



**International Truck and Engine Corp.
T110/R170/D180 System Manual**

(DM-R170-0002)

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International Truck and Engine Corp. T110/R170/D180 System Manual

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Revision History

Rev	Description
1.0	Initial Release

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1. Introduction

The R170 is a radio receiver that takes commands from an OMNEX wireless controller and translates the commands into J1939 Protocol Data Units (PDU). The PDUs are broadcast over the J1939 CAN network. The R170 has two CAN ports but currently only CAN1 is enabled.

The R170 also has a dedicated EN-418 compliant E-Stop system to ensure the safe shutdown of a controlled machine. The R170 must be configured properly when used in a control system. The following sections describe how to configure the R170.

To configure the R170 a serial communications program such as HyperTerminal¹ is required. You may choose to configure HyperTerminal as described in this manual or download pre-set HyperTerminal configurations from the following URL:

http://www.omnexcontrols.com/Support/R170_Support_Files.aspx

¹ HyperTerminal is developed by Hilgraeve Inc. for Microsoft®, and comes bundled with the Microsoft Windows™ operating system.

2. Setting Up HyperTerminal

A serial interface from the R170 to a PC running a serial communications program such as HyperTerminal is required to configure the R170. The program should be set to 9600 baud, 8 data bits, no parity, 1 stop bit and no flow control; an example using HyperTerminal is shown below. To create a new HyperTerminal configuration, launch HyperTerminal and follow the configuration prompts. To modify an existing HyperTerminal configuration, make sure HyperTerminal is disconnected and open the Properties window by clicking the *Properties* menu item under the *File* menu. In the Properties window click the *Configure* button to open the Configuration window and make the appropriate changes, as shown in Figure 1 below. Also ensure that “Echo characters typed locally” (in *Settings, ASCII Setup*) is disabled. After the serial interface is connected and your serial communications program is running, you will then be able to configure the R170 using HyperTerminal and the front panel of the R170.

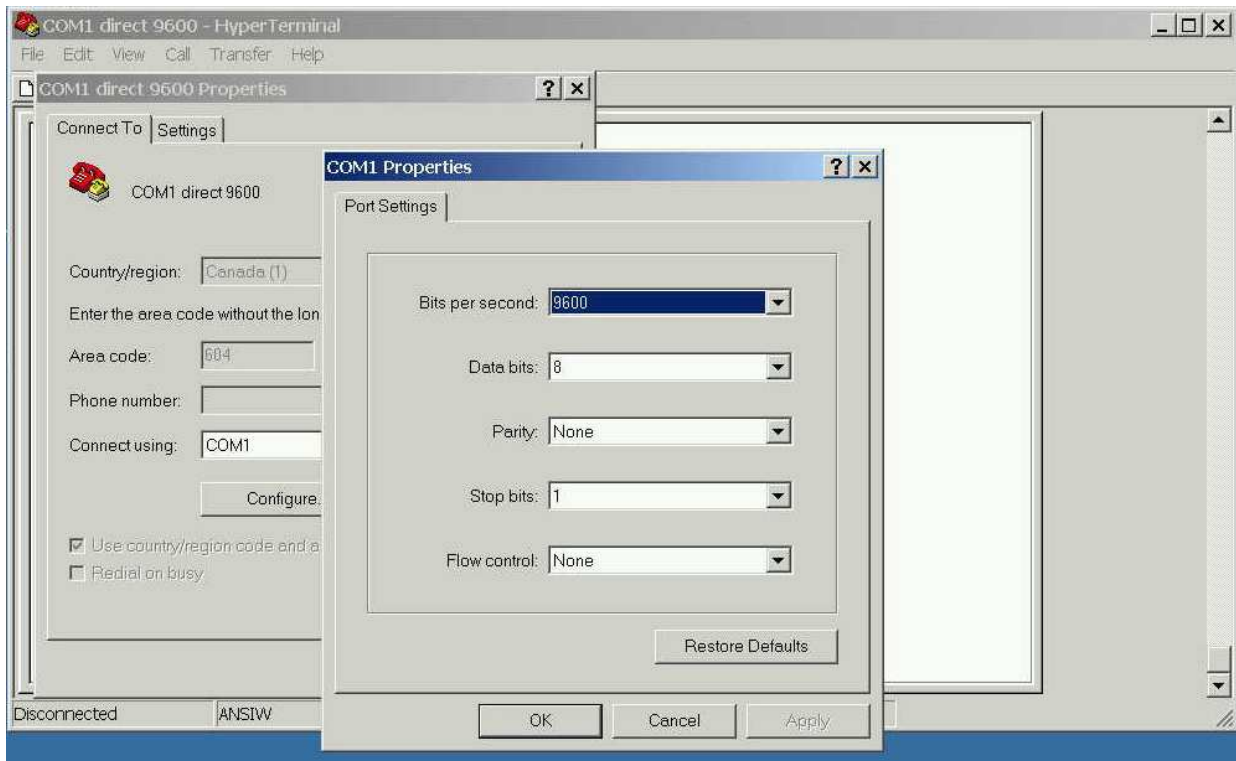


Figure 1 HyperTerminal Configuration Menu

A HyperTerminal configuration file with the settings shown above may be found at: http://www.omnexcontrols.com/Support/R170_Support_Files.aspx then click on R170Conf link.

3. Front Panel

The R170's Front Panel consists of 5 LED indicator lights and two push buttons. The indicator lights are labeled as shown in Figure 2.

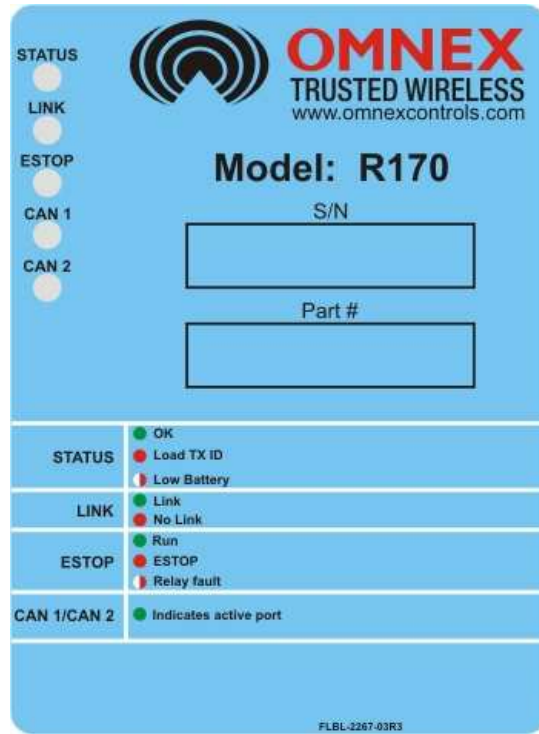


Figure 2 R170's Front Panel Indicator Lights

The STATUS light is normally green when the R170 is in normal operating mode. The LINK light indicates when a signal is being received from an OMNEX controller. The ESTOP light is red when the Emergency-Stop relay is open and green when the relay is closed (the machine is being controllable by the R170). The CAN1 and CAN2 lights indicate when the respective CAN ports are active (currently only CAN1 is enabled).

The two push buttons on the R170's front panel can be used in conjunction with the HyperTerminal interface to configure the R170 for desired operation. BUTTON1 is used for general configuration and BUTTON2 is used for CAN configuration.

4. Downloading the Transmitter ID

The R170 requires a transmitter ID from an OMNEX wireless controller before it can be operated. The R170 can only hold a single transmitter ID; if another transmitter ID is downloaded then the new ID will overwrite the previous ID. OMNEX controller IDs are unique, ensuring that the R170 will only respond to the correct controller.

NOTE: In this section, ID downloading is described with the serial connection set up. It is not necessary to have the serial connection set up to download the ID.

When the R170 is initially powered up, it will display a message in the communications program as shown in Figure 3.

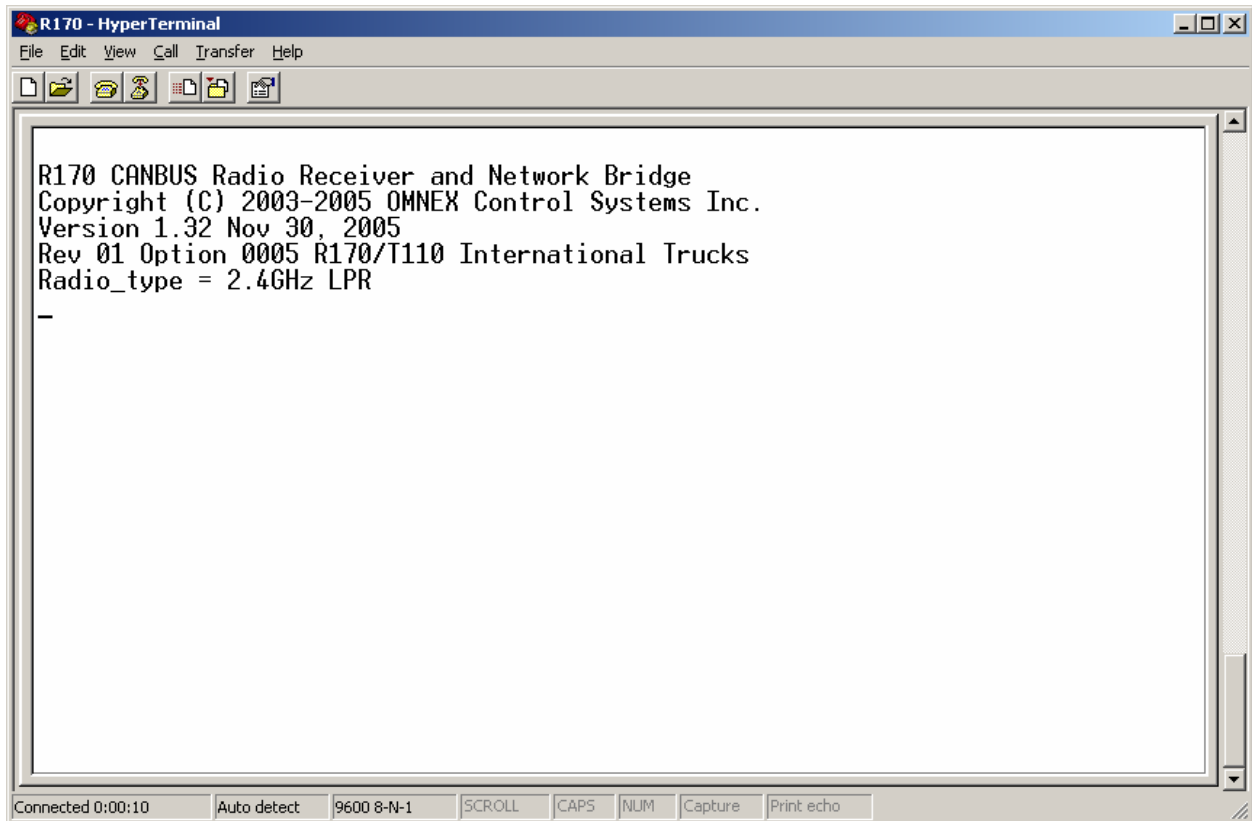


Figure 3 HyperTerminal Display on Power Up

The first time that the R170 is powered up it will not have a transmitter ID and will not be operational until a transmitter ID is downloaded. The STATUS light will be red to indicate that the R170 is not operational. Please use the following procedure to download a transmitter ID from an OMNEX wireless controller:

1. Press and hold BUTTON1 on the front panel of the R170. The Status light will turn green and flash slowly.

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2. Continue to hold BUTTON1 until the Status light begins to flash green quickly. When this occurs, release the button to enter Setup mode. If the serial connection is set up, a message will be displayed in the communications program prompting you with instructions for downloading the transmitter ID as shown in Figure 4.

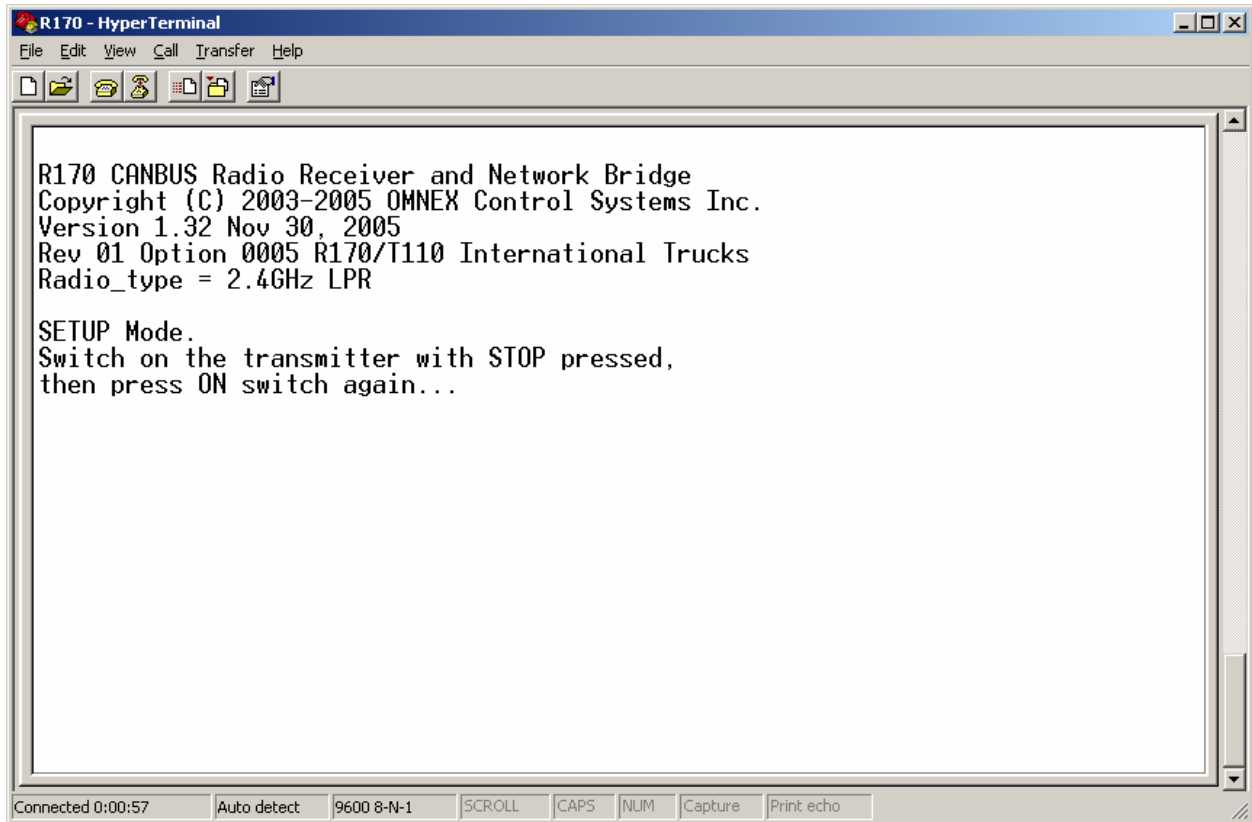
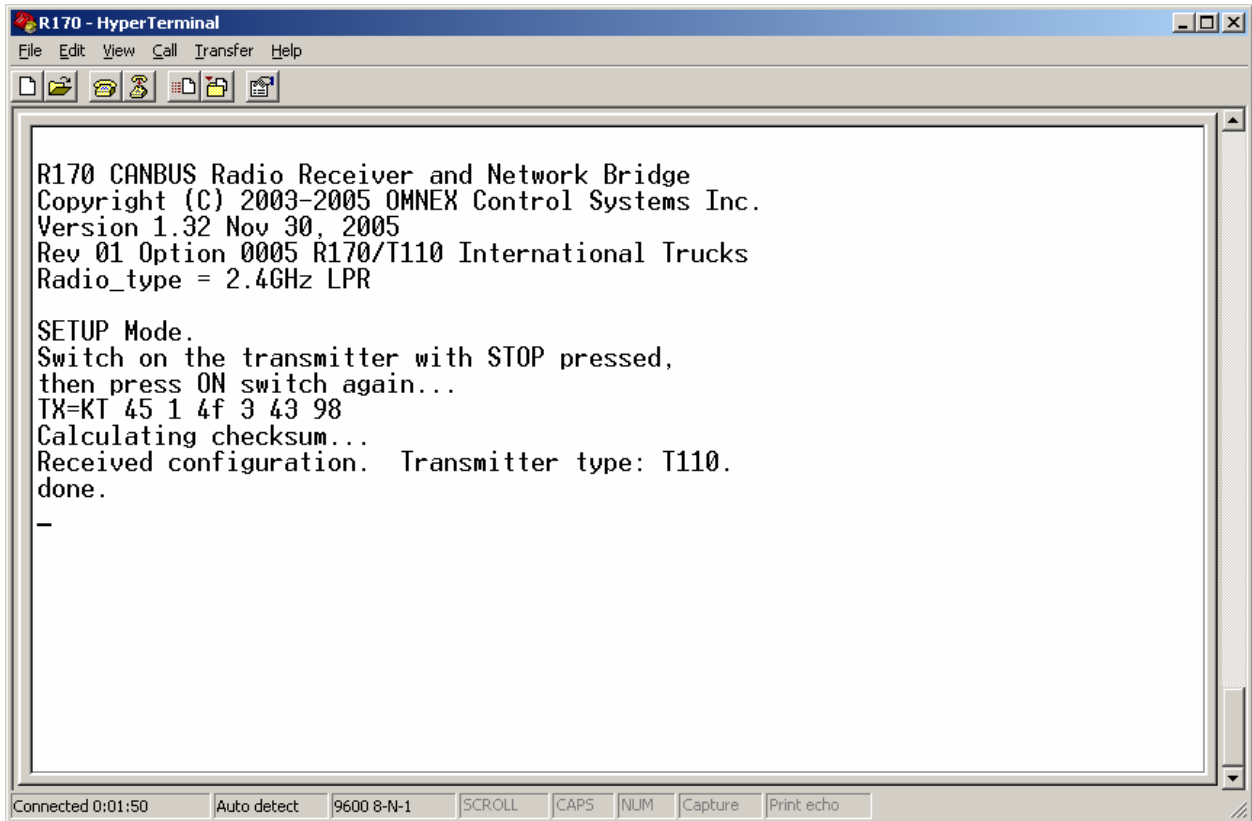


Figure 4 Setup Mode

3. After turning the OMNEX wireless controller on with its STOP (or E-Stop) button pressed then releasing the STOP (or E-Stop) button and pressing its ON button again, the OMNEX controller will begin sending the transmitter ID to the R170.

After successfully downloading the transmitter ID the R170 will display the message shown in Figure 5 and will exit setup mode. The Status light should now turn and remain green. Should errors be encountered during the download process, an appropriate message will be displayed.

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```
R170 - HyperTerminal
File Edit View Call Transfer Help
R170 CANBUS Radio Receiver and Network Bridge
Copyright (C) 2003-2005 OMNEX Control Systems Inc.
Version 1.32 Nov 30, 2005
Rev 01 Option 0005 R170/T110 International Trucks
Radio_type = 2.4GHz LPR

SETUP Mode.
Switch on the transmitter with STOP pressed,
then press ON switch again...
TX=KT 45 1 4f 3 43 98
Calculating checksum...
Received configuration. Transmitter type: T110.
done.
-

Connected 0:01:50 Auto detect 9600 8-N-1 SCROLL CAPS NUM Capture Print echo
```

Figure 5 Successfully Downloaded Transmitter ID

Note: The R170 will only remain in Setup Mode for 30 seconds. If a transmitter ID is not successfully received during this time, the R170 will exit Setup Mode with the warning message shown in Figure 6. The STATUS and LINK lights will also flash red to indicate that there was an error downloading the transmitter ID. If this happens try downloading the transmitter ID again as described above. Pressing BUTTON1 again will stop the STATUS and LINK lights from flashing red.

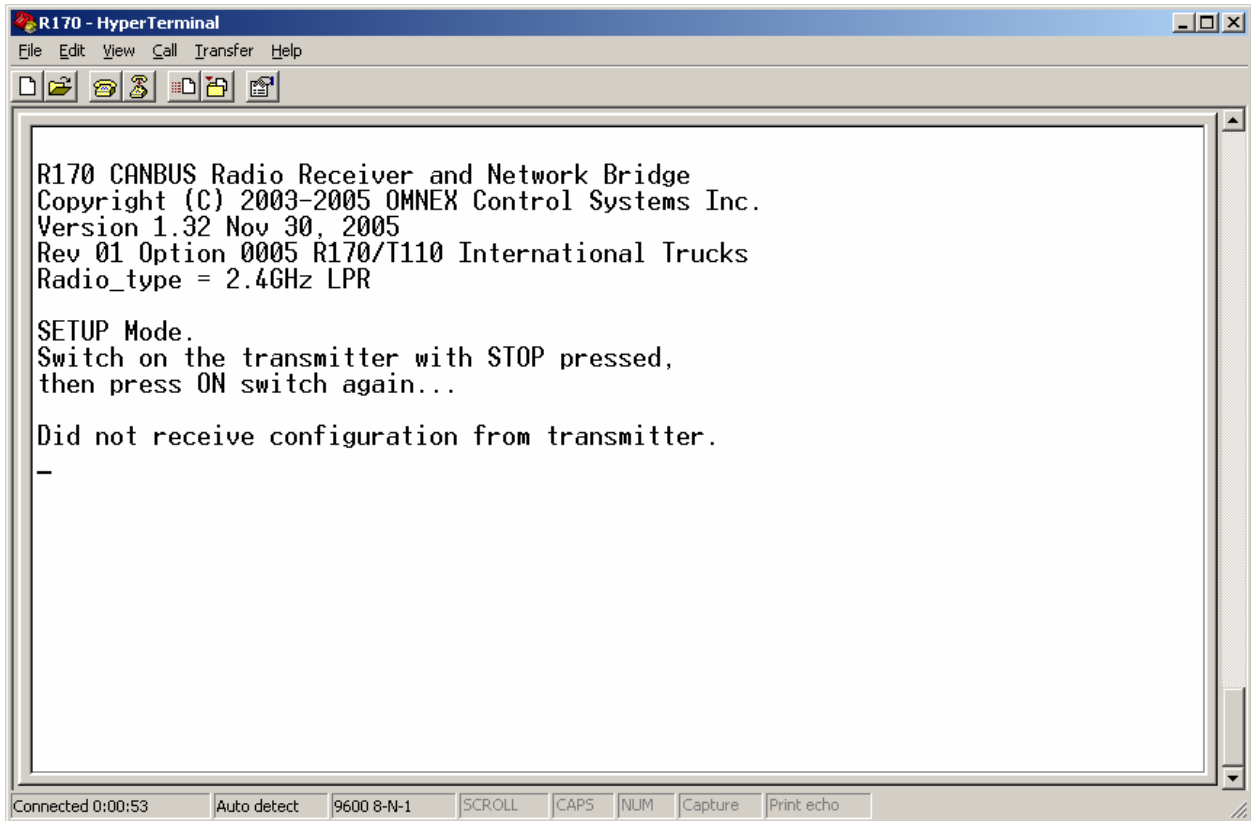


Figure 6 An Unsuccessful Transmitter ID Download

A transmitter ID may be downloaded at anytime even if the R170 already has a valid transmitter ID—the new ID will simply overwrite the previous ID. When the R170 enters Setup Mode, it shuts down the CAN ports and opens the Emergency-Stop Relay, thus disabling normal operations.

If, for some reason, BUTTON1 or BUTTON2 is stuck “on”, the R170 will indicate this fault by flashing its STATUS and LINK lights red, and also flash its CAN1 light green.

5. J1939 Setup

Certain J1939 specific parameters in the R170 may be configured by the user by entering the R170's J1939 CANbus Setup Mode. To enter J1939 CANbus Setup Mode, proceed as follows:

1. Press and hold BUTTON2 on the R170's front panel. The Status and CAN1 lights will flash green slowly.
2. Continue to hold BUTTON2 until the STATUS and CAN1 lights begin to flash green quickly. When this occurs, release the button to enter J1939 CANbus Setup Mode. A menu will be displayed in your communications program as shown in Figure 7.

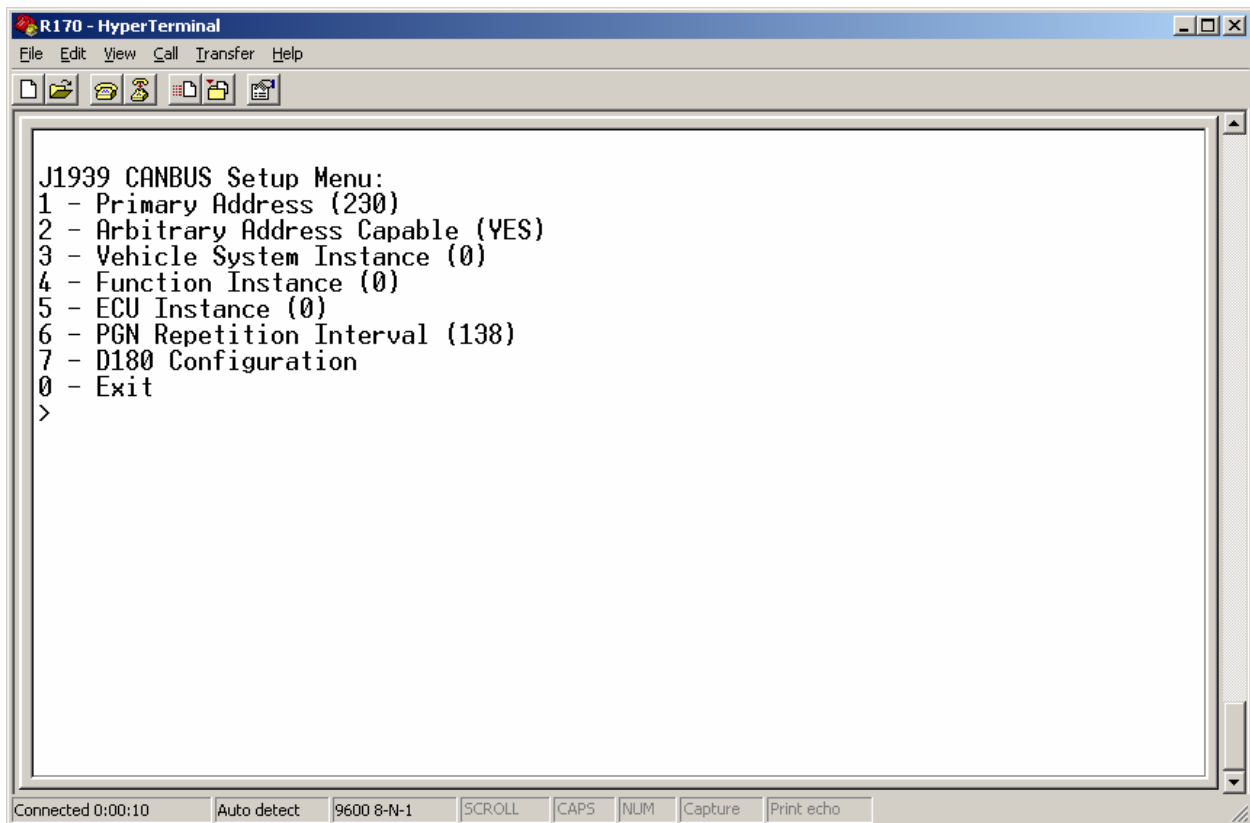


Figure 7 J1939 CANbus Setup Menu

3. You may set the R170's J1939 primary address using option 1 in the menu. The default primary address is 230.
4. Use option 6 to set the PGN repetition interval in milliseconds.
5. Option 7 can be used to temporarily change selected D180 configuration parameters.

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The other items in the menu affect the R170's J1939 NAME on the J1939 network. A J1939 node name is 8 bytes long and in the R170 is defined as shown in

Table 1.

Table 1 R170 J1939 NAME Fields

Name Field	Arbitrary Address Capable	Industry Group	Vehicle Systems Instance	Vehicle System	Reserved	Function	Function Instance	ECU Instance	Manufacturer Code	Identity Number	
										R170 ID	Transmitter ID
Number of bits	1 bit	3 bits	4 bits	7 bits	1 bit	8 bits	5 bits	3 bits	11 bits	5 bits	16 bits
Defined by	User	OMNEX	User	OMNEX	SAE	OMNEX	User	User	OMNEX	OMNEX	OMNEX Controller
Default value	1	0	0	0	0	52	0	0	129	0	N/A

As shown in the table, the Arbitrary Address Capable, Vehicle Systems Instance, Function Instance and ECU Instance fields can be defined by the user using the CAN setup menu. Each node on a J1939 network must have a unique name. To facilitate this, the R170's J1939 name is dependent on the transmitter ID downloaded from an OMNEX wireless controller. The transmitter ID is labeled on the OMNEX controller.

When the J1939 CANbus Setup Mode is exited, the R170 will re-initialize with the new J1939 NAME and continue normal operation.

If, for some reason, BUTTON1 or BUTTON2 is stuck "on", the R170 will indicate this fault by flashing its STATUS and LINK lights red, and also flash its CAN1 light green.

6. Tethered Mode

Under normal operation the R170 will act as a radio receiver, receiving commands from an OMNEX controller via a radio link. However, the R170 is also capable of operating in a tethered mode in which an RS-485 cable is directly connected from the OMNEX controller to the R170.

When operating in tethered mode the R170 and OMNEX controller behave the same as in wireless mode; that is, the R170 receives commands from the OMNEX controller and sends the commands as J1939 PDUs over the CAN network. Just as in wireless mode, the R170 requires a transmitter ID before it can be operated in tethered mode.

The two modes (tethered and wireless) are mutually exclusive and non-preemptive, that is the R170 can only operate in one of the two modes at any given time and the existing link must be terminated before another link is established.

To operate in tethered mode, shut off the OMNEX controller and connect the cable (provided by OMNEX) from the controller to the R170. Then, turn on the controller and toggle the STOP (E-Stop) button. The R170's LINK light will flash green indicating a link has been established.

Normally OMNEX will provide a cable for operating in tethered mode. The cable diagram for the cable is shown in Figure 8.

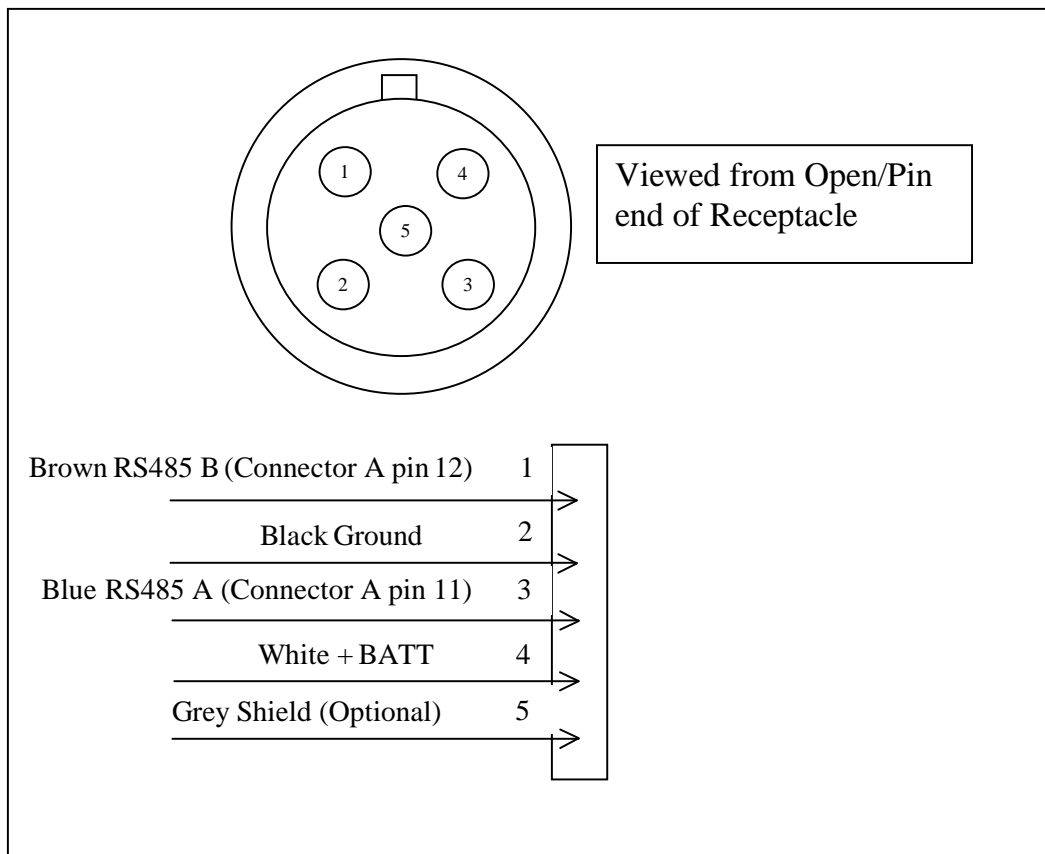


Figure 8 Tether connector pin-out

7. Firmware Upgrade

The R170 provides for in-field firmware upgrades. If an upgrade is necessary, a file containing the new firmware will be provided by OMNEX. The firmware is upgraded using the R170's serial interface and a serial communications program such as HyperTerminal. The serial communication settings for firmware upgrades are different from the settings used in the setup procedures described in the previous sections.

To upgrade the firmware, configure your communications program for 9600 baud, 8 data bits, no parity, 1 stop bit and Xon/Xoff flow control. A HyperTerminal configuration file with these settings may be found at:

<http://www.omnexcontrols.com/Support/downloads/R170/HyperTerminal/R170BootLoad.ht>

To perform a firmware upgrade, first switch off the power to the R170. Press and hold BUTTON2 as you power on the R170 then release BUTTON2 within 3 seconds of powering on. The R170 will enter Bootloader Mode and displayed a menu on the HyperTerminal screen as shown in Figure 9. If BUTTON2 is not released within 3 seconds of powering on the R170, the R170 assumes that BUTTON2 is stuck and will not enter Bootloader Mode; instead, it will start normal operation and display the initial power up message shown in Figure 3.

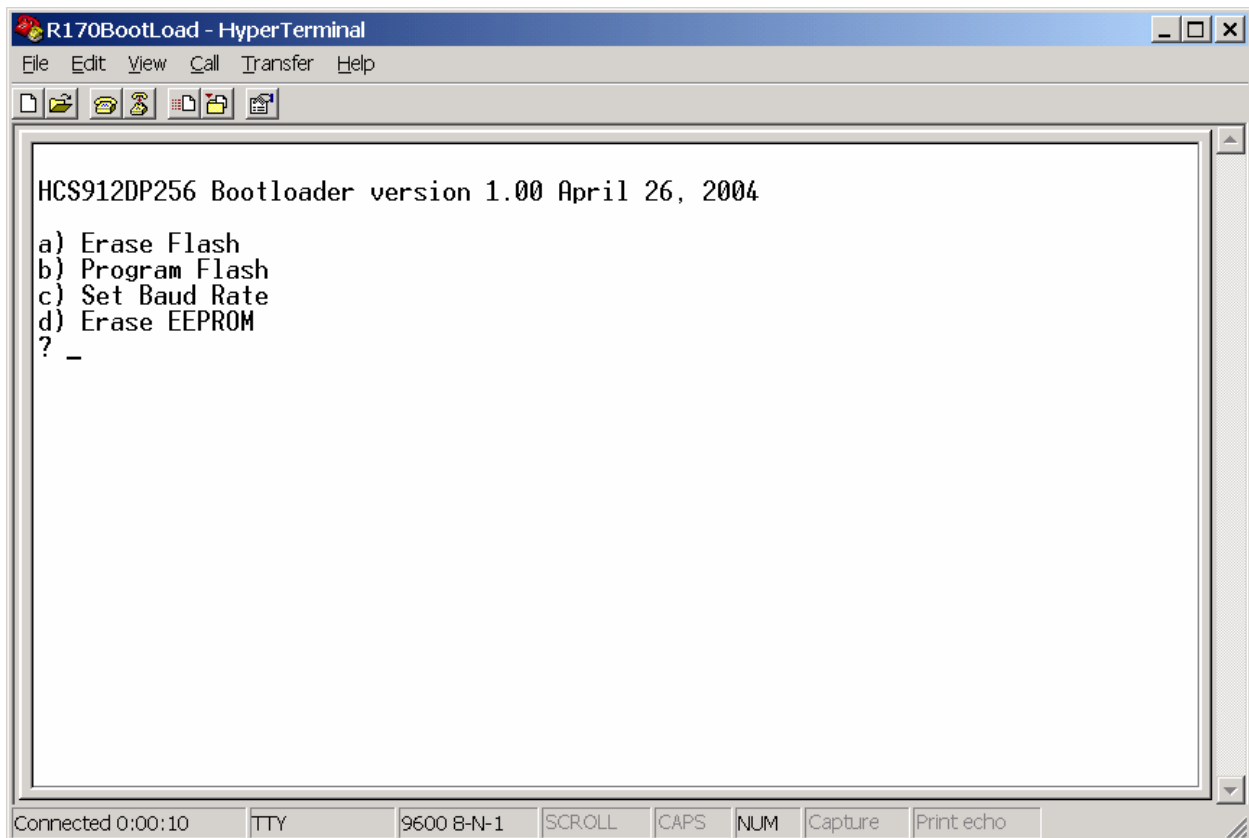


Figure 9 Bootloader Menu

Optionally the baud rate of the R170's serial interface may be changed, by choosing **c) Set Baud Rate**, to shorten the firmware download time. If the R170's baud rate is changed then

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the baud rate of your communications program must also be changed to match. (Note: The R170's baud rate will default to 9600 baud each time it is powered up.)

Before downloading the new firmware choose *a) Erase Flash* to erase the flash. To begin downloading the new firmware, choose *b) Program Flash*, and perform a text/ASCII upload in your communications program. If you are using HyperTerminal, this is accomplished by clicking *Transfer* and *Send Text File* in HyperTerminal's menu as illustrated in Figure 10.

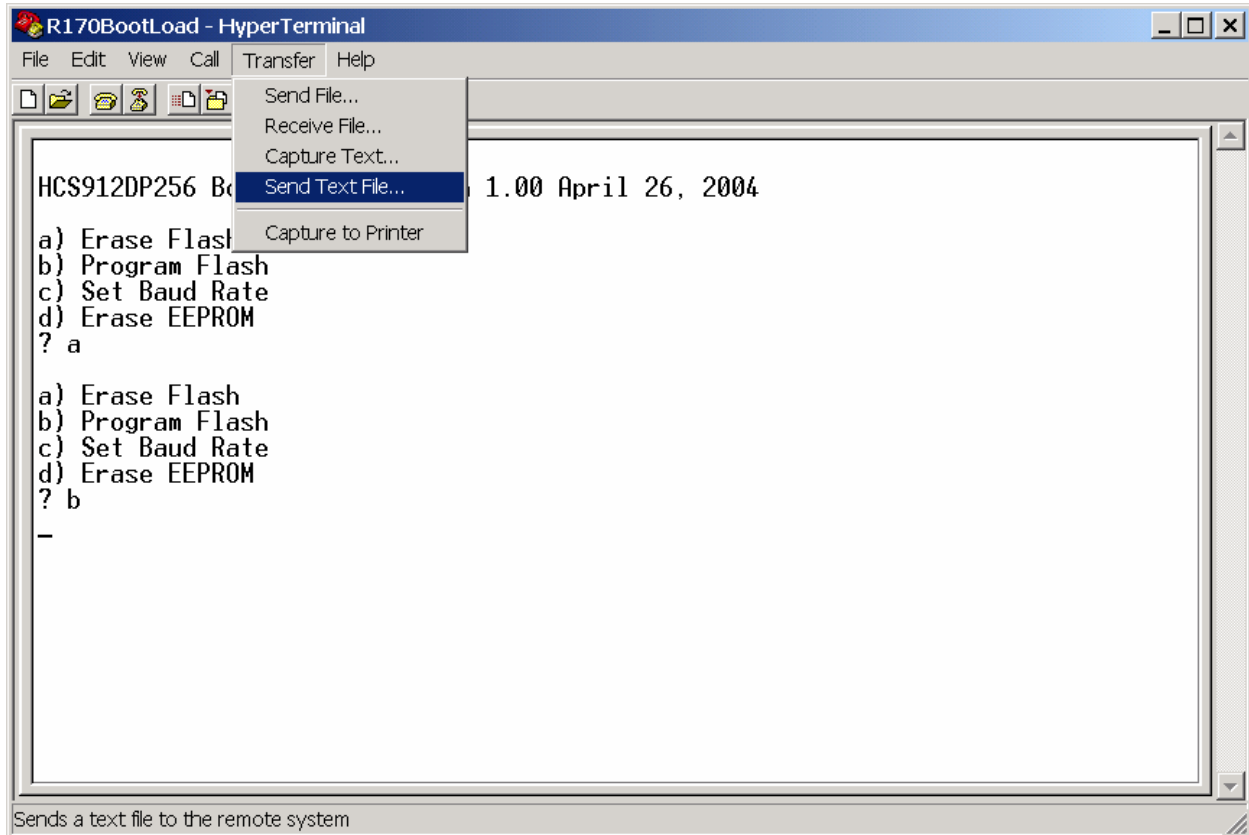


Figure 10 Send Text File

Specify the file, provided by OMNEX, containing the firmware upgrade to send to the R170. The R170 will now begin to receive and program the new firmware. As the firmware is programming, asterisks will be printed to the screen indicating progress as shown in Figure 11.

8. Connector Pin Assignments

There are two connectors on the R170 and two on the D180. Connector A is Grey, Connector B is Black. The pin functions for both connectors are provided below. The wire colors for the supplied cable are also shown. Note that the R170 portion of the cable is prewired with connectors for an RS232 connection, and a standard OMNEX tether connection.

R170 Connector A (Grey)

<u>Pin</u>	<u>Wire Color</u>	<u>Function</u>
A1	n/c	
A2	n/c	
A3	Black	Ground
A4	Brown	E-Stop Relay dry contact (internally fused to 7.5A)
A5	White	E-Stop Relay dry contact
A6	Red	Power Input (+ 9V to 30VDC)
A7	Blue	CAN Ground
A8	Green	CAN1 High
A9	Orange	CAN1 Low
A10	Black	RS485 Ground
A11	Blue	RS485 A
A12	Brown	RS485 B

R170 Connector B (Black)

<u>Pin</u>	<u>Wire Color</u>	<u>Function</u>
B1	Black	RS232 Ground
B2	Clear	RS232 TX (for serial configuration menus)
B3	Red	RS232 RX (for serial configuration menus)
B4	n/c	
B5	n/c	
B6	n/c	
B7	n/c	
B8	n/c	
B9	n/c	
B10	n/c	
B11	n/c	
B12	n/c	

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D180 Connector A (Grey)

<u>Pin</u>	<u>Wire Color</u>	<u>Function</u>
A1	Blue/Black	not used
A2	Black/White	not used
A3	Black	Ground
A4	Green/Black	not used
A5	Black/White/Red	not used
A6	Red	Power Input (+ 9V to 30VDC)
A7	Orange/Green	Output 1
A8	Red/Green	Output 2
A9	White/Red	Output 3
A10	Orange/Black	Output 5
A11	Blue/Red	Output 4
A12	Orange/Red	Output 6

D180 Connector B (Black)

<u>Pin</u>	<u>Wire Color</u>	<u>Function</u>
B1	White/Red/Black	Output 7
B2	Red/Black/White	Output 8
B3	Green	Output 9
B4	Green/Black/White	Output 10
B5	White	Output 11
B6	Orange	Output 12
B7	Blue	RS485 A
B8	Brown	RS485 B
B9	Red/White	not used
B10	Blue/White	not used
B11	White/Black	not used
B12	Black/Red	not used

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9. Warranty

OMNEX Control Systems Inc. Warrants to the original purchaser that the OMNEX products are free from defects in materials and workmanship under normal use and service for a period of **ONE YEAR**, parts (EXCLUDING: SWITCHES, CRYSTALS, OR PARTS SUBJECT TO UNAUTHORIZED REPAIR OR MODIFICATION) and labor from the date of delivery as evidenced by a copy of the receipt. OMNEX's entire liability and your exclusive remedy shall be, at OMNEX's option, either the (a) repair or (b) replacement of the OMNEX product which is returned within the warranty period to OMNEX freight collect by the OMNEX **APPROVED** carrier with a copy of the purchase receipt and with the **return authorization** of OMNEX. If failure has resulted from accident, abuse or misapplication, OMNEX shall have no responsibility to repair or replace the product under warranty. In no event shall OMNEX be responsible for incidental or consequential damage caused by defects in its products, whether such damage occurs or is discovered before or after replacement or repair and whether or not such damage is caused by the negligence of OMNEX Control Systems Inc.

Neither OMNEX nor its Distributors shall be liable for any delay or failure of the performance of any of its obligations under this agreement caused by acts of God, labor disputes, embargoes, boycotts, shortage of parts or any cause beyond its reasonable control.

Neither OMNEX nor its Distributors shall be responsible for incurred costs associated with border clearance or with the delay of the OMNEX products in transit to OMNEX. Any charges associated with the return of the OMNEX products may be subject to billing to the original purchaser in the event that the OMNEX products are NOT covered by the warranty as noted above.