SPIRE METERING TECHNOLOGY

wPrime ™ Series 280W-CI2/CI4

Ultrasonic Water Meter
User's Manual and Installation Guide

<UM280W-CI2/CI4-0222>

（DN50、DN65、DN80、DN100、DN125、DN150、DN200、DN250、DN300）

I. General

The wPrime Series 280W-CI is a metering instrument to continuously measure, record and display volume of water flowing through sensors by use of ultrasonic time difference methodology.

Please read this manual carefully before use, in order to achieve best meter performance.

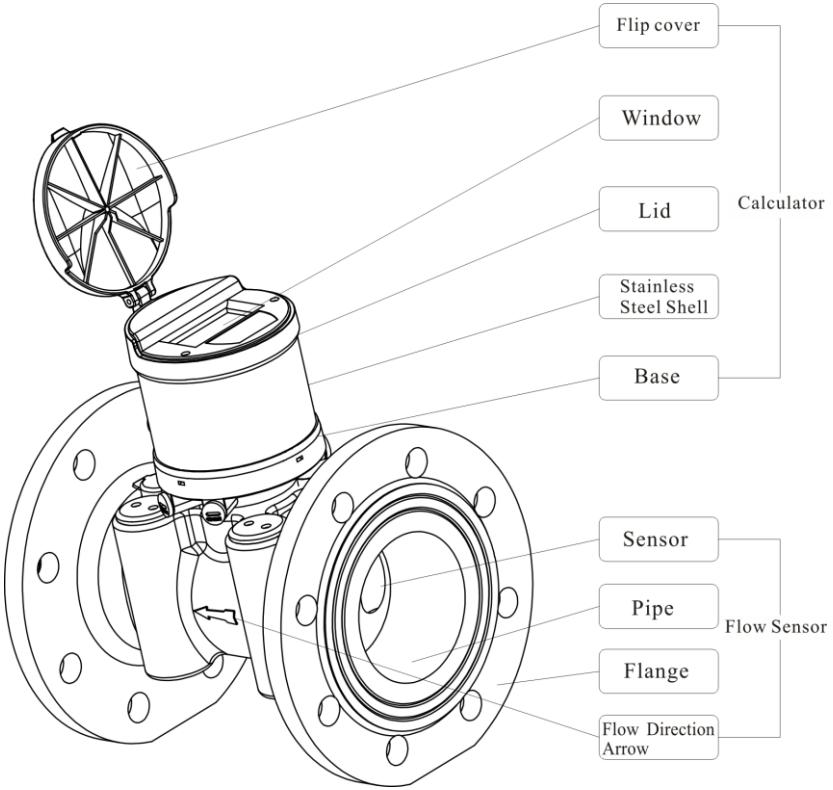
Features:

- ✧ Not affected by impurities, chemicals, and magnetic materials in medium.
- ✧ No moving parts in the measuring mechanism, free from wear and tear, and accuracy does not degrade over the life of the meter.
- ✧ Ability to mount horizontally or vertically.
- ✧ Low pressure drop.
- ✧ Utilizes German-made time measurement chip GP22 that achieves accuracy of 22 psec.

II. Composition

The meter is composed of flow sensor, calculator, pipe fittings, etc., detailed as follows.

- ✧ DN50-DN300 Ultrasonic Water Meter

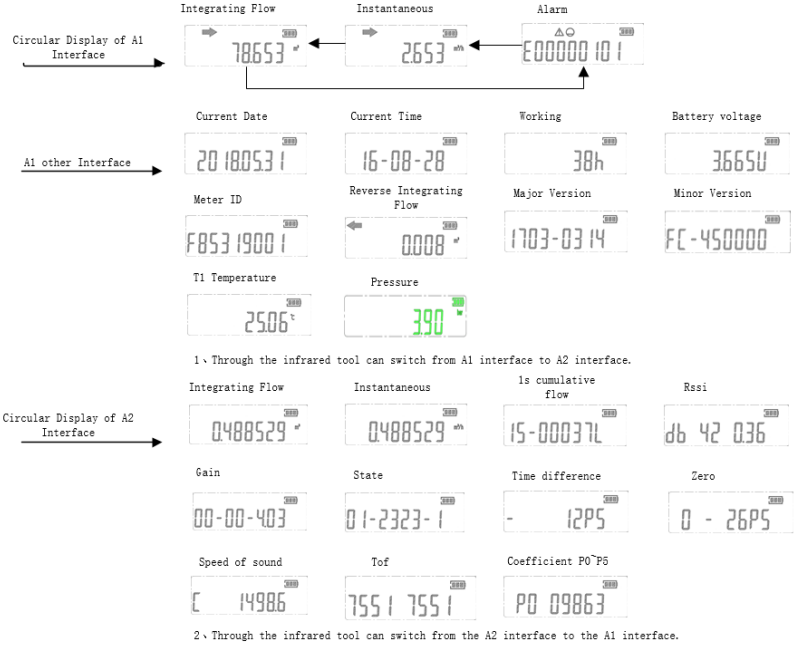

Flip cover
Window
Lid
Stainless Steel Shell
Base
Calculator
Sensor
Pipe
Flange
Flow Direction Arrow
Flow Sensor

III. Display Functions

wPrime ™ Series 280W-CI2/CI4 Ultrasonic Water Meter has two main display interfaces:

- ✧ User Interface (A1 Interface):
- ✧ Testing Interface (A2 Interface):

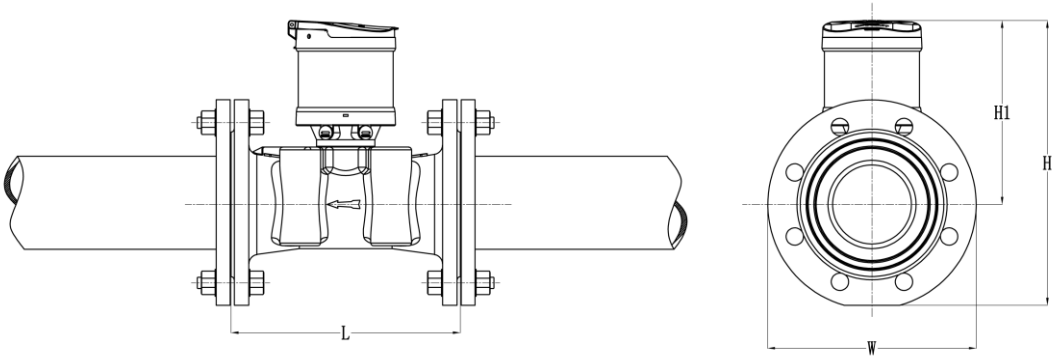
Their respective display contents and switch mode between interfaces are shown as follows:



Note: 1. At 00:00:00, it will automatically jump from the A2 interface to the A1 interface for cyclic display.
2. The display interface of the meter is subject to change for customization or upgrading.

IV. Technical Parameters

✧ DN50-DN300 technical parameters



Nominal Diameter		DN50	DN65	DN80	DN100	DN125	DN150	DN200	DN250	DN300
Dimensions	L	200	200	225	250	250	300	350	450	500
	W	165	182	201	221	245	284	340	404	460
	H1	224	229	231	235	257	254	273	327	345
	H	300	310	320	335	370	385	434	530	575
Nominal Flow (m^3/h)		25	40	63	100	160	250	400	630	1000
Transitional Flow Q_2(m^3/h)		0.16	0.25	0.4	0.64	1	1.6	2.56	4	6.4
Min Flow Rate Q_1 (m^3/h)		0.1	0.16	0.25	0.4	0.64	1	1.6	2.56	4
Sound Path		Dual-path			Quad-path					
Pipe Joint		Flange (Default: DIN)								
Accuracy Class	2	Environmental Severity Class	C	Environmental Class	A or B					
Range	Q_3/Q_1=250	Electromagnetic Class	EI	Pressure Loss Class	△p63					
Pressure Class	MAP16, MAP10	Flow Field Sensitivity Class	U5/ D3	Temperature Class	T30, T50					

Note: The above technical parameters are subject to change for customization.

V. Order Specifications

wPrime ™ Series 280W-CI2/CI4 Ultrasonic Water Meter:

280W – CI2 – [ ] – [ ] – [ ] – [ ] – [ ]

Meter Size

Metric Unit System	English Unit System
DN50	IN2
DN65	IN2.5
DN80	IN3
DN100	IN4
DN125	IN5
DN150	IN6
DN200	IN8

Communication Interface

Serial TTL (Default)	0
M-Bus	1
RS485 / Modbus	8
Dual Pulse (dry contact, requires 9~12 VDC power)	A
RS485 / Modbus + 4~20mA	9

Sensor Body Material

1	Ductile Iron

Dynamic Range

B	250 (Default)

Flange / Body Pressure

0	DIN Flange / PN16 (Default)
1	ANSI Flange* / RF150#

280W – CI4 – [ ] – [ ] – [ ] – [ ] – [ ]

Meter Size

Metric Unit System	English Unit System
DN50	IN2
DN65	IN2.5
DN80	IN3
DN100	IN4
DN125	IN5
DN150	IN6
DN200	IN8
DN250	IN10
DN300	IN12
DN350	IN14
DN400	IN16
DN450	IN18
DN500	IN20
DN600	IN24

Communication Interface

0	Serial TTL (Default)
1	M-Bus
8	RS485 / Modbus
A	Dual Pulse (dry contact, requires 9~12 VDC power)
9	RS485 / Modbus + 4~20mA

Sensor Body Material

1	Ductile Iron (DN200 and below)
2	Carbon Steel (DN250 and above)

Dynamic Range

B	250 (Default)
E	500

Flange / Body Pressure

0	DIN Flange / PN16 (Default)
1	ANSI Flange* / RF150#

***Note:**

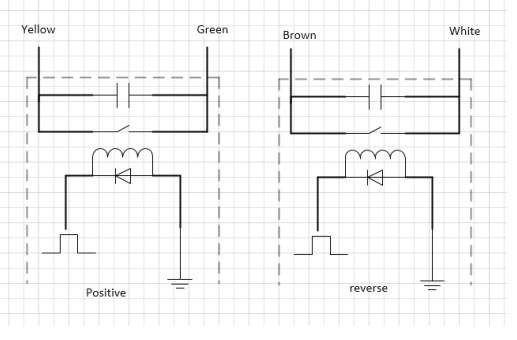
• The actual outer diameter and thickness of the water meter flange are slightly smaller than the ANSI flange standard. All other parameters of the flange comply with the ANSI standard.

VI. Interface/Communication

The 280W-CI2/CI4 will have one of the many optional outputs pre-selected when placing the order. This section will describe each output:

- Pulse output
- MBus output
- Modbus/BACnet/RS485 output
- Analog output
- Wireless output

Pulse Output (Battery Powered)

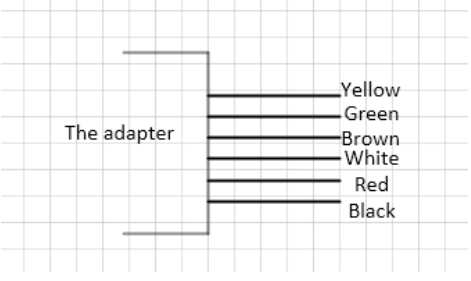


Four wires, Yellow: PP+, Green: PP-, Brown: PR+, White: PR-

Wire Size: AWG22

Pulse Output (External Power Supply)

This opto-isolated digital output is a dry reed pipe pulse. The allowable voltage range for the pulse is 5-24 VDC. Consult the instrument representative or Spire Metering if you are uncertain as to the proper diagram interpretation and wires details:



Six wires, red: VDC (12-24V), black: GND, white: PR+, Brown: PR-; yellow: PP+, Green: PP-

Wire Size: AWG22

The following are the relevant parameters of the pulse:

Parameter	Range of values	Default(<=DN25)	Default(<=DN40)	Default(<=DN80)	Default(<=DN150)	Default(<=DN300)	Default(<=DN600)	Default(=DN1000)
Update cycle	8s~3600s	60s	60s	60s	60s	60s	60s	60s
pulse width(ms)	10ms~1000ms	20	20	20	20	20	20	20
Pulse interval(ms)	50ms~4000ms	100	100	100	100	100	100	100
Pulse single amount(metric)	2m³ 1m³ 500L 100L 30L 10L 2L	2L	10L	30L	100L	500L	1m³	2m³
Pulse single amount(GAL, AWWA)	300GAL 150GAL 40GAL 10GAL 3GAL 0.5GAL	0.5GAL	3GAL	10GAL	40GAL	150GAL	300GAL	

MBus/BACnet Output

The M-Bus uses two wire cables which are going from the M-Bus Master / Repeater to each

M-Bus device (bus structure). The M-Bus is polarity independent and needs no line termination resistors at the end of the cables.

Any cable type may be used as long as the cable is suitable for 42 V / 500 mA. Shielding is not necessary and not recommended since the capacity of the cable should be minimized.

In most cases a standard telephone cable is used which is a twisted-pair wire with a diameter of 0.8 mm each (2 x 0.8 mm). This type of cable should be used for the main wiring. For the wiring to the meters from the main wiring (last 1 … 5 m to the meter) a cable with smaller diameter may be used.

The M-Bus system is a European instrument “bus” standard designed for domestic metering devices, such as water meters, heat/water meters, gas meters, etc., to communicate with data centers. The “bus” simply uses two non-polarized wires to achieve a variety of options for reliable meter reading, remote diagnosis, remote control, incremental pricing, time-based pricing, batch service, prepaid billing, and more. This ‘bus’ system is both simple and economical to wire and implement.

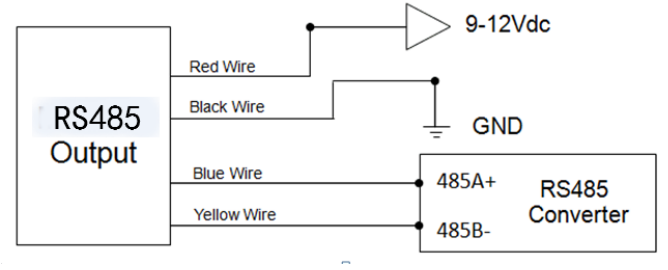
A typical M-Bus AMR system consists of a number of M-Bus utility meters, several M-Bus concentrators, a GSM/GPRS Data Transmitter Unit (DTU) for each M-Bus concentrator, and a data center. The M-Bus Concentrator

communicates with the data center computer through a GSM/GPRS network. The data center first issues a meter reading command and sends it to the network. The DTU receives the command and forwards it to the M-Bus concentrator. Then, the concentrator either replies to the command with requested data or passes the command to its submeters transparently.

Please note that you may not need the DTU unit if you can connect the M-Bus concentrator(s) to your computer directly. Alternatively, you may connect the concentrator(s) to your computer through TCP/IP network by using Ethernet-232 adapters. Similarly, you may connect the concentrator(s) to your BACnet or MODBUS network by using proper adapters.

The 280C Concentrators are used for an AMR system to facilitate the communication between the data center and the M-Bus utility meters of the AMR system. These concentrators support up to 280 meters 280W-CI. A wireless M-Bus concentrator is also available, where the M-Bus concentrator is affixed with a GSM/GPRS data transmitter unit (DTU).

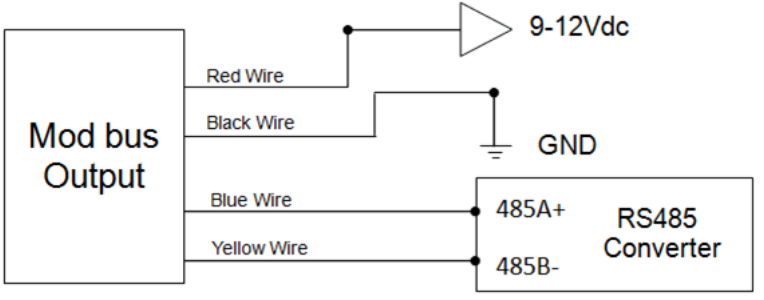
RS485 Output Wiring Connection



Four wires, red: VDC (9-12V), black: GND, blue: TX+, yellow: TX-

Wire Size: AWG22

Modbus Output Wiring Connection



Four wires, RED: VDC（9-12V）, BLACK:GND, BLUE:A+, YELLOW:B-

The 280W-CI2/CI4 meter is equipped with MODBUS serial communications to volume rate data, volume data in a variety of engineering units. You select the engineering units you wish to use by mapping to the appropriate registers.

This document provides a suggested list of registers to use.

Modbus Register Format and Networking Information:

MODBUS RS485, 2-wire (half-duplex) serial output is master/Slave communication architecture with the 280W meter being the slave.

With the MODBUS module option, the 280W supports standard MODBUS protocol:

- Baud Rate: 9600 bps
- Checksum: None
- Data bit: 8 bits
- Stop bit: 1 bit

1. All registers are 16 bit MODBUS Holding Registers.
2. MODBUS Holding Registers are used in 4 different ways.
   - As an Analog Value: In some cases these values are scaled by multiplying the register contents by a fixed multiplier.
   - As a status or mode indicator where the register value can be “1” or “2”...etc.
   - As a control register where the host can write a value.
   - Registers are described below in the registers table.

Modbus Register Table

Register Address	# of registers	Variable Name	Data Type	Notes
0001-0002	2	Flow Rate	LONG	*

0003-0003	1	Flow Rate Unit	INTEGER	*
0004-0005	2	Power	LONG	*
0006-0006	1	Power Unit	INTEGER	*
0007-0008	2	Flow Total	LONG	*
0009-0009	1	Flow Total Unit	INTEGER	*
0010-0011	2	Heat Energy Total	LONG	*
0012-0012	1	Heat Energy Total Unit	INTEGER	*
0013-0014	2	Cold Energy Total	LONG	*
0015-0015	1	Cold Energy Total Unit	INTEGER	*
0016-0017	2	T1 /Supply Temp	LONG	x0.01degC
0018-0019	2	T2 /Return Temp	LONG	x0.01degC
0020-0020	1	State	INTEGER	
0021-0022	2	Working Time	LONG	Unsigned. second
0023-0024	2	Clock	BCD	Writable. 3bytes BCD for second, minute and hour. Low on left
0025-0026	2	Date	BCD	Writable. 4bytes BCD for day, month and year. Low on left

0027-0027	1	4-20mA output current value	INTEGER	x0.01mA
0028-0029	2	Flowrate/Energy rate at 4mA	LONG	Unit similar to (0003)
0030-0031	2	Flowrate/Energy rate at 20mA	LONG	Unit similar to (0006)
0032-0032	1	Size	LONG	mm (saved in flash)
0033-0034	2	SN#	BCD	High on left
0035-0035	1	MODBUS ADDR	INTEGER	Writable (saved in flash)，default 1
0036-0036	1	Meter Type	INTEGER	BIT0=0:water meter BIT0=1:heat meter (saved in flash)
0037-0037	1	Comm Mode Select	INTEGER	Writable. 0 - 9600/MODBUS （Default）; 1- 2400/Mbus**
0038-0038	1	Firmware Version	INTEGER	Hex

Data Format

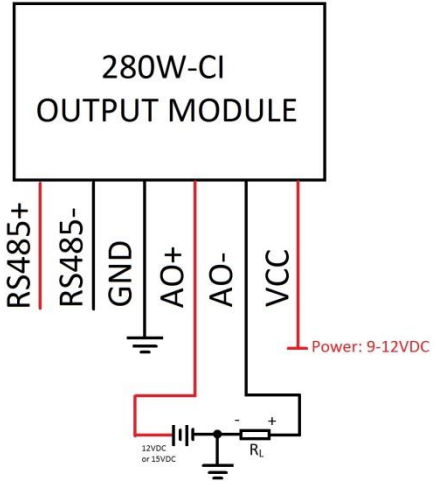
For LONG data, it has 32bits. Thus, two registers are used to store a LONG. The first register (lower address) is for the lower 16bits of the data. The second register (higher address) is for the higher 16bits of the data.

**** Use factory software to change the communication protocol. If you set the Communication Mode to 1, and set the duration to 6556, then the meter will switch to M-Bus protocol. Resetting the external power will switch the mode back to MODBUS protocol.**

Analog Output

The current output is passive 4-20 mA. 4 mA is always “0” (zero) flow and the 20 mA is factory programmable at the max flow rate of the meter.

Below is the diagram showing the wiring details:



4-20mA output diagram

Wireless Output

The 280W-CI2/CI4 could be remotely monitored with its robust and reliable wireless module. This module can be RF (for short distances, less than 2K feet), GPRS or GSM. All the data can be monitored and analyzed using our software.

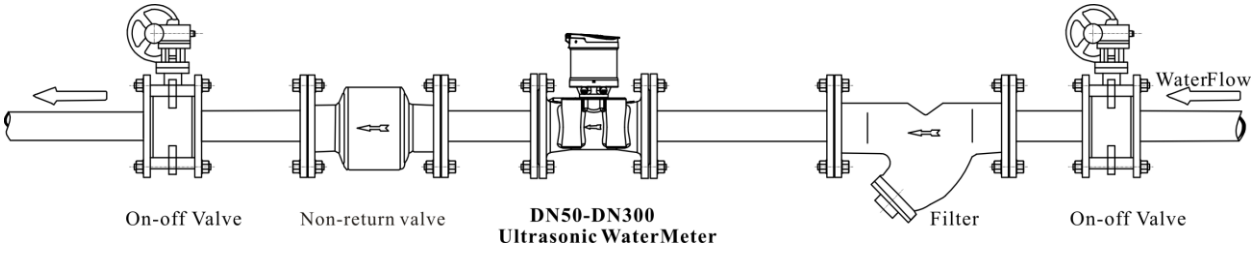
For details on the wireless interface, please consult with our tech support department by phone at +1978-263-7100 or by email at support@spiremt.com.

VII. Notices for Installation

- ✧ Flush pipes before installation to avoid gravels and other foreign objects.
- ✧ Install a valve and filter before the water meter.
- ✧ Do not touch the electrical part or pull wires to avoid damage during installation.
- ✧ Reserve an adequate space for maintenance during installation.
- ✧ When the water meter is installed in a horizontal or inclined way, the ultrasonic flow probe on pipes shall be placed horizontally, and when installed in a vertical way, make sure the water flows from down to up.
- ✧ Please note that the arrow direction on the pipe shall be consistent with the water flow direction during installation.
- ✧ During installation, avoid misaligning the joint washer as it may block flow and affect accuracy of the water

meter.

- ✧ The water meter shall not be installed at the place that may be affected by strong mechanical vibrations.
- ✧ Installation Figure:



Special Notices:

1. Be sure to install an on-off valve and filter before the water meter and another on-off valve is recommended after it for maintenance.

2. If the ultrasonic water meter is installed through flange, make sure the parallelism between water meter flange and pipe flange is not more than 0.5% of flange outer diameter and is less than 2mm, otherwise it may result in damage to the water meter.

- ✧ Ensure 5 times and 3 times of straight pipe run before and after the water meter, respectively, during installation.
- ✧ Do not test the water meter until the testing arrow flickers.
- ✧ The water meter shall refresh the display at every 8 seconds and read the water meter (including the starting value and end value) 8 seconds at least after the valve is closed when test the water meter, otherwise the

testing results may be affected.

- ✧ Please make sure the medium flow is within the flow range of the water meter during test and use, otherwise it may result in damage to the water meter.
- ✧ In case of any malfunction (e.g., metering failed) during use, please contact the manufacturer and do not attempt repair.
- ✧ The product is designed with a disposable anti-disassembly seal which shall be removed only by appointed personnel, or otherwise it shall void the warranty and compromise after-sales service.

✧ **Warning:**

The product contains disposable lithium batteries which shall be removed and replaced only by appointed personnel. If the batteries are replaced with incorrect ones, cut open or exposed to conductive materials, liquid, or high temperature (higher than 55℃), etc., it may result in an explosion or personal injury. Please follow the local regulations to dispose the discarded or damaged batteries.

VIII. Product Recovery and Environmental Protection

✧ For the purpose of environmental protection, we are making every effort to ensure that all materials used in the product can be recovered in an environmental-friendly way.

✧ Disposal by Recovery Department: users can send the complete product to be recovered to the national\local recovery/recycling department with the below material disposal recommendation form.

✧ Dispose by User: dismantle the product according to the material disposal recommendation form, and then send the dismantled parts to the national/local recovery department.

Material Disposal Recommendation Form:

S/N	Name	Material	Recommended Disposal	Remark
1	Lithium Battery	Lithium thionyl chloride	Specialized battery recovery	
2	Printed Circuit Board	Copper-plating epoxy resin laminate	Scrap metal recovery	
3	LCD	Glass and liquid crystal	Specialized LCD recovery	
4	Shell	Stainless steel	Scrap metal recovery	
5	Pipe	Ductile iron	Scrap metal recovery	
6	Other Plastic Parts	Plastic-injected plastic	Plastic recovery	
7	Package	Tri-wall corrugated paper	Paper board recovery	

IX. Technical support

Any questions, please contact:

Tel: +1 978 263 7100 Fax: +1 978 418 9170

Email: support@spiremt.com