

TRAKIT-25A

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SPECIFICATIONS

Input voltage	11VDC - 18VDC
Standby current @ 13.8VDC with GPS receiver and antenna	125mA 310mA
Temperature range	0 to +70 deg C
Relative humidity	90% at 50 deg C
Tx audio output impedance high impedance	600 ohms 10k ohms
Tx audio level	0V to .77V RMS into 600 ohms
Rx audio level	30mV RMS to 2.5V RMS
Modem data	1200 baud MSK
Weight	1.1 lb.
Dimensions	5.5" x 5.5" x 1.5"

1.0 GENERAL DESCRIPTION

1.1 Description

The TrakIt-25A provides a full featured Automatic Vehicle Location (AVL) system for fleet management using the Global Positioning System (GPS). The TrakIt-25A contains a GPS receiver, a data buffer and a data modem. Location data is accumulated in the buffer and can be sent to the AVL base computer through a radio link.

The TrakIt-25A is designed for use on 450 MHz, 800 MHz, shared or dedicated, trunked or conventional radio systems. Interfaces to a number of different radios have been developed for the TrakIt-25A. Various radio interface cables are available for quick and easy installation.

1.2 Capabilities and Features

- ◆ Can be used on 450 MHz, 800 MHz, shared or dedicated, trunked or conventional radio systems.
- ◆ Interface kits to many radios are available for easy installation.
- ◆ Operating and timing parameters are stored in non-volatile EEPROM and can be programmed to meet system requirements.
- ◆ Voice and data can be intermixed on the radio channel.
- ◆ Data port has numerous programmable operating modes.
- ◆ Two event input signals allow position records to be generated on external events.
- ◆ Multi-input expander option provides 8 additional inputs that allow position records to be generated on external events.
- ◆ An external output allows control of external devices by the AVL base software.
- ◆ On board battery backed position buffer holds 1000+ records.
- ◆ Internally located GPS receiver board.
- ◆ Onboard 1200 baud MSK modem.

2.0 INSTALLATION AND SETUP

2.1 Inspection

Please refer to the checklist packed with the TrakIt-25A in order to become familiar with the unit and to insure that everything ordered has been received. In the event a part is missing from the checklist, please call the Customer Services Department at 1-701-280-1122.

This unit was thoroughly inspected before leaving the factory. If the outer package appears damaged, please inspect the unit for possible damage immediately. Any dents, scratches, or marks suggest rough handling in shipping. Please notify the shipper if you find any indications of mishandling. If there are any concerns about the condition of the TrakIt-25A when it is received, please don't hesitate to call the Customer Services Department.

2.2 Disassembly and Reassembly

When performing the alignment procedure or making changes to the jumpers and dip switches on the TrakIt-25A, it is necessary to remove the printed circuit board from the case. This is accomplished by removing the two black screws from the front of the TrakIt-25A and removing the front panel. Remove the top cover by sliding it off the TrakIt-25A. Since the printed circuit board contains sensitive circuitry, be sure to take the necessary precautions against static discharge.

To reassemble the TrakIt-25A, replace the top cover and the front panel making sure the front and back panels are seated properly with the case. Replace the two black screws but do not over-tighten them.

2.3 Installation Procedure

This section describes the procedure for installing the TrakIt-25A in a vehicle. The first step is to perform a quick bench test on the TrakIt-25A before connecting it to a radio. The purpose of the bench test is to set up the TrakIt-25A to operate with the radio to which it will be connected. To perform the bench test, connect power and ground to the TrakIt-25A. Refer to section **2.4 Radio Connection** for the power and ground connections. Connect the TrakIt-25A to the computer that the AVL Installer program is on as described in section **2.5 Data Port Connection**. Then use the AVL Installer program to edit the installer table in the TrakIt-25A. Refer to section **2.11 AVL Installer Program** for information on editing the installer table.

The next step is to connect the TrakIt-25A to the radio. Section **2.4 Radio Connection** lists the different connections that can be made to the radio. Interface cables for many radios are available from IDA. In addition, the TrakIt Radio Interface Manual contains instructions for interfacing to many different radios. The jumpers and dip switches should also be set as required. Refer to sections **2.8 Jumper Settings** and **2.9 Dip Switch Settings** for a description of the jumpers and dip switches. Be sure to program the radio's frequencies and features as required.

2.3 Installation Procedure (cont.)

After the TrakIt-25A is connected to the radio, its audio levels should be adjusted by performing the alignment procedure described in section **3.0 Alignment Procedure**. After completing the alignment procedure, recheck the installer table settings and the radio programming and make any changes that may be required.

The TrakIt-25A along with the radio can now be installed into the vehicle. Refer to the radio's manual for instructions on installing the radio into a vehicle. The TrakIt-25A should be installed in close proximity to the radio. Be sure to allow sufficient space around the radio and TrakIt-25A for air cooling. The GPS antenna should also be installed as described in section **2.6 GPS Antenna Connection**.

NOTE: The TrakIt-25A can key the radio at any time. Because of this, the radio should be connected to an antenna or a dummy load at all times. This will prevent damage to the radio caused by transmitting without a load.

2.4 Radio Connection

The connector J1 is used to interface the TrakIt-25A to a radio to provide the signals required for the TrakIt-25A to control the radio and send data through the radio system. Interfaces to many radios have been developed and the TrakIt Radio Interface Manual contains procedures for connecting the TrakIt-25A to these radios using factory supplied cables. Following is a description of the function of each pin of J1.

1. This is the receive audio pin. Modem data is decoded from the audio present on this pin. For trunking or conventional systems, this pin should be connected to some point after the radio's squelch gate so that the TrakIt-25A will only receive audio that is being sent to the radio's speaker. This will prevent the TrakIt-25A from receiving data transmissions that are being sent to mobiles with a different ID.

For trunking systems, it is also possible to connect the receive audio pin to some point before the radio's squelch gate (such as the discriminator output) but only if the receive indicator pin is connected to a point in the radio that goes active when the radio is receiving a transmission (audio is being passed to the speaker). This is to ensure that the TrakIt-25A does not receive data transmissions that are being sent to mobiles with a different ID.

NOTE: The point in the radio where the receive audio is obtained should not be affected by the radio's volume control.

2. This is the transmit audio pin. Modem data that is to be transmitted will appear on this pin. This pin should be connected to some point in the radio that will allow the audio on this pin to be transmitted when the TrakIt-25A activates the radio's PTT. The transmit audio pin can be set up as either a low or high impedance output.

2.4 Radio Connection (cont.)

3. This is the transmit indicator pin. This pin is used to indicate to the TrakIt-25A when the radio is keyed. It should be connected to some point that goes active when the radio is keyed (such as the transmit LED). For trunking systems, it could instead be connected to a point that goes active when the system has been successfully accessed. The transmit indicator pin can be programmed as either an active high or active low input.

While this pin is active, the TrakIt-25A will not attempt to key the radio. This is to prevent the TrakIt-25A from sending data messages while the radio's microphone is keying the radio. When the TrakIt-25A has a data message to send, it will wait for this pin to go non-active before keying the radio. After keying the radio, the TrakIt-25A will wait for this pin to go active before sending the modem data.

This pin can also be programmed to operate as a second event input signal pin that functions the same as the event input signal pin (pin 5).

4. This is the receive indicator pin. This pin is used to indicate to the TrakIt-25A when the radio is receiving a transmission. When this pin is active, the TrakIt-25A will attempt to decode modem data from the received audio. Also, the TrakIt-25A will not attempt to key the radio while this pin is in an active state. The receive indicator pin can be programmed as either an active high or active low input.

For trunking systems, this pin should be connected to a point in the radio that goes active when a transmission is being received by the radio but does not go active when other traffic occurs on the channel (for example, the control line that enables audio to the radio's speaker). This is to ensure that the TrakIt-25A does not receive data transmissions that are being sent to mobiles with a different ID.

For conventional systems, this pin should be connected to a point in the radio that goes active when a carrier is detected by the radio (such as the output of the squelch detect circuit). This is to ensure that the TrakIt-25A will not attempt to transmit while the radio channel is busy with other users.

5. This is the event input signal pin. The TrakIt-25A uses this pin to determine the state of an external device. Position records can be generated by the TrakIt-25A when the state of the external device changes. The event input signal pin is de-bounced and any new input level on this pin should be held for at least 1 second. The event input signal pin can be programmed as either an active high or active low input.
- 6,7. These two pins are used to mute the radio's microphone audio while the TrakIt-25A is sending modem data. This is necessary in some installations to prevent microphone audio from corrupting the modem data being sent. These pins can be used to enable or disable a control line that mutes the microphone audio or the microphone audio path can be broken and passed through these two pins. An audio gate is connected between these two pins in the TrakIt-25A and when enabled it will effectively connect pin 6 to pin 7. The TrakIt-25A can be programmed to mute the microphone audio by either enabling or disabling this audio gate.

2.4 Radio Connection (cont.)

8. This pin is used to supply power to the TrakIt-25A. It should be connected to a point in the radio that will provide 13.8 VDC to the TrakIt-25A. It is recommended that the radio's power switch control power to the TrakIt-25A as well.
9. This is the ground pin. It should be connected to the radio's ground.
10. This is the PTT output pin. The TrakIt-25A keys the radio by activating this pin. This pin should be connected to some point in the radio that will cause the radio to key up when this pin is activated. The PTT output pin can be programmed as either an active high or active low output.
11. This is the TXD pin of Data Port 2 when switch SW4 is set to position A. This pin is not currently used and should be left unconnected.
12. This is the RXD pin of Data Port 2 when switch SW4 is set to position A. This pin is not currently used and should be left unconnected.
13. This is the external output pin. The function of this pin is programmable and it should be connected to an appropriate point based upon its programmed function. The external output pin can also be programmed as either an active high or active low output. This pin does not need to be connected if none of its programmable functions are to be used.
14. This pin is not used.
15. This pin is the 5 VDC output from the TrakIt-25A and does not generally need to be connected.

2.5 Data Port Connection

Connector J2 (labeled "DATA PORT") provides the connections for two serial ports, Data Port 1 and Data Port 2. To provide separate connectors for Data Port 1 and Data Port 2, a Y-cable will need to be used. Various Y-cables are available from IDA to satisfy the requirements of most installations. The pin-out for connector J2 is as follows:

<u>Pin #</u>	<u>Function</u>
1	TXD2
2	TXD1
3	RXD1
4	RXD2
5	GND
6	CTS2, or 5VDC, or 10VDC
7	CTS1
8	RTS1
9	RTS2

2.5 Data Port Connection (cont.)

Data Port 1 is used to make a serial connection from the TrakIt-25A to a computer, a TrakIt Vehicle Terminal, or some other device. What the Data Port 1 connector is connected to is determined by the operating mode of Data Port 1 which is selected using the AVL Installer program. The operating modes of Data Port 1 are as follows:

NMEA - In this mode, NMEA messages that are received from the GPS receiver are sent to Data Port 1. Data Port 1 should be connected to a computer or some other appropriate device.

Supervisor/Monitor - This mode allows the AVL Supervisor/Monitor software to communicate with the TrakIt-25A. Data Port 1 should be connected to the computer that will be running the AVL Supervisor/Monitor software.

ASCII In/Out - This mode allows ASCII dispatch messages to be sent and received through Data Port 1. Data Port 1 should be connected to a computer or some other appropriate device.

Vehicle Terminal - This mode allows the TrakIt Vehicle Terminal to send and receive dispatch messages through Data Port 1. Data Port 1 should be connected to the TrakIt Vehicle Terminal.

VDO - This mode allows the TrakIt-25A to communicate with a VDO on-board computer. Data Port 1 should be connected to the VDO on-board computer.

Cellular - This mode allows the AVL base software to communicate with the TrakIt-25A through a cellular modem. Data Port 1 should be connected to the cellular modem.

To connect Data Port 1 to the serial port of a computer, connect the Data Port 1 connector directly to the computer or use a male DB-9 to female DB-9 serial cable with straight through connections. If the computer's serial port is a DB-25, a DB-9 to DB-25 adapter will need to be used. In addition, the data port connector will need to be set up for RS232 levels as described in section **2.9 Dip Switch Settings**. The following table details the connections that are made between Data Port 1 and the computer.

Data Port 1 DB-9	Computer DB-9	Computer DB-25
2 - TXD	2 - RXD	3 - RXD
3 - RXD	3 - TXD	2 - TXD
5 - GND	5 - GND	7 - GND
7 - CTS	7 - RTS	4 - RTS
8 - RTS	8 - CTS	5 - CTS

Data Port 2 is used to make a serial connection from the TrakIt-25A to another device as determined by the operating mode of Data Port 2. The operating mode of Data Port 2 is factory programmed to meet the special needs of each installation. Please contact IDA for more information.

2.6 GPS Antenna Connection

The TrakIt-25A comes with a GPS receiver and a GPS antenna. The GPS antenna should be connected to the connector on the back of the TrakIt-25A that is labeled "GPS ANT". The GPS antenna is either magnetic mount or permanent mount and should be mounted to a flat horizontal surface that will have an unobstructed view of the sky. When installing the GPS antenna, be sure that the antenna cable is not pinched or run past sharp edges.

2.7 Multi-Input Expander Cable Connection

The Multi-Input Expander Cable option provides 8 inputs to the TrakIt-25A. The TrakIt-25A uses these inputs to determine the state of external devices. Position records can be generated by the TrakIt-25A when the states of the external devices change. The inputs are de-bounced and any new input level must be held for at least 1 second to be recognized. The inputs can be programmed as either active high or active low.

The Multi-Input Expander Cable provides the connection to the external devices through a standard 15 pin Molex connector. Eight pins are used for the input signal connections and the other seven pins provide ground connections. Refer to the Multi-Input Expander Cable schematic at the end of the manual for further information on connecting the cable to external devices.

2.8 Jumper Settings

The following is a description of the jumpers and their settings on the TrakIt-25A board. Staple jumpers are used on most of these jumpers but posts with shorting blocks are used for some jumpers. Since shorting blocks can vibrate off when the TrakIt-25A is installed in a vehicle, they should be removed and the necessary connections should be made with wire wrap wire or by bending the posts together and soldering them.

JP1 - This jumper determines if the transmit audio output is low impedance or high impedance. It should be installed for low impedance and removed (or cut) for high impedance.

JP2 - This jumper is not used and should not be changed.

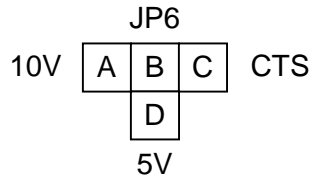
JP3 - This jumper is not used and should remain not installed.

JP4 - This jumper determines if the received audio will be de-emphasized. If JP4 is jumpered to A-B, the received audio will not be de-emphasized. If JP4 is jumpered to B-C, the received audio will be de-emphasized.

JP5 - This jumper is factory installed and should not be changed.

2.8 Jumper Settings (cont.)

JP6 - This jumper determines if the Data Port 2 CTS pin is used for CTS signal input or if it will provide power to the device connected to Data Port 2. CTS signal input is selected if JP6 is jumpered to B-C. Otherwise, power output is selected if JP6 is jumpered to A-B (10V) or B-D (5V) as shown in the following diagram:



2.9 Dip Switch Settings

The following describes the function of each of the dip switches on the TrakIt-25A.

SW1-1,2: These switches are used to set the operating mode of the TrakIt-25A as follows:

1	2	Mode
OFF	OFF	Normal
OFF	ON	Test
ON	OFF	Not used
ON	ON	Not used

Normal - This is the normal operating mode. The TrakIt-25A should always be in this mode except when it is necessary to have the unit in test mode.

Test - This is the test mode. When put into this mode, the TrakIt-25A will key the radio and start generating a modem test tone. This will allow the audio levels to be adjusted. Refer to section **3.0 Alignment Procedure** for more information on adjusting the audio levels. If the TrakIt-25A does not key up the radio when put into test mode, check the radio connections and the installer table settings.

Not used - These modes are not used and should not be selected.

SW1-3: This switch routes the received data from Data Port 1 to the internal GPS receiver board when in the ON position. This allows differential GPS information to be passed to the internal GPS receiver. If DGPS is not being used, this switch should be in the OFF position. Data Port 1 can only be used in the None and NMEA operating modes when DGPS is being used.

SW1-4: This switch routes the received data from Data Port 1 to the TrakIt-25A's micro-processor. This switch should normally be in the ON position. If DGPS is being used (SW1-3 ON), this switch should be in the OFF position. Programming information from the AVL Installer program can only be received through Data Port 1 when this switch is in the ON position.

2.9 Dip Switch Settings (cont.)

SW2: This switch determines if Data Port 1 is at TTL levels or at RS232 levels. Position A selects TTL levels and position B selects RS232 levels. This switch should normally be set to position B.

SW3: This switch determines if Data Port 2 is at TTL levels or at RS232 levels. Position A selects TTL levels and position B selects RS232 levels. This switch should normally be set to position B.

SW4: This switch determines if Data Port 2 is routed to the radio port or to the data port. Position A selects the radio port and position B selects the data port. This switch should normally be set to position B.

2.10 Adjustment Potentiometers

The functions of the adjustment potentiometers are described below. Refer to section **3.0 Alignment Procedure** for step-by-step instructions on adjusting these pots.

Receive Audio Level - The potentiometer R3 is used to adjust the receive audio level that is applied to the modem IC.

Transmit Audio Level - The potentiometer R2 is used to adjust the level of audio from the modem IC that is sent to the radio for transmission.

DTMF Audio Level - The potentiometer R1 is used to adjust the level of DTMF tones that are sent to the radio for transmission. This pot is not currently used.

2.11 AVL Installer Program

The AVL Installer program is used only by the installer and allows the many different programmable parameters of the TrakIt-25A to be tailored to the selected radio and system on which it will operate. The AVL Installer program contains an installer table and an operator table. The parameters contained in the installer table determine how the TrakIt-25A will operate with the selected radio and system and can be changed only by the installer using the AVL Installer program. The parameters contained in the operator table determine how the TrakIt-25A handles position records and can be changed by the installer using the AVL Installer program or by the operator using over the air programming.

To change the installer table settings, the installer should use the AVL Installer program to edit the installer table and then upload the installer table to the TrakIt-25A. The installer does not normally need to edit and upload the operator table since the operator can change the operator table settings using over the air programming. In addition, the installer does not need to initialize the unit ID since the automated initialization feature will allow the operator to initialize the unit ID after the TrakIt-25A has been installed in a vehicle.

2.11 AVL Installer Program (cont.)

The different parameters that are available in the installer table are described below. Before changing any parameter, its function should be completely understood since the full effect of any change may not be immediately noticeable.

Vehicle Name - Vehicle name helps the system operator identify which vehicle is connected when the automated initialization feature is being utilized. Use an identifier here that the operator will equate to the vehicle (for example, "Red truck" or "Truck 112").

Event input signal active - If the event input signal at J1-5 is active high, this should be set to high. If the event input signal is active low, this should be set to low. The TrakIt-25A can use the event input signal to generate position records.

Transmit indicator active/Event input 2 signal active - If the transmit indicator line (J1-3) is active high, this should be set to high. If the transmit indicator line is active low, this should be set to low. If the transmit indicator pin is programmed to operate as a second event input signal pin, this setting reflects the active level of the second event input signal.

Receive indicator active - If the receive indicator line (J1-4) is active high, this should be set to high. If the receive indicator line is active low, this should be set to low.

PTT output active - If the PTT output (J1-10) needs to be at a high level to key the radio, set this to high. If the PTT output needs to be at a low level to key the radio, set this to low.

External output active - If the external output (J1-13) needs to be active high, set this to high. If the external output needs to be active low, set this to low.

Enable mic mute gate on transmit - The TrakIt-25A uses the mic mute audio gate to mute the microphone audio while it is transmitting a data message. If the radio's microphone audio will be muted with the mic mute audio gate enabled, this should be set to yes. If the radio's microphone audio will be muted with the mic mute audio gate disabled, this should be set to no.

Transmit while receive indicator active - When this is set to no, the TrakIt-25A will not attempt to key the radio to send a data message while the receive indicator line is active. This prevents the TrakIt-25A from trying to key the radio while the radio is receiving a transmission. Setting this to yes allows the TrakIt-25A to key the radio while the receive indicator line is active (unless modem data is currently being detected). Normally, this should be set to no.

2.11 AVL Installer Program (cont.)

Transmit while transmit indicator active - When this is set to no, the TrakIt-25A will not attempt to key the radio to send a data message while the transmit indicator line is active. This prevents the TrakIt-25A from trying to key the radio and send a data message while the microphone is being used for voice communications. Setting this to yes allows the TrakIt-25A to key the radio and send a data message while the transmit indicator line is active. Normally, this should be set to no.

Number of key up attempts - This is the maximum number of times the TrakIt-25A will attempt to key the radio when it has a data message to send. If the radio does not successfully key up within this number of attempts, the data message will not be sent.

Key up delay after receive - When the TrakIt-25A has a data message to send, it will not activate the PTT output to key the radio until a minimum of this amount of time has passed since the receive indicator line was last active (if *transmit while receive indicator active* is set to no) or since modem data was last detected (if *transmit while receive indicator active* is set to yes).

Key up delay after transmit - When the TrakIt-25A has a data message to send, it will not activate the PTT output to key the radio until a minimum of this amount of time has passed since the transmit indicator line was last active. If *transmit while transmit indicator active* is set to yes, this time will be ignored.

Transmit considered active time - After activating the PTT output, the TrakIt-25A will monitor the transmit indicator line to determine when the radio has keyed and accessed the system. Only after the transmit indicator line has been continuously active for this amount of time will the TrakIt-25A assume that the radio has successfully keyed up and the modem data can be sent.

Enable Tx indicator as event 2 - When this is set to no, the transmit indicator line will be used to determine when the radio is keyed. On conventional systems, this may not be required in which case setting this to yes will allow the transmit indicator pin to be used as a second event input signal. When this is set to yes, *transmit while transmit indicator active*, *number of key up attempts*, *key up delay after transmit*, *transmit considered active time*, *key up failure time*, and *key up failure delay time* will be ignored.

Key up failure time - After activating the PTT output, this is the maximum amount of time the TrakIt-25A will wait for the radio to successfully key up. (The radio has successfully keyed up when the transmit indicator line has been continuously active for *transmit considered active time*). If the radio does not successfully key up within this amount of time, the TrakIt-25A will consider this key up attempt to have failed and will de-activate the PTT output.

Key up failure delay time - After a failed key up attempt, the TrakIt-25A will de-activate the PTT output and then delay this amount of time before it attempts to re-key the radio (provided that the *number of key up attempts* has not been exceeded).

2.11 AVL Installer Program (cont.)

Delay before data send - After the radio has been successfully keyed up, the TrakIt-25A will delay this amount of time before sending the modem data. This will allow time for the radios that are to receive the data to decode the radio ID and open their audio paths and/or to trunk to the channel being used.

After send delay before unkey - After the TrakIt-25A has sent the modem data, it will delay this amount of time before de-activating the PTT output to unkey the radio.

Minimum time between sends - After the TrakIt-25A has sent a message and de-activated the PTT output, it will wait a minimum of this amount of time before activating the PTT output to send another message.

External output active time - If the *external output mode* is set to speaker mute, the TrakIt-25A will activate the external output while receiving a data message and keep it active for this amount of time after receiving the data message or until the receive indicator line is no longer active. If the *external output mode* is set to second PTT, the TrakIt-25A will activate the external output this amount of time before the PTT output is activated and deactivate the external output this amount of time after the PTT output is deactivated. The *external output active time* is not used when the *external output mode* is set to user output.

External output mode - This setting determines the operating mode for the external output. Following is a description of the different operating modes of the external output.

Speaker mute - In this mode, the TrakIt-25A will activate the external output while receiving a data message to mute the radio's speaker audio to prevent the modem data tones from being heard through the radio's speaker.

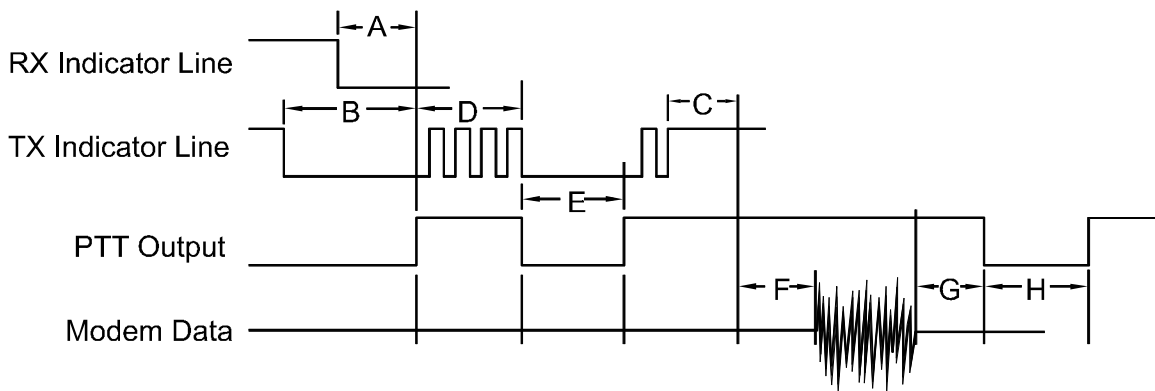
Second PTT - In this mode, the external output will provide a second PTT signal that goes active before the PTT output is activated and is deactivated after the PTT output is deactivated. This second PTT signal can be used on some radios to change the radio to a data channel before the radio is keyed.

User output - In this mode, the state of the external output is controlled by the operator using the AVL base software. This allows a device in the vehicle to be enabled and disabled from the base site.

Line (1 - 8) signal active - If the input signal provided through the Multi-Input Expander Cable is active high, this should be set to high. If the input signal is active low, this should be set to low. The TrakIt-25A can use the input signals to generate position records.

2.11 AVL Installer Program (cont.)

The following diagram shows the relationship between the different programmable times and the different input and output signals. For illustration purposes, this diagram assumes the inputs and outputs are all active high.



The letters used in the diagram correspond to the programmable times as follows:

- A. Key up delay after receive
- B. Key up delay after transmit
- C. Transmit considered active time
- D. Key up failure time
- E. Key up failure delay time
- F. Delay before data send
- G. After send delay before unkey
- H. Minimum time between sends

3.0 ALIGNMENT PROCEDURE

The alignment procedure requires two Traklt-25A units connected to the radios that they are to operate with. The two Traklt-25A units will be aligned at the same time. A Traklt-20 base unit can be used in place of one of the Traklt-25A units.

1. Connect the Traklt-25A units to the radios, set the switches and jumpers as required, and program the required installer data into the Traklt-25A units using the AVL Installer program. The radios should be programmed for correct operation with the system on which they will be used.
2. Put the first Traklt-25A into test mode (SW1-1 OFF, SW1-2 ON) and the second Traklt-25A into normal mode (SW1-1 OFF, SW1-2 OFF). Monitor the first radio's transmit frequency with a communications monitor and adjust R2 on the first Traklt-25A for 3 kHz deviation.
3. On the second Traklt-25A, measure the voltage level at TP2 using an AC voltmeter while receiving the test tone from the first Traklt-25A. Adjust R3 on the second Traklt-25A to obtain a level of 440mV RMS.
4. Put the second Traklt-25A into test mode (SW1-1 OFF, SW1-2 ON) and the first Traklt-25A into normal mode (SW1-1 OFF, SW1-2 OFF). Monitor the second radio's transmit frequency with a communications monitor and adjust R2 on the second Traklt-25A for 3 kHz deviation.
5. On the first Traklt-25A, measure the voltage level at TP2 using an AC voltmeter while receiving the test tone from the second Traklt-25A. Adjust R3 on the first Traklt-25A to obtain a level of 440mV RMS.
6. On both units, turn R1 completely counter-clockwise since R1 is not currently used.
7. Make sure both Traklt-25A units are in normal mode and not in test mode before reassembling the Traklt-25A units in their cases.

PARTS LIST

TRAKIT-25A PCB BOARD 101-0277

Item	Reference	Description	Part No.	Qty.
1	B1	3V BATTERY	399-0008	1
2	B1	3V BATTERY HOLDER	399-0009	1
3	C1	2.2uF ELEC. NP CAP	361-0002	1
4	C2,3	1uF ELEC. CAP	360-0001	2
5	C4,5,6	10uF ELEC. CAP	360-0004	3
6	C11	220uF ELEC. CAP	360-0007	1
7	C7,8,9,10,12,13,14,15, 16,19,20,21,22,23,24, 26,29,30*,31*,32,35*, 37*,40,41,42,43*,44,45, 46,47*,48,63	.1uF 10% X7R CAP	372-5104	32
8	C17,18,27,28	18pF 5% NPO CAP	372-5180	4
9	C25,36*,38*,49,50,51, 52,53,54,55,56,57,58, 59,60,61,62	.01uF 10% X7R CAP	372-5103	17
10	C33,34	33pF 5% NPO CAP	372-5330	2
11	C39*	.001uF 5% NPO CAP	372-5102	1
12	D1,2,4	4148 DIODE	110-0018	3
13	D3	1N4003 DIODE	110-0002	1
14	D5,6,7,8	1N5232 5.6V ZENER DIODE	111-0018	4
15	F1	1 AMP PC MOUNT FUSE	290-0008	1
16	J1	DB15 FEMALE CONN R/A	231-0031	1
17	J2	DB9 FEMALE CONN R/A	231-0026	1
18	J1,2	HEX NUT 4-40	199-0010	4
19	J1,2	WASHER, STAR #4	199-2001	4
20	J1,2	SCREW, 4-40 x 3/8 PHLP	199-3056	4
21	J3	8 POS HEADER	231-1518	1
22	J4	7 POS HEADER	231-1517	1
23	JP1,2*,5	STAPLE JUMPER	265-0016	3
24	JP3	NOT INSTALLED	000-0002	1
25	JP4,6	3 POS JUMPER POST	231-1003	2
26	JP4,6	SHORTING JUMPER	234-0046	2
27	JP6	1 POS JUMPER POST	231-1001	1
28	P1	8 POS DIP CONN	234-0022	1
29	Q1,2,3,4,5,6,8,9,10,11, 12,13,14,15	MMUN2211 TRANSISTOR	180-0040	14
30	R1*,2,3	50K 1 TURN POT	351-0010	3
31	R4,28	1M 5% 1/8 W RES	321-1105	2

32	R5,8,9,11,12,13,14,16, 18,20,21,23,24,25,26, 27,31*,32*,34,35,38,39, 40,41,42,43*,44,45,49, 52,53,54,55,56,57,58, 59,60,61,62,63,64,65	10K 5% 1/8 W RES	321-1103	43
33	R6,19,22,29*,46*,48,51	100K 5% 1/8 W RES	321-1104	7
34	R7,10,15,17	100ohm 5% 1/8 W RES	321-1101	4
35	R30*	390K 5% 1/8 W RES	321-1394	1
36	R33*	30K 5% 1/8 W RES	321-1303	1
37	R36*,66	4.7K 5% 1/8 W RES	321-1472	2
38	R37*	56K 5% 1/8 W RES	321-1563	1
39	R47	1K 5% 1/8 W RES	321-1102	1
40	R50	470ohm 5% 1/8 W RES	321-1471	1
41	SW1	4 POS DIP SWITCH	613-0002	1
42	SW2,3,4	DPDT SWITCH	611-0048	3
43	TP1,2	PC MOUNT TEST POINT	200-0013	2
44	U1	LM2940-10 TO-220 IC	130-0277	1
45	U2	80C32 IC	131-3005	1
46	U3	UA7805 TO-220 IC	130-0022	1
47	U4	27C512 IC	130-0319	1
48	U6	74HCT245 IC	131-1023	1
49	U7	74HC373 IC	131-1022	1
50	U8	208 IC	131-1032	1
51	U9	24LC04 IC	131-1029	1
52	U10	60L256 IC	131-1024	1
53	U11	74HC244 IC	131-1021	1
54	U12	74HC138 IC	131-1020	1
55	U14	88C681 IC	131-3004	1
56	U15*	8888 IC	131-1027	1
57	U16*	TL082 IC	131-1007	1
58	U17	TL084 IC	131-1001	1
59	U18	4066 IC	131-1028	1
60	U19	7407 IC	131-1025	1
61	U20	MX429 IC	131-3003	1
62	U21	695 IC	131-1018	1
63	U22	MM74HC573WM IC	131-1055	1
64	U23	74HC08M IC	131-1034	1
65	U24	74HC32 IC	131-1031	1
66	U2	44 PIN PLCC SOCKET	220-0011	1
67	U3	T0220 INSULATOR	210-0103	1
68	U4	28 PIN DIP SOCKET	220-0008	1
69	X1	4MHz CRYSTAL	305-0007	1
70	X2	3.579545MHZ CRYSTAL	305-0001	1
71	X3	11.0592MHZ CRYSTAL	305-0012	1
72	X1,2,3	CRYSTAL INSULATOR	210-0106	3
73		SPACER, 4-40 x 3/8	200-0305	4
74		PC BOARD TRAKIT-25	900-0277	1

* Indicates parts not placed

**TRAKIT-25A CABINET
103-0277**

Item	Description	Part No.	Qty.
1	NUT, HEX, 4-40	199-0010	1
2	WASHER, STAR #4	199-2001	1
3	SCW, 4-40 X 1/4 SLOT	199-3055	1
4	S/N LBL IDA PRODUCT	199-6009	1
5	NUT, PEM 6-32 FLUSH	200-0056	4
6	BACKPLATE, TRAKIT	900-6062A	1
7	CABINET, TRAKIT	900-6071	1
8	FACEPLATE (w/o Multi-Input)	900-6072S	1
9	FACEPLATE (w/ Multi-Input)	900-6077S	1

TRAKIT-25A MULTI-INPUT EXPANDER CABLE

Item	Description	Part No.	Qty.
1	MULTI-INPUT CABLE ASSY	800-2092	1

**TRAKIT-25A GPS RECEIVER KIT
105-0268**

Item	Description	Part No.	Qty.
1	NUT, HEX 10 X 32	199-0046	1
2	SCW, #4-40 X 1/4 SLOT	199-3055	4
3	GPS RECEIVER BD.	902-0006	1

GPS MAGNETIC ANTENNA

Item	Description	Part No.	Qty.
2	GPS MAGNETIC ANTENNA	902-0007	1

GPS PERMANENT ANTENNA

Item	Description	Part No.	Qty.
1	GPS PERMANENT ANT.	902-0011	1

**TRAKIT CABINET BRACKET KIT
103-5025**

Item	Description	Part No.	Qty.
1	SCW, #10 X 3/4 SHEET MET.	199-1009	4
2	SCW, #6-32 X 3/16 PHILLIPS	199-3068	4
3	WASHER, STAR #6	199-2002	4
4	BRACKET, TRAKIT ANOD.	900-5025A	1

SCHEMATICS