ApStarnet user manual

Revision History:

Revision	Date	Comment
001	08/06/2015	Initial Release

1. ApStarnet Features

To be updated

1.1 Standard facilities

- Ethernet port, supporting Modbus TCP/IP 16 Clients
- USB port supporting Modbus
- RS485 ports x 4 for connection to external devices
- Any of the RS485 ports can be used for Modbus RTU
- Uses the HDLC protocol
- Link speeds of 48 and 180 kbits/sec
- Configuration data retained through a power down
- 4 ports support 2 ESP, 2 HDLC. Any can be reallocated as Modbus RTU
- Compatible with Gem80 Controllers and associated products.

1.1.1 Ethernet

- 100Mbit Ethernet Interface
- Control and Monitor via Modbus TCP/IP and RTU
- Up to 16 Modbus TCP/IP simultaneous connections
- User defined IP address ranges for attached clients

1.1.2 USB

- Serial Modbus access via the USB port.

1.1.3 ApStarnet

- ApStarnet configuration settings retained through a power down
- Unit configuration via Ethernet, Communications ports or USB Modbus interface
- Switchable termination resistors
- Diagnostic LED indications
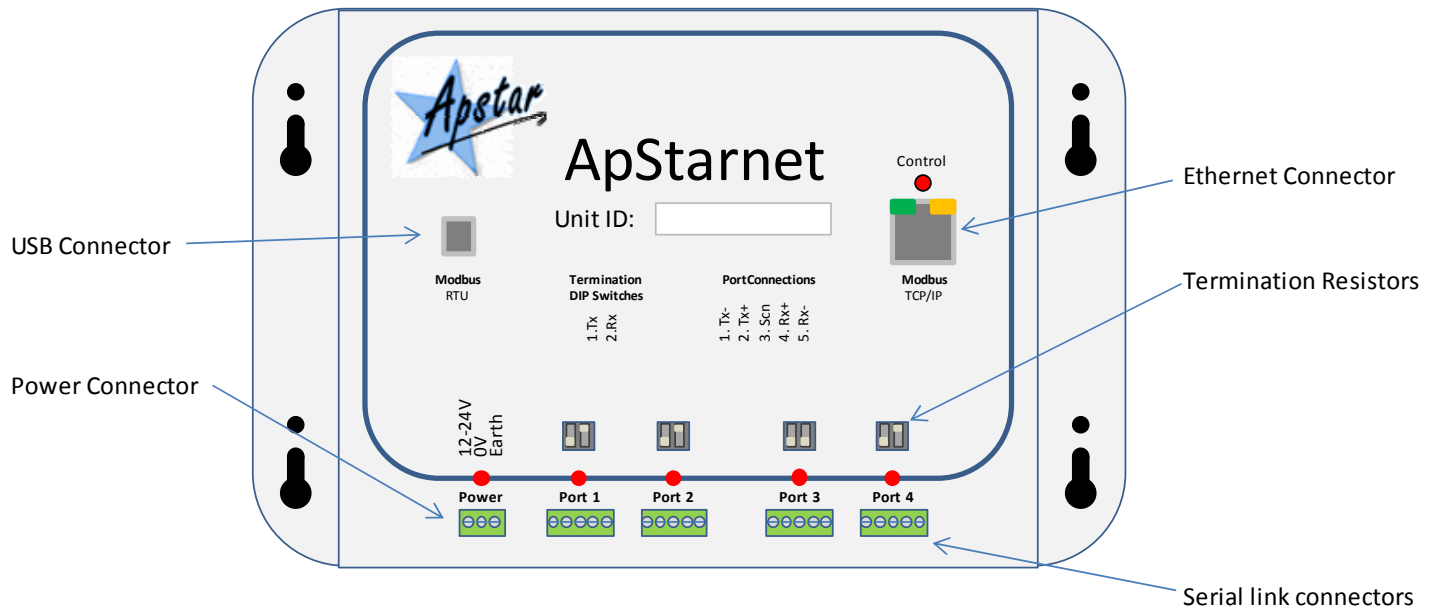
2. ApStarnet operation and use

1.2 Basic principles

The ApStarnet is a fully functioning host for 4 communications ports. These can be configured as HDLC, ESP or Modbus RTU. An attached Modbus client, PLC or SCADA system, writes data and commands to the ApStarnet which in turn are used to create and transfer data with devices attached to the communications ports. As messages are sent out, replies are received which the Modbus clients can then retrieve from a Modbus data map. A separate map is maintained for each communications port.

The ApStarnet presents data in two main forms:

1. **General ApStarnet data**. This is data that is general to the unit or to all four communication links. It is available to a client device which should access this data by using Modbus messages to station ID 16.
2. **Communications port specific data**. Four identical data areas are available for clients to read and write, each one being specific to one of the four communications ports. The client must use the following station ID's to access each area:
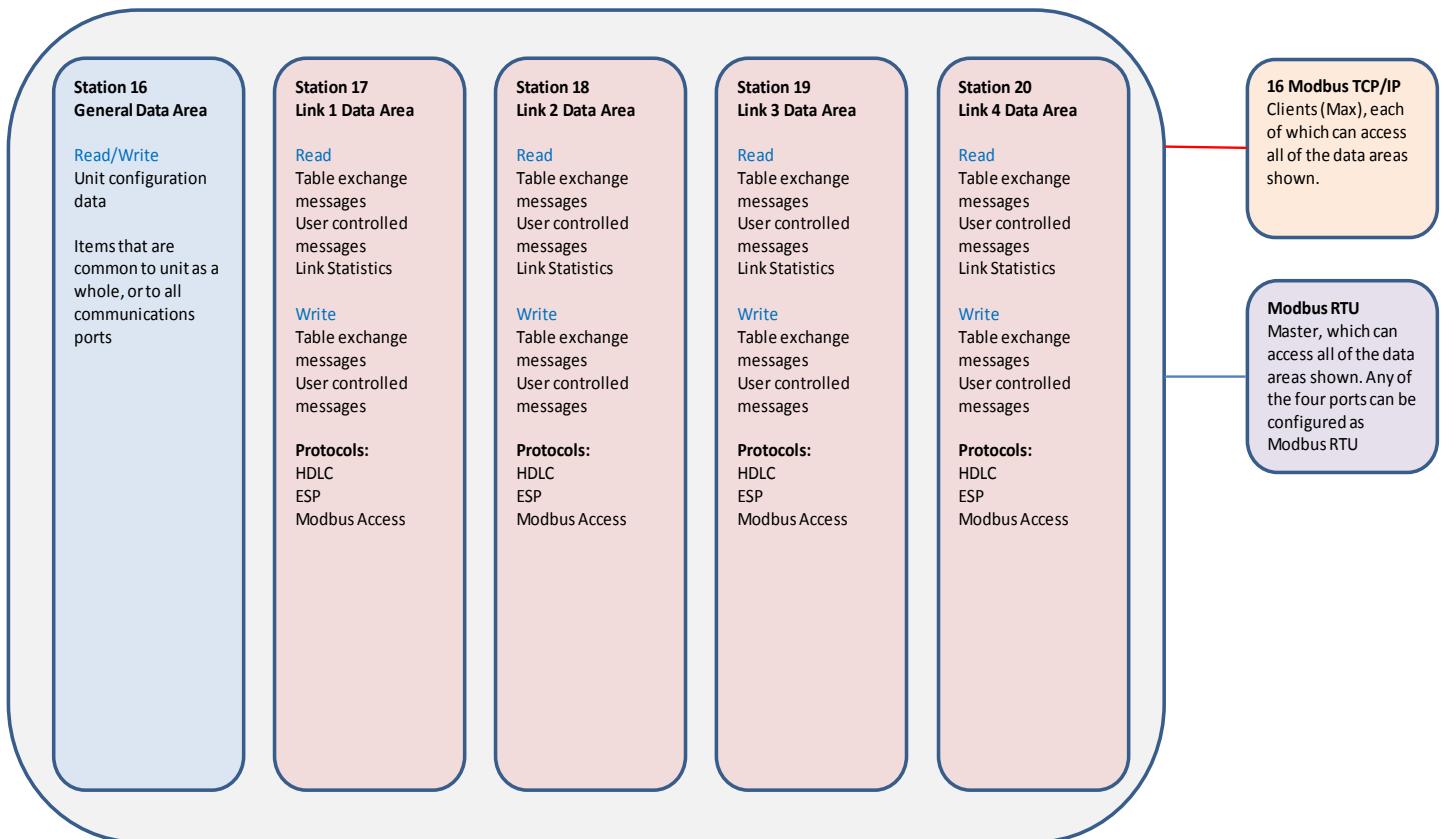   Port 1: station 17
    Port 2: station 18
    Port 3: station 19
    Port 4: station 20

Please refer to the Modbus data map for full details of the data structures that are available for client access.

Station 16 General Data Area	Station 17 Link 1 Data Area	Station 18 Link 2 Data Area	Station 19 Link 3 Data Area	Station 20 Link 4 Data Area	16 Modbus TCP/IP Clients (Max), each of which can access all of the data areas shown.
Read/Write Unit configuration data Items that are common to unit as a whole, or to all communications ports	Read Table exchange messages User controlled messages Link Statistics Write Table exchange messages User controlled messages Protocols: HDLC ESP Modbus Access	Read Table exchange messages User controlled messages Link Statistics Write Table exchange messages User controlled messages Protocols: HDLC ESP Modbus Access	Read Table exchange messages User controlled messages Link Statistics Write Table exchange messages User controlled messages Protocols: HDLC ESP Modbus Access	Read Table exchange messages User controlled messages Link Statistics Write Table exchange messages User controlled messages Protocols: HDLC ESP Modbus Access	Modbus RTU Master, which can access all of the data areas shown. Any of the four ports can be configured as Modbus RTU

1.3 Terminology

The ApStarnet and connected devices are descried in the ApStarnet documentation as:

Element	HDLC Description	ESP Description
Main controlling device in a communications link/network	Primary	Control
Device attached that responds to messages from the main device	Secondary	Tributary
	Generally these devices can be referred to as Partners	

2. Technical Specification

PSU:	12 to 24V dc +/- 20%, 250mA
Power:	3W
Weight:	600g
Mounting:	DIN Rail or Surface Mount
Connectors:	Phoenix MC1.5 Series (3.8mm pitch) connector: 3 way for PSU
	Phoenix MC1.5 Series (3.8mm pitch) connector: 5 way for communications ports
Ethernet:	10/100Mbit RJ45
USB:	USB type B connector.
	Appears as a COM port on PC. Windows will need an .inf file for installation.
	Please download latest version from our web site.

2.1 Port Functionality

The up to 31 partner devices are connected to the ApStarnet via the 4 wire RS485 link. Refer to the documentation of the partner device to determine wring details.

ApStarnet Pin number	ApStarnet Description	Partner usual Description
Protocols	HDLC	Bit address, 8 Bit control
		48k, 180k Bits per second
		Maximum of 31 secondaries
	ESP	1 Start bit, 8 Data bits, 1 Stop bit, No Parity
		1.2, 2.4, 4.8, 9.6 Kbits per second
		Maximum of 15 Tributaries

3. Connections

Power Connector

Pin	Description
1 (left)	12V to 24V dc
2	0V
3	Earth for metal box

3.1 Communications Port Connector

The up to 31 partner devices are connected to the ApStarnet via the 4 wire RS485 link. Refer to the documentation of the partner device to determine wring details.

ApStarnet Pin number	ApStarnet Description	Partner usual Description
1 (left)	Tx-	Rx-
2	Tx+	Rx+
3	Screen	No connection
4	Rx+	Tx+
5	Rx-	Tx-

3.2 Termination

The two ends of the link are normally fitted with 120ohm termination resistors. An ApStarnet unit will be fitted to one end of the link. In this case the built in termination resistors should be turned on using the front panel dip switches.

At the other end of the link from the ApStarnet you may need to add a 120ohm termination resistor connecting Rx+ and Rx-, and another resistor connecting Tx+ and Tx-.

Historically some networks were terminated with a 220ohm resistor to reduce the loading. Only use this if the 120ohm resistor causes communication errors.
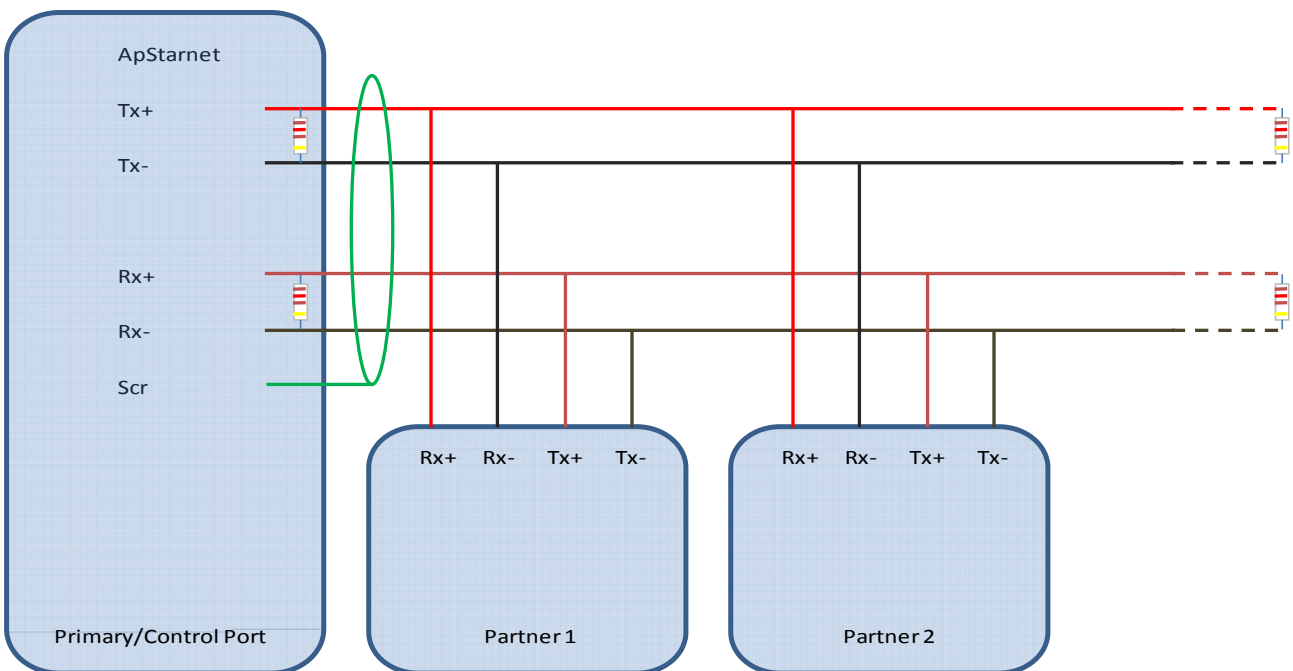
3.3 Modbus connection using RS845

Any of the four communications ports can be configure to allow connection to a Modbus RTU Master. This gives greater flexibility when selecting a controlling device, allowing the PLC to connect using RS485 instead of TCP/IP.

This is the same Modbus protocol interface as used on the USB port. The only difference is the hardware interface which is RS485 instead of USB. The relevant RS485 port has to be configured to be Modbus: See registers 106 to 109.

The RS485 port can be used as 2 wire or 4 wire. For 2 wire connection connect all the +ve connectors and all the –ve connectors. Ie ApStarnet Tx+ to ApStarnet Rx+ to Master Tx/Rx+ and the same for the –ve connections.

The baud rate can be configured to a large range of values (see register 1006). The other port settings are fixed as 8 data bits, 1 stop bit and no parity. The Modbus master must adopt these values.

4. LED indications

4.1 PSU LED

LED	Description
Off	No power
2 Red flashes	Power from USB only. No communications functionality
Slow g-y-r cycle	USB connected (ApStarnet powered from 12-24V supply)
Green On	Healthy

4.2 RS485 Ports

The RS485 ports are mostly used for external device communication, HDLC or ESP but can be configured to be a Modbus Slave connection to the PLC.

4.2.1 Port LEDs

LED	Description

4.2.2 Modbus Slave LEDs

LED	Description
Off	Not received anything for 1s (but not yet timed out)
Red On	No Modbus messages received within the timeout period on any Modbus Control port. (TCP/IP or RS485)
Yellow On	Communications Timeout. No Modbus messages received on this port within the timeout period. Messages are being received on another Modbus Control port. (TCP/IP or RS485)
Green On	Receiving valid Modbus messages
Green On	Receiving valid Modbus messages

4.3 Network LED

LED	Description
Off	IP Hardware not initialised yet or no valid Modbus message for more than 1s but less that the PLC Control Timeout time.
Red On	No Modbus messages received within the timeout period on any Modbus Control port. (TCP/IP or RS485)
2 Red flashes	Not seen the network yet (cable not plugged in since power on)
3 Red flashes	Network cable removed (cable was plugged in but now removed)
4 Red flashes	DHCP not found
5 Red flashes	IP address not allocated
Yellow On	Communications Timeout. No Modbus messages received on this port within the timeout period. Messages are being received on another Modbus Control port. (TCP/IP or RS485)
Green On	Receiving TCP/IP Modbus messages within timeout period

4.4 Network Connector

Left LED	Description
Off	No link
Green	Good link

Right LED	Description
Off	No activity
Green	Link Activity (NB Not necessarily to this device)

4.5 LED Testing

Register 207 can be used to test all 8 LEDs without affecting the functionality of Apstarnet. To test write the following values in to register 4x207:

Value	Result
0	Testing not active, normal operation results.
1	All six status LEDs are switched to green
2	All six status LEDs are switched to red
3	All six status LEDs are switched to yellow
4	All six status LEDs are switched to cycle through colours

5. Control Timing

The time it takes for a command to be actioned and confirmed is dependant on a number of factors.

Reference	Description

5.1 Scan Times

6. USB

The USB port allows local access to the ApStarnet data map. The port can also be used to see diagnostic information generated by Apstarnet. See the Data Map document for a description of how to access the diagnostic data.

6.1 USB Installation

Connect the ApStarnet to the PC using the USB connector. If the PC tries to install the driver then point it to the relevant inf file which can be found http://www.gembushub.com/support.html and follow the installation instructions.

Once installed look in the Device Manager / Ports section to see which com port has been allocated to "Apstar ApStarnet Win*X* Driver".
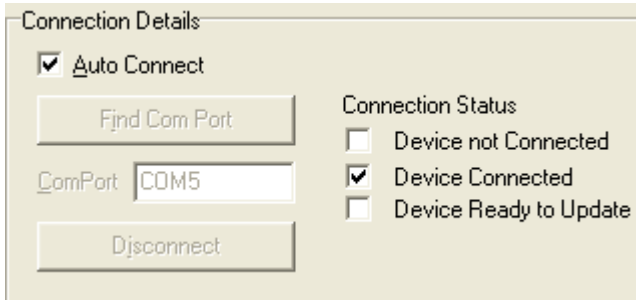
7. Reprogramming

Make sure you have disconnected your Modbus application and that Simple Diagnostics is also disconnected from the USB port.

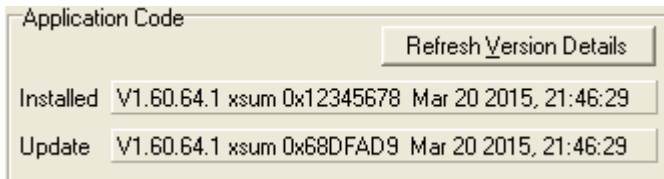Get the latest GHubV1-60-xx-xx.exe file from Apstar.

Run the exe file

Device Connected
If it doesn't say it's connected then double check nothing else is connected to the ApStarnet
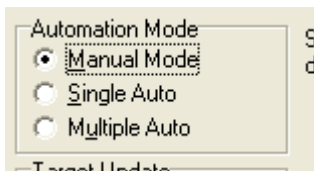

Version Info
It tells you which version is in the device and which version you are about to reprogram it with.
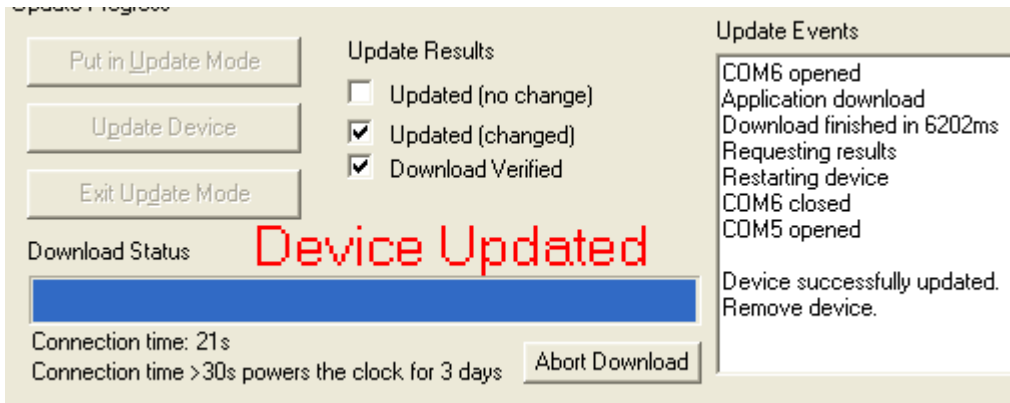

Update Apstarnet
Click Single Auto

Wait for Completion
Once the Device Updated text appears the device has been updated.

Disconnect the USB lead and the update program will auto close.

8. Remote Reboot

Sometimes it is useful to be able to remotely reset the ApStarnet, eg after changing the Modbus TCP/IP Port setting which is only used during start-up. A remote reboot can be actioned by writing "REBOOT" to the time setting registers with a single multi register write to 6 registers ie

Write Address:	100	
Write Length:	6 registers	
Register 100:	82	(Ascii R)
Register 101:	69	(Ascii E)
Register 102:	66	(Ascii B)
Register 103:	79	(Ascii O)
Register 104:	79	(Ascii O)
Register 105:	84	(Ascii T)

There will be no reply to this message and the ApStarnet will immediately reboot. Communications to the external devices will stop for about 2.7s.

9. Other Documents

As well as this manual there are a number of other documents that may be useful:

Title	Description	Reference
Getting Started	A quick start guide to help with familiarisation of the ApStarnet	
Data Map	A detailed description of the data elements within the ApStarnet that are available to access.	
Data Sheet	A data sheet for the ApStarnet	