

The **Railroad Products RRD-114** breakout box allows EOT service technicians to easily bench test a Wabtec EOT-NG3 microprocessor board by itself (with the associated equipment listed below), and perform rapid NG3 electronic assembly tests (microprocessor board., HVM, motion sensor, and radio). Isolating the functions of the microprocessor board from other EOT assemblies greatly improves repair and troubleshooting time. The NG3 breakout box is compatible with all NG3 board level versions. Using a known good microprocessor board with the initial box connection will familiarize the technician with future board / component level troubleshooting of defective boards.

**Optional associated equipment:** (for microprocessor board only testing)

- 24 volt DC power source (may use the 24 volt DC power pack included with the Wabtec 24062 kit)
- 12 volt DC power source set to 13.0 volts DC
- **Railroad Products RRD-1140** or Wabtec model 23660 UHF radio unit (RF terminated with load, antenna, or service analyzer)
- Head of Train unit setup and running with 2-way operation.
- PC laptop with a RS-232 communication port (Microsoft HyperTerminal or any terminal emulating software)
- **RRD-114.2** (WPN27916) NG3 radio to microprocessor board cable.
- **RR-365 and RR-365/1** Battery calibration box and adapter cable.

**Connecting to the board:**

- Solenoid J15 cable (15 pins), pigtail to pigtail white connector
- Downloader / ECP/ GPS J6 cable (6 pins), pigtail to pigtail white connector
- Generator voltage J3 cable (3 pins), pigtail to pigtail white connector
- Battery J2 cable (2 pins), pigtail to pigtail white connector
- Test Switch P6 cable (4 pins), pigtail to J6 on microprocessor board, black connector
- *Assembly Setup:* Connect the microprocessor board radio pigtail cable (J1) to the UHF radio (**Railroad Products RRD-1140** or Wabtec 23660)
- *Microprocessor Board Only Setup:* Connect **RRD-114.3** to the microprocessor board radio pigtail cable (J1) and the UHF radio (**Railroad Products RRD-1140** or Wabtec 23660)
- GPS/Cell cable P10 (10 pins), pigtail to J10 on microprocessor board, black connector
- HVM / GPS cable P11 cable (14 pins), pigtail to J11 on microprocessor board, black connector
- Connect the laptop 9 pin serial cable to the Download / ECP UART1 connector on box
- Leave DC power source cables disconnected for now.

**Initial Switch and pot Settings:**

- Emergency and Release Solenoid switches in 'In' position
- Supply and Exhaust solenoid switches in 'Out' position
- Charge / Service switch in 'service' position and UART0 in 'Loopback – ON' position.
- Battery Charge Test switch in 'float' position and tilt switch to 'no tilt' position
- HVM LED String Disable switch position 'all on'
- Set Transducer Simulator pot for pressure 1: 1300 ohms between TP7 (Pres1) and TP8 (A-GND). This should simulate approximately 90 lbs. of air pressure on displays. (Microprocessor board. HTD, PC)

**Startup HyperTerminal in direct connect mode:** Com1 or Com2

- Hang-up phone (disconnect), File, Properties, Configure, 19.2K baud, 8 no parity, 1, no flow control.
- File, properties, settings, ASCII setup, check 'echo characters locally'
- Save configuration and connection

**Power up:**

- Apply 24 volts DC to either the 'charger input' connector on box; or the round +24Vdc connector using the **Railroad Products RRP-330** test bench charger and cable.
- Apply 13.0 volts DC to the Battery Test Power connector on the box.
- After a couple of seconds, the microprocessor board display should indicate '111' indicating mode 1 (bootloader), and the HyperTerminal screen will show the bootloader version characters.
- After a couple more seconds, the microprocessor board display should indicate '444' indicating mode 4 (service mode), and the HyperTerminal screen will prompt for 'Auto Configuration Y/N?'

**Wabtec NG Micro Board / Assembly Service and Testing Notes:**

There are many firmware versions that are used for the different railroad NG3 EOT applications. *[NOTE: Since the service mode menu is dependent upon the microprocessor board's firmware version, step by step instructions of the service mode cannot be included to describe all firmware versions.]*

- The P5, TX Audio Adjust cable (6 pins) and the P1 Radio control cable (12 pins), from breakout box, should **not be connected** unless micro board TX audio adjustments are required. Instructions for this procedure are included at the end of this document.
- Replacement NG3 micro boards that are not pre-configured with correct software (warranty boards included) require software downloads to update the board's memory. When powering up a replacement board, bootload the correct software first, as described in the maintenance manual 31365P appendix A, page A-1. After loading the micro board's correct software version, a default password '1592', may be required to continue configuring parameters. Be sure to enter the correct WPN when prompted. The NG3 WPN is normally found on the metal tag on outside EOT housing. Entering the correct WPN will insure that the **proper password** and other configurations are enabled for auto-configuration on future start-ups. The new password will be determined by the correct WPN. Contact Wabtec Engineering if having difficulty obtaining the proper NG3 password or WPN for the unit.
- The 'Radio Test?' menu item on the service menu is standard on most firmware versions.
- The 'Valve Test' menu item on the service menu is also standard on most firmware versions.
- The 'UART0 Test' is standard on most firmware version (be sure UART0 switch is 'loopback - on')
- The 'Test HVM?' menu item will test the HVM circuit when the P11 HVM cable is connected.
- Do not perform pressure 1 calibration until the 'PRESSURE 1' potentiometer has been calibrated using a with a known good calibrated microprocessor board, to display 90 lbs on the micro board display during operational mode, or displayed on the HyperTerminal screen (P90). Placing narrow marks on the pot and box housing to indicate 90 lbs, 45 lbs, and 0 lbs, will aid in performing air pressure troubleshooting and calibration. Always finalize air pressure calibration test with the mechanical air pressure transducer before releasing the EOT for service.
- Not all NG3 software includes battery calibration in the service menu. Battery Calibration should not be performed until the calibration method as described in the NG maintenance manual has read. Use **Railroad Products RR-365** battery calibration box and **RRD-365/1** for battery calibration. Battery charge calibration should be performed on the same battery installed in the NG unit.
- Exiting the service mode menu will place the NG3 micro board into operational mode 1 with debug/diagnostic data being displayed on the RS232 port (HyperTerminal screen).
- Operational mode 1 allows a Head of Train unit to be 'armed' to the EOT using the 'EOT test' switch on box.
- Moving the electronic module assembly (HVM / GSM module) will produce motion and HVM 'on' status on the HyperTerminal screen and Head of Train's screen.

- Enabling the 'emergency' mode on the Head Train unit will cause the 'emergency' LED on the box to light. Be sure to reduce Pot setting to zero simulated air pressure (and open / close switches) to reset and return to 90 lbs.
- The V+,Vrad, 3.3M, 3.3V, 5V, 1.8V, Pres 1, AGND, 3.3 V GPS, HVM RTN1 / 2, and Tx Audio are access points used for micro board component level troubleshooting.
- With 13.0 volt battery input and switch set to float, the current shown on the displays (PC and micro display) should be around zero (I=0). Switching to 'fast' charge should slowly increase current reading to I=+7 (battery fail message may occur on Head of Train display).
- Placing the 'charge / service' switch to *service* and the 'tilt / no tilt' switch to *tilt*, will place the microprocessor board into sleep charge mode.

#### NG3 Battery Calibration Box Adjustment:

NG3 Battery calibration requires **Railroad Products RR-356 and RR-365/1** (Wabtec fixture number 827). This fixture requires calibration to insure correct battery calibration as described in the service menu item. Operating the micro board with DC power supplied to J10 (V+ is pin 8 and pin 5 GND) will allow precision battery charge calibrations performed by the microprocessor.

1. Set external power supply to 14.5 VDC
2. Connect fixture box to power supply (2 pin battery connector to P/S and 10 pin adapter cable to J10)
3. Connect Digital Multi-Meter to I(+) & I(-) test points on box.
4. Set the switch on box to FN CAL.
5. Adjust the 'cal-pot' located in the Cal hole until a measured current of 145mA is obtained
6. Test fixture is now calibrated. Set the box switch to 'operate'

The calibrated box and external power supply may now be used to perform battery calibration as described in the service mode 'battery calibration?' menu item.

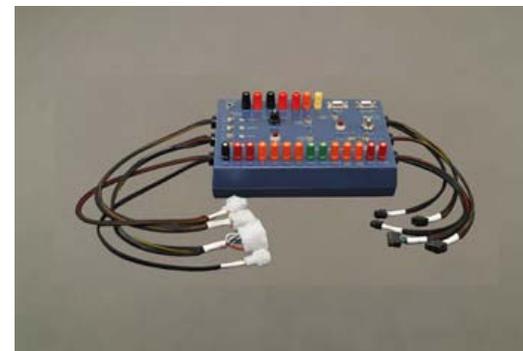
#### NG3 TX Audio Adjustment:

Connect cables P1 and P5 from the breakout box to the NG3 micro board. The audio level from the micro board at 'Tx Audio' BNC connector on the box may be adjusted to the desired level. Normally, the TX audio level from the micro board, as measured at the 'Tx Audio' on the breakout box, is 2 volts peak to peak when attached to a Railroad Products RRD-1140 or Wabtec 23660. Other radios may require lower TX audio signal levels. Do not use this method to fine tune radio TX deviation adjustments. The 'Tx Audio' level is only used to achieve nominal fixed signal levels to certain radio type models and not intended as fine tuning of the Radio TX deviation. Radio transmit deviation is achieved using radio specific software application for that particular radio.

If the NG3 micro board 'Tx Audio' requires adjustments, place the micro board / assembly into service mode 4 and go to 'Radio Test?' while using the terminal emulation application (HyperTerminal or whatever). Measure the audio signal level at 'Tx Audio' on the breakout box with a scope when transmitting the radio with the 1200 Hz signal. Normal desired audio signal level is 2 Vpp (.707 Vrms) for **Railroad Products** (Ritron) and Wabtec.

The audio level at 'Tx Audio' may be adjusted as follows:

1. Select TX AUD CS switch to Low position.
2. Select TX AUD U/D to high to enable increase mode or low to enable decrease mode.
3. Press TX AUD INC to target (to increment / de-increment signal to desired level).
4. After adjustment, select TX AUD CS switch to High position
5. Disconnect P1 and P5 from micro board and connect normal P1 radio cable to J1.
6. Check radio Tx Deviation from radio while transmitting.
7. FM Dev. 2.4 kHz – 2.5 kHz should occur after fine tuning target radio.



## RRD-114 Break Out Box

### Instructions For

### Wabtec NG3-EOT