

HYDRA-R

INSTALLER'S MANUAL

HYDRA-R Plug-in Vehicle Charging Control System

Access Control, Metering, Reporting, Billing and Load Management
for Workplaces, Multi-Unit Dwellings and other Shared Parking Areas

This Manual provides information required to properly install and perform basic functional testing of the HYDRA-R Plug-in Vehicle Charging Control System. All installations must be performed by a licensed electrician and in compliance with all national and local electrical codes.

READ THIS ENTIRE MANUAL PRIOR TO INSTALLATION.

DO NOT DRILL INTO THE ENCLOSURE WITH THE BACKPLATE INSTALLED - METAL SHAVINGS WILL DAMAGE COMPONENTS AND VOID ALL WARRANTIES.

SECURELY SEAL ALL CONNECTIONS TO PREVENT WATER INFILTRATION.

AVOID INSTALLATIONS WITH CONTINUOUS EXPOSURE TO DIRECT SUN.

IF ELECTROMAGNETIC INTERFERENCE (EMI) OR POOR POWER QUALITY ("NOISE") CAUSES ERRONEOUS METER READINGS ON YOUR SITE, LIBERTY PLUGINS CAN PROVIDE SHIELDING AND/OR LINE FILTERS TO REDUCE INTERFERENCE FROM THESE CONDITIONS. CONTACT YOUR SALES REPRESENTATIVE.

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This document contains the latest information for Liberty PlugIns products. Liberty PlugIns reserves the right to make changes to its products without notice. Any modification of this product by anyone other than authorized Liberty PlugIns service personnel will void the product safety-certification and product warranty. If you have questions about this product, contact Liberty PlugIns or a licensed electrical contractor.



SAFETY NOTICE

Before providing any power to this product, read this document completely.

The following symbols are designed to draw your attention to especially important information:

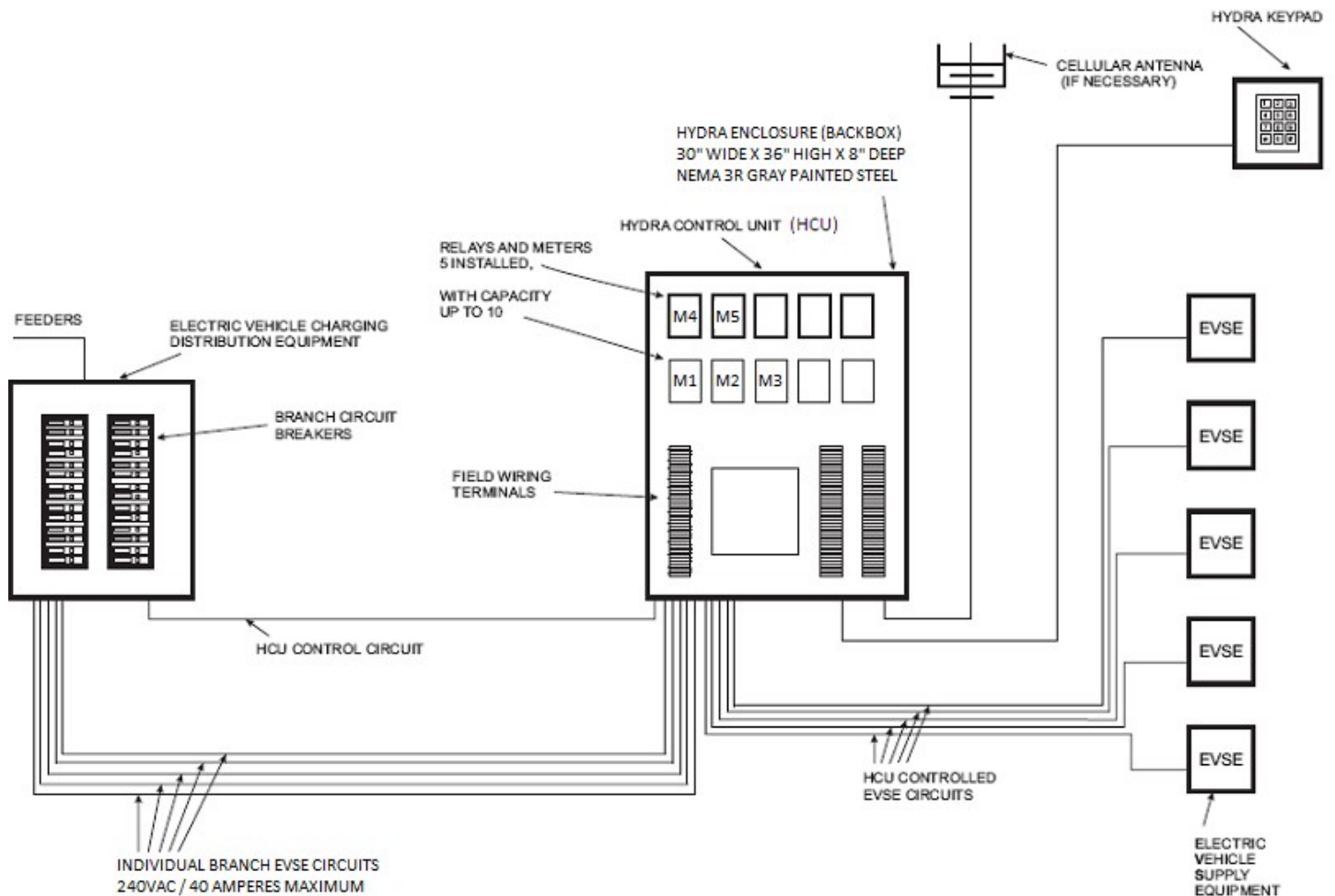
NOTE	Notes provide helpful information and guidance to facilitate your installation process.
	The CAUTION symbol emphasizes information needed to minimize the risk of harm and/or equipment malfunction.
	The DANGER symbol emphasizes information to minimize the risk of electrical shock.

The HYDRA-R product is designed exclusively to control **electric vehicle (EV) charging equipment (“EVSE”)** safety-certified by Underwriters Laboratory (UL), Intertek (ETL) or other nationally recognized testing laboratory (NRTL) - do not use this product with any other type of electrical device.

-  This product contains high voltage components; allow only licensed electricians to service this product.
 - All supply power must be turned off prior to opening the front cover for any service.
-  Use this product only with safety-certified EV charging units (e.g. UL, ETL, CE) rated for **no more than** 240 Volts at 32 Amperes continuous current. DO NOT EXCEED THE 40A RATING OF THE HYDRA-R INTERNAL RELAYS (Relay Meter Modules, “RMM”) UNDER ANY CIRCUMSTANCES.
 - Do not operate this product until all EV charging units are installed in accordance with manufacturer specifications and all local and national electric codes and standards.

OVERVIEW

The HYDRA-R provides access control, usage reporting and load management capabilities for low cost, non-networked electric vehicle charging stations in shared parking areas typically found in workplaces and multi-unit dwellings. The system operates by simply switching and metering each EVSE supply circuit. Each EVSE circuit is routed through a dedicated relay and meter unit inside the HYDRA-R enclosure. A central controller board, and Ethernet or cellular modem communications, are used to control the relays and read the meter data.



The HYDRA-R reduces equipment costs by centralizing components that facilitate control, data recording and communications into a single device instead of replicating these components across multiple EV chargers. Electric Vehicle drivers simply select a particular charging unit, and then enter their charging code (or “PIN#”) using a numeric keypad, or by using a smartphone application or website interface. A valid PIN and charging unit number closes the corresponding relay and starts the flow and measurement of electricity. Each charging session’s data is securely transmitted and stored (via wired or wireless communications), and is made available to authorized individuals via Liberty PlugIns’ secure Web site or smartphone app.

NOTE: the HYDRA-R will not work properly when connected to EV charging units equipped with “cold load pickup.” This feature prevents the HYDRA-R from working properly, by randomizing the amount of time it takes to resume vehicle charging following an electrical outage. **This feature must be disabled.** Check with your EV charger manufacturer to determine if your charger is equipped with this feature.

SPECIFICATIONS

- Each HYDRA-R unit can support up to ten (10) 120/240VAC, “Level 2” EVSE requiring no more than 32 Amperes each.



DO NOT EXCEED THE 40A MAXIMUM RATING OF THE HYDRA-R INTERNAL RELAY METER MODULES (“RMM”) UNDER ANY CIRCUMSTANCES.

- The HYDRA-R controller board requires one 120VAC Single Phase, 60 Hz circuit (Any breaker 5 Amp or greater is acceptable).

NOTE: To ensure proper function of the HYDRA-R unit, the 120VAC internal controller circuit must be connected to the same electrical panel source as the 120/240VAC circuits supplying the HYDRA-R Relay Meter Modules.

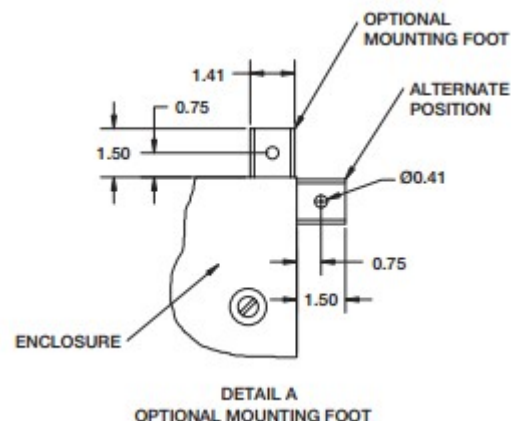
HYDRA-R Panel		
Rating	Value	Unit
Outside Dimensions	30 x 38.5 x 9.75	inches
Weight (approx.)	80	lbs
NEMA Ratings	4, 12, 13	
Managed EVSE circuits (max)	10	
EVSE circuit voltage	110-240	VAC
EVSE circuit current (each, max)	32	A
EVSE circuit breaker (each, typ.)	40	A
Control circuit	110	VAC
Control circuit current (max)	1	A
Control circuit power (typ. During use)	75	W
Control circuit power (Max. Standby)	25	W
Internet Connection	LTE modem, Ethernet	
Access control input options	Keypad, Phone app, Website, None (metering only)	

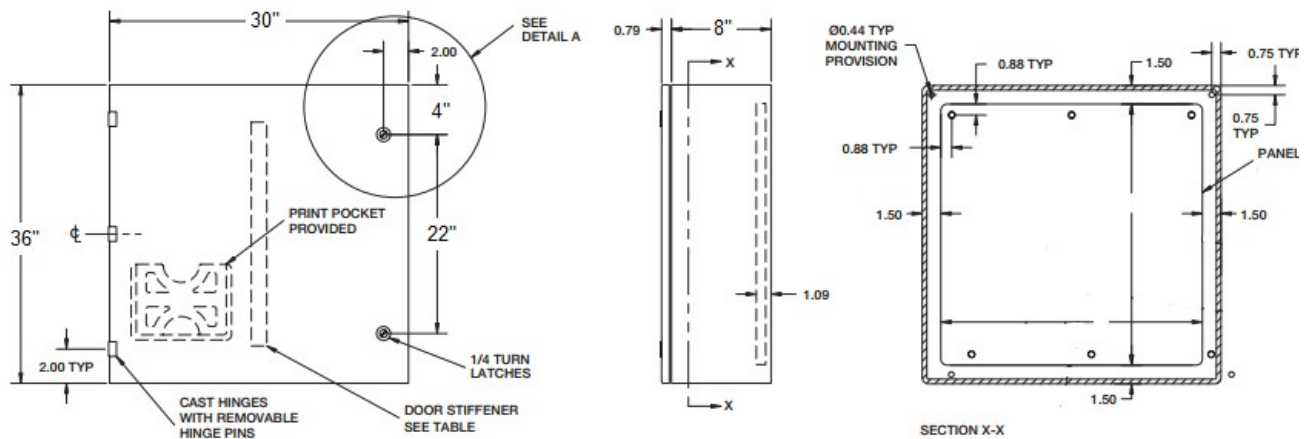
HYDRA-R Keypad(s) (optional)		
Number of keypads	0-2	
Max. wire run from Hydra to keypad	400	ft
Wire run gauge	16-26	AWG
Number of Conductors (each keypad)	4	wires
Max. PIN length	7	digits
Min. PIN length	4	digits
Outdoor rated	Yes	
Vandal-resistant	Yes	

- A HYDRA-R unit should be mounted using at least ¼-inch grade 5 steel or stainless steel fasteners, and/or using mounting foot kits supplied by Liberty PlugIns. The optional mounting foot kit increases depth to approximately 11-inches.
- Communications between the HCU and Liberty PlugIns Back Office is accomplished using the methods listed. If using Ethernet, the site host is responsible for keeping the internet connection active. **The desired communications method must be chosen prior to ordering equipment. Equipment must be factory-configured for the desired communications method, and sites must be evaluated for cellular coverage if necessary.**



The HYDRA-R unit





LOCATING & MOUNTING THE HYDRA-R CONTROL UNIT AND KEYPAD

- The HYDRA-R panel **must** be mounted vertically in the enclosure provided
- The door can be configured to open to the left or right by removing the backplane and rotating 180 degrees
- The panel **must** have enough clearance to allow the door to open at least 90 degrees
- Avoid locations with constant, direct sunlight
- If using a cellular connection, the location must be evaluated for cellular coverage
- As with any electrical metering hardware, the shorter the wire run between the HYDRA-R and the actual chargers, the more accurate the metering will be
- If possible, the feeder breakers should be mounted nearby, and the HYDRA-R panel should be mounted near ground level to make maintenance more convenient
- The Keypad(s) should be mounted near the chargers themselves so that arriving drivers can easily find and use the keypad before or after plugging in their car
- If multiple EVSEs are spread far apart, it's a good idea to install more than one keypad so that one keypad is always nearby and visible



ELECTROMAGNETIC INTERFERENCE (EMI) AND POOR POWER QUALITY ("LINE NOISE") CAN CAUSE ERRONEOUS ELECTRIC METER READINGS AND INABILITY TO START NEW CHARGING SESSIONS. THE HYDRA-R MUST BE INSTALLED NO CLOSER THAN 50 FEET (WIRE RUN) FROM ALL SOURCES OF HIGH-FREQUENCY INTERFERENCE, INCLUDING RADIO TRANSMITTERS, LARGE BATTERY CHARGERS, VARIABLE FREQUENCY MOTOR DRIVES (VFDs) ETC. IN ORDER TO PREVENT EMI FROM CREATING "PHANTOM CURRENT" READINGS FROM THE HYDRA-R METERS. If installation closer than 50 feet from sources of EMI cannot be avoided, speak with your Liberty Plugins sales representative about EMI protection options.


Ensuring power quality is the responsibility of the customer and electrical contractor. If line filters or uninterruptible power supplies (UPS) are required to remedy local power problems, contact your project engineer or local contractor.

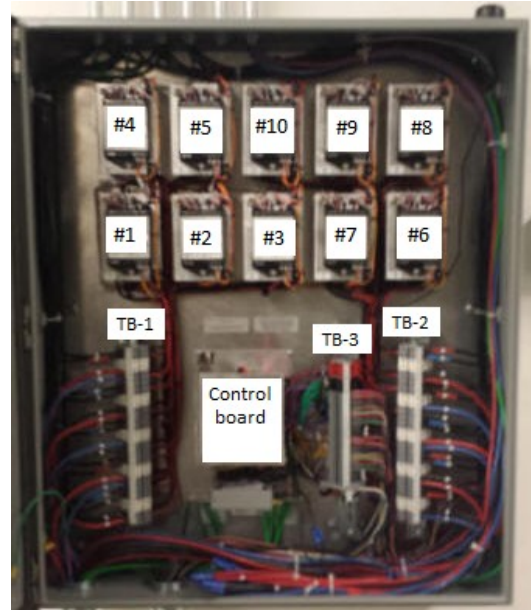
The HYDRA-R requires up to ten (10) branch circuits. Each circuit is connected to a dedicated relay-meter module (RMM) inside the enclosure. Each RMM provides power to one EV charger. The system uses up to two hard-wired numeric keypads to facilitate entry of access control numbers ("PIN" codes). As a supplement to the keypad(s), a smartphone application or web site may be used to activate EV charging. Meter and relay-control data and commands are transferred to and from the Liberty back-office via cellular or Ethernet-based communications.

The HYDRA-R internal components are housed inside a NEMA 4-rated enclosure suitable for outdoor use. The enclosure

is rated “rain tight” and “dust tight”, however it is best to install HYDRA-R indoors or shielded from direct sun and rain in order to maximize the longevity of the internal components. **Extended exposure to direct sun should be avoided. All penetrations into the enclosure must be adequately sealed to prevent water infiltration.**

INSTALLING THE HYDRA-R

1. First, unscrew the six 5/16” nuts holding the backplate inside the enclosure, remove the backplate, and set aside in a safe, clean place.
2. Mount the enclosure and cut all wire ingresses, conduit fittings etc. while the enclosure is empty.
3. Cut one or two holes for the cell antennas (if provided). Antenna holes should be 15mm (19/32”) in diameter. If using two antennas, they should be at least 13” apart, more if possible. Always mount antennas as far away from other nearby metal objects as possible.
4.  Install the backplate only after the enclosure is securely mounted. **NEVER DRILL INTO THE ENCLOSURE WHILE THE BACKPLATE IS INSTALLED!** Lift the backplate into the enclosure and align mounting holes with the threaded studs located on the back of the enclosure. Use the six 5/16” threaded nuts to secure the backplate.



Relay-Meter Modules (RMM), by number
“TB” = Terminal Block
NOTE POSITION AND NUMBERING OF RMMs

SERVICE CONNECTIONS



ELECTRICAL SERVICE SUPPLIED TO THE SYSTEM MUST HAVE A GROUNDED CONDUCTOR (NEUTRAL) AS PART OF ITS ELECTRICAL CONFIGURATION. THIS NEUTRAL LINE MUST BE THE NEUTRAL LINE USED FOR THE CONTROL CIRCUIT.



ALL ELECTRICAL WIRING MUST BE PERFORMED BY LICENSED ELECTRICIANS, AND IN COMPLIANCE WITH NEC 2014, NFPA 70 AND ALL LOCAL CODES AND STANDARDS.

Each HYDRA-R Control Unit (HCU) requires up to eleven circuits, consisting of the following:

- One (1) 120VAC, 5-15 Amperes, Single Phase, 60 Hz – to supply the HYDRA-R internal controller board and modem (“Control Circuit”), requiring 0.5 Amperes continuous.
- Up to ten (10) 120/240VAC, 40 Amperes maximum – to supply power for each of ten (10) Relay Meter Modules (RMMs), providing power to EV charging units typically requiring up to 32A continuously.
- The hi-leg of a mid-point grounded delta configuration **must not** be used. **MAX 120 Volts to ground/neutral.**
- Pull the EV-charger supply branch circuits, and the control circuit from the same electrical system. The neutral conductor is required for the Control Circuit and optional for the branch circuits.



DO NOT EXCEED THE 40A RATING OF THE HYDRA-R INTERNAL RELAYS (“RMM”) UNDER ANY CIRCUMSTANCES.



DO NOT USE any three-phase, three-wire, delta configuration without a system grounded conductor to supply the HYDRA-R Control Unit.

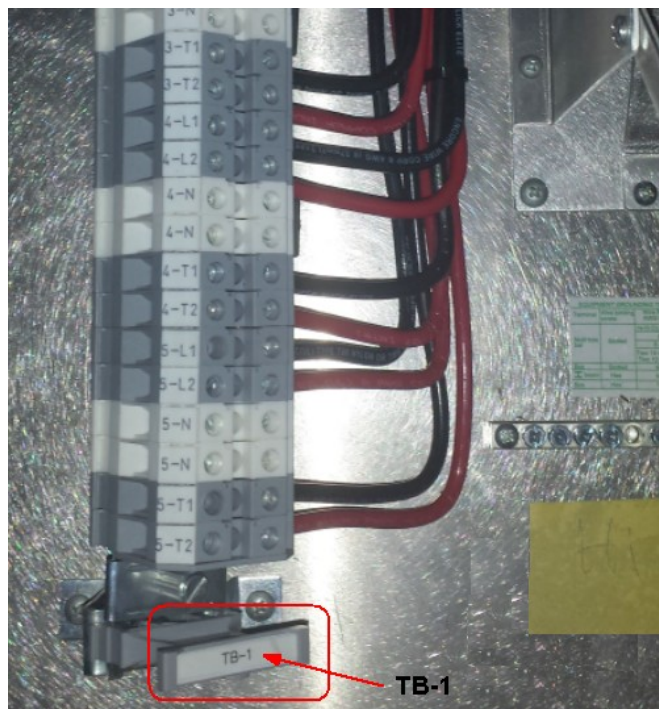


DO NOT USE 277V OR 480V SUPPLY WITH HYDRA-R UNIT. MAXIMUM 120V BETWEEN EACH LINE AND NEUTRAL.



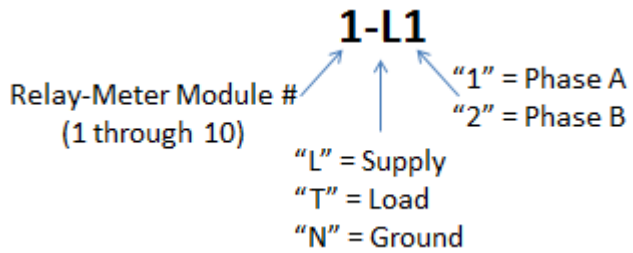
To minimize the possibility of damaging components on the Backplate, pull all conductors into the enclosure *before* installing the Backplate. **NEVER ALLOW ANY METAL PARTICLES TO CONTACT ANY INTERNAL COMPONENTS!**

- Raceways and conduits may be terminated on any side of the enclosure.
- The most efficient termination for LINE and LOAD wiring for Relay Meter Modules (RMM) #1 - #5 is on the bottom-left side of the enclosure.
- The most efficient termination for LINE and LOAD wiring for Relay Meter Modules (RMM) #6 - #10 is on the bottom-right side of the enclosure.
- Connections for RMM #1 - #5 are located on the internal terminal block labeled “TB-1” (picture on right).
- Connections for RMM #6 - #10 are located on the internal terminal block labeled “TB-2” on the right side, mirroring TB-1.
- **IMPORTANT: THE RMM CIRCUIT NUMBERS CORRESPOND TO THE CHARGER NUMBERS IN THE ACCESS CONTROL SYSTEM. IF YOU ARE LABELING ONE EVSE “#1”, THAT MUST BE THE EVSE POWERED THROUGH RMM #1. USERS WILL TYPE “1#” AT THE KEYPAD TO TELL THE SYSTEM THEY ARE PLUGGED INTO CHARGER #1.**



- **Terminal Block (TB-1 and TB-2) Labels** - Termination of the Branch Circuit Conductors

Example: for Relay Meter Module #1		
Terminal Block Label	Description	Direction
1-L1	Phase 1 (supply circuit)	Supply (from breaker)
1-L2	Phase 2 (supply circuit) (optional)	Supply (from breaker)
1-N	Neutral conductor (supply circuit)	Supply (from breaker)
1-N	Neutral conductor (load circuit)	Load (to EVSE)
1-T1	Phase 1 (load circuit)	Load (to EVSE)
1-T2	Phase 2 (load circuit) (optional)	Load (to EVSE)



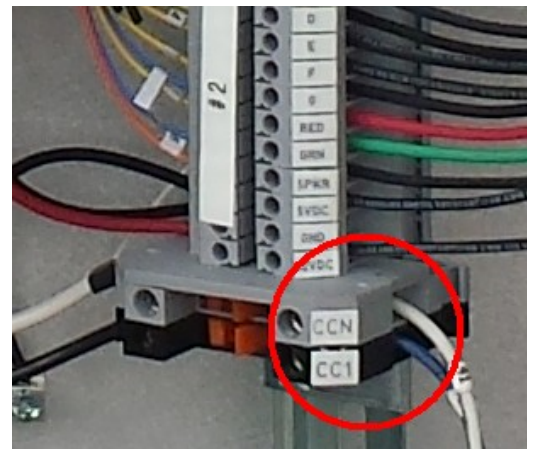
(HYDRA-R terminal block Labeling scheme)

NOTE: As shown, terminal blocks are sequentially numbered for Relay Meter Modules #1 through #10. The HYDRA-R terminal block labeling scheme, for "TB-1" and "TB-2", is as shown, at left.

TERMINATION OF THE CONTROL BOARD CIRCUIT (TB-3)

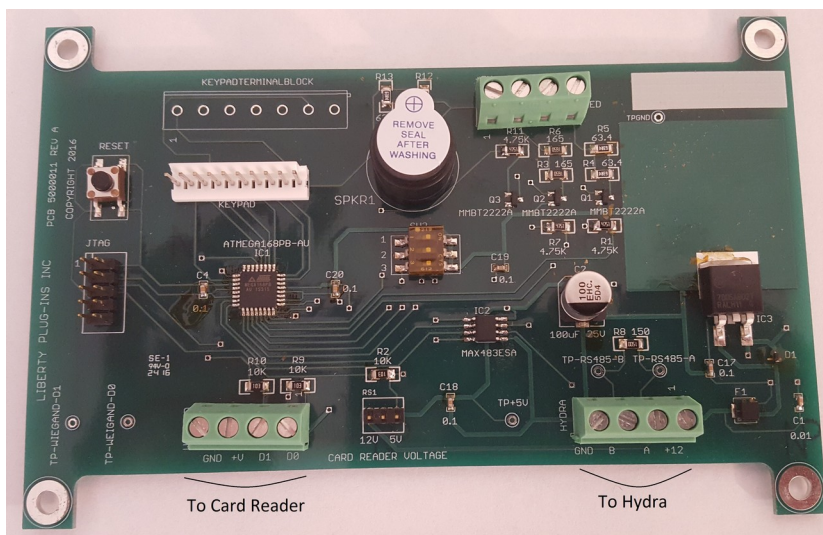
The TB-3 terminal block (see image, above) provides termination point for the 120 Volt, 5-15 Amp Control board branch circuit and the Keypad conductors. TB-3 is located on the lower, right-hand side of the Backplate. The 120 Volt branch circuit's conductors are terminated as follows:

TB-3 label	Purpose
CCN	Grounded 120V branch circuit conductor (Neutral)
CC1	Ungrounded branch circuit conductor (Line)

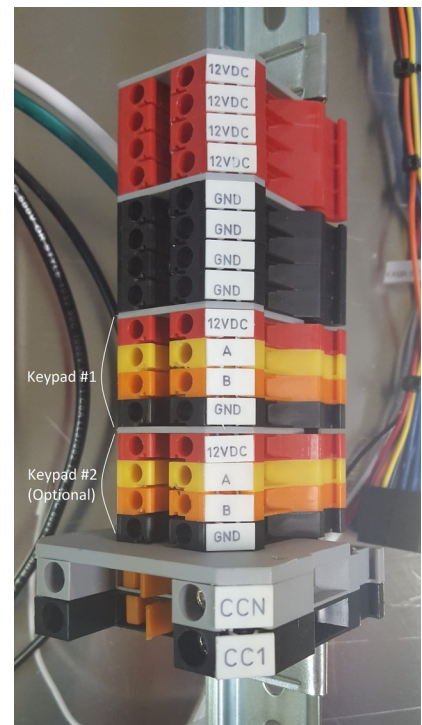


TERMINATION OF THE KEYPAD CONDUCTORS (TB-3)

1. Note: Hydras sold before October 2016 used a different 13-conductor keypad connection. If your Hydra looks different from the pictures here, contact Liberty for an earlier version of the installer's manual.
2. The remotely wired numeric Keypad connects to the HYDRA-R with any 4-conductor waterproof/weatherproof, direct-burial, shielded, pure copper cable. The conductors must be terminated at the **TB-3 terminal block**, at terminals labeled 12V, A, B, and GND. **If possible, the A and B conductors should be a twisted pair** (this is especially important for cable runs over 100ft). Corresponding labels are found inside the keypad enclosure, printed on the circuit board on the terminal labeled “HYDRA”.




Keypad circuit board



TB-3

NOTE: If an **optional, second Keypad** was ordered, the second Keypad terminates with same configuration to a second set of identically labeled terminals on **TB-3**.

TERMINATION OF THE EQUIPMENT GROUNDING CONDUCTORS

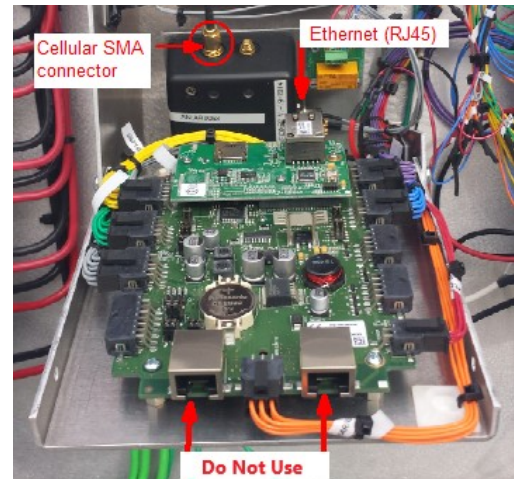
- Terminate all equipment grounding conductors at the equipment Grounding Bus strips located near the bottom of the Backplate.
- NOTE: Equipment grounding conductors have been factory-installed. A jumper has been provided between the door and the enclosure, matching the enclosure instructions, with a lead provided to meet the location of the equipment grounding bus depending upon the left or right hand door operation.
-  An equipment grounding conductor has been provided and must be installed in the field immediately upon mounting the Backplate, in order to bond the enclosure's door to the enclosure housing, and to the Grounding Bus on the Backplate. Ample conductor length is provided for any door or enclosure-mounting configuration.

COMMUNICATIONS CONNECTION (ANTENNA OR ETHERNET)

1. IMPORTANT: EQUIPMENT IS CONFIGURED DURING MANUFACTURING -- YOU MUST SPECIFY YOUR INTENT TO USE ETHERNET OR CELLULAR COMMUNICATIONS WHEN PLACING YOUR ORDER.

- If using hard-wired Ethernet, ensure your firewall will allow incoming communications from the Liberty Plugins server. **It is the site host's responsibility to provide the HYDRA with a working internet connection if using Ethernet.**

1. Flip down the HYDRA-R logic board cover by loosening the top-left side screw and rotating the plate down.
2. Attach the RJ45 connector of your Ethernet line to the RJ45 jack on the TOP of the board as shown on the image at right. The two RJ45 connectors on the bottom of the board are NOT for an internet interface.



2. **IF USING CELLULAR INSTEAD OF ETHERNET:** A preliminary signal-strength site survey should be conducted to determine if adequate signal strength is present. Generally, observed measurements should be stronger than -90 dB. If signal strength observed during field testing is -100 dB or weaker, either a cellular repeater or Ethernet communications must be used to ensure reliable access control and availability of usage data.
 - a. IT support personnel are generally familiar with conducting informal cellular signal-strength field tests using common cellular phones. If there is any doubt regarding available cellular carrier signal strength, either Ethernet communications should be specified during your equipment order, or a comprehensive cellular signal-strength assessment should be performed by qualified wireless networking professional.
3. For HYDRA-R units ordered with an accommodation for cellular communications, the antenna is included inside the enclosure. Connect the antenna's female SMA connector to the modem's male SMA connector located under the Controller Board cover (see above). In accordance with findings from a signal-strength site survey, locate an optimum location on the enclosure and carefully drill a 15mm (19/32") through-hole, preferably on the side or bottom of the enclosure (**NEVER ALLOW METAL CHIPS TO FALL INTO THE ENCLOSURE** – AND REMOVE SHARP EDGES) (You should have performed this when mounting the enclosure). Carefully thread the cable through the hole – being careful to avoid damage to the cable – and insert the threaded portion of the antenna through the hole. Reconnect the cable to the modem. To eliminate the chance for water infiltration, ensure there is a tight seal between the antenna base and enclosure by deburring the hole and inspecting the joint visually.

FINISHING THE HYDRA-R INSTALLATION

NOTE: Before applying power to the Hydra unit for the first time, torque all internal connections, as they may loosen during shipping.

Relay/contacter terminal lugs **MUST** be torqued to 15 in.-lbs.

Terminal block screws (TB1 and TB2) **MUST** be torqued to 11 in.-lbs.

Loose connections may cause permanent damage to the Hydra unit.

To confirm proper installation by your contractor and proper functioning of the unit, three “commissioning” steps must be performed. Results from your basic functional test should be documented and provided to the customer. Since the unit must be powered on during commissioning, the electrician or other authorized person performing the commissioning tests must take all safety precautions appropriate for working with live circuits.

Commissioning should not require support from Liberty, but support is available if needed.

BASIC FUNCTIONAL TESTING

(COMPLETE THE FORM ON THE LAST PAGE OF THIS DOCUMENT)

NOTE: When a keypad is wired properly to a HYDRA-R unit, pressing any of the keys will result in an immediate audible tone and momentary lighting of an LED on the front of the keypad enclosure.

If you do not hear a tone or see an LED light when pressing any key, the keypad is wired incorrectly, conductors were damaged during installation and/or power is not being provided to the Hydra panel.

STEP 1. CONFIRMING RMM/EVSE WIRING

1. Pictured at right is the Bypass switch on each RMM
2. Flip all of the bypass switches DOWN and confirm all of the EVSE are OFF
3. One by one, starting at #1, flip one switch UP at a time and confirm that one and only one EVSE is powered ON. As you are doing this, ensure that the EVSE that turns on with switch #1 gets labeled #1, etc.
4. When all the switches have been tested, flip the last one DOWN so they are all DOWN.



STEP 2. CONFIRMING KEYPAD/CONTROL OPERATION

1. Look closely at the keypad and confirm that the key backlight is on. Each key should be illuminated.
2. Press the star (*) key repeatedly. The green LED should flash quickly with each press, and there should be an audible beep.
3. Press number keys at random. The green and red lights should flash alternately, and you should still hear a beep with each keypress.

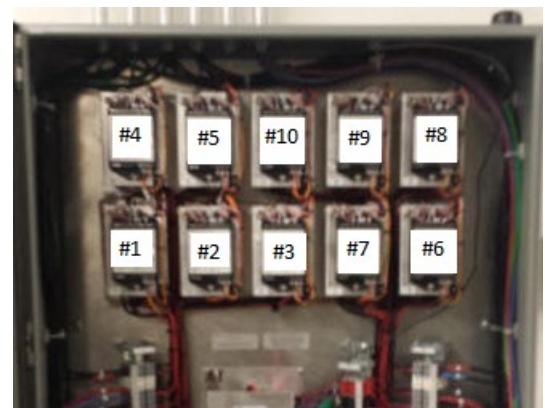
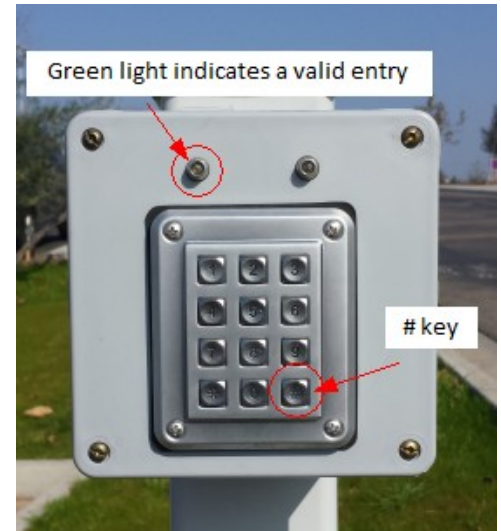
If the above tests passed, press * to clear the keypad state, then perform the following for each EV charger installed:

5. Enter a charger number (e.g., 1,2,3,4,5,6,7,8,9 or 10), then press the '#' key.
 - a. A green light and short "beep" indicates a valid charger number.
6. Enter any one of the standard PIN codes (1111, 2222, 3333, 4444, 5555, 6666, 7777, 8888, 9999 or 1010). PIN codes can be used on only one charger at a time. **For example, "1#1111#", "2#2222#"...**
 - a. A green light and long "beep" indicates a valid PIN code. Check that the charger has powered up.
 - b. A 1-second red light and beep indicates a valid but unauthorized PIN. If you own other Hydras, you may need to use existing PINs already in your system instead of the standard PINs above. Contact your charging administrator.
 - c. If, after a few seconds, you get a 5-second red LED and beep, contact Liberty for help in resolving this error.

If you were successful in powering up each charger using the keypad, your functional commissioning is complete!

NOTE: a single PIN cannot be used to operate more than one RMM/EV charger simultaneously.

On a properly wired system, once a valid charger number and PIN code have been entered, the relay corresponding to the chosen charger number will close. (relay numbers, as shown)

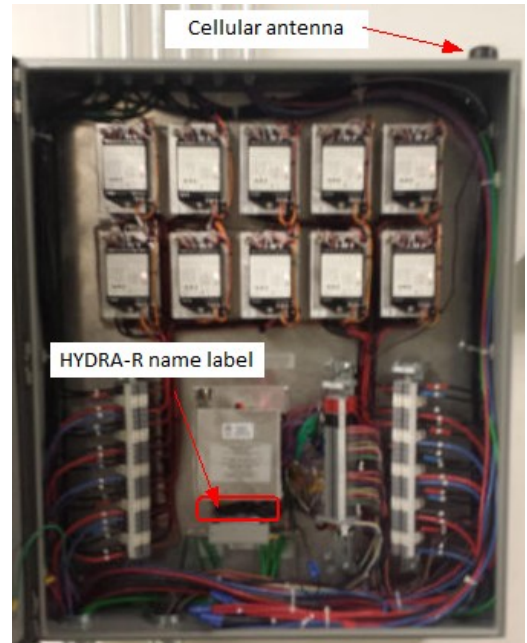


HYDRA-R relays, by relay number

STEP 3. CONFIRMING NETWORK AND DATA COMMUNICATIONS

Verifying communications between the HYDRA-R unit and Liberty PlugIns back-office requires the cooperation of Liberty PlugIns personnel. Please coordinate performance of this step through your sales representative.

Each HYDRA-R is configured at the factory with a unique name that is specific to each particular site. This unique name is required to facilitate network/data communications with back-office. You must have this name to perform this step – check the **HYDRA-R name label** underneath the metal cover protecting the logic card (shown below). **Write the HYDRA-R name down** and contact your Liberty PlugIns representative.



INITIAL FUNCTIONAL TEST RECORD

(SEND A COPY OF THIS TO LIBERTY PLUGINS TO COMPLETE COMMISSIONING)

PERFORMED BY: _____ PHONE: _____

DATE PERFORMED: _____ SIGNATURE: _____

NAME AND ADDRESS OF INSTALLATION SITE: _____

QUESTION	PLEASE WRITE IN YOUR ANSWER
How many Relay Meter Modules (RMM) are installed in the HYDRA-R unit?	
How many EV chargers are connected to the HYDRA-R unit?	
What is the HYDRA-R's unique name?	
Describe the HYDRA's location	

Charger number	Manufacturer	Model	Serial number
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			