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Connecting. Converting. Leading!

USER MANUAL FOR SC15L / SC15L APS

Table of Contents

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1. Introduction

LoRa devices SC15L, SC15L241 and access point SC15L APS are ideal for machine monitoring and sending sensor data using LoRa wireless technology over long range. SC15L is a LoRa device which connects transparently to the SC15L APS access point. SC15L241M sends IO data or field Modbus slave devices data to the SC15L APS, which gives output in Modbus RTU interface for monitoring. SC15L APS is used in 2 modes viz. Transparent and Modbus RTU Slave depending on application requirement.
GW IoT EL and GW IoT G8L are Ethernet and Cellular IoT LoRa gateways respectively which are used for sending data received from SC15L241M to the Cloud. Hundreds of sensors can be clustered together on single network and data can be aggregated at central monitoring system. This system is used in industrial applications for reading analog and digital inputs.

2. Features

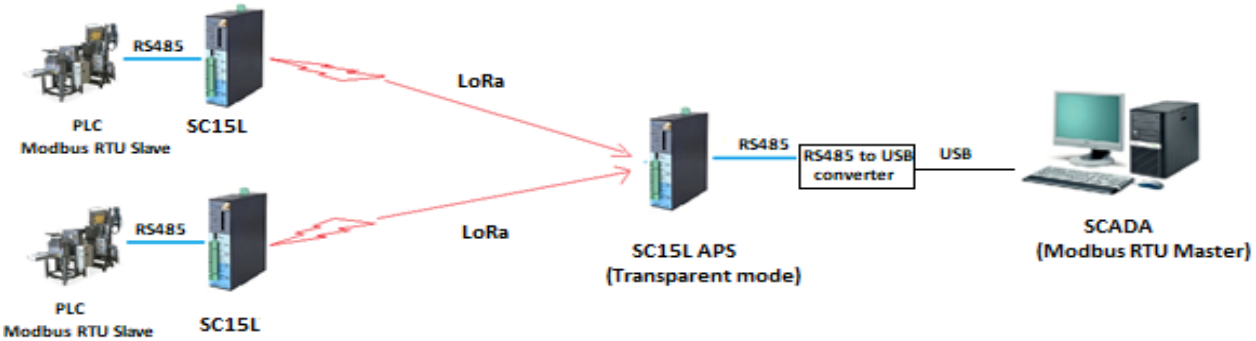
- SC15L241 supports 2 Analog Inputs (4-20mA), 4 Digital Inputs (Potential Free) and 1 Digital Outputs (Potential free).
- SC15L supports RS485 port two wires and RS232 interface.
- Robust design with DIN rail mounting and wall mounting enclosure
- Industrial Screw type Power Terminal block for 12V DC operation
- Communication:
  - Frequency Band: 867 MHz
  - Outdoor/RF Line-of-Sight Range: 3.5km
  - Transmit Power: Up to 20dBm (100mW)
  - Receiver Sensitivity: -140dBm at bits: 8
- Antenna connector: SMA female type, the characteristic impedance of 50 ohms

System will need this gateway to be paired with any one of receiver LoRa gateways or routers.

3. Operation

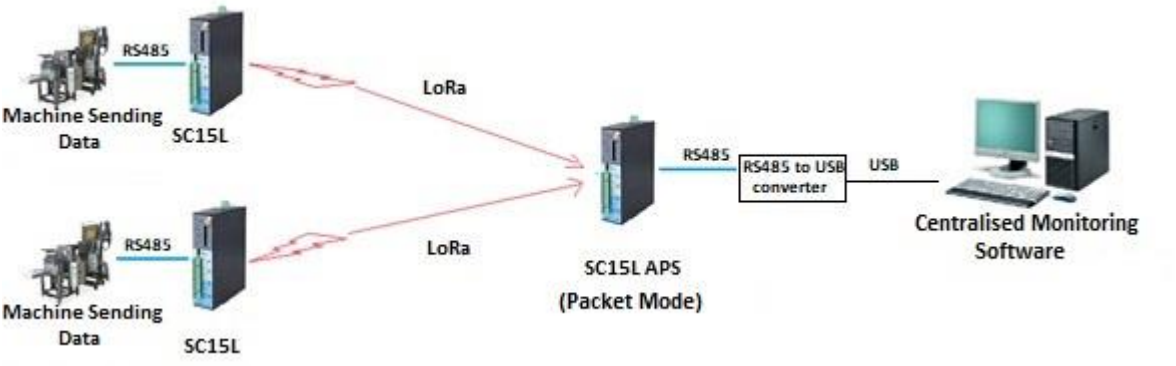
3.1 Transparent mode:

In this mode SC15L device will connect to a specific SC15LAPS device, both devices will be in same transparent mode. SC15L/SC15LAPS device will transmit serial data to other connected device transparently SC15L APS will broadcast the serial data received on its serial port to all connected SC15L devices in the network and all SC15L devices will transmit their serial data to access point (SC15LAPS).



3.2 Packet mode:

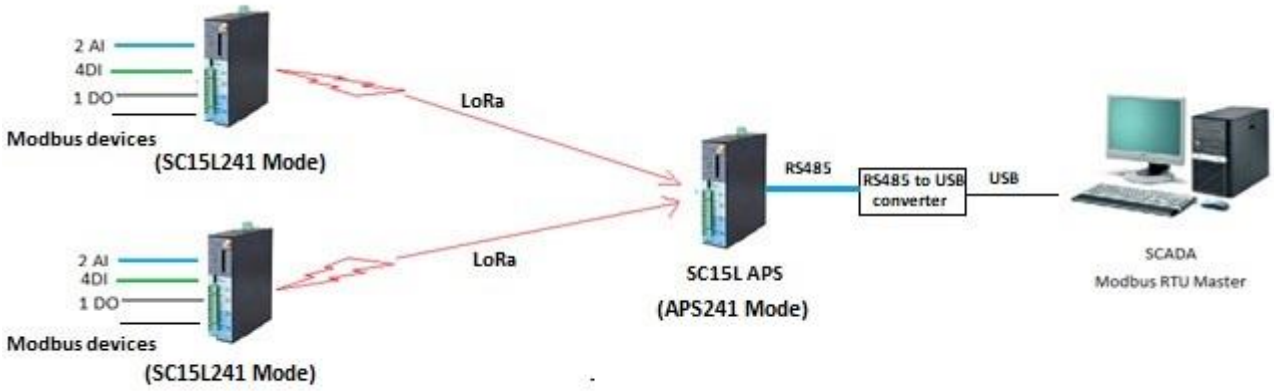
In this mode SC15L device will send data on serial port transparently. Data received at access point will contain the unique device ID of transmitter device (SC15L). One SC15LAPS will receive data from SC15L with their specific Device ID which will help user to bifurcate data and arrange it accordingly.



3.3 SC15L241/APS241 mode:

In this mode APS device will work as MODBUS slave, in which SC15LAPS will receive status/data of IO of different SC15L devices connected in the network, then it will aggregate all data in a memory map and give response to the master device connected to it.

When SC15LAPS is in APS241 mode then it will act as a slave device with a specific Slave ID as entered by user. Master device connected to serial port of APS will send required query for that specific Slave ID. If the Slave ID is different in the query then SC15LAPS will transmit query wirelessly to all connected SC15L devices and the received response of SC15L will transparently transmitted to serial port of SC15LAPS.



- Function Code 01: To read the current status of Digital Output with respect to their device ID
- Function Code 02: To read the current status of Digital Inputs with respect to their device ID.
- Function Code 03: To read the current status of Analog Inputs with respect to their device ID.
- Function Code 05: To operate DO with respect to their device ID.

4. Connection Details

Console:
Serial Interface
Interface:
RS-232
No. of Ports: 1 Port
Connector: 3 Pin Screw Type

PIN no.	PIN details
1	TX
2	RX
3	GND

RTU:
No. of Ports: 1 Port
Interface: RS- 485 (2-Wire)
Connector: 2 Pin Screw Type

PIN no.	PIN details
1	D+/TX
2	D-/RX

Power Requirements:
Power Input: 12V DC, 1A
Connector: 3 Pin Screw Type

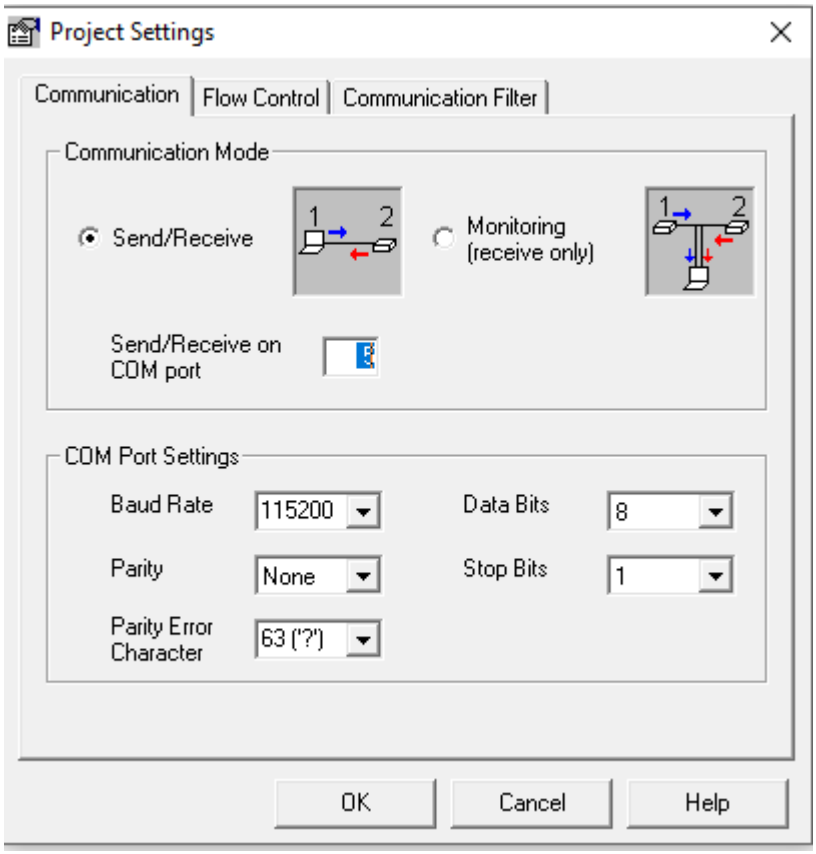
PIN no.	PIN details
1	+Vin
2	-Vin
3	Earth

5. Configuration

Connect RS485/RS232 connector of SC15L/SC15L APS to the PC.

5.1 Docklight Setting:

Open Project setting in your Docklight then change the COM PORT name to COM PORT of the connected device.



Select Baud Rate, Parity and Stop Bits as per previously stored data while configuration and keep Data Bits 8(fixed).

Note: Default Serial Parameters are:

- Baud Rate = 115200
- Parity = None
- Stop Bits = 1

5.2 Device Configuration:

- After completing docklight setting connect Power to your Device.
- “System Started” message will print on your docklight window.
- LED will Glow for 30 Sec. within this 30 Sec enter “UUU” in docklight window through keyboard.
- Start message will display on screen along with main menu.

SC15L

```
**************************************************<CR>
* Product description: SC15L                  *<CR>
* Firmware version    : 1.00                 *<CR>
* Manufacturer        : SAN Telequip Pvt. Ltd.   *<CR>
* website             : www.santelequip.com      *<CR>
**************************************************<CR>
Select Main Menu<CR>
<CR>
1 - Mode of Work<CR>
2 - System Settings<CR>
3 - Serial Port <CR>
E - Save & Exit <CR>
<CR>
Enter <1-3/E>   <CR>
```

SC15L APS

```
**************************************************<CR>
* Product description: SC15LAPS               *<CR>
* Firmware version    : 1.00                 *<CR>
* Manufacturer        : SAN Telequip Pvt. Ltd.   *<CR>
* Website             : www.santelequip.com      *<CR>
**************************************************<CR>
Select Main Menu<CR>
<CR>
1 - Mode of Work<CR>
2 - System Settings<CR>
3 - Serial Port <CR>
E - Save & Exit <CR>
<CR>
Enter <1-3/E>   <CR>
```

5.2.1 Enter '1' to select Mode of work

- If your device is SC15L APS then below message will display after your selection :

Current Mode is: Not Set<CR>
Select Work Mode <CR>
<CR>
1 - PACKET Mode <CR>
2 - Transparent Mode<CR>
3 – APS241 Mode <CR>
B - Back to Main <CR>
E - Save & Exit <CR>
<CR>
Enter <1-3/B, E> <CR>

When you select APS241 Mode you have to enter the IO Slave ID your device on which your MODBUS master will poll query.
Based on your requirement select mode of work. Then enter 'B' to go back to main menu.

If your device is SC15L/SC15L241 then below message will display after your selection:

Current Mode is: Not Set<CR>
Select Work Mode <CR>
<CR>
1 - Packet Mode <CR>
2 - Transparent Mode<CR>
3 - SC15L241 Mode <CR>
B - Back to Main <CR>
E - Save & Exit <CR>
<CR>
Enter <1-2/B, E> <CR>

When you select SC15L241 Mode you have to enter the IO data sending time for your device in seconds.
Based on your requirement select mode of work. Then enter 'B' to go back to main menu.

5.2.2 Enter '2' to go into System Settings. Below message will display on your screen:

Current Device Address is: 00000<CR>
Current Destination Address is: 00000<CR>
Current PAN ID is: 00001<CR>
Current Data Rate is 1<CR>
Select System Menu<CR>
<CR>

---

1 - Device Address<CR>
2 - Destination Address<CR>
3 - Network PAN ID<CR>
4 - Data Rate <CR>
B - Back To Main <CR>
E - Save & Exit <CR>
<CR>
Enter <1-4/B, E> <CR>

Enter 1 to select Device Address then below message will display:
Enter Device Address <0~65000><CR>
B - Back
Enter your desired device ID.

Note:

- If your device is SC15L/SC15L241 then keep device ID within range of 1 to 99.
- If your Device is SC15L APS then keep your device ID above 100.
- Based on your requirement select Device Address then enter 'B' to go back to system menu.

Enter 2 to select Destination Address then below message will display:
Enter Destination Address <0~65000><CR>
B – Back
Enter your desired destination ID.

Note:

- If your device is SC15L/SC15L241 then keep destination ID same as of connected SC15L APS Device ID.
- If your Device is SC15L APS then keep your destination ID as 65535.
- Based on your requirement select Destination Address then enters 'B' to go back to system menu.

Enter 3 to select Network PAN ID then below message will display:
Enter Network PAN ID <0~65535><CR>
B – Back

Enter your network loop number. Device connected with same SC15L APS device must have same PAN ID.
Based on your requirement select PAN ID then enter 'B' to go back to system menu.

Enter 4 to select Data Rate then below message will display :
Enter Device Data Rate 1 = 0.3Kbps, 2 = 0.6Kbps, 3 = 1.0Kbps, 4 = 1.8Kbps, 5 = 3.1Kbps, 6 = 5.5Kbps <CR>
B - Back

Select your desired Data Rate for communication.

Note:

- All connected devices must have same data rate to communicate with each other.
- Default Data Rate is 1.

- Based on your requirement select System Parameters then enter 'B' to go back to main menu.

5.2.3 Enter '3' to go into Serial Port Settings. Below message will display on your screen:

Current Baud rate is: 115200<CR>
Current Parity is: None<CR>
Current Stop Bits is : One<CR>
Select Serial Port Menu<CR>
<CR>
1 - Baud Rate <CR>
2 - Parity <CR>
3 - Stop Bits <CR>
B - Back to Main <CR>
E - Save & Exit <CR>
<CR>
Enter <1-3/B, E> <CR>

Enter 1 to select Baud Rate then below message will display:
Enter desired Baud Rate 3 = 2400 4 = 4800 5 = 9600 6 = 19200 7 = 38400 8 = 57600 9 = 115200<CR>
B - Back
Select Baud Rate from above options then your device will again redirect to the Serial Port Setting Menu.

Enter 2 to select Parity then below message will display:
Enter Parity: 0 = None 1 = Even 2 = Odd<CR>
B - Back
Select Parity from above options then your device will again redirect to the Serial Port Setting Menu.

Enter 3 to select Stop Bits then below message will display:
Enter Stop Bits: 0 = 1 stop bit, 1 = 2 stop bit<CR>
B - Back
Select Stop Bits from above options then your device will again redirect to the Serial Port Setting Menu.

After completing all setting enter 'E' to save and Exit from configuration mode.
Again, System Started message will display on your screen and your device is ready to use with new configuration.

6. LED INDICATIONS

LED NAME	STATUS	MEANING
Power	ON	Device is ON
LED	ON	Device is waiting to enter configuration mode
TX	ON	Device is Transmitting Data
RX	ON	Device is Receiving Data

7. MEMORY MAP in SC15L APS

1. DI Data: a) Function Code – 02: INPUT STATUS
2. AI Data: a) Function Code – 03: HOLDING RESISTER
3. DO Data:
    a) To read DO data use Function Code – 01: COIL STATUS
    b) To write on single DO use Function Code – 05: FORCE SINGLE COIL

SC15L Device ID	Memory Length	DI (FC : 02)	AI (FC : 03)	DO (FC : 01)
1	0-29 (30 Bytes)	0-7 (8 Bytes)	8-23 (16 Bytes)	24-27 (4 Bytes)
2	30-59 (30 Bytes)	30-37 (8 Bytes)	38-53 (16 Bytes)	54-57 (4 Bytes)
3	60-89 (30 Bytes)	60-67 (8 Bytes)	68-83 (16 Bytes)	84-87 (4 Bytes)
4	90-119 (30 Bytes)	90-97 (8 Bytes)	98-113 (16 Bytes)	114-117 (4 Bytes)
5	120-149 (30 Bytes)	120-127 (8 Bytes)	128-143 (16 Bytes)	144-147 (4 Bytes)
6	150-179 (30 Bytes)	150-157(8 Bytes)	158-173(16 Bytes)	174-177(4 Bytes)
7	180-209(30 Bytes)	180-187(8 Bytes)	188-203(16 Bytes)	204-207(4 Bytes)
8	210-239(30 Bytes)	210-217(8 Bytes)	218-233(16 Bytes)	234-237(4 Bytes)
9	240-269(30 Bytes)	240-247(8 Bytes)	248-263(16 Bytes)	264-267(4 Bytes)
10	270-299(30 Bytes)	270-277(8 Bytes)	278-293(16 Bytes)	294-297(4 Bytes)

Starting Address Calculation Method
DI: (SC15L Device ID-1)*30

AI: [(SC15L Device ID-1)*30 + 8]
DO: [(SC15L Device ID-1)*30 + 24]

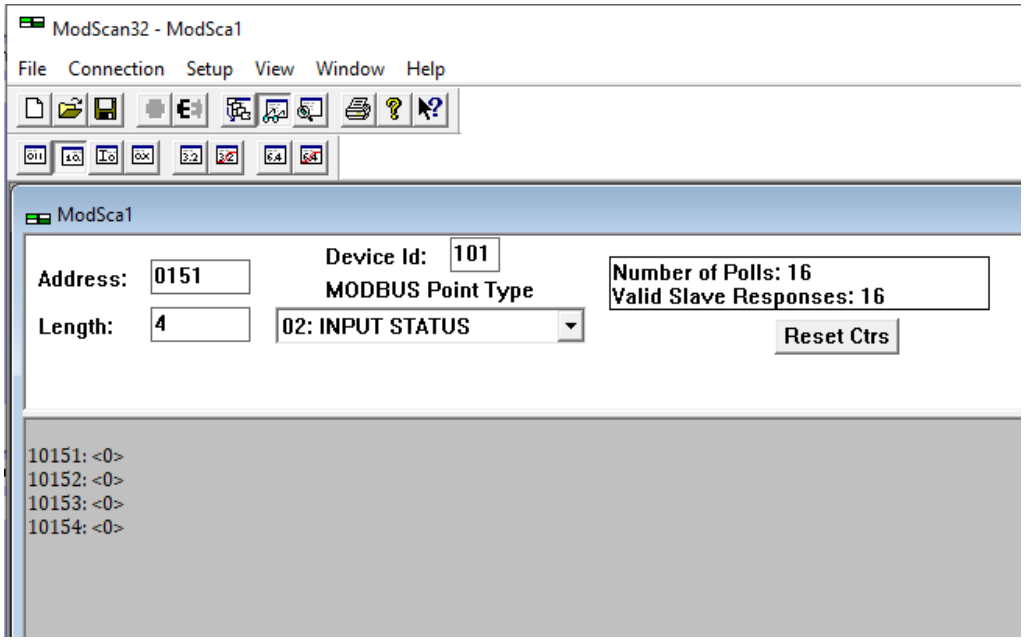
Example:

Condition:

1. Modbus Slave ID of SC15L_APS is 101.
2. LORA Device ID of SC15L241 connected under SC15L_APS is 6. It is sending data to APS and APS is storing data in its memory map as configured above.

- DI data will be stored in location: (SC15L Device ID-1)*30
- Device ID = 6, therefore: (6-1) *30 = 5*30 = 150.

For this configuration to read DI status of device enter configuration as follow



- AI data will be stored in location: [(SC15L Device ID-1)*30 + 8]
- Device ID = 6, therefore: [(6-1) *30 + 8]= [5*30 + 8] = 158.

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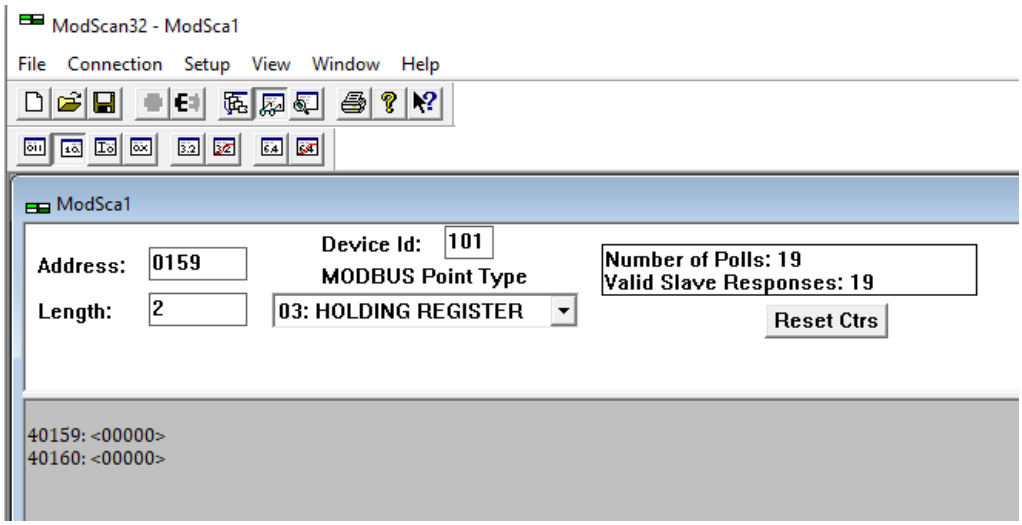
For this configuration to read AI status of device enter configuration as follow



- DI data will stored in location : (SC15L Device ID-1)*30
- Device ID = 6, therefore: (6-1)*30 = 5*30 = 150.

For this configuration to read DI status of device enter configuration as follow