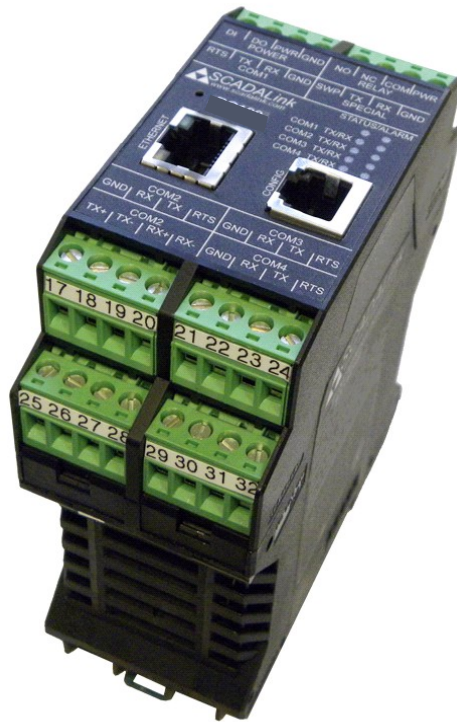


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SCADA & Telemetry
Control Systems
Instrumentation
Operator Interfaces
Data Communications

SCADALink IP100 IP Gateway



User Manual

June 24, 2011

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1 Overview

The SCADALink IP100 is a multiport industrial terminal server designed for SCADA and automation applications requiring serial connectivity over LAN/WAN and Internet Networks. The IP100 enables IP access to serially connected devices such as PLC's, RTU's, SCADA Hosts, Flow Computers, Data loggers and Radio Modem systems.

The IP100 comes with 5 serial ports and 1 auto-detect ethernet port. Unique features such as multiple host connections and simultaneous TCP, UDP and Modbus TCP connection to any port gives it flexibility and scalability in automation and SCADA applications. The SCADALink IP100 is a compact replacement for the SCADALink UNICON IP Gateway with additional ports and expanded functionality.

The IP100 can be configured as:

- SCADA Terminal Server
- Modbus Multiplexer
- Multiport Terminal Server
- Modbus Serial to IP Master
- Virtual Serial Port

It offers powerful features such as:

- RS-232, RS-485 Serial Connectivity
- Autodetecting 10/100Base-T Ethernet
- TCP, UDP and ModbusTCP Protocols
- Easy configuration and setup via Ethernet or Serial
- Wide ranging 10-30 VDC Input Power
- DIN Rail Mount
- Class I Div 2 approval

1 Quick Start Guide

Follow these instructions to prepare an IP100 for configuration in the GUI.

- 1. Download IP100 GUI software from BenteK website**
Doubleclick to install it
- 2. Connect 10-30VDC regulated DC power supply to IP100 power supply terminals**
- 3. Connect user cable from PC to IP100**

If you are setting up the IP100 for the first time, use one of the serial cables below. If you have already setup this IP100 with an IP address, you can also use a standard ethernet cable.

Users can connect the configuration PC using 1 of 2 different types of serial cables:

1. Switch serial cable to COM 0, the RJ11 port (DB9M to RJ11 with an embedded switch to switch between Firmware Upgrade mode and User Mode)
2. DB9M to Flying leads cable to connect to COM 1 (See Appendix A)

Cables are available for purchase from BenteK or can be constructed by following instructions in Appendix A

NOTE: The IP100 ships from the factory without any IP Address. If you are intending to use the IP100 for Ethernet applications, you must first use a serial connection to setup the IP address. Thereafter, you can use either serial or ethernet connection to update configuration.

- 4. Turn Power Supply on**
- 5. Click on GUI software and navigate to <Device>< Connect>**
- 6. Choose Serial or Ethernet and configure appropriate parameters**
- 7. You are now ready to configure parameters in the IP100 GUI**
- 8. For instructions on using the GUI, click on < HELP><CONTENT>**

2 Hardware Overview

2.1. Hardware Features

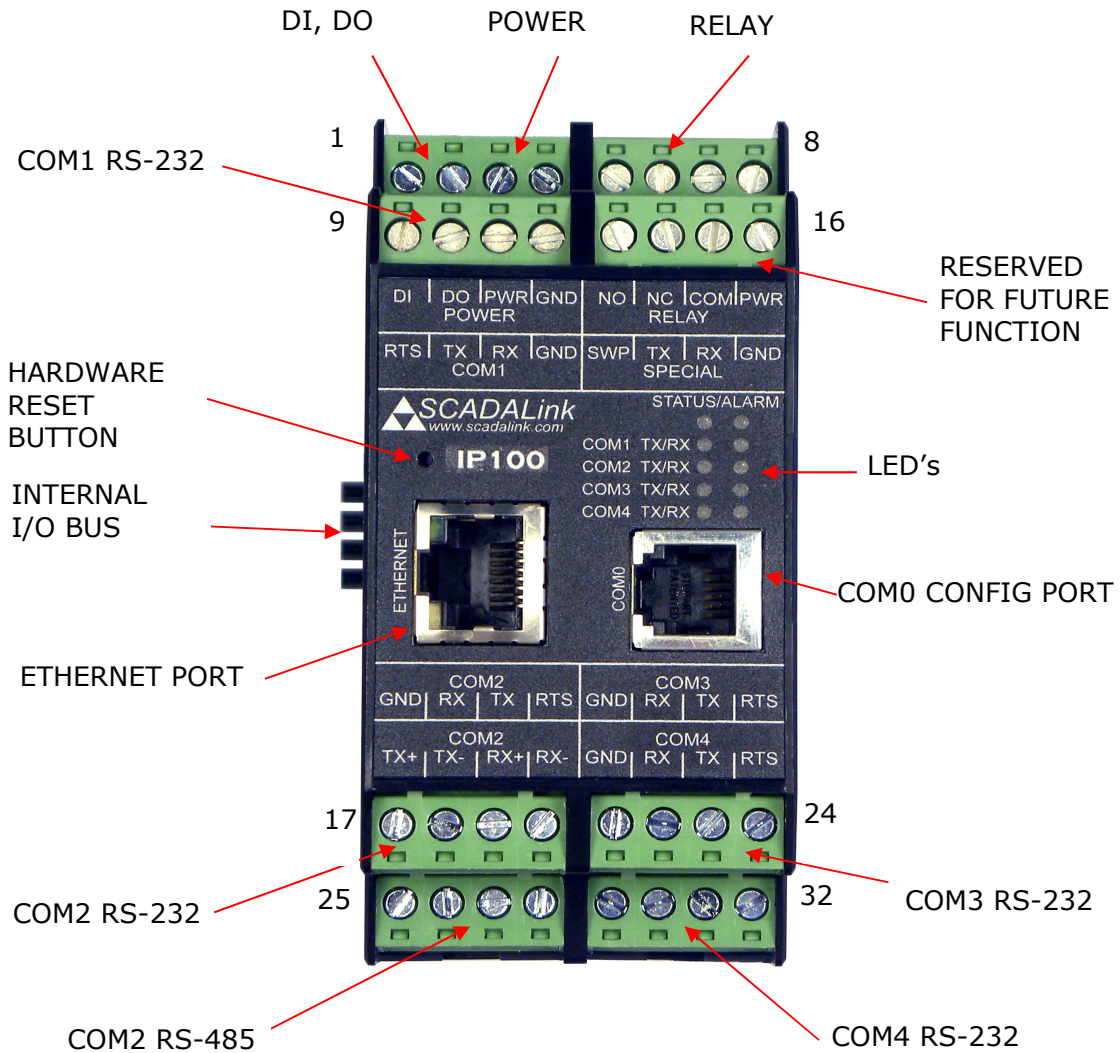


Figure 1 IP100 Hardware Major Features

Table 1 Port Pinouts

NAME	PIN NO.	PIN NAME	DESCRIPTION
Power Terminal Block	1	DI	Discrete Input, Active Low, (switched to GND), 30VDC, 125mA resettable fuse
	2	DO	Discrete Output, Open Drain, 30VDC/50mA max, Sinking, 125mA resettable fuse, ESD protect.
	3	PWR	10-30VDC, 50mA@12Vdc Reverse Polarity Protection
	4	GND	Main Power GND
Relay Terminal Block	5	NO	NO Contact, 30Vdc@50mA max.
	6	NC	NC Contact, 30Vdc@50mA max.
	7	COM	Common Relay Pole
	8	PWR O/P	Sourced Vin-0.5V@250mA max.
COM1 Terminal Block	9	RTS	RS-232 / Configuration Parameter Port or General Serial Port
	10	TX	
	11	RX	
	12	GND	
Special Terminal Block	13	SWP	Switched Power = Vin-0.5V
	14	TX	Reserved for future use
	15	RX	
	16	GND	
COM2 Terminal Block1	17	GND	RS-232 General Serial Port (runs simultaneous to COM2 RS-485 port, same data, data rates and port settings)
	18	RX	
	19	TX	
	20	RTS	
COM2 Terminal Block2	25	TX+	RS-485 (runs simultaneous to COM2 RS-232 port, same data, data rates and port settings)
	26	TX -	
	27	RX+	
	28	RX -	
COM3 Terminal Block	21	GND	RS-232 General Serial Port
	22	RX	
	23	TX	
	24	RTS	
COM4 Terminal Block	29	GND	RS-232 General Serial Port
	30	RX	
	31	TX	
	32	RTS	
Ethernet	-	-	10/100 Base-T, 8 pin RJ45 / Telnet
COM0	-	-	RJ11 Firmware Loading Port / Configuration Port / General Serial Port

2.2 Specifications

Table 2 IP100 Specifications

POWER REQUIREMENT									
Voltage	10-30Vdc								
Power Consumption	0.6 W: 50 mA @12V or 25mA @ 24V (not including Load current of connected devices)								
RELAY PWR	RELAY PWR to POWER GND: Sourced Vin - 0.5Vdc / 250mA max								
GENERAL FEATURES									
Protocols	TCP/IP, Modbus TCP, UDP, ROC, Call/Response protocols								
Battery Backup	For RAM data and Realtime clock retention								
Status LEDs	Status, Alarm, TX/RX for COM1,COM2,COM3,COM4								
Hardware Reset	Pushbutton via small diameter hole located above ethernet port								
MECHANICAL									
Dimensions (LxWxH)	4.5" x 1.8" x 3.9" (114mm x 45mm x99mm)								
Mounting	35mm DIN Railmount								
Terminal Blocks	4 Pin Removable Screw Terminals, Wire Gauge: 12 -24 AWG								
Internal I/O Bus	5 pin molded male connector								
SERIAL PORTS									
All ports are async and configurable for: 7 or 8 Data Bits, Odd/Even/No Parity, 1 or 2 Stop Bits, up to 115Kbps throughput									
	Tx	Rx	RTS	GND	RTS Flow Control	Connector	RS232	RS485 4-wire	Port Usage
COM 0	√	√	-	√	-	RJ-11	√	-	Firmware Loading Parameter Configuration
COM 1	√	√	√	√	√	Terminals	√	-	Parameter Configuration
COM 2	√	√	√	√	√	Terminals	√	√	General
COM 3	√	√	√	√	√	Terminals	√	-	General
COM 4	√	√	√	√	√	Terminals	√	-	General
ETHERNET PORT									
Ethernet	RJ-45 10/100Base-T(auto-sensing)								
APPROVALS									
CSA	Class I Div 2, Group C,D T3C @ Ta= -40 to 70 Deg. C								
ENVIRONMENTAL									
Operating	-45 Deg.C to 70 Deg. C								

Temperature	
Relative Humidity	Up to 90% RH (Non Condensing)
Serial Port Protection	
Power Supply Protection	Rev. Polarity protected
DIGITAL I/O	
DI	Active low digital input, ESD protected, +30Vdc clamped, 125 mA resettable fuse
DO	Open drain digital output, 30VDC S=sinking, 50mA, ESD protected, 125mA resettable fuse
RELAY NO/NC	Isolated Output 50mA (ac/dc) max @ 30Vdcmax, NO/NC Contact
SPECIAL SWP	Vin -0.5Vdc / 2.0Amax, reverse polarity protected

3 Installation & Wiring

3.1 Mounting and Power Connection

1. Connect a regulated 10-30VDC power supply to the (+) and (-) power supply screw terminals of the power supply terminal block plug via 12-24 AWG multistrand wire. Observe proper polarity.
2. Insert the plug into the IP100 power supply header.

3.2 Data Connection

- The IP100 has 5 serial ports (COM0 to COM4) and a 100Base-T Ethernet port with auto-detection
- COM1 to COM4 are DTE RS-232 ports with TX, RX, RTS & GND and are connected via 4 pin screw terminal plugs using a small flathead screwdriver and 12-24 AWG multi-strand wire. Detailed connections are shown on the IP100 side label.
- COM0 is used for both firmware upgrade and normal configuration. Each function requires a corresponding cable terminated in an RJ11 connector or a BenteK Switch Cable that does both. See Appendix A for cables. COM0 has no RTS
- COM1 is used for normal serial data but can also be used for configuration.
- Ethernet port can autodetect straight thru or crossover cable

NOTE: It is recommended that COM1 to COM4 be used for normal data communications and to keep COM0 free for firmware upgrade and configuration.

4 GUI Configuration

The IP100 is a flexible industrial appliance which can be easily configured to enable a variety of communications between ethernet, serial, or I/O Devices. Once configured, the IP 100 takes care of all protocol translation and I/O mapping to enable transparent end-to-end device communications.

Configuration is handled by the GUI application and broken down into 6 menu sections:

1. General – site name, password, power options
2. Network – IP / ethernet parameters
3. Serial - serial parameters
4. Connections – the IP100 operating modes
5. Digital I/O – onboard Digital I/O
6. Modbus RTU – Internal Memory and I/O found on attached I/O bus modules



Figure 2 IP100 GUI Main Menu

Before configuring the IP100 for your application, it is useful to first become acquainted with it's basic operation by looking at the basic operating modes and application examples found in Appendix B and C.

Once you've identified the applicatoioin example that best matches your application, start the IP100 GUI application (supplied by Bentek Systems) and select and configure the appropriate operating mode.

The GUI Help menu contains detailed descriptions of the various modes.

5 LED Functions

Once Configuration is done, recycle power and allow IP100 to reset.

In-service operation of the IP100 is completely automatic. Once the unit is properly installed and configured, operator actions are limited to observing the front panel LED status indicators for proper operation.

If all parameters are correctly set, start IP100 operation by following these steps:

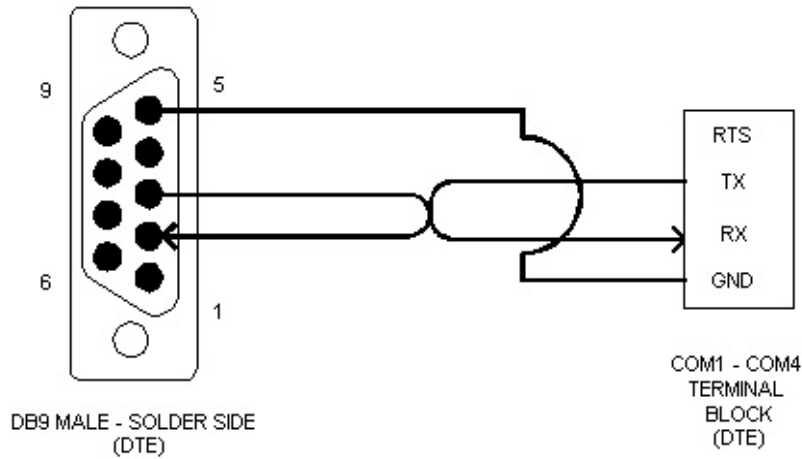
1. Apply DC power to the IP100
2. Observe the LED status for the proper indications

Table 3 LEDs

LED	Description
STATUS	Solidly lit: Power is good and Firmware running Off: No Power or Firmware not running
ALARM	N/A
COM1 Tx	Flashes when there is TX on COM1
COM1 Rx	Flashes when there is RX from COM1
COM2 Tx	Flashes when there is TX on COM2
COM2 Rx	Flashes when there is RX from COM2
COM3 Tx	Flashes when there is TX on COM3
COM3 Rx	Flashes when there is RX from COM3
COM4 Tx	Flashes when there is TX on COM4
COM4 Rx	Flashes when there is RX from COM4
Ethernet RJ45 Green LED	Collision Detect
Ethernet RJ45 Yellow LED	Link/Activity

Appendix A – Cabling Examples

A1 DB9M (DTE) to COM1 - COM4 Terminal Block (Bentek Systems Part Number: *CBL-100-USER*)



NOTE: Used for COM1 parameter configuration or COM1 to COM4 serial data

Figure 3 DB9M (DTE) to COM1 - COM4 TERMINAL BLOCK.

A2 COM1- COM4 Terminal Block to DB9M (DCE)

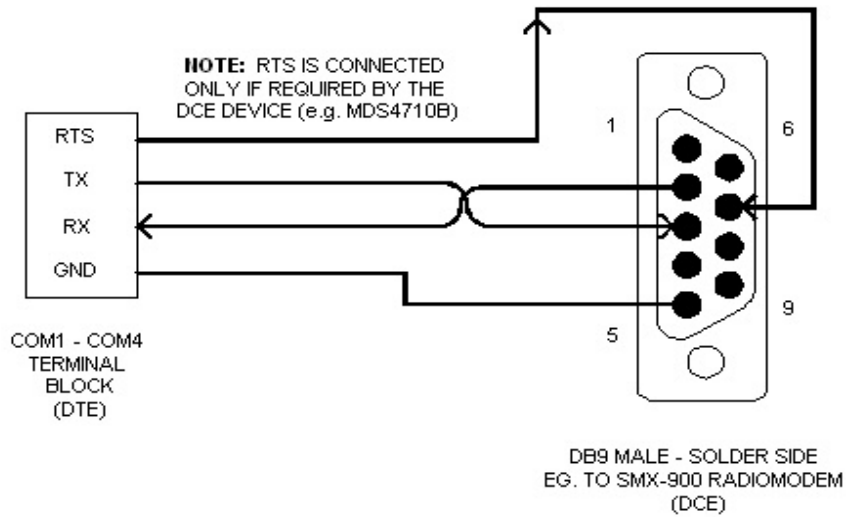


Figure 4 COM1-COM4 TERMINAL BLOCK to DB9M (DCE)

A3 COM1 - COM4 Terminal Block to DB25M (DCE)

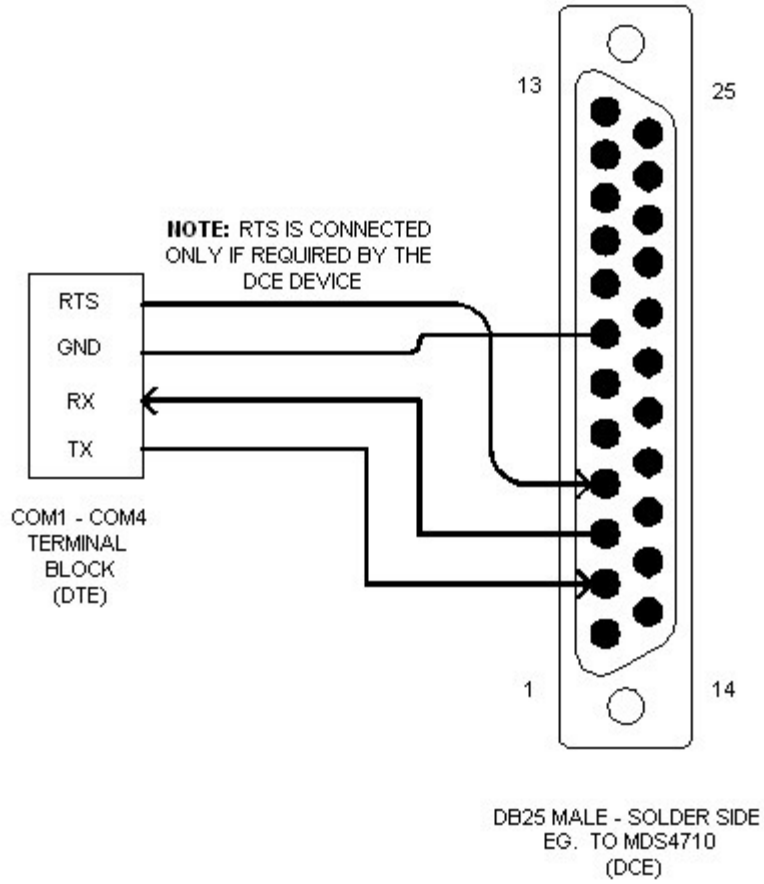
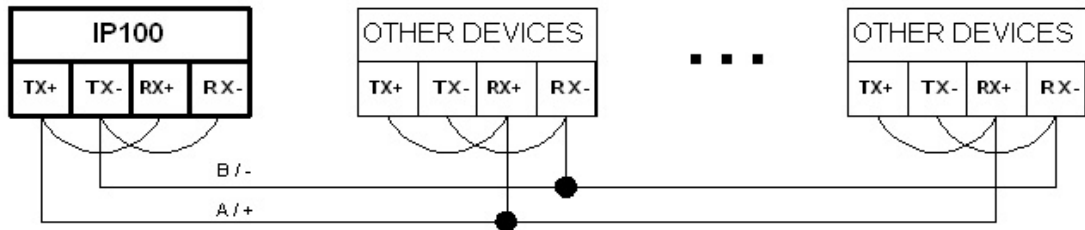
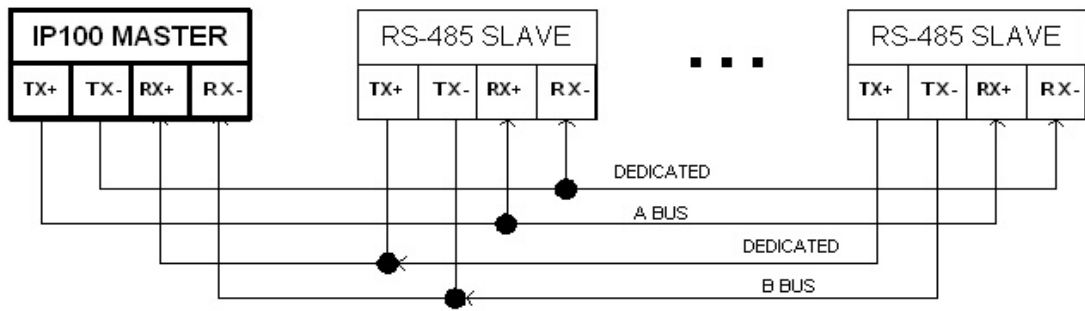


Figure 5: COM1 - COM4 TERMINAL BLOCK to DB25M (DCE)

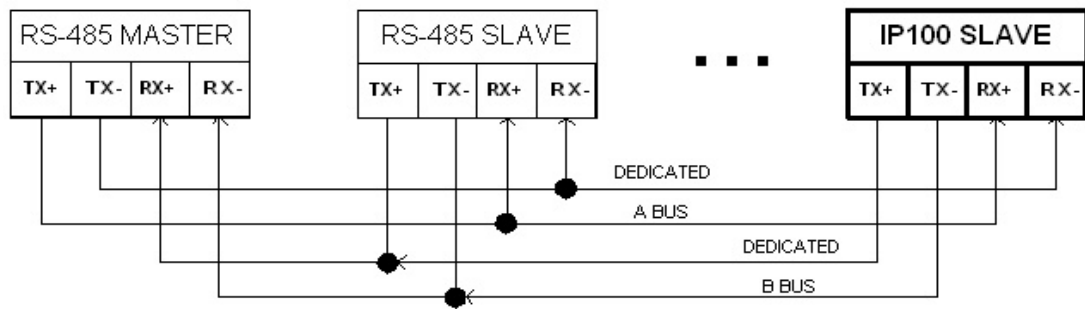
A4 COM2 RS-485 Terminal Block Wiring



2 WIRE HALF-DUPLEX RS-485 NETWORK



4 WIRE FULL-DUPLEX RS-485 NETWORK
IP100 IN MASTER MODE



4 WIRE FULL-DUPLEX RS-485 NETWORK
IP100 IN SLAVE MODE

NOTE: Connect all GND terminals together

Figure 6: COM 2 RS-485 Multidrop Wiring

A5 DB9M to COM0 / RJ11 Data Cable

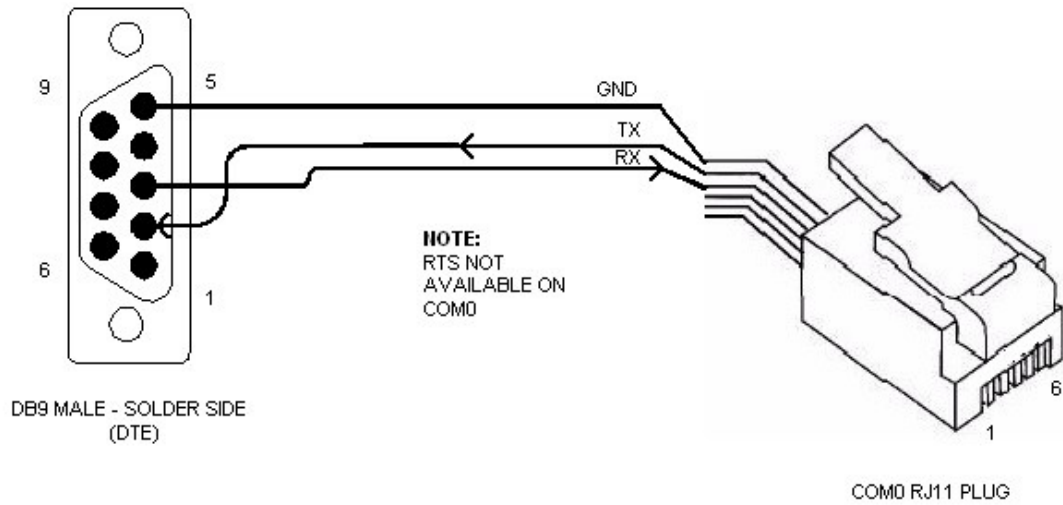


Figure 7: DB9M (DTE) to RJ11 / COM0 plug for data only.

A6 COM0 / RJ11 to DB9M (DCE) Data Cable

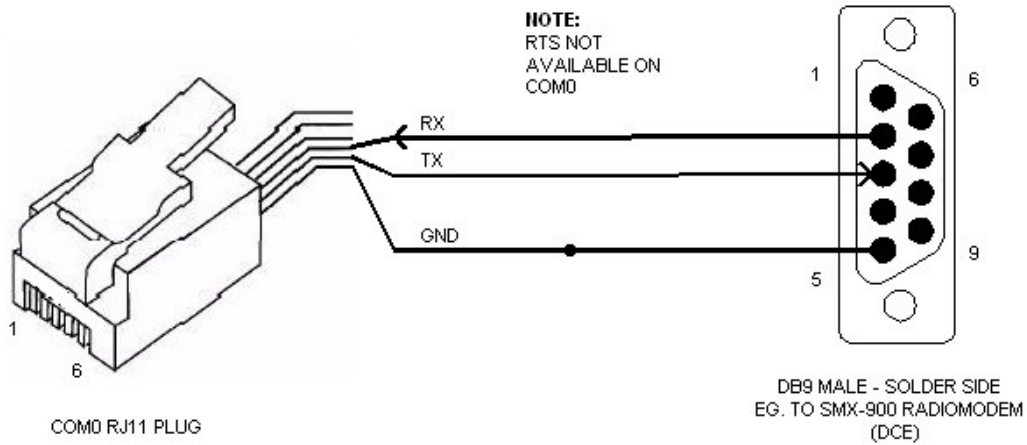


Figure 8: RJ11 / COM0 plug to DB9M (DCE) for data only

A7 COM0 / RJ11 to DB25M (DCE) Data Cable

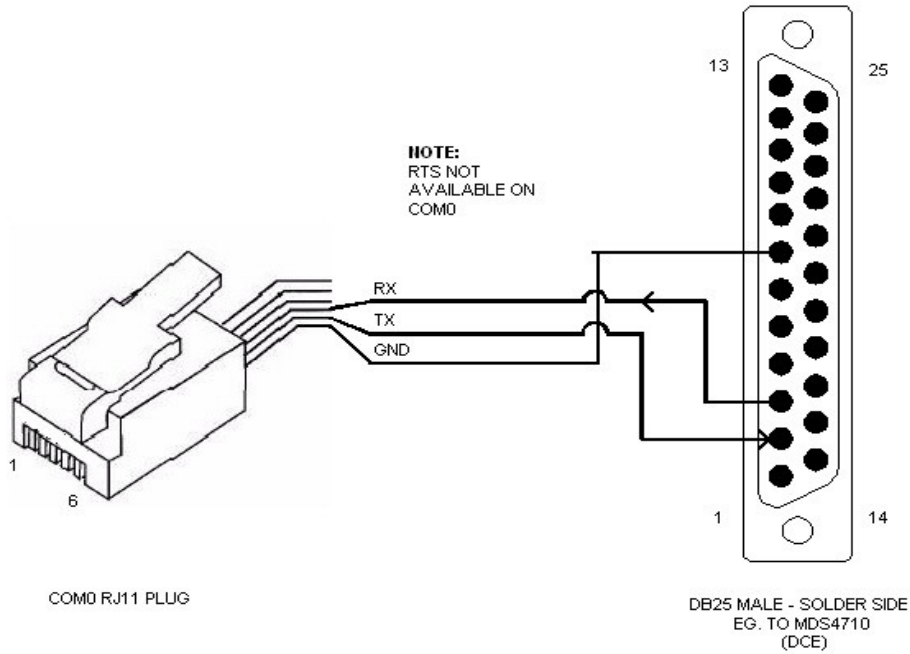


Figure 9: RJ11 / COM0 plug to DB25M (DCE) for data only.

A8 DB9M to COM0 / RJ11 Firmware Loading Cable (Bentek Systems Part Number: *CBL-100-FIRMWARE*)

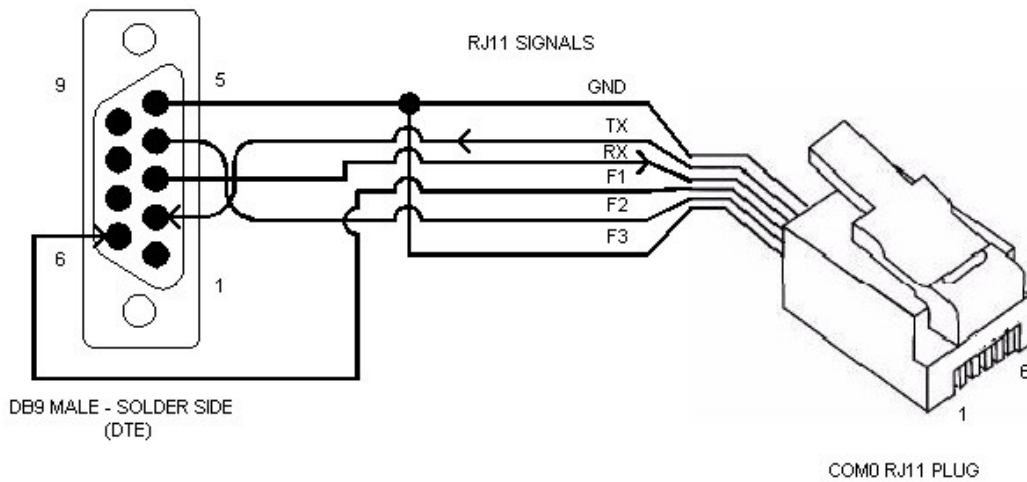


Figure 10: DB9M (DTE) to RJ11 / COM0 plug for firmware only

Appendix B – Operating Modes

This section describes each of the supported IP100 operating modes found in the GUI. These modes are found in the GUI under the tree branch called CONNECTIONS. For more detailed information, click on the context sensitive ? Icon button in the GUI

(Before beginning configuration, ensure you have done initial hardware setup as described in chapter 1 of this user manual: Quick Start Guide.)



Figure 11: IP100 GUI

MODBUS IP

- This mode enables multiple ethernet hosts to connect to one serial port
- Only supports poll / response protocols such as Modbus IP & ROC.
- IP100 buffers incoming traffic to allow simultaneous communications from all hosts.
- Supports TCP, Modbus TCP and UDP protocols
- Up to 8 host connections can be set by configuring the *count* parameter
- Each Modbus IP connection is specified by an ethernet/serial port pair

SERIAL MUX

- This mode enables multiple *source* serial ports to connect to the same *destination* serial port
- Only supports poll / response protocols such as Modbus IP or ROC
- Serial Multiplexer connections are specified by *source* / *destination* port pairs
- Serial Multiplexer *destination* ports can also be shared with Modbus IP COM ports

VIRTUAL SERIAL SERVER

- This connection is used to setup a full duplex ethernet-to-serial link from one dedicated IP port to a single dedicated serial port.
- Virtual Serial Server listens to incoming IP address and serves data once a client has established a connection
- In particular, this mode can be used in the case where the other device is an IP100 configured as a Virtual Serial Client. Together, the two provide a bidirectional serial In/Serial out connection over ethernet
- A Virtual Serial Connection is protocol independent and allows bidirectional data flow

VIRTUAL SERIAL CLIENT

- This connection is used to setup a full duplex serial-to-ethernet link from one dedicated serial port to a single dedicated IP port
- Client establishes the connection to the IP address of the remote device
- In particular this mode can be used in the case where the remote device is another IP100 configured as a Virtual Serial Server. Together, the two provide a bidirectional serial In/Serial out connection over ethernet
- A Virtual Serial Connection is protocol independent and allows bidirectional data flow

SERIAL MASTER

- This mode converts incoming Modbus serial polls to TCP/IP polls. The TCP/IP poll messages are created from a user configured lookup table that assigns a specific TCP message type, IP address and IP port to each incoming RTU address. This mode can also be used for ROC protocol when using TCP or UDP.

MODBUS BROADCAST MODE

- This mode is used to replicate data from an incoming serial or IP port to multiple *destination* serial ports.

CONNECT

- This mode works in conjunction with Virtual Serial Server or Client and is used to create a link between 2 serial ports (a *source* and a *destination*) that is overridden by an IP connection when socket is established.

Appendix C – Typical Applications

1 SCADA Terminal Server – Multiple ethernet sources to a single serial destination

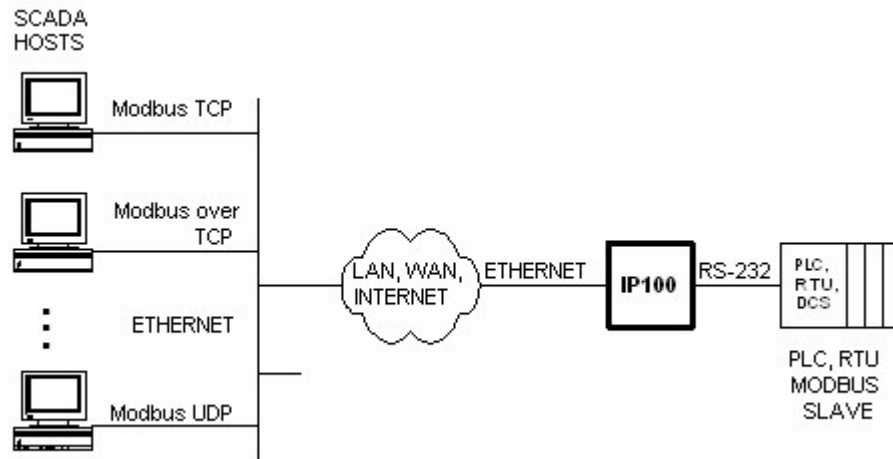


Figure 12 SCADA Terminal Server

Scenario Description

Multiple IP stations using UDP, TCP or MTCP protocol to simultaneously communicate to a single serial slave device connected to an IP100 COM port. Multiple request / response connections must be muxed to the same port.

Suggested Mode

Modbus IP

2 Multiple serial sources to serial destination

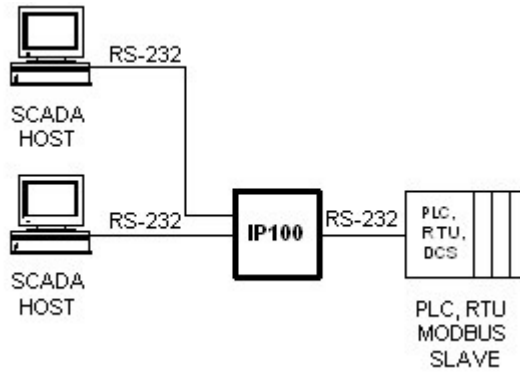


Figure 13 Modbus / Serial Multiplexer

Scenario Description

Multiple Modbus serial master devices need to simultaneously communicate to a single Modbus serial slave device connected to an IP100 COM port.

Suggested Mode

Serial Multiplexer

3 Combination of ethernet and serial sources to a single serial destination

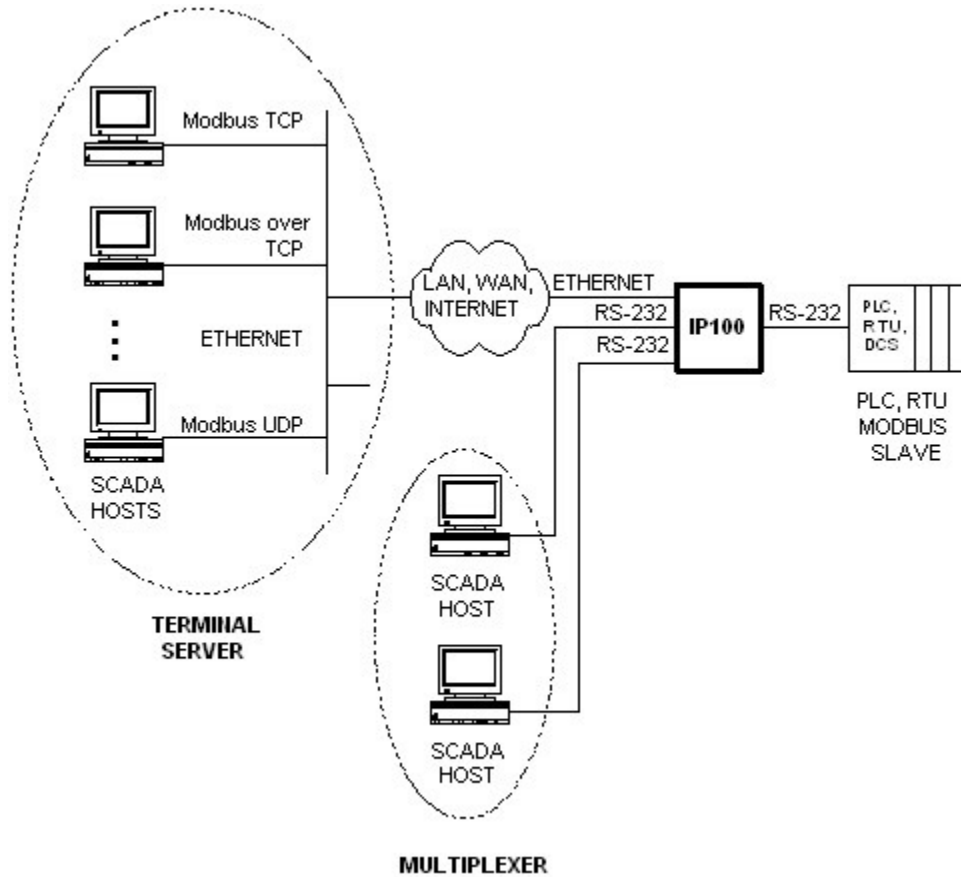


Figure 14 Many ethernet and serial sources to a serial destination

Description

Multiple Modbus serial master devices AND multiple MB Ethernet master devices need to simultaneously communicate to a single MB serial slave device connected to an IP100 COM port.

Suggested Mode

combination of Modbus IP and Serial Mux

4 Two serial devices using ethernet communication channel

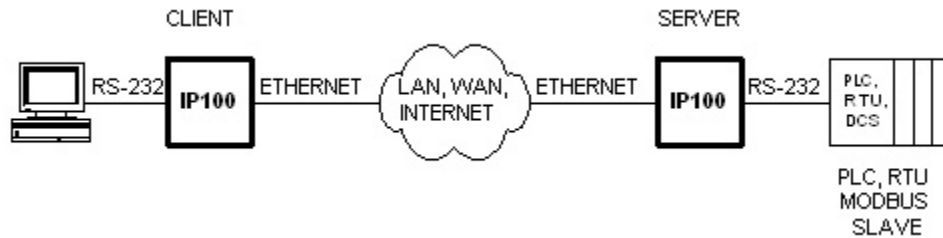


Figure 15 Virtual Serial

Scenario Description

Two serial devices need to communicate but only an ethernet network is available.

Suggested Mode

Virtual Serial Client for IP100 of one serial device and Virtual Serial Server for IP100 of the other serial device.

Notes

The server is typically remote and the client is local. This mode allows the two IP100's to emulate a virtual wire and enables bidirectional communications. It can work for all kinds of protocols, not just request / response. For instance, it could work equally well for unidirectional streaming data. Client does not need to be another IP100 device. It can be virtual COM port redirection software such as Tactical Software serial / IP software.

5 Modbus master needs to communicate to multiple Ethernet slaves

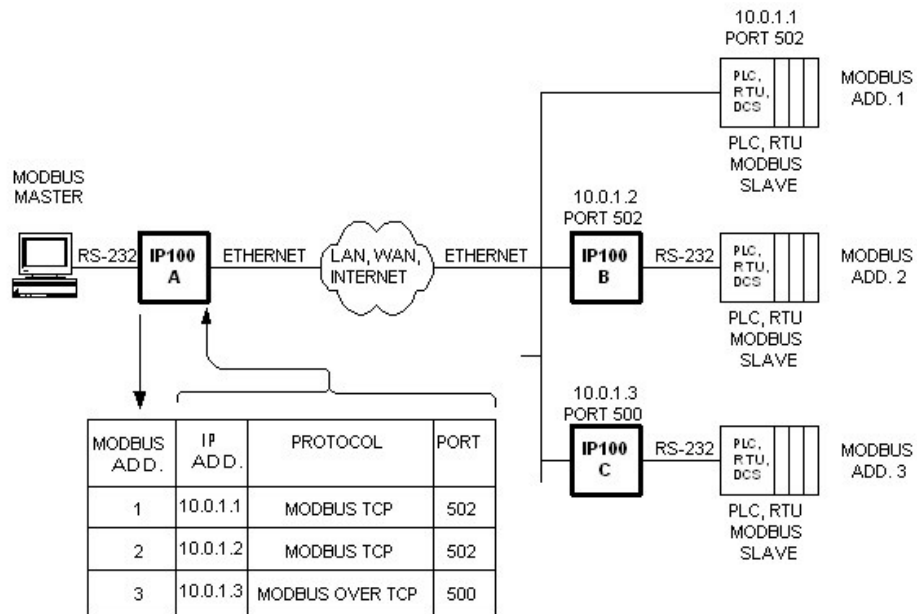


Figure 16 Modbus Master

Scenario Description

A Modbus RTU serial master needs to communicate to multiple remote Modbus serial or Ethernet slaves which are each speaking different protocols.

Suggested Mode

Serial Master

Notes

The IP100 reads the first byte of the Masters message and uses an internal lookup table to construct the proper message packet to go to the destination address. This effectively enables point-to-multipoint communications over Ethernet where the internal lookup table simulates the point-to-multipoint connectivity. Aside from Modbus, this also works for other request-response protocols such as Fisher ROC.

6 Multiport Terminal Server

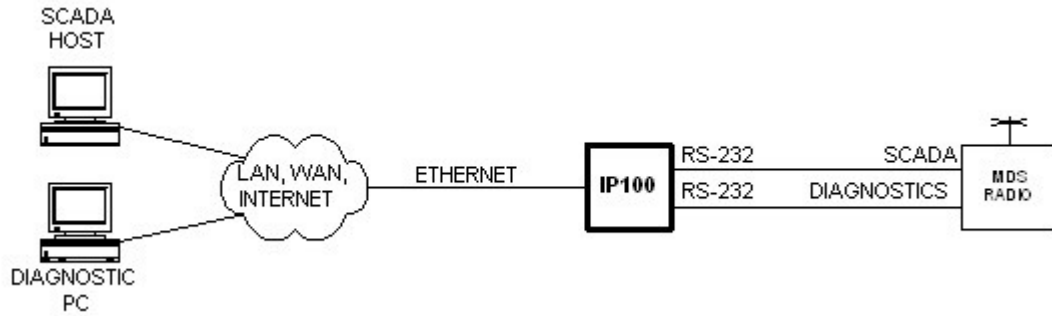


Figure 17 Multiport Terminal Server

Scenario Description

Two ethernet sources must communicate to 2 different serial ports on the MDS radio. One is for normal SCADA communications while the other is for simultaneous diagnostics.

Suggested Mode

Modbus IP mode for each ethernet/serial port pairs

Notes

The IP100 has many ports that can be independently set for different modes, parameters and connections.

7 Temporary over-ride of normal polling

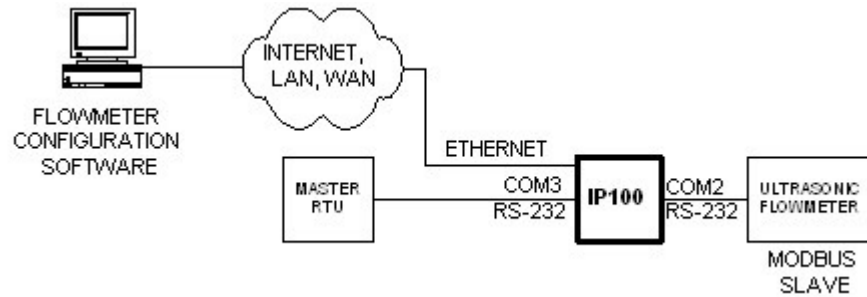


Figure 18 Connect Mode

Scenario Description

Sometimes there is need for remote diagnostic connectivity where a selected connection overrides another connection. An example of this requirement is a pipeline SCADA application in which an RTU (Modbus RTU Master) normally communicates with an Ultrasonic Flowmeter (Modbus Slave). Occasionally, there is need for remote WAN connection to the flow meter from a central site for maintenance and troubleshooting. It is desirable that this connection temporarily overrides the existing connection.

Suggested Mode

COM 2 set to Virtual Serial Server
COM 3 set to Connect Mode for COM 2

Notes

In normal operation, the RTU on COM3 communicates with the Flowmeter on COM2. When the Remote Virtual Serial Client attempts to connect to COM2, however, it overrides COM3 and COM3 is switched off temporarily, allowing Flowmeter configuration. When the Remote Virtual serial client is finished and drops the connection, The master RTU on COM3 resumes communications with COM2.

When the serial ports are configured in the Connect Mode and Virtual Serial Mode, the serial data protocol used in the application does not have to be a Request-Response type.

Appendix D – Firmware Upgrade

Firmware can be field upgraded for feature upgrades or bug fixes. Upgrading new firmware requires:

1. DB9M to RJ-11 firmware loading cable for COM0, Bentek Systems Part No. *CBL-100-FIRMWARE* (See Appendix A)
2. IP100 firmware loading program running on a PC.
3. IP100 firmware file

These files are provided by Bentek Systems as required. Contact Bentek at:

support@scadalink.com

(403) 243-5135