



Telemetry Leased Line Adapter for Smart Bell-202 Modem

Model TL.202



However, the setup of legacy Bell-202 modems have traditionally presented two challenges: 1. implementation of “push-to-talk” pre-transmit and post-transmit timings; and 2. implementation of a delay in the transmit data stream until a sufficient duration of pre-transmit “push-to-talk” has completed.

In the past, system integrators have implemented proper push-to-talk timing by setting up sensitive serial port handshaking behaviors within both the modem and the RTU/PLC. Sound a little tricky? Until now, it used to be!



The Models TL.202/ SB.202 combination delivers all the benefits of Bell-202 modem technology – yet without the hassles. At the heart of the TL.202/ SB.202 is an intelligent microcontroller that supervises the timing of the transmit data stream, thereby allowing your RTU/PLC to offload its Modbus requests and responses immediately – without RTS/CTS delays. In fact, you may even set up your PLC for simple 3-wire serial communication with RTS/CTS flow control disabled. The SB.202 then intelligently handles the keying/unkeying of the transmitter using dip-switch-selectable timings.

It is important to note that the Model SB.202 does **not** modify the content of the messages, and it does **not** add proprietary framing layers to the transmissions. Therefore, you may be assured that it will be over-the-wire compatible with other-brand modems that adhere to the Bell-202 standard.

For example, if your SCADA network’s communication system is built around the Schneider Electric™ SCADAPack 5902 Bell-202 modem, then you can be assured that the TL.202/ SB.202 will **interoperate** seamlessly.

Are you interested in how SCADAMETRICS modem technology can help your SCADA system communicate more effectively through rugged terrain? Give us a call! We’ll be glad to discuss the details!

The Industry’s First Landline, Bell-202 Modem That Works with a Simple 3-Wire RS.232 Serial Port Connection!

Introducing another member of the SCADAMETRICS DINstrumentation™ series! – **Model TL.202 Telemetry Line Modem Interface!**

The **Model TL.202** provides adaption of the SCADAMETRICS Model SB.202 Modem so that it can be utilized for landline applications. Simply connect an SB.202 to a TL.202, and the resultant combination is a Bell-202 modem assembly that is suitable for landlines – and which can be driven with a simple 3-wire RS.232 serial port connection.

The TL.202 Modem delivers non-proprietary, Bell-202 data modulation and demodulation. Its rugged design is optimized for use with industrial serial communication protocols, such as Modbus/RTU, Allen-Bradley DF1, and DNP3.

Bell-202 modem technology offers significant advantages when applied to certain difficult system integration projects: **1.** It offers unsurpassed ability to communicate across long distances through imperfect, unshielded, telephone-grade wires. **2.** It permits interoperability of an inhomogenous mix of various makes and models of compatible Bell-202 modems within a telemetry system.



Engineering Specifications -

Dimensions:	4.5" x 5.0" x 1.275"
Weight:	6.2 Ounces
Supply Voltage:	9-36V _{DC} (Should always be powered from radio's power source)
Supply Current:	25mA @ 12V _{DC} , 14mA @ 24V _{DC}
Supply Power:	0.34W Approx.
Internal Power Efficiency:	87%, Typical
Circuit Protection:	Supply V+ Fused 1000mA, TVSS Diode, Reverse-Protection Zener Diode Leased Line Fused 1000mA, Gas Discharge Tube Protection, Bi-Directional Zener
Temperature:	-30C to +85C
Relative Humidity:	5% to 95%, Non-Condensing
Enclosure Rating:	Built to IP40 Specifications, Not Rated for Submersion/Outdoor Use
Panel Mounts:	Universal Din-Rail Clip
Environmental:	ROHS-Compliant, Lead-Free
Programming Method:	No Programming Required.
Source:	Transmit Level and Receive Level Adjustments Factory-Tuned, But Available via Internal Pots Designed & Manufactured at our Facility in Wildwood, Missouri from a combination of domestic and imported components.
Warranty:	2 Years (see www.scadametrics.com for details)

Port Pinouts -

Leased Line Port:

- Line A (non-polarized)
- Line B (non-polarized)

SB.202 Interface Port:

- 1: XMT.AUDIO (to TL.202)
- 2: RCV.AUDIO (from TL.202)
- 3: PUSH-TO-TALK (ground to transmit)
- 4: N/C
- 5: V_{DC-}/GND, SIGNAL.GROUND
- 6: V_{DC+}

* In accordance with FCC CFR 47 Part 15.103(a,b,c) - the TL.202 is intended to be used as a control system component at public utility facilities, industrial plants, and within commercial transportation vehicles. It is also intended to be used within industrial, commercial, & medical test equipment. Not intended for consumer applications.

Engineering Dimensions (Inches) -



Telemetry Leased Line Interface Instructions -

SB.202 and TL.202 Telemetry Leased Copper Line



Model SB.202 and Model TL.202

TL.202 Configuration for 2-Wire and 4-Wire Networks:

In order to convert the **Model SB.202** for use with 2-wire and 4-wire telemetry leased copper lines, the **Model TL.202** should be added by connecting the following five (5) jumper wires:

2-Wire Configuration			
	SB.202 Smart Bell-202 Modem for Radio Telemetry		TL.202 Telemetry Leased Line Adapter for Bell-202 Radio Modem
1.	TRANSMIT AUDIO	↔	TRANSMIT AUDIO
2.	RECEIVE AUDIO	↔	RECEIVE AUDIO
3.	PTT (PUSH-TO-TALK)	↔	PTT (PUSH-TO-TALK)
4.	CARRIER DETECT (DO NOT CONNECT)	n/c	CARRIER DETECT (DO NOT CONNECT)
5.	V- / SIGNAL GROUND	↔	V- / SIGNAL GROUND
6.	V+	↔	V+

4-Wire Configuration				
	SB.202 Smart Bell-202 Modem for Radio Telemetry		TL.202 #1 - Transmitter Telemetry Leased Line Adapter for Bell-202 Radio Modem	TL.202 #2 - Receiver Telemetry Leased Line Adapter for Bell-202 Radio Modem
1.	TRANSMIT AUDIO	↔	TRANSMIT AUDIO	TRANSMIT AUDIO
2.	RECEIVE AUDIO	↔	RECEIVE AUDIO	RECEIVE AUDIO
3.	PTT (PUSH-TO-TALK)	↔	PTT (PUSH-TO-TALK)	PTT (PUSH-TO-TALK)
4.	CARRIER DETECT (DO NOT CONNECT)	n/c	CARRIER DETECT (DO NOT CONNECT)	CARRIER DETECT (DO NOT CONNECT)
5.	V- / SIGNAL GROUND	↔	V- / SIGNAL GROUND	V- / SIGNAL GROUND
6.	V+	↔	V+	V+

... and then the telemetry leased line(s) should be connected to the **Line.A** and **Line.B** terminals in the front of the TL.202(s). Please note that Line A and Line B are polarity-insensitive.

SB.202 Configuration for 2-Wire and 4-Wire Networks:

1. All SB.202 Modems on the network should have IDENTICAL DIP Switch settings, with the exception of DIP Switch #1, which sets the RS.232 baud rate. DIP Switch #1 should be set to the RS.232 baud rate of the connected RTU/PLC/Computer. Available settings are 1200 bps and 9600 bps.
2. All SB.202 modems on the network should be set for Carrier Detect Source=Modem (DIP Switch #3 = OFF)

QUICK-START TIPS -

Initial Setup:

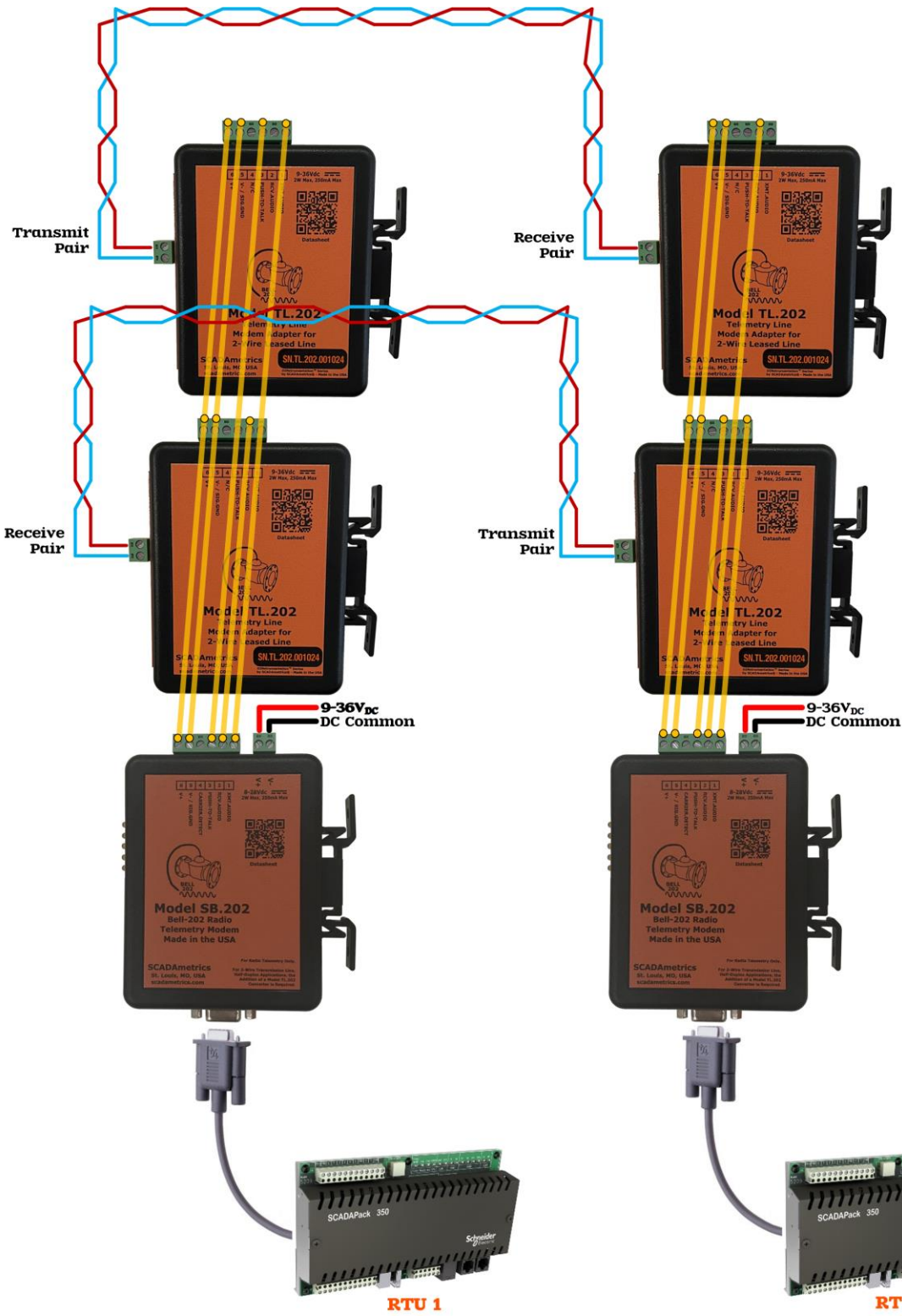
- 1. Connect the RS-232 Serial Port of the PLC/RTU to the Serial Port of the SB.202. Take special care to ensure that the pins are interconnected properly and according to the respective pinouts.**
- 2. Connect the Radio Interface Port of the SB.202 to the TL.202. Take special care to ensure that the pins are interconnected properly and according to the respective pinouts.**
- 3. Connect the SB.202 to the DC Power Source.**
- 4. Apply Power, and Observe...**
 - The 'Power' LED should be lit up continuously.
 - The 'Heartbeat' LED should be blinking slowly, signifying that the SB.202 microcontroller is working.
 - The RTU LED's should light up whenever serial port activity is detected.
 - The Modem LED's should light up whenever radio activity is detected.
- 5. Perform Modbus (or DF1) test polls to validate performance.**

Telemetry Interface Examples -

SCADAPack RTU's Connected Via 2-Wire Leased Line



**SCADAPack RTU's Connected
Via 4-Wire Leased Line**



FAQ's -

- **Is the SB.202 a 'smart' modem?** Yes and No. The SB.202 is 'smart' in the sense that it contains an integral microcontroller that supervises the timing of the radio's transmitter and the data stream, thereby allowing your RTU/PLC to offload its Modbus requests and responses immediately – without RTS/CTS delays. In fact, you may even use a simple 3-wire serial cable with RTS/CTS flow control disabled. Additionally, you may even connect an RS-485 Modbus device to the SB.202 without an intermediary RTU/PLC – although an external RS-485 to RS-232 converter would be required.

On the other hand, the SB.202 is 'dumb' in the sense that it does ***not*** modify the content of the messages, and it does ***not*** add proprietary framing layers to the transmissions. For these reasons, you may be assured that it will be over-the-air compatible with other-brand modems that adhere to the Bell-202 standard.

- **What are the power requirements of the SB.202?** The SB.202 provides the user with a great deal of flexibility in that it will operate on any voltage between 8-28V_{DC}. However, it is **required** that the user power the modem with the same voltage source that is used to power the radio – which will generally be ~12VDC. Radio Interface Terminal 6 provides a direct connection back to the V_{DC+} terminal block.

- **Does the SB.202 require programming?** No, the unit features 16 DIP switches for tailoring the modem to your radio and application, and one trim pot for adjusting the transmit audio level.

- **What are the Bell-202 modulation tones?** The Bell-202 standard uses 1200 Hz for 'MARK' (Binary '1'), and 2200 Hz for 'SPACE' (Binary '0').

- **Will the SB.202 work over leased lines?** No, not by itself, as the SB.202 is designed for use with radios only. However, the combination of the **Model SB.202** and the **Model TL.202 Telemetry Line Interface** does enable usage over 2-wire and 4-wire leased lines.