SIEMENS

USER'S HANDBOOK

DYNAMIC BRAKE MONITOR (DBM), A90330

October 2010 (Revised June 2014)

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VERSION A.1

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Throughout this manual, notes, cautions, and warnings are frequently used to direct the reader's attention to specific information. Use of the three terms is defined as follows:

⚠ WARNING

WARNING

INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR SERIOUS INJURY. WARNINGS ALWAYS TAKE PRECEDENCE OVER NOTES, CAUTIONS, AND ALL OTHER INFORMATION.

⚠ CAUTION

CAUTION

REFERS TO PROPER PROCEDURES OR PRACTICES WHICH IF NOT STRICTLY OBSERVED, COULD RESULT IN A POTENTIALLY HAZARDOUS SITUATION AND/OR POSSIBLE DAMAGE TO EQUIPMENT. CAUTIONS TAKE PRECEDENCE OVER NOTES AND ALL OTHER INFORMATION, EXCEPT WARNINGS.

NOTE

NOTE

Generally used to highlight certain information relating to the topic under discussion.

If there are any questions, contact Siemens Industry Inc., Rail Automation Application Engineering.

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REVISION HISTORY

Rev.	Date	Author	Description
A	10/2010	DLW	Initial release
A.1	06/2014	TP	Change to Siemens Branding

1.0 INTRODUCTION

The Siemens Dynamic Brake Monitor (DBM), part number A90330, is a non-vital product that fills an “information-only” role on-board the locomotive. This device is designed to communicate dynamic braking or tractive effort information (measured in thousands of pounds) between interconnected locomotives in a MU (multiple unit) consist. The DBM is intended for use in locomotives equipped with an Integrated Locomotive Computer (ILC) and is compatible with existing products of this type meeting the requirements of AAR Specification S-5509 and operating on the CENELEC A-band. The Siemens DBM may also be used as a direct upgrade for similar equipment from other manufacturers that are compliant with the old AAR CENELEC C-band specification.

The DBM is installed in each locomotive in a consist. Each DBM detects the status of the host engine and broadcasts this information to all other locomotives in the consist. Each DBM also accumulates the parameters generated by all connected consist locomotives and provides the total effort (dynamic braking or tractive) of the contributing locomotives for display to the engineer.

Communication between DBM units is done via a power-line communications network which uses an existing pair of wires on the MU cable interconnecting all locomotives in the consist. In addition, the DBM can make the information available to a Distributed Power System (DP) so that total accumulated effort can be reported to the lead locomotive of trains with a distributed power configuration. Communications between DBMs is governed by a self-organizing messaging scheme that promotes automatic entry and exit of locomotives on the network.

Figure 1. Dynamic Brake Monitor (DBM), A90330

1.1 SYSTEM CONTEXT

As shown in Figure 2 below, the DBM interacts with a limited number of locomotive subsystems. On integrated locomotives, the DBM interfaces with the ILC in order to obtain locomotive configuration information as well as engine dynamic braking and traction status. The DBM provides the ILC with the aggregate consist dynamic braking and traction information collected from all other DBM units on the network. The interface between the DBM and ILC can be Ethernet or serial RS232.

The same aggregate consist status is presented on the Listener Port Interface to other subsystems that may need to use this type of information, such as a Distributed Power System.

NOTE

NOTE

If the DBM is used on non-integrated locomotives, additional sensors may be required for proper determination of dynamic braking or tractive effort. The serial interface normally used with the ILC is used for communication with a standalone Display Unit when the DBM is installed on a non-integrated locomotive.

A user interface via a serial RS232 connection is provided for configuration, monitoring and diagnostics of the DBM.

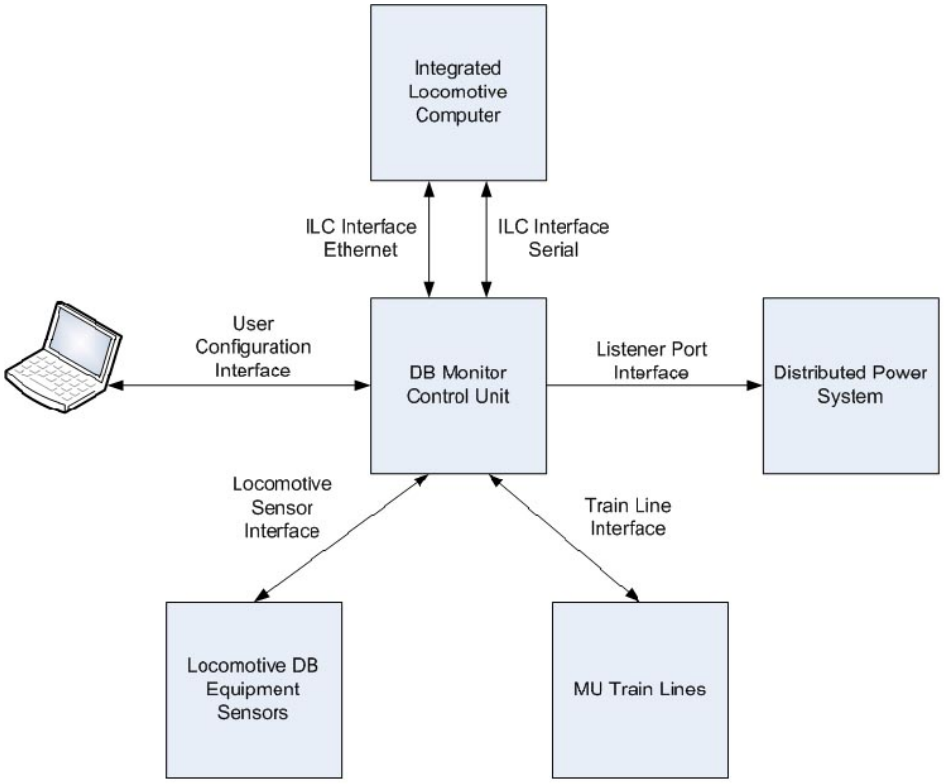


Figure 2. Dynamic Braking Monitor System Context

The DBM collects the aggregate dynamic braking and tractive effort information by means of a network linking all DBM units in a locomotive consist. This is implemented as a power-line communications network on the wiring (the MU train lines) that interconnects all locomotives in the consist.

1.2 HARDWARE

The DBM is housed in a rugged steel enclosure with a carrying handle incorporated into the base plate. The unit is designed to be installed in the locomotive LSI equipment rack. All interfaces to the locomotive wiring are accomplished through circular Mil-Spec connectors located on the front panel. The DBM can be configured via the DB-9 (RS232) connector on the front panel using a computer running a terminal emulation program such as HyperTerminal.

1.3 SPECIFICATIONS

Operating voltage	74 VDC (nominal 60 – 90 VDC) supplied from locomotive wiring harness via pins A and B of connector J1 (see paragraph 2.4.1 for details)
Operating Current	75mA typical (400mA max)
Operating Temperature Range	-40 °F to +158 °F (-40 °C to +70 °C)
Power Supply Isolation	1500 Vrms at 60Hz for 1 minute
Packaging	Housed in standard LSI rack enclosure with a 3 MCU form factor per AAR Standard S-590
Dimensions	3.6 inches high (9.1cm) 13.5 inches long (34.3 cm) including carrying handle 9.2 inches wide (23.4 cm)
Weight	8 pounds (3.63 kg)

1.4 PARTS LIST

Siemens P/N	Quantity	Description
9000-90330-0001	1	Dynamic Brake Monitor
QP-09654/10	Optional	Cable, Serial Connector
QP-09665	Optional	USB-to-Serial Adapter
OBE-00-10-13	Optional	DBM User's Handbook

2.0 INSTALLATION

2.1 LOCATION

The DBM has a 3 MCU form factor (per AAR Standard S-590) and fits in the locomotive LSI equipment rack. With the appropriate mounting brackets the DBM may be mounted outside of the LSI rack.

2.2 CONNECTOR DESCRIPTIONS

All connections to the DBM are made via connectors located on the DBM front panel adjacent to the carrying handle (see Figure 3). Connector identification is provided in Table 1.

Table 1. End Panel Connectors

Connector Number	Nomenclature	Configuration	Description
J1	PWR/TL	21-pin, male (22-21P)	Connection to locomotive power and train lines
J2A	LISTENER	4-pin, female (see NOTE) (8-4S)	Interface to Distributed Power System or other locomotive subsystem requiring dynamic braking or tractive effort information
J2B	LISTENER	4-pin, male (see NOTE) (8-4P)	Interface to Distributed Power System or other locomotive subsystem requiring dynamic braking or tractive effort information
J3A	DISPLAY / ILC	6-pin, female (see NOTE) (10-6S)	Interface to Integrated Locomotive Computer. Display interface function is for future applications.
J3B	DISPLAY / ILC	6-pin, male (see NOTE) (10-6P)	Interface to Integrated Locomotive Computer. Display interface function is for future applications.
J4	ETHERNET	8-pin, female (M12)	Ethernet interface to ILC
J5	CONFIGURATION	DB-9, female	RS232 user configuration interface
J6	SENSORS	5-pin, female (10-5S)	RS485, bi-directional half-duplex - for future applications

NOTE: The J2 and J3 connectors are provided in both male and female configurations to accommodate any installation including replacing existing non-standard units.

WARNING

THE POSSIBILITY OF A MINOR SHOCK EXISTS WHEN CONNECTING THE DBM TO 74-VOLT LOCOMOTIVE BATTERY POWER.

2.3 INTERFACE CONNECTOR LOCATIONS

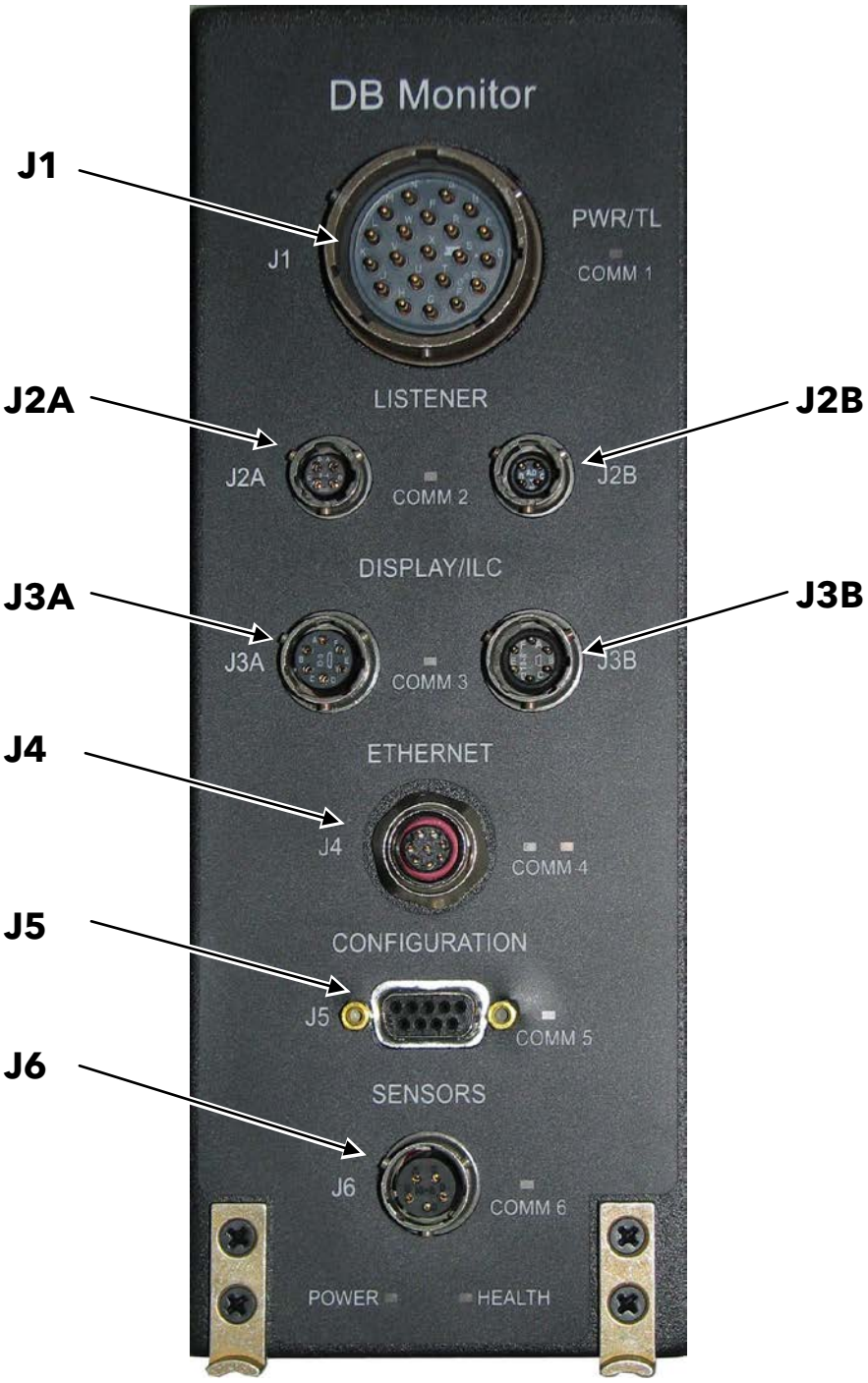


Figure 3. DBM Connector Locations

2.4 CONNECTOR PIN ASSIGNMENTS

2.4.1 J1 – PWR /TL (Locomotive Interface Connector)

Table 2. J1 Pin Assignments

Pin A	BP+ (74V battery input - positive)	 J1 (male)
Pin B	BP- (74V battery input - negative)	
Pin C	TL23 (Trainline – Manual Sand) (power-line network)	
Pin D	TL4 (Trainline – Negative) (power-line network)	
Pin E	TL17 (Trainline – DB Setup) (discrete input)	
Pin F	Locomotive in Isolate (discrete input)	
Pin G	DB Cutout (discrete input)	
Pin J	Speed Input (discrete Input)	
Pin K	Dynamic Brake Only (discrete input)	
Pin L	Chassis ground	

NOTES:

- TL23 (pin C) and TL4 (pin D) provide the transmission medium for the DBM power-line communication network on the MU train line.
- Hardware functionality on pins E, F, G, J, K and L not currently supported in software. Reserved for future applications.

2.4.2 J2A/J2B – LISTENER

Table 3. J2 Pin Assignments

Pin A	RS232 transmit output from DB Monitor to Listener	  J2A (female) J2B (male)
Pin B	RS232 receive input to DB Monitor from Listener	
Pin C	RS232 ground	
Pin D	Chassis ground	

Default serial communication parameters for J2A/J2B:

Baud Rate	9600
Character Length	8
Stop Bits	1
Parity	None
Hardware Handshake	None

2.4.3 J3A/J3B – DISPLAY / ILC

Table 4. J3 Pin Assignments

Pin A	RS232 receive input to DB Monitor from Display Unit or ILC
Pin B	RS232 transmit output from DB Monitor to Display Unit or ILC
Pin C	RS232 ground
Pin D	12V (pos) - power output to Display Unit (not used by ILC)
Pin E	12V (com) - power output to Display Unit (not used by ILC)
Pin F	Chassis ground

J3A (female)

J3B (male)

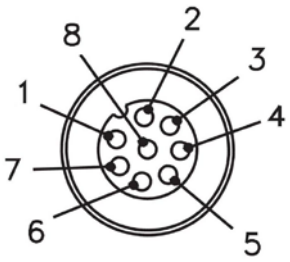
Default serial communication parameters for J3A/J3B:

Baud Rate	9600
Character Length	8
Stop Bits	1
Parity	None
Hardware Handshake	None

2.4.4 J4 – ETHERNET

Table 5. J4 Pin Assignments

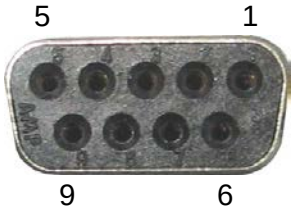
Pin 1	Reserved
Pin 2	Reserved
Pin 3	Reserved
Pin 4	TX-
Pin 5	RX+
Pin 6	TX+
Pin 7	Reserved
Pin 8	RX-



J4 (female)

2.4.5 J5 – CONFIGURATION

Table 6. J5 Pin Assignments

Pin 2	RS232 transmit output from DB Monitor to Laptop	 J5 (female)
Pin 3	RS232 receive input to DB Monitor from Laptop	
Pin 4	RS232 DTR output from Laptop to DB Monitor	
Pin 5	RS232 ground	

Default serial communication parameters for J5:

Baud Rate	9600
Character Length	8
Stop Bits	1
Parity	None
Hardware Handshake	None

2.4.6 J6 – SENSORS

Table 7. J6 Pin Assignments

Pin A	RS485-A	 J6 (female)
Pin B	RS485-B	
Pin C	12V (pos) - power output to Smart Sensor Module	
Pin D	12V (com) - power output to Smart Sensor Module	
Pin E	Chassis ground	

2.5 SYSTEM STATUS INDICATORS

The DBM is equipped with several LED status indicators which are located on the front panel adjacent to the interface connectors (see Figure 4). Status indications are defined in Table 8 below.

2.5.1 Status LED Indications

Table 8. LED Indication Descriptions

LED Nomenclature	LED Color	LED State	Indication
COMM 1	Green / Red	Green	Transmitting data on power line communications network
		Red	Receiving data on power line communications network
COMM 2	Green / Red	Green	Transmitting data on Listener port
		Red	Receiving data on Listener port (not specified)
COMM 3	Green / Red	Green	Transmitting data on ILC / Display port
		Red	Receiving data on ILC / Display port
COMM 4 (2 LEDs)	Green	Off	No Ethernet link
		On	Ethernet link established
	Yellow	Off	No activity on Ethernet link
		Flashing	Data activity on Ethernet link
COMM 5	Green / Red	Green	Transmitting data on Configuration port
		Red	Receiving data on Configuration port
COMM 6	Green / Red	Green	Transmitting data on Sensor Interface port
		Red	Receiving data on Sensor Interface port
HEALTH	Red	Solid On	Normal operation
		Flashing	Self-test failure (see Note 1)
POWER	Green	On	Power is supplied to DBM
		Off	Power not supplied to DBM

Note1: After power-up / reboot, the HEALTH LED will flash until the unit has configured itself and is ready for operation.

2.5.2 Status LED Locations

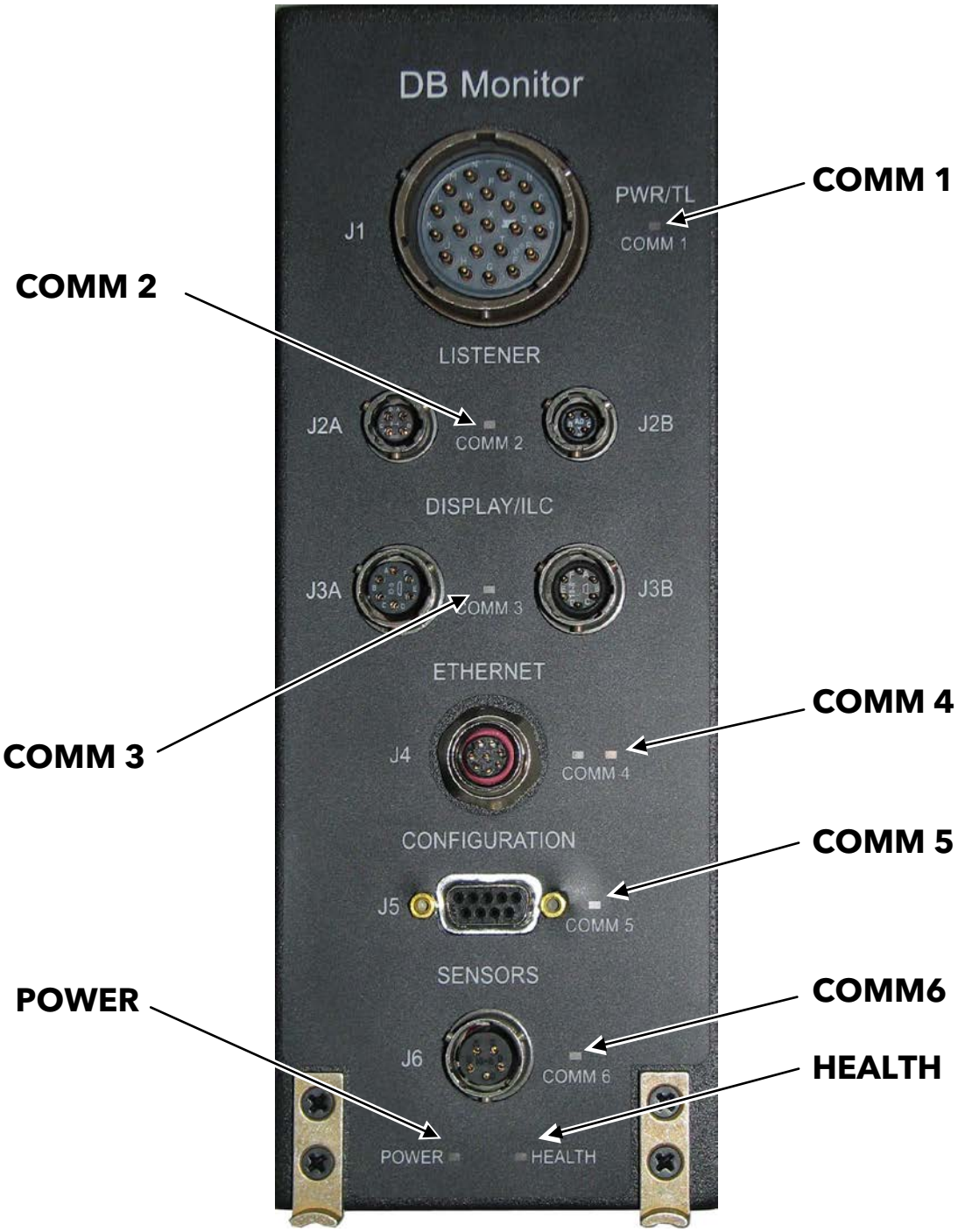


Figure 4. DBM Status LED Locations

3.0 DBM CONFIGURATION EDITOR

The DBM has a built-in configuration editor that allows the user to change the display options, the locomotive road number and the railroad ID. This editor can be accessed via the Configuration interface (J5) using a laptop computer running suitable terminal emulation software, such as HyperTerminal. All commands entered in the editor must be entered as capital letters.

To access the DBM configuration editor routine:

1. Connect J5 on the DBM to the serial port of a laptop PC using serial cable QP-09654/10 (any DB9-F to DB9-M serial cable will work). If the laptop does not have a serial port, USB-to-serial adapter QP-09665 will be required.
2. Start the terminal emulation program and connect to the DBM (configure PC serial port as follows: 9600 baud, no parity, 8 bits, 1 stop bit, no flow control).
3. If the DBM is powered up when the connection is made, the screen will go blank. Type **DBM** (all capital letters) and press the **Enter** key on the PC keyboard. The current DBM configuration will be displayed (see sample in Figure 5).

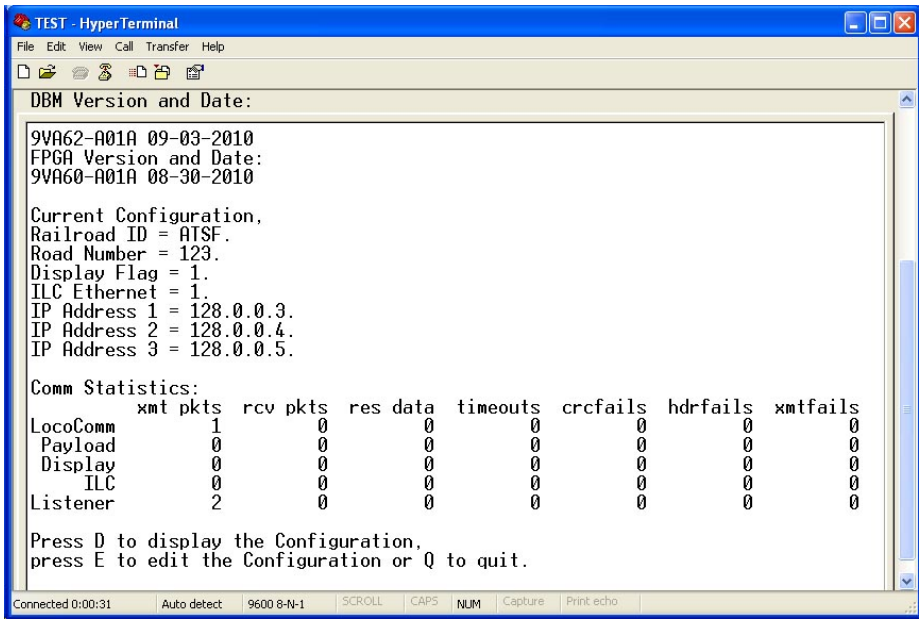


Figure 5. DBM Initial Configuration Screen

NOTE

NOTE

This screen can be refreshed by pressing the letter **D** key on the PC keyboard. This will update items such as the Comm Statistics to current values.

3.1 SELECT CONFIGURATION EDIT MODE

To edit the DBM configuration:

1. Press the letter **E** key on the PC keyboard. The screen will scroll up slightly to reveal additional options.
2. Continue this option selection process until the desired configuration data is displayed. The configuration editing processes are described in the following paragraphs.

NOTE

NOTE

The term Computer on all configuration screens refers to the ILC (Integrated Locomotive Computer).

3.2 EDIT ETHERNET IP ADDRESSES

1. Following selection of the Edit mode, press the **C** key on the PC keyboard to select "Computer or Display input"

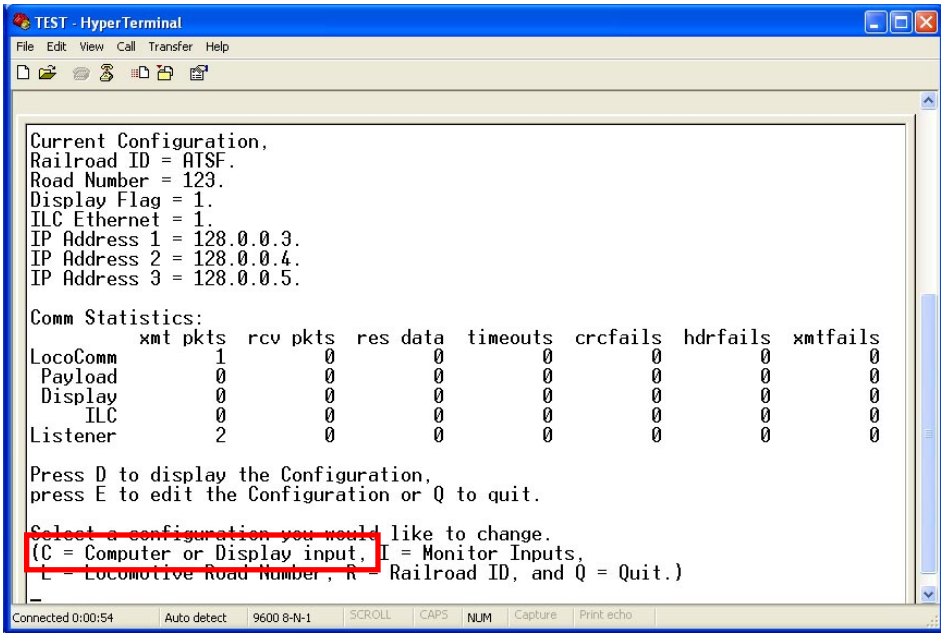
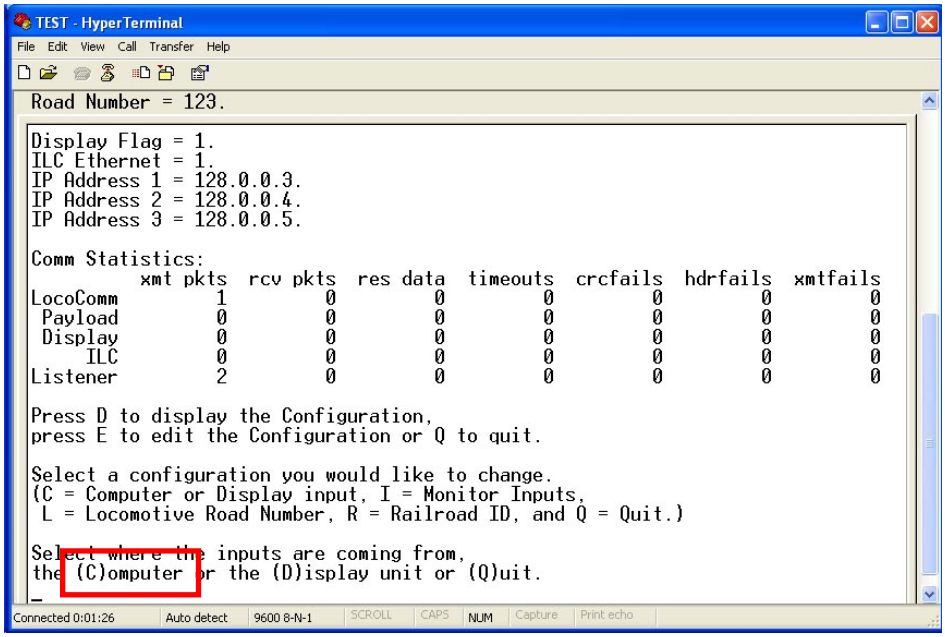
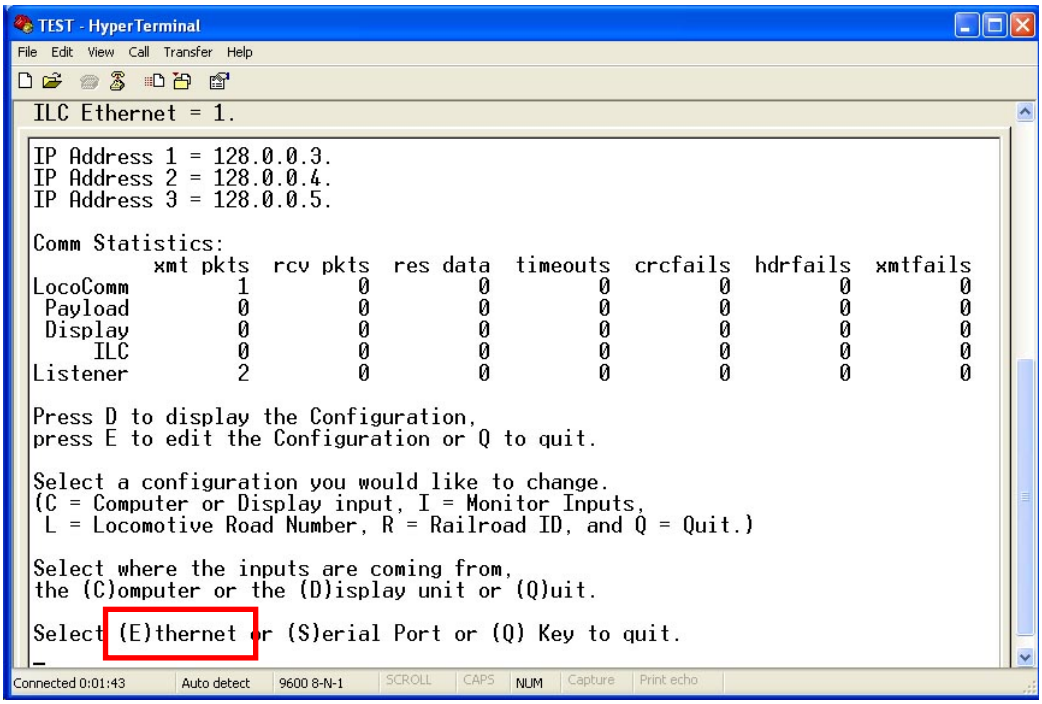


Figure 6. Initial Configuration Editing Screen

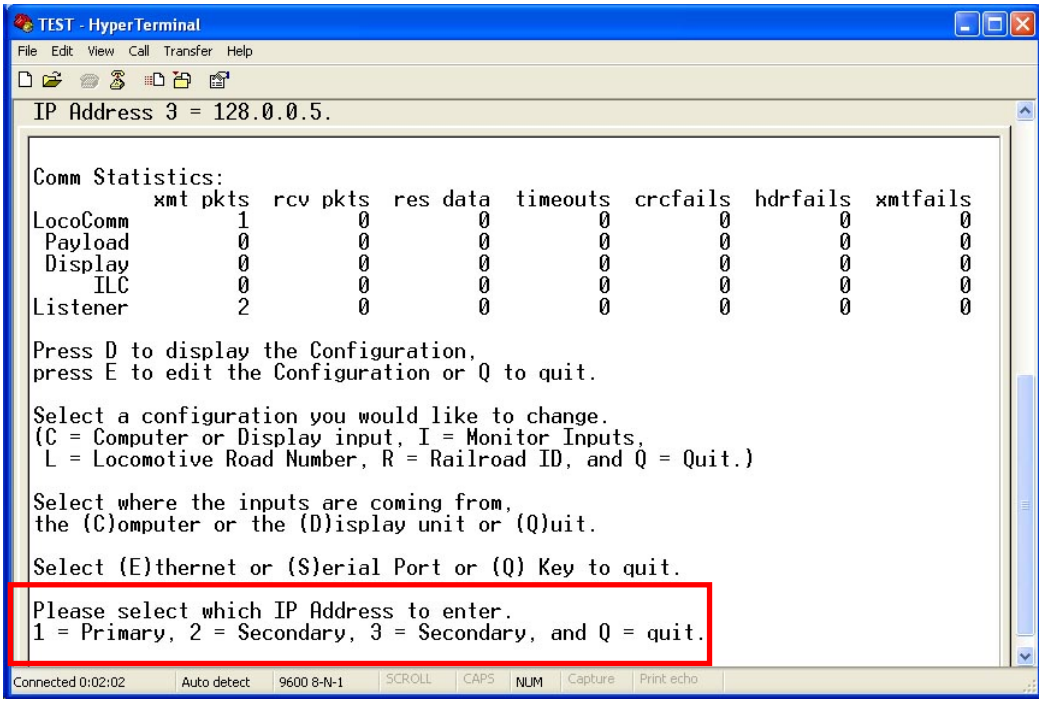
2. Press the **C** key on the PC keyboard to select "Computer" as the input source.



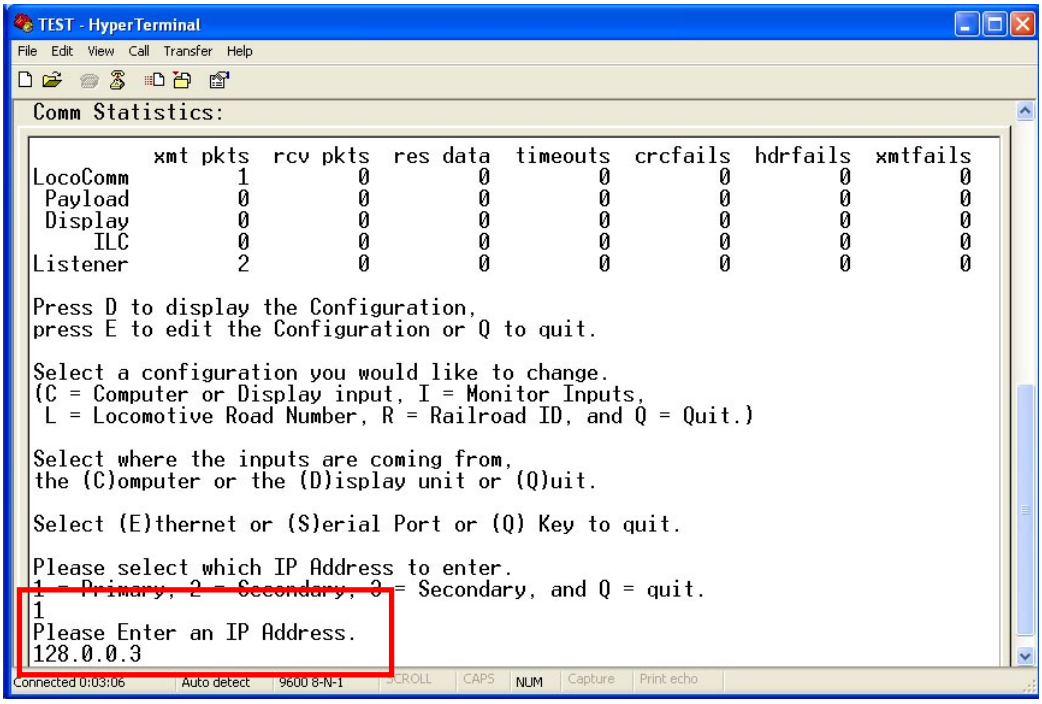
3. Press the **E** key on the PC keyboard to select “Ethernet”.



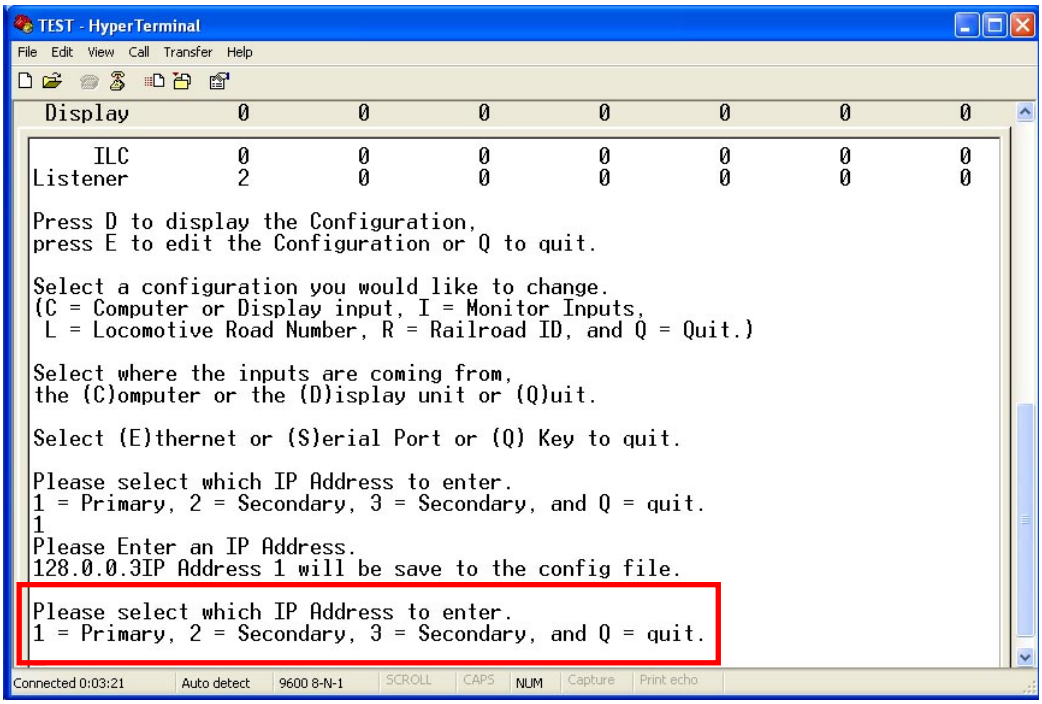
4. Select the IP address to edit (1= primary, 2 = secondary or 3 = secondary) by pressing the corresponding number key on the PC keyboard. Up to three IP addresses can be entered from this screen.



5. At the prompt enter the IP address.



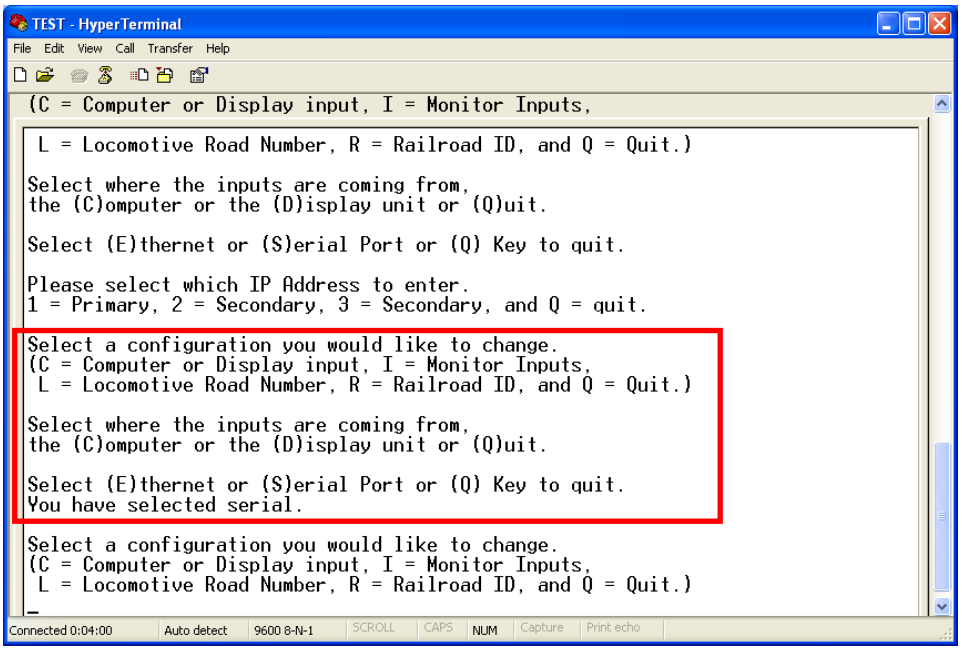
6. Press the **Enter** key on PC keyboard to save the IP address to the configuration file.
7. Select another IP address to edit or press the **Q** key on the PC keyboard to return to the configuration edit selection prompt.



3.3 SELECT SERIAL PORT AS INPUT SOURCE

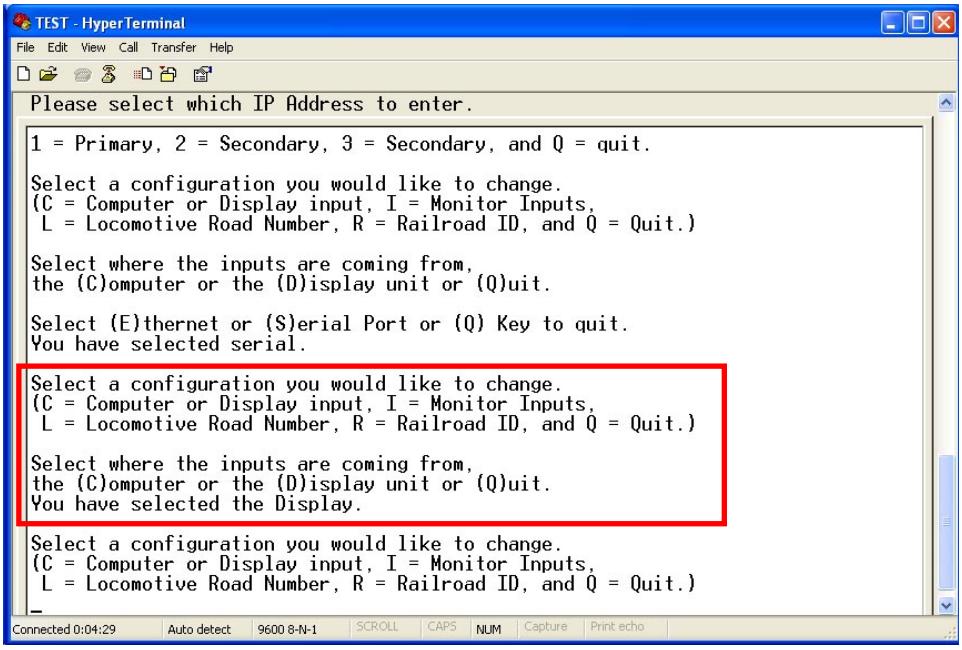
NOTE: Selects serial port as input source for dynamic breaking / tractive effort information.

1. Press the **C** key on the PC keyboard to select “Computer or Display input”.
2. Press the **C** key on the PC keyboard to select “Computer”.
3. Press the **S** key on the PC keyboard to select “Serial”



3.4 SELECT DISPLAY AS INPUT SOURCE (NOT CURRENTLY SUPPORTED)

1. Press the **C** key on the PC keyboard to select “Computer or Display input”.
2. Press the **D** key on the PC keyboard to select “Display”.



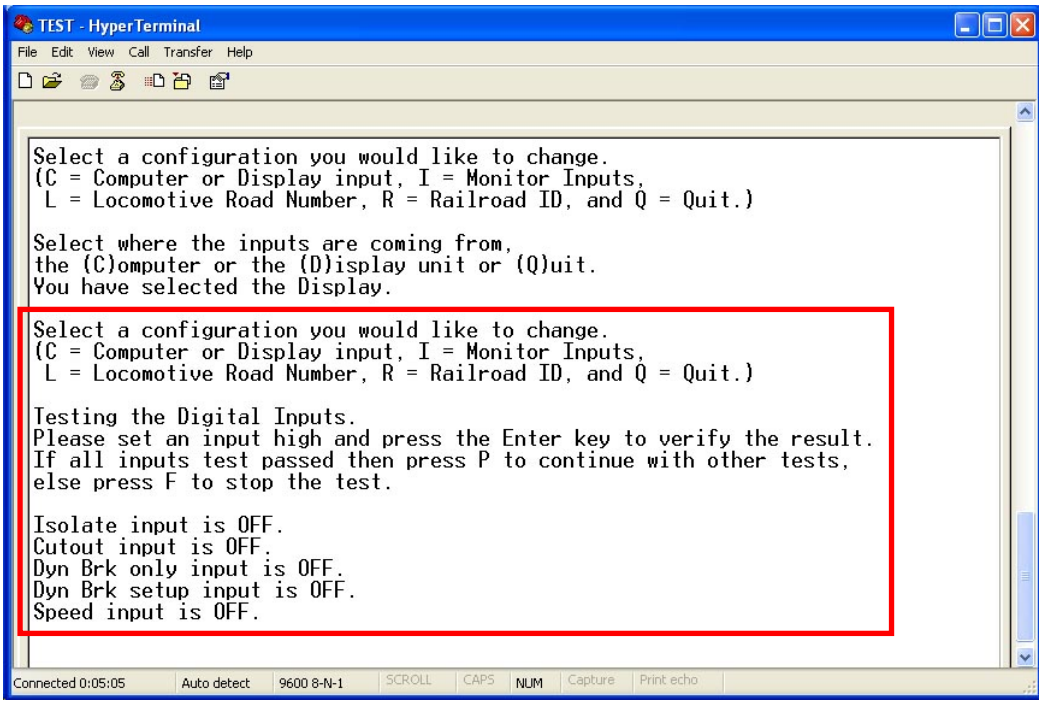
NOTE: This function intended for integrated locomotives only.

3.5 MONITOR INPUTS

The Monitor Inputs function can be used to view and/or test the digital inputs.

3.5.1 View Input Status

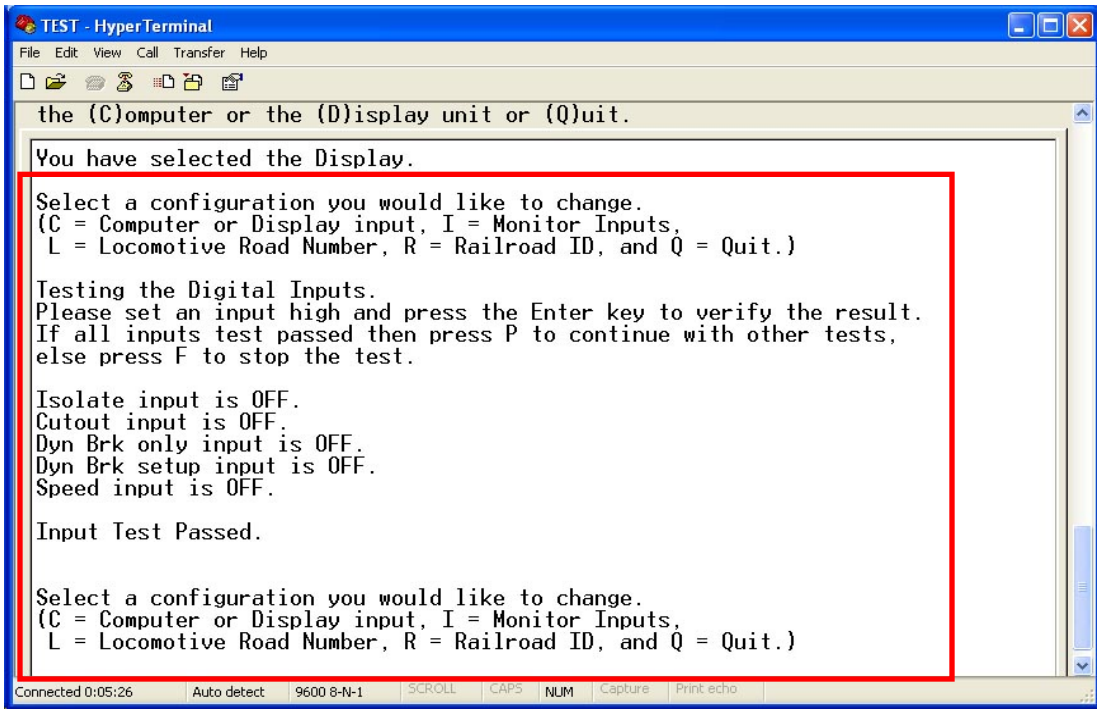
1. Press the **I** key on the PC keyboard to select “Monitor Inputs”.



2. To view current input status, press the **Enter** key on the PC keyboard. The current condition of each input is displayed at the bottom of the screen.
3. Press the **P** or **F** key on the PC keyboard to exit this mode.

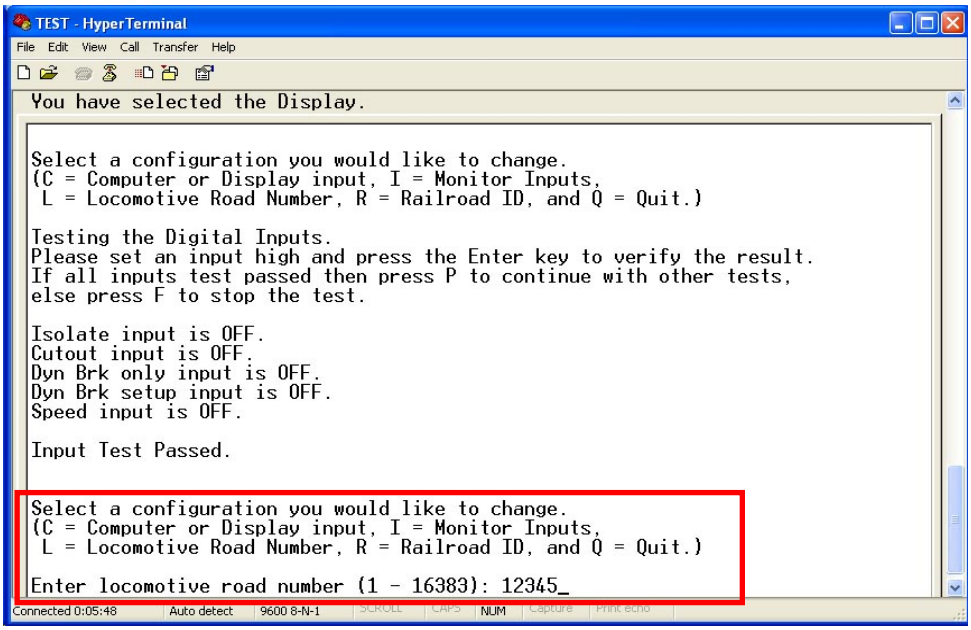
3.5.2 Test Inputs

1. Press the **I** key on the PC keyboard to select “Monitor Inputs”.
2. Change the state of input(s) to be tested (e.g., from Run to Isolate using the isolation switch).
3. Press the **Enter** key on the PC keyboard to view current input status. The screen showing the state of all inputs is refreshed every time the **Enter** key is pressed..
4. Press the **F** or **P** key on the PC keyboard to exit this mode.

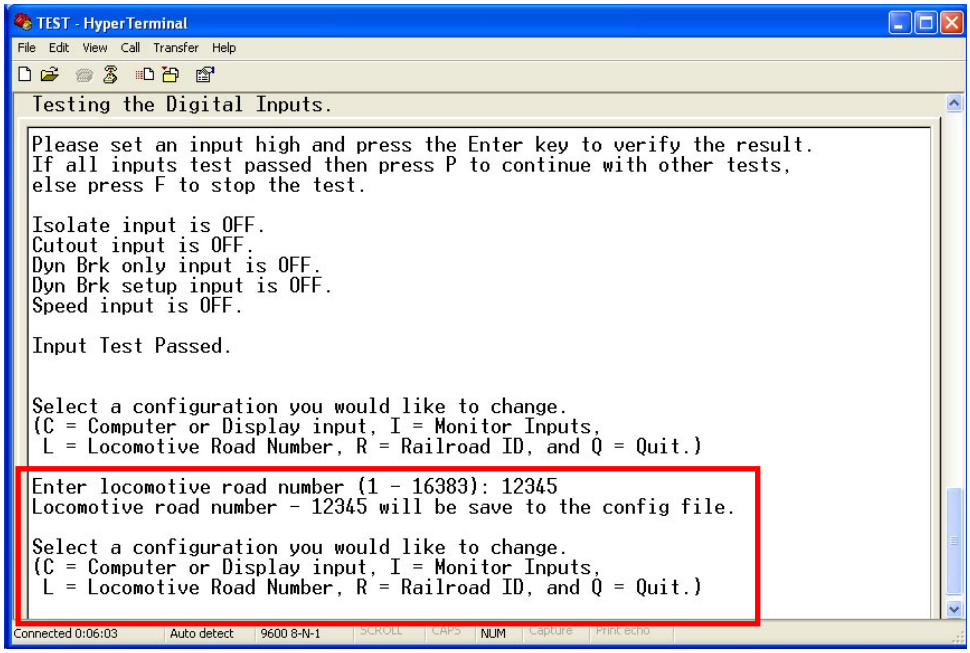


3.6 EDIT LOCOMOTIVE ROAD NUMBER

1. Press the **L** key on the PC keyboard to select “Locomotive Road Number”.
2. Enter the new locomotive road number (range is 1 – 16383).



3. Press the **Enter** key on PC keyboard to save the locomotive road number to the configuration file and return to the configuration edit selection prompt.



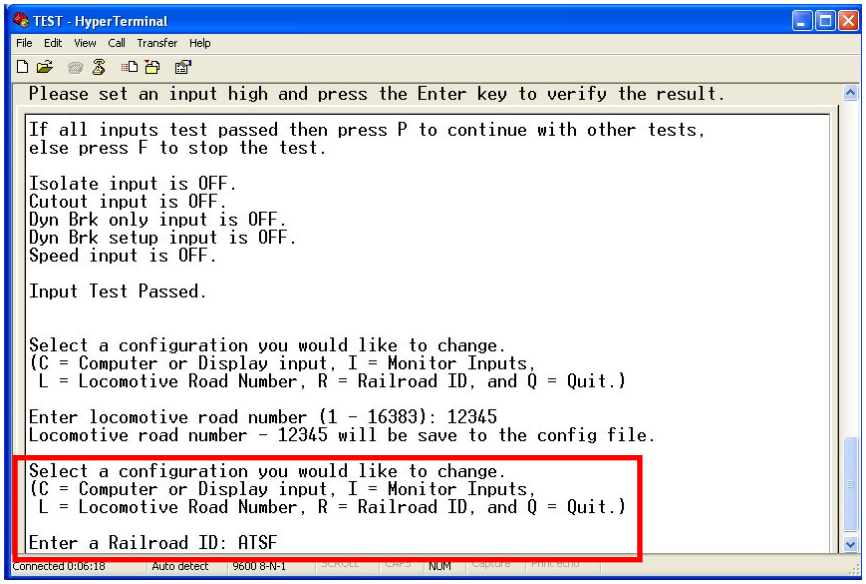
NOTE

NOTE

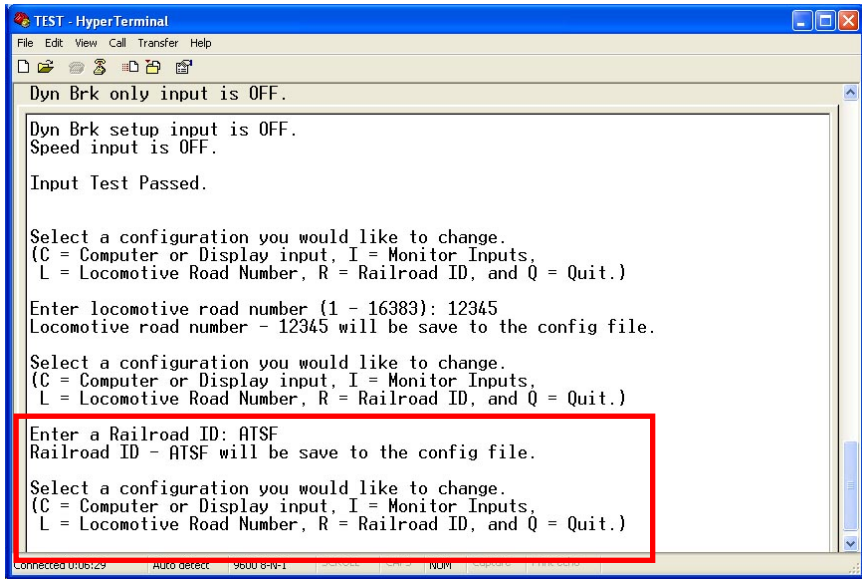
The DBM will accept Locomotive Road Number information from both the ILC (via ILC Status message) and the user (via the above described configuration process.) The DBM will retain whichever is received last. During normal operation in an integrated locomotive, the ILC will send an ILC Status message once per second, effectively overriding any user-entered information

3.7 EDIT RIALROAD ID

1. Press the **R** key on the PC keyboard to select “Railroad ID”.
2. Enter the new Railroad ID.



3. Press the **Enter** key on PC keyboard to save the Railroad ID to the configuration file and return to the configuration edit selection prompt.



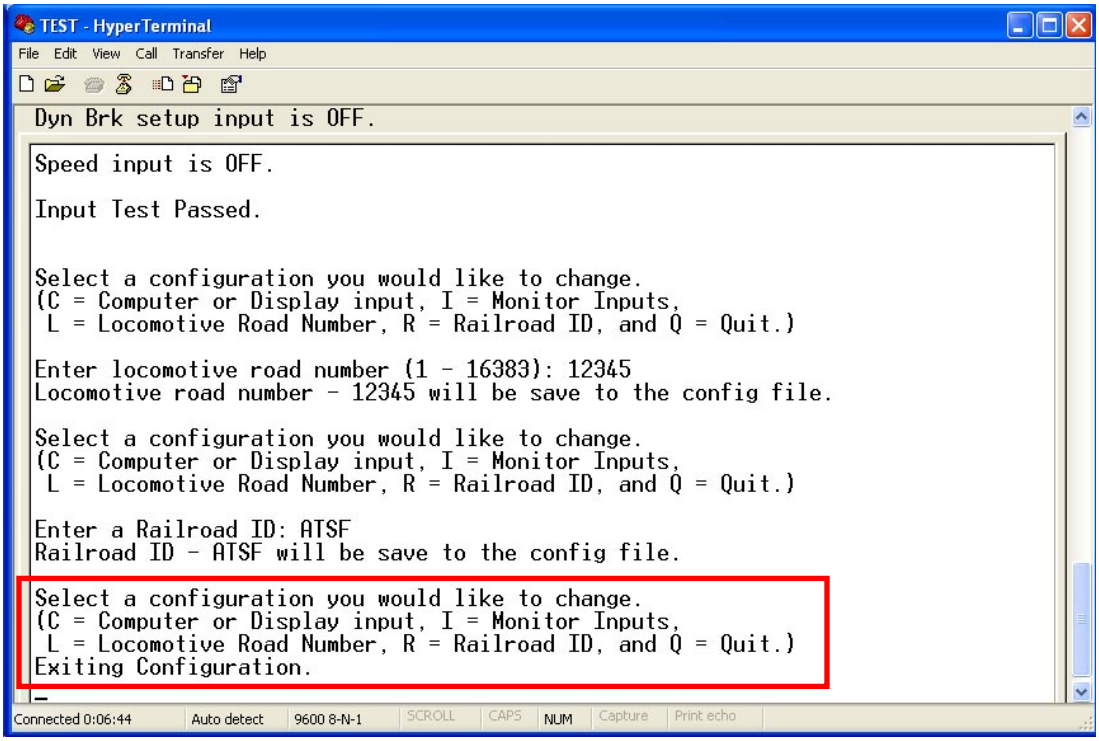
NOTE

NOTE

The DBM will accept Railroad ID information from both the ILC (via ILC Status message) and the user (via the above described configuration process.) The DBM will retain whichever is received last. During normal operation in an integrated locomotive, the ILC will send an ILC Status message once per second, effectively overriding any user-entered information.

3.8 EXIT CONFIGURATION MODE

1. At the configuration edit selection prompt, press the **Q** key on the PC keyboard.



4.0 MAINTENANCE AND TROUBLESHOOTING

4.1 MAINTENANCE

No routine maintenance is required and there are no field replaceable components on the DBM.

4.2 TROUBLESHOOTING

The DBM continuously runs a self-test diagnostic routine in the background. If a malfunction is suspected, the first course of action is to examine the status LEDs on the front panel and verify that indications correspond to the activity on the communications interfaces. LED indications are described in Table 8.

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