SUPERIOR BUILDING AUTOMATION SENSORS

Core Module Installation Guide

Higher reliability

Faster installation

Superior accuracy

Core Module System

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Safety Information

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- This product must be installed inside a suitable fire and electrical enclosure.
- Follow safe electrical work practices. See NFPA 70E in the USA, or applicable local codes.
- This equipment must only be installed and serviced by qualified electrical personnel.
- Do not use this product for life or safety applications.
- Do not install this product in hazardous or classified locations.
- Read, understand and follow the instructions before installing this product.
- Turn off all power supplying equipment before working on or inside the equipment.
- Product may use multiple voltage/power sources. Disconnect ALL sources before servicing.
- Use a properly rated voltage sensing device to confirm that power is off. DO NOT depend on this product for voltage indication.
- Current transformer secondaries (current mode) must be shorted or connected to a burden at all times.
- Products rated only for basic insulation must be installed on insulated conductors.
- Replace all doors, covers and protective devices before powering the equipment.
- The installer is responsible for conformance to all applicable codes.

Failure to follow these instructions will result in death or serious injury.

A qualified person is one who has skills and knowledge related to the construction and operation of this electrical equipment and installations, and has received safety training to recognize and avoid the hazards involved. NEC Article 100 If this product is used in a manner not specified by the manufacturer, the protection provided by the product may be impaired. No responsibility is assumed by the manufacturer for any consequences arising out of the use of this material.

Provide a disconnect device to disconnect the meter from the supply source. Place this device in close proximity to the equipment and within easy reach of the operator, and mark it as the disconnecting device. The disconnecting device shall meet the relevant requirements of IEC 60947-1 and IEC 60947-3 and shall be suitable for the application. In the US and Canada, disconnecting fuse holders can be used. Provide overcurrent protection and disconnecting device for supply conductors with approved current limiting devices suitable for protecting the wiring.

Control system design must consider the potential failure modes of control paths and, for certain critical control functions, provide a means to achieve a safe state during and after a path failure.

Examples of critical control functions are emergency stop and over-travel stop.

⚠ WARNING

LOSS OF CONTROL

- Assure that the system will reach a safe state during and after a control path failure.
- Separate or redundant control paths must be provided for critical control functions.
- Test the effect of transmission delays or failures of communication links.[1]
- Each implementation of equipment using communication links must be individually and thoroughly tested for proper operation before placing it in service.

Failure to follow these instructions may cause injury, death or equipment damage.

[1]For additional information about anticipated transmission delays or failures of the link, refer to NEMA ICS 1.1 (latest edition). Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Controls or its equivalent in your specific country, language, and/or location.

FCC PART 15 INFORMATION
NOTE:
This equipment has been tested by the manufacturer and found to comply with the limits for a class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Modifications to this product without the express authorization of the manufacturer nullify this statement.

This Class A digital apparatus complies with Canadian ICES-003.)

⚠ This symbol indicates an electrical shock hazard exists.

⚠ Documentation must be consulted where this symbol is used on the product.

Information sur la sécurité

⚠⚠ DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

Cet appareil doit être installé à l'intérieur d'une armoire offrant une protection contre les risques électriques et d'incendie.

- Suivez les bonnes pratiques de travail associées à la sécurité des interventions électriques. Voir l'article NFPA 70E aux États-Unis, ou la réglementation locale en vigueur.
- Cet équipement ne doit être installé et entretenu que par du personnel qualifié.
- N'utilisez pas ce produit pour des applications de sécurité ou en charge de la protection vitale des personnes.
- N'installez pas ce produit dans des endroits dangereux ou classifiés.
- Lisez, comprenez et suivez les instructions avant d'installer ce produit.
- Coupez toutes les équipements d'alimentation électrique avant de travailler sur ou dans l'équipement.
- Le produit est susceptible d'utiliser plusieurs sources de tension, d'alimentation.

Déconnectez TOUTES les sources avant toute intervention d'entretien.

- Utilisez un dispositif de détection de tension adéquat afin de vérifier que l'alimentation est bien coupée.

NE considérez PAS ce produit comme un indicateur de tension.

- Les secondaires du transformateur de courant (mode courant) doivent être en permanence mis en court-circuit ou reliés à une charge.
- Les produits n'étant conçus que pour une isolation nominale, doivent être installés sur des conducteurs isolés.
- Replacez toutes les portes, tous les capots et dispositifs de protection avant de mettre l'équipement sous tension.
- L'installateur est responsable du respect de toutes les réglementations en vigueur.

Le non-respect de ces instructions est susceptible d'entraîner la mort ou des blessures graves.

Une personne qualifée est une personne disposant des compétences et des connaissances liées à la construction et à l'utilisation de cet équipement et de ces installations électriques, et a suivi une formation de sécurité lui permettant d'identifier et d'éviter les risques impliqués. NEC article 100 En cas d'utilisation de l'appareil d'une manière non conforme à celle spécifée par le fabricant, la sécurité fournie par l'équipement est susceptible d'être compromise. Aucune responsabilité ne sera assumée par le constructeur pour toutes les conséquences découlant de l'utilisation de cet équipement.

Utilisation dans un environnement de pollution de niveau 2 ou inférieur uniquement. Un environnement de niveau de pollution 2 doit contrôler le niveau de pollution conductrice et la possibilité de condensation ou d'humidité élevée. Prendre en compte l'enceinte, l'utilisation correcte de la ventilation, les propriétés thermiques de l'équipement, et les interactions avec l'environnement.

Utiliser un dispositif de déconnexion pour déconnecter l'appareil de mesure de la source d'alimentation. Placer ce dispositif à proximité immédiate de l'équipement et à portée de main de l'opérateur, et l'identifier en tant que dispositif de déconnexion par un marquage physique. Le dispositif de déconnexion doit satisfaire aux exigences des articles CEI 609471 et CEI 609473 et doit être adapté à l'application. Aux ÉtatsUnis et au Canada, des portefusibles sectionneurs peuvent être utilisés. Mettre en place une protection contre les surintensités ainsi qu'un dispositif de déconnexion pour les conducteurs d'alimentation, ces protections doivent de plus intégrer des dispositifs de limitation de courant approuvés, appropriés à la protection du câblage.

La conception du système de contrôle doit tenir compte des types de défaillances potentielles des liaisons de commande et, pour certaines fonctions de commande critiques, prévoir un moyen d'atteindre un état de fonctionnement sûr pendant et après la défaillance d'une de ces liaisons. L'arrêt d'urgence et l'arrêt en cas de dépassement de course sont des exemples de fonctions de commande critiques.

⚠ AVERTISSEMENT

PERTE DE LA LIAISON DE COMMANDE

- Assurez-vous que le système atteigne un état de fonctionnement sûr pendant et après un dysfonctionnement de la liaison de commande.
- Des liaisons de commande séparées ou redondantes doivent être prévues pour les fonctions de commande essentielles.
- Testez l'effet des retards de transmission ou des pannes des liaisons de communication.
- Le fonctionnement correct de chaque installation d'équipements utilisant des liaisons de communication doit être individuellement et minutieusement testé avant d'être mis en service

Le non-respect de ces instructions est susceptible d'entraîner des blessures, la mort ou des dommages matériels.

[1]Pour plus d'informations sur les latences de transmission ou sur les défaillances de la liaison possibles, reportez-vous à la norme NEMA ICS 1.1 (dernière édition). Safety Guidelines for the Application, Installation and Maintenance of Solid-State Controls (consignes de sécurité pour l'utilisation, l'installation et l'entretien de commandes électroniques) ou son équivalent dans votre pays, votre langue et/ou votre site.

⚠ Ce symbole indique qu'il existe un risque de choc électrique.

⚠ La documentation doit être consultée lorsque ce symbole est utilisé sur le produit.

Table of Contents

System Overview

The Core Module Multi-Circuit Monitoring System is designed to measure the current, voltage, and energy consumption and other critical power parameters on up to 96 circuits. Current transformers are connected via a variety of Interface Boards optimized for different applications that connect to the Core Module via network cables. Each Interface Card monitors up to 24 circuits and the Core Module hosts up to four interface cards. The Core Module can communicate via Modbus TCP/IP, Modbus RTU as well as provides access to real time and logged data via an on board web server. Data is also transmitted wirelessly via an option cellular modem. Logged data can reside directly on the Core Module or on SD storage card with up to 32 GB capacity. The Core Module also monitors two digital inputs and provides two digital outputs.

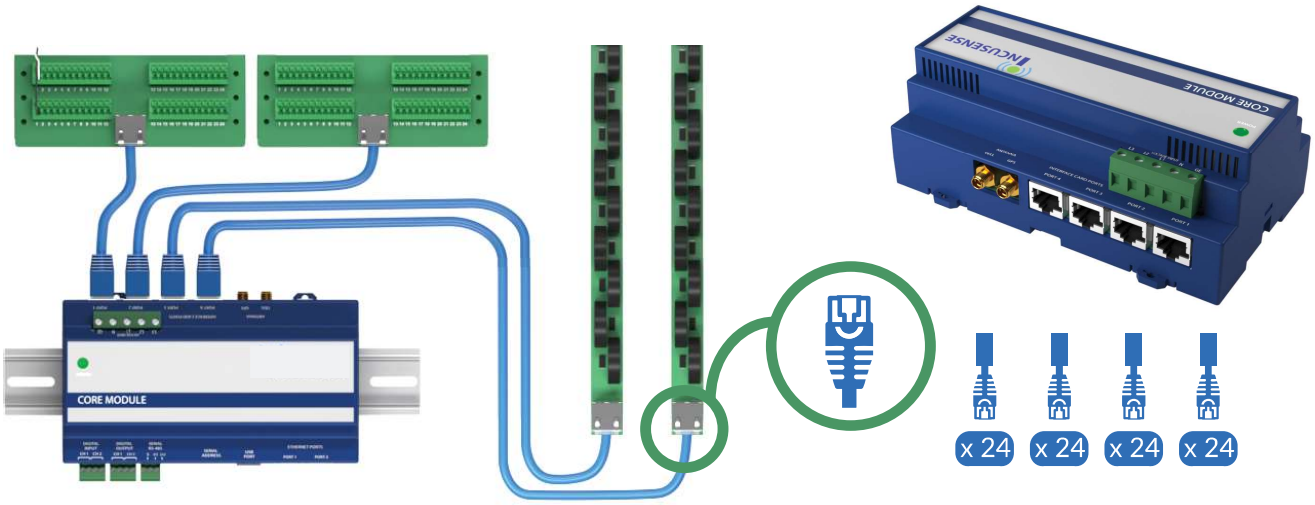


Figure 1: Interface Boards connect to the Smart Ports on the Core Module using network cables.

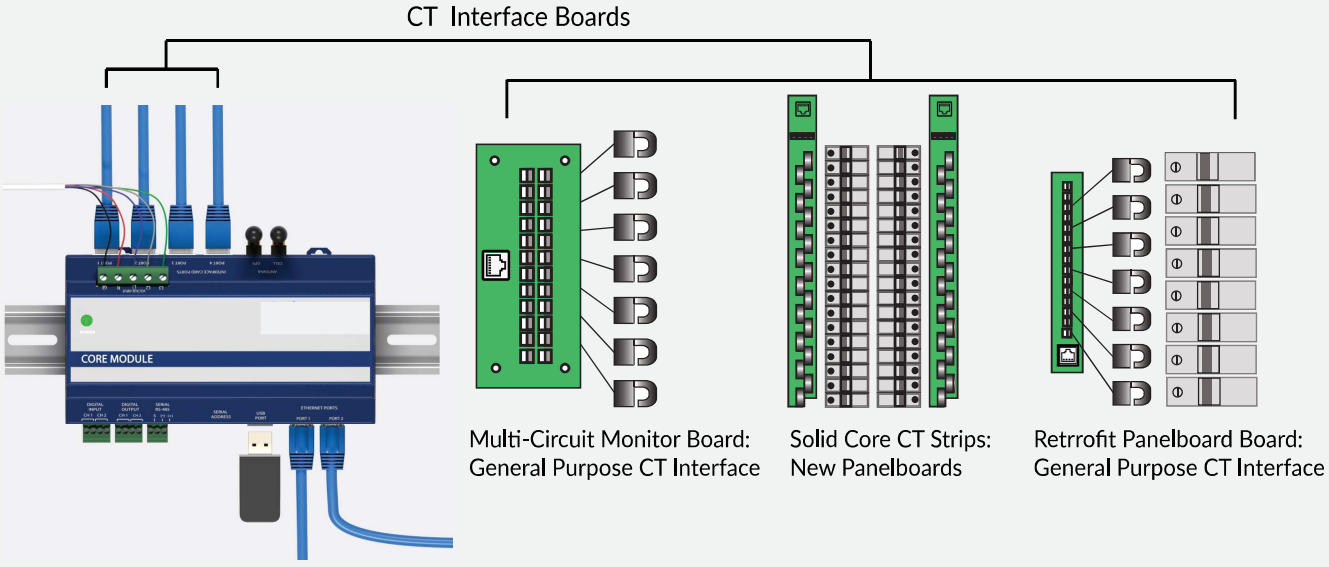


Figure 2: The Core Module connects to three different application specific CT Interface Boards

Product Identification

Specifications

VOLTAGE INPUTS	
Measurement Voltage / Control Power	90 to 300 VAC line-to-neutral, 50/60 Hz
DC Control Power	12-24 VDC nominal (only available on models with DC input power supply)
Overload Protection	Internally fused (0.5 A @ 300 VAC)
Current Consumption	<0.1A @ 277 VAC
ACCURACY and MONITORING	
Power/Energy	IEC 62053-21 Class 1, ANSI C12.1-2008 System Accuracy (including branch CTs) (1% system accuracy includes both the Core Module and branch current sensors
Voltage	±0.5% of reading 90 to 277 VAC line-to-neutral
Current	±0.5% of reading
Minimum ON Current	50 mA
Channel Capacity	Up to 96 channels / circuits
COMMUNICATIONS	
Data protocols	Modbus TCP/IP (Ethernet), Modbus RTU (RS-485 2 wire), HTML (web server)
Ethernet ports	2 x RJ-45 10/100 Mbit
USB port	USB 2.0 Type C
Web server	HTML via standard browser
Cellular option	CAT 1 / CAT M1; requires subscription
ETHERNET COMMUNICATION	
Physical Interface	RJ45 connector with 10/100 Mbit Ethernet
Protocols Supported	Modbus TCP/IP
SERIAL COMMUNICATION	
Physical Interface	2-wire RS-485
Serial Protocols Supported	Modbus RTU
Address Range	0-255
Baud Rate	9600, 19200, 38400
Parity	Modbus RTU: NONE (fixed)
Communication Format	8 data-bits, 1 start-bit, 1 stop-bit
Termination	3 pole connector
Wire Size	up to 16 AWG
DIGITAL I/O	
Digital Input	Dry Contact (N.O.) with 5V @ 10mA source
Digital Output	30VDC / 0.1A maximum
WIRE SIZE RANGE	
Voltage Connection	24 to 12 AWG
I/O and Serial Connections	22 to 16 AWG

Aux. Terminals on CT Interface Boards	26 to 16 AWG
TERMINAL BLOCK TORQUE	
Voltage Connection	4.4 to 5.3 in-lb (0.5 to 0.6 N-m)
I/O and Serial Connections	3.5 to 4.4 in-lb (0.4 to 0.5 N-m)
Aux. Terminals on CT Interface Boards	1.9 to 2.2 in-lb (0.22 to 0.26 N-m)
MECHANICAL	
Network Cable	8 conductor network cable with insulation rated for neighboring conductors and terminated with RJ45 connectors
OPERATING CONDITIONS	
Operating Temperature Range	0° to 60 °C (32 to 140 °F) (<95% RH non-condensing)
Storage Temperature Range	-40° to 70 °C (-40 to 158 °F)
Altitude of Operation	2000 m max.
COMPLIANCE INFORMATION	
Agency Approvals	UL61010 IEC/EN61010-1, CE
Installation Category*	Cat III, pollution degree 2***
Conducted and Radiated Emissions	FCC part 15 Class A, EN55011/EN61000-6-4 Class A (heavy industrial)
Conducted and Radiated Immunity	EN 61000-6-2 and EN 61326-1

*For indoor use only.
** The Core Module must be installed in an appropriate electrical and fire enclosure per local regulations. If Insusense products are used in installations with circuits higher than the product ratings, the circuits must be kept segregated. Note: Cables used with the Core Module cables must be rated for the appropriate installation environment.

*** A Pollution Degree 2 environment must control conductive pollution and the possibility of condensation or high humidity. Consideration must be given to the enclosure, the correct use of ventilation, thermal properties of the equipment and the relationship with the environment.

Monitored Parameters and Feature Sets

Monitored Parameters

Monitored Parameter	Circuit Level	Input Level[1]
Current per phase	•	•
Max. current per phase	•	•
Avg. Current per phase	•	•
Current demand per phase	•	•
Max. current demand per phase	•	•
Current phase angle	•	•
Voltage Phase Angle	•	•
Real power (kW) per phase	•	•
Real power (kW) demand per phase	•	•
Real power (kW) demand max	•	•
Energy (kWh) per phase	•	•
Power factor	•	•
Power factor vector	•	•
Apparent Power (kVA)	•	•
Reactive Power (kVA)	•	•
THDI	•	•
THDV	•	•
Voltage, L-L and average		•
Voltage, L-N and average		•
Voltage, L-N and per phase		•
Waveform capture	•	•
Breaker trip detection[4]	•	•
Presence of Voltage[3]	•	•
ITIC / CBEMA Violation	•	•
Ground Current[2]	•	•

[1]Input level data can be calculated by summing up branch CT measurements or directly measured using CTs.
[2]Requires optional ground current CT connected to auxiliary CT input
[3]Optional feature
[3]Processor based feature different from presence of voltage detection

Core Module Monitor Feature Sets

Monitors are available with a Standard and Enhanced feature set.

Feature	Version	
	Standard	Enhanced
Local Network Access	•	•
Integrated Web Server	•	•
Field Upgradeable Feature Set	•	•
SD Card and Network Configuration	•	•
Modbus TCP/IP output	•	•
Modbus RTU Serial Output	•	•
Integrated Gateway		•
Presence of Voltage Detection		•
Waveform Capture		•
True Circuit Display		•
SD Card Data Storage		•
Newtork Data File Export		•
Alarming		•

Connector Overview

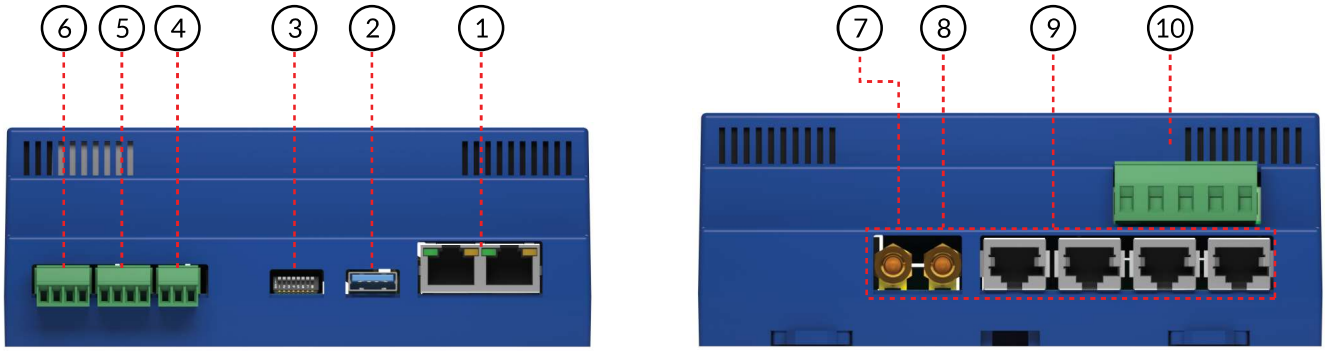


Figure 3: Connector Overview

[1] Ethernet Ports: The Core Module is equipped with two Ethernet ports to facilitate easy daisy chaining of network connections. Either port may be used for network connectivity. The ports utilize standard RJ45 connectors.

- Ethernet Port LED Status Indicators
- Green LED is on, there is 10/100/100Mbps traffic
- Orange LED is on, the port is being connected, but no data is being transferred
- Orange LED is blinking, data is being transferred

[2] USB Port (Type C) : The USB port can be used both as a data interface port as well as hosting a data logging USB SD card on Enhanced Core Modules. The USB port can be used to configure the Core Module using a USB thumb drive with up to 64GB in capacity the configuration file. See the "Configuration" section for details.

[3] Serial port configuration DIP switches: The serial port configuration and device address can be set with the DIP switches. The serial port can also be configured using the onboard web console or configuration file via USB drive.

[4] Serial Port: (RS-485 Modbus RTU 2 wire)

[5] Digital Input: Two isolated dry contact digital inputs

[6] Digital Output: Two isolated dry contact digital outputs rated at 30 V x 0.1 A.

[7] GPS Antenna (requires embedded cellular modem): Micro SMA

[8] GSM Antenna: Micro SMA port (requires embedded cellular modem); connect to an external GPS antenna using a co-axial cable link

[9] Interface Module ports (RJ45); for CT and auxiliary cards

[10] Voltage Input Terminal Block

Core Module Installation

Disconnect power to the panel or equipment on which the monitor is being installed before starting the installation.

Débranchez l'alimentation du panneau ou de l'équipement sur lequel le moniteur est en cours d'installation avant de commencer l'installation.

The Core Module can be housed in existing enclosures where permitted by code or inside standard electrical enclosures. Note that when using the cellular modem option the antennas must be mounted on the exterior of any metallic enclosure. Be sure that the mounting area allows for adequate wire bending radiuses per local and national electrical codes.

The Core Module is installed by mounting on standard 35mm DIN rail. The enclosure can be mounted in any orientation. Secure the DIN rail using a mechanical fastener such as sheet metal screw or bolt to a secure surface.

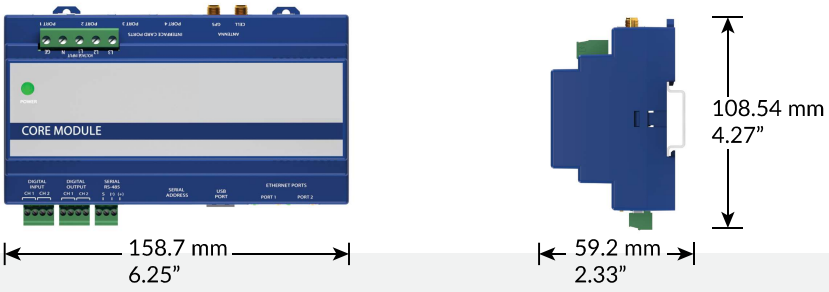


Figure 4: Core Module dimensions

Mount the enclosure on the DIN rail by lifting up circlips and placing enclosure over the rail as shown. Once rail is in place push the circlips down to secure the enclosure in place.

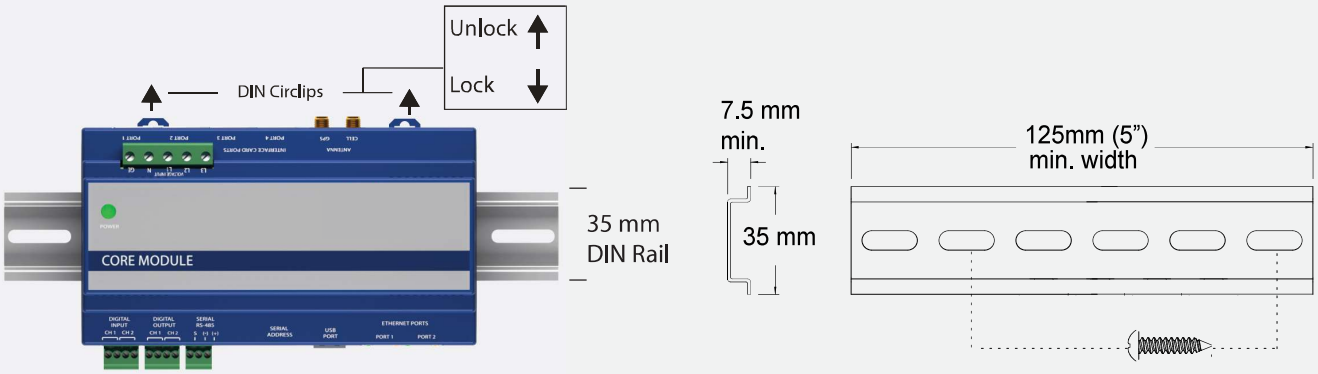


Figure 5: Core Module Installation

Connection of Interface Boards

CAUTION: Note that the when the Ethernet cable is run in the same raceway or conduit area it must have insulation rated to the correct voltages and listings required. For applications up to 240 VAC the in insulation must be rated to 300 VAC. For 480 VAC applications use 600 VAC insulation. The appropriate cables can be provided by Senva. Ethernet cable may also be routed in appropriatley rated flexible tubing.

ATTENTION: Notez que lorsque le câble Ethernet est branché dans le même chemin de roulement ou la même zone de conduits, il doit être isolé aux tensions et aux listages requis. Pour les applications jusqu'à 240 VAC, l'isolation intérieure doit être nominale jusqu'à 300 VAC. Pour les applications à 480 VAC, utilisez une isolation 600 VAC. Les câbles appropriés peuvent être fournis par Senva.

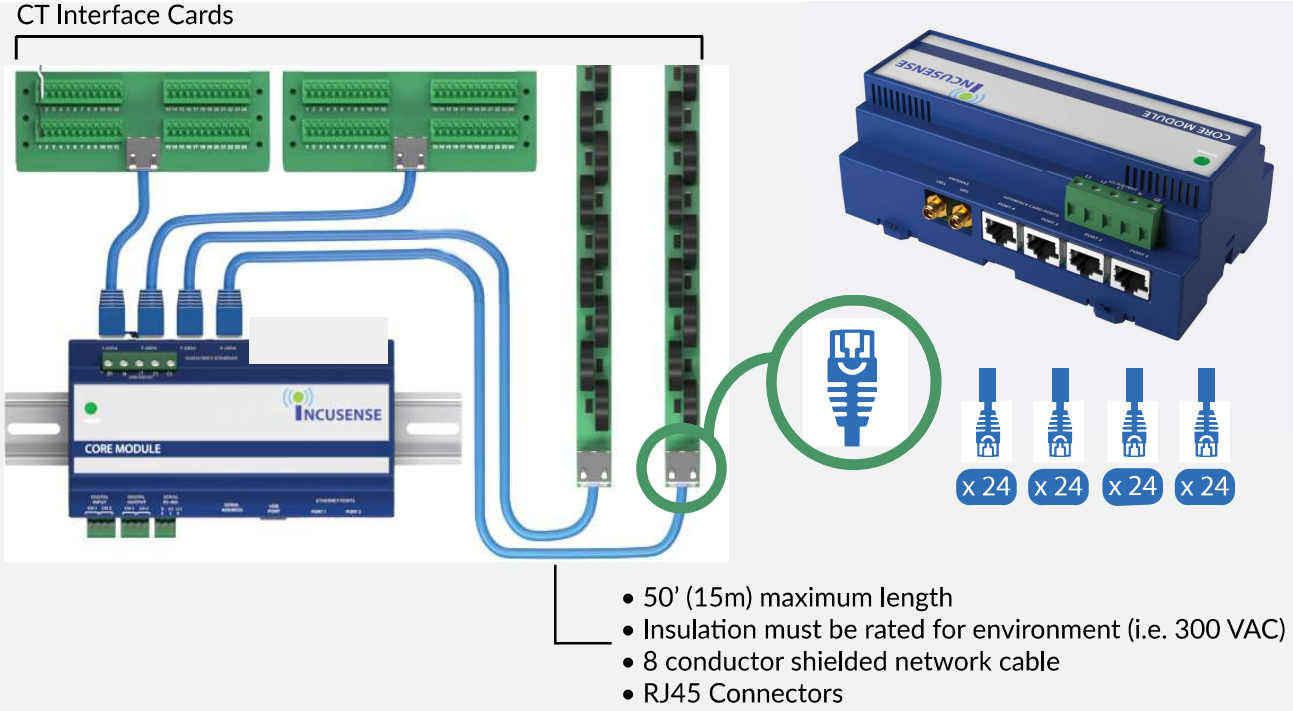
There are different application specific Current Transformer Interface Boards that connect to Smart Ports on the Core Module using network cable.

Cables are eight conductor network / Ethernet cables with RJ45 connector terminations; cables must have insulation voltages rated for the environment.

Cable runs between the Core Module and Interface Card can be up to 50'. For distances longer consult factory for details.

Cables can also be field constructed from network cable and terminated with RJ45 connectors. Always make sure that pin to cable connections on both sides of the cable match when making custom cables.

CT Interface Cards



- 50' (15m) maximum length
- Insulation must be rated for environment (i.e. 300 VAC)
- 8 conductor shielded network cable
- RJ45 Connectors

Figure 6: Interface Card Wiring to Core Module

Cable Ports and Circuit Designation:

There are four Smart Port receptacles on the Core Module. It is critical the correct Smart Port receptacle is assigned to the correct CT Interface Board as it will affect how circuit numbers are referenced.

The circuit designation assigned by the monitor will vary with the Interface Board type. Consult the section on this manual for the specific CT interface cards to determine the correct Smart Port to CT interface card relationship. Native circuit numbers may be changed using the Dynamic Circuit (True Circuit) display configuration tool.
The chart below shows a generalized relationship between the Smart Port and CT Interface Card.

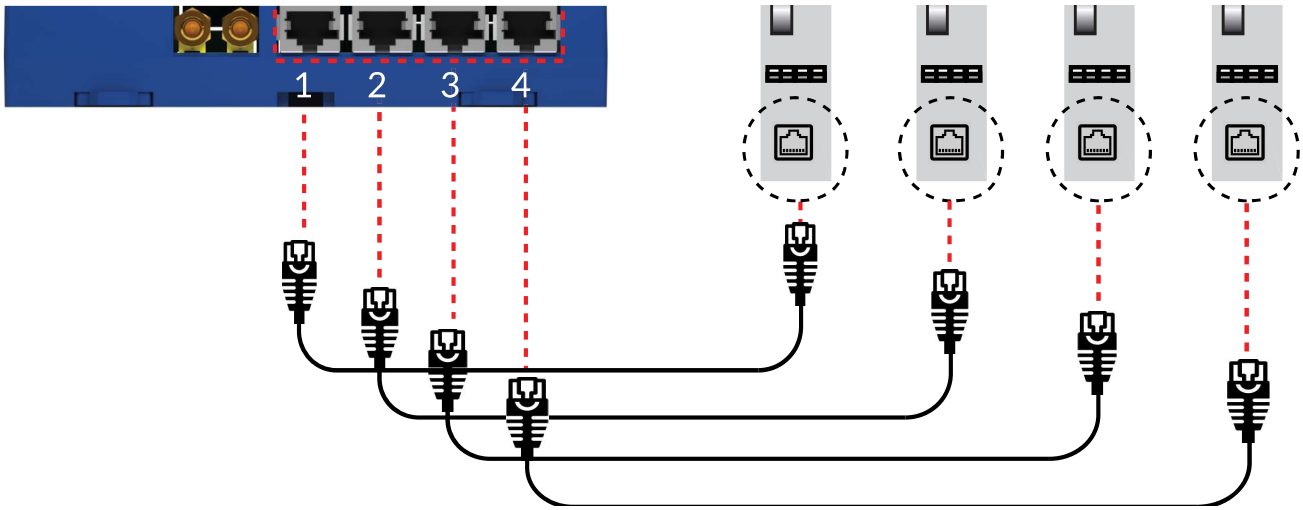


Figure 7: Solid Core CT Strip Configuration

PORT	CIRCUIT DESIGNATOR ON INTERFACE BOARD																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
2	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
3	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72
4	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
	CIRCUIT ASSIGMENT / CHANNEL DESCRIPTION																							

Multi-Circuit Monitor Interface Board Installation

⚠⚠ DANGER

HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH

- While removing or installing panels and covers, assure that they do not contact an energized bus.
- NEVER bypass external fusing.
- NEVER short the secondary of a potential transformer.
- Before closimg covers and doors, carefully inspect the work area and remove any tools, wire scraps or other objects that may have been left inside the equipment.

Failure to follow these instructions will result in death or serious injury.

⚠⚠ DANGER

RISQUE DE CHOC ÉLECTRIQUE, D'EXPLOSION OU D'ARC ÉLECTRIQUE

- Lors du retrait ou de l'installation des panneaux et des capots, assurez-vous qu'ils ne sont pas en contact avec un bus sous tension.
- NE JAMAIS contourner la fusion externe.
- NE JAMAIS court-circuiter le secondaire d'un transformateur de potentiel.
- Avant de fermer les portes et les capots, inspectez soigneusement la zone de travail et retirez tous les outils, débris de fils métalliques ou autres objets éventuellement restés à l'intérieur de l'équipement.

Le non-respect de ces instructions est susceptible d'entraîner la mort ou des blessures graves.

Multi Circuit Monitor Card Installation

The Multi Circuit Monitor Interface Board is typically mounted as closed to the location where the CTs are placed to minimize CT wiring distance. The board is installed by mounting it on a standard 35mm DIN rail strip which can be affixed mechanically using screws or bolts, or using VHB tape to affix the DIN rail.

Current Transformer Types

The interface board is designed to used 0.33V output CTs provided by Senva. Other 0.33V CTs will also work but Senva does not warranty the performance if third party CTs are used. DO NOT USE unburdened i.e. current output, CTs as these will destroy the board as well as can produce lethal voltages during installation. When using the Enhanced Core Monitor, the Interface Board will support native Rogowski Coils (provided by Senva) without an integrator. CTs types (i.e. solid core and split core) and current ranges (i.e. 10 A – 5000 A) may be mixed on any circuit so long as the correct current specification is entered on the configuration chart.

Figure 8: Current Transformer types

Installation and Placement of Current Transformers

Connect the current transformers (CT's) into to the CT terminal block as shown in figure. Observe the wiring polarity with the white or positive wire of the CT connecting to the top terminal blocks and black or negative to the bottom terminal blocks as shown in figure 9. Prior to inserting the CT wires ensure that at least 8mm (¼") of CT conductor is uninsulated before inserting into the terminal. Gently pull the conductor after insertion to ensure that is secured by the cage connector. If the conductor needs to be removed from the terminal push the lever on top of the terminal gently pull the conductor when the lever is depressed.

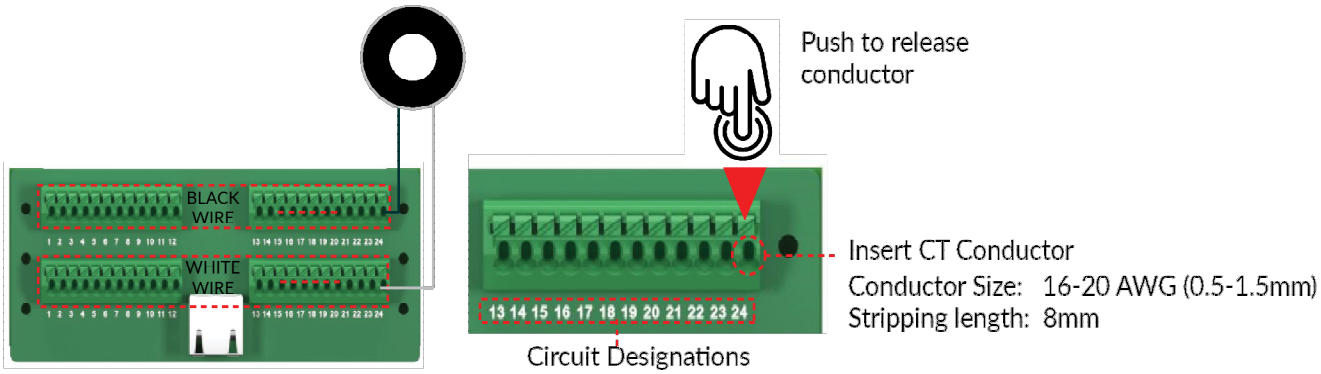
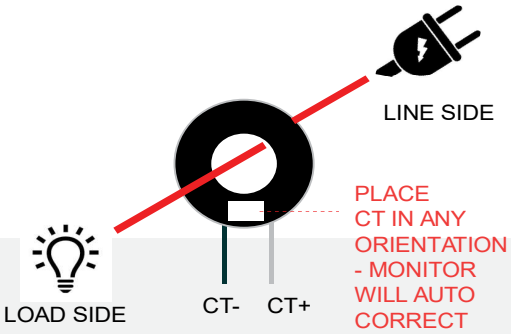


Figure 9: Current Transformer installation

Auto-CT Orientation and Polarity Correction:
Senva monitors feature an auto CT connection and orientation system. This means that the orientation of the CT relative to the load and line side does not matter. If CTs are backwards oriented and produce a negative reading, this will automatically be corrected by the monitor. Likewise, if CT cables are wired opposite to their polarity, the meter will detect the error and auto-correct.



Cable Ports and Circuit Designation

It is critical the correct Smart Port receptacle is connected to the correct CT Interface Board. The circuit number expressed by the monitor will be determined by the port the Interface Board is plugged into. Native circuit numbers may be changed using the Dynamic Circuit (True Circuit) display configuration tool. The chart below shows a relationship between the Smart Port and CT Interface Card based on the Schneider Emulation point map.

VIRTUAL METER ID		CIRCUIT DESIGNATION ON INTERFACE BOARD																						
	PORT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Slave ID "X"	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	AUX 1	AUX 2	AUX 3
	2	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	AUX 4	N/A	N/A
Slave ID "X+1"	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	AUX 1	AUX 2	AUX 3
	4	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	NEUTR	N/A	N/A
		CIRCUIT ASSIGNMENT / CHANNEL DESCRIPTION ON REGISTER MAP																						

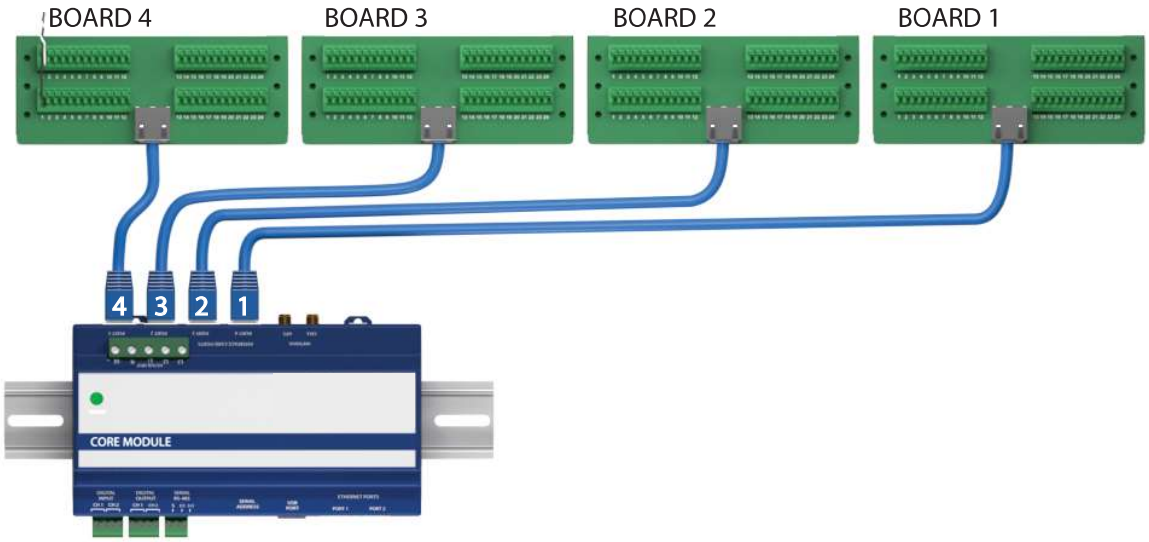


Figure 11: Current Transformer Interface Card wiring

Discovery of CT Interface Card by the Core Module

Once the CT Interface Card(s) are plugged into the Core Module and the module is energized, they will automatically be discovered upon power up of the Core Module. A green LED on the CT strip that will indicate if it is discovered and communicating. To be properly communicating the LED will be pulsing at a 1Hz rate.

IMPORTANT: CT Strips and Cards can only be discovered upon power up of the Core Module. Plugging in a new Strip or Card when the Core Module is energized will require power cycling of the Core Module.

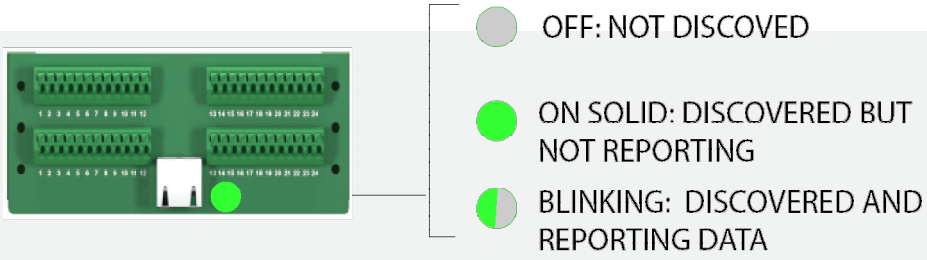


Figure 12: Confirming communication and operation of Interface Card

Solid Core CT Strips Interface Board Installation

Solid core CT strips are used for new installations on panelboards. There are two versions of the CT strip designed to match specific breaker spacing and pole count; an 18mm x 18 CT strip and 0.75” x 21 CT. Make sure that the strip selected matches the panelboard specifications.

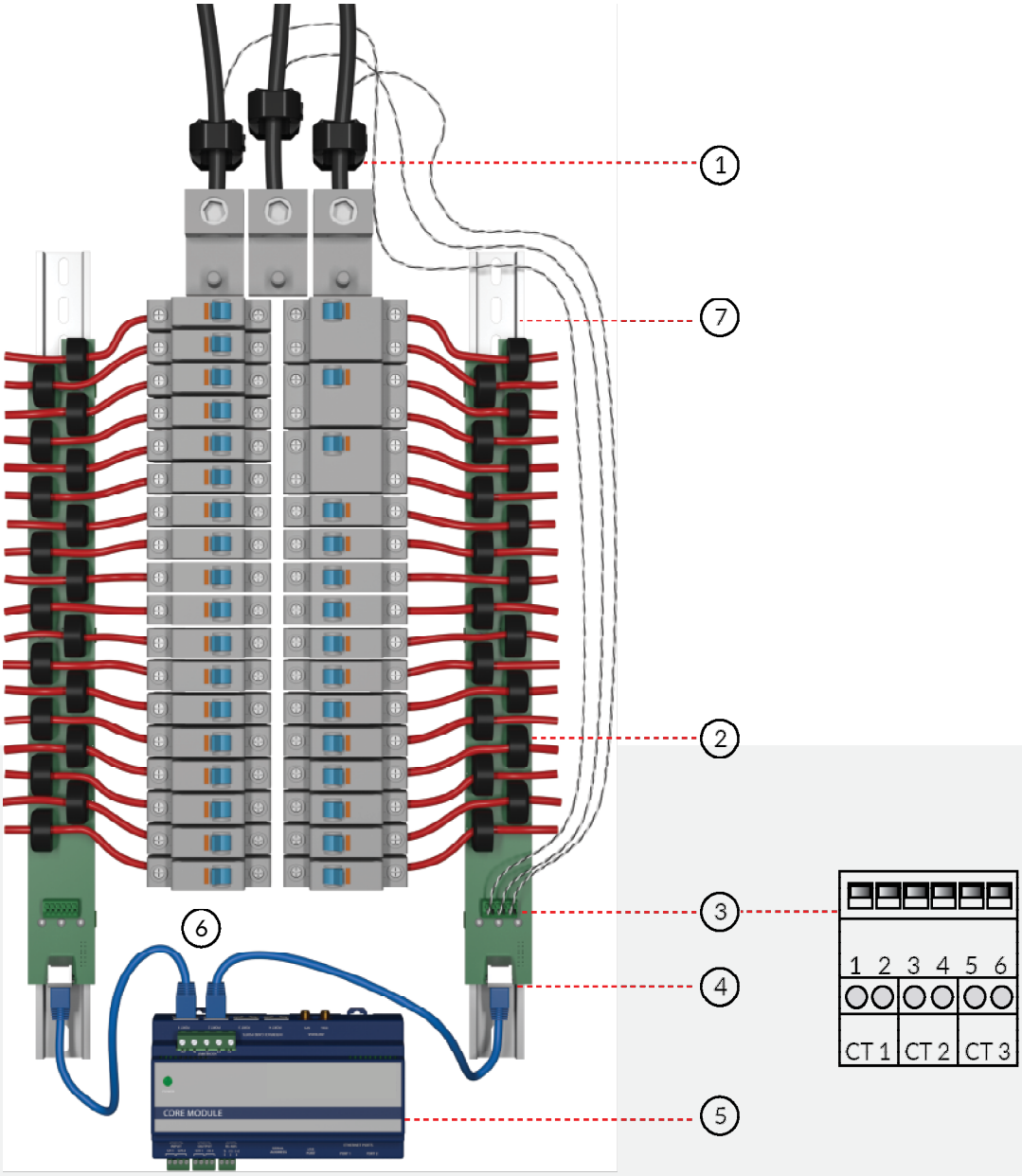


Figure 13: Branch Circuit Monitor installation overview

[1] Main Input CTs: main input CTs can be connected to CT auxiliary terminal blocks
[2] Solid Core CTs: solid core CTs are rated for 100 A and have a 10mm window diameter
[3] Auxiliary CT Terminal Block: monitors up to three auxiliary CTs per strip, typically used to monitor main input circuits and ground current.
[4] Smart Port Jack: RJ45 connector used to interface the CT strip with the Core Module.
[5] Core Module: Hosts up to four CT strips or two panels.
[6] Network Cable: Used to connect Smart Ports to CT strips.
[7] DIN rail / Mounting Bracket: Used to secure CT strip to the panel.

18 mm center to center CT strip Dimensions

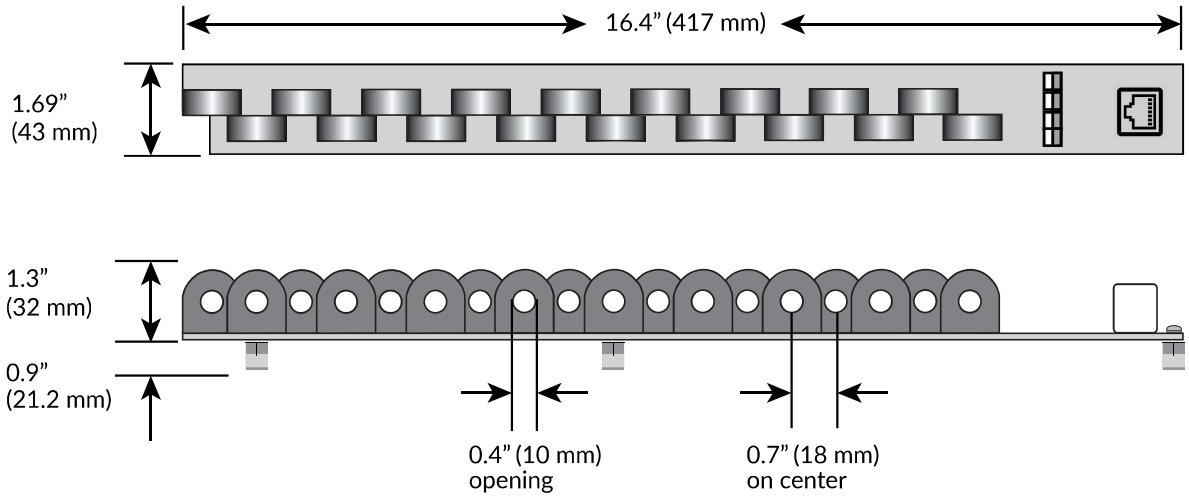


Figure 14: 18 mm CT strip dimensions

0.75" center to center CT strip Dimensions

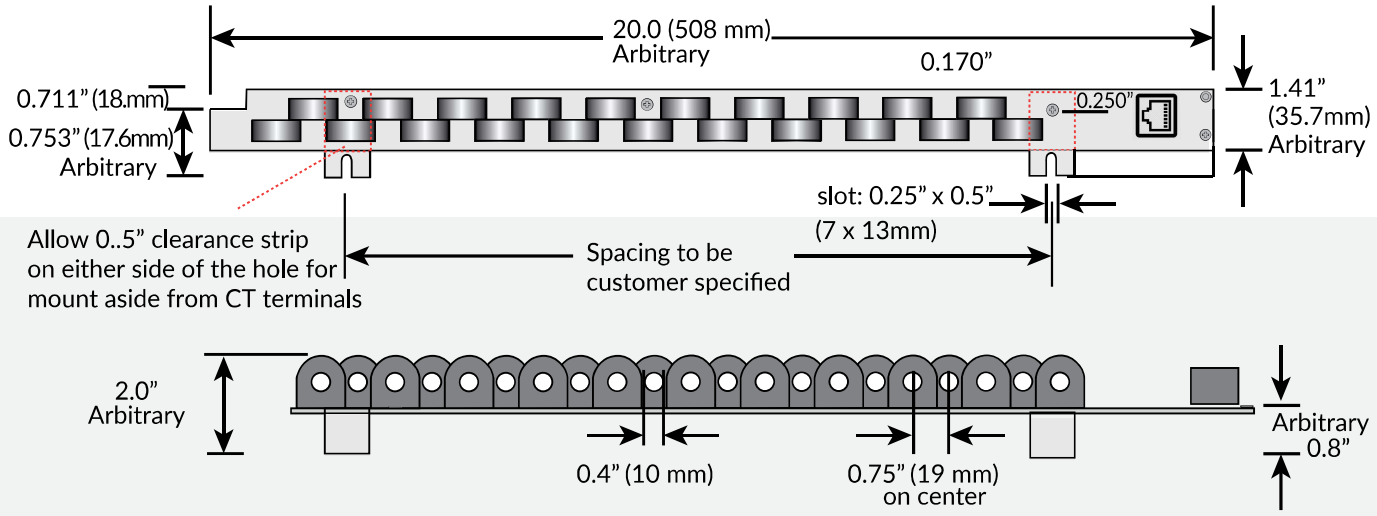


Figure 15: 0.75" CT strip dimensions

Placement and Orientation of Solid Core CT Strips

CT strips can be installed in a number of configurations designed to match the panelboard layout and pole numbering. Position and orient the CT strips in one of the configurations shown in the diagrams below. Note the orientation by the location of RJ45 cable jack. It is critical that each CT strip be connected to the correct Interface Card Port on the module. See the required port to CT strip relationship in figure 16 and 17. Failure to do so will result in incorrect assignment of the circuits.

0.75" C-C CT Strip Positioning and Port Connections

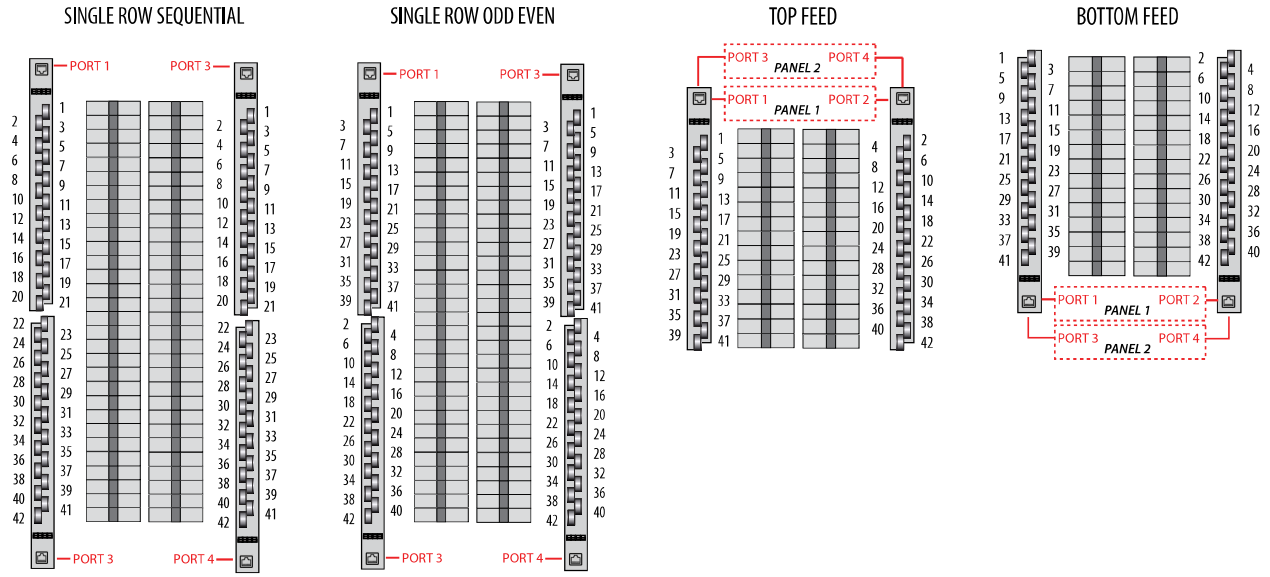


Figure 16: 0.75" CT strip numbering schemes

18mm C-C CT Strip Positioning

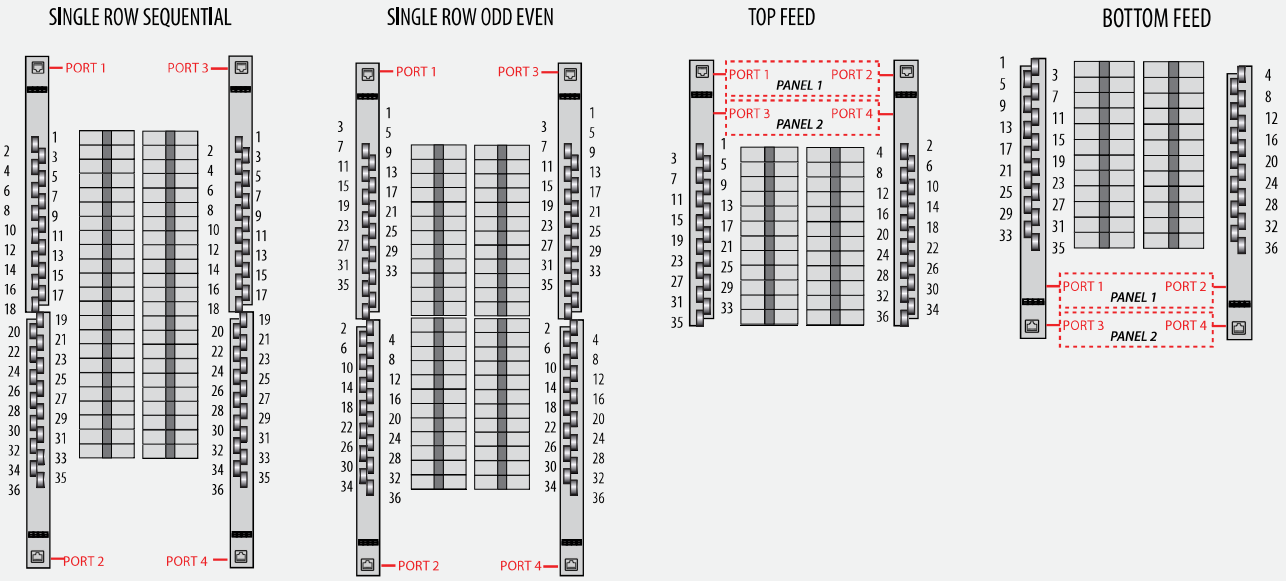


Figure 17: 18mm CT strip numbering schemes

Mounting Instructions: 18mm Strip

The 18mm Solid Core CT strip is mounted using standard 35mm DIN rail. Each strip is supplied with 3 DIN clips to fasten to the rail. Once the strip is secured to the DIN rail ensure that CT windows are correctly aligned with circuit breaker conductor terminals. Avoid placing the strips too close to the circuit breaker and allow a minimum of 1" (25mm) from the circuit breaker terminal to the edge of the CT strip. Once correctly positioned connect the strip to the Smart Port Interface using network cable designated for the approved voltage range (300-600 VAC). Always ensure that the specific CT strip is connected to the correct Smart Port as shown in figure 18.

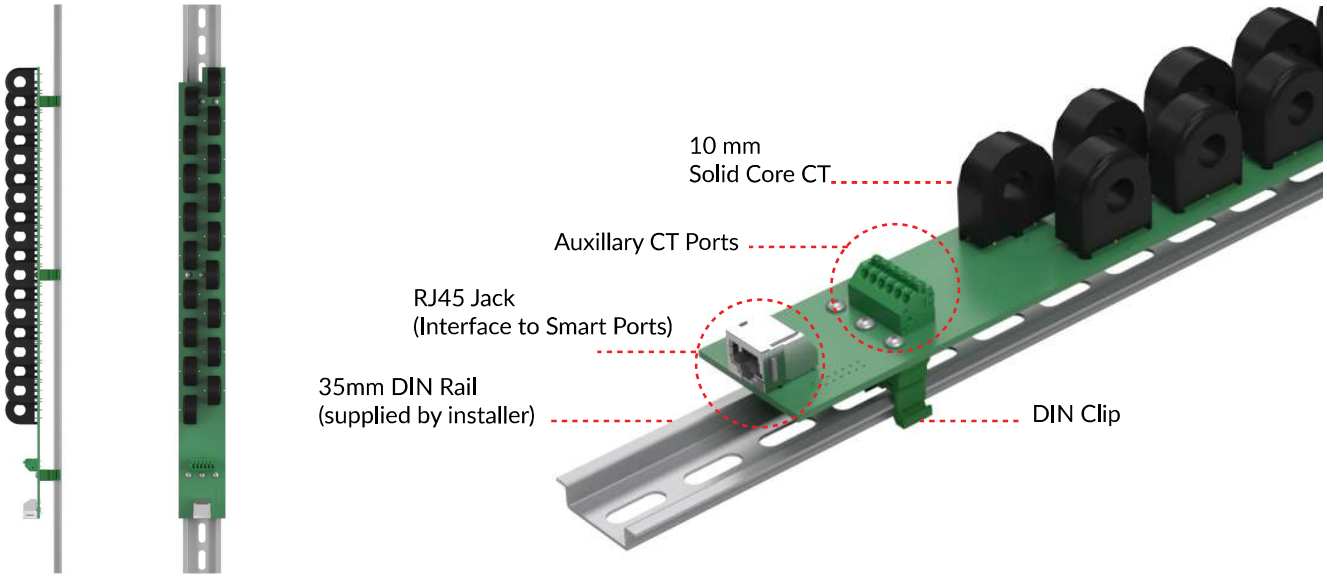


Figure 18: 18mm CT strip topology

Mounting Instructions: 0.75" CT Strip

The 0.75" Solid Core CT strip is mounted using the attached steel Z bracket that is mechanically fastened to the panelboard substrate via two key slots as shown in figure xx. Ensure that CT windows are correctly aligned with circuit breaker conductor terminals. Avoid placing the strips too close to the circuit breaker and allow a minimum of 1" (25mm) from the circuit breaker terminal to the edge of the CT strip. Once correctly positioned connect the strip to the Smart Port Interface using network cable designated for the approved voltage range (300-600 VAC). Always ensure that the specific CT strip is connected to the correct Smart Port as shown in figure 21.

Figure 19: 18mm CT strip mounting

Connection of Auxiliary CT Terminals

⚠⚠ DANGER	⚠⚠ DANGER
Failure to use 0.33V CTs will damage the CT Strip and can also result in serious injury or death as unburdened / current output CTs can result in lethal voltages.	**Si vous n'utilisez pas de TC de 0.33 V, vous risquez d'endommager la barrette de tomodensitométrie et de provoquer des blessures graves, voire mortelles, du fait que les TC à sortie de courant / courant peuvent entraîner des tensions mortelles.**

Each CT strip is equipped with three auxiliary CT terminals designed to support CTs for panel main input monitoring. The inputs are designed exclusively for 0.33 V output CTs. Note that the assignment of channels to the CT Strip Auxillary terminal block will vary with the specific register map being used.

Always connect phase currents from the input source to the auxiliary terminals on a single CT strip designated with auxiliary CT terminal block numbered 1. Failure to do so will result in incorrect current and power calculations for the main input circuit. Observe the polarity of the CT wires as noted in figure 20.

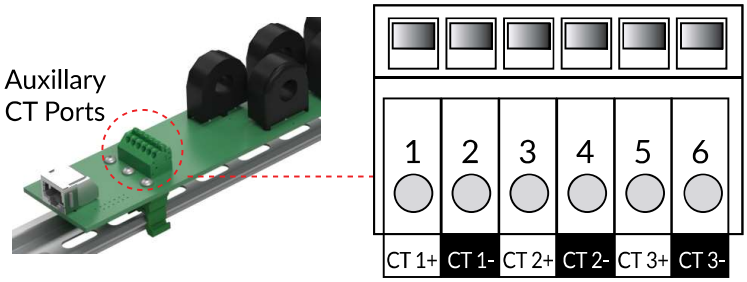


Figure 20: CT strip CT auxiliary ports

Schnieder BCMs Point Map Emulation Connection

CT Strip (Smart Port #I)	CT Terminal 1-2	CT Terminal 3-4	CT Terminal 5-6	Panel
1	L1	L2	L3	1
2	Neutral	N/A	N/A	
3	L1	L2	L3	2
4	Neutral	N/A	N/A	

Senva BCMs Point Map Connection

CT Strip (Smart Port #I)	CT Terminal 1-2	CT Terminal 3-4	CT Terminal 5-6	Panel
1	L1	L2	L3	1
2	Neutral	Aux 1	Aux 2	
3	L1	L2	L3	2
4	Neutral	Aux 1	Aux 2	

Connection of CT Strips to Smart Ports

Important: Always use the correctly rated insulation on the network cables. This is typically 300 V rated cable for 240 VAC applications and 600 V rated insulation for 277/480 VAC applications.

Always observe the sequence of connection of the CT strips to the Smart Ports. Panelboard 1 shall be connected to ports 1 and 2. Port 1 shall be the CT strip where CT position number 1 is located per igure 21. Port 2 shall be connected to the other CT strip for panel 1. For two panel systems, Port 3 shall be the CT strip where CT position number 1 is located per diagram xx. Port 4 shall be connected to the other CT strip for panel 1.

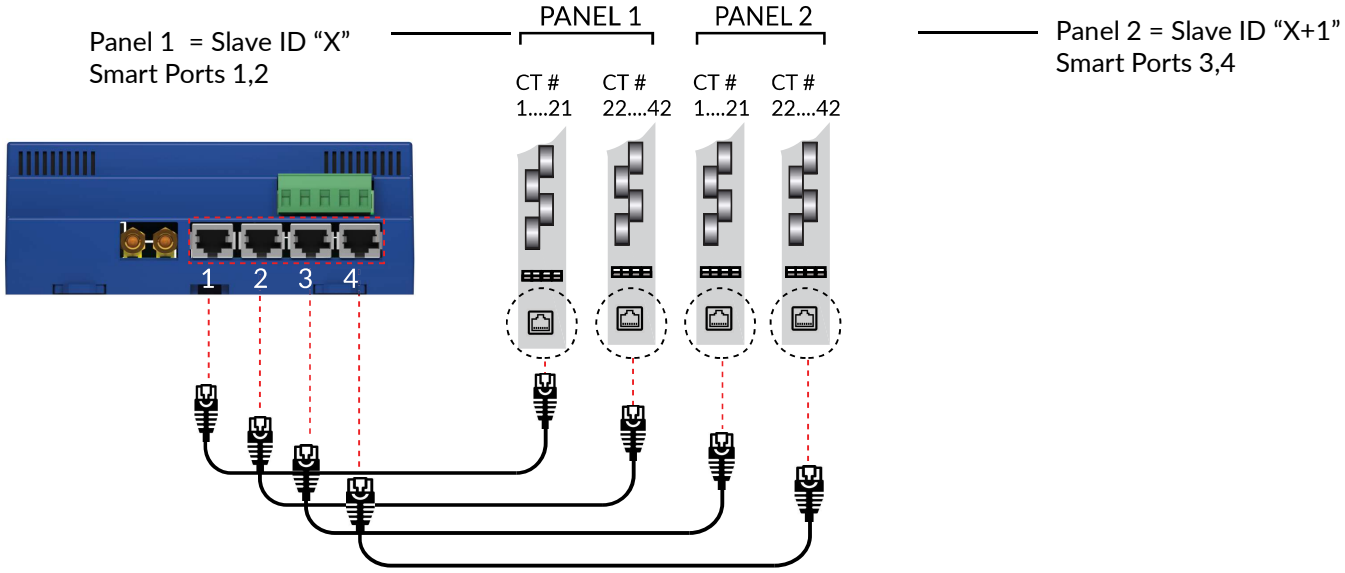


Figure 21: CT strip Smart Port conections

Discovery of CT Strips by the Core Module

Once the CT Strips are plugged into the Core Module and the module is energized, they will automatically be discovered upon power up of the Core Module. A green LED on the CT strip that will indicate if it is discovered and communicating. To be properly communicating the LED will be pulsing at a 1Hz rate.

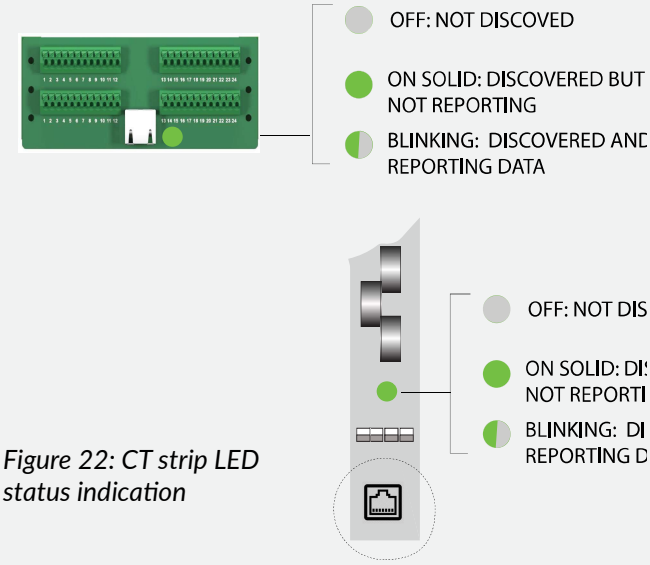


Figure 22: CT strip LED status indication

IMPORTANT: CT Strips and Cards can only be discovered upon power up of the Core Module. Plugging in a new Strip or Card when the Core Module is energized will require power cycling of the Core Module.

Voltage Input / Electrical Connections

⚠⚠ DANGER	⚠⚠ DANGER
HAZARD OF ELECTRIC SHOCK, EXPLOSION, OR ARC FLASH · While removing or installing panels and covers, assure that they do not contact an energized bus. · NEVER bypass external fsing. · NEVER short the secondary of a potential transformer. · Before closimg covers and doors, carefully inspect the work area and remove any tools, wire scraps or other objects that may have been left inside the equipment. **Failure to follow these instructions will result in death or serious injury.**	**RISQUE DE CHOC ÉLECTRIQUE, EXPLOSION OU ARC FLASH** · Lors du retrait ou de l'installation des panneaux et des capots, assurez-vous qu'ils ne touchent pas un bus sous tension. · NE JAMAIS contourner la recherche externe. · NE JAMAIS court-circuiter le secondaire d'un transformateur de potentiel. · Avant de fermer les capots et les portes, inspectez soigneusement la zone de travail et retirez les outils, bouts de fil ou autres objets éventuellement restés à l'intérieur de l'équipement. **Si ces précautions ne sont pas respectées, cela entraînera la mort ou des blessures graves.**

The Core Module must be connected to the voltage source being monitored. The Voltage Input terminal serves as the both power source to the monitor and voltage sensing. All phases that are to be monitored must be connected. The current consumption of the monitor will not exceed 0.2 A at any operational voltage. **The monitor is fused internally but additional fusing may be required per local and national codes.** Inline fuses are available from Senva.

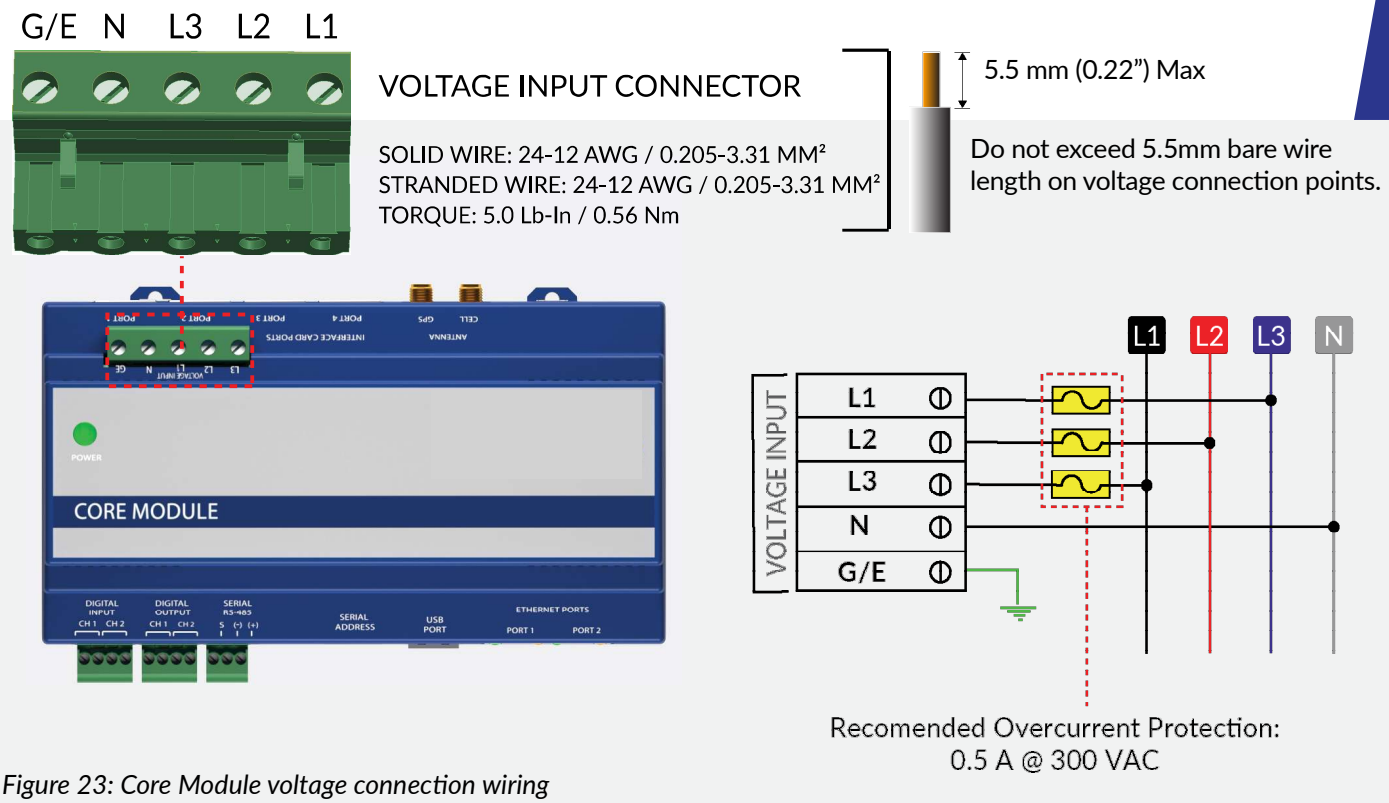


Figure 23: Core Module voltage connection wiring

ACCEPTABLE WIRING CONFIGURATIONS

The monitor may be connected to any wiring configuration shown in figure xx except for corner grounded delta circuits.

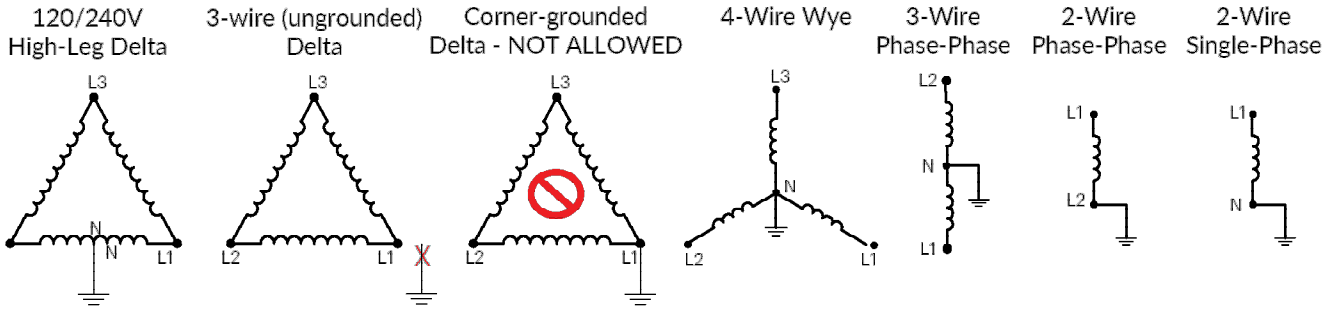


Figure 24: Core Module acceptable wiring configurations

Serial Communications

The Core Module supports both Modbus TCP/IP and Modbus RTU serials communications.
Connect the shielded 2 wire cable to the 2-wire Modbus RS-485 network with the serial interface jack.
Mechanically secure the RS-485 cable(s) where they enter the electrical panel.
Connect serial cable(s) from the RS-485 loop to the serial connector on the Core Module. Connect all RS-485 devices in a daisy-chain, and properly terminate the chain as shown on figure xx.
Follow all applicable wiring and termination connection guidelines for the standard in use.

Note that while both the Modbus RTU standards identify requirements for RS-485 line polarization/bias and termination, the value and placement of these resistors varies for each standard. The Core Module does not implement any RS-485 line polarization/bias or termination internally. For the RS-485 cable, use shielded, twisted-pair wire that is voltage-rated for the installation. The shield is not internally connected to Earth Ground. Connect the shield to Earth Ground somewhere on the RS-485 bus (single point connection only).

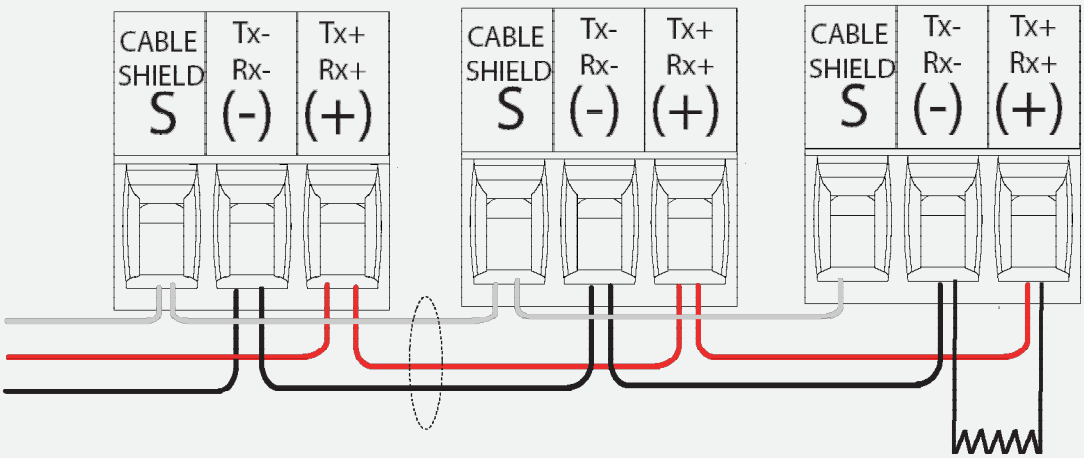


Figure 25: Serial communications wiring

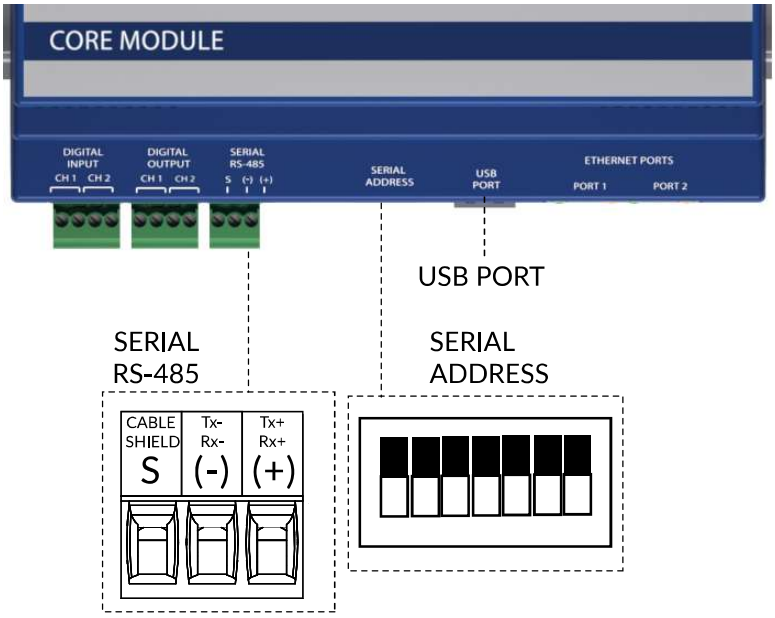


Figure 26: Serial communications port and serial DIP switch address settings locations

Ethernet Communications

The Core Module s equipped with dual managed Ethernet ports. Either port can be used to communicate with the device. The free or open port can be used to link additional Core Modules or other third party Ethernet devices to the network. To configure the IP settings see the configuration.

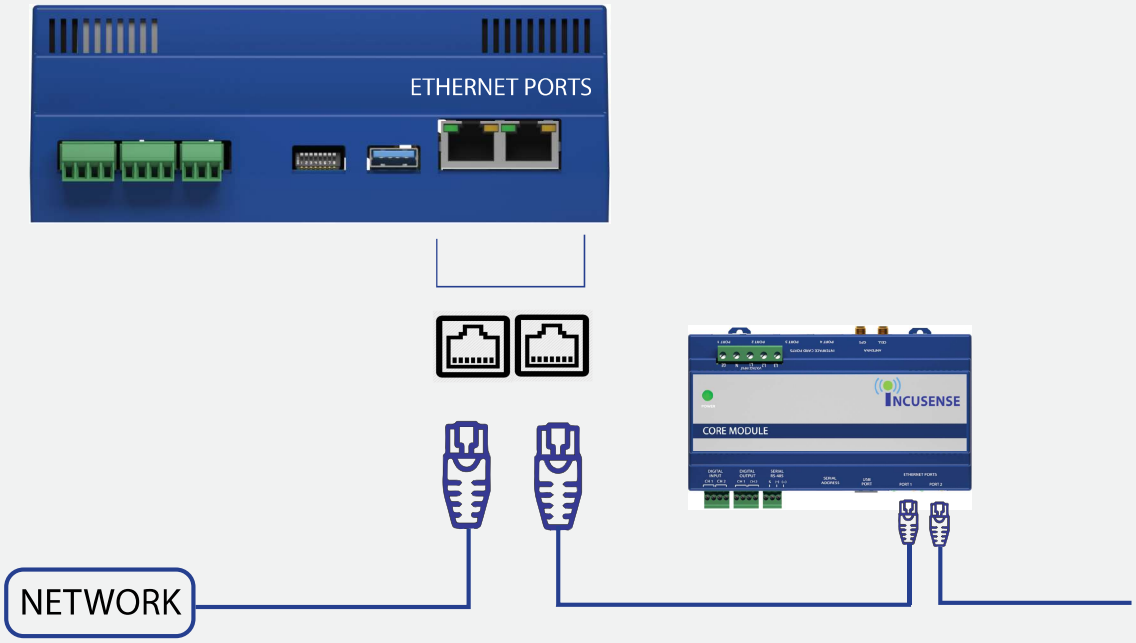


Figure 27: Ethernet port wiring

Configuration of Core Module Settings

CONFIGURATION METHODS

The Core Module can be configured in three different ways:

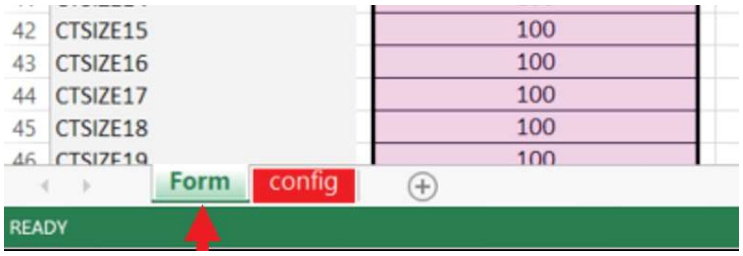
1. Via the USB Interface using a USB Flash Drive with the Configuration File / spreadsheet. ***This is the recommended and most flexible method.***

2. Using the onboard Web Console by directly access the Core Module over an Ethernet connection with a standard HTML browser via IP access to the monitor using a network or direct Ethernet connection. This method is currently limited to changing only communications settings.

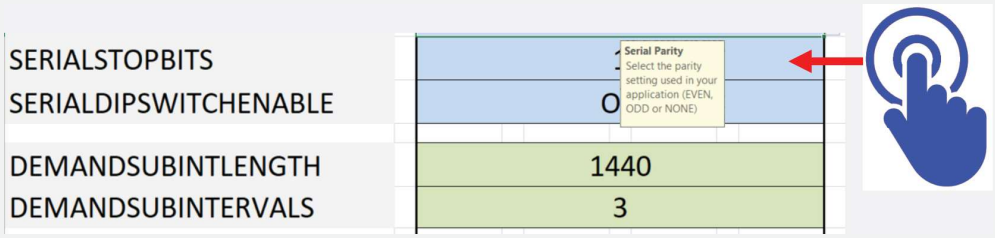
3. Writing to Modbus registers using a Modbus utility

CONFIGURING VIA THE USB INTERFACE USING THE SPREADSHEET APPLICATION

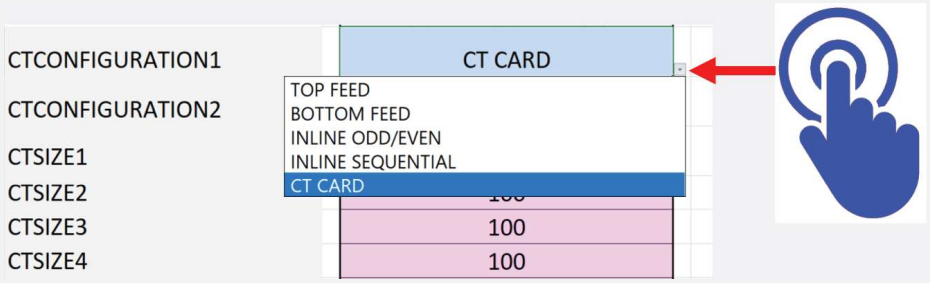
Open the spreadsheet “Core Module Configurator” using Microsoft Excel. Make sure to select the spreadsheet tab “FORM”



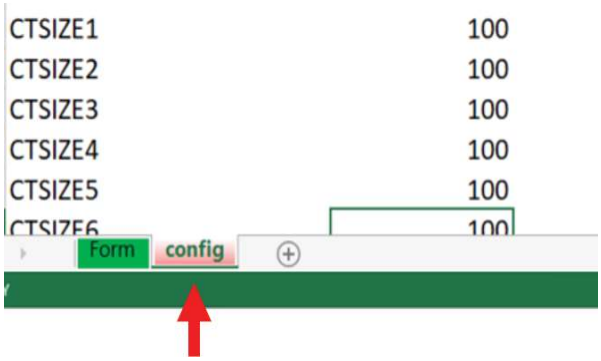
Follow the instructions on the sheet and make any required changes to the fields highlighted in color. Explanations for these fields will be visible when the cursor hovers over the field.



Light blue fields will have a drop down menu, while olive and pink colored fields will require a direct entry. Always view the notes field to find the entry parameters for directions.

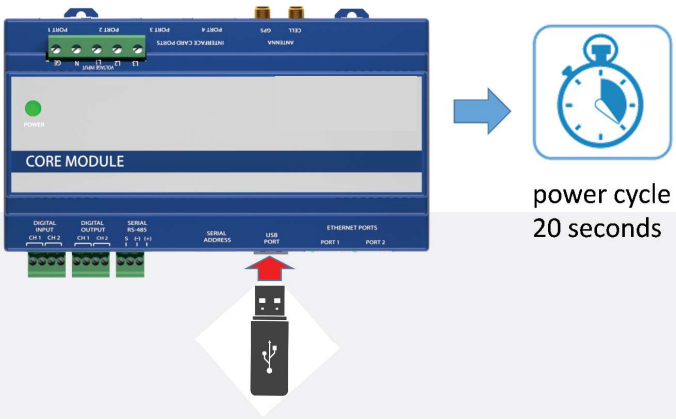


When all data entry is complete, select the red “CONFIG” tab spreadsheet and save the sheet as a comma delimited text file (.csv) using the file name “config”. The resulting file will be saved as “config.csv”.



Save as “config.csv”

Transfer the file onto a USB flash drive or save directly to the flash drive. Place the USB flash drive into the USB port of the Core Module. If the Core Module is energized it will need to be power cycled. Once the Core Module is energized wait 20 seconds and the configuration data will automatically be extracted from the .csv file.



CONFIGURING VIA THE ONBOARD WEB CONSOLE

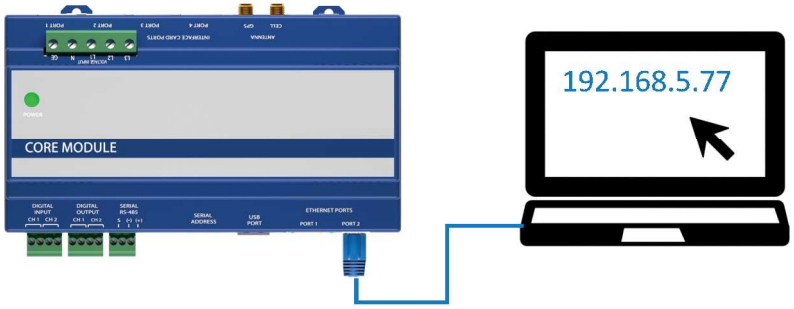
The onboard web console may be used to configure the serial or Ethernet communications parameters but advanced configuration must be done using the spreadsheet or directly via a Modbus communications utility. The web console also gives a real time view of device readings allowing it to be used for confirmation of proper operation.

1) Connect either Ethernet port of the Core Module to an accessible network or directly to the Ethernet port of a PC. Note that some PCs configured with security features may not permit direct connection of an end user device.

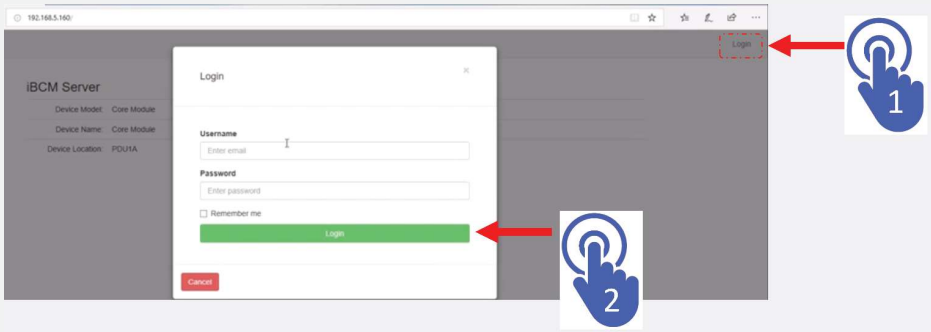
2) Using a standard web browser, enter the IP address of the Core Module and select the [Network] tab on the web console. The default IP address is 192.168.5.77

3) If the web console of the Core Module does not appear, ping the IP address using the windows command line prompt “ping_ 192.168.5.77” to confirm the communications link.

4) When the web console appears click on the login tab on the top right corner then click on the green “login” button. Note that there is no user name or password for the default configuration.



Use the default login of “admin” and default password of “admin”. This may be changed as required.



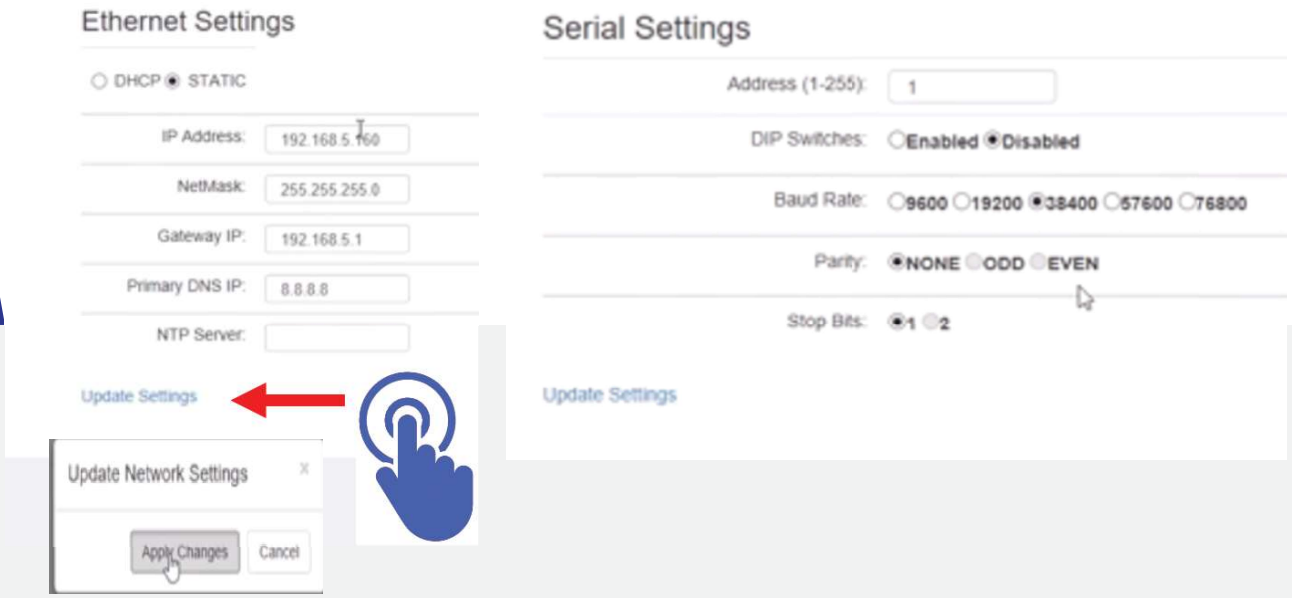
The web console screen will have a menu with four tabs located at the top of the screen:

MAIN TAB:

The Main Status page lists the device (Core Module) specifics including the user defined parameters “Device Name” and “Device Location” as well as firmware version and MAC Address.

NETWORK TAB:

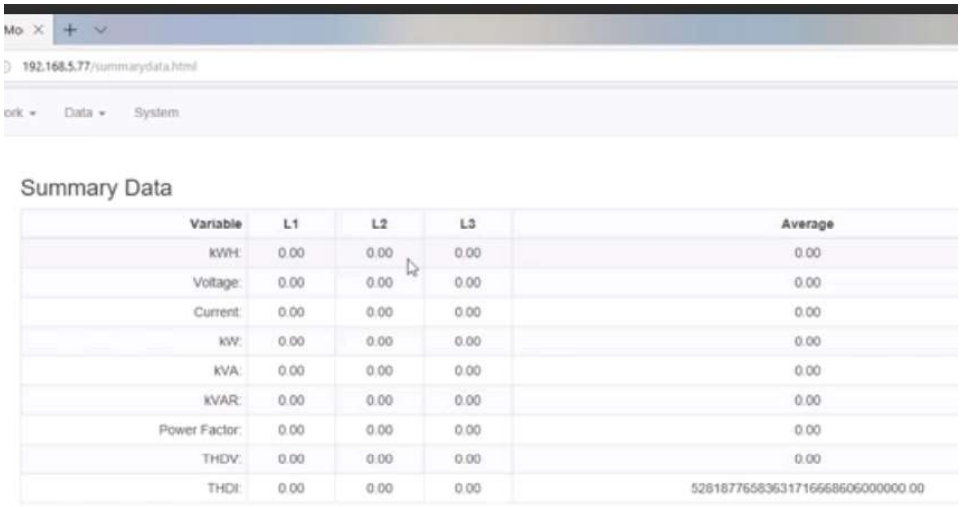
The Network tab is has two sub tabs [Ethernet] and [Serial] which define the respective communication ports. Select either Ethernet of Serial settings from the drop down menu. Make the appropriate modifications depending on your network settings.

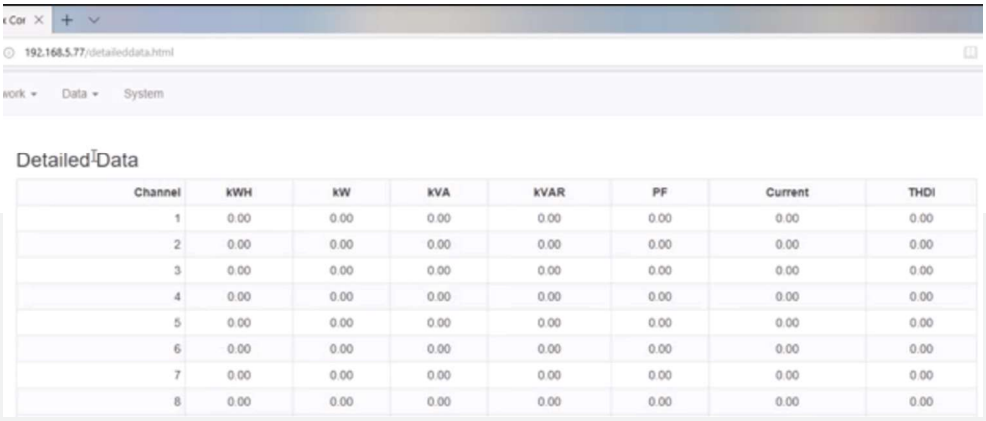


To save the settings click on the “Update Settings” hyperlink at the bottom of the page then click apply changes.

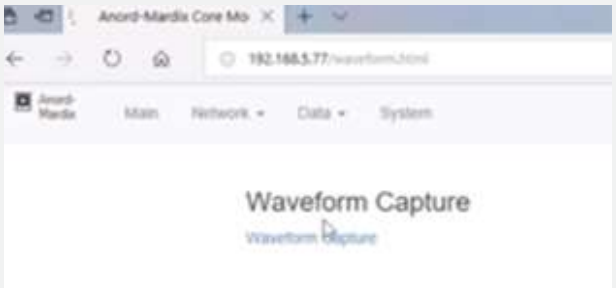
DATA TABS:

The Data tab provides access to real time data from the monitor. This is separated into a “Summary Data” page which provides an overview of main input power and a “Detail Data” page which provides details on each circuit being monitored.





It is also possible to trigger manual waveform captures using the Waveform Capture function on the Waveform Capture page. The resulting data are waveforms for each channel will be stored as a .CSV file. These can be viewed graphically using the waveform graphing template.



CONFIGURING VIA DIRECT MODIFICATION OF THE CSV FILE

The “configuration.csv” file can be opened with any text editor or spreadsheet application. The initial text in all capitals refers to the field followed by a comma and the configuration value. These values may be changed manually and the file saved. It can then be loaded into the Core Module by power cycling the device with the USB drive installed. Note that the file must be saved as “config.csv”.

If the config.csv file is not present it can be generated by opening the “Core Module Configuration.xls” file and go to the “Config” tab and save the file as “config.csv”.

```
ADMIN_NAME,admin
ADMIN_PASSWORD,admin
DEVICE_NAME,Core Module
INSTALL_LOCATION1,East Building
INSTALL_LOCATION2,West Building
,
DHCP,0
IPV4ADDRESS,192.168.5.77
IPV4DNS1,8.8.8.8
IPV4GATEWAY,192.168.5.1
IPV4MASK,255.255.255.0
IPV4NTP,pool.ntp.org
```