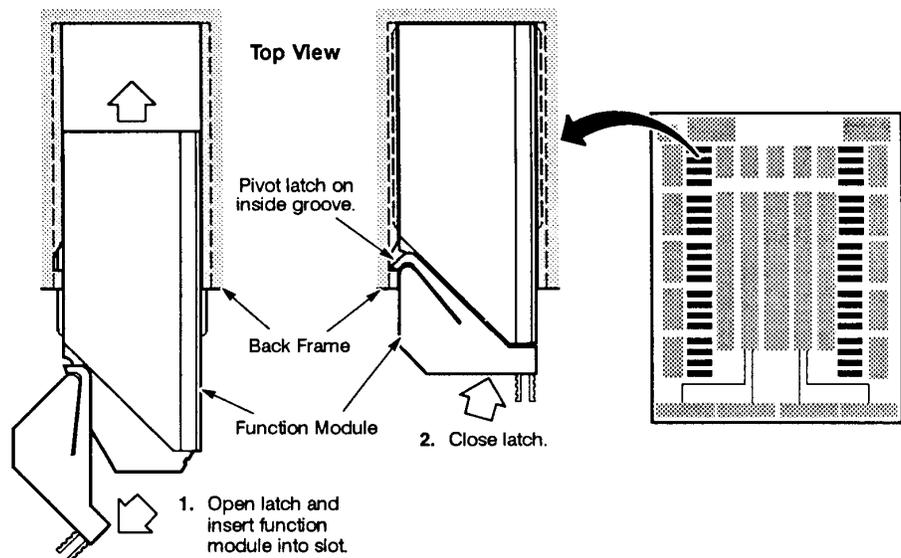
Function modules are inserted in the smaller horizontal slots. To install an FM:

1. Refer to the engineering drawings and verify that the field device is correctly wired to the terminal block associated with the function module. For FMs requiring pneumatic connections, ensure that the tubes are secured on the correct port and over both sides of the barbed coupling that connects the silicon tubing to the polytubing.
2. With the digital voltmeter, check the terminal blocks leading to the function module for the appropriate signal, as indicated by the engineering drawings (e.g., resistance, low-voltage, line-voltage).



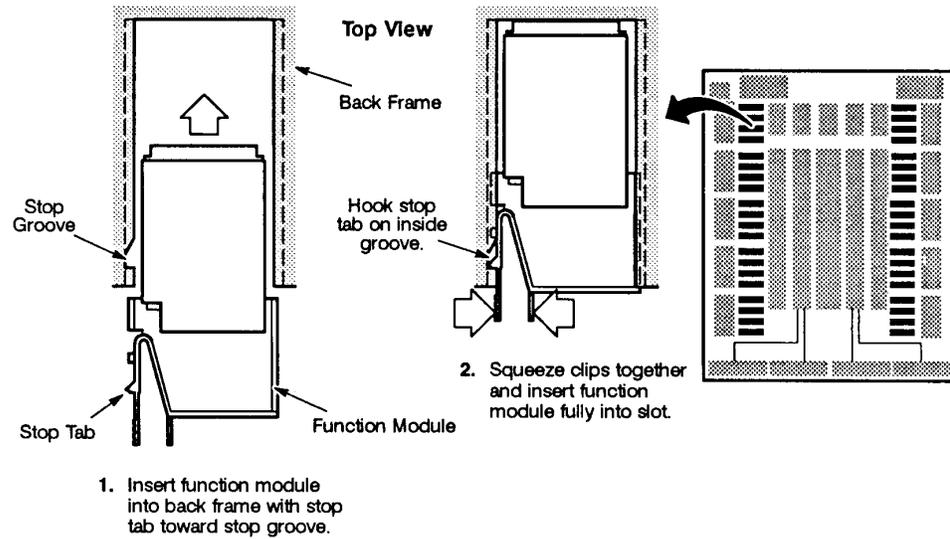
**CAUTION:** Line-voltage may be present.

3. Before installing the function module, check its type against that designated in the engineering drawings. Refer to the individual FM's technical bulletin for information on setting its switches.
4. Set the HOA switch on the module. The "H" position may immediately activate the field device; "O" will leave the device Off. Always switch override switches to "Off" before inserting or removing FMs.
5. Pull out the release latch of the function module.
  - To properly orient the FM, the release latch always unfolds away from the center of the control panel.



**Figure 30: Installing a Function Module, Left Position**

- IUN Function Modules use squeeze clips to lock into place.



**Figure 31: Squeeze Clips Locking IUN Function Module into Left Position**

6. Insert the function module into its slot, and press it firmly into the base frame until the connectors fit tightly.
7. Push the release latch in until it clicks.

For further FM commissioning information, refer to the specific function module component data sheets.

---

## Install Power Supplies

If proper AC voltage is present, install the separate Power Supply Modules:

1. Locate the slots for the power supplies that will be installed (above the electronic modules).
2. Ensure that the NCU/NEU power switch is turned Off.
3. Look at module side to ensure that the 230/115 voltage setting is correct. If necessary, change the setting with a screwdriver.
4. Pull out the release latch on the Power Supply Module until it is in the open position.

Note that the latch slides through a detent position to a final stop. Attempting to install or remove the module while the latch is only in the detent position will result in broken teeth on the retaining clip inside the module. Modules with broken teeth in their latches connect loosely to the base frame, and may detach while in use.

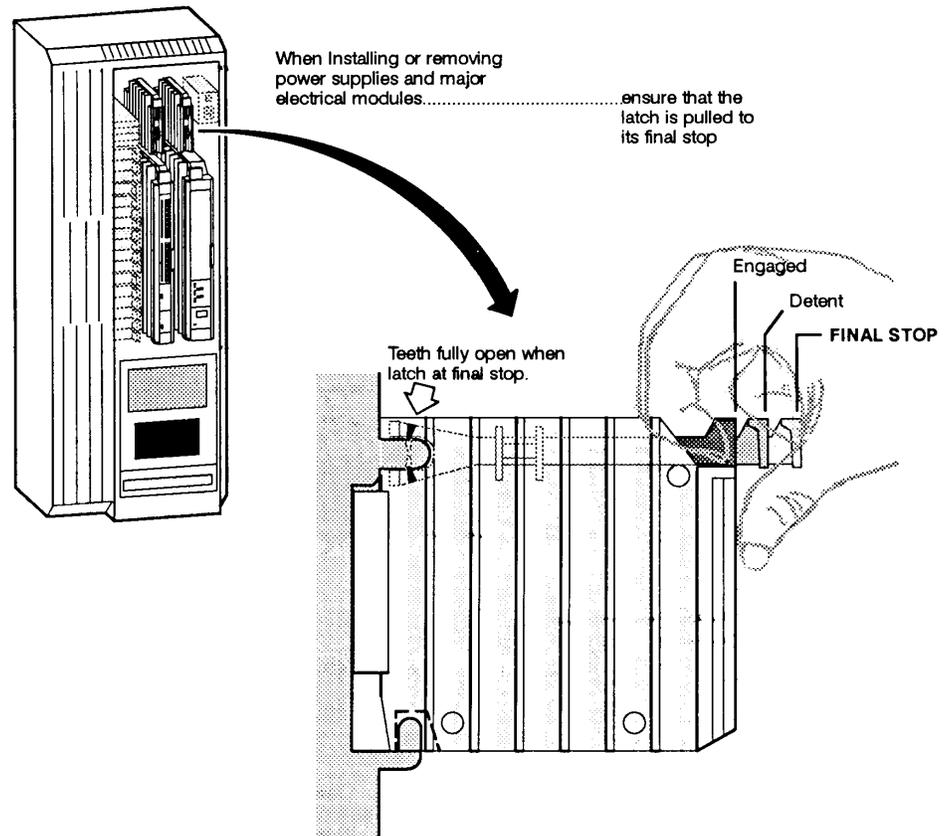
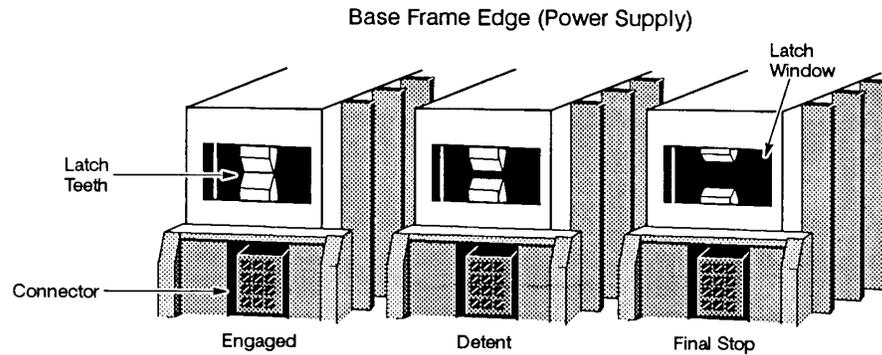


Figure 32: Pull Latch Until Teeth Are Fully Open

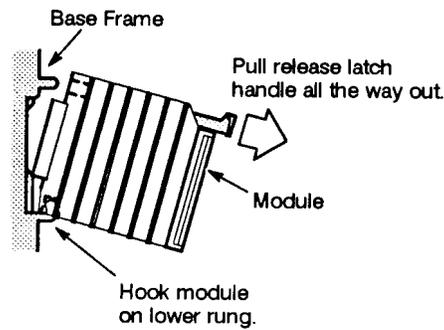
To ensure that the latch teeth are fully open, use your thumb as reinforcement against the module to firmly pull the latch through the detent position until it reaches a final stop (teeth completely open). You will know that the final stop has been reached when the module freely attaches to and disengages from the base frame.

Before installing a module, look at the base frame side of the latch and make sure the teeth are fully open (Figure 33).



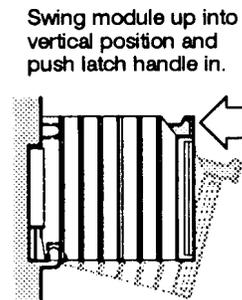
**Figure 33: Check To Ensure Teeth Are Open Before Installing**

5. Hook the power supply over the rung at the bottom of the slot (Figure 34).



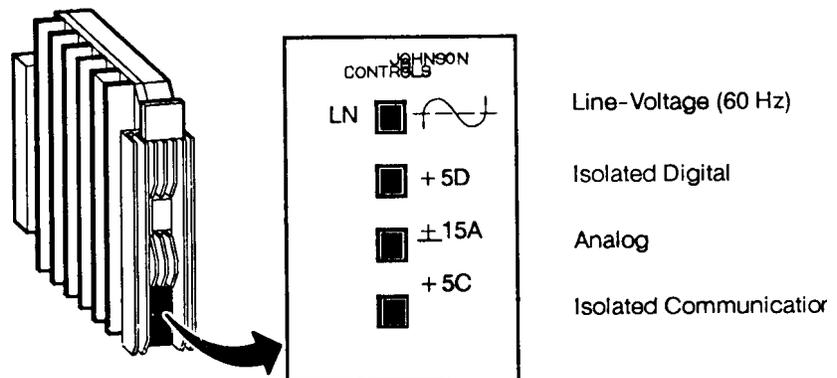
**Figure 34: Release Latch Position on Power Supply Module**

6. Press the power supply into the base frame connectors (Figure 35).
7. Press the release latch in until it clicks, indicating a closed position (Figure 35).



**Figure 35: Installing the Power Supply Module**

8. Turn On both the NCU/NEU power switch and the Power Supply Module power switch. Lit LEDs indicate proper operation (Figure 36).



**Figure 36: LEDs on the Power Supply**

9. Turn Off the power supply power switch.

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## ***Install Electronic Modules***

Before installing the Digital Control Modules, Point Multiplex Modules, and Network Control Module, ensure that the Power Supply Modules are turned Off, then:

- *Set the N2 Address* for each of the modules (the NCM does not have an N2 Address switch; the address is set via software). For information on how to set the N2 Address switch, refer to each module's technical bulletin.
- *Set the End-of-Line Switches* for those two devices that constitute the N2 Bus EOL. For detailed instructions, refer to the *N2 Bus Technical Bulletin*, in this manual. In general, the EOL should be set to "In" for:  
a) the device physically last on the network (this device has N2 Bus wires entering, but not exiting), and b) the module in the first occupied slot on the base frame.

Then install the modules.

1. Use the engineering drawings to locate the slot for the designated electronic module.
2. Set the HOA switches on XRLs and XREs to "Off," and Auto/Manual switches on XRM as desired. Always set HOA switches to Off, and press momentary "Stop" switches before removing modules. This helps prevent devices from automatically activating before you want them to.



**CAUTION:** Plugging in the modules may activate field devices.

3. Pull out the release latch until it is in the open position.

Note: To ensure that the release latch is entirely open, review Step 4 in the *Install Power Supplies* subsection.

- Hook the module on the rung at the bottom of the slot.

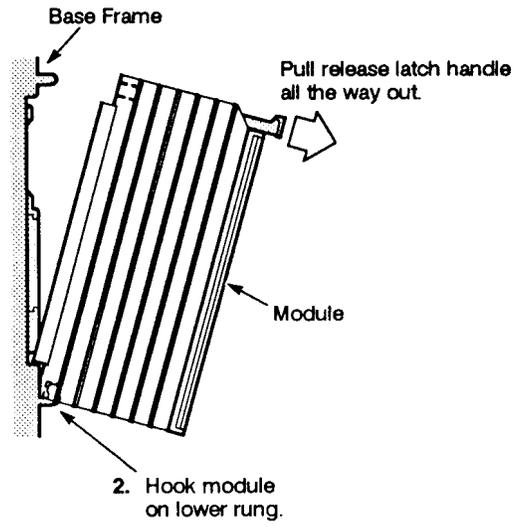
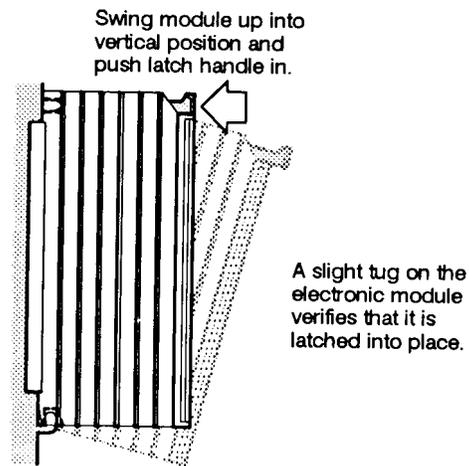


Figure 37: Electronic Module Release Latch

5. Press the module into the base frame connectors (Figure 38).
6. Press the release latch in until it clicks, indicating a closed position (Figure 38).



**Figure 38: Installing the Electronic Module**

7. Refer to the specific electronic module component data sheet for further commissioning information.

# Troubleshooting Procedures

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## *Troubleshooting*

This section of the document lists preventive maintenance for the NCU/NEU, then describes symptoms and tests to isolate problems to a replaceable component: power assembly (TBP), communications board (TBC), screw terminal blocks (TBF), preload resistors (PLR), and the backplane.

After isolating the problem, refer to the *Repair* section of this document for how to replace the component.

## **Preventive Maintenance**

- Inspect wires for corrosion, fraying, and quick discoloration (indicates improper currents on the wire).
- Keep the heat sink relatively free of dust by either vacuuming or blowing the dust free with compressed air.
- Clean the transparent cover panel with rubbing alcohol or any common cleaning solution that does not contain ammonia (for example, use Mr. Clean™, Top Job™, 409™, Windex™, Fantastik™).
- Use isopropyl (rubbing alcohol) to clean the enclosure and cover. You may also lightly sand them.
- Check adjustments and calibrations on the OAP and IDP Function Modules. (Refer to the FM's specific technical bulletin.)

There are no field adjustments on the power assembly or communications board.

## Replaceable Parts

Figure 39 indicates the location of replaceable parts on the NCU/NEU units.

Note: The NCM-Only base frame does not contain field terminal blocks. Also, its preload resistor is mounted on the circuit board and can not effectively be replaced in the field. Finally, there is no N1 connector on the NCM-Only communications board; however, the N2/L2 termination blocks may be serviced as described under the *TBC* section.

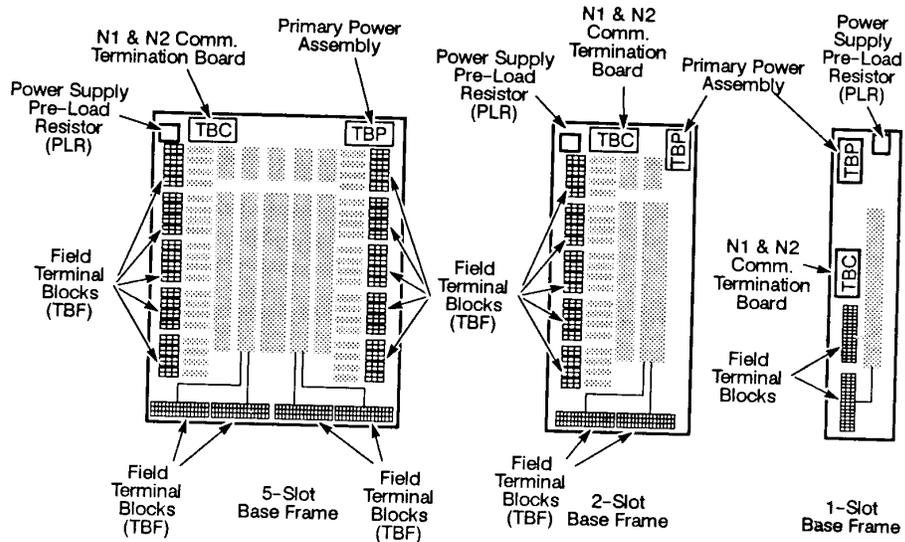


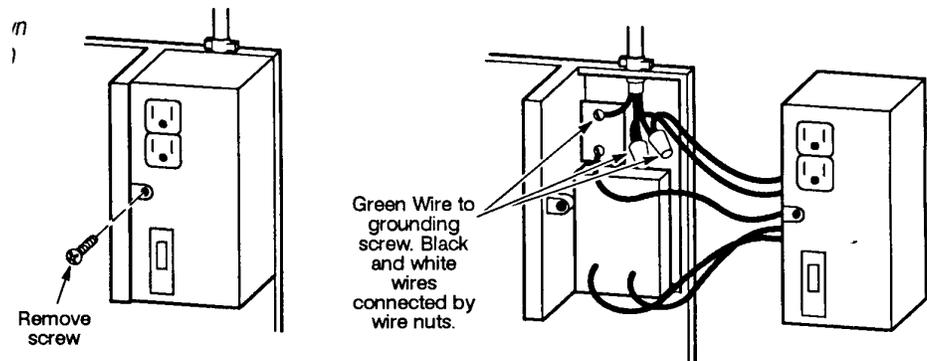
Figure 39: Location on the NCU/NEU of Replaceable Parts

## Power Assembly (TBP)

A power assembly problem is indicated if none of the Power Supply Modules have AC power.

1. Check that the Power Supply Modules are turned On.
2. Verify that the circuit breaker in the power distribution panel is supplying power (turned On) to the base frame.
3. Check that the circuit breaker (switch) on the TBP is turned On.
4. Inspect the power lines to ensure proper connection (wire nuted) to the TBP pigtails (Figure 40).
5. Use the AC voltage tester to verify that power is properly connected and showing up at the outlets on the TBP.
6. If none of the above steps rectify the problem, replace the TBP.

*TBP Terminations are identical for all base frames. Example shown represents an EWC200 orientation.*



**Figure 40: TBP Terminations**

## Communications Board (TBC)

A communications board failure may be indicated by a “Device Offline” flag on the appropriate focus window of the Operator Workstation (this flag may also appear for reasons of device or power failure).

Another symptom is if devices function to their last commanded state (and the NCM is functioning), but fail to respond to new commands.

### *N1*

Little can go wrong on the TBC with regard to N1 communication. If you suspect N1 LAN problems, investigate these possible sources:

- The most likely cause of N1 communication problems is an improperly crimped connector or a damaged coaxial cable. Visually inspect and tug on the connectors to verify solid, physical crimping.
- Verify that the TBC has either two coaxial cables connected to it at the N1 BNCs or, if only one cable is connected, the other BNC is capped with a 93 ohm terminator.
- If you have added an End-of-Line terminating cap to an NCM200, ensure that the cap (or any metal connection, such as the T, or the exposed metal part of the cable) is not touching a case or any metal on the base frame. Black tape or a clip-on plastic shroud will ensure protection from inadvertent contact.
- If the N1 LAN is continuous (unbroken), as indicated by satisfying the conditions above, refer to the *N1 LAN Technical Bulletin* for further N1 troubleshooting methods.

## N2

Check for N2 communications among the N2 devices (NCMs, DCMs, and XMs) plugged directly into the base frame. If the N2 communication lights are flashing on these modules, but not to modules remote from the base frame, then the TBC or N2 trunk should be investigated.

For a suspected failure of N2 communications, first check (a) the power supply, (b) the N2 cable integrity, and (c) that only two EOL switches have been set to “In.” If these check well, it is possible that a fuse has blown on the TBC.

1. Remove the cover that swings over the TBC. Use a small, flat screwdriver to pry the sides of the cover until the set pins slip out of their sockets.
2. Remove the one screw that holds the TBC to the base frame. (The 1-Slot base frame is awkwardly positioned—use a right angle screwdriver.)
3. Pull the TBC board out far enough to enable you to probe the non-component side of the board (Figure 41).

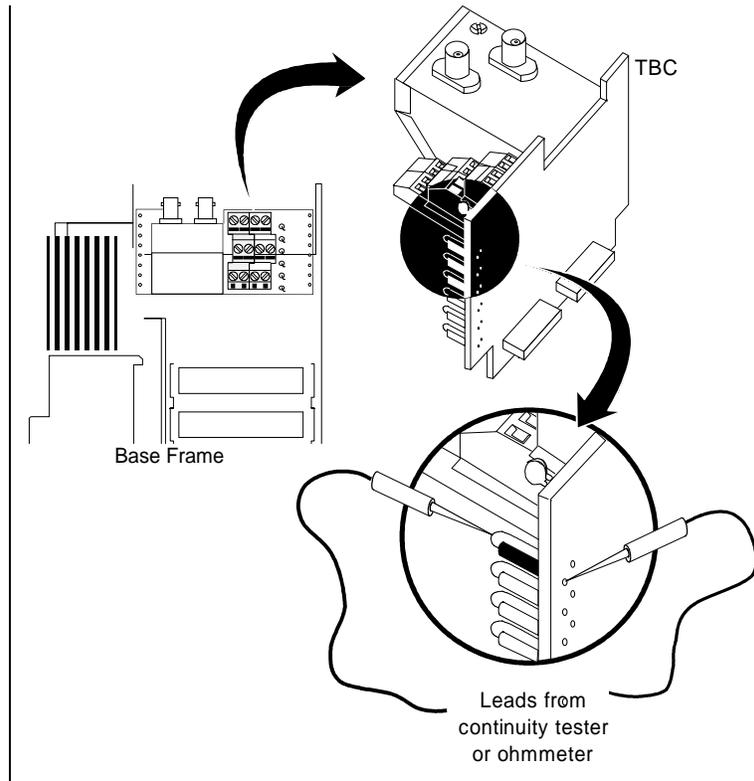
Note: Figure 41 shows the TBC on a standard 1-Slot, 2-Slot, or 5-Slot base frame. The NCM-Only TBC does not contain an N1 connector assembly. However, the terminal screw and fuse connections, and the technique for testing the fuses, is identical to the information described here.

4. Measure for continuity across each fuse. Using an ohmmeter, place one probe on the exposed portion of the fuse (you can also touch the terminal screw associated with that fuse). Place the second probe on the non-component side of the board, onto the fuse pad with a trace leading to the ribbon connector.

For example, to test fuse F1, place the probes on the exposed portion of F1 (or terminal screw 2), and to the F1 pad on the non-component side whose trace goes to the connector. If you measure an open circuit, the fuse is blown.

<u>Terminal Screw</u>	<u>Fuse</u>
TB1 1 N2(+)	F2
TB1 2 N2(-)	F1
TB1 4 REF	F3
TB2 1	F5
TB2 2	F4
TB2 4	F6

5. When reassembling the TBC, verify that the two cables are seated in their connectors at both ends.



**Figure 41: Measuring N2 Fuses on the TBC**

## Field Terminal Block

Indications of a problem within field terminal blocks (TBF) are when field signals read correctly at the screws, but no response is indicated at the electronics (i.e., FMs, DCMs, XMs).

Physical symptoms of a failed screw terminal include severe discoloration of the block, evidence of shorting, stripped screw threads, or loose wiring that cannot be corrected by tightening the screw clamp.

Failure of an entire block of terminals may be the result of faulty grounding or a detached ribbon cable

1. Verify that the electronics and software are functioning and defined properly. Protection and fusing is done on the electronics and it is very unlikely that the TBF has faulted.
2. Verify that the proper TBF has been installed.
  - In the 2-Slot and 5-Slot base frames, TBF101s are located in bays 1 - 5 at the left side of the panels; TBFs 201 are used in bays 6 - 9 at the bottom of the panels.
  - For the 5-Slot base frame, TBF301s are used in bays 10 - 14 on the right side of the panel.
  - The 1-Slot base frame uses TBF201 in bays 1 and 2 at the left lower side of the panel.
  - The NCM-Only base frame does not use field terminal blocks.
3. Ensure that the ribbon cables are fully plugged into the backframe and that the grounding screw is snug.
4. If the electronics still do not receive field signals, then either the TBF or the base frame has faulted. Try replacing the TBF first.

## Preload Resistor

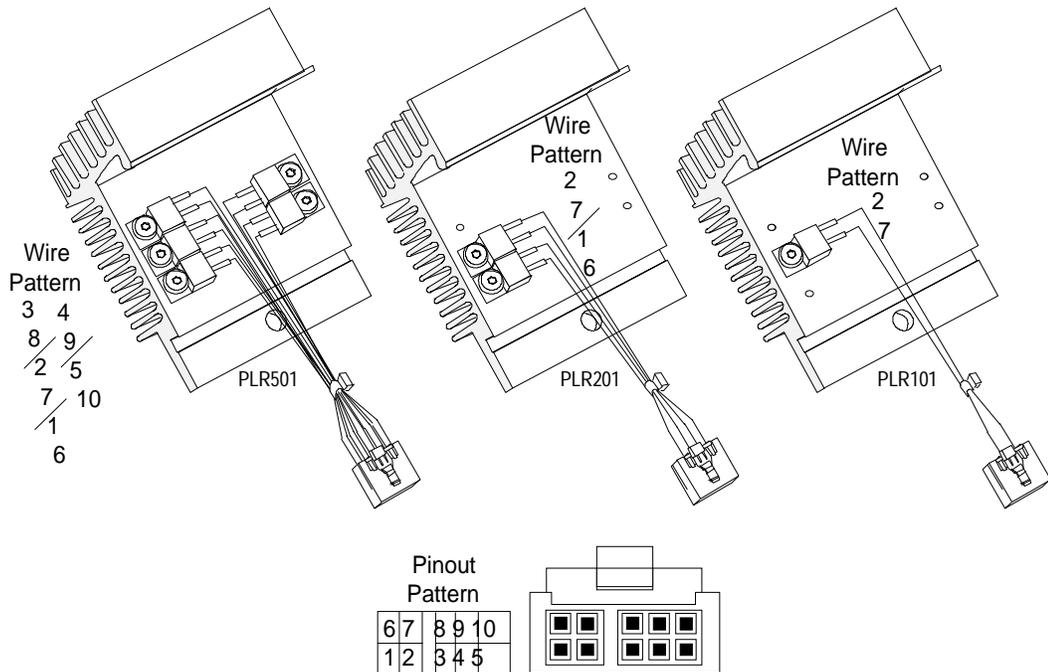
The preload resistors (PLR) provide a minimum load for base frame power supplies, allowing the supplies to stay in regulation with no other loads. A faulty preload resistor may reveal itself through erratic device operation or errors in calibration. More specifically, a faulty preload resistor results in an analog  $\pm 15$  V power supply problem.

1. Verify that the proper PLR is installed in the base frame:
  - A 5-Slot base frame uses a PLR501 (all ten wires connected on the ribbon connector)
  - A 2-Slot base frame uses a PLR201 (four wires connected)
  - A 1-Slot base frame uses a PLR 101 (two wires connected)

Note: The preload resistor on the NCM-Only base frame is mounted directly onto the circuit board and cannot be tested as described here. If you suspect a failed preload resistor on an NCM-Only base frame, return the base frame.

2. Check that the ribbon connector is properly plugged into the base frame and that none of the wires are broken.
3. With the PLR unplugged, use an ohmmeter to measure across the resistors for the following values (measure at the exposed metal points on the connector):
  - PLR501: two (2) 200 ohm resistors, three (3) 1200 ohm resistors.
  - PLR201: one (1) 200 ohm resistor, one (1) 1200 ohm resistor.
  - PLR101: one (1) 1200 ohm resistor.

If the resistors do not measure to within 20% of these values, replace the PLR.



Test resistors by inserting probes into the connector end. Use the same size probes as you would to test the base frame.

**Figure 42: Measuring Preload Resistors**

4. If the analog supply is still showing a problem, then either the power supply or the base frame motherboard has faulted. Try swapping or replacing the power supply first.

### Troubleshooting the Backplane (Motherboard)

The base frame motherboards have been designed to withstand extreme abuse and are not likely to fail. Troubleshooting tests described for the TBPs, TBCs, TBFs, and PLRs should be used to help determine if a motherboard has failed.

Also, visually inspect the connectors for pins or other foreign objects that may be jammed into the female receptacles.

---

## Repairs

This section of the manual describes how to replace the repairable components in the NCU/NEU.

### Replacing the Power Assembly

This procedure (Figure 43) is the same for power assemblies on all sizes of NCU/NEUs. Masking tape or an assistant will be useful to support the assembly after it is pulled out of the backplane.

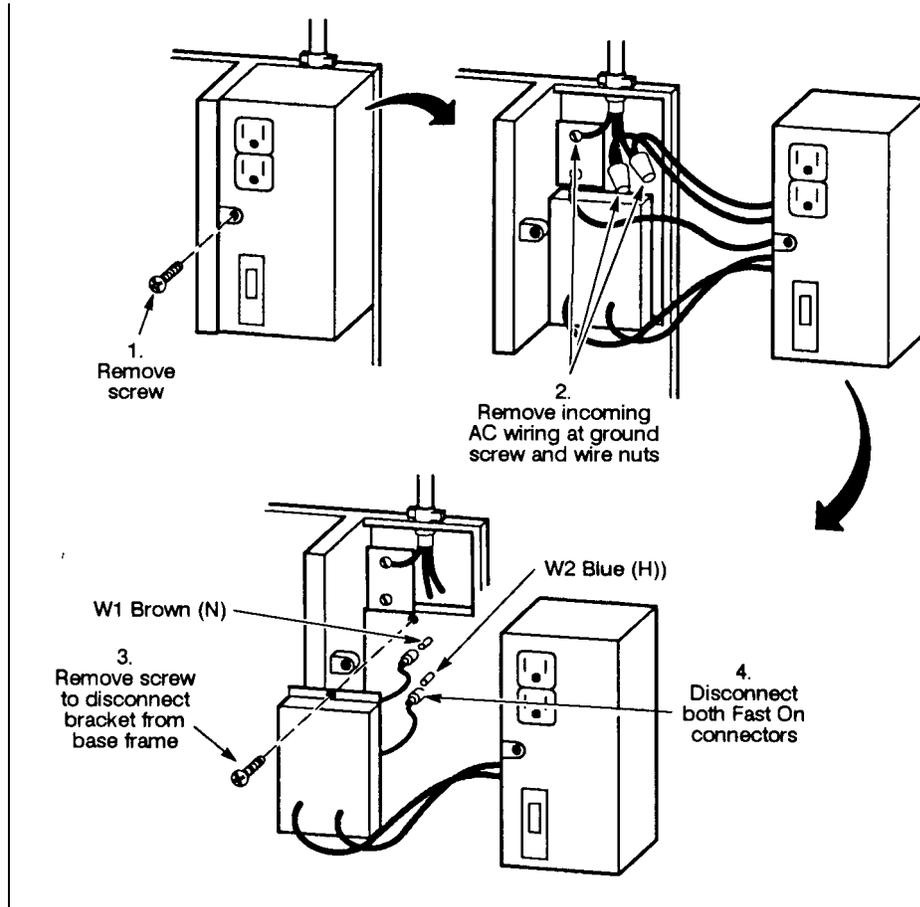
1. Turn Off power to the unit at the circuit breaker.



**WARNING:** To avoid risk of injury due to electrical shock, ensure that power is Off at the circuit breaker .

2. Unscrew the single mounting screw that holds the assembly onto the backplane.
3. Lift the assembly off the base frame. Use masking tape or an assistant to support the assembly while disconnecting the incoming line-voltage wires.
4. Line-voltage input wires (black, white, and green for ground) are wire-nutted between the assembly, power source, and base frame. Disconnect the wires and remove the assembly.

5. Disconnect the inside bracket assembly by removing its screw. Lift the bracket and unplug the Fast On connectors.



**Figure 43: Replacing the Power Assembly (2-Slot Shown)**

6. Install a new assembly using the reverse order of these directions. The assembly is grounded upon inserting the mounting screw.

## Replacing the Communication Board

Replacing the TBC (communication board) does not affect the normal operation of field devices connected directly to an NCU.

However, some devices connected to an NEU may fall out of synchronization with the system because the N2 connection has been interrupted between the device and NCM. After replacement connections have been completed, these devices must be manually reset to the desired position via the Operator Workstation.

Note: The TBC on the NCM-Only base frame does not contain an N1 connection. Otherwise, the location and repair of the NCM-Only TBC is similar to the standard 1-Slot base frame.

Note: As shown in Figure 45, older versions of the TBC connect to the base frame via a separate cable. New versions of the TBC integrate that cable. In event of a repair, new repair part TBCs also integrate the cable, and are fully compatible with all versions of base frames. However, old repair part TBCs did not include the separate cable. To avoid a situation where your repair part lacks the intermediate cable, be sure to include a new TBC repair part in your repair kit to service both old and new TBCs.

1. Power may be left On during this procedure.
2. Open the terminal door of the bay containing the communication board.
3. Disconnect the N1 LAN and N2 Bus cables.
4. Unscrew the mounting screw that is located in the middle of the clip on top of the board.

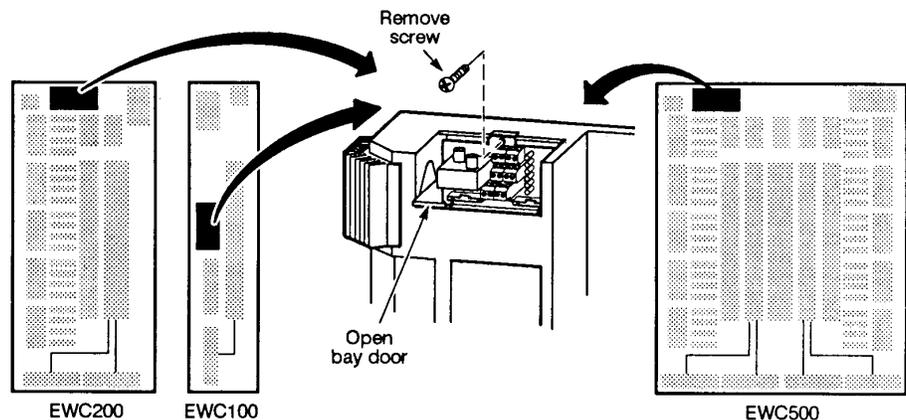
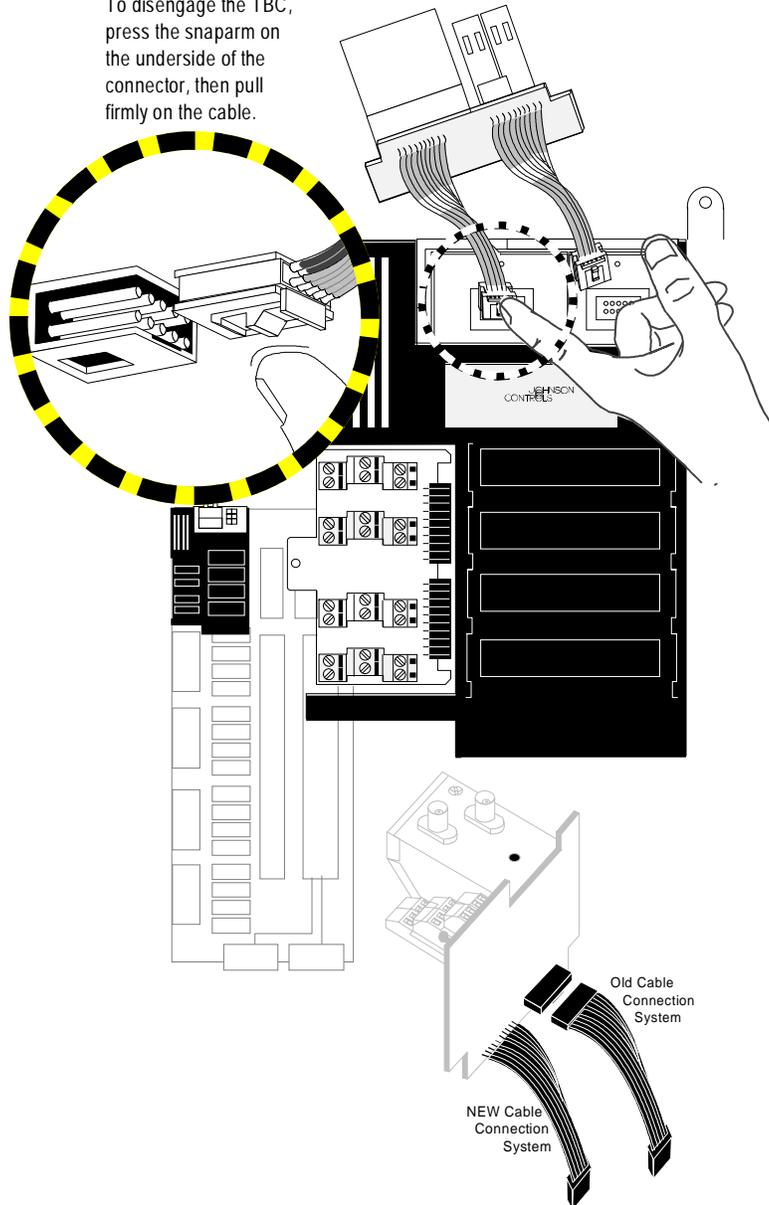


Figure 44: Locating and Removing the TBC Mounting Screw

5. Pull the TBC out of the clip and away from the base frame. Reach down to the backplane to where the ribbon cable connects to the header. Uncouple the connector/header by pressing the snaparm on the underside of the connector, then pulling firmly on the cable.

To disengage the TBC, press the snaparm on the underside of the connector, then pull firmly on the cable.



**Figure 45: Removing the TBC Cable Connector from Backplane Header**

**Note:** The old version TBC has a separate cable with a header/connector assembly joined at the TBC board. When removing the old version of TBC, make sure to remove the separate cable.

6. To install the replacement board, press the cable connector onto the backplane cable header. Then insert the board into the clip and attach the mounting screw.

## Replacing the Field Terminal Blocks

When replacing a field terminal block (TBF), power may be left On for the electronic and function modules in the unaffected slots.

Note: The NCM-Only base frame does not contain field terminal blocks.

Note: As expressed under *Replacing the Communications Terminal Board* in this document, avoid a situation where an old repair part lacks the intermediate cable to the base frame by including a new TBF repair part in your repair kit to service old and new TBFs.

1. Remove the power sources.
  - Internally, turn Off the power supply for the affected slot.
  - Externally, turn Off the source power from any line-voltage device.

 **WARNING:** To avoid risk of injury due to electrical shock, ensure that power is Off at the affected terminal block assemblies and affected devices .

Note that the devices connected to the replaced terminal blocks may turn Off. Examples include digital devices activated by relay outputs, such as motor starters, fans, and lights. These devices would then fall out of synchronization with the system for one schedule cycle (their last commanded state was On and the system does not restart them at power interruption until the On signal issues at the next scheduled On time). It will be necessary to manually turn these devices On, using the Operator Workstation or Network Terminal after the screw terminal blocks have been replaced and reconnected.

2. Verify that all wires and cables are tagged.
3. Open the terminal door covering the block to be replaced.
4. Unscrew the connecting/grounding screw. Lift the block unit out.

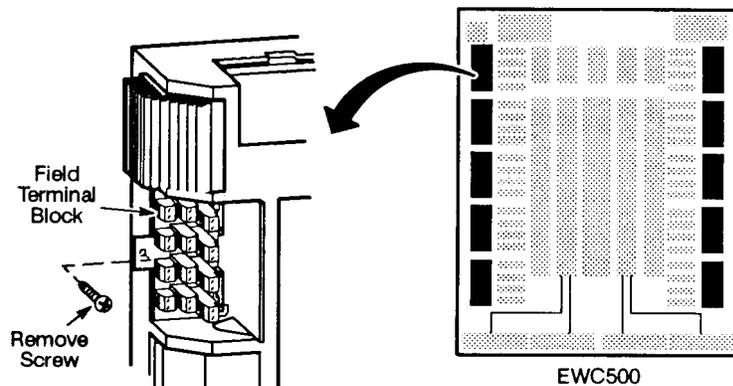
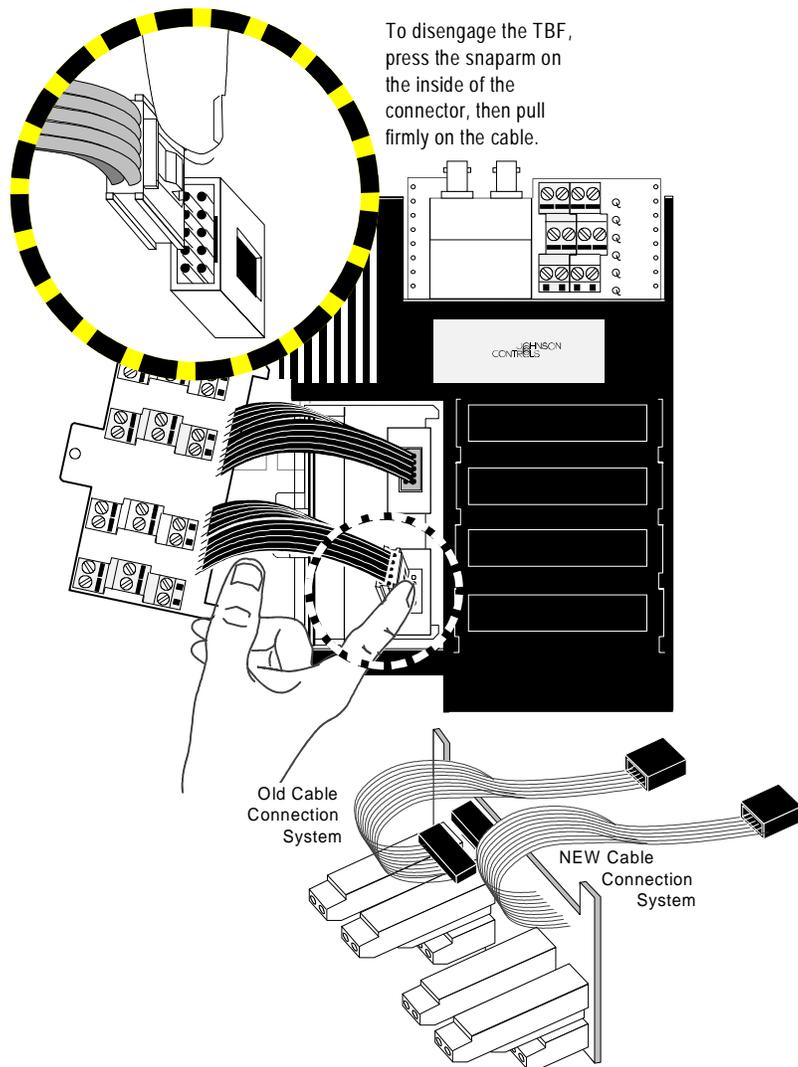


Figure 46: Locating and Removing the TBF Grounding Screw

5. With your finger, uncouple the ribbon cable from its backplane header by pressing the snaparm on the inward side of the connector, then pulling firmly on the cable.



**Figure 47: Disconnecting the TBF Cable from the Backplane Header**

Note: The old version TBF has a separate cable with a header/connector assembly joined at the TBF board. When removing the old version of TBF, make sure to remove the separate cable.

6. To install the new terminal block unit, use your finger to press the cable connector onto the backplane cable header. Then position the block into its bay and attach the connecting/grounding screw.
7. Reconnect the field wires.
8. Turn On both the internal and external power sources.

9. Check the status of each device serviced by the replaced block, restarting devices as necessary via local Auto/Manual switches and Start/Stop pushbuttons, or HOA switches.

### Replacing the Preload Resistors

1. Turn Off power at the power assembly unit and at the Power Supply Modules.

 **WARNING:** To avoid risk of injury due to electrical shock, ensure that the base frame power is Off .

Note: There is no removable preload resistor on the NCM-Only base frame. (The resistor is mounted on the motherboard.)

2. Use a No. 8 Allen head wrench to remove the termination screw and lift out the assembly (the cable is still attached).

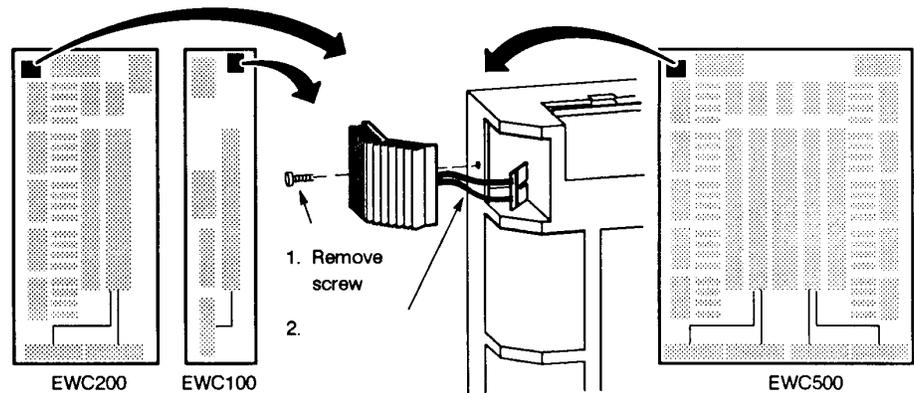
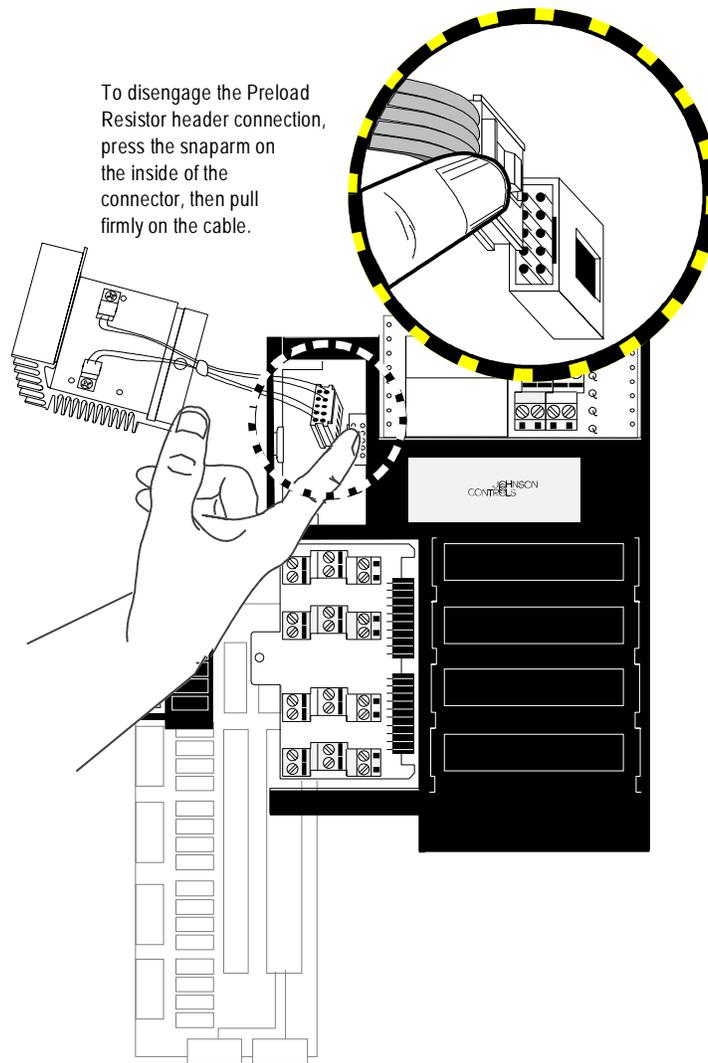


Figure 48: Locating and Removing the Preload Resistor Termination Screw

3. With your finger, uncouple the preload resistor cable from its backplane header by pressing the snaparm on the inward side of the connector, then pulling firmly on the cable.



**Figure 49: Replacing the Preload Resistor**

4. To install the new heat sink, use your finger to press the cable connector onto the backplane cable header. Then position the unit into its bay and attach the termination screw. Make sure to carefully tuck down the wires to avoid pinching them.
5. Cycle power to the NCU/NEU.

**Ordering  
Information**

This section provides ordering information for all equipment, required or optional, needed to set up a Network Control Unit or Network Expansion Unit.

**Table 2: Ordering Information**

<b>BASE FRAME</b>		
NCM-Only base frame		EN-BSF121-0
1-Slot base frame		EN-BSF101-0
2-Slot base frame		EN-BSF201-0
5-Slot base frame		EN-BSF501-0
<b>NCU/NEU ENCLOSURES-WITH-COVERS</b>		
10 x 28 in. Enclosure with Matching Cover		EN-EWC100-0
16 x 38 in. Enclosure with Matching Cover		EN-EWC200-0
26 x 46 in. Enclosure with Matching Cover		EN-EWC500-0
<b>NCU/NEU REPAIR COVERS</b>		
10 x 28 in. Repair Cover		EN-CVC101-700
16 x 38 in. Repair Cover		EN-CVC201-700
25 x 35 in. Repair Cover (for old 5-Slot short enclosure)		EN-CVC501-700
26 x 46 in. Repair Cover		EN-CVC502-700
<b>ENCLOSURE ACCESSORIES</b>		
Enclosure Repair Kit (brackets for enclosure door; wire guides)		EN-KIT126-0
Wire Guide Kit, (includes 8 wire guides, 16 screws)		EN-WGK101-0
<b>KEYS (Bag of 5)</b>		
Master Keys		EN-KEY101-0
Tenant Keys		EN-KEY102-0
<b>MAJOR MODULES</b>		
Network Control Module with N1 ARCNET Board		NU-NCM101-0
Network Control Module w/o N1 ARCNET Board		NU-NCM102-0
Network Control Module, Migration		NU-NCM401-0
Network Control Module 200 (note: requires NIM, see <i>NCM200 Technical Bulletin</i> )		NU-NCM200-0
Digital Control Module		NU-DCM101-0
Point Multiplex Module, 32 Binary Inputs		NU-XBN101-0
Point Multiplex Module, 8 Binary Inputs/8 Magnetically Latched Outputs		NU-XRL101-0
Point Multiplex Module, 8 Binary Inputs/8 Electrically Maintained Outputs		NU-XRE101-0
Point Multiplex Module, 8 Binary Inputs/8 Momentary Outputs		NU-XRM101-0
Power Supply Module		NU-PWR101-0
Identification Inserts; Door		NU-LAI101-0
<b>FIELD TERMINAL BLOCKS</b>		
In/Out Terminals (left)		EN-TBF101-0
In/Out Terminals (bottom—XMs)		EN-TBF201-0
In/Out Terminals (right)		EN-TBF301-0
Continued on next page . . .		

<b>PRELOAD RESISTORS (Cont.)</b>	
Preload Resistors for 1-Slot base frame	EN-PLR101-0
Preload Resistors for 2-Slot base frame	EN-PLR201-0
Preload Resistors for 5-Slot base frame	EN-PLR501-0
<b>COMMUNICATIONS BOARD</b>	
Standard Communications Terminal Board	EN-TBC801-0
NCM-Only Communications Terminal Board	EN-TBC821-0
<b>POWER ASSEMBLY</b>	
1-Slot Power Assembly	EN-TBP102-0
2-Slot Power Assembly	EN-TBP202-0
5-Slot Power Assembly	EN-TBP502-0
<b>NETWORK TERMINAL</b>	
Network Terminal Unit	IO-NTU101-0
Network Terminal Unit with Light	IO-NTU102-2
Network Terminal Cradle Kit	EN-KIT103-0

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## Notes

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# Notes



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