CONRAIL EQUIPMENT DEFECT DETECTOR

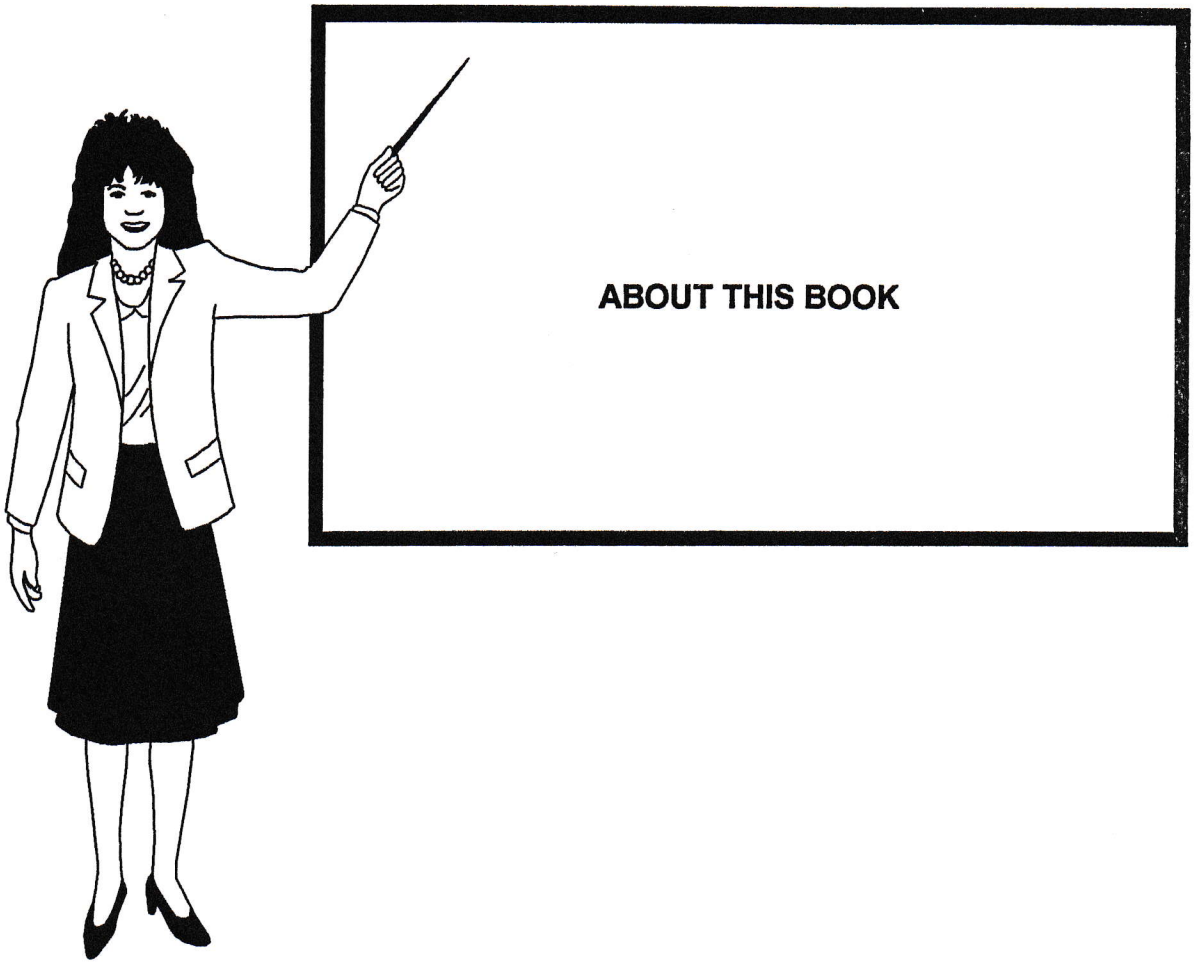
DEVTRONICS, INC.

PRINT DATE: February 26, 1998

SOFTWARE VERSION: V012Rxxx

MODEL NUMBER: RTU1005

MANUAL VERSION: 12.9



ABOUT THIS BOOK

This manual is intended as an installation guide and a hardware reference document for those thoroughly skilled in electronics maintenance and repair. Any applications operations documentation relating to the overall system operation in conjunction with this manual should suffice to meet all contract specifications relating to equipment operation and installation.

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Recognizing the sensitivity and proprietary nature of the data contained within this document, the distribution must be limited to only those persons necessary in performing necessary emergency maintenance functions.

The production and testing of this equipment is based upon the design and engineering study as to the application and utilization of the hardware. Therefore, the contents of the manufacturing data are intended to be used only for maintenance testing of the equipment. Any other use of the data should not be made without consulting DEVTRONICS, Inc.

The information contained in this document is subject to change without notice.

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LIST OF CHANGES

1.0.0 Switch function reassignment caused the following pages to change: ii, vi and 20. Additional information added to page 22 to facilitate discrete input connections. Removed reference to site address (no longer applicable) page 41.

1.0.1 Changed software version number, pages: title page, 7, 9, 26, 42, and 45-47.

1.0.2 Changed alarm enunciation and processing, affected pages: vii, 11, 12, 45, 47, 52, 54, A-1 and A-2.

1.0.3 Changed software version number, pages: title page, 7, 9, 26, 42, and 45-47. Added features, affected numerous pages.

1.0.4 Added additional features and changed software version, affected numerous pages.

1.0.5 Added additional features and verbage to make directions more clear, affected numerous pages. October 7, 1996.

1.0.6 Changed manual layout. Sentence deleted page 29. Added test #26, Radio Busy. New manual version: 12.9. September 22, 1997.

Section One System Overview

1.1 General Information

The **Equipment Defect Detector** will check a train for high loads or dragging equipment defects. Defect detection may be activated for either, neither or both directions. Defect detection for any input may be disabled by setting the direction to "NONE". The unit can support up to three tracks, sharing a common radio and will check for a radio busy indication. The database has the ability to store the last 90 trains. Alarm messages are enunciated as they occur. After the train has been analyzed, a message will be enunciated to the train crew via radio indicating the status of the train. The railroad name, site name, city and state is appended to the beginning of each message. A pre-train integrity test checks if any alarms are activated before train arrival. A post train integrity test checks for proper operation of alarm input devices. The integrity test may be disabled via the menu system. A local printer interface is provided for hard copy reports. Terminal interface is provided through the printer port. An 8-character **LED** display and keypad are mounted on the front panel of the unit. The **LED** is used to provide diagnostic, maintenance and error messages to maintenance personnel. Both are used for displaying and editing the operational parameters from the menu system. These parameters are stored in non-volatile RAM.

1.2 System Operation Overview

This section is designed to provide an operational guide for normal train processing. The following are chronological guides based upon various system options.

1) If train is traveling in the MAIN direction, the direction circuit will activate before the track circuit. Otherwise, it will remain inactive until after the track circuit has activated.

2) Track circuit activates.

3) Train direction is determined from direction circuit. **This is the only time the direction circuit will be monitored and this occurs instantaneously when the track circuit is activated.**

4) If directional defect detection is enabled and the train is not traveling in the selected direction, no further processing will occur, otherwise the alarm inputs will be tested to insurethey are operating correctly before gating occurs.

Environment - capable of handling -20°F to 140°F, with 0-90% non-condensing humidity. Customer may select other options.

Local Communications - RS-232C serial port.

Power - lithium battery backup for RAM and clock; input power range is 9-18 VDC. Input power (N12/B12) is protected by a TransZorb® transient voltage suppressor which clamps the voltage at 30 VDC.

Mounting - unit is mountable on a panel, a standard 19" rack or in a weather enclosure suitable for outdoor installation depending on user requirements.

Lightning Protection - each input is lightning protected with an EDCO SURRESTOR® protector. This device will clamp an input surge at less than 50 volts.

Micropositioners - each transducer is connected to a micropositioner which conditions the transducer's signal to provide an accurate axle count. The

1.5 Features

- Industrially "hardened" hardware components used in many applications for several years by the railroad industry and municipal water processing plants.
- "Plug-in" (modular) circuit boards.
- Keypad and 8 character LED display for diagnostic messages during normal operation. Maintenance personnel use the menu system provided to send stored train reports to a local printer and to setup the unit.
- *Watchdog Timer* automatically resets the unit after 2 seconds if the unit is not executing properly.
- Built-in diagnostics and data verification.

INPUT LOCATIONS - DOUBLE TRACK

Terminal Board	Input Board	Track	Nomenclature
2TB1-1	1A3-1	TRK1	Direction Circuit or Approach Transducer
2TB1-2	1A4-1	TRK2	Direction Circuit or Approach Transducer
2TB1-3	1A3-3	TRK1	Track Circuit
2TB1-4	1A4-3	TRK2	Track Circuit
2TB1-5	1A3-9	TRK1	High Load 1
2TB1-6	1A4-9	TRK2	High Load 1
2TB1-7	1A3-11	TRK1	High Load 2
2TB1-8	1A4-11	TRK2	High Load 2
2TB1-9	1A3-7		Radio Busy
2TB1-10	1A3-8		Radio Busy Common
2TB1-11	1A3-5	TRK1	Gating Transducer
2TB1-12		TRK1	Gating Transducer Com.
2TB1-13	1A4-5	TRK2	Gating Transducer
2TB1-14		TRK2	Gating Transducer Com.
2TB1-15	1A3-13	TRK1	Dragging Equipment (DE)
2TB1-16	1A3-14	TRK1	DE Common
2TB1-17	1A4-13	TRK2	Dragging Equipment (DE)
2TB1-18	1A4-14	TRK2	DE Common

OUTPUT LOCATIONS - SINGLE TRACK SITES

Terminal Board	Output Board	Track	Nomenclature
2TB3-1	1A6-10	TRK1	Integrity Relay
2TB3-2	1A6-11	TRK1	Integrity Relay Common
2TB3-3	1A6-7		Radio Alarm Key
2TB3-4	1A6-8		Radio Alarm Key Common
2TB3-5	1A6-4		System Operational Relay
2TB3-6	1A6-5		System Operational Relay Common
2TB3-7	1A11-3		Radio Transmit (XMIT) Audio
2TB3-8	1A11-4		Radio Transmit (XMIT) Audio Common
2TB3-9	1A6-1		Radio Transmit Key
2TB3-10	1A6-2		Radio Transmit Key Common
2TB3-11	UP1-7 UP2-7		Battery (+) to 1TB1-1
2TB3-12	UP1-8 UP2-8		Battery (-) to 1TB1-3

OUTPUT LOCATIONS - TRIPLE TRACK SITES

Terminal Board	Output Board	Track	Nomenclature
2TB3-1	1A6-10	TRK1	Integrity Relay
2TB3-2	1A6-11	TRK1	Integrity Relay Common
2TB3-3	1A6-13	TRK2	Integrity Relay
2TB3-4	1A6-14	TRK2	Integrity Relay Common
2TB3-5	1A6-16	TRK3	Integrity Relay
2TB3-6	1A6-17	TRK3	Integrity Relay Common
2TB3-7	1A6-7		Radio Alarm Key
2TB3-8	1A6-8		Radio Alarm Key Common
2TB3-9	1A6-4		System Operational Relay
2TB3-10	1A6-5		System Operational Relay Common
2TB3-11	1A11-3		Radio Transmit (XMIT) Audio
2TB3-12	1A11-4		Radio Transmit (XMIT) Audio Common
2TB3-13	1A6-1		Radio Transmit Key
2TB3-14	1A6-2		Radio Transmit Key Common
2TB3-15	UP1-7 UP2-7		Battery (+) to 1TB1-1
2TB3-16	UP1-8 UP2-8		Battery (-) to 1TB1-3

Eprom Label Examples

CONRAIL SCAT
V012Rxxx U-20
1A12 EDD3
081693

CONRAIL SCAT
VB-1 U-8
1A13 V012Rxxx
081693

CONRAIL SCAT
VB-2 U-9
1A13 V012Rxxx
081693

1.8.6 Radio Busy: This input is provided to the unit to allow the multiple tracks to share the same radio. For normal messages if the radio is busy the unit will wait up to 30 seconds to enunciate its message. If an alarm message is generated, the message will be enunciated immediately.

1.8.7 DE Sensor: (Optional - incorporated into current software version). The Dragging Equipment input is one of the alarm inputs and is used to alert the system when dragging equipment has been detected on the appropriate track. When the Dragging Equipment Alarm activates, both the beginning and ending axles are recorded and are enunciated. See Section Five Voice Formats.

1.9 Output Definitions The following is a list of all outputs and a detailed description of their responsibilities.

1.9.1 Integrity Relay (1, 2 or 3): The Integrity Relay is used to change the state of the alarm inputs to verify their proper operation.

NOTE: If the option to disable this check is activated for any track, the following checks will not be performed for that track.

At the beginning of the integrity check the LED will display **INTEG x**, with x being the track number under test. If the alarm inputs change within 5 seconds the test is determined to be successful and the unit will pass.

However, if the alarm input (or inputs) does not change the system will declare an error and a **System Not Working** message will be enunciated. The Integrity Relay can be used with an external relay to cycle power to the alarm source. **See Figure 1 - Integrity Relay Option.**

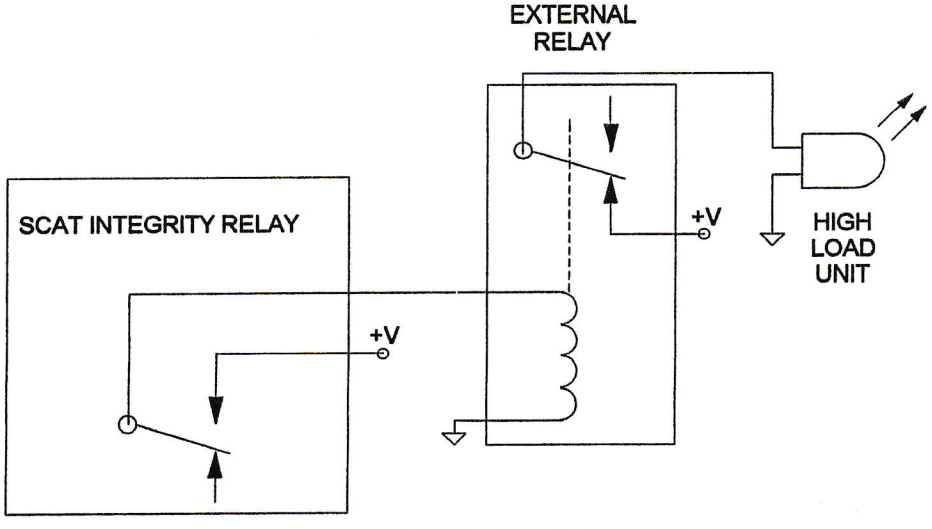


Figure 1 - Integrity Relay Option

Section Two Installation

NOTE: *Whenever this manual refers to a button to press on the unit or a key stroke on the PC or laptop, it will be enclosed in quotation marks and in bold typeface. For instance,* ***"ENTER"*** *means to press the ENTER key. When pressing keys on the unit, apply only as much pressure as needed until a slight depression (click) is felt. When the unit senses a key has been pressed, a beep will sound.*

2.1 Power Requirements The Equipment Defect Detector requires a battery voltage of 9 - 18 VDC. Power consumption is 2 amps maximum at 18 VDC, under maximum load conditions. Power is connected to the unit via 2TB3-13 and 2TB3-14.

2.2 Input Specifications

2.2.1 Connectors The supplied rail mounted connector strip, where all the connections will be made, is conveniently mounted near the unit.

2.2.2 Requirements All discrete inputs must be driven by a positive voltage, ranging from 5 to 15 VDC at 22 mA maximum per input. Inputs can be configured to sense either active high (voltage on the input) or active low (no voltage on the input) voltages.

2.2.3 Availability The number of discrete inputs are variable depending on user requirements. The system software reads the installed boards and determines how many inputs are present in the system. The unit may have up to three discrete input boards to support triple track configurations.

2.3 Output Specifications

2.3.1 Connectors The Equipment Defect Detector has one RS-232C connector for connection with a terminal, laptop, or printer.

2.3.2 Availability The unit contains only one output board. See section **1.7 I/O Assignments** for available outputs.

2.4 Terminal Contacts Terminal types can be varied per user specifications. Barrier strips, rail mounted connector strips with spring loaded contacts or standard AAR connectors may be installed.

2.5 Mounting Configuration Designed to mount to a panel, a standard 19" rack or in a weather enclosure. Configuration is variable depending on user requirements.

2.6 Space Requirements The current Equipment Defect Detector (detector only) dimensions are: length (top to bottom) - 12.75", width (side to side) - 10.8", and depth (front to back) - 6.5".

2.7.3 Connecting Power

WARNING! Insure proper polarity is observed and power switch is in the OFF position prior to connecting power to the unit.

After connecting the inputs and outputs, power must be connected. Power is brought into the connector strip mounted next to the unit labeled 2TB3 (pins 13 and 14). Attach the positive side of the battery to connector 2TB3-13 and the negative side to connector 2TB3-14.

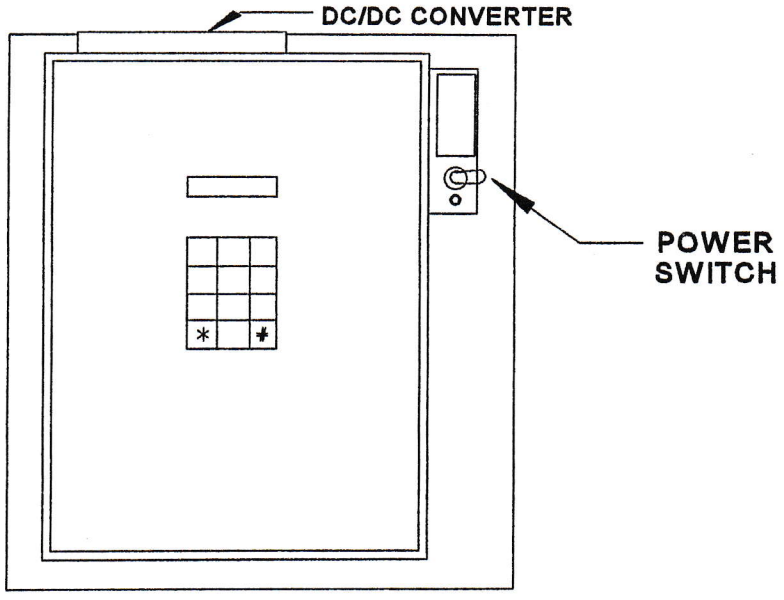


Figure 3 - Power Switch Location

2.7.4 Applying Power Turn power ON by placing the switch located on the upper right-hand corner of the unit in the ON position. **See Figure 3 - Power Switch Location.**

Section Three Keypad Interface

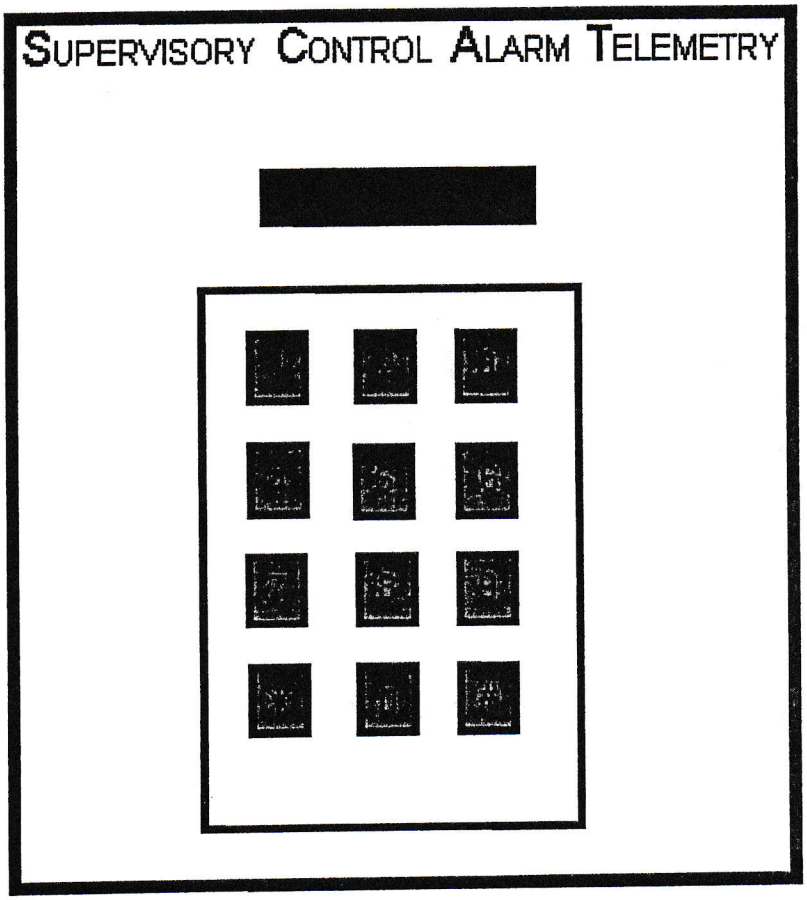


Figure 4 - SCAT LED and Keypad

3.2.4 Speak Selected Database Train - Press "4" If **"4"** is selected after selecting a train from the database, the unit will re-enunciate the message that was delivered to the train crew and sends it to the local speaker.

3.2.5 Change the Time & Date - Press "5" When **"5"** is selected, the current time appears in HH:MM:SS format, using the 24-hour clock (military time) vice the 12-hour clock. See time table below for conversion from the 12-hour clock to the 24-hour clock. The first digit will be flashing. As soon as a button is pressed, that digit is updated and all other digits will disappear. Continue to enter new time. Upon entering last digit, the LED display will exhibit the date, in MM-DD-YY format.

1:00 a.m. = 01:00	1:00 p.m. = 13:00
2:00 a.m. = 02:00	2:00 p.m. = 14:00
3:00 a.m. = 03:00	3:00 p.m. = 15:00
4:00 a.m. = 04:00	4:00 p.m. = 16:00
5:00 a.m. = 05:00	5:00 p.m. = 17:00
6:00 a.m. = 06:00	6:00 p.m. = 18:00
7:00 a.m. = 07:00	7:00 p.m. = 19:00
8:00 a.m. = 08:00	8:00 p.m. = 20:00
9:00 a.m. = 09:00	9:00 p.m. = 21:00
10:00 a.m. = 10:00	10:00 p.m. = 22:00
11:00 a.m. = 11:00	11:00 p.m. = 23:00
12:00 p.m. = 12:00	12:00 a.m. = 00:00

The first digit will be flashing. As soon as a button is pressed, that digit is updated and all other digits will disappear. Continue to enter new date. Upon entering last digit, the LED display will return to normal operation.

3.2.6 Setup Menu - Press "6" By pressing the **"6"** the unit will access the Setup Menu, which is used to set the system parameters. See section **3.3 Setting System Parameters** for key definitions and information on each.

3.2.7 Display Next Database Train - Press "7" By pressing the **"7"** when already accessing the database, the next train in the database will be displayed as follows: the train date is displayed for one second; the train time is displayed for one second; and the train's axle count will be displayed for 5 seconds. The next/previous train can be accessed without waiting 5 seconds.

3.2.8 Display Previous Database Train - Press "8" By pressing the **"8"** when already accessing the data-base, the previous train in the database will be displayed as follows: the date of train is displayed for one second; the time of the train is displayed for one second; and the axle count of the train will be displayed for five seconds. The next or previous train can be accessed without waiting the full 5 seconds.

3.3.3 Announce No Defects After saving the defect enunciations, Nod=x will be displayed. This is the number of times trains with no defects will be enunciated. The "x" can be any number from one (1) to five (5). **NOTE: This is not the number of times the message will be repeated, it is the number of times the message will be announced for trains with no defects.** Select the desired number of enunciations and press " # " to save an entry and access the next parameter or " * " to abort and exit the menu.

NOTE: The following functions (sections 3.3.4 through 3.3.11) operate the same for all three tracks, the only difference will be the second character which indicates the track number each applies to. T1 = track 1, T2 = track 2 and T3 = track 3.

3.3.4 Maximum Alarms Enunciated After saving the no defect enunciations, T1A=x will appear. This is the maximum number of each type of alarm that will be enunciated before the unit declares "Check Train". This can be any number from one (1) to six (6). Select the maximum number of enunciations and press " # " to save an entry and access the next parameter or " * " to abort and exit the menu.

NOTE: When alarms are enunciated or when the data is sent to the printer, all of each type of alarm will be spoken or printed in a group. For example, all High Load 1's then all High Load 2's, etc.

3.3.5 Type of Direction Circuit After saving the maximum number of alarms, T1C=DIR will appear. This option allows the user to specify the type of direction circuit that is installed, DIR for a normal direction circuit or TRAN for transducers. Choose the desired selection and press " # " to save an entry and access the next parameter or " * " to abort and exit the menu.

3.3.6 Enable Integrity Checking After saving the greeting message option, T1D=ON will appear. This option allows the user to turn ON (enable) or turn OFF (disable) integrity checking. Choose the desired selection and press " # " to save an entry and access the next parameter or " * " to abort and exit the menu.

3.3.7 High Load Type 1 Defect Detection After saving the integrity checking option, T1E=NONE will appear. This option allows the user to select the direction in which the unit will look for certain height (Type 1) high loads. Select **NONE** for no high load detection (input is disabled), **MAIN** for detection only in the main direction, **REV** for detection in the reverse direction and **BOTH** for detection in both directions. Choose the desired selection and press " # " to save an entry and access the next parameter or " * " to abort and exit the menu.

WARNING! ***No trains will be processed while the unit is in test mode.***

If a train approaches the site while tests are being performed, the menu or test may be quickly exited by pressing the " * " key.

3.4.1 Test 1 - Track Circuit Track 1 When selected the LED will display TP1ACTIV if a train is present or TP1INACT if no train is detected. This test corresponds to the status of the monitored **Track Circuit**.

3.4.2 Test 2 - Track Circuit Track 2 When selected the LED will display TP2ACTIV if a train is present or TP2INACT if no train is detected. This test corresponds to the status of the monitored **Track Circuit**.

3.4.3 Test 3 - Track Circuit Track 3 When selected the LED will display TP3ACTIV if a train is present or TP3INACT if no train is detected. This test corresponds to the status of the monitored **Track Circuit**.

3.4.4 Test 4 - Transducer Track 1 When selected the LED will display X1= 0000. The zeros will be replaced by the current axle count.

3.4.5 Test 5 - Transducer Track 2 When selected the LED will display X2= 0000. The zeros will be replaced by the current axle count.

3.4.6 Test 6 - Transducer Track 3 When selected the LED will display X3= 0000. The zeros will be replaced by the current axle count.

3.4.7 Test 7 - Monitored Direction or Approach Transducers Track 1 When selected the LED will display D1= MAIN, indicating the status of the direction circuit for Track 1. Possible indications are **MAIN** or **REV**.

3.4.8 Test 8 - Monitored Direction or Approach Transducers Track 2 When selected the LED will display D2= MAIN, indicating the status of the direction circuit for Track 2. Possible indications are **MAIN** or **REV**.

3.4.9 Test 9 - Monitored Direction or Approach Transducers Track 3 When selected the LED will display D3= MAIN, indicating the status of the direction circuit for Track 3. Possible indications are **MAIN** or **REV**.

3.4.10 Test 10 - HL Type 1 Track 1 When selected the LED will display HL1 1 xx. The xx will be replaced by the number of High Load Type 1 alarms detected on Track 1.

3.4.11 Test 11 - HL Type 2 Track 1 When selected the LED will display HL2 1 xx. The xx will be replaced by the number of High Load Type 2 alarms detected on Track 1.

3.4.23 Test 23 - Radio Alarm Key, Radio Key and Test Talk When selected the LED will display the corresponding word number as each word/phrase is enunciated to the local speaker and to the radio. Radio Alarm Key will also be activated. Tones that the unit generates will also be enunciated. After enunciating entire vocabulary, the unit will return to normal mode of operation. See **Appendix A** for current word list.

WARNING! The following tests will run continuously, the maintainer must return the unit to the normal operation mode by pressing the " * " key or the the Master Reset switch located under the SCAT power switch.

3.4.24 Test 24 - Continuous Radio Key and Generate Tone When selected this test will key the radio and enunciate a test tone for ten (10) minutes. This function can be used to set transmit levels for the radio and volume on the local speaker.

3.4.25 Test 25 - Continuous Radio Alarm Key, Radio Key and Test Talk When selected the LED will display the corresponding word number as each word/phrase is enunciated to the local speaker and to the radio. Radio Alarm Key will also be activated. Tones that the unit generates will also be enunciated. This test will run forever if the unit is not returned to normal operation.

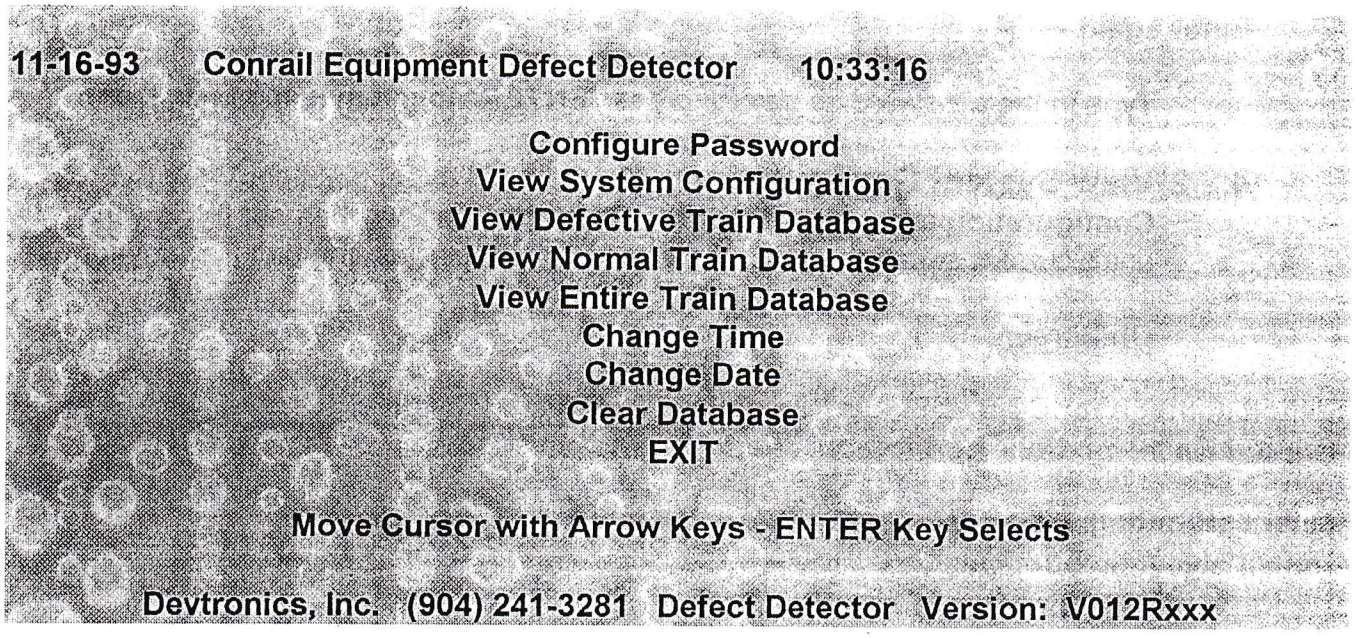
3.4.26 Test 26 - Radio Busy When selected the LED will display the current status of the radio. When the radio is transmitting the LED will show **BUSY**. When in not transmitting, the display will show **NOT BUSY**.

Section Four Terminal Interface

4.1 Preliminary Procedures Connect your laptop or PC to the DB9 connector labeled P1 (serial port1). Start the terminal emulation program as instructed in that programs manual. Communication - Serial Port Parameters: data bits - 8, parity - none, stop bits - 1. To get to the main menu type **" * 1 "** and press **"ENTER"**. **NOTE:** None of the characters that are being typed in will appear on the screen, this is to prevent access from unauthorized users. To log in, type in the password **"mlddpg"** in lowercase letters or selected password and press **"ENTER"**. The following will appear:

4.1.1 Main Menu

On Screen:



Use the arrow keys to position the highlighted bar over a selection and press **"ENTER"**. Pressing **"ESC"** at any time will cause program to return to Main Menu.

4.2 Terminal Interface This section will provide instructions for using the terminal to set the parameters of the Equipment Defect Detector. For additional information on any of the following functions, refer to the **Keypad Interface section** of this manual.

***NOTE:* Reports contained in this manual are only examples. Actual reports may contain other information.**

4.2.3 View Defective Train Database On the main menu highlight **View Defective Train Database** and press **"ENTER"**. The user will be able to view only the defective trains that have been previously recorded.

On Screen:

```
EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 1
 ARRIVAL: 12-30-1999 AT 23:59:59  DEPARTURE: 12-31-1999 AT 01:12:43
 DIRECTION - MAIN     TOTAL AXLES: 102
 HIGH CAR (HIGH ALARM 2) FROM AXLE 54 TO AXLE 56

EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 2
 ARRIVAL: 12-31-1999 AT 03:59:59  DEPARTURE: 12-31-1999 AT 04:12:43
 DIRECTION - MAIN     TOTAL AXLES: 154
 HIGH CAR (HIGH ALARM 2) FROM AXLE 54 TO AXLE 56
 DRAGGING EQUIPMENT FROM AXLE 65 TO AXLE 67

EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 3
 ARRIVAL: 12-31-1999 AT 04:30:01  DEPARTURE: 12-31-1999 AT 04:45:51
 DIRECTION - MAIN     TOTAL AXLES: 172
 HIGH CAR (HIGH ALARM 1) FROM AXLE 63 TO AXLE 65
 HIGH CAR (HIGH ALARM 2) FROM AXLE 54 TO AXLE 56

EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 1
 ARRIVAL: 12-31-1999 AT 05:23:31  DEPARTURE: 12-31-1999 AT 05:42:43
 DIRECTION - MAIN     TOTAL AXLES: 72
 HIGH CAR (HIGH ALARM 2) FROM AXLE 54 TO AXLE 56
```

4.2.5 View Entire Train Database On the main menu highlight **View Entire Train Database** and press **"ENTER"**. The user will be able to view all the trains that have been previously recorded.

On Screen:

```
EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 2
  ARRIVAL:  12-24-1999 AT 23:59:59  DEPARTURE:  12-25-1999 AT 01:11:11
  DIRECTION - REVERSE   TOTAL AXLES:  214
  NO DEFECTS

EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 1
  ARRIVAL:  12-27-1999 AT 17:17:02  DEPARTURE:  12-27-1999 AT 17:22:46
  DIRECTION - MAIN      TOTAL AXLES:  64
  NO DEFECTS

EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 3
  ARRIVAL:  12-31-1999 AT 04:30:01  DEPARTURE:  12-31-1999 AT 04:45:51
  DIRECTION - MAIN      TOTAL AXLES:  172
  HIGH CAR (HIGH ALARM 1)  FROM AXLE  63 TO AXLE  65
  HIGH CAR (HIGH ALARM 2)  FROM AXLE  54 TO AXLE  56

EQUIPMENT DEFECT DETECTOR (V012Rxxx)  TRACK NUMBER 1
  ARRIVAL:  12-31-1999 AT 05:23:31  DEPARTURE:  12-31-1999 AT 05:42:43
  DIRECTION - MAIN      TOTAL AXLES:  72
  HIGH CAR (HIGH ALARM 2)  FROM AXLE  54 TO AXLE  56
```

4.2.9 EXIT Selecting this option will exit the terminal interface operation. Also, if no functions are executed in a ten minute time frame, the program will automatically end the terminal interface operation.

Section Five Voice Formats

5.1 Speech Data Menu options are provided to allow the user to test the vocabulary of the unit. The tone is a 1000 Hz alarm tone. Enunciated messages will appear highlighted like this.

5.1.1 Alarm Tones Four half second 1000 Hz alert tones will be generated upon defect detection.

5.1.2 Train Stops On Site If a train stops on site, the unit will not enunciate any message to the train crew. When the **Track Circuit** clears, the message will be enunciated.

5.2 Enunciated Messages

5.2.1 No Defect Message If no alarms exist and the train is processed correctly, the following message will be enunciated: <railroad name> <site name> <city> <state> TRACK x (the x will be replaced by the appropriate track number) NO DEFECTS, TOTAL AXLE COUNT xxxx (if selected), OVER. **NOTE: "TRACK x" will not be enunciated if in single track mode.**

5.2.2 Real Time Alarm Message Whenever any type of alarm is sensed, four (4) half second alert tones will be generated followed by the type of defect detected. For example: <railroad name> <site name> <city> <state> TRACK x (the x will be replaced by the appropriate track number) CLEARANCE DEFECT (or detected defect), AXLE xx (xx will be replaced by the appropriate axle), TOTAL AXLE COUNT xxxx (if selected), OVER. **NOTE: "TRACK x" will not be enunciated if in single track mode.** This type of message will be enunciated for each alarm detected up to the defects maximum alarm setting.

5.2.3 Clearance Alarm Message If an alarm input is asserted during train time, 4 half second alert tones will be transmitted. The alarm message will consist of the following: <railroad name> <site name> <city> <state> TRACK x (the x will be replaced by the appropriate track number) CLEARANCE DEFECT FROM AXLE xxxx TO AXLE xxxx (the x's being replaced by the appropriate axle count), after a 2 second pause the message will be repeated and followed by: TOTAL AXLE COUNT xxxx, OVER. If more than one clearance defect exists, the alarm message will be as follows: <railroad name> <site name> <city> <state> TRACK x (the x will be replaced by the appropriate track number) ALARM x (the x will be replaced by a 1 for High Load 1 alarms or a 2 for High Load 2 alarms) CLEARANCE DEFECT, FIRST HIGH CAR FROM AXLE xxxx TO AXLE xxxx (the x's being replaced by the appropriate axle count). SECOND HIGH CAR FROM AXLE xxxx TO AXLE xxxx (if present), [all high cars or other defects up to the maximum alarm setting will be enunciated in this manner], after a 2 second pause the message will be repeated and followed by: TOTAL AXLE COUNT xxxx, OVER.

Appendix A

WORD LIST

Word List

Appendix B

WIRING AND SCHEMATIC DIAGRAMS

SCAT Equipment Defect Detector System RTU1005F Single Track
SCATCRL1B.DWG