Network Interface Unit

## Preinstallation Check _____

Carefully inspect all shipping containers for damage. If any equipment is damaged, notify the delivery service immediately. Save the damaged shipping container for inspection by the delivery service. After unpacking the equipment, record all serial numbers. Save the shipping containers and packing material in case it is necessary to transport or ship any part of the system.

Quick Start Guide _____

1. **Install the NIU on the DIN Rail** by simply clicking it into place.
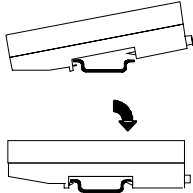

    Note: The NIU and connecting carriers must be installed on the same section of 35mm x 7.5mm DIN rail.

    The DIN rail must have a conductive (unpainted) finish for proper grounding.

    (*Refer to the heading* **Module Installation** *for information about space requirements or module orientation, or if you are installing the NIU in an area of excessive vibration*).

2. **Install the Power Supply on the NIU**.
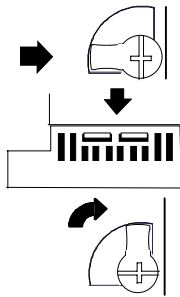
    The latch on the power supply must be in the unlocked position.

    Align the connectors and the latch post and press the power supply module down until the two tabs on the bottom of the power supply click into place.

   Turn the latch to the locked position to secure the power supply to the top of the NIU.

    Complete the power supply wiring as described in the installation instructions provided with the Power Supply**.**

3. **Adjust the rotary switches** on the front of the NIU using a 2.44mm (3/32in) flat screwdriver. *(Refer to the NIU User's Manual if the NIU is being configured using datagrams.*
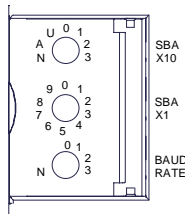

    -   Select the serial bus address with the two upper rotary switches, SBA X10 (for the tens digit) and SBA X1(for the ones digit). Each device on a bus must have a unique serial bus address in the range 0 - 31.

    -   Select the baud rate to match that used by the other devices on the bus by setting the bottom rotary switch: (3) 153.6 Kbaud extended, (2) 153.6 Kbaud standard, (1) 76.8 Kbaud, or (0) 38.4 Kbaud.

    -   Cycle power to the NIU after changing the switch settings.

4. **Connect the communications bus to the NIU**. (*Refer to the heading* **Bus Installation Guidelines** *if the NIU is at the end of the bus, or for detailed bus installation instructions.)*
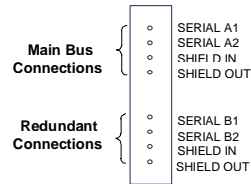

    The NIU has two sets of bus terminals. The upper terminals are for the main bus cable. The lower bus terminals are for an optional redundant (dual) bus cable.

5. **Remove the connector cover on the righthand side of the NIU**. Do not discard this cover; you will need to install it on the last carrier. It protects the connector pins from damage and ESD during handling and use. Do not remove the connector cover on the lefthand side.

    Connector Cover

    Connector Cover
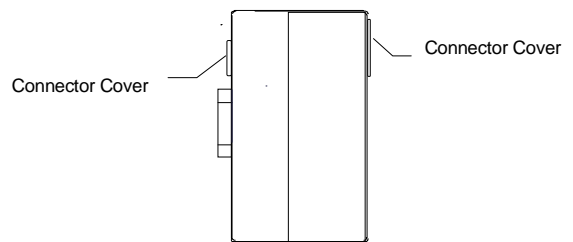
6. **Install additional modules** by mounting modules on their carriers and sliding them along the DIN rail to fully engage the connectors in the sides of the carriers.
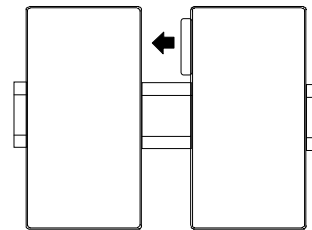
7. **Power up the NIU**. The modules in the I/O station will automatically be configured, starting at slot 1 in each rack including expansion racks. If an empty slot or faulted module is encountered, autoconfiguration for that rack stops. Autoconfiguration then skips to the next rack and continues until all racks are configured.

    Note: If the I/O station includes any additional power supplies, those power supplies must be turned on either before the NIU Power Supply or at the same time to assure accurate autoconfiguration.

8. **Observe the NIU LEDs,** which indicate the presence of power and show the operating mode and status of the NIU.

	PWR	Indicates that the NIU is receiving power.
OK	Indicates diagnostics executed successfully.
FAULT	Is ON if there are one of more faults.
I/O ENBL	This bicolor LED is green if the I/O scan is enabled and data is being received from the bus. Otherwise, this LED is amber.
FORCE	Is ON if one of more I/O points is forced.
SBA ERR	Is ON if a duplicate device SBA or invalid SBA exists.
BUS B	Is ON if bus B is active.

    LEDs: PWR, OK, FAULT, I/O ENBL, FORCE, SBA ERR, BUS B

General Module Installation Instructions_____
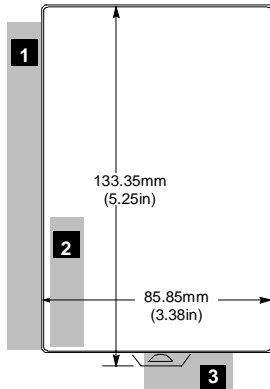
Modules must be mounted on a horizontal DIN rail.

1. Allow sufficient finger clearance for opening NIU door.
2. Allow adequate clearance for serial port cables.
3. Allow adequate space for power wiring.

The NIU with power supply attached fits into a 70mm deep enclosure.

Rated thermal specifications are based on a clearance of 5.1cm (2in) above and below the equipment and 2.54cm (1in) to the left of the NIU module.
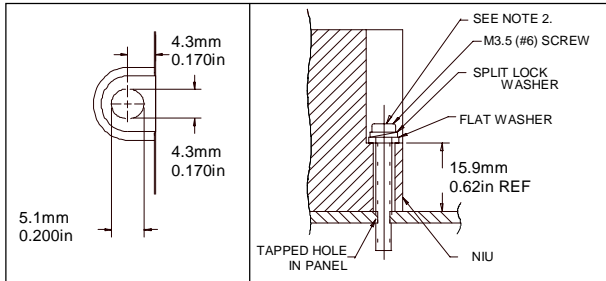
133.35mm (5.25in)
85.85mm (3.38in)

Panel-Mounting

For best stability, the DIN rail should be installed on a panel using screws spaced approximately 5.24cm (6in) apart.

If excessive vibration is a factor the NIU should also be screwed down to the mounting panel.

Note 1. Tolerances are +/- 0.13mm (0.005in) non-cumulative.

Note 2. 1.1-1.4Nm (10-12 in/lbs) of torque should be applied to M3.5 (#6-32) steel screw threaded into material containing internal threads and having a minimum thickness of 2.4mm (0.093in).

4.3mm 0.170in
4.3mm 0.170in
5.1mm 0.200in

SEE NOTE 2.
M3.5 (#6) SCREW
SPLIT LOCK WASHER
FLAT WASHER
15.9mm 0.62in REF
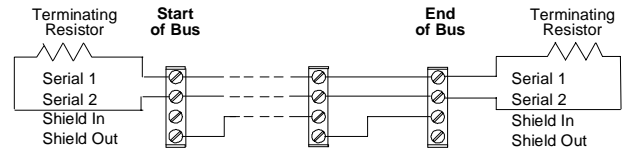TAPPED HOLE IN PANEL
NIU

Removing the NIU from the DIN Rail

1. Turn off power to the power supply.
2. (If the NIU is attached to the panel with a screw) remove the power supply module. Remove the panel-mount screw.
3. Slide the NIU away from the other modules until the connector on the right side disengages from the next carrier.
4. With a small flathead screwdriver, pull the DIN rail latch out while tilting the other end of the NIU down to disengage it from the DIN rail.

Bus Installation Guidelines _____

The maximum exposed length of unshielded wires should be 5cm (2in). For added protection, each shield drain wire should be insulated with spaghetti tubing to prevent the Shield In and Shield Out wires from touching each other, or the signal wires.

1. Connect Serial 1 to the Serial 1 terminals of the previous device and the next device.
2. Connect Serial 2 to the Serial 2 terminals of the previous device and the next device.
3. Connect Shield In to Shield Out of the preceding device. Connect Shield Out to Shield In of the next device. If the NIU is the first device on a bus, Shield In can be left unconnected. If it is the last device on a bus, Shield Out can be left unconnected.
4. When inserting two wires into the same terminal block position, the wire size must be 0.86mm^2 (18AWG) or smaller. Both wires should be of the same size and style. Do not mix stranded with solid wire in the same position.

Terminating the Bus

Terminating Resistor — **Start of Bus** — **End of Bus** — Terminating Resistor
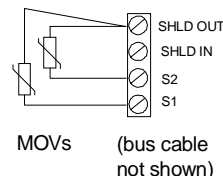
Serial 1
Serial 2
Shield In
Shield Out

If either bus will terminate at the NIU, connect a 75, 100, 120, or 150-ohm terminating resistor across the Serial 1 and Serial 2 terminals. The use of a ferrule is recommended to crimp each resistor lead to the corresponding serial line. If ferrules are not used, twist each resister lead with the corresponding serial line and solder them together before inserting the wires into the terminal block.

System Bus Installation Guidelines

The serial bus can be treated as a Class 2 circuit when appropriate wiring practices are followed. Maximum bus lengths may be affected when installation requires the high-voltage rated CM rating. CM types can replace CL2, but not vice versa.

Do not mix cables of different impedance, regardless of cable run length. Do not mix cable types in long and/or noisy installations. Other, small-size twisted pair shielded wire of unspecified impedance can be used for short runs of 50 feet or less, using 75 ohm terminations. Selection of wire type may be limited by local and national codes and industry standards. Consult the cable manufacturer to determine the cable's suitability for a particular type of installation.

Installing Suppression at the Communications Line

SHLD OUT
SHLD IN
S2
S1

MOVs   (bus cable not shown)

For an individual NIU, suppression can be supplied by connecting two small MOVs from Serial 1 and Serial 2 to the Shield Out terminal. Suitable MOVs include Harris part number V220MA2A, Panasonic ERZ-CO5FK221U, and Siemens 505K140. Higher energy-rated devices can also be used. Follow the wiring instructions above for installing MOVs. Be sure the MOV leads do not cause shorts between the serial data and shield connectors.

Network Interface Unit

Product Description _____

Revision Letters:	AC
Firmware version:	1.50
Firmware upgrades:	44A748000-G02

Specifications _____

Number of Modules	8 per NIU/station
Network inputs per bus scan	128 bytes
Network outputs per bus scan	128 bytes
Discrete Input Memory	1024 points
Discrete Output Memory	1024 points
Analog Input Memory	128 bytes
Analog Output Memory	128 bytes
Power Consumption	+5V@250mA, +3.3V@10mA
Serial Bus Address	0 to 31
Network data rate	153.6 Kbaud extended, 153.6 Kbaud standard, 76.8 Kbaud, or 38.4 Kbaud.

New Feature of this NIU Version _____

- Supports the use of expansion transmitter/receiver modules. This capability allows up to seven additional I/O racks to be cascaded off a single NIU. It is important to note that the total amount of I/O data that can be exchanged by the NIU is 128 bytes of discrete + analog inputs and 128 bytes of discrete + analog outputs. Additional I/O are ignored.

Operating Note/Restrictions for this NIU Version _____

- If the NIU is configured via datagrams from the bus, the value of the Force BSM bit is accessible but must not be changed.
- No analog modules or intelligent I/O modules should be used in a Duplex Redundancy system.
- During a firmware upgrade to an intelligent I/O module, outputs hold last state regardless of their configuration.
- The NIU does not detect a configuration mismatch for jumper configurations on the ALG260 and 230 modules and the ALG262 and 264 modules. For these module pairs, the NIU does not detect the difference between bi-polar voltage and 4-20mA current configuration. For the ALG262 and 264 modules, the NIU does not detect the difference between uni-polar voltage and 0-20mA current configuration.

Fixed for this Version _____

- If the NIU is powered up with autoconfiguration enabled via the NIU rotary switches, and the NIU was previously configured for Hot Standby CPU Redundancy, the I/O Enabled LED lights green even if there is an address error.
- (Module MDL730 only) After a short circuit condition on discrete output module MDL730, it may be necessary to issue two Clear All Faults commands to clear both the Fault LED and the diagnostic fault message.
- If the I/O station includes any intelligent module powered by a booster power supply and power is cycled quickly and repeatedly on the booster power supply but not the NIU power supply, the NIU may record a configuration mismatch fault for the intelligent module.

Compatibility _____

Any type of PLC or computer capable of controlling the bus can be used as the host. This Network Interface Unit is compatible with:

- For an IC697 PLC
    - CPU firmware, release 3.0 or later.
    - Bus Controller release 5.4 or later
    - If the IC641SWP701/704 programming and configuration software is used, it must be release 3.0 or later.
- For an IC693 PLC
    - CPU firmware: any version for NIU compatibility. If the NIU I/O station includes any expansion racks, the CPU must be a model 350, 352, 360, 363, or 364, Release 10.0 or later. If an earlier version of CPU firmware is used or if any other Series 90-30 CPU model is used, a Loss/Add of Rack fault causes the CPU to go to Stop/Faulted mode.
    - Bus Controller: any version.
- For an IC600PLC:
    - CPU: rev. 105 or later
    - Programming Software: Release 4.02 or later
    - Bus Controllers: CBB902 or 903, version 1.7 or later
- To be used in an expansion rack, analog modules IC200ALG320, 321, 322, and 432 must be revision B or later. Analog modules IC200ALG430 and 431 that are used in expansion racks must be revision C or later.
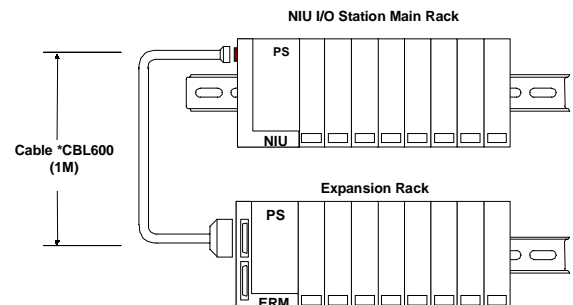
Expansion Systems _____

This section summarizes the expansion capabilities of this NIU version. For more information about expansion modules, installation and required equipment, please refer to current version of the *I/O Modules, Power Supplies, and Carriers Manual*, and to the documentation supplied with Expansion Transmitter and Receiver Modules.

Regardless of the number of racks used, the maximum I/O capacity of the NIU system is 128 bytes of discrete +analog inputs and 128 bytes of discrete + analog outputs. Any additional I/O is ignored.

Two-Rack Local System

This type of system uses one Non-Isolated Expansion Receiver *ERM002 to connect just one expansion rack to the NIU I/O Station without having an Expansion Transmitter Module in the main rack.

This "single-ended" configuration has a maximum cable length of 1 meter. No terminator plug is required in the expansion rack.

RS-485 Differential Expansion System

A multi-rack expansion system requires an Expansion Transmitter Module in the NIU I/O Station. Up to seven expansion racks can be included in the system. With any non-isolated Expansion Receiver Module in the system, the total overall length of the expansion cable can be up to 15 meters.

With all Isolated Receiver Modules, the total overall length of the expansion cable can be up to 750 meters.

The expansion bus must be terminated with terminator plug *ACC201 (included with the Expansion Transmitter).
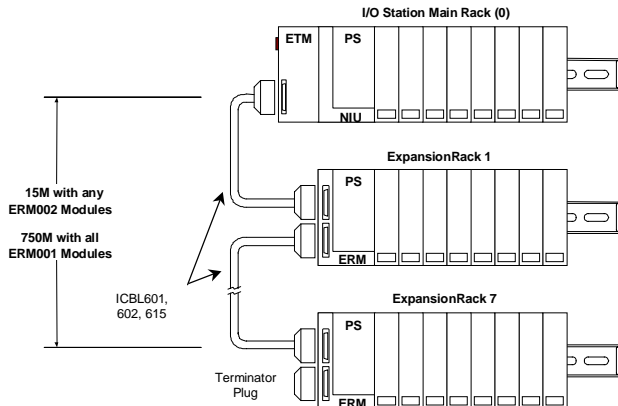
Communications in an Expansion System

The NIU in the main rack communicates with the expansion racks through a high-speed serial interface. The frequency used depends on the types of expansion receivers in the expansion rack(s).

- In a Two-Rack Local system, the communications frequency is 3MHz.

- In Differential system, the NIU communications frequency is 3MHz unless at least one isolated expansion receiver is installed.

Modules for an Expansion System

Expansion racks are built from the same carrier bases and I/O modules that are allowed in main rack applications. Note the special revisions required for some analog modules mentioned above.

Configuration and Installation Notes for Expansion Systems

- The NIU must have its rack dial set to rack 1 or it will not auto-configure. The Expansion Receiver modules also have Rack ID selection dials. Each must be set correctly as described in the Expansion Module datasheets.

- In a multiple-rack expansion system, any available rack number can be used for a new expansion rack but they must all be unique (no duplicate rack numbers). It is best to assign expansion racks numbers from lowest (1) to highest (7) as they are installed. That is most compatible with the NIU auto-configuration feature. Auto-configuration automatically assigns reference addresses to I/O points and channels as it configures them. Autoconfiguration starts in the main rack and proceeds through the slots and additional racks in order, assigning references from lowest to highest.

- To force auto configuration for expansion racks, first power down the NIU. Remove the transmitter module from the NIU or remove the expansion cable at the transmitter. Power up the NIU and let it autoconfigure. Power the NIU down again, reattach the transmitter or cable and power up the NIU again.

- In an local system, the NIU rack and the expansion rack may be on different power supplies if desired. If so, on a single-ended or differential system, disconnecting the cable between the NIU/transmitter and receivers may cause disruptions on the bus.

- In a multiple-rack expansion system, if a new expansion rack is added in the future, it should be assigned a rack address that is higher than the racks that are already installed. If a new expansion rack with a lower rack number than those previously auto-configured is installed and the system is auto-configured, the racks numbered higher than the new rack number have their I/O reference addresses shifted in the reference tables. Any existing program logic that uses those references must then be adjusted to use the new references.

- To add a new expansion rack to the system, the system must be powered down. After adding the module, according to the instructions in the Expansion Module datasheet, power up the system. It will then autoconfigure.

Fault Handling for an Expansion System

This version of the NIU can detect extra, lost, and added expansion racks as a result of a power cycle.

- When a complete rack is lost, only a "Loss of Rack" fault is generated. Individual "Loss of Module" faults are suppressed.

- When a rack is added only an "Addition of Rack" fault and any I/O module mismatch or loss conditions are reported. Individual I/O module additions are suppressed.

- An "Extra rack" fault is generated when an expansion rack is present but has not been configured. The Scan LED on the Expansion Receiver Module is green instead of yellow whenever the Expansion Receiver is properly configured and is working.

- Hot swapping of Expansion Transmitter Modules is not supported. The NIU detects the loss and addition of the Expansion Transmitter Module and generates the appropriate faults.

- If the run-time expansion frequency changes, an "Expansion bus speed change" fault is generated.

The table below summarizes programmer faults in an expansion system:

Programmer Fault Text		Fault Description
VP/C90	**LM90**	
Expansion Bus Speed Change	Reset of, Addition of, or extra option module	Expansion bus operating frequency has changed from 250kHz to 3MHz or vice versa.
Addition of rack	Addition of, or extra rack	Occurs when a receiver is first configured and when it returns after being lost.
Loss of, or missing rack	Loss of, or missing rack	Occurs when a properly configured receiver is not physically present at power up or lost at run-time.
System Configuration Mismatch	System Configuration Mismatch	The configuration stored for a receiver does not match the physical receiver present.
Extra Rack	Addition of, or extra rack	Generated when a receiver is present that is not currently configured. Also indicates improperly-numbered rack ID.
Loss of, or missing option module	Loss of, or missing option module	Generated when a properly configured transmitter module in a differential rack system is not present.
Reset of module	Reset of, Addition of, or extra option module	Generated when a transmitter in a differential rack system is either configured for the first time or is now present after being lost.
Extra module present but not configured	Reset of, Addition of, or extra option module	Generated when a system is configured for single-ended operation and a transmitter module is present.
Extra Transmitter		Expansion Transmitter installed in 2-rack local system