

BSR100D™

Wireless VHF / UHF Radio Modem



User Manual

KP ELECTRONIC
SYSTEMS LTD

ISRAEL Office:

Email: info@kpsystems.com

P.O. Box 42, Tefen Industrial Park, Tefen 24959

Tel: 972-4-987-3066 / Fax: 972-4-987-3692

USA Office: **KP ELECTRONICS INC.**

Email: info@kpelectronics.com

109 Tudor Drive, North Wales, PA 19454

Tel: (215) 542-7460 / Fax: (215) 542-7461

Web Site: www.kpsystems.com

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1 General Description

The BSR100D is a data radio modem unit designed for high performance, long-range SCADA (Supervisory Control and Data Acquisition) and telemetry applications. The BSR100D offers the advantage of distanced communications using long-range VHF and UHF frequencies with data modem.

1.1 BSR100D Functions

BSR100D functions include the following:

- Receives and transmits DRCMSK (Differential Raise Cosine Minimum Shift Keying) and DF (Direct Frequency) modulation
- Performs receiving and transmitting frequency programming changes
- RSSI output
- Visual control
- Channel monitor control
- PTT control
- On/Off indicator
- Data speeds of 4800 to 19200 bps (9600bps maximum in half channels) using a standard RS-232 interface
- Power output of 10 watt
- Half duplex or simplex operations
- Transmit control via Request-to-Send (RTS)
- Online diagnostic monitoring
- Offline local and remote diagnostics

1.2 Front Panel Display

The front panel includes three large LED indicators for radio operations, three smaller LED indicators for modem operations and a 15-pin data port (see *Figure 1: Front Panel Display* and *Table 1: Front Panel LED Indication* for full explanation).

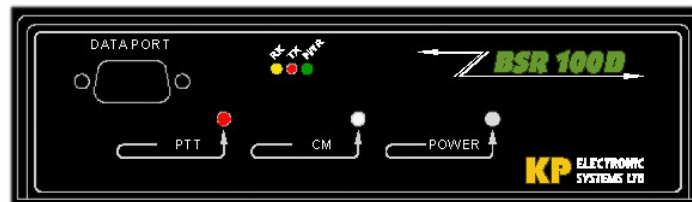


Figure 1: Front Panel Display

Table 1: Front Panel LED Indication

<i>Functionality</i>	<i>Indicates</i>	<i>LED</i>	<i>Description</i>
Radio	Push to talk (PTT)	Red/Off	Radio transmit/receive mode
	Channel Monitor (CM)	Green/Red	Monitors channel activity
	Power	Green/Red	DC power
Modem	Receive (RX)	Yellow	Unit is receiving signal
	Transmit (TX)	Red	Unit is transmitting signal
	Power (PWR)	Green	DC power is applied

1.3 Rear Panel Display

The back panel includes cable connection for Tx/Rx mode with an optional Rx plug, a 15-pin control connector and power outlet.



Figure 2: Rear Panel Display

2 Radio Module Description

The BSR100D has a built in radio module that acts as a VHF/UHF transceiver and operates as a two-way base station in half duplex mode at remote central stations and repeaters.

The BSR100D™ has four sets of radio connectors in the rear of the unit: J1, J2, J3, J6 (see *Figure 3: Radio Connectors J1, J2, J3 & J6* and *Table 2: Radio Connector Description* for full explanation).

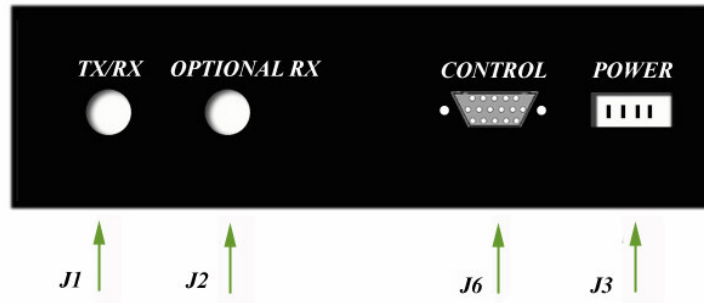


Figure 3: Radio Connectors J1, J2, J3 & J6

Table 2: Radio Connector Description

<i>Connector</i>	<i>Function</i>
J1	BNC connector for TX/RX antenna
J2	Additional RX plug for antenna
J3	12.5 VDC power supply
J6	15-pin control connector

The J6 is a D-type 15-pin panel connector that connects the following:

Table 3: J6 Pin Description

<i>Connector</i>	<i>Pin</i>
PTT1	1
GND	2, 5, 7, 11, 13, 15
RS232 IN	3
RS232 OUT	4
+VB	6
METER OUT	8
NC	9, 10
AUDIO IN	12
DATA OUT	14

3 Modem Module Description

The BSR100D has a built-in wireless modem that provides a high-speed data link suitable for a wide variety of applications with system security for diagnostics reporting.

3.1 Data Port Interface

The BSR100D modem component is equipped with a J4 15-pin data port interface. The J4 is used for connection between the radio modem and PC for set-up and data communications (see *Figure 4: Data Port Interface*).

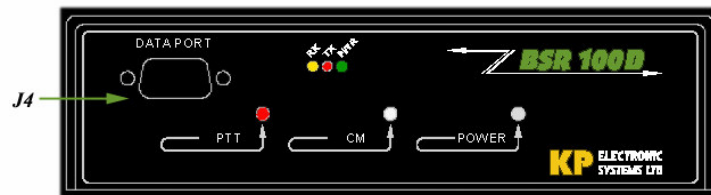


Figure 4: Data Port Interface

Set-up and data communications require two separate cables to be used. Each cable is labeled *SET-UP* or *PC DATA* cable and is equipped with a male 15-pin cable connection to connect directly to the J4 interface, and a corresponding female 9-pin COM port connector to connect to the PC.

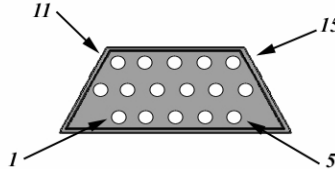


Figure 5: Data Port Connector Diagram

Following is a detailed pin description and data port cable description:

Table 4: J4 Pin Description

<i>Pin</i>	<i>Name</i>	<i>Pin</i>	<i>Name</i>	<i>Pin</i>	<i>Name</i>
1	Ground	6	Ground	11	CS 0
2	Rx Data	7	Clear to Send (CTS)	12	CS 1
3	Tx Data	8	Request to Send (RTS)	13	CS 2
4	Test Audio	9	Data Carrier Detect (DCD)	14	Received Signal Strength Indicator (RSSI)
5	B+ Power	10	B+ Power	15	DTR Programming

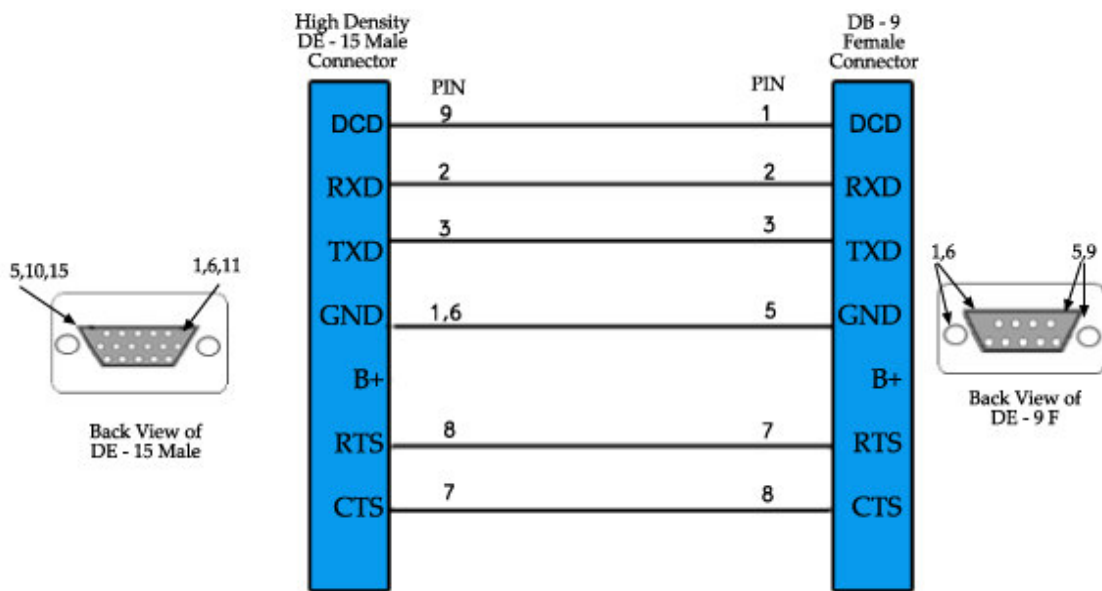


Figure 6: Data Port Cable Description

Table 5: Interface Signal Description

<i>Name</i>	<i>Description</i>
B+ Power (input)	10 to 16 VDC (13.3V nominal maximum) 2.5A (<i>Not Applicable</i>)
RX Data	Receive data from BSR100D to DTE
TX Data	Transmit data from DTE to BSR100D
CTS	Asserted when the BSR100D is ready to accept TX data
RTS	Causes the BSR100D to transmit when asserted by the DTE
DCD	Asserted by the BSR100D when a data signal is being received

DTR	Data Terminal Ready. Asserted by the BSR100D Field Programming Software to select set-up mode (Don't connect to this pin for user application)
Test Audio	Output signal used during adjustment and testing
RSSI	Output signal used during testing

4 Preparing for Operation

Before installing the BSR100D™, it is suggested that the following preparations are performed:

- Connecting assembly cables
- Connecting PC to Modem Module DTE
- Connecting power supply
- Performing a self test

4.1 RF exposure statement

Power listed is Conducted. For mobile operation, the antenna used for this transmitter must not exceed 2 dBi and must be installed to provide a separation distance of at least 80 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Installers and end-users must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

For Fixed Base operation, the antenna(s) used for this transmitter must not exceed 6 dBi and must be installed to provide a separation distance of at least 1.25 m from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. Installers and end-users must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

4.2 Connecting Assembly Cables

To connect the assembly cables:

1. Connect one end of the $\rho=50$ Ohm cable to J1, the Rx/Tx BNC connector.
2. Connect the other end of the $\rho=50$ Ohm cable to the 50 Ohm load, according to its application wiring diagram

4.3 Connecting PC/DTE to Modem Module

To connect the assembly cables:

1. Connect the cable labeled *PC DATA* to the 15-pin J4 DTE connector on the front panel of the BSR100D's modem module (see *Figure 7*).
2. Connect the other end of the *PC DATA* cable to the 9-pin serial COM port at the rear of the computer.

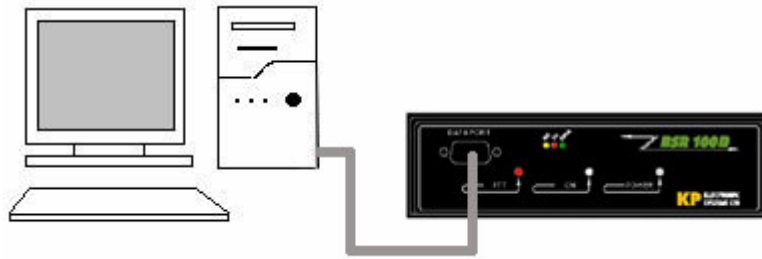


Figure 7: PC/ Modem Module DTE Connection

4.4 Connecting Power Supply

To connect the DC plug to the J3 DC Power Connector:

1. Connect one end of the cable to J3, the four-pin rear panel connector.
2. Connect the other end of the cable to a 12.5 VDC, 5A power source (power supply/battery)

4.5 Performing a Self Test

To perform a self test:

1. Switch on the 12.5 VDC power supply
2. Observe the Self-Test LEDs (see *Figure 8: Self-Test LEDs* and *Table 6: Self-Test LEDs* for full description)

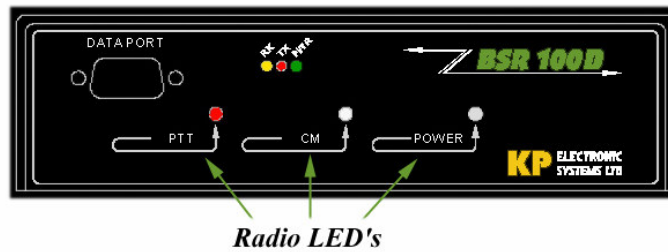


Figure 8: Self-Test LEDs

Table 6: Self-Test LEDs

LED Indicator	Status
LED PTT	
ON (red)	Tx mode
OFF	Rx mode
2 Flashes	Overload (optional)
3 Flashes	Predriver/Driver
1 Flash	Time out timer
4 Flashes	PLL
4 Flashes	Synthesizer

<i>LED Indicator</i>	<i>Status</i>
Power LED	
Green	Normal
Red	Dead Battery
CM LED	
Green	Free
Red	Channel Monitor
Flashes red/-green	RF/IF Amplifiers

In addition to the signals in *Table 6: Self-Test LEDs*, there is an error-status word in the Gup10™ Utility Program (see following *Section 5 Setting Communication Parameters*)

5 Setting Communication Parameters

5.1 BSR100D™ Radio Programming Guide Using GUP10™

Using KP's Gup10 Utility Program, the BSR100D™ parameter values listed below can be programmed or modified.

- Transmit frequency (MHz)
- Receiver frequency (MHz)
- Tx time out (0-240 sec)

Connecting RADIO SET-UP cable using KP's RS232 adaptor (RSINT001™) are configured between the BSR100D and a PC (see *Figure 9: BSR100D/PC Connection Configuration*).



Figure 9: BSR100D/PC Connection Configuration

5.1.1 Operating Instructions

- Connecting BSR100D to Gup10 (utility program)
- Loading Parameter Values
- Changing Parameter Values
- Updating Parameter Value Changes
- Confirming Parameter Value Changes
- Activating Self Test

5.1.2 Connecting BSR100D to Gup10

Connect BSR100D™ to a PC using the RSINT001 adaptor and cables

Click Start>Programs>KP Utilities>GUP10.

The GUP10 main screen displays the device type, version, status device diagnostics and parameters (see *Figure 10: Gup10 Main Screen*)

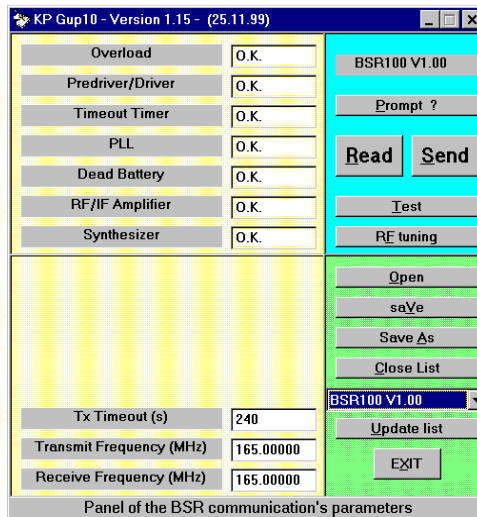


Figure 10: Gup10 Main Screen

5.1.3 Loading Parameter Values

Parameter values must be loaded after connecting the Gup10 utility software.

To Load Parameter Values

1. From the Gup10 main screen, click Prompt? (Alt P)
2. Click Read (Alt R). The name of the device type, version, and suitable parameters are displayed

5.1.4 Changing Parameter Values

Parameter values can be changed as required. Type the new parameter value in the designated parameter text box.

5.1.5 Updating Parameter Value Changes

1. Click Send (Alt S). The Send Warning dialog box displays “Are you sure?”
2. Choose one:
 - Click Yes, to update parameter changes
O
R
 - Click No, to return to the Gup10 main screen without updating changes

5.1.6 Confirming Parameter Changes

Ensure that any parameter value changes made are updated. To confirm parameter changes click Read (Alt R) from the

Gup10 main screen. The Gup10 main screen displays the updated parameter values.

5.1.7 Activating Self Test

After parameter values are loaded, perform a self-test:

1. Disconnect BSR100D from the PC
2. Press the self-test button
3. Observe the self-test led

5.1.8 On-Screen HELP

To view a brief explanation of any BSR100D parameter, click the required parameter text box. The cursor will appear in the designated text box, and the valid parameter range, with a brief explanation, displays at the bottom of the screen.

5.2 BSR100D Modem Programming Guide Using DATARADIO™ Field Programming (DFP) Software

The DATARADIO field programming (DFP) software provides programming and diagnostics for the BSR100D Radio Modem. The DFP software allows the user to edit and program user programmable settings, interactively tune modem, and monitor diagnostic data from the BSR100D (See *Figure 11: DFP Software Startup Screen*).



Figure 11: DFP Software Startup Screen

This manual assumes the DFP software has been installed on the user's PC with at least one operational serial COM Port available.

5.2.1 Preparing Programming

To commence programming of the BSR100D modem module parameters, connect the *MODEM SET-UP* cable (refer to *Section 3.1 Data Port Interface*) to the J4 connector on the front panel of the BSR100D. The corresponding 9-pin connection on the *SET-UP* cable is connected to the PC serial COM port.

5.2.2 COM Port Settings

BSR100D programming is done through the PC's primary COM port. Primary and secondary COM ports are configured with the DFP software.

The programming cable is connected from the set-up port on the BSR100D to the PC's COM port configured as the primary port. The Port Setting Screen of the FPS is accessed via the Utilities pull-down menu (see *Figure 12: DFP Software Port Setting Screens*).

The Port Setting Screens are used to configure the PC's serial COM ports. COM port assignments are displayed in the bottom status bar of the DFP software screen.

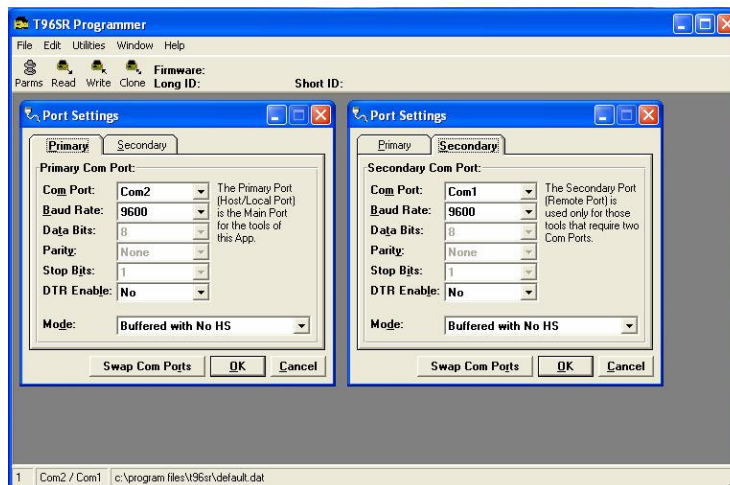


Figure 12: DFP Software Port Setting Screens

5.2.3 COM Port Parameters

COM Port

Selects COM Port number (COM 1-4) for primary and secondary COM ports (see *Figure 12: DFP Software Port Setting Screens*)

Baud Rate

Selects the communication speed for primary and secondary COM ports

Data Bits

Selects the number of data bits (4-8) transmitted or received for the primary and secondary COM ports

Parity

Selects transmission or reception of any parity bits for the primary and secondary COM ports

Stop Bits

Selects number of stop bits (1 or 2) transmitted or received for the primary and secondary COM ports

DTR Enable

Used to assert DTR line of the RS232 port when the port is open for the primary and secondary COM ports

Swap COM Ports

Selecting the Swap COM Ports button moves the secondary COM port setting to the primary COM port (and moves the primary COM port to the secondary settings). Since the BSR100D programming is done through the primary COM port, this is useful when two units are connected to the primary and secondary COM ports. A swap COM port allows the second unit to be programmed without switching programming cables.

5.2.4 Primary and Secondary Port Settings Communications Modes

The mode drop down menu configures the communication mode for the primary and secondary PC Port (See *Table 7: Communication Modes*).

Table 7: Communication Modes

Mode	Description
Sync/ESC with no Handshake (HS)	Sends data using Sync/byte-stuffing protocol with out HS
Buffered with no HS	Sends buffered data without HS (this mode required for DOX operation)
Sync/Esc with RTS/CTS HS	Sends data using the Sync/Esc byte-stuffing protocol with RTS/CTS HS
Buffered with RTS/CTS HS	Sends buffered data with RTS/CTS hardware HS
Sync/Esc with flow control HS	Sends data using the Sync/Esc byte-stuffing protocol with flow control HS
Buffered with flow control H/S	Sends buffered data with flow control hardware HS

5.2.5 Port Statistics

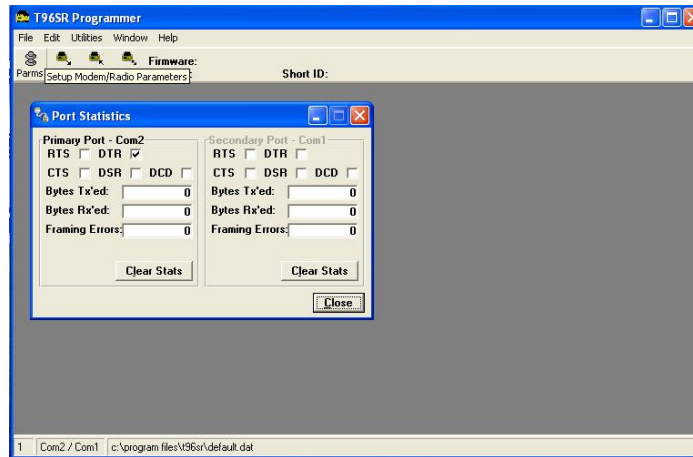


Figure 13: Port Statistics Screen

Port statistics show current parameters of the PC's primary and secondary COM ports.

RTS

Shows the current state of the RTS line. RTS is an output from the PC.

DTR

Shows the current state of the DTR line. DTR is an output from the PC.

CTS

Shows the current state of the CTS line. CTS is an input to the PC.

Data Set Ready (DSR)

DSR shows the current state of the DSR line. DSR is an input to the PC.

DCD

DCD shows the current state of the DCD line. DCD is an input to the PC.

Bytes Transmitted

Bytes Tx'ed shows the number of bytes (characters) transmitted since the port was last open or cleared.

Bytes Received

Bytes Rx'ed shows the number of bytes (characters) received since the port was last open or cleared.

Framing Errors

Framing Errors shows the number of framing errors received since the port was last open or cleared.

Dribble Bytes

Dribble Bytes shows the number of extra (not expected) bytes (characters) received since the port was last open or cleared.

6 Technical Specifications

General

Band	BSR100D VHF	BSRU100D UHF
Frequency Range	136-174 MHz	410-510 MHz
Channel Bandwidth	12.5 KHz	
Programming	Fully PC programming	
FCC Type Acceptance	H78KPBSR100	H78KPBSRU100
ETSI	300.113	
Operating Voltage	10-15 VDC	
Current Consumption	150mA STBY; 3A TX	160mA STBY; 3A TX
Diagnostics	Overload trouble, driver fault, timeout, PLL lock, dead battery, power trouble, RSSI	
Frequency Stability	± 2.5ppm @ -30 degrees Celsius to 60 degrees Celsius (23 degrees Fahrenheit – 141degrees Fahrenheit)	

Receiver

Sensitivity	-117dBm @12 dB SINAD
Selectivity	65 dB for 12.5 KHz
Inter-modulation	75 dB
Spurious and Image Rejection	75 dB

Transmitter

RF Output Power	1-10 Watts
Spurious Emission	-80 dB

Modem

Data Rate	4800, 9600
Modulation	DRCMSK
Bit Error Rate	Better than 1×10^{-5} @ 1.0μ V @ 4800 , 12.5 KHz
Signal Level	EIA RS -232C
Data Format	Asynchronous, serial, transparent
Word Length	7 or 8 bit words, 1 or 2 stop bits
Parity	Even, odd, or none
Handshake	RTS-CTS
RTS/CTS Delay	15 msec
Diagnostics	Power, TX RX, internal temp

Physical Dimension	
Size	169x150x44 mm (6.6"x5.9"x1.7)
Weight	0.65 Kg (1.44 Lbs)