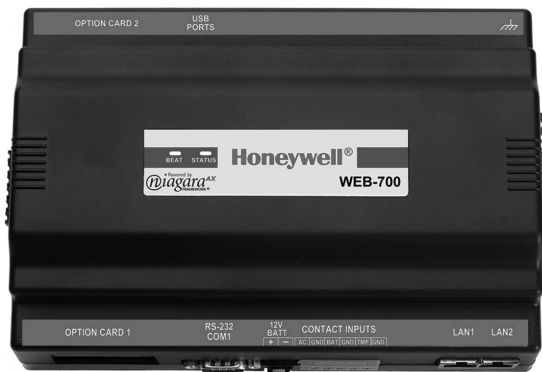


# WEB-700 WEB-700-O CP-700

## INSTALLATION INSTRUCTIONS



## APPLICATION

The WEB-700 and CP-700 are compact, embedded controller/server platforms that allow integrated control and management of external devices over the Internet. They provide support for two optional communications boards as well as optional remote I/O expansion modules.

## CONTENTS

### About This Guide 2

Related Documentation 2

Product Description 3

Packaging and Features 3

Technical Specifications 5

Equipment Ratings 5

### Preparation 6

Included in this Package 6

Material and Tools Required 6

### Precautions 6

Safety Precautions 6

Static Discharge Precautions 7

Battery Precautions 7

### Mounting 7

Environmental Requirements 7

Physical Mounting 8

Removing and Replacing the Cover 9

Board Layout 10

About Expansion Options 11

About Option Cards 11

About Remote I/O Modules 12

About MiniPCI Cards 12

### Wiring Details 13

Communications Wiring 13

Grounding 14

Power Wiring 15

Contact Inputs 17

External 12V Backup Battery 18

Wiring to Remote I/O Modules 19

Power Up and Initial Checkout 19

Apply Power 19

Check the Status LED 19

About the Backup Batteries 20

NiMH battery pack 20

### About LEDs 21

Status 21

Heartbeat 21

Debug 21

Ethernet Ports 21

### Maintaining the WEB/CP-700 21

Cleaning 21

Required NiMH Battery Maintenance 22

### Replacement Parts 23

Non-replaceable Parts 23

Standard Replacement Parts 23

New Replacement Unit 23

Replacing the WEB/CP-700 24

Returning a Defective Unit 27

### Certifications 26

Federal Communications Commission (FCC) 26

Canadian Department of Communications (DOC) 26

CE Declaration of Conformity 26

### Tab Mounting Dimensions 27



## ABOUT THIS GUIDE

This document covers the mounting and wiring of the Tridium® WEB/CP-700 (T-700) controller. It assumes that you are an engineer, technician, or service person who is performing control system installation. Instructions in this document apply to the following products:

Model	Description
WEB-700 WEB-700-O CP-700	DIN mount 7 series controller, powered by separate plug-in power supply module or wall mount AC power adapter. Controller supports optional remote I/O expansion modules and internal communications option cards.
NPB-PWR-UN-H	90–263Vac universal input/15Vdc output power supply module, DIN mountable.
NPB-WPM-US	Wall-mount, 120V AC power adapter.

**NOTE:** Not covered in this document is the Niagara<sup>AX</sup> software installation and configuration required for a fully functioning unit. Refer to the *Niagara AX Install and Startup Guide* for this information. In addition, the mounting and wiring of controller expansion options are covered in separate documents. See the section **About Expansion Options**, page 11.

## Related Documentation

For more information on configuring and using the WEB/CP-700 controller, consult the following documents:

- IO-16-REM-H Installation and Configuration Instructions, Form # 95-7768
- NPB-LON Option Installation Sheet, Form # 62-0263
- NPB-MDM Option Installation Sheet, Form # 95-7730
- NPB-GPRS-W-H Installation Sheet, Form # 62-0301
- NPB-SRAM (Static RAM) Option Installation Instructions, Form #62-0425
- NPB-ZWAVE Option Card Installation Instructions, Form # 62-0349
- NPB-WIFI-7 Controller WIFI Option Installation Instructions, Form # 62-0426
- Niagara AX Install and Startup Guide
- NiagaraAX Nrio Guide
- NiagaraAX User Guide

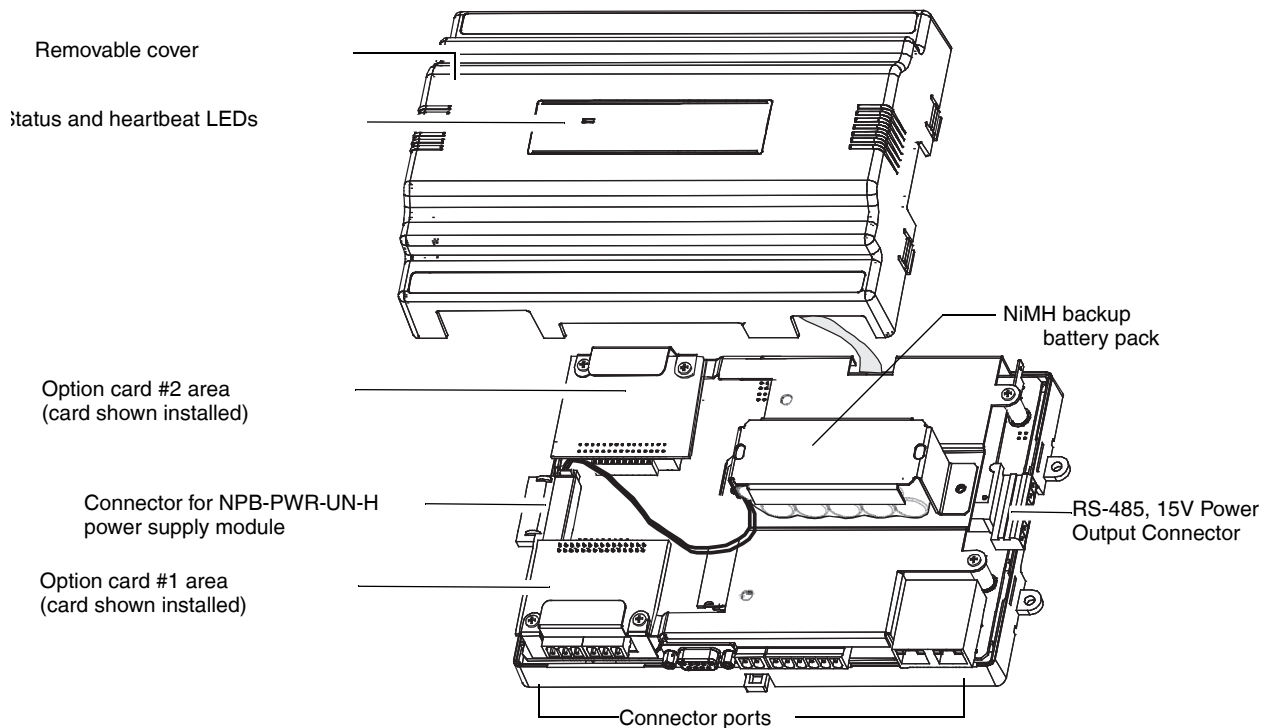
## PRODUCT DESCRIPTION

The WEB/CP-700 controller is a compact embedded processor platform using on-board Flash memory for backup, in an expandable DIN-modular package. Designed for use in commercial environments, the WEB/CP-700 runs the NiagaraAX Framework to provide integrated control, supervision, and network management solutions for wide variety of networked field devices. NiagaraAX-3.5 or later is required.

## Packaging and Features

The WEB/CP-700 features a DIN-mount controller base with mounting tabs for alternate panel mount. Two available comm option card slots are accessed under the controller's removable cover.

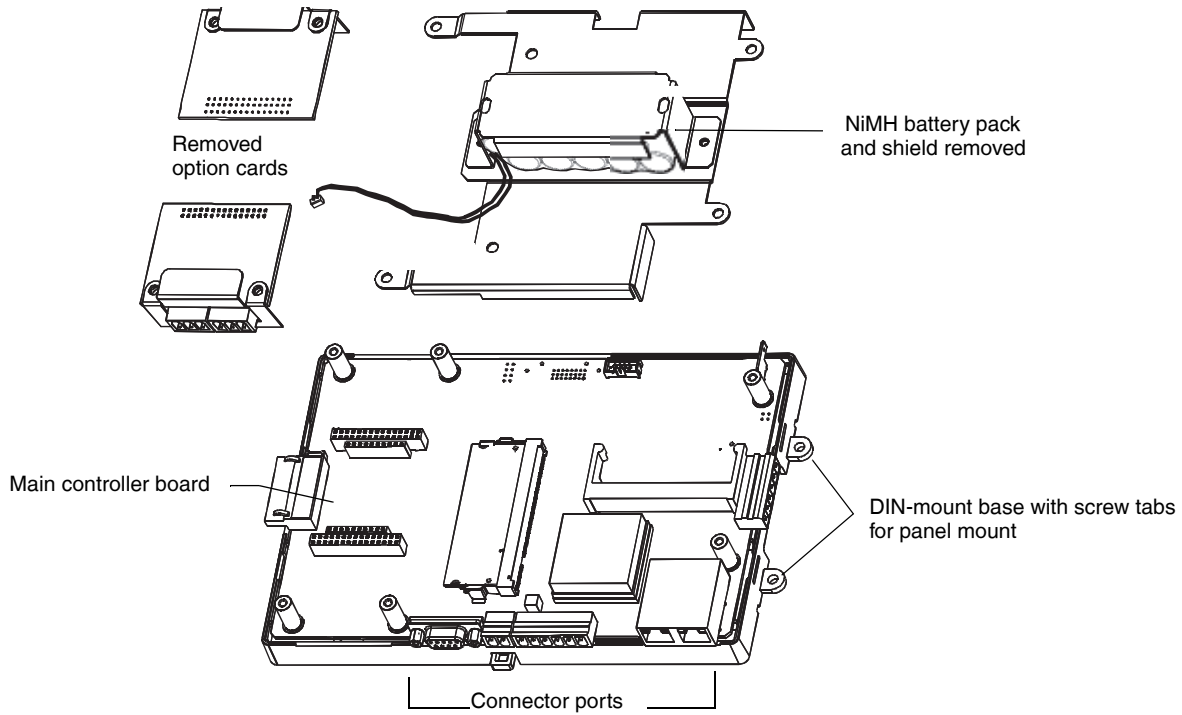
Fig. 1 and Fig. 2 show locations of important features of the WEB/CP-700.



**Fig. 1. WEB/CP-700 Cover removed with 2 options installed on main board.**

Typical installation requires an NPB-PWR-UN-H universal power supply module (furnishing 15Vdc) for power, attaching to the controller's left side. An RS-485 port is on the controller's opposite right end connector, along with 15Vdc power for support of remote I/O expansion modules, either chained directly and/or wired remotely.

**NOTE:** Instead of using the NPB-PWR-UN-H power supply module, you can adapt an NPB-WPM-US wall mount AC power adapter to power the WEB/CP-700 controller. However, you cannot directly attach I/O expansion modules in this configuration, nor power remote I/O modules from that NPB-WPM-US.



**Fig. 2. WEB/CP-700 main controller board and 2 option cards uninstalled.**

As a 7 series controller, the WEB/CP-700 uses a PowerPC 440EPx processor, 1GB Flash storage, and 1 GB DDR-2 RAM. TCP/IP access is via two standard Gigabit Ethernet ports. Serial communications ports (RS-232, RS-485) are standard.

One or two option cards can be added for additional communications, e.g. LonWorks FTT-10, or another RS-232 port. A MiniPCI slot is also available for WiFi 802.11g support. The WEB/CP-700 uses the QNX Neutrino operating system, with the Oracle Java Hotspot VM (Virtual Machine).

Two status LEDs are visible atop the cover. Integral contact inputs are provided to allow system monitoring of UPS power and battery, and an external enclosure door. A rechargeable NiMH battery pack is included inside the unit, and a separate connector provides recharging and monitoring of an external 12V sealed lead-acid battery ordered separately.

The table below provides a summary of features of the WEB/CP-700 controller model.

**Table 1. WEB/CP-700 features and options**

Model	Description	Ports
WEB-700-O CP-700	DIN-mountable controller. PowerPC 440Epx 667MHz processor, 1GB NAND Flash storage, 1 GB base DDR-2 system RAM.  Includes integral NiMH battery pack, two open enhanced comm option card slots, one open MiniPCI slot (for WiFi 802.11g option card). Not furnished is NPB-PWR-UN-H universal power supply, or external 12V sealed lead-acid battery and harness.	Two 1GB Ethernet, RJ-45  One RS-232 Serial, DB-9 male  One RS-485 Serial, isolated, with 15V/12Vdc power, 6-position plug on right side.

## Technical Specifications

### WEB/CP-700 PLATFORM

- PowerPC 440Epx @ 667MHz processor (speed approximate due to spread spectrum clock).
- 1GB on-board NAND Flash storage.
- 1 GB DDR-2 333Mhz RAM (maximum Java Heap size 384MB).
- Two (2) Gigabit Ethernet ports.
- Standard RS-232 port.
- 6-position end connector with isolated RS-485/15Vdc power (usable as a standard non-powered isolated RS-485 port, or to support remote I/O modules).
- MiniPCI option slot, for optional NPB-WIFI-7 802.11 b/g WIFI adapter (WEBsAX-3.6 required).
- Two (2) available comm option slots in the WEB/CP-700, for LonWorks, RS-485 or RS-232, GPRS/Edge Cellular, Jennic 802.15.4 wireless, etc.
- LEDs on front of unit to monitor power and system status.
- Available contact inputs (3) to monitor external UPS AC present, UPS battery level, external enclosure door status.

### POWER SUPPLY

- Requires universal AC input (90V – 264V) NPB-PWR-UN-H power supply module, supplies 15Vdc, 30VA. Alternately, a NPB-WPM-US wall-mount AC adapter can power the WEB/CP-700 only (requires removal of barrel plug end and wiring to end connector).
- Includes integral rechargeable NiMH backup battery pack, for short duration AC power fail operation.
- Connection for external, rechargeable, 12V sealed lead-acid battery, for continuous system operation over longer power outages. Provides trickle charge and monitoring support to separately ordered batteries.

### OPERATING SYSTEM

- QNX Neutrino Real-Time Operating System.
- Oracle Hotspot JVM (Java Virtual Machine) in units with WEBsAX-3.6 or later; IBM J9 JVM is used in units with WEBsAX-3.5.
- NiagaraAX software (WEBsAX-3.5 or later required). WEBsAX-3.6 or later required to use the optional NPB-WIFI-7 adapter.

### PHYSICAL

- Plastic DIN-mount backplate with screw tabs for alternate panel mounting.
- Removable snap-on plastic cover with status LEDs and connecting cable.
- Cooling by internal air convection.
- Dimensions: 8.7" (221mm) wide x 5.6" (142mm) high x 2.44" (62mm) deep.
- Weight: Net 1.67 lbs. (0.76 kg), Gross 2.0 lbs. (0.91 kg).

### ENVIRONMENT

- Operating temperature range: 32°F to 122°F (0°C to 50°C).
- Relative humidity range: 10% to 90% at 77°F (25°C), non-condensing.
- Mechanical ambient conditions are as follows:
  - Vibration, in operation: 5 to 9 Hz: 3.5mm amplitude, 9 to 150Hz: 1g.
  - Shock resistance, in operation: 15g acceleration, 11 ms duration.
- Storage temperature range: 32°F to 158°F (0°C to 70°C).
- Storage relative humidity range: 5% to 94%, non-condensing.

## Equipment Ratings

### ELECTRICAL

- Input voltage range: 15Vdc (from separate AC power supply, 90Vac to 264Vac, 50/60Hz).
- Power consumption: 20VA maximum.

## PREPARATION

Unpack the WEB/CP-700 and inspect the package contents for damaged or missing components. If damaged, notify the appropriate carrier at once and return any damaged components for immediate repair or replacement. See "Returning a Defective Unit" on page 25.

- Included in this Package
- Material and Tools Required

### Included in this Package

Included in this package you should find the following items:

- WEB/CP-700 controller.
- *WEB/CP-700 Installation Instructions*, Form Number 95-7776.
- Hardware bag containing the following items:
  - Two (2) 6-position screw terminal plugs, one for integral contact inputs (door tamper, UPS battery OK, UPS AC present), one end-mount to wire RS-485/power to optional remote expansion devices.
  - One (1) 2-position screw terminal plug for external sealed lead-acid (SLA) rechargeable battery (not provided).
  - One (1) grounding wire, with quick-disconnect 0.187" female connector.

### Material and Tools Required

The following supplies and tools are typically required for installation:

- NPB-PWR-UN-H universal AC power supply module, 90-263 Vac input, 15Vdc 30W output, DIN-mount capable, with grounding wire.  
Alternatively, a NPB-WPM-US wall-mount AC adapter can power the WEB/CP-700 controller only. You must cut off the adapter's barrel plug end, and then wire leads into the controller's end connector. A multimeter is needed to check polarity.
- DIN rail, type NS35/7.5 (35mm x 7.5mm) and DIN rail end-clips (stop clips), unless using panel mounting method with screws through mounting tabs.
- Suitable tools and fasteners for mounting unit and accessories.
- #2 phillips screwdriver: used to install and remove an optional option card.
- Small flat-blade screwdriver: used for making wiring connections to removable screw terminal plugs.
- (Optional) One or two 12V sealed-lead-acid (SLA) rechargeable backup batteries, with wire harness for connecting to the 2-position connector on the unit. Should be sized as required by the system. See Contact Input wiring to WEB/CP-700, page 17.

## PRECAUTIONS

This document uses the following warning and caution conventions:



### CAUTION

**Cautions remind the reader to be careful. They alert readers to situations where there is a chance that the reader might perform an action that cannot be undone, might receive unexpected results, or might lose data. Cautions contain an explanation of why the action is potentially problematic.**



### WARNING

**Warnings alert the reader to proceed with extreme care in situations where there is a chance that the reader might do something that can result in personal injury or equipment damage. Warnings contain an explanation of why the action is potentially dangerous.**

## Safety Precautions

The following items are warnings of a general nature relating to the installation and start-up of the WEB/CP-700 controller. Be sure to heed these warnings to prevent personal injury or equipment damage.



## WARNING

A 120Vac or 240Vac circuit powers the NPB-PWR-UN-H power supply for the controller. 15Vdc input (DC only) to controller.

Disconnect power before installation or servicing to prevent electrical shock or equipment damage.

Make all connections in accordance with national and local electrical codes. Use copper conductors only.

To reduce the risk of fire or electrical shock, install in a controlled environment relatively free of contaminants.

This device is only intended for use as a monitoring and control device. To prevent data loss or equipment damage, do not use it for any other purpose.

## Static Discharge Precautions

Static charges produce voltages high enough to damage electronic components. The microprocessors and associated circuitry within a WEB/CP-700 controller are sensitive to static discharge. Follow these precautions when installing, servicing, or operating the system:



## CAUTION

Work in a static-free area.

Discharge any static electricity you may have accumulated. Discharge static electricity by touching a known, securely grounded object. Do not handle printed circuit boards (PCBs) without proper protection against static discharge. Use a wrist strap when handling PCBs. The wrist strap clamp must be secured to earth ground.

## Battery Precautions



## CAUTION

The NiMH battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 122°F (50°C), or incinerate. Replace battery pack with NPB-BATT-7 only. Use of another battery may present a risk of fire or explosion.

Dispose of used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.

Replace external backup battery with Listed Power Source Battery Only.

## MOUNTING

**NOTE:** This product is intended for indoor use only. The unit should not be exposed to ambient conditions outside of the range of 32°F (0°C) to 122°F (50°C), or relative humidity outside the range of 10 to 90% at 77°F (25°C), non-condensing. Refer to Environment, page 5 for further details on mechanical and storage specifications.

Before mounting the unit, install any option card(s) and memory upgrade. See About Expansion Options, page 11.

## Environmental Requirements

Note the following requirements for the WEB/CP-700 mounting location:

- If mounting inside an enclosure, that enclosure should be designed to keep the unit within its required operating range considering a 20-watt dissipation by the controller, plus dissipation from any other devices installed in the same enclosure. This is especially important if the controller is mounted inside an enclosure with other heat producing equipment.
- Do not mount the unit:
  - in an area with excessive moisture, corrosive fumes, or explosive vapors.
  - where vibration or shock is likely to occur.
  - in a location subject to electrical noise. This includes the proximity of large electrical contractors, electrical machinery, welding equipment, spark igniters, and variable frequency drives.

## Physical Mounting

The following information applies about physically mounting the unit.

- You can mount the WEB/CP-700 in any orientation. It is not necessary to remove the cover before mounting.
- Mounting on a 35mm wide DIN rail is recommended. The WEB/CP-700 unit base has a molded DIN rail slot and locking clip, as does the NPB-PWR-UN-H power supply module and any I/O expansion modules. Mounting on a DIN rail ensures accurate alignment of connectors between all modules.
- If DIN rail mounting is impractical, use screws in mounting tabs on the NPB-PWR-UN-H module and the WEB/CP-700, as well as any end-connected accessory. Tab mounting dimensions are on the last page of this document.

Fig. 3 and the following procedure provides step-by-step DIN rail mounting instructions for the WEB/CP-700.

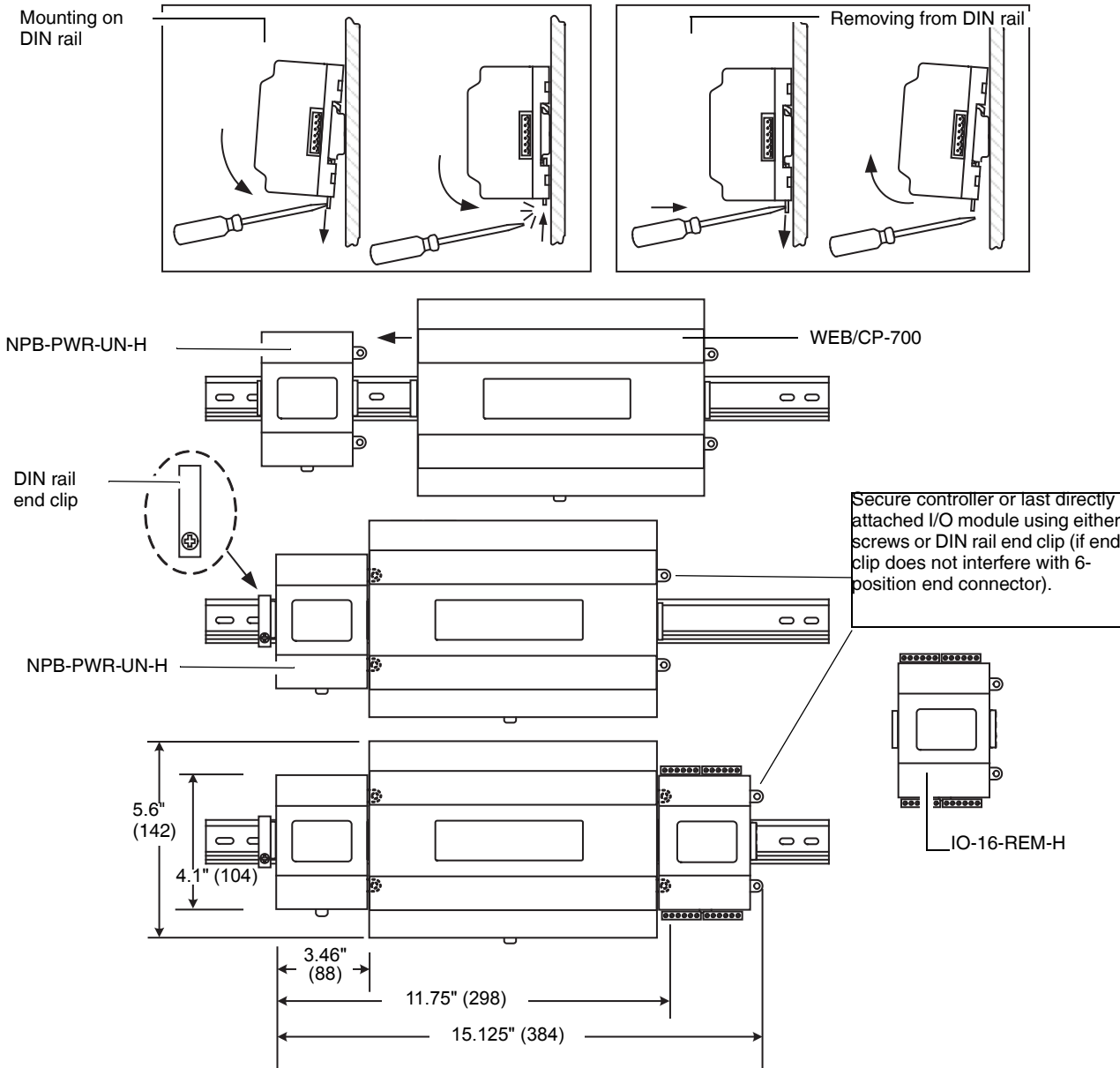


Fig. 3. WEB/CP-700 and accessory mounting details.

**NOTE:** Mount the NPB-PWR-UN-H power supply first, then the WEB/CP-700 controller, then any directly attached I/O expansion module.



**To mount on DIN rail**

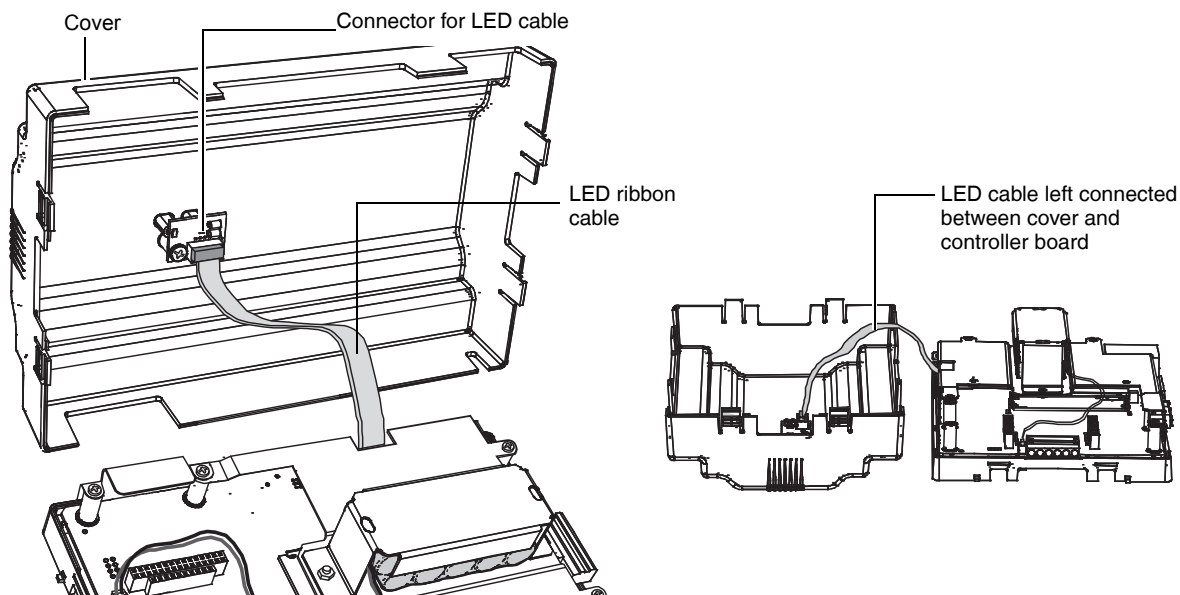
1. Securely install the DIN rail with at least two screws, near the two rail ends.
2. Position the NPB-PWR-UN-H power supply module on the rail, tilting to hook DIN rail tabs over one edge of the DIN rail (Fig. 3).
3. Use a screwdriver to pry down the plastic locking clip, and push down and in on the module, to force the locking clip to snap over the other edge of the DIN rail.
4. Mount the WEB/CP-700 controller onto the DIN rail in the same way, such that its left 6-position end connector faces the NPB-PWR-UN-H power supply.
5. Slide the two devices together along the DIN rail to connect their 6-position connectors.
6. If installing any I/O expansion modules, repeat this for each one, until all are mounted on the DIN rail and firmly connected into one assembly.
7. To keep the final assembly together, secure at both ends with DIN rail **end-clips** provided by the DIN rail vendor. This also prevents the assembly from sliding on the DIN rail. See Fig. 3.

**Removing and Replacing the Cover**

You must remove the WEB/CP-700 cover to connect the battery (new unit), and/or to replace the NiMH battery, install any option cards, or replace the NiMH battery. The cover snaps onto the base with four plastic end tabs—two on each end.

**CAUTION**

An LED ribbon cable connects the cover to the main board. Be careful when lifting the cover off. If the controller is on a flat work surface, you can leave the cable connected, with the cover next to the unit. See Fig. 4.



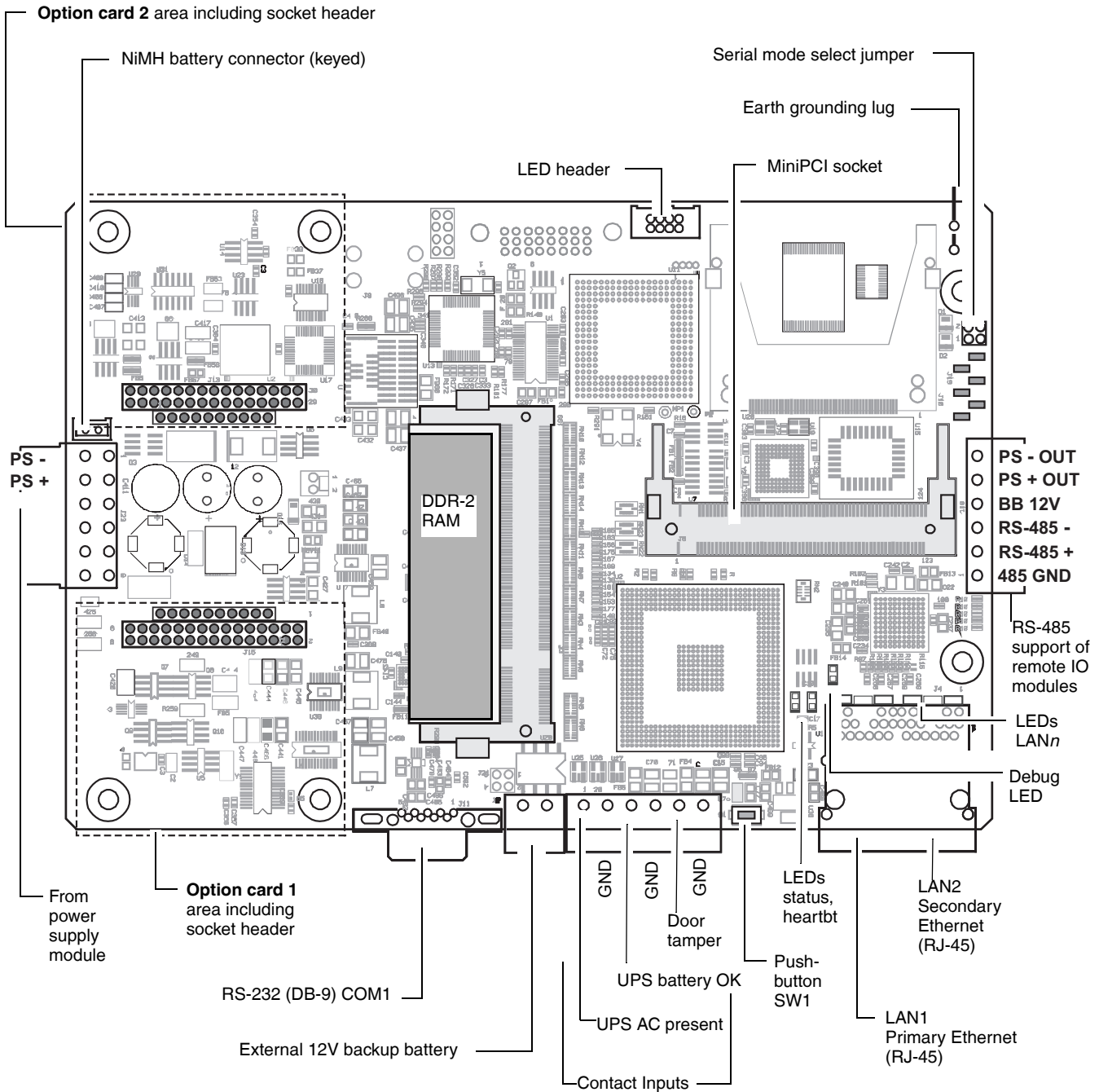
**Fig. 4. Removing WEB/CP-700 cover.**

**NOTE:** If accessory modules are plugged into the WEB/CP-700, you may need to slide them away from the unit to get to the end cover tabs.

- To remove the cover, press in the tabs on both ends of the unit, and carefully lift it off (see previous Caution). If necessary, unplug the LED cable from the cover, at the connector on the back of the cover (see Fig. 4).
- To replace the cover, make sure that the LED cable is connected and not folded outside the base. Orient the cover so the cutout area for comm ports is correct, then push inwards to snap in place.

## Board Layout

Fig. 5 shows the location of connectors, option slots, and other features of the main board in the WEB/CP-700. For side views of communications ports and other features, see Fig. 6, page 13.



**Fig. 5. WEB/CP-700 main board layout details**

A WEB/CP-700 controller ships with both option card slots 1 and 2 open. The DDR-2 RAM socket is populated with a 1GB module. A variety of communications option cards are available. For related details, see the next section About Expansion Options.

## ABOUT EXPANSION OPTIONS

The WEB/CP-700 provides for **field-installable** expansion using these types of options:

- **Option card** — Install on connectors inside the WEB/CP-700 base unit. See About Option Cards, page 11.
- **Remote I/O modules** — To wire to the WEB/CP-700's right-side 6-pin connector. See About Remote I/O Modules, page 12.
- **MiniPCI option card** — (future use). See About MiniPCI Cards, page 12.

### About Option Cards

The WEB-700/CP has two (2) available option slots to accept a custom option card, compatible with either of these types:

- Series 2 and 6 controller options cards: 30-pin, 2 row connector, **or**
- Future release Series 7 option cards: 40-pin, 3 row connector.

To accept either, both option slots on the WEB/CP-700 base board have a 40-pin connector. See Fig. 5, page 10. Installing an option card is recommended before mounting the unit. See Installing an Option Card, page 12.



### WARNING

**Power to the WEB/CP-700 must be OFF when installing or removing option cards, or damage will occur! Also, you must be very careful to plug an option card into its connector properly (pins aligned).**

Option cards typically provide additional communications features, with the following available models (with others still in development) listed in Table 2.

**Table 2. WEB/CP-700 Option Cards**

Option	Description	Notes
NPB-2X-RS485	Dual, optically-isolated, RS-485 adapter with two 3-position removable screw-terminal connector plugs.	30-pin option card. If installed in option slot 1, ports operate as COM5 and COM6.
NPB-LON	FTT-10A LON (LonWorks) adapter with a 2-position removable screw-terminal connector plug.	30-pin (WEB-2/6) option card. Port operates as LON1 if only one LON option, or LON2 in slot 2 if two LON cards.
NPB-RS232	Single port RS-232 adapter, with a DB-9M connector. Supports baud rates up to 115200.	30-pin (JACE-2/6) option card. If installed in option slot 1, port operates as COM5.
NPB-GPRS-W-H	GSM cellular modem card using GPRS (General Packet Radio Service), with onboard socket for SIM card, and a Wyleless SIM. Includes a stub SMA antenna.	30-pin (JACE-2/6) option card. Card uses two WEB/CP-700 COM ports, e.g. COM5 and COM6 if option slot 1.
NPB-MDM	56Kbps Auto-dial/Auto-answer Modem <sup>1</sup> with one RJ-11 connector for phone line.	30-pin (JACE-2/6) option card. Does not have own UART (unlike most other serial cards). Operates as COM3 if installed in option slot 1, COM4 if in slot 2.

<sup>1</sup>Unlike with a Series 2/6 controller with an NPB-MDM installed in slot 1, the onboard RS-232 COM1 port (DB9) remains operational. Also, any NPB-MDM option is unaffected by the "mode jumper" position for serial shell access (jumper in "serial shell" position affects the operation of the onboard RS-232 COM1 port only).

### OPTION CARD COM PORT ASSIGNMENTS

COM port assignments for option cards installed in a WEB/CP-700 start at COM5, with Slot 1 evaluated first, then Slot 2. (COM1 and COM2 are always assigned to the onboard RS-232 and RS-485 ports, while COM3 and COM4 are reserved for slots.)

### INSTALLING AN OPTION CARD

For option-specific details, see the mounting & wiring document that accompanies the particular option card. The following procedure provides a basic set of steps.

## WARNING

Installing an option card in option Slot 2 requires careful attention—you must carefully pry up the shield tab to install the option card under the tab. Do not install an option card in Slot 2 with the card resting on top of the shield tab! Otherwise, an electrical short or some other issue from misaligned card header pins may result.

### Mounting an option card in a WEB/CP-700.

1. Remove power from the WEB/CP-700, including any external battery—see the previous on page 11.
2. Remove the cover. See Removing and Replacing the Cover, page 9.
3. Remove the blanking plate for the option slot, retaining the two screws. Retain the blanking plate in case the option card must be removed later.
4. Carefully insert the pins of the option card into the socket headers of the option card slot.

**NOTE:** If installing in Slot 2, first carefully pry up the shield tab that goes over the standoff. Option card 2 must be installed under the shield tab.

The mounting holes on the option board should line up with the standoffs on the base board. If they do not, the connector is not properly aligned. Press until the option card is completely seated.

5. Place the custom end plate for the option card over the connector(s) of the option card. With some option cards, the card's end plate is pre-fastened.
6. With the mounting holes aligned with the standoffs, place the two screws through the end plate, and into the standoffs on the WEB/CP-700 base board. Using a screwdriver, hand tighten these screws.
7. Replace the cover on the controller.

## About Remote I/O Modules

The WEB/CP-700 has an integral 6-pin connector to support remote I/O modules. The connector provides both 15Vdc power and RS-485 communications to modules on that connected trunk, and is located on the right side of the unit.

Each remote I/O module has a DIN-mount base, and provides two (2) 6-pin connectors that allow you to “chain” multiple modules together into one assembly. Table 3. lists the currently available modules.

**Table 3. Remote I/O modules compatible with the WEB/CP-700**

Model	Description	Notes
IO-16-REM-H	Remote I/O RS-485 Module DIN-mountable RS-485 comm module that provides 16 points I/O, with I/O point types as noted.	Provides the following I/O points: <ul style="list-style-type: none"> <li>• 8 - Universal Inputs (UIs).</li> <li>• 4 - Digital Outputs (DOs), SPST-relay type.</li> <li>• 4 - Analog Outputs, 0–10Vdc type.</li> </ul> Up to 16 (maximum) IO-16-REM-H accessory modules are supported. Wiring is covered in a <b>separate</b> document, see the <i>IO-16-REM-H Installation and Configuration Instructions</i> .

## About MiniPCI Cards

The WEB/CP-700 has one (1) available MiniPCI slot—see Fig. 5, page 10. This slot supports a specific 802.11 wireless (Wifi) adapter option, model NPB-WIFI-7.

## WIRING DETAILS

See Fig. 5, page 10 to locate connectors and other components on the WEB/CP-700 controller.

Make connections to the WEB/CP-700 in the following order.

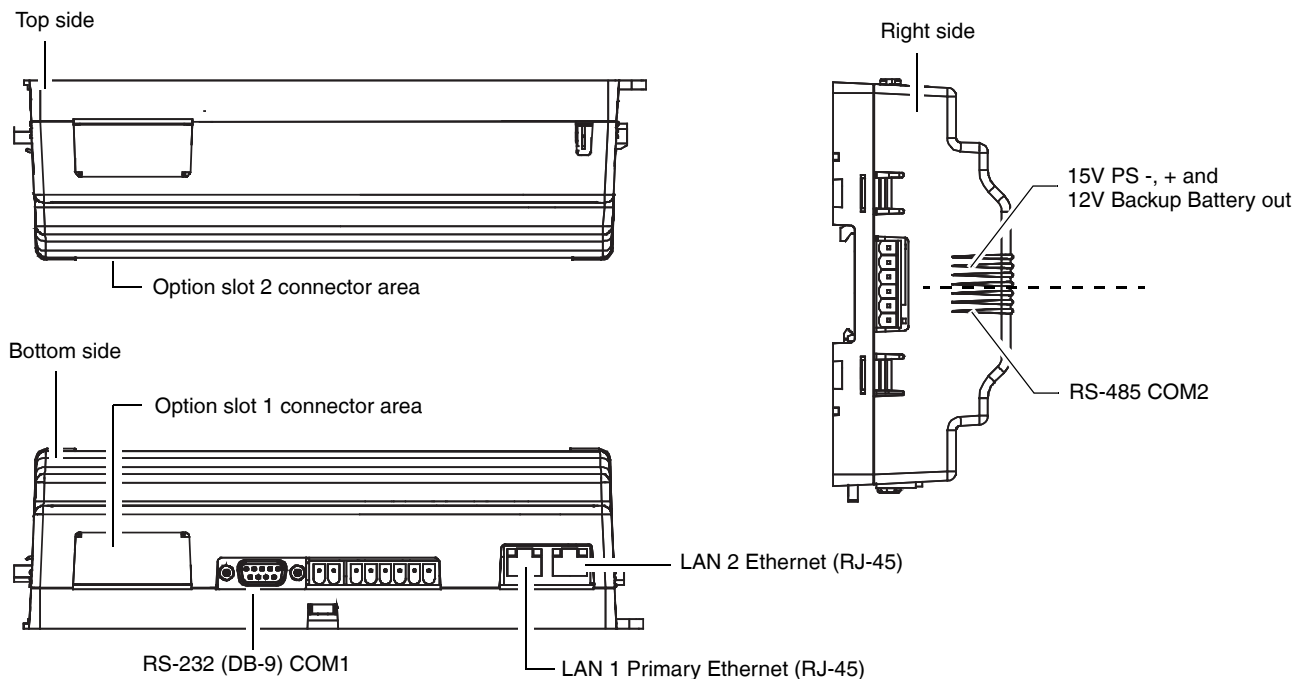
1. Install any option board (LON, RS-485, RS-232, etc.) in the available option slots. See *Installing an Option Card*, page 12 for a procedure. For complete details, refer to the specific documentation that accompanied the option.
2. Connect communications cables. See *Communications Wiring*, page 13 for ports available on the WEB/CP-700 base unit. For ports on any installed option board (RS-232, LON, RS-485, modem) see the specific mounting and wiring guide for any additional details.
3. Apply power to the unit. See *Power Up and Initial Checkout*, page 19.

## Communications Wiring

Communications ports on the WEB/CP-700 controller are primarily on the bottom side of the unit, with ports also on the right side and top (Fig. 6). Communications port types include:

- Ethernet
- Serial

**NOTE:** Prior to connecting cables, provide strain relief for them to prevent damage to the controller.



**Fig. 6. WEB/CP-700 communications ports.**

### ETHERNET

Two, female 1-Gigabit Ethernet connections are provided on the WEB/CP-700. These are RJ-45 connectors labeled LAN1 and LAN2. Use a standard Ethernet patch cable for connecting to a hub or Ethernet switch.

The factory-default IP address for LAN1 on a WEB/CP-700 is **192.168.1.12n**, where the last numeral **n** in the address matches the last digit in the WEB/CP-700's serial number, and the subnet mask is **255.255.255.0**. By default, LAN2 on a WEB/CP-700 is disabled.

Refer to the *NiagaraAX Install and Startup Guide* for details on changing IP address.

**NOTE:** Typically, you only use LAN1 (primary port), unless you have a specific application for the other LAN2 port. For example, isolating a driver's network traffic, using LAN2. Do not use LAN2 as the primary port.

**SERIAL**

There are two “RS” serial ports on the WEB/CP-700 base board. Each has a UART capable of operation up to 115,200 baud. At the bottom of the board (see Fig. 6, page 13) is an RS-232 port using an DB-9 plug (male) connector. On the right side of the unit is an isolated RS-485 port, using the bottom three terminals of a 6-position screw-terminal connector plug.

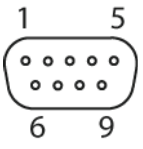
**NOTE:** Additional serial ports may be added with option card(s) in Option Slot 1 and Slot 2, such as an NPB-RS232 card, or NPB-2X-RS485 card (note the last option actually adds two serial ports).

**RS-232**

An RS-232 serial port using a male DB-9 connector always operates as COM1. You can use standard DB-9 serial cables with this port. The WEB/CP-700 is a serial DTE device, another DTE device (PC, for example) requires a “null modem” cable. If connecting to a DCE device (modem, for example), use a straight-through cable. Table 4. provides standard serial DB-9 pinouts.

**NOTE:** If rebooted with the mode jumper in the “Serial Shell” position (see Fig. 5, page 10), the RS-232 port provides “system shell” access. See the *NiagaraAX Install and Startup Guide* for related details.

**Table 4. Serial port (RS-232 and RS-485) pinouts.**

Base RS-232 DB-9 Port (COM1)			Base RS-485 Port (COM2)
Pinout Reference	Signal	DB-9 Pin	Pinouts
DB-9 Plug  (male)	DCD	Data carrier detect	1
	RXD	Receive data	2
	TXD	Transmit data	3
	DTR	Data terminal ready	4
	GND	Ground	5
	DSR	Data set ready	6
	RTS	Request to send	7
	CTS	Clear to send	8
		not used on the 7	9

**RS-485**

An RS-485, optically isolated port is available on 3 pins of the 6-position right-side connector, and always operates as COM2. As shown in Table 4, the screw terminals are minus (-), plus (+), and shield. Wire in a continuous multidrop fashion to other RS-485 devices, meaning “minus to minus”, “plus to plus,” and “shield to shield.” Connect the shield to earth ground at one end only, such as at the WEB/CP-700.

**Grounding**

An earth ground spade lug (0.187") is provided on the controller for connection to earth ground. For maximum protection from electrostatic discharge or other forms of EMI, connect the supplied earth grounding wire to this lug and a nearby earth ground. Keep this wire as short as possible, see Fig. 7.

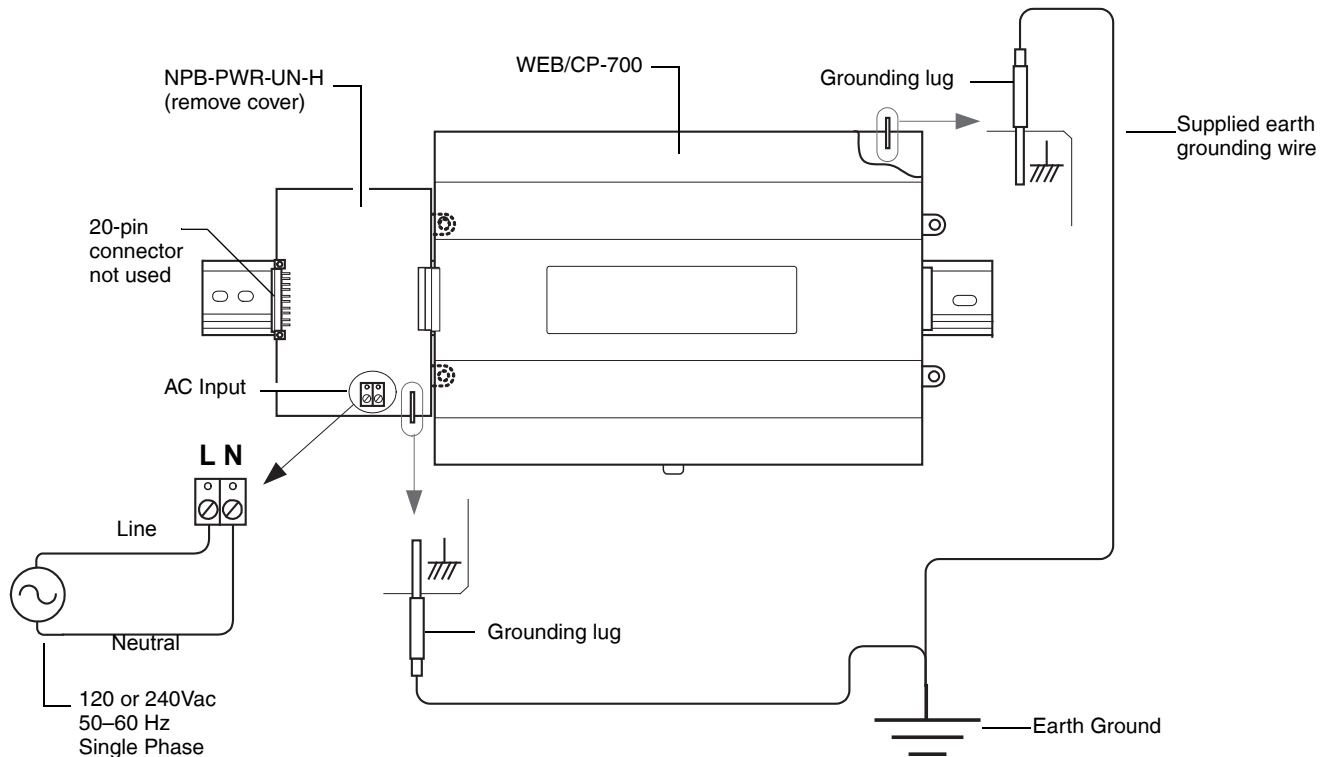


Fig. 7. Grounding and power wiring connections to NPB-PWR-UN-H module.

## Power Wiring

There are two power options for the WEB/CP-700 controller: the NPB-PWR-UN-H power supply module (typical), or a NPB-WPM-US (Wall Mount AC Adapter).

### NPB-PWR-UN-H

The NPB-PWR-UN-H module lets you power the WEB/CP-700 (and if installed, connected I/O modules) from AC line power, with a universal input range from 90–263Vac. The NPB-PWR-UN-H installs on the **left side** (end) of the WEB/CP-700 controller. See Fig. 7.



## WARNING

A 120Vac or 240Vac circuit powers the NPB-PWR-UN-H. Disconnect power to this circuit before installation to prevent electrical shock of equipment damage.

Make all connections in accordance with national and local electrical codes. Use copper conductors only.

Do not exceed the 30W capacity of NPB-PWR-UN-H by the powered devices.

Power input connections are made to the terminals on the NPB-PWR-UN-H circuit board (cover removal is required). Use the supplied earth grounding wires to make a connection from a nearby earth ground to the grounding lug on both the NPB-PWR-UN-H power supply and the WEB/CP-700 controller. See Fig. 7, page 15.

**Wiring NPB-PWR-UN-H input power and earth ground.**

1. **Remove power** from the AC circuit being wired to the NPB-PWR-UN-H—see previous .
2. Remove the NPB-PWR-UN-H cover.  
To do this, press in the four tabs on both ends of the unit, and lift the cover off. If the WEB/CP-700 is plugged into the unit, you may need to slide it away to get to the cover tabs.
3. Connect the supplied earth grounding wire to a nearby grounding point. See Fig. 7.
4. Make AC circuit connections line (mains) and neutral to the terminals labeled "INPUT PWR."
5. Replace the cover on the NPB-PWR-UN-H.  
Make sure all modules in the mounted assembly are firmly connected together and secured.

**! CAUTION**

**Do not energize the AC circuit wired to the NPB-PWR-UN-H until all other controller mounting and wiring is completed. See Power Up and Initial Checkout, page 19.**

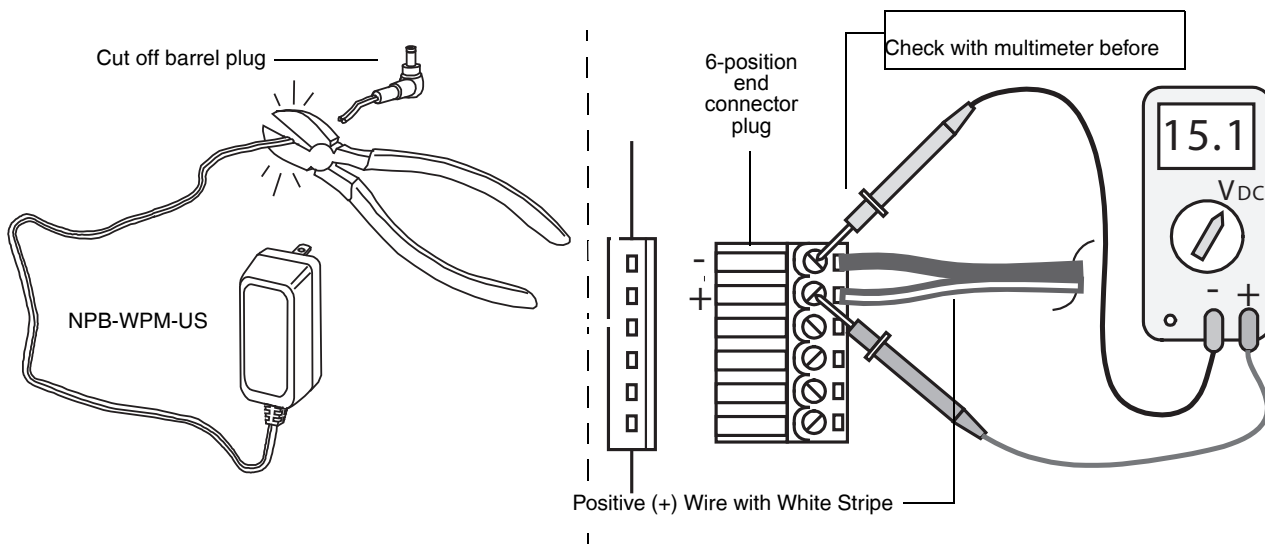
Power and ground is also provided in wiring to remote I/O modules through the 6-position connector. However, note for **each remote I/O module**, you should also connect its earth ground spade lug to earth ground at that module's location.

**NPB-WPM-US (WALL MOUNT AC ADAPTER)**

You can order and adapt a wall mount AC adapter (model NPB-WPM-US) to power **only** the WEB/CP-700 controller. To use the adapter, you must cut off its "barrel plug" end, then wire the two leads into the top positions of the 6-position end connector plug, observing proper + and – polarity.

**NOTE: I/O modules cannot be powered by that NPB-WPM-US adapter.**

**Before plugging the wired connector plug into the WEB/CP-700, check for 15Vdc at the proper polarity using a multimeter (see Fig. 8).**



**Fig. 8. Adapting a NPB-WPM-US wall mount AC adapter to power the WEB/CP-700.**

Do not power the controller until all other mounting and wiring is completed. See Power Up and Initial Checkout, page 19.



# Contact Inputs

Three contact inputs (CIs) are available on a 6-position connector next to the 2-position external battery connector. CIs are typically used to monitor normally-closed (N.C.) alarm contacts, if available on a UPS and/or the “door tamper” switch of an enclosure. These CIs are **unsupervised**—no end-of-line resistors are required. Fig. 9 shows example wiring to all three CIs of the WEB/CP-700.

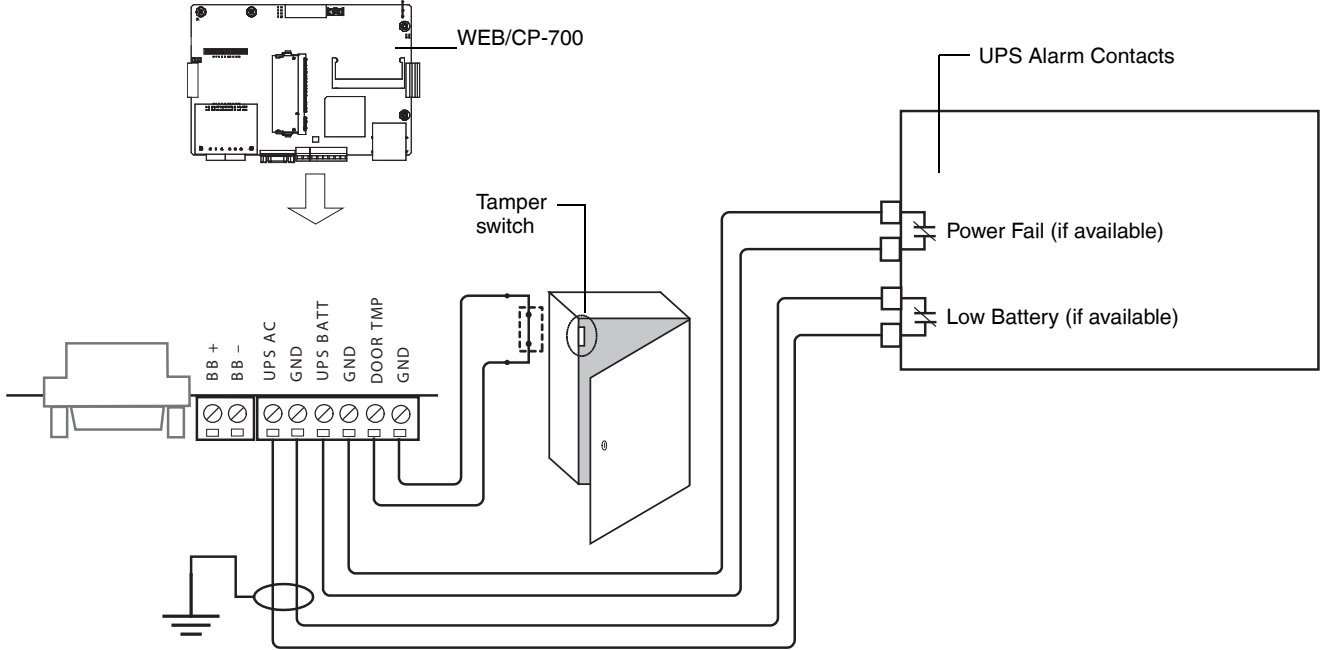


Fig. 9. Contact Input wiring to WEB/CP-700

## EXTERNAL 12V BACKUP BATTERY

A 2-position connector provides support for an external 12V sealed lead-acid (SLA) type rechargeable battery. For more details, see About the Backup Batteries, page 20.

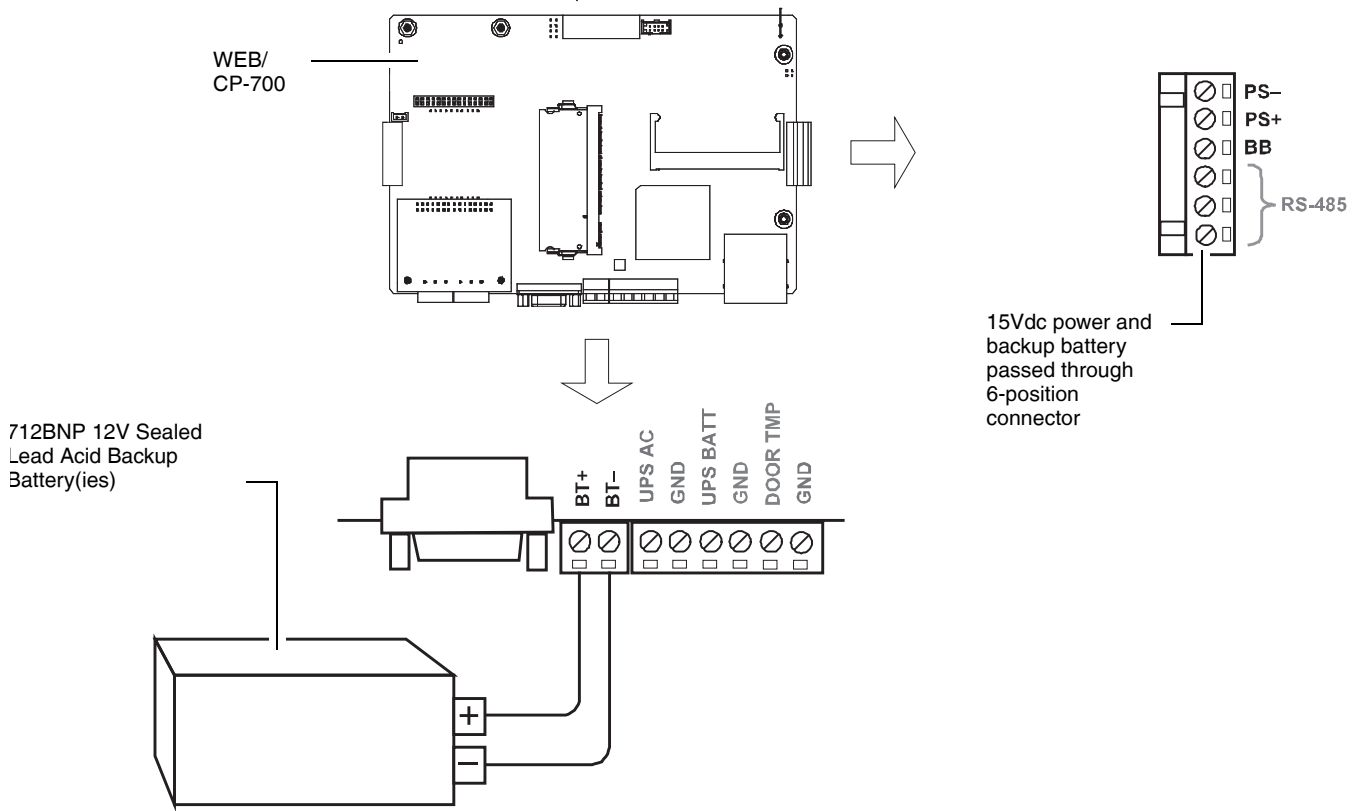


Fig. 10. Sealed lead-acid backup battery connection on WEB/CP-700.

**NOTE:** The minimum wire size for battery connections is 18AWG (1.0mm<sup>2</sup>) for up to 4 ft. (1.22m), or 16AWG (1.29mm<sup>2</sup>) for up to 12 ft. (3.66m).

## Wiring to Remote I/O Modules

Wiring to remote I/O modules typically provides both 15Vdc power and 12V battery backup, along with RS-485 communications to the modules. See Fig. 11.

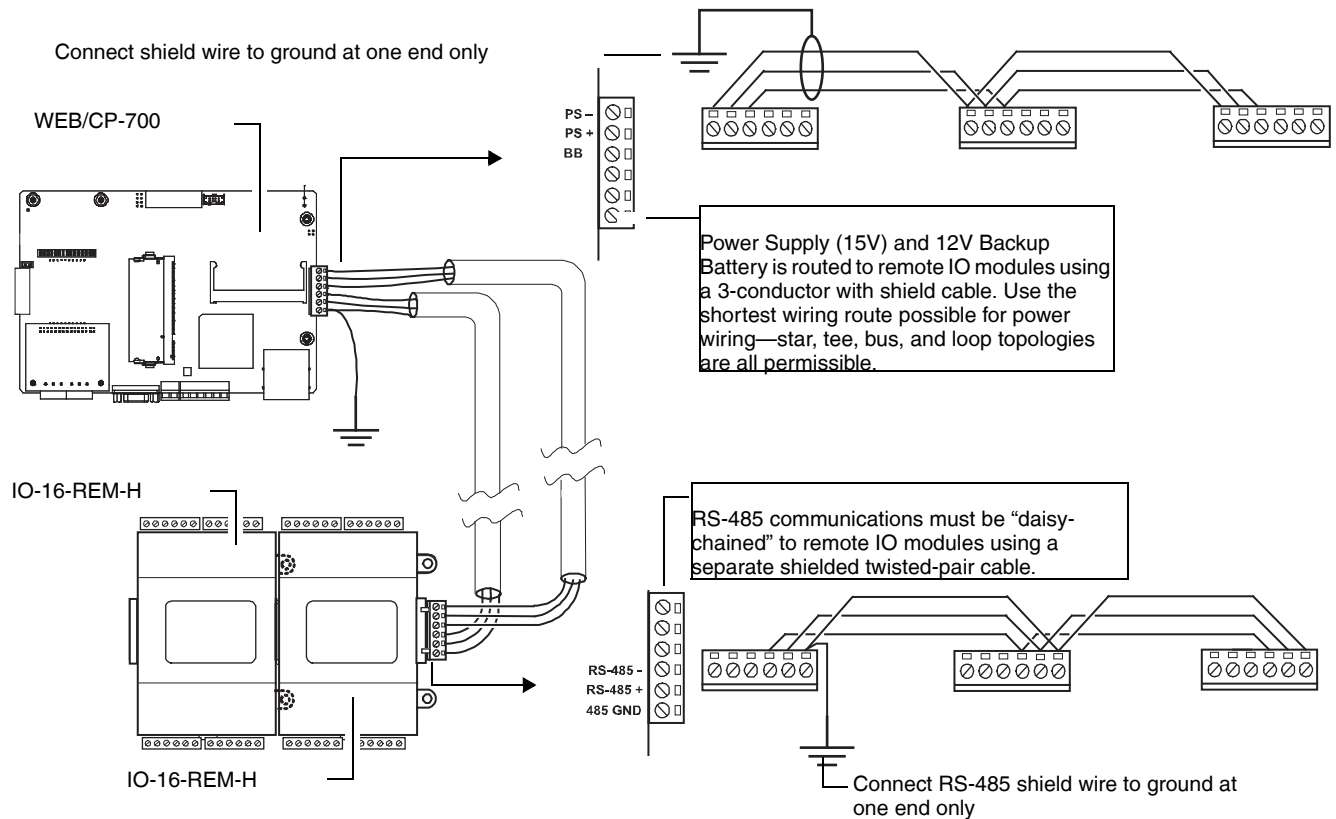


Fig. 11. Power and RS-485 cabling between WEB/CP-700 and remote I/O modules

## POWER UP AND INITIAL CHECKOUT

Following all mounting and wiring, perform the following:

### Initial power up and checkout.

1. Apply Power.
2. Check the Status LED.

Also see the section About the Backup Batteries, page 20.

### Apply Power

The WEB/CP-700 controller does not include an on/off switch. To apply power, you simply energize the AC circuit (90–263 Vac) wired to the attached NPB-PWR-UN-H power supply module. If remote I/O modules are wired to the unit, they are also typically powered by the WEB/CP-700 as well.

If powering the WEB/CP-700 controller with a NPB-WPM-US (Wall Mount AC Adapter), simply plug the AC adapter into a nearby wall outlet.

### Check the Status LED

When power is applied, the front cover STATUS LED will light green. This indicates that the system is OK and that power is applied. The STATUS LED may be blinking until the QNX OS has finished loading and the Niagara platform daemon is running.

Once this boot sequence has finished, the STATUS LED should remain lit (steady), and the BEAT LED should start blinking, at a typical rate of 1Hz. Typically, this is about 30 seconds after power is applied.

If after applying power, the STATUS LED goes out, or if the BEAT LED comes on (steady) and stays lit longer than 2 minutes, contact your local distributor for technical assistance. See also “About LEDs” on page 21.

## About the Backup Batteries

A WEB/CP-700 controller has two different backup batteries:

- An on-board NiMH battery pack, and
- An optional external, sealed lead-acid, rechargeable backup battery (or batteries). See below.

For continuous system operation during loss of primary power (to the NPB-PWR-UN-H module powering the unit), unless power loss is only a few seconds, both batteries should be installed. Station alarms are generated if either battery is uncharged or unable to hold a sufficient charge, as well as whenever primary power is lost. You should always investigate any alarm related to backup batteries.

### NiMH battery pack

A custom 10-cell NiMH (nickel metal hydride) battery pack is installed inside the WEB/CP-700, mounted atop the shield, and is secured by a metal bracket and two keps nuts. This battery allows the controller to continue station operation (only) through very short power bumps, meaning a few seconds in duration. In the case of a longer outage, the NiMH battery provides enough run time for the unit to backup data and then shutdown. Typically, this process takes about one minute. Shutdown occurs automatically, after data is backed up to on-board flash memory.

Upon startup (boot), a test of the NiMH battery is performed. A system alarm is generated if the NiMH battery voltage level is found to be bad. A charge is also initiated upon startup, which lasts from 3 hours minimum, and can range up to 18 hours if the battery is completely discharged. During this NiMH battery charge period, neither the NiMH battery or the external backup battery is tested. After the startup NiMH charge period, a periodic test of **both** batteries occurs, and the appropriate battery alarm is generated if either battery is found to be bad.

**NOTE: If the last NiMH battery test was “bad,” upon loss of primary power the controller performs an immediate shutdown, backing up data and powering off (including attached readers, and expansion modules).**

**A NiMH battery characteristic is to lose charge if not left in charge mode (trickle charge). Leaving the battery unconnected, or the unit powered off, will cause the battery to fully discharge in a matter of weeks. Note that in the case of a new controller, it ships from the factory with a completely discharged battery. Therefore, allow at least 18 hours for the battery to charge after the controller is initially powered.**

Replace the NiMH battery pack approximately every three years, or more often if the unit is in a high temperature environment. For more information on the use and replacement of the battery, refer to Required NiMH Battery Maintenance, page 22.

### BACKUP BATTERY

The optional sealed lead-acid backup battery (part number 712BNP) is an external, 12V, rechargeable battery (or multiple batteries) sized to operate the system during loss of primary power, for some duration. This includes the controller, as well as power to attached I/O expansion modules.

Connect the backup battery to the controller using a 2-position connector—see Fig. 10, page 18. Whenever primary-powered, the controller supplies a constant “trickle” charge to this battery, at 200mA maximum. At startup (boot), a test of the backup battery is performed, as well as a periodic test. A system alarm is generated if a battery test deems the backup battery to be bad.

Providing that the backup battery has tested good, upon loss of primary power the system operates from this backup battery power until the charge level of the on-board NiMH battery pack reaches 0. Note that both batteries discharge in parallel. However, as the sealed lead-acid backup battery capacity is much greater, the NiMH battery pack discharges much slower than if these backup battery(ies) were bad or not present.

**NOTE: If the backup battery test was “bad,” upon loss of primary power, the controller performs an immediate shutdown, backing up data and powering off (including attached readers, expansion modules).**

Replace the sealed lead-acid backup battery(ies) approximately every three years, or more often if the unit is in a high temperature environment.

## ABOUT LEDS

The WEB/CP-700 provides a number of LEDs on its main board. Only the Status and Heartbeat LEDs are visible on the cover. Checking other LEDs requires first removing the cover.

LEDs include the following types:

- Status
- Heartbeat
- Debug
- Ethernet Ports

For the location of LEDs on the main board, see Fig. 5, page 10.

### Status

The green "STATUS" LED is located on the cover. On the main board, it is also the green "SYSOK" LED next to the "HBEAT" LED—both are found near the Ethernet connector housing. The status LED should remain lit whenever the WEB/CP-700 is **powered**, or else be blinking during the boot sequence. If the status LED **does not light** while power is applied, contact System Engineering for technical support.

### Heartbeat

The yellow heartbeat "HBEAT" LED is located on the cover, as well as on the main board next to the "SYSOK" Status LED. The heartbeat LED blinks about once per second. If the heartbeat LED stays **on constantly, does not light**, or blinks **very fast** (more than once per second), contact your local distributor for technical support.

### Debug

The yellow "DEBUG" LED is located on the main board near the Ethernet connector housing, and remains lit whenever the WEB/CP-700 has been rebooted with the "serial mode select" jumper in the "serial shell" position (see Fig. 5, page 10). This indicates that the DB-9 RS-232 port is operating in serial shell mode.

### Ethernet Ports

Two LEDs for each of the two LAN ports are provided on the back of the metal LAN connector housing, and operate as follows.

The left-side **green** "activity" LED indicates activity on that port as follows:

- **Off** — No Ethernet link is made
- **On** — Ethernet link is present, but no activity on the LAN
- **Blinking** — Ethernet link is present with data activity on the LAN.

The right-side **yellow** "speed" LED Indicates Ethernet connection speed, as either:

- OFF - "Fast Ethernet"/"Ethernet" (100 Mbps/10 Mbps).
- ON - "Gigabit Ethernet" speed (1000 Mbps).

## MAINTAINING THE WEB/CP-700

This section provides information on the following topics:

- Cleaning
- Required NiMH Battery Maintenance
- Replacement Parts
- Replacing the WEB/CP-700
- Returning a Defective Unit

### Cleaning

If dust or metal filings are present inside the unit, clean with vacuum or compressed air. Otherwise, no cleaning inside the unit is required. If the cover becomes dirty, you can wipe it with a damp cloth and mild detergent.

## Required NiMH Battery Maintenance

Battery life expectancy is a function of its discharge cycles (the number of discharges and their depth) and the ambient temperature of the battery during normal operation. In most applications, the NiMH battery should see relatively few discharges. Therefore, ambient temperature has more to do with the life expectancy of the battery than does any other factor. If the WEB/CP-700 is installed in a conditioned space, this battery should provide dependable service for approximately three years (average). In an environment where the operating temperature is higher (that is, 50°C or 122°F), you should only expect the battery to last approximately one year.

The NiMH battery in the WEB/CP-700 controller is fully discharged when factory shipped. Additionally, NiMH batteries lose charge over time if not kept trickle-charged (for more details, see NiMH battery pack, page 20). Therefore, even a new unit (or replacement battery) will require up to 18 hours of powered operation before it can provide reliable backup power (is at full charge).

The WEB/CP-700 monitors the NiMH battery and periodically loads the battery to test its ability to maintain battery-backed functions. Investigate any battery trouble message, and check the battery connections to the unit. Replace the battery as required. To order a new battery, see “Standard Replacement Parts” on page 23. See the section below for a replacement procedure.

### REPLACING THE NIMH BATTERY

The replacement NiMH battery is an assembly, that is a custom battery pack with an attached cable and connector plug. See Fig. 12. To replace the battery, you must remove power to the unit and remove its cover.



## CAUTION

Use only NiMH battery packs approved for use with the WEB/CP-700.

### Replacing NiMH battery assembly on a WEB/CP-700.

1. **Backup** the WEB/CP-700 controller's configuration to your PC using the appropriate WEBsAX software tool (for example, Workbench).
2. Remove all power from the WEB/CP-700, including any sealed lead-acid battery. Wait for LED activity to stop—after a couple of minutes, all LEDs on the unit should be off.
3. Remove the cover. See Removing and Replacing the Cover, page 9.  
At this point you have access to the NiMH battery assembly (Fig. 12).

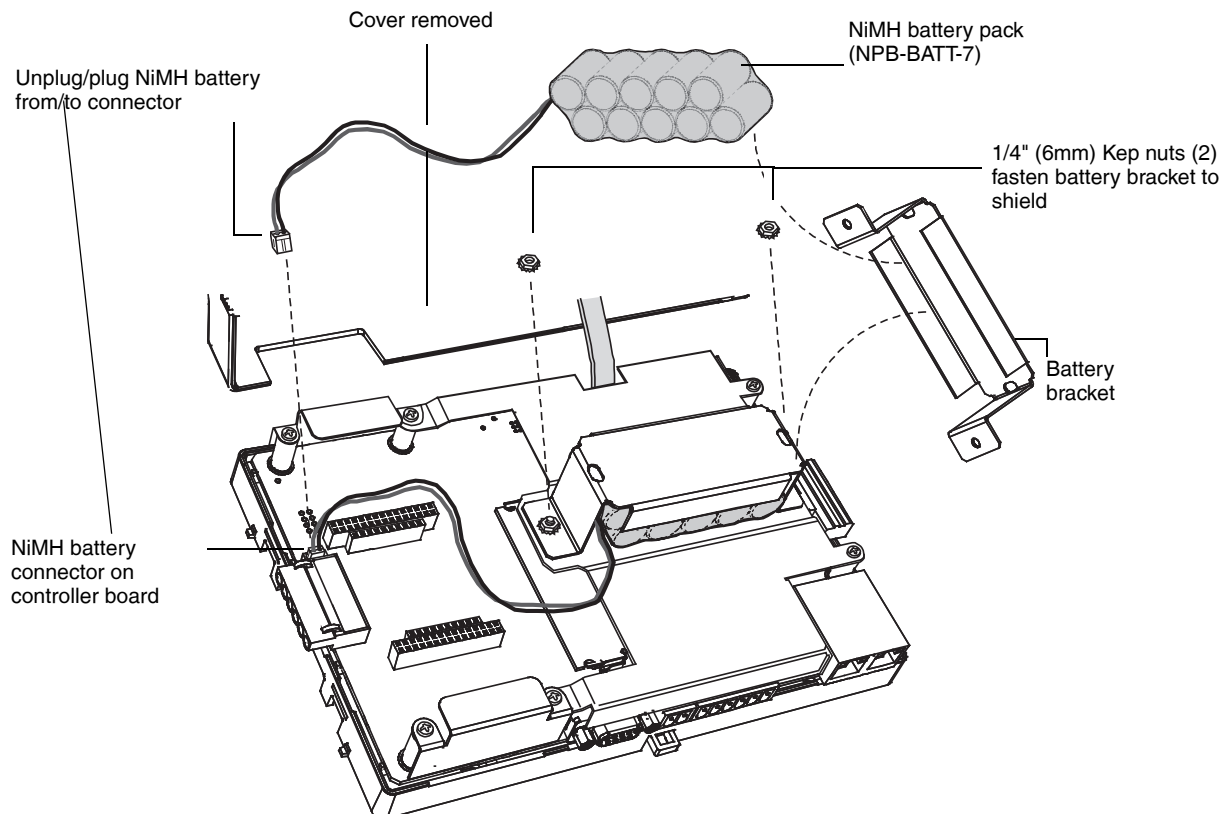


Fig. 12. Replacing NiMH battery pack in WEB/CP-700.

**NOTE: Dispose of the used NiMH battery properly.**

4. Unplug the NiMH battery from the main board connector (see Fig. 12).
5. Using a 1/4" (6mm) nutdriver, unfasten and retain the two keps nuts that secure the metal battery bracket to the shield, and remove the shield and battery pack.
6. Put the **replacement battery** into the metal shield, and refasten back into place on the shield, using the two keps nuts. Hand tighten with a nutdriver.
7. Plug the battery connector plug of the replacement battery into the NiMH battery connector on the main board of the WEB/CP-700. The connector is keyed—you cannot plug the battery in reversed.
8. Replace the cover.
9. Restore power to the WEB/CP-700 and verify normal operation.

### BATTERY DISPOSAL

Please dispose of the used NiMH battery in accordance with local, state, and federal regulations.



## WARNING

**Do not incinerate or mutilate the battery, as this may cause it to burst or release toxic materials.**

If regulations specify returning the old battery to a recycling center, but no acceptable recycling center can be found, please return the old NiMH battery pack to Tridium for proper disposal.

## REPLACEMENT PARTS

Servicing the WEB/CP-700 may call for replacement parts. There are three categories of parts:

- Non-replaceable Parts
- Standard Replacement Parts
- New Replacement Unit

### Non-replaceable Parts

#### FUSE

The WEB/CP-700 contains a non-user replaceable 2.5A slow-blow fuse, soldered on the main circuit board. This fuse provides protection from internal shorts or connection to incorrect power supplies. If the fuse circuitry is suspect, contact your regional Tridium office for technical support. See "Returning a Defective Unit" on page 25.

### Standard Replacement Parts

#### MEMORY

Standard replacement parts are listed in Table 5, and can be ordered from stock without restriction. Standard replacement parts cannot be returned for credit and should be disposed of in an appropriate manner.

**Table 5. Standard replacement parts for a WEB/CP-700.**

Part Number	Description
NPB-BATT-7	NiMH Battery Pack—see Required NiMH Battery Maintenance, page 22
NPM-1GB	1 GB DDR-2 333MHz SODIMM memory module (upgrade)
H11696	Hardware Bag for WEB/CP-700, containing screw terminal connector plugs (two 6-position, one 2-position, earth grounding wire).
712BNP	SLA 12V 7AH External backup battery.

### New Replacement Unit

To replace an entire unit, order and install a **new** WEB/CP-700. If the faulty WEB/CP-700 is **still in warranty**, you can receive credit by returning it to Tridium. Be sure to contact Tridium for a return authorization (RA) number before shipping an item for return credit. See Returning a Defective Unit, page 25, for more details.

**NOTE: Before ordering a new WEB/CP-700, it is strongly recommended that you contact your normal technical support resource to eliminate the possibility of a software issue or mis-configuration problem.**

## Replacing the WEB/CP-700

**NOTE:** Before handling circuit boards, discharge any accumulated static by touching a nearby earth ground. For details, see “Static Discharge Precautions” on page 7.

To replace a WEB/CP-700 with a new replacement unit, proceed as follows:

### Replacing a WEB/CP-700 main controller board.

1. If possible, use the appropriate NiagaraAX software tool to back up the WEB/CP-700's configuration to your PC.
2. Remove power to the WEB/CP-700, including any external 12V battery. The unit should power down automatically. Wait for all LEDs to remain off.
3. Remove the front cover. See Removing and Replacing the Cover, page 9.
4. Note positions of all communications and other wiring cables going to the controller. If necessary, label connectors and accessory modules to avoid mis-connection later, after WEB/CP-700 is replaced.
5. Unplug all Ethernet, serial, LON, modem, and I/O connectors from the controller. Note the position of installed option cards, if any. You must transfer them to the replacement WEB/CP-700 controller.
6. Remove the controller from its mounting (DIN rail, panel mount tabs, etc).
7. Remove any option cards from the old controller and install them into the replacement WEB/CP-700, if applicable. See Installing an Option Card, page 12 for more details.
8. Mount the replacement WEB/CP-700 as it was previously, using the same DIN rail location and/or screws.
9. Reconnect the earth ground wire to the WEB/CP-700 grounding lug and any installed accessory modules.
10. Reconnect any Ethernet, serial, modem, and I/O connectors to the WEB/CP-700 board.
11. If using IO modules, and any of your I/O points have voltage, turn the devices back on, or reconnect power to them.
12. Replace the cover. See Removing and Replacing the Cover, page 9
13. Restore power to the unit. It should boot up as a new unit (see Check the Status LED, page 19).
14. Using the WEBsAX platform tools, re-commission the WEB/CP-700, and install the saved station database. For more details, see the *WEBsAX Install and Startup Guide*.



## Returning a Defective Unit

For proper credit on an in-warranty unit, ship the defective unit to Tridium within 30 days.

**NOTE: If the defective unit is under warranty, please follow return instructions provided in this section.**

**If the unit is out of warranty, please discard any replaced part.**

**Do not return an out-of-warranty WEB/CP-700 to Tridium.**

Prior to returning the unit, contact one of the following Tridium offices to obtain a return materials authorization (RMA) number and other instructions.

Please provide:

- Product model
- Serial number
- Nature of the defect
- PO number to secure the RMA

### United States

Phone: 804-254-7086, ext. 11  
Email for RMA: rma@tridium.com

Return to:

Tridium, Inc.  
2256 Dabney Road, Suite C  
Richmond, VA 23230  
Attn: Return Department RMA# \_\_\_\_\_

### Asia/Pacific

Phone: +65 6887 5154  
Fax: +65 6887 5342  
Email for technical support: hclim@tridium.com

Return to:

Tridium Asia Pacific Pte Ltd  
17 Changi Business Park Central 1  
Honeywell Building  
Attn: Mr Lim Hoon Chat, Engineering Mgr.  
Singapore 486073  
Attn: Return Department RA# \_\_\_\_\_

### Australia/Asia Pacific Sales:

Phone: +61 4 1264 4234  
Email: mhodder@tridium.com

# CERTIFICATIONS

## Federal Communications Commission (FCC)

This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause interference with radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case, users at their own expense will be required to take whatever measures may be required to correct the interference. Any unauthorized modification of this equipment may result in the revocation of the owner's authority to continue its operation.

## Canadian Department of Communications (DOC)

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numerique de la classe A respecte toutes les exigences du Reglement sur le material brouilleur du Canada.

## CE Declaration of Conformity

**Date:** December, 2009

**Application of Council Directive:** 89/336/EEC, 92/31/EEC, 73/23/EEC, 93/68/EEC

**Manufacturer:** Tridium Inc.  
3951 Westerre Parkway, Suite 350  
Richmond, Virginia 23233  
United States of America

**Manufacturer's Representative:** Steve Fey, President  
Tridium Inc.

**Product Model Numbers:** WEB/CP-700

**Type of Equipment:** Electrical Equipment for Measurement, Control and Laboratory Use

EMS Standards Applied:	Standard	Description	Criteria Met
	CISPR 16-2-3:2006	Radiated Emissions - Class A	Complies
	IEC 61000-4-2	Electrostatic Discharge Immunity	PASS Class B
	IEC 61000-4-3	Radiated Electromagnetic Field Immunity	PASS Class A
	IEC 61000-4-4	Electrical Fast Transient / Burst Immunity	PASS Class B
	IEC 61000-4-6	Conducted Radio-Frequency Immunity	PASS Class A
	IEC 61010-1:2001	Safety requirement for electrical equipment	PASS
	rev. 9/19/03	For measurement, control and laboratory use	

I, **Steve Fey**, President of Tridium Inc., hereby declare that the equipment specified above conforms to the above Directives and Standards.

# TAB MOUNTING DIMENSIONS

Measurements are in inches and (mm). DIN mounting is recommended over tab mounting. See Fig. 3, page 8.

**NOTE:** Electronic and printed versions of this guide may not show the dimensions to scale. Verify all measurements before drilling.

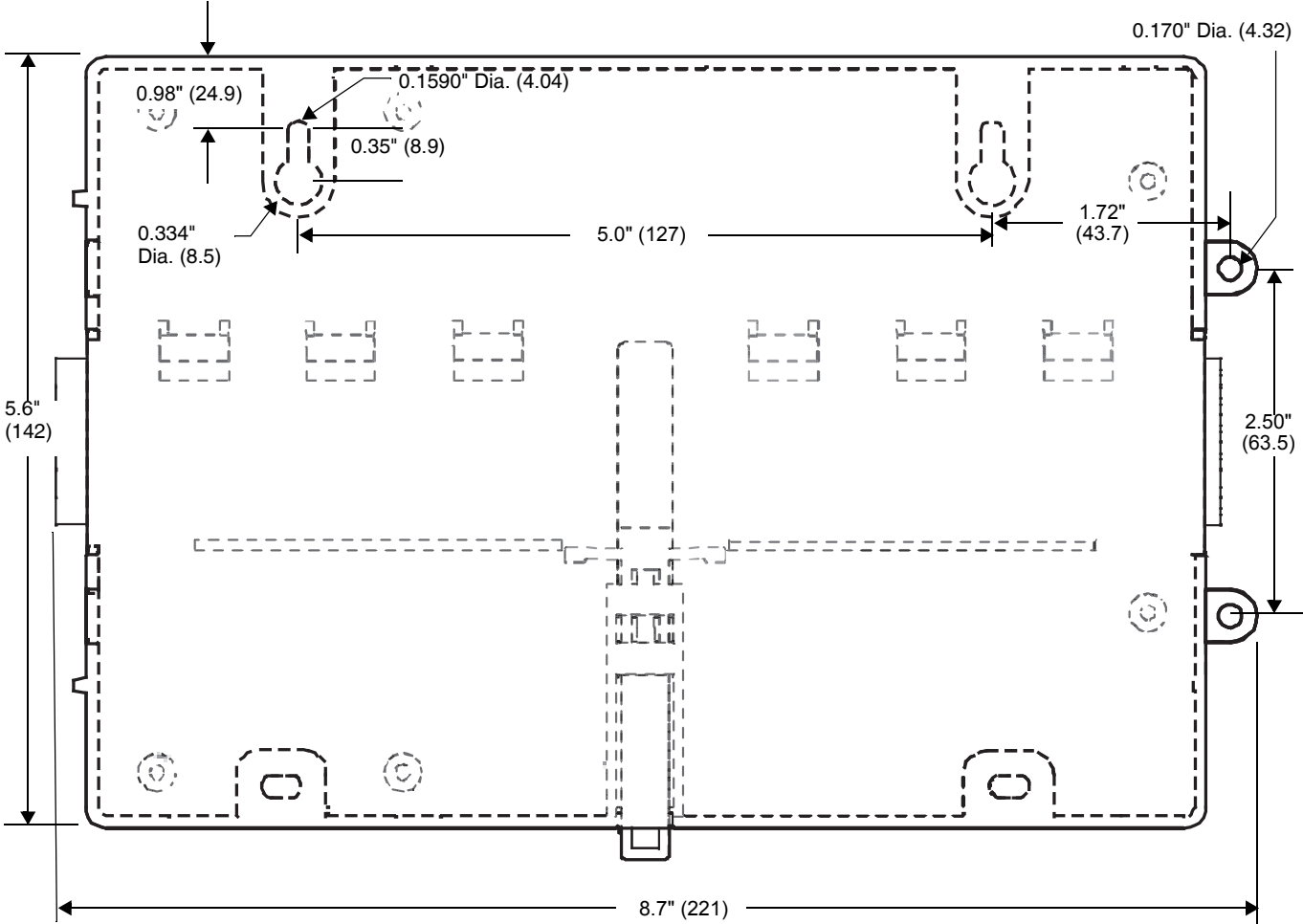


Fig. 13. WEB/CP-700 tab mounting dimensions.

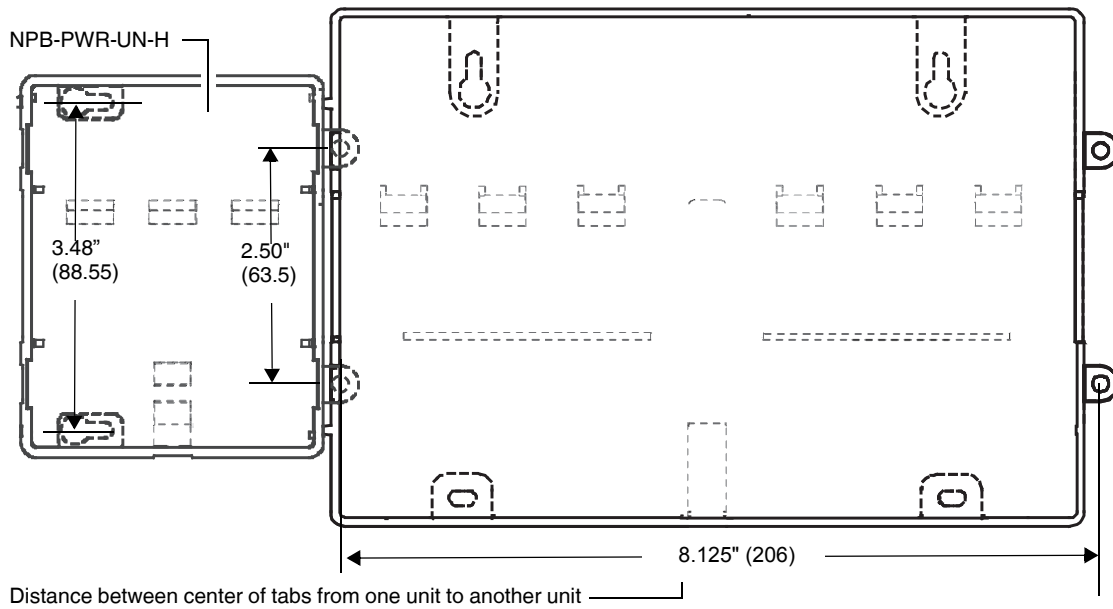


Fig. 14. WEB/CP-700 with power supply attached.

**Automation and Control Solutions**

Honeywell International Inc.  
1985 Douglas Drive North  
Golden Valley, MN 55422  
customer.honeywell.com



© U.S. Registered Trademark  
© 2012 Honeywell International Inc.  
95-7776-03 M.S. Rev. 03-12  
Printed in U.S.A.

## Free Manuals Download Website

<http://myh66.com>

<http://usermanuals.us>

<http://www.somanuals.com>

<http://www.4manuals.cc>

<http://www.manual-lib.com>

<http://www.404manual.com>

<http://www.luxmanual.com>

<http://aubethermostatmanual.com>

Golf course search by state

<http://golfingnear.com>

Email search by domain

<http://emailbydomain.com>

Auto manuals search

<http://auto.somanuals.com>

TV manuals search

<http://tv.somanuals.com>