STAR POWER SUPPLY INSTALLATION

Recommended installation of the power supply is a wall mounted configuration within 20 feet from the STAR Receiver.

Wall Mount Power Supply

Figure 8 shows the power supply with integrated mounting brackets.

Figure 8: STAR Power Supply

The wall mounted power supply requires the following hardware (not included with shipment).

- #6 Drywall (bugle head) or #6 wood screws if the unit is being fastened to a wooden surface
- For a solid wood mount, box nails are a suitable option, provided that the head diameter is more than .28” and less than .30” in diameter and the shank of the nail is at least 2” long.
- For a metal surface mount that is at least .1875” thick, #6-32 pan head machine screws may be used.
- For drywall/plaster fastening, 1/8 Molly or Toggle bolts must be used.

The recommended mounting procedure is:

1. For drywall mounts, "Molly Bolts" are preferred. Alternatively, toggle bolts are a suitable option, as they offer a pull-down force more than 4X the industry standard, and are highly recommended in areas prone to seismic activity.
2. Alternatively for drywall mounts, Bugle-head #6 Drywall screws (coarse thread) are also acceptable, if all 4 tie-down points are used, offering an industry standard of a pull-down strength of at least 4X the weight of the unit.

3. If the wall thickness is at least 1/2" wood (plywood, for example), nails can also be used.

Cables must be properly dressed and supported. Both AC and DC cables should be routed with a service loop and must be supported at least once within 18” of the power supply unit. Cables can be run in conduit, providing (a) the conduit is not hanging on the cables, (b) the service loop exists, and (c) there is at least one support/tie-down on the cables between conduit and power supply.

ENODE INSTALLATION

The Mojix eNodes (exciter Node) are the building blocks of the Mojix STAR system, defining multiple RFID coverage areas and interrogation zones configured to support each unique business process. Mojix provides a full range of eNode models from wired to wireless, certified in multiple regions and across multiple frequency bands.

The Mojix eNodes are reliable, autonomously operated simple RF transmitters, designed to excite all types of EPC UHF Gen 2 RFID tags within their designated RFID coverage areas. The eNode connects to four RFID antennas that are controlled by the STAR to energize RFID tags. The network of eNodes is connected through a distributed architecture to a STAR unit via an eMux using coaxial cable. Each eNode can service up to either four connected antennas or four eXpander modules with up to sixteen antennas, using low-loss cables up to a distance of 50 feet.

eNode Specifications

Figure 9 shows the eNode and its interfaces, and Table 1 details the specifications of its interface connectors.

Figure 9: eNode Interfaces

eNode Connector Function	Connector Type
RF Input connector	TNC connector
RF Output connector	TNC connector
Antenna – 1 output connector	TNC-RP connector
Antenna – 2 output connector	TNC-RP connector
Antenna – 3 output connector	TNC-RP connector
Antenna – 4 output connector	TNC-RP connector
GPIO connector	5-conductor circular

Table 1: eNode Connector Specification

Part Numbers: (Indoor / Outdoor)	FCC/Americas: ENM-3004-F EU: ENM-3004-E Japan: ENM-3004-J	Korea: ENM-3004-K Brazil: ENM-3004-B Singapore: ENM-3004-S
Frequency:	FCC/Americas: 902 – 928 MHz EU: 865 – 868 MHz Japan: 916.7 – 920.9 MHz	Korea: 917 – 923.5 MHz Brazil: 902 – 907.5, 915 – 928 MHz Singapore: 920 – 925 MHz
Power:	24 VDC from RF input	
Dimensions (L x W x H):	10.5” x 6.25” x 1.5” (26.7cm x 15.9cm x 3.8cm)	
Weight:	2.5 lbs (1.1 kg)	
Operating Temperature:	-30°C to +60°C	
Storage Temperature:	-40°C to +85°C	
Humidity:	5 – 95% non-condensing	
Environmental Rating:	IP65	
Regulatory:	FCC Part 15, EN 60950, EN 50364, EN 301 489-1 EN 301 489-3, EN 302 208-2	
Maximum Transmit Power:	Compliant with local regulations	
Physical Interfaces:	Antenna transmit connectors: 4 TNC-RP Male Input: TNC female Output: TNC female General Purpose I/O connector: Circular Connector	
Indicators:	Power, Command Link, Transmit	
Mounting Configuration:	Built-in mounting ears	
Tag Waveform and Protocols:	EPC Class 1 Gen 2 Compliant ISO 18000-6 Compliant	
Insertion Loss for Daisy Chaining:	0.8 dB	

Table 2: eNode Operating Specification

EMUX INSTALLATION

eNodes frequently are deployed with eMuxes that can connect multiple eNodes to a STAR or to another (upstream) eMux. The eMux amplifies and conditions RF signals from the STAR and provides DC power to eNodes. This section describes the steps involved to install an eMux. eMuxes should be used either when:

1. The insertion loss from long lengths of coaxial cables and eNodes is too high
2. The wired eNode system layout requires splitting the wiring to multiple wiring branches

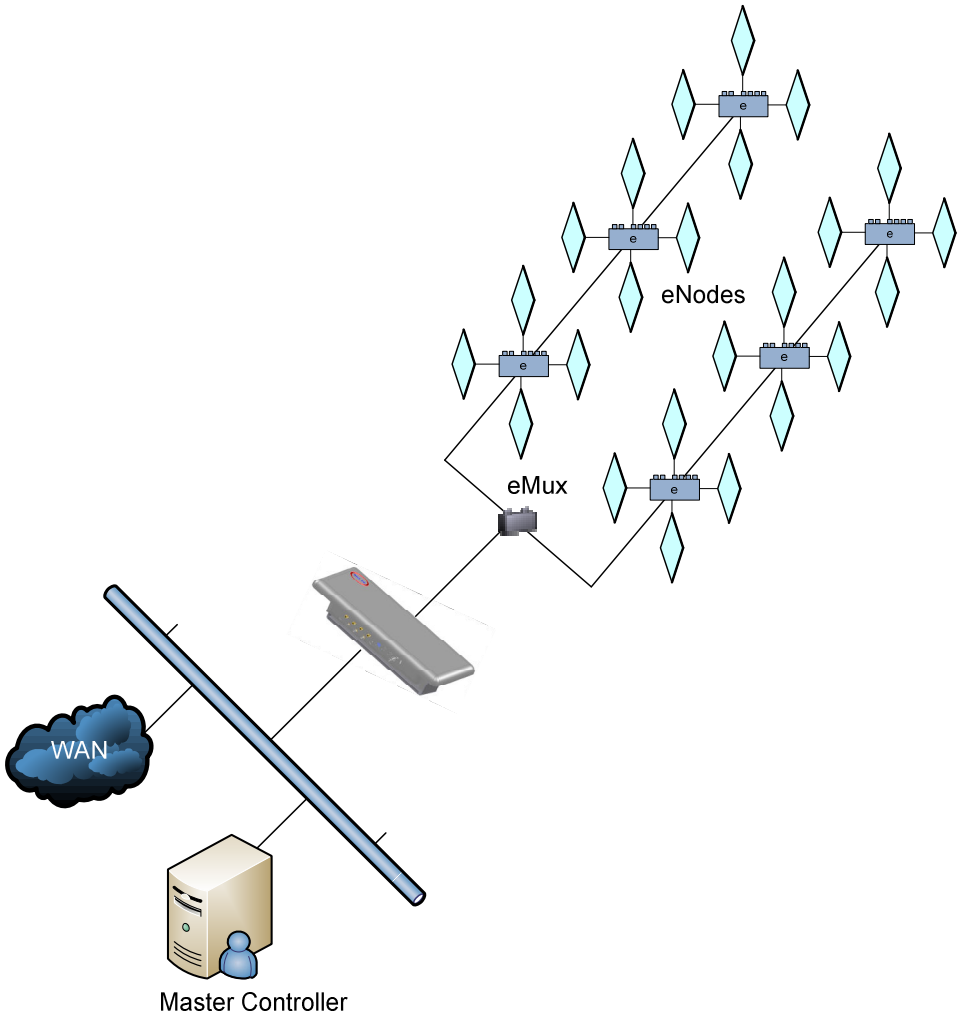

Figure 10: Example Cabling Diagram for eNodes and eMuxes

About Insertion Loss

The STAR transmits a signal of +23 dBm. Insertion loss of coaxial cable varies from one cable to the next. For reference purposes, LMR-240 or equivalent cable has a loss of approximately 7.5 dBm per 100 feet (24.8 dB per 100 m) when measured at 865 MHz to 928 MHz. Insertion loss of wired eNodes is 0.8 dBm. Input power levels for both the eMux and the eNode must be greater than -10 dBm. In order to increase the signal strength for longer cable runs or many eNodes connected together, an eMux must be

used to amplify the signal. The maximum output level on an eMux for any of the 4 output ports is +22 dBm and the maximum gain of the eMux is 30 dB.

eMux Specifications

The eMux is used to expand a single input into four outputs to create a distributed architecture, as well as to provide power to extend the operational range of the STAR wired eNode network. The eMux powers the RFID and Command signals present on its input port to compensate for the cable loss and provides the amplified signal on its 4 output ports. Each eMux output port can drive up to 10 cascaded eNodes powering up to 40 eNodes. Figure 11 depicts the eMux and its interfaces, showing the RF connections as well as the power supply connection. The connector specification is summarized in Table 3 below.

Figure 11: eMux Interfaces

eMux Connector Function	Connector Type
RF input connector	TNC connector
RF output connector – 1	TNC connector
RF output connector – 2	TNC connector
RF output connector – 3	TNC connector
RF output connector – 4	TNC connector
Power Supply Connector	External Power Supply

Table 3: eMux Connector Specification

Part Numbers:	**Indoor:** EMX-3004-W EMX-3004-EW	**Outdoor:** EMX-3004-WO EMX-3004-EWO
Frequency:	865 – 928 MHz	
Maximum Power Consumption:	10 Watts	
Maximum DC Power Supply:	130 Watts	
Power:	24 VDC input	
Power Supply:	115 VAC input; 24 VDC, 5.41 A output (EMX-3004-W Model) 230 VAC input; 24 VDC, 5.41 A output (EMX-3004-EW Model)	
Dimensions (L x W x H):	10.5” x 6.25” x 1.5” (26.7cm x 15.9cm x 3.8cm)	
Weight:	2.5 lbs (1.1 kg)	
Operating Temperature:	-30°C to +60°C	
Storage Temperature:	-40°C to +85°C	
Humidity:	5 – 95% non-condensing	
Regulatory:	FCC Part 15, EN 60950, EN 50364, EN 301 489-1 EN 301 489-3, EN 302 208-2	
Maximum RF Output Power:	22 dBm	
Maximum Gain:	30 dB	
Physical Interfaces:	Input: 1 TNC female Output: 4 TNC female DC Input: 5-Pin Circular	
Indicators:	Power, Status	
Mounting Configuration:	Built-in mounting ears	

Table 4: eMux Operating Specification

EXPANDER INSTALLATION

The eXpander module provides a cost effective means of increasing antenna densities by expanding the total number of antennas from 4 to 16 per eNode as depicted in the drawing below. The eXpander offers a smaller form factor to help simplify deployments and further reduce installation costs. The interfaces and operating specification are detailed in Figure 12 and Table 3 below.

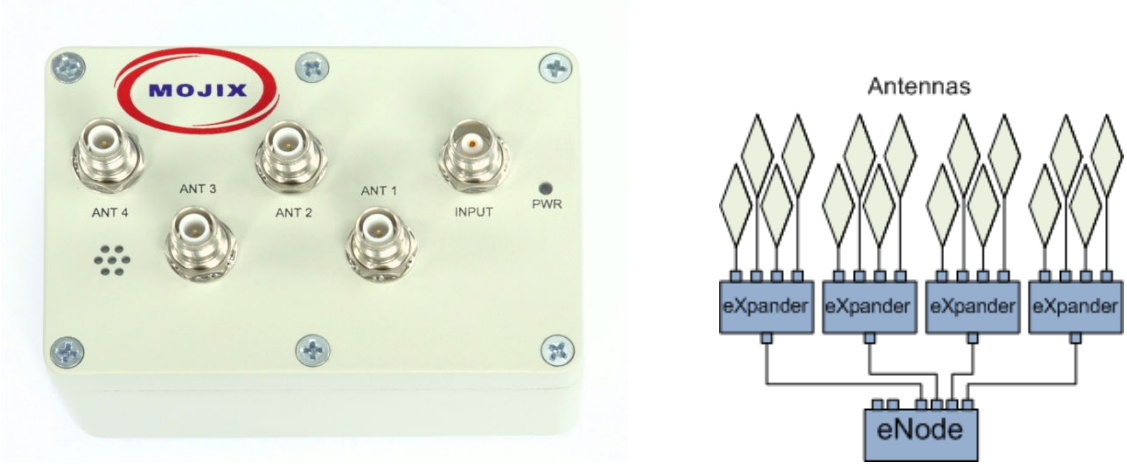

Figure 12: eXpander Interfaces

Part Number:	EXP-3004-W
Maximum Power Consumption:	0.75 Watts
Insertion Loss:	1.8 dB
Input Connector:	TNC Female
Output Connectors:	TNC-RP Female
Termination:	Required only on used ports
Dimensions (L x W x H):	4.8” x 3.2” x 2.2” (12.1cm x 8.1cm x 5.6cm)
Weight:	0.5 lbs (0.23 kg)
Mounting Configuration:	Includes 2 brackets
Frequency:	850 to 950 MHz
Operating Temperature:	-30°C to +60°C
Storage Temperature:	-40°C to +85°C
Regulatory:	FCC Part 15 (in process), IEC 60950 (in process)
Environmental:	IP65 rated

Table 5: eXpander Operating Specification

GPIO INSTALLATION

The GPIO or General Purpose Input/Output is an interface card that connects different types of sensors and actuator devices such as infrared presence sensors and light stacks to an eNode. The GPIO unit is powered by an interfacing cable from the eNode. The GPIO unit, as shown in Figure 13 below, has a unique ID which is added to the configuration of the Mojix MCON software. Each sensor connected to the GPIO unit has a position ID within the GPIO and this ID is mapped to the eNode in the MCON software.

Figure 13: GPIO Unit with RS-485 Cable

The operating specification for the GPIO unit is as follows.

Part Number:	GPO-3008-W
Input Power:	24 VDC and 5 VDC from eNode
Dimensions (L x W x H):	7.08” x 4.92” x 2.2” (18.0cm x 12.5cm x 5.6cm)
Weight:	0.5 lbs (0.2 kg)
Operating Temperature:	-40°C to +85°C
Humidity:	5 – 95% non-condensing`
Environmental Rating:	IP65
Regulatory Compliance:	FCC Part 15, EN 60950, EN 50364, EN 301 489-1, EN 301, 489-3, EN 302 208-2
Physical Interfaces:	Terminal lugs
Mounting Configuration:	Built-in mounting ears, mounting hardware included
External Component Interfaces:	1 eNode, 8 sensors, 8 actuators

Table 6: GPIO Operating Specification

The Terminal block is used to connect wires to and from the external sensor/actuator devices. The Jumper block allows the circuits to be configured.

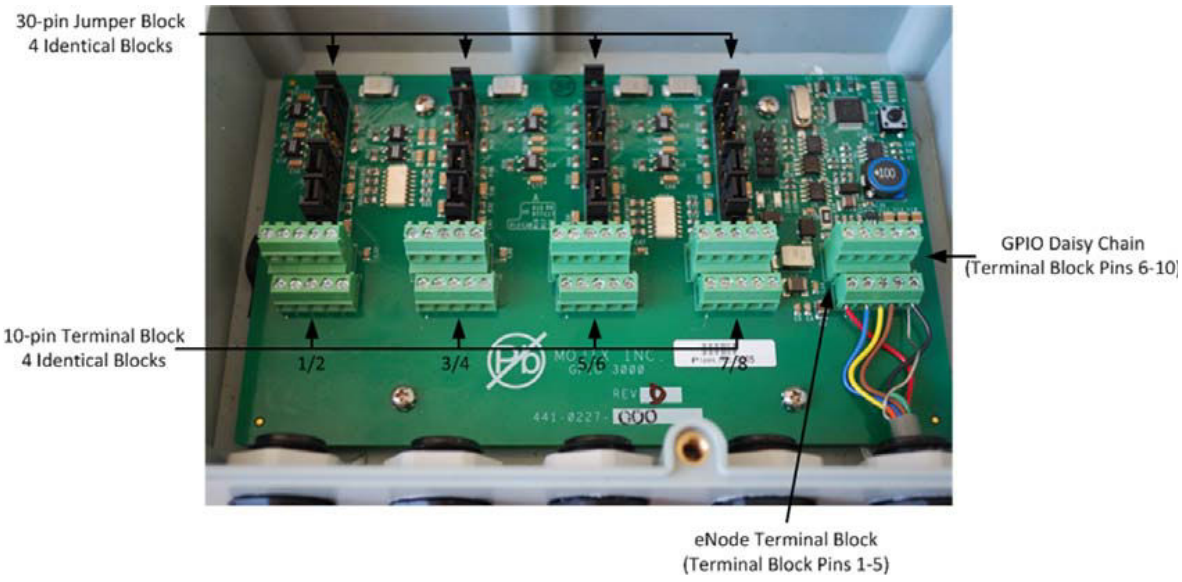

Figure 14: GPIO Unit Terminal Blocks

Each configuration group, made up of one terminal block and one jumper block, allow the configuration of the two sensor circuits and two actuator circuits as required.

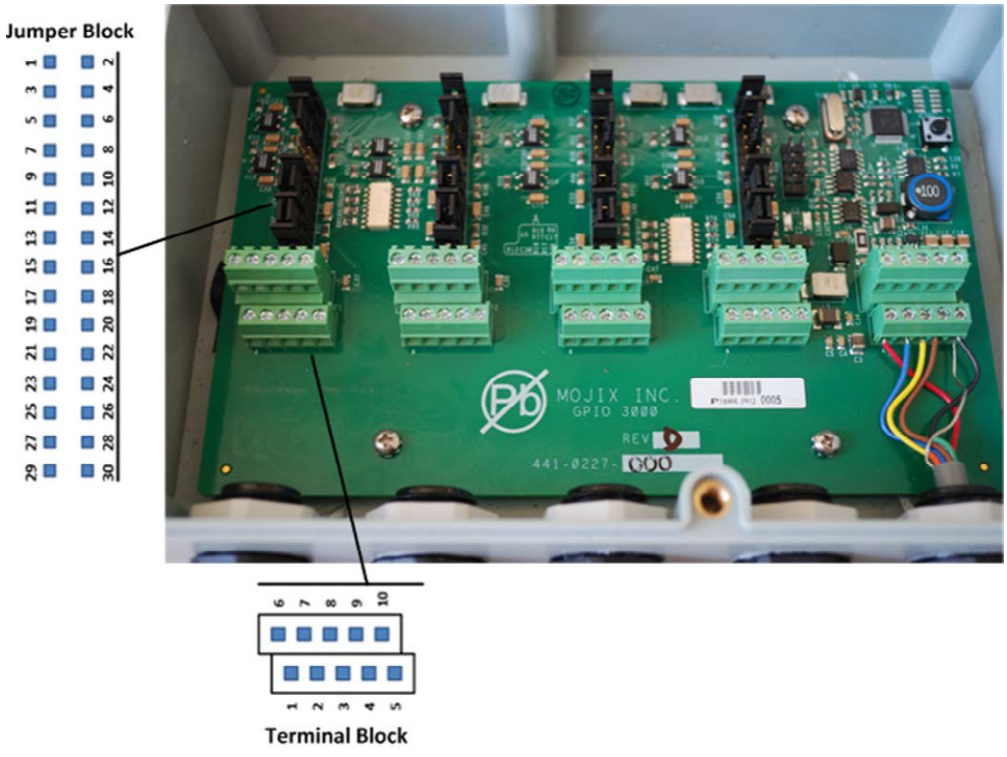

Figure 15: GPIO Unit Jumper Blocks

The eNode uses an RS-485 type connection to both power and command the GPIO unit. The following figure illustrates how this connection is made.

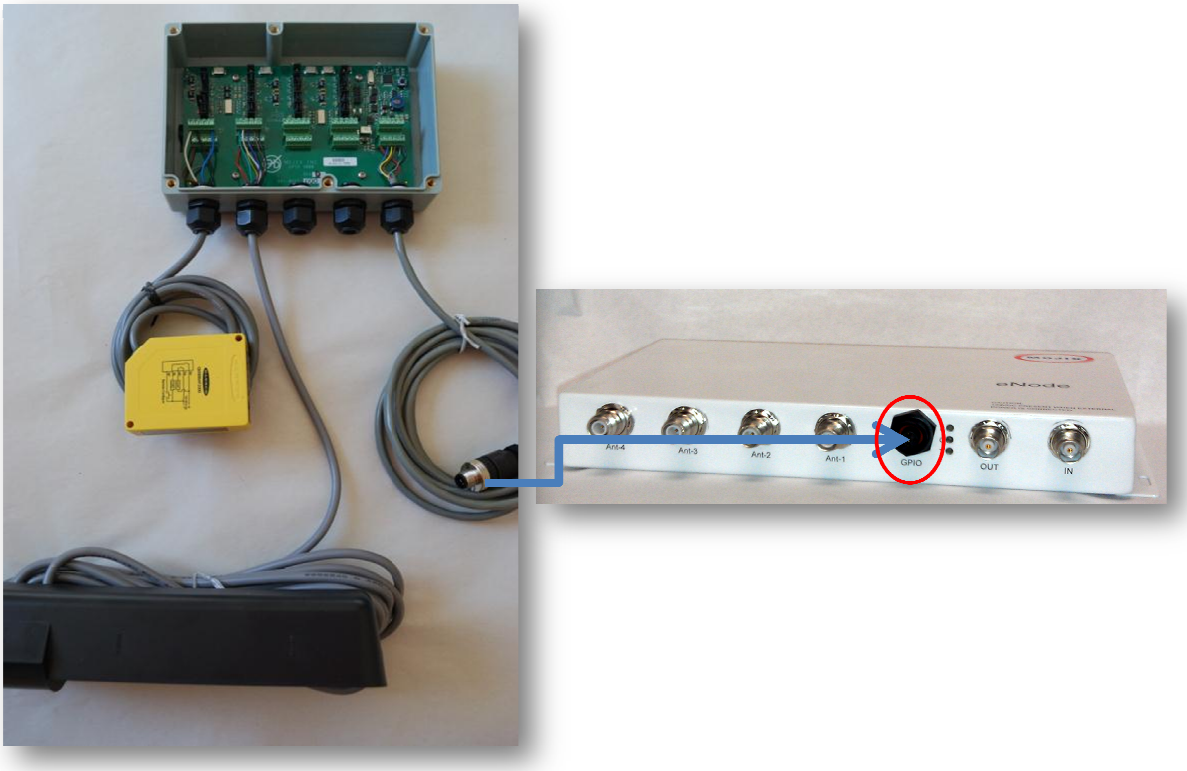

Figure 16: GPIO / eNode Physical Interface

Installers will need the following set of tools to perform a proper GPIO installation.

- Medium-size Phillips screw driver for the cover of the GPIO
- Small-size Phillips screw driver for the GPIO terminal block connectors
- Wire cutter to shorten connectors and/or connector cables (if necessary)

GPIO Cabling

The GPIO unit comes with the input cable pre-installed, however, in the case where GPIO boxes need to be daisy-chained together. Figure 17 and Table 7 provide wiring and pin-out details for the input terminal block.

Figure 17: GPIO Input Terminal Wiring

Terminal Block Pin	Wire Color	Signal
1	Red	24V
2	White	RS-485 A
3	Orange	RS-485 B
4	Blue	+ 3V
5	Black	GND
6	-	-
7	-	-
8	-	-
9	-	-
10	Shield	GND

Table 7: GPIO Input Terminal Block

For directions on how to connect sensors and actuators to the GPIO unit, please refer to the GPIO user guide provided separately.