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**TR-06-93**  
**Automated Vehicle Location (AVL)**

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Submitted by  
Royal Canadian Mounted Police  
Technology Assessment Section

TECHNICAL REPORT

**October 1992**

NOTE: Further information  
about this report can be  
obtained by calling the  
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## SUMMARY

The police community has shown much interest in the ability to track police vehicles especially for those times when an officer is in trouble and the location is unknown.

The Royal Canadian Mounted Police(RCMP) in concert with the Department of Communications(DOC) conducted a field trial of the AVL-LORAN-C Nocus and GPS units in the National Capital Region during 1992.

The field trial objectives were met. The equipment services were generally impressive. The AVL(Position feature of RoadKIT) was sufficient for RCMP operation in rural and remote areas. Loran-C and GPS navigation technologies were widely available and easy to operate. Line-of-sight is still a problem for satellite communication in urban areas.



## RÉSUMÉ

La collectivité policière veut pouvoir connaître l'emplacement des voitures de police, particulièrement lorsqu'un agent est en difficulté et qu'on ne sait pas où il se trouve.

La Gendarmerie royale du Canada (GRC), en collaboration avec le ministère des Communications (MDC), a fait l'essai des systèmes de localisation automatique des véhicules et de positionnement global LORAN-C et NOCUS dans la région de la capitale nationale en 1992.

On a atteint les objectifs fixés. Ces équipements sont très performants. Le Système de localisation automatique des véhicules (système d'emplacement exact de RoadKIT) est suffisant pour les opérations de la GRC dans les endroits ruraux et éloignés. Le Système de positionnement global de Loran-C est facile à utiliser et on peut s'en procurer un aisément. Dans le domaine de la communication satellite, la portée optique constitue toujours un problème dans les régions urbaines.



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## PROJECT OVERVIEW

After several meetings between the RCMP and DOC, on 91-09-23, the RCMP submitted their MSAT field trial proposal (Automated Vehicle Location (AVL)) to Mr. David W. Halayko, MSAT trial implementation manager, Department of Communications for approval. The proposal was approved by DOC in Oct. 91. There were four shipments of equipment which were received by the RCMP:

- 1) on 91-11-23, shipment of six (6) AVL-LORAN-C units;
- 2) on 92-01-30, shipment of one (1) portable laptop computer complete with modem and software;
- 3) on 92-04-02, shipment of one (1) AVL-GPS unit;
- 4) on 92-04-14, shipment of one (1) AVL-LORAN-C with NOCUS coverage.

On 92-03-06, the RCMP accepted DOC's invitation to participate in evaluating the additional units (new LORAN-C NOCUS & GPS) until 92-07-31. By 92-04-30, three AVL-LORAN-C units were in full operation. One AVL-LORAN-C unit was installed at a fixed location, while the other two AVL-LORAN-C units were installed in two vehicles. On 92-05-25, the first three MET units (LORAN-C) were sent back to DOC after they were evaluated successfully. The rest of the units were in full operation by 92-05-15. Information on location of the vehicles and messages that are sent were being monitored, collected and evaluated to determine the viability of mobile satellite communication and effectiveness of the RoadKIT terminal with LORAN-C & GPS coverage. The trials were carried out locally in the National Capital Region (NCR), which will

represent typical environments of geographic locations throughout the country.

This report will also cover the following areas: TECHNICAL SYSTEM AND OPERATIONS, EVALUATION, FINANCIAL CONSIDERATIONS, ADMINISTRATIVE CONSIDERATIONS AND CONCLUSIONS.

## TECHNICAL SYSTEM AND OPERATIONS

The R.C.M.P. provided vehicles and equipped them with TMI-RoadKIT's. Each RoadKIT consists of an omni-directional antenna, a satellite transceiver and a mobile terminal for receiving and transmitting messages to a dispatch centre via an INMARSAT satellite link. The satellite transceiver sends the information on location received by LORAN-C/GPS receiver to a dispatch centre via INMARSAT satellite link. The RoadKIT terminal is one part of a larger system called the Mobile Data Service (MDS). A block diagram of MDS is shown in figure #1. The Hub forms the core to the MDS system with customer dispatch centre on the one side and RoadKIT Terminals on the other. The Hub receives messages from multiple dispatch centres and formats them for transmission to a satellite. The satellite then retransmits the messages to the RoadKIT Terminals. The RoadKit processes only those messages that are relevant to a particular vehicle or fleet of vehicles and ignores all others. In the trial, the dispatch centre was located in an RCMP facility and consisted of one Laptop computer and a modem. The data communications software, Procomm allowed a dial-up link to the TMI-Hub and established the communication link between the dispatch centre and Mobile Network controller (MNET) system (situated at TMI-Hub).

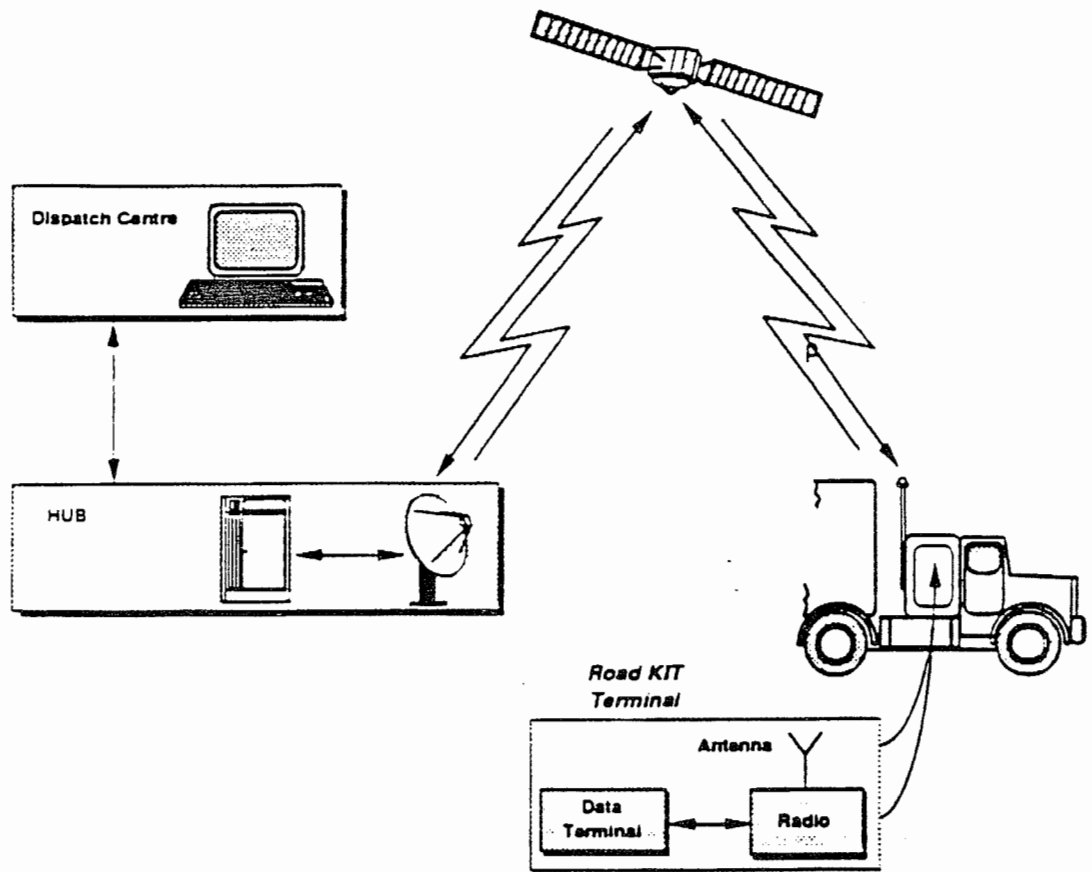


Figure 1: System configuration

Description:

A) HARDWARE:

1) Mobile Earth Terminal (MET):

The MET operates in half-duplex mode. It provides position reports at a pre-selected intervals of 15 minutes by the dispatcher. This interval can be modified at any time to increase or decrease the frequency of reports. The MET-200 consists of the following hardware:

- i) Compact keyboard/display unit: it enables the operator to read incoming messages and type any outgoing messages under any lighting condition. It has a full keyboard with a numeric keypad, cursor control keys and four special function keys, a 40 character by four line liquid crystal display, two LEDs and an annunciator.
- ii) Modular transceiver: consists of up/down converter, baseband processor (BBP), LORAN-C/GPS receiver, power amplifier (PA) and power supply. The function of each unit is as follows:

Converter: Provides reference frequency generation, frequency synthesis, down-conversion from L-band to baseband, up-conversion of data input to L-band output, and separation of the received LORAN-C/GPS

signals.

BBP: Performs all digital processing, including unique-word (UW) detection, de-interleaving, demodulation, Viterbi decoding, descrambling, and the corresponding inverse operations. Also provides the satellite protocol processing and system control for the entire MET.

LORAN-C Rx: Receives and demodulates 100 KHz LORAN-C pulses, performs automatic selection of chains, measures time differences, compensates for propagation path characteristics, and computes latitude and longitude.

Power Amplifier: Class-C amplifier providing 35 W minimum output power over the full uplink band. Also provides control bias for the transmit/receive (T/R) switch in the Antenna subsystem.

Power Supply: Converts 12 V vehicle power into +5 V, +15 V, and +28 V regulated voltages for the MET.

iii) Antenna: is a rugged, lightweight unit, covered with a durable plastic cover which is dust and water resistant. It uses a single element for

both L-band communication and LORAN-C/GPS reception. The single circuit board provides the following functions:

Low noise amplifier (LNA): Provides over 30 dB of low noise gain over the full receive band.

LORAN-C preamplifier: Provides gain and buffering for 100 KHz LORAN-C signals.

T/R switch: A pin diode switch to connect the antenna element to either the PA output or the LNA input.

Bias tee: Removes +15 V dc supply from coaxial cable for use in antenna subsystem.

Duplexers: Separate and combine L-band and LORAN-C signals

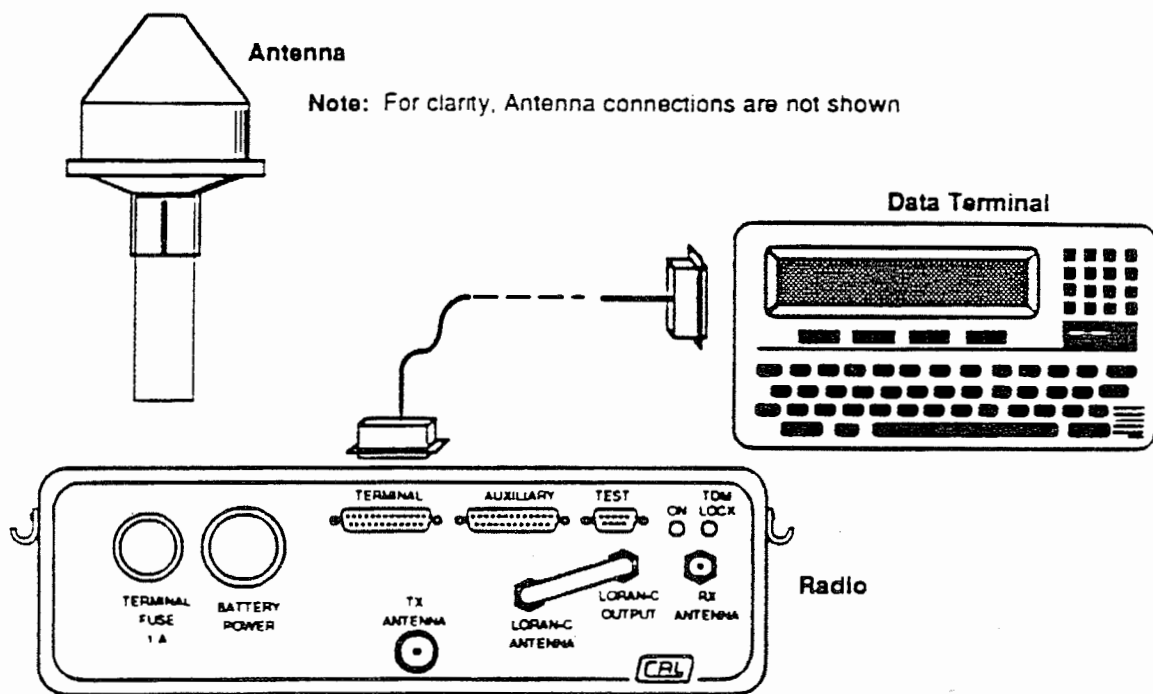


Figure #2 : Block Diagram of the MET



B) Electrical Specifications:

Transmit Frequency.....1626.5-1660.5 MHz

Receive Frequency.....1530.0-1559.0 MHz

Channel Spacing .....5 KHz

Azimuth Coverage.....Omnidirectional

Transmission Rate.....1200 sps (receive)

600/1200 sps

(transmit)

System Supply Voltage.....+10 to +15 V

C) Temperature:

Operating temperature.....-35 to +50°C

Storage temperature.....-55 to +70°C

B) Mobile Satellite Data System:

The Telesat Mobile Incorporated (TMI) Mobile Data System (MDS) will provide two-way messaging and automatic position reporting capabilities between dispatch centres and RCMP's vehicles. The vehicles are connected to the central HUB via terrestrial (dialup facilities). The system connectivity maps each dispatch centre to a fleet or subfleets of vehicles. The mobile earth terminal (MET) identifier then becomes the only routing indicator needed to address or identify the originator or addressee of a one-to-one message. There are four classes of messages which are utilized in the MDS:

a) General messages: up to 121 bytes (outbound)  
129 bytes (inbound)

b) Coded messages: a set of 32 pre-selected messages, 32 pre-formatted messages with blank fields to be filled in by the operator and broadcast messages.

Messages from dispatch centres are routed from the incoming terrestrial circuits to the on-line Network Control Processors (NCP) via the System Switch (SS). The NCP contains the dispatch records, fleet and terminal information and system configuration data. Historical records are also maintained in the NCP for billing and network management purposes. Incoming messages are processed by the NCP and forwarded to two queues

(priority and routine) to the Satellite Protocol Processors (SPP). The NCP maintains the position reporting register and assigns channels, slots and slot intervals to the MET's at log-on for position reporting messages. The two elements of the Hub are interconnected by four 9.6 kbps terrestrial routed lines, backed up by a single redundant line. The remote switch configuration is controlled by the NCP and lines and channel unit grouping are changed via a 2.4 kbps dialup orderwire. The land mobile satellite channel is characterized by a line-of-sight (LOS) component, a shadowing or blockage of the LOS components. The limited satellite EIRP (Effective Isotropically Radiated Power) available at L-Band (21.6dBW) and relatively wide bandwidth available per channel (5 KHz), in relation to the channel data band.

Protocols are an extension of Inmarsat's Standard "C" optimized for land mobile use. Both Scheduled and solicited position reports are provided. The LORAN-C 100 KHz navigational system was selected for the positioning system.

## EVALUATION

Evaluation of the MET unit:

Evaluation of the MET unit, to see if it meets RCMP operational requirements in the vehicle.

### Comments:

#### A) RoadKIT terminal & software (for Dispatch centre)

1) Antenna is supported by the aluminum pipe, secured by brackets. The top of the antenna was placed at a pre-determined height (no more than 4.12m or 13ft 6in.) above the road. The spiral antenna has been designed very well; however, I found that the antenna is too big for mounting on the vehicle with the emergency lights (Dome-lights) on the roof of the car.

The power (in safety range) of 35 W radiates from the Class -C amplifier via the antenna providing the uplink communication to the satellite.

2) The data terminal is easy to operate. The terminal user's manual (see appendix) provides step-by-step information on how to use the RoadKIT terminal.

3) The radio unit does withstand the roughness of the mobile environment.

4) Dispatch centre (Toshiba-T1000 laptop) with Procomm (communication software) is easy to use. DOC also made available the MNet PC-Access + Graphics for trial, it is an excellent messaging and position reporting software

package.

B) Messaging and AVL position reports:

The messaging report was very reliable; however, it was slow due to the volume of messages that are handled at the HUB. I also experienced occasional down-time problems from the HUB at TMI.

The position report was quite accurate. It was reliable most of time. The position report was accurate on the vehicle location: (LORAN-C) test around 95% of the time, (GPS) test around 97% of the time.

## FINANCIAL CONSIDERATIONS

General costing to operate the MET RoadKIT:(based on the RoadKIT sample prices given by Mr. Terry Brukewich, Manager of Government Sales, TMI Inc, Quebec, Canada on August 31th, 92)

### 1) Service:

- \$89 per month per mobile includes:

Six messages/vehicle/day pooled on a fleet basis (message allocations not used by certain vehicles are available for use by other vehicles in the fleet). Messages can be coded, fill-in-the-blank-form, or text messages up to 129 characters.

- 24 position reports/vehicle/day

- 24 coded routine messages/vehicle ( 1 per scheduled position report)

Network Access : \$5/vehicle/month

Additional Messaging: \$0.25/position report

\$0.25/message

### 2) Dispatch Centre

The Dispatch Centre charge ranges from \$490 to \$790/month depending on fleet size, and includes all necessary hardware and software. Where the customer is prepared to supply the hardware, a new lower cost option for software-only is expected to be available within the next few months. Certain other charges apply for options such as multi-dispatcher systems etc.

### 3) Mobile Equipment

Purchase price for a Loran-C type mobile unit is \$7,000.

A rental of \$160/month can be arranged with a twelve month minimum term.

Licence fee: \$5/month (collected by TMI on behalf of DoC)

Message customizing: first set free; additional sets \$50/vehicle.

## ADMINISTRATIVE CONSIDERATIONS

The organization structure of sponsoring agencies: The RCMP Technology Assessment section focuses on long range new and evolving technologies and standards in the Informatics area. The RCMP has supported MSAT since its inception and will integrate MSAT services where economically and operationally viable in the future.

This project provides RCMP Technology assessment and engineering staff with mobile satellite experience necessary to aid in identifying potential applications for the given service.



## CONCLUSIONS

The field trial was initially considered for selected sites across Canada; due to budget constraints and limited number of available manpower, National Capital Region was dedicated to be the field trial sites. The field trial objectives were met. The RoadKIT services were generally impressive. The AVL (Position feature of RoadKIT) was sufficient for RCMP operation in rural and remote areas. Loran-C and GPS navigation technologies were widely available and easy to operate. Line-of-sight is still a problem for satellite communication in urban areas.

## ACKNOWLEDGEMENT

The DoC has provided the RCMP with equipments and services at no cost. I would like to express my appreciation to Mr. Terry Mayhew (DoC) and Mr. Michel Ouellet (DoC) and their staff for being great help during the trial.

Appendix A

Road KIT® Mobile Terminal

User's Manual

Gandalf Technologies Inc.

Revision 1A3  
Preliminary Draft



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## Chapter 1 BEFORE YOU BEGIN ...

### Section 1 AN INTRODUCTION TO Road KIT

Road KIT is a fleet management and communications system that allows you to keep in touch with your dispatch centre. The Mobile Terminal, or "terminal" for short, installed in the cab of your vehicle is part of Road KIT. You use the terminal to communicate with your dispatch centre, regardless of where you are in the country.

Road KIT is made up of five major groups of equipment as illustrated in Figure 1. These groups are:

- 1) the dispatch centre - the office that arranges when and where you are to pick-up and deliver your cargo,
- 2) the data processing centre - a central location providing connections between the dispatch centre and a satellite,
- 3) the satellite dish - a device located at the data processing centre that receives and transmits information to and from the satellite,
- 4) the satellite - a space craft that orbits the earth which transmits information between the processing centre and your vehicle, and
- 5) the Mobile Equipment - the equipment installed in your vehicle which allows you to communicate with the dispatch centre. The Mobile Equipment consists of the terminal, a satellite radio (radio), and an omnidirectional antenna (antenna).

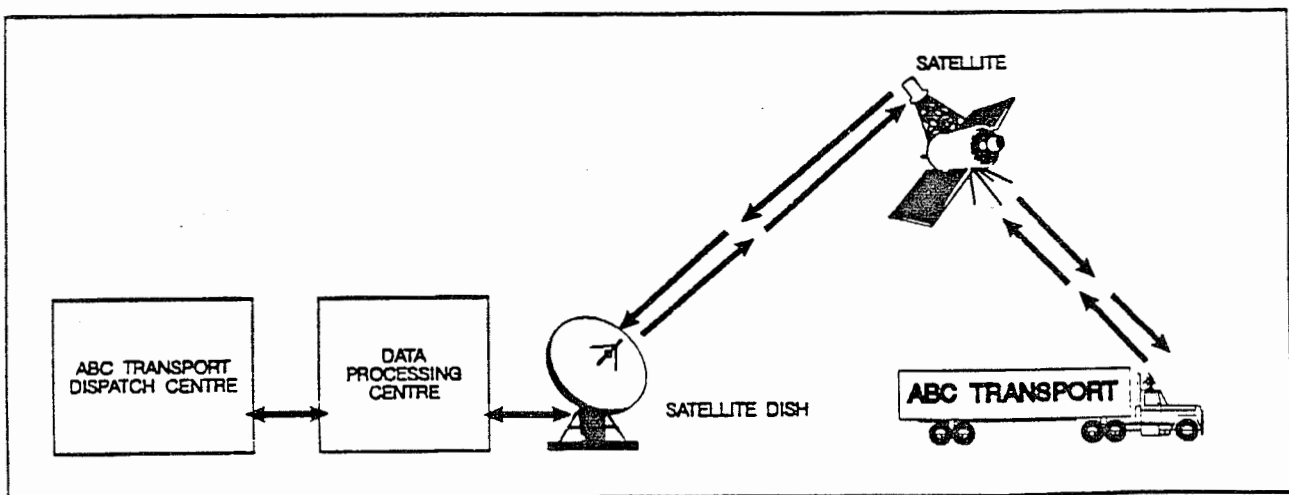


Figure 1 Road KIT





## 2.1 The Display Panel

The display panel is located on the front of the terminal in the top left corner (a, Figure 2). The display panel is divided into four separate lines. Each line is divided into 40 individual blocks. Each of the blocks can display one character.

The display is illuminated by a background light (backlight) so that the display characters are visible in low lighting conditions. The backlight is turned on each time a key is pressed, and automatically turns off if no other key is pressed within 30 seconds.

### 2.1.1 The Display Cursor

The cursor is a character used to point to specific locations on the display panel. The cursor occupies one character block on the display. It appears as either a pointer ( > ), an underscore ( \_ ), or a block ( █ ), depending on the information currently displayed. The cursor is moved pressing the keyboard arrow keys.

### 2.1.2 Adjusting the Display Contrast

The terminal allows you to adjust the intensity of the characters on the display for your personal viewing preference. This adjustment is called the contrast adjustment. Adjusting the contrast will make the display characters appear lighter or darker.

This adjustment can only be made when the terminal is powered up and the terminal model number is shown on the display (refer to Chapter 2, Section 3 ). To adjust the display contrast, press the ↑ and ↓ keys until you are comfortable with the intensity of the characters on the display.

*Note: In very cold weather conditions the terminal display will operate slowly and may have poor contrast. Time should be allowed for the display to warm up before using the terminal.*

## 2.2 The Terminal Indicator Lights and Beeper

The terminal is equipped with two indicator lights. One light indicates the quality of the link between your terminal and the satellite, while the other lets you know when the terminal has received a message from the dispatch centre.

The green LINK light (b, Figure 2) should be on at all times the terminal is on. When the light is on, there is a good connection between the terminal and the satellite. If this light is off, you may not be able to receive or send messages to the dispatch centre. If the LINK light is off, you should move your vehicle until the LINK light comes on.

The yellow MSG light (c, Figure 2) is normally off, but will turn on each time the terminal receives a message from the dispatch centre. The terminal will store these messages until you read them. The MSG light will remain on until you read all the stored messages.

The beeper (d, Figure 2) works in association with the MSG light. The beeper will sound a short beep each time the terminal receives a new message from the dispatch centre. Two longer beeps will sound in succession if the number of unread messages stored in the terminal is nearing the maximum that can be held by the terminal.

### 2.3 The Terminal Keyboard

The terminal keyboard is located on the bottom half of the terminal (e, Figure 2). The keyboard allows you to enter information into the terminal. The keyboard consists of 64 keys as illustrated in Figure 3.

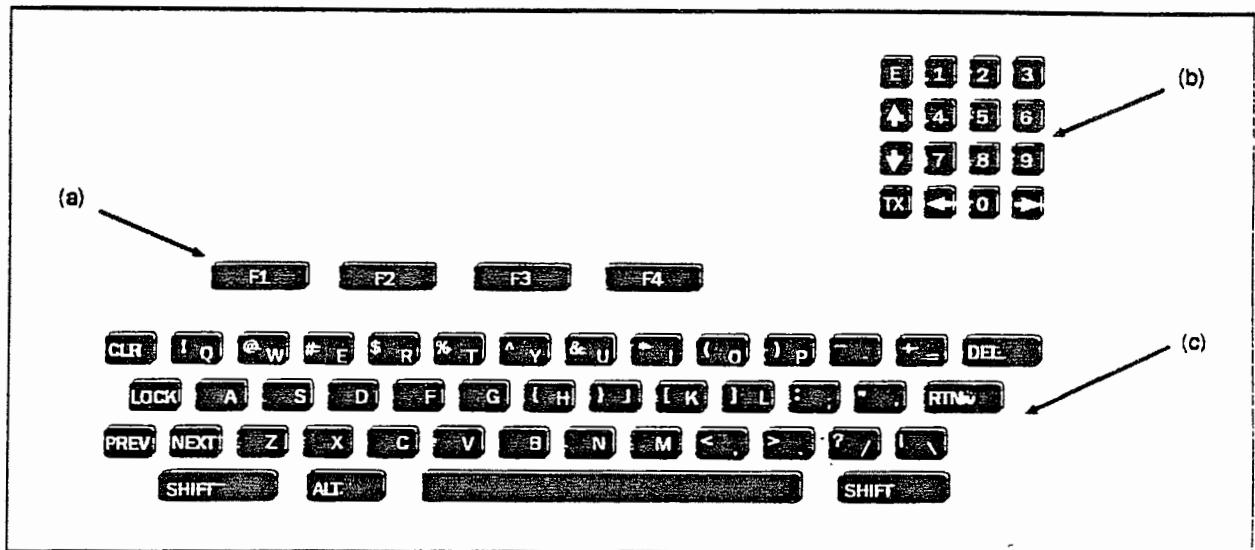


Figure 3 The Keyboard Layout

Each of the keys is backlit so that the characters on the keys are visible in low lighting conditions. The backlight is normally off, but will automatically come on when a key is pressed and will automatically turn off if no other key is pressed within 30 seconds.

The keyboard consists of three major groups of keys as follows:

- 1) the special operation keys (a, Figure 3) - selects special features of the terminal depending on the information currently displayed,
- 2) the numeric keys (b, Figure) - enters the corresponding number on the display, and
- 3) the data entry keys (c, Figure 3) - used like a standard typewriter keyboard; when a key is pressed the character is echoed or "entered" in one of the character blocks on the display.

The following table identifies and defines the keys in each of the three groups.

<u>KEYBOARD GROUP</u>	<u>KEYS</u>	<u>FUNCTION OF KEY WHEN PRESSED</u>
Data Entry Keys	Alphabetic A-Z	Enters the corresponding lower case (small) letter on the display.
	SHIFT	When pressed and held with an alphabetic key, will enter the corresponding letter as an upper case (capital) on the display.
	Punctuation and Symbol keys including: - _ + = ; : ' " , < . > / ? \   ! @ # \$ % ^ & * { } [ ]	Enters the corresponding punctuation mark or symbol on the display.  Note: Characters on the upper half of a key (e.g. the ! character on the Q key) require that the ALT key be pressed at the same time to enter the character on the display.
	ALT	Allows characters on the upper half of a key to be entered on the display.
	Space bar	Enters a space between letters or words on the display.
	LOCK	Allows all alphabetic keys to be entered as capital letters on the display.
	RTN	Returns the cursor to the first character space in the next line of the display.
	DEL	Moves the cursor to the previous character position deleting the character that was there.
Numeric Keys	1, 2, 3, 4, 5, 6, 7, 8, 9, 0	Used to enter the corresponding number on the display or to make a selection from a numbered list.

Table 1. The Terminal Keyboard Keys

<u>KEYBOARD GROUP</u>	<u>KEYS</u>	<u>FUNCTION OF KEY WHEN PRESSED</u>
Special Function Keys	PREV	Moves the cursor to the first character of the previous line on the display.
	NEXT	Moves the cursor to the first character of the next line on the display.
	CLR	Cancels operations currently in progress and returns terminal to Main Menu.
	F1, F2, F3, F4	Function keys that perform special tasks. The task performed by the key corresponds to the information presented on the last line of the display.
	TX	Starts the transmission of a message from your vehicle to the dispatch centre.
	E	When followed by the TX key, the terminal sends a special message to the dispatch centre indicating an emergency situation.
	→ ← ↑ ↓	Moves the display cursor one character in the direction indicated by the key. Up and down arrows also control the display contrast.

Table 1. The Terminal Keyboard Keys (Cont'd)

## Chapter 2 USING THE TERMINAL

### Section 1 ACTIVATING THE TERMINAL

The terminal is automatically activated when you turn on the vehicle ignition. At that time, the terminal immediately performs a series of four self-tests to ensure that it is working properly. The following display is presented when the self-tests begin.

```
-----  
| Self test in progress |  
|-----|  
|--F1--] [--F2--] [--F3--] [--F4--]
```

As each self-test is successfully completed, the terminal sounds a short beep and a dot ( . ) appears on the display after the self-test message. Once all four self-tests are successfully completed, you should have heard four beeps, and there should be four dots after the self-test message as illustrated below.

```
-----  
| Self test in progress .... |  
|-----|  
|--F1--] [--F2--] [--F3--] [--F4--]
```

If a failure is detected during the self-tests, the terminal will discontinue all operations. The number of successfully completed self-tests is indicated by the number of dots after the self-test message. The terminal will not allow any further use until the failure has been resolved.

*Note: If there is a self-test failure, note the number of dots after the self-test message and contact the dispatch centre immediately for assistance.*

If there are no failures during the self-test, the terminal will present a display similar to that illustrated below.

```
-----  
| GANDALF MDT 4001 |  
| [READ-MSG] [SND-CODE] [SND-TEXT] |  
|-----|  
|--F1--] [--F2--] [--F3--] [--F4--]
```

This display is called the Main Menu. The Main Menu is distinguished by the "GANDALF MDT 4001" message displayed on the first line. This message identifies the model number of your terminal.

The green LINK light should be on when the Main Menu is displayed. If the LINK light is not on, you must move the vehicle to another area before attempting to send messages to the dispatch centre.

The terminal remains activated and available for use as long as the vehicle ignition is on and the LINK light is on.

When the vehicle ignition is turned off, the terminal does not power down completely. The terminal can still receive messages from the dispatch centre for 30 minutes after the ignition is turned off. You can read messages during this 30 minute time frame, but you cannot send messages to the dispatch centre. If messages received during this 30 minute time period are not read, they will be automatically discarded and cannot be recovered.

After 30 minutes the terminal continues to draw a small amount of current from the vehicle's battery. This only provides enough power for the terminal to keep messages that you may have previously stored. All other functions of the terminal are disabled until the vehicles ignition is turned on again.

## Section 2 UNDERSTANDING THE TERMINAL MENUS

The terminal is an interactive device. That is to say, you respond to actions initiated by the terminal, and the terminal responds to actions initiated by you.

The terminal can only complete a task if you provide the required information. The terminal gathers this information by presenting a series of display screens. These display screens are called menus. Each menu provides a list of options related to the task you are performing. The options are always presented on the bottom line of the display, and are contained in square [ ] brackets. You select an option by pressing the function keys (F1 to F4) located directly below the desired option. Each time you select an option the terminal presents another menu. This interactive process continues until the terminal gathers all the information required to perform a task.

Figure 4 illustrates the terminal menu structure, or "tree". The branches of this tree represent the tasks that you can perform on the terminal. All tasks start at the Main Menu. To begin a task, you choose one of the options from the Main Menu. The operation of the terminal follows the branch associated with that option. The terminal continues along the branch until the task is complete, or you decide that you don't want to proceed any further.

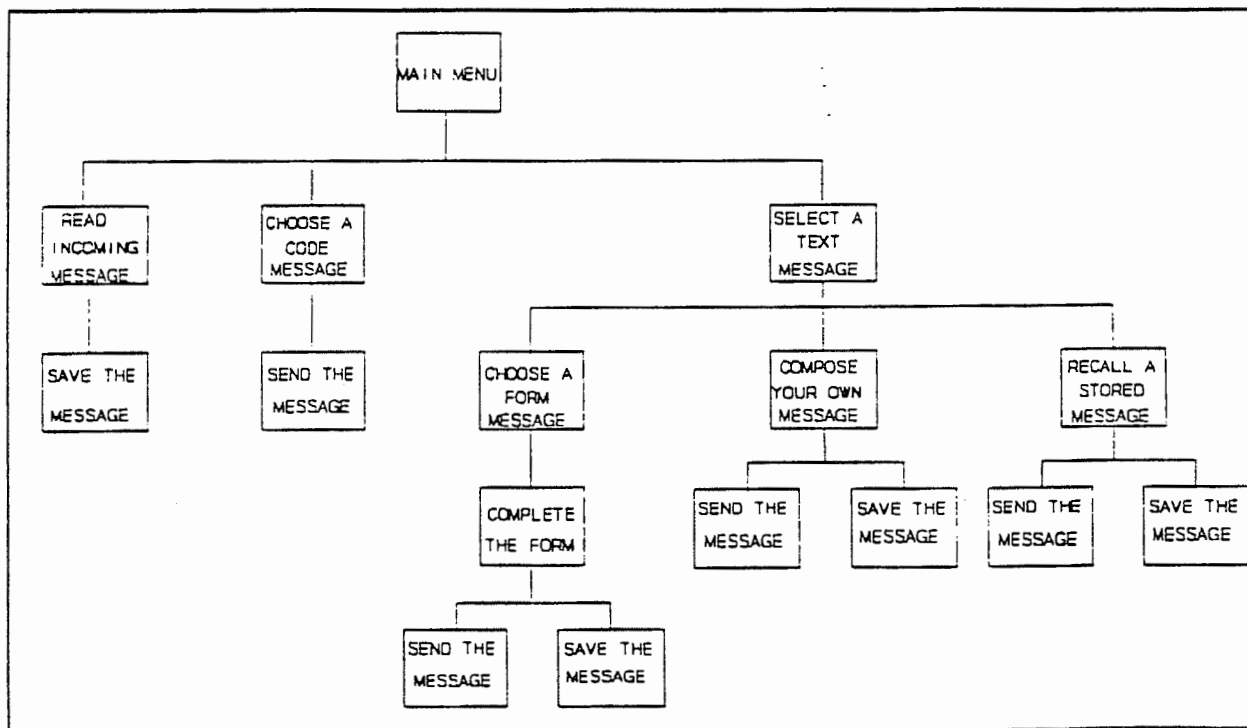


Figure 4 The Terminal Menu Tree

Each branch of the terminal menu tree shown in Figure 4 is described in detail in the sections that follow.





## Chapter 3 RECEIVING MESSAGES FROM THE DISPATCH CENTRE

### Section 1 TYPES OF MESSAGES YOU CAN RECEIVE

When the terminal receives a message from the dispatch centre the beeper will sound briefly and the yellow MSG light will come on.

There are three types of messages that the terminal can receive from the dispatch centre. These messages are identified and explained below.

- Code - Code messages describe routine situations. The content and meaning of these messages are defined by the dispatch centre and do not change. The dispatch centre uses a Code message when it wants to send routine information.
- Form - Form messages are "fill in the blanks" messages with headings and blank areas. These messages provide a standard format for information exchanged between you and the dispatch centre. These messages are also defined by the dispatch centre and do not change.
- Compose - Compose messages are used when a Code or Form message can't convey the required information. The sender composes the entire message. There is no standard format to these messages.

#### 1.1 Queuing Incoming Messages

If you don't read an incoming message when the MSG light goes on and the beeper sounds, the radio will place the message in a list of messages waiting to be read. This waiting list is called a "queue".

The radio can only queue a limited number of unread messages. When the number of queued messages reaches this maximum, the terminal will sound two long beeps and display the message illustrated below.

```
-----  
Received messages waiting  
Read immediately or messages may be lost  
[EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

**WARNING:** *If you don't read the messages waiting in the unread message queue when this message is displayed, the queued messages may be overwritten by new messages.*

Stop your vehicle and read the queued messages by pressing the F4 key below the [EXIT] option, and continue with the following section.

Section 2 READING AN INCOMING MESSAGE

**CAUTION : STOP YOUR VEHICLE BEFORE USING THE TERMINAL!**

Reading an incoming message begins at the Main Menu. If you don't know how to display the Main Menu, refer to "Displaying the Main Menu" in Chapter 2.

When you are alerted to an incoming message from the dispatch centre, press the F1 key below the [READ-MSG] option in the Main Menu as illustrated below.

```
-----  
GANDALF MDT 4001  
[READ-MSG] [SND-CODE] [SND-TEXT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

The terminal responds by displaying the message illustrated below.

```
-----  
Reading message...  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

When the terminal finishes reading the incoming message, the message is displayed on the Read Menu as illustrated below.

```
-----  
Text of first incoming message from  
the dispatch centre. There may be up to  
121 characters in this message.  
[SAVE] [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

*Note: The [SAVE] option is not displayed if the incoming message is a Code message.*

When the incoming message is displayed, the cursor appears as an underscore ( \_ ) on the first character of the message.

The terminal can only display the first three lines of the message. If there are more than three lines in the message, press the ↓ and ↑ keys to move the cursor so that you can read the remaining lines.

Once you have read the message, the options on the bottom line of the display allow you to discard or save the message. The following sections describe how to use these options.

## 2.1 Discarding an Incoming Message

If you decide that you don't want to save a message once you have read it, press the F4 key under the [CANCEL] option in the Read Menu. The terminal responds with a message as illustrated below.

```
-----  
Clear message display?  
[CONFIRM]                                [CANCEL]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

If you press the F1 key under the [CONFIRM] option or you press the CLR key, the message you were reading will be discarded and the terminal will return to the Main Menu. If you press the F4 key under the [CANCEL] option, the terminal will re-display the message you were reading.

## 2.2 Saving an Incoming Message

You can store a message from the dispatch centre in the terminal's memory for later use. The terminal has room to store a maximum of nine different messages.

If you want to save an incoming message, press the F1 key under the [SAVE] option in the Read Menu when the text of the message is on the display as illustrated below.

```
-----  
Text of first incoming message from  
The dispatch centre. There may be up to  
121 characters in this message.  
[SAVE]                                [CANCEL]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

*Note: The [SAVE] option is not displayed if the incoming message is a Code message.*

When you press the F1 key below the [SAVE] option, the terminal will display the Stored Message Menu. This menu is used to store messages that you may want to use at a later time.

For detailed instructions on how to use the Stored Message Menu, refer to Chapter 5 of this manual.

### 2.3 No Messages to Read

If you select the [READ-MSG] option from the Main Menu when there are no incoming messages to read, the terminal will display a message as illustrated below.

```
-----  
No messages available to read  
  
[EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If this should occur, press the F4 key below the [EXIT] option and the terminal will display the Main Menu.

## Chapter 4 SENDING MESSAGES TO THE DISPATCH CENTRE

### Section 1 TYPES OF MESSAGES YOU CAN SEND

**CAUTION : STOP YOUR VEHICLE BEFORE USING THE TERMINAL!**

There are four types of messages that you can send to the dispatch centre. These message types are identified and explained below.

- Code** Code messages describe routine situations. The information contained in a Code message is defined by the dispatch centre and cannot be changed. Code messages are permanently stored in the terminal.
- Form** Form messages are "fill in the blanks" type of messages with pre-written headings, and blank areas for standard information such as vehicle and load information. Form message headings are defined by the dispatch centre and are permanently stored in the terminal.
- Compose** Compose messages are created by you. Compose messages are used when neither Code nor Form messages convey the information that you want. There is no standard format for Compose messages. You can enter whatever information you like and send it to the dispatch centre.
- Emergency** Emergency messages are used to indicate that you are in a crisis situation. You can send an Emergency message to the dispatch centre at any time.

Each of these messages has advantages and disadvantages. Code messages are the most cost effective messages to transmit over the satellite because they require the least amount of time to transmit. However, Code messages are inflexible. There are only a limited number of Code messages, and they cannot be modified.

Form messages save time when entering repetitive information such as vehicle and load information. Form messages help standardize the information supplied by vehicle operators. Form messages only provide enough room to enter a limited amount of information.

Compose messages provide total flexibility. You can enter whatever information you want in this type of message. However, Compose messages require large amounts of costly satellite time.

Emergency messages should only be used in crisis situations when absolutely necessary.

*Note: Check with your company's dispatch manager to see if there are any restrictions on the use of a particular message type.*

## Section 2 SENDING A CODE MESSAGE

Code messages allow you to quickly select and send pre-written information to your dispatch centre. Code messages are defined by your company to represent the most common situations encountered by vehicle operators.

*Note: It is highly recommended that you familiarize yourself with the Code messages prior to using them.*

Sending a Code message to the dispatch centre begins at the Main Menu. If you don't know how to display the Main Menu, refer to the "Displaying the Main Menu" section in Chapter 2.

To display a list of Code messages, press the F2 key below the [SND-CODE] option in the Main Menu as illustrated below.

```
-----  
GANDALF MDT 4001  
-----  
{READ-MSG} {SND-CODE} {SND-TEXT}  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

The terminal responds by displaying the Code Message Selection Menu as illustrated below.

```
-----  
01>Title of Code Message #1  
02 Title of Code Message #2  
03 Title of Code Message #3  
[CHOOSE] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

When the Code Message Selection Menu is on the display, the cursor appears as a pointer ( > ) beside the first Code message.

### 2.1 Choosing a Code Message

Each Code message is identified by a number and a title. The title is a close representation of what the message is used for. The terminal can only display three Code message titles at one time. To view the remaining Code message titles, press the ↓ or ↑ keys. These keys move the cursor up and down the list of Code messages. When the last Code message is shown, the terminal will re-display the first Code message again as illustrated below.

```
-----  
31 Title of Code Message #31  
32>Title of Code Message #32  
01 Title of Code Message #01  
[CHOOSE] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

You can also use the numeric keys to move the cursor to the desired Code message. This method will cause the cursor to jump directly to the corresponding code number.

When you press the first numeric key, that number is echoed on the display above the F2 function key. You must enter 0 as the first digit for Code message numbers that are less than 10 (ie. 01 through 09). When you press the second numeric key, the terminal displays three new Code message numbers and titles; the Code message corresponding to the number you entered, and the two Code messages following the number that you entered.

For example, if you press the 0 key followed by the 9 key, the terminal displays Code messages 09, 10, and 11 as illustrated below.

```
-----  
09>Title of Code Message #09  
10 Title of Code Message #10  
11 Title of Code Message #11  
[CHOOSE] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If you press two numeric keys that form a number greater than the number of Code messages stored in the terminal, the cursor will jump to the last Code message.

## 2.2 Reading a Code Message

Once you have moved the cursor to the desired Code message, you can read the text of that message. Press the F1 key below the [CHOOSE] option in the Select Code Message Menu and the terminal will display the Read Code Message Menu as illustrated below.

```
-----  
Code message title  
Text of selected code message. Up to  
80 characters may be displayed.  
<ROUTINE> [PRIORITY] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

When the text of the Code message is on the display, the cursor appears as an underscore ( \_ ) on the first character of the Code message.

If there are more than 3 lines in the Code message, the ↓ or ↑ keys can be used to move the cursor so that the remaining lines can be displayed.

## 2.3 Selecting the Class of a Code Message

The sequence in which the dispatch centre reads Code messages is determined by a class which you assign before sending the message to the dispatch centre. The class tells the dispatch centre which messages are more important than others. Code messages with a higher class are read before Code messages with a lower class.

The text of the Code message must be on the display before you can assign one of the following classes:

- 1) Routine - the message is placed at the end of a list of Code messages waiting to be read by the dispatch centre,
- 2) Priority - the message is placed at the top of a list of Code messages to be read by the dispatch centre, or
- 3) Emergency - the message is placed ahead of all routine or priority Code messages in the list of messages waiting to be read by the dispatch centre.

When you display a Code message, angle < > brackets surround the ROUTINE option above the F2 key as illustrated below. This indicates that the message will be sent to the dispatch centre with the routine class. The terminal automatically assigns the routine class when the text of the Code message is first displayed.

```
-----  
Code message title  
Text of selected code message. Up to  
80 characters may be displayed.  
  <ROUTINE> [PRIORITY] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If you want to change the class to priority, press the F3 key below the [PRIORITY] option. The square [ ] brackets around the [PRIORITY] option change to angle < > brackets, and the angle < > brackets around the ROUTINE option change to square [ ] brackets as illustrated below.

```
-----  
Code message title  
Text of selected code message. Up to  
80 characters may be displayed.  
  [ROUTINE] <PRIORITY> [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If you want to assign the emergency class to a Code message, press the red E key located to the right of the display beside the numeric keys. Emergency Code messages are given special attention at the dispatch centre and will be read before any other messages, including priority or routine messages.

*Note: The terminal does not provide any visual indication that the Code message has been assigned the emergency class.*





### Section 3 SENDING A FORM MESSAGE

Form messages provide you with a pattern for entering information. The Form message pattern is defined by the dispatch centre to represent the most common situations encountered by vehicle operators. The Form message pattern includes headings to identify what type of information is required, and blank areas where you enter the information. The blank areas are called "fields". Each field in a Form message provides enough room to enter the information required by the heading.

*Note: It is highly recommended that you familiarize yourself with the Form messages prior to using them.*

Sending a Form message to the dispatch centre begins at the Main Menu. If you don't know how to display the Main Menu, refer to the "Displaying the Main Menu" section in Chapter 2.

To display a list of Form messages, press the F3 key below the [SND-TEXT] option in the Main Menu as illustrated below.

```
-----  
GANDALF MDT 4001  
-----  
[READ-MSG] [SND-CODE] [SND-TEXT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

The terminal responds by displaying the Message Selection Menu as illustrated below.

```
-----  
Select option:  
-----  
[FORMS] [CREATE] [RECALL] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

The Message Selection Menu provides four options on the bottom line of the display. To select Form messages, press the F1 key below the [FORMS] option. The terminal will respond by displaying the Form Message Selection Menu as illustrated below.

```
-----  
01>Title of Form Message #1  
02 Title of Form Message #2  
03 Title of Form Message #3  
[CHOOSE] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

### 3.1 Choosing a Form Message

Each Form message is identified by a number and a title. The title is a close representation of what the message is used for. The terminal can only display the first three Form message titles at one time. To view the remaining Form message titles, press the ↓ or ↑ keys. These keys move the cursor up and down the list of Form messages. When the last Form message is shown, the display wraps around and re-displays the first Form message again as illustrated below.

```
-----  
31 Title of Form Message #31  
32 Title of Form Message #32  
01>Title of Form Message #01  
[CHOOSE] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

You can also use the numeric keys to move the cursor to the desired Form Message. This method will cause the cursor to jump directly to the corresponding code number.

When you press the first numeric key, that number is echoed on the display above the F2 function key. You must enter 0 as the first digit for message numbers that are less than 10 (ie. 01 through 09). When you press the second numeric key, the terminal displays three new Form message numbers and titles; the Form message corresponding to the number you entered, and the two Form messages following the number that you entered.

For example, if you press the 0 key followed by the 9 key, the terminal displays Form messages 09, 10, and 11 as illustrated below.

```
-----  
09>Title of Form Message #09  
10 Title of Form Message #10  
11 Title of Form Message #11  
[CHOOSE] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If you press two numeric keys that equal a number greater than the number of Form messages stored in the terminal, the cursor will jump to the last Form message.

### 3.2 Reading a Form Message

Once you have moved the cursor to the desired Form message you can display the text of the message. Press the F1 key below the [CHOOSE] option in the Form Message Selection Menu. The terminal will display the Read Form Menu as illustrated below.

```
-----  
Form message title  
HEADING: [data input field # 1 ]  
HEADING: [data input field # 2 ]  
[SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

This display allows you to enter information in the fields of the Form message. This display also allows you to send the message, or return to the previous display.

### 3.3 Entering Information In a Form Message

Information is entered in the fields of a Form message by pressing the data entry keys on the terminal keyboard. If you make a mistake when entering information on a Form message, the information can be modified before it is sent to the dispatch centre.

When the terminal is displaying a Form message, the cursor is shown as a block (█). The block cursor indicates that you are allowed to enter and modify information on this display.

Before entering information in the Form message, use the ↑ ↓ → ← keys to position the cursor at the location where you want to begin. The cursor can be moved from one field to another field using either the arrow keys or the PREV and NEXT keys.

The PREV key will move the cursor from its present location to the first character of the previous field. If the cursor is in the first field when the PREV key is pressed, the cursor will jump to the first character of the last field in the form. The NEXT key will move the cursor from its present location to the first character of the next field. If the cursor is in the last field when the NEXT keys is pressed, the cursor will jump to the first character in the first field of the form.

Once the cursor is positioned, you can start entering information by pressing the appropriate data entry keys. The character is entered on the display as you press the key. The number of characters you can enter in a field is limited by the number of spaces between the square [ ] brackets. If the cursor is on the last space of a field and you try to enter more characters or you try to move the cursor with the → key, the terminal will beep to warn you that no more information can be entered in this field.

When you finish entering information in a field, press the NEXT or RTN key. This will automatically move the cursor to the beginning of the next field. Continue entering information until all fields on the form are filled in. You can use any data entry key listed in the "Terminal Keyboard Keys" table in Chapter 1.

To delete unwanted text, position the cursor one space to the right of the character you want to delete and press the DEL key. The cursor will start moving to the left, removing one character at a time. Continue pressing the DEL key until all unwanted text is removed.

To add new text, position the cursor on the character where the text is to be added. Start entering the new text using the data entry keys. The new text will overwrite the old text as you press the keys.

### 3.4 Selecting the Class of a Form Message

The sequence in which the dispatch centre reads Form messages is determined by a class which you assign before sending the message to the dispatch centre. The class tells the dispatch centre which messages are more important than others. Form messages with a higher class are read before Form messages with a lower class.

The text of the Form message must be on the display before you can assign one of the following classes:

- 1) Routine - the message is placed at the end of a list of Form messages waiting to be read by the dispatch centre, or
- 2) Priority - the message is placed at the top of a list of Form messages to be read by the dispatch centre.

When you display a Form message, angle < > brackets surround the ROUTINE option above the F2 key as illustrated below. This indicates that the message will be sent to the dispatch centre with the routine class. The terminal automatically assigns the routine class to a Form message when the text of the message is first displayed.

```
-----  
| Form message title  
| TITLE: [text of first field ]  
| TITLE: [text of second field]  
| [SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
|-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If you want to change the class to priority, press the F3 key below the [PRIORITY] option. The square [ ] brackets around the [PRIORITY] option change to angle < > brackets, and the angle < > brackets around the ROUTINE option change to square [ ] brackets as illustrated below.

```
-----  
Form message title  
TITLE: [text of first field ]  
TITLE: [text of second field]  
[SAVE] [ROUTINE] <PRIORITY> [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

### 3.5 Sending the Form Message

*Note: Before attempting to send any messages to the dispatch centre, ensure that the green LINK light is on.*

Now that you have selected a Form message, filled in the fields, and assigned the class, you are ready to send the message to the dispatch centre. When the text of the Form message is on the display, press the green TX key located to the right of the display.

*Note: Once the TX key is pressed, transmission of a Form message cannot be stopped.*

When the TX key is pressed, the message is first sent to the radio. The radio then sends the message to the antenna which transmits the message to the satellite. The terminal will confirm that the message is being sent to the radio by displaying the message illustrated below.

```
-----  
Sending message...  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

When the radio receives the message, the terminal will display the following message.

```
-----  
Message sent successfully  
-----  
[EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

*Note: Depending on the length of the message and how busy Road KIT is, a Form messages can take up to 10 minutes to arrive at the dispatch centre.*

Once the message has been sent to the radio you can continue with other tasks. Press the F4 key below the [EXIT] option to re-display the Select Form Message Menu.

### 3.6 Saving a Form Message

There may be occasions when you want to save a completed Form message for future use. This may be the case if your first attempt to sent the message to the dispatch centre was unsuccessful and you have to wait and send the message later.

Rather than re-entering all the same information, you can save the completed message in the memory of the terminal, and proceed with other tasks. Later, you can re-call the message, change it if you like, and send it without re-entering any information.

If you want to save the Form message, press the F1 key under the [SAVE] option while the text of the message is on the display as illustrated below.

```
-----  
Form message title  
TITLE: [text of first field ]  
TITLE: [text of second field]  
[SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

When you press the F1 key below the [SAVE] option, the terminal will display the Stored Message Menu. This menu is used to store messages that you may want to use at a later time.

For detailed instructions on how to use the Stored Message Menu, refer to Chapter 5 of this manual.

### 3.7 Ending a Form Message Session

There are two places in the Form message session that the session can be ended; in the Select Form Menu, or in the Read Form Menu.

If you would like to end the session while in the Select Form Menu, press the F4 key below the [EXIT] option. The terminal will display the Message Selection Menu as illustrated below.

```
-----  
Select option:  
[FORMS]   [CREATE]  [RECALL]  [EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

If you would like to end the session while in the Read Form Menu is on the display, press the F4 key below the [CANCEL] option. The terminal will display the message illustrated below.

```
-----  
Clear message display?  
[CONFIRM]                                [CANCEL]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

If you press the F4 key below the [CANCEL] option, the terminal will return the information was previously on the display.

If you press the F1 key below the [CONFIRM] option, the terminal will display the Select Form Message Menu as illustrated below.

```
-----  
01>Title of Form Message #1  
02 Title of Form Message #2  
03 Title of Form Message #3  
[CHOOSE]                                [EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

You can proceed with other tasks.



## Section 4 COMPOSING YOUR OWN MESSAGE

In situations where neither Code nor Form messages are suitable for the information you want to send to the dispatch centre, you can compose your own message.

Messages that you compose can contain whatever information you like. The only limitation to the information is the size of the message. Compose messages can be no longer than 123 characters long, including spaces. Any of the data entry keys listed in the "Terminal Keyboard Keys" table in Chapter 1 can be used to compose your message.

Once you have composed the message, you can modify it, save it, or send it to the dispatch centre.

*Note: Composed messages require a large amount of satellite time to get to the dispatch centre. Check with your company's dispatch manager to see if there are any restrictions on the use of Compose messages.*

The process of composing a message starts at the Main Menu. If you don't know how to display the Main Menu, refer to the "Displaying the Main Menu" section in Chapter 2.

To begin composing your own message, press the F3 key below the [SND-TEXT] option in the Main Menu as illustrated below.

```
-----  
GANDALF MDT 4001  
-----  
[READ-MSG] [SND-CODE] [SND-TEXT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

The terminal responds by displaying the Message Selection Menu as illustrated below.

```
-----  
Select option:  
-----  
[FORMS]   [CREATE]  [RECALL]  [EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

The Message Selection Menu provides four options. To Compose your own message, press the F2 key below the [CREATE] option. The terminal will respond by displaying the Compose Menu as illustrated below.

```
-----  
█  
-----  
[SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

This display allows you to compose your own message.

## 4.1 Composing a Message

When the Compose Message Menu is on the display, the cursor is shown as a block (█). The block cursor indicates that you are allowed to enter and modify information on this display. The cursor is automatically positioned on the first character space of the display.

To compose a message press the appropriate data entry keys. When a key is pressed, the corresponding character is entered on the display. When the cursor reaches the end of the line, it automatically jumps to the first character position in the next line. This is called "wrapping".

If you want to end a line before reaching the last character position, press the RTN key. This will automatically move the cursor to the beginning of the next line. Continue entering information with the data entry keys until you complete your message.

The following is a sample message that you can enter on the Compose Message display. Enter the message exactly as shown, pressing the space bar and RTN where indicated by the angle < > brackets. Do not press any of the special operation keys or the sample message may be sent to the dispatch centre.

Enter the following:

```
this <space bar> isjust <space bar> a <space bar> test  
<space bar> of <space bar> a <space bar> compose <space bar>  
message <RTN>
```

The terminal should display the message as illustrated below.

```
-----  
this isjust a test of a compose message  
█  
[SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

You will notice two things about this message. First, the cursor is now on the first character of the second line. This is because the RTN key was pressed after the word "message". Second you will notice that the words "is" and "just" are tight together. This is not a problem for the terminal, but it makes the message difficult to read.

You can use the ↑ ↓ → ← keys to position the cursor at a location where you want to correct a data entry error. In this case, move the cursor to the letter j in "just" and press the space bar twice.

This causes two things to happen as illustrated below.

```
-----  
|this is  just a test of a compose messag|  
|e                                             |  
| [SAVE]  <ROUTINE> [PRIORITY] [CANCEL]  |  
|-----|  
| [--F1--]  [--F2--]  [--F3--]  [--F4--]  |  
|-----|
```

First, two spaces have been inserted between the words "is" and "just". Second, the "e" in "message" has moved to the second line. This happens because there is only room for 40 characters on each line. When the cursor reaches the end of the line, or you insert new text that makes a line greater than 40 characters long, the 41<sup>st</sup> character automatically wraps around to the next line.

To delete unwanted text in a message, move the cursor to the space after the last character you want to delete, and press the DEL key. The cursor will start moving to the left, removing one character at a time. Continue pressing the DEL key until all unwanted text is removed.

Try deleting the word "just" in the sample message. The cursor will move one space to the left each time you press the DEL key. If you press and hold the DEL key, the cursor will continue to move until you release the key. Be careful not to hold the DEL key down too long or you will delete more characters than you planned. After you release the DEL key, the message will be displayed as illustrated below.

```
-----  
|this is  a test of a compose message      |  
| [SAVE]  <ROUTINE> [PRIORITY] [CANCEL]  |  
|-----|  
| [--F1--]  [--F2--]  [--F3--]  [--F4--]  |  
|-----|
```

The SHIFT key allows you to enter the upper case (capital) of an alphabetic letter, rather than a lower case (small) letter. To enter one upper case letter, press and hold the SHIFT key while pressing the desired alphabetic key.

The terminal does not care whether the letters are capital or small letters, but you may want to use one or the other to make the message easier to read.

If you want to enter a series of capital letters, press the LOCK key once. Now, each letter you press will be in upper case. When you want to switch back to lower case press the LOCK again.

Try it on the sample message. Press the SHIFT key and the J key at the same time. Press the LOCK key once and the u s and t keys. The terminal will display the message as illustrated below.

```
-----  
|this is JUST a test of a compose message|  
|e|  
| [SAVE] <ROUTINE> [PRIORITY] [CANCEL] |  
|-----|  
| [--F1--] [--F2--] [--F3--] [--F4--] |
```

If you don't want any more upper case letters, press the LOCK once.

The ALT key allows you to enter the symbol characters on the upper half of the Q W E R T Y U I O P H J K and L alphabetic keys. When you press and hold the ALT key, and at the same time press these keys. The terminal will display the character that is on the upper half of the key.

Move the cursor to the space after the "e" on the second line and press and hold the ALT key and at the same time press the Q W E R T Y keys. The terminal will display the message as illustrated below.

```
-----  
|this is JUST a test of a compose message|  
|e!@#%$%^|  
| [SAVE] <ROUTINE> [PRIORITY] [CANCEL] |  
|-----|  
| [--F1--] [--F2--] [--F3--] [--F4--] |
```

Experiment with the keys on the keyboard by composing your own message.

If you try to enter more than 123 characters in a Compose message, the terminal will warn you that the message is too large by beeping each time a key is pressed after the 123<sup>rd</sup> character. You must delete part of the message before more information can be entered.

*Note: At this point DO NOT press the E (Emergency), or TX keys. These keys will cause a special emergency message, or the sample message to be sent to the dispatch centre. Also refrain from pressing the F1 key under the SAVE option. This key will open a different menu. The functions of these keys are explained later in the manual.*

## 4.2 Selecting the Class of a Compose Message

The sequence in which the dispatch centre reads Compose messages is determined by a class that you assign to the message. The class tells the dispatch centre which messages are more important than others. Compose messages with a higher class are read before Compose messages with a lower class.

The text of the Compose message must be on the display before you can assign one of the following classes:

- 1) Routine - the message is placed at the end of a list of Compose messages waiting to be read by the dispatch centre, or
- 2) Priority - the message is placed at the top of a list of Compose messages to be read by the dispatch centre.

When you display a Compose message, angle < > brackets surround the ROUTINE option above the F2 key as illustrated below. This indicates that the message will be sent to the dispatch centre with the routine class. The terminal automatically assigns the routine class to a Compose message when the text of the message is first displayed.

```
-----  
text of the composed message█  
[SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

If you want to change the class to priority, press the F3 key below the [PRIORITY] option. The square [ ] brackets around the [PRIORITY] option change to angle < > brackets, and the angle < > brackets around the ROUTINE option change to square [ ] brackets as illustrated below.

```
-----  
text of the composed message█  
[SAVE] [ROUTINE] <PRIORITY> [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

### 4.3 Sending the Compose Message

*Note: Before attempting to send any messages to the dispatch centre, ensure that the green LINK light is on.*

Now that you have composed your message and assigned the class you are ready to send the message to the dispatch centre. When the Compose message text is on the display, press the green TX key located to the right of the display.

*Note: Once the TX key is pressed, transmission of a Compose message cannot be stopped.*

When the TX key is pressed, the message is first sent to the radio. The radio then sends the message to the antenna which transmits the message to the satellite. The terminal will confirm that the message is being sent to the radio by displaying the message illustrated below.

```
-----  
Sending message...  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

When the radio receives the message, the terminal will display the following message.

```
-----  
Message sent successfully  
-----  
[EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

*Note: Depending on the length of the message and how busy Road KIT is, a Compose message can take up to 10 minutes to arrive at the dispatch centre.*

Once the message has been sent to the radio you can continue with other tasks. Press the F4 key below the [EXIT] option to re-display the message

#### 4.4 Saving the Compose Message

There may be occasions when you want to save the composed message for future use. This may be the case if the first attempt to send the message to the dispatch centre was unsuccessful and you have to wait and send the message later.

Rather than re-entering the same information again, you can save the message in the terminal memory and proceed with other tasks. Later, you can re-call the message, change it if you like, and send without re-entering any information.

If you want to save a Compose message, press the F1 key under the [SAVE] option when the text of the message is on the display as illustrated below.

```
-----  
text of the composed message  
-----  
[SAVE] <ROUTINE> [PRIORITY] [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]  
-----
```

When you press the F1 key below the [SAVE] option, the terminal will display the Store Message Menu. This menu is used to store messages that you may want to use later.

For detailed instructions on how to use the Store Message Menu, refer to Section Chapter 5 of this manual.

#### 4.5 Ending a Compose Message Session

If you want to end a Compose message session at any point before the message is sent to the dispatch centre, press the F4 key below the [CANCEL] option. The terminal will respond with the message illustrated below.

```
-----  
Clear message display?  
-----  
[CONFIRM] [CANCEL]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]  
-----
```

If you press the F4 key below the [CANCEL] option, the terminal will return the information that was previously on the display.

To end the Compose message session, press the F1 key below the [CONFIRM] option. The terminal will display the Select Message Menu as illustrated below.

```
-----  
Select option:  
-----  
[FORMS] [CREATE] [RECALL] [EXIT]  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]  
-----
```

You can now proceed with other tasks.

## Section 5 THE SPECIAL EMERGENCY MESSAGE

The Special Emergency messages is used to tell the dispatch centre that you are in a situation that requires immediate attention. The Special Emergency Message is assigned the highest class of any message sent to the dispatch centre, and will be read by the dispatch centre before any routine or priority Code, Form, or Compose messages.

The Special Emergency message is a prearranged message that is permanently stored in the terminal. You can send this message at any time without interrupting the task you are currently performing.

The Special Emergency Message is immediately brought to the attention of the dispatch centre operating personnel who give the message priority over any other tasks they may be performing.

*Note: The Special Emergency message is to be use only in life threatening situations.*

If your situation is not life threatening but requires prompt attention by the dispatch centre, refer to the Emergency Class Code messages described in Section 2.3 of this Chapter.

### 5.1 Sending the Special Emergency Message

If you need to send the Special Emergency message press the red E key (Emergency) located beside the top right corner of the display, and then immediately press the green TX key.

The terminal will send the Special Emergency message to the dispatch centre without disturbing the information on the display.

*Note: The terminal does not provide any visual indication that the E key has been pressed, or if the terminal sent the message.*

If you accidentally press the E key and have not yet pressed the TX key, or want to cancel the emergency before pressing the TX key, press any key other than the TX key. The emergency message will not be sent to the dispatch centre.



## Chapter 5 STORING AND RECALLING MESSAGES

### Section 1 STORING MESSAGES FOR LATER USE

The terminal allows you to save three different types of messages. These messages are; incoming messages received from the dispatch centre, completed Form messages, and Compose messages. It is entirely up to you which messages get saved and which messages get discarded, but there is a limit of nine messages in total that can be saved.

Messages can only be saved if the text of the message is on the display, and the [SAVE] option is shown on the bottom line of the display.

When you want to save a message, press the F1 key below the [SAVE] option. The terminal will display the Stored Message Menu as illustrated below.

```
-----  
| 01>1st 35 characters of stored msg # 1 |  
| 02 1st 35 characters of stored msg # 2 |  
| 03 1st 35 characters of stored msg # 3 |  
| [SAVE]                                [EXIT] |  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

#### 1.1 Selecting a Storage Location

The Stored Message Menu display is divided into nine lines called slots. Each slot occupies one line of the display. The slots are numbered from 01 to 09. The entire message is stored by the terminal, however, only the first 35 characters of the message are entered into one of the slots. These characters help you identify the message that is stored in the slot.

The terminal can only display three slots at one time. The ↓ and ↑ keys can be used to move the cursor up and down the display to view the remaining slots.

You can also press two numeric keys in sequence which will cause the cursor to jump to the corresponding slot number. When you press the first numeric key, the number is echoed on the display above the F2 function key. You must enter 0 as the first digit in the slot number (ie. 01 through 09). When you press the second numeric key, the terminal displays three new slots: the slot corresponding to the number you entered, and the two slots following the number that you entered. If you press two numeric keys that form a number larger than the number of slots, the cursor will jump to the last slot in the Stored Message Menu.

## 1.2 Saving the Message

If there are no empty slots in the Stored Message Menu, skip this section and proceed to the "Overwriting Existing Stored Message" section that follows.

To save a message, move the cursor to an empty slot in the Message Storage Menu using either the ↑ and ↓ keys or the numeric keys. When the cursor is on a blank slot, press the F1 key under the [SAVE] option. The terminal responds with the following message.

```
-----  
Save in this slot?  
[CONFIRM]                                [CANCEL]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

Press the F4 key below the [CANCEL] option if you don't want to store the message in the selected slot. The terminal will re-display the Stored Message Menu without saving the message.

Press the F1 key below the [CONFIRM] option if you want to store the message in the selected slot. The terminal will store the message in the selected slot and re-display the Stored Message Menu. The first 35 characters of the message will be displayed in the selected slot.

The message is now stored in the memory of the terminal. You can recall the stored message at any time to read it, modify it, or send it to the dispatch centre. Instructions for recalling the message are provided in Chapter 5 of this manual.

## 1.3 Overwriting Existing Stored Messages

If there are no empty slots available when you want to store a message, an existing message must be overwritten.

*Note: The message that you choose to overwrite will be discarded and cannot be recovered.*

To overwrite an existing stored message, move the cursor with the ↑ and ↓ keys, or the numeric keys, to a slot containing a message that you no longer require. Press the F1 key under the [SAVE] option in the Stored Message Menu.

The terminal responds with the following message.

```
-----  
Save in this slot?  
[CONFIRM]                                     [EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

Press the F4 key below the [EXIT] option if you don't want to store the message in the selected slot. The terminal will re-display the Stored Message Menu without saving the message.

If want to store the message in the selected slot, press the F1 key below the [CONFIRM] option. The terminal will store the message in the selected slot and re-display the Stored Message Menu. The first 35 characters of the message will be displayed in the selected slot.

The message is now stored in the memory of the terminal. You can recall the stored message at any time to read it, modify it, or send it to the dispatch centre. Instructions for recalling the message are provided in Section 2 of this chapter.

#### 1.4 Returning To the Previous Task

To return to the task you were performing before saving the message, press the F4 key under the [EXIT] option in the Stored Message Menu. The terminal will then return the information that was on the display before you saved the message.

## Section 2 RECALLING A STORED MESSAGE

Messages that you previously stored in the terminal's memory can be recalled to the display at any time. There are several reasons for recalling stored messages. You may want to recall a message that you use frequently, and send it the dispatch centre. Or, you can modify a stored message and send it to the dispatch centre, or you can recall a stored message that you saved as a reminder.

There are two types of messages that you can store and recall from the terminal memory; Form messages, and Compose messages. Once you select and recall one of these messages from memory, the message is handled in exactly the same way as an ordinary Form or Compose message.

As with all terminal operations, recalling a stored message begins at the Main Menu. If you don't know how to display the Main Menu, refer to the "Displaying the Main Menu" section in Chapter 2.

To begin recalling a stored message, press the F3 key below the [SND-TEXT] option on the Main Menu as illustrated below.

```
-----  
GANDALF MDT 4001  
-----  
[READ-MSG] [SND-CODE] [SND-TEXT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

The terminal responds by displaying the Message Selection Menu as illustrated below.

```
-----  
Select option:  
-----  
[FORMS]   [CREATE]   [RECALL]   [EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

## 2.1 Selecting the Message To Recall

The Message Selection Menu allows you to recall previously stored message to the display. Press the F3 key below the [RECALL] option. The terminal will display the Recall Menu as illustrated below.

```
-----  
01>1st 35 characters of stored msg # 1  
02 1st 35 characters of stored msg # 2  
03 1st 35 characters of stored msg # 3  
[RECALL]                                     [EXIT]  
-----  
[--F1--]  [--F2--]  [--F3--]  [--F4--]
```

The Recall Menu display is divided into nine lines called slots. Each slot occupies one line of the display. The slots are numbered from 01 to 09. Each slot contains one message that you previously saved. Only the first 35 characters of the message are displayed in the slots. These characters help you identify the message stored in the slot.

The terminal can only display three slots at one time. The ↓ and ↑ keys can be used to move the cursor up and down the display to view the remaining slots, or you can press two numeric keys in sequence. This will cause the cursor to jump directly to the corresponding slot number.

When you press the first numeric key, the number is echoed on the display above the F2 function key. You must enter 0 as the first digit in the slot number (ie. 01 through 09). When you press the second numeric key, the terminal displays three new slots; the slot corresponding to the number you entered, and the two slots following the number that you entered. If you press two numeric keys that form a number larger than the number of slots, the cursor will jump to the last slot in the Recall Menu.

## 2.2 Reading the Recalled Message

When you locate the slot containing the message you want to recall, press the F1 key below the [RECALL] option in the Recall Menu. The terminal will respond by displaying the contents of the message as illustrated below.

```
-----  
| Message title (if applicable) |  
| First line of selected stored message. |  
| Second line of selected stored message. |  
| [SAVE] <ROUTINE> [PRIORITY] [CANCEL] |  
-----  
[--F1--] [--F2--] [--F3--] [--F4--]
```

When you display the text of the recalled message, the cursor appears as an underscore ( \_ ). To read the message use the ↓ ↑ → ← PREV and NEXT keys to move the cursor around the display. If you like, you can change the message using the data entry keys.

Recalled messages can be saved using the [SAVE] option, assigned to a class using the [ROUTINE] or [PRIORITY] options, cancelled without saving or sending the message using the [CANCEL] option, or sent to the dispatch centre using the TX key. The options are used in the same way as if the recalled message were an ordinary Form or Compose message.

For a detailed description on how use the options, refer to Chapter 4, Section 3 if the message is a Form message, and Chapter 4, Section 4 if the message is a Compose message.

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— Notes —





# RoadKIT™ MET-100B Installation Manual

Revision A: 17 June 1991

(Issue 4, 22 October 1991)

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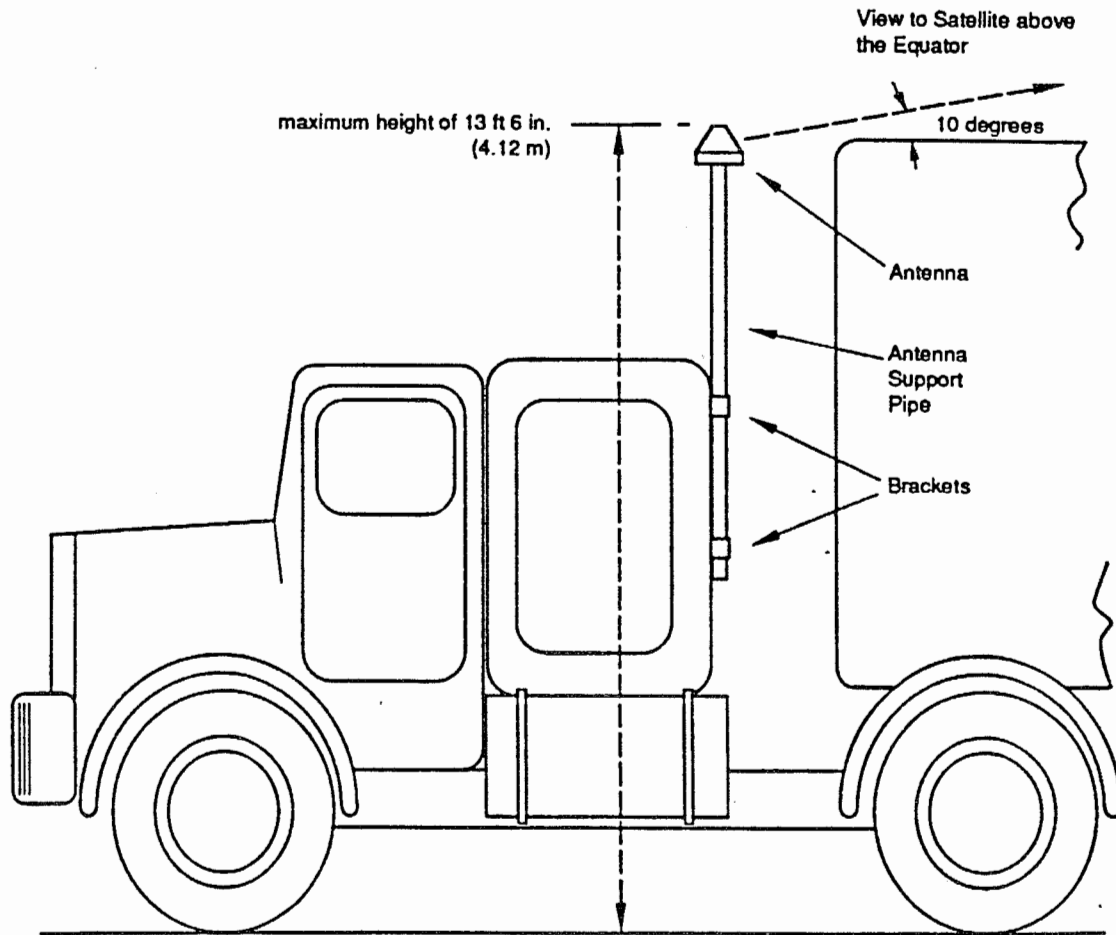
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Note that a good electrical connection is essential between the Antenna and Pipe, the Pipe and Brackets, and the Brackets and Vehicle frame ground.

Figure 1 Typical Antenna Location

## INTRODUCTION

This manual supports the following three RoadKIT™ MET-100B variations:

1. RoadKIT™ MET-100B-000
2. RoadKIT™ MET-100B-001
3. RoadKIT™ MET-100B-002

The manual provides information relevant to the installation of RoadKIT™ MET-100B components in a vehicle, and also notes the precautions to be taken to prevent damage to the equipment. (RoadKIT is a registered trade-mark of Telesat Mobile inc.)

A description of the function of the RoadKIT is given in the Terminal User's Manual, CAL-MN-494-10029.

The installation of the RoadKIT vehicle components will vary from company to company, therefore the procedures given below can only act as a guide. Thus, it is the *responsibility of the installing company and its personnel* to ensure that the mounting of the Antenna support pipe and the Radio, and the drilling of holes in the vehicle walls, comply to any conditions stated by the vehicle owners or lessors, and that the installation is conducted by competent persons.

Figure 1 is a line drawing of a typical installation showing dimensions that must be considered when planning an installation.

## RELATED DOCUMENTATION

The following manuals are not necessary for the installation procedure, but can be referred to for further information on the operation and maintenance of the equipment.

RoadKIT Maintenance Manual	CAL-MN-0494-10030
RoadKIT Terminal User's Manual	CAL-MN-0494-10029
RoadKIT In-cab Terminal Maintenance Manual	Gandalf Doc No. 5874G

## RoadKIT COMPONENTS

The RoadKIT components are listed in Table 1. Some items, such as the aluminum pipe that supports the antenna, brackets to secure the pipe, and cable protection devices, are to be supplied by the installing company.

## INSTALLATION REQUIREMENTS

The installing company must provide the following items.

1. Pipe, ASA Schedule 40, of sufficient length so that the top of the antenna is not more than 4.12 m (13 ft 6 in.) above the road surface. The top of the installed antenna will be 230 mm (9 in.) above the top of the pipe. The pipe has a nominal diameter of 63.5 mm (2½ in.), a wall thickness of 5.15 mm (0.203 in.), and weighs about 0.9 kg/m (2 lbft).
2. Two sturdy brackets and backing plates to hold the antenna support pipe.
3. Split grommets and cable ties as necessary.
4. Oetiker Model 1079 I Economy Pincers (for Antenna clamp).
5. Silicone grease and anti-oxidant (such as NOALOX).
6. Suitable connectors for the in-line fuse (see Step E1, page 7).
7. Dashboard mounting bracket for the terminal, if permitted.
8. Mandatory 120-A alternator filter, such as:

Marine Technology International Long Beach, California Part no. MAR-120A.	or	Captor Corp Tipp City, Ohio Part no. A-1030
---	----	---

**Table 1 Component Part Numbers For RoadKIT™MET 100B Variations**

Qty	Description	100B-000	100B-001	100B-002
1	Radio unit	0494-A-0002-1	0494-A-0002-02	0494-A-0002
1	Antenna assembly with stepless ear clamp	0494-A-0003	0494-A-0003	0494-A-0003
1	Data terminal	491-F-0004	491-F-0004	Not applicable
1	30-A in-line fuse cable	UAP 720211	UAP 720211	UAP 720211
1	Installation kit, comprising:	0494-A-0027	0494-A-0027	0494-A-0027
1	Label, antenna EMR, warning	0494-D-0100	0494-D-0100	0494-D-0100
1	Radio unit mounting plate	0494-D-0133	0494-D-0133	0494-D-0133
1	Installation kit, cables, comprising:	0494-F-0121	0494-F-0121	0494-F-0121
1	Antenna N-N cable assembly			
1	Antenna TNC-TNC cable assembly			
1	Terminal cable cable assembly			
1	BNC-BNC cable cable assembly			
1	Power cable			
1	Self-tap Screw (Antenna ground)			

## INSTALLATION CONSIDERATIONS

A suggested sequence of events is: 1, Antenna installation, 2, Radio Unit location, 3, Data Terminal location, 4, power connections, and 5, cable interconnections.

When planning the installation, note the lengths of the supplied cables as shown in Figure 2. The power cable can be shortened to suit the installation and to reduce the voltage drop between the vehicle battery and the Radio Unit. The length of the Data Terminal cable and the two Antenna rf coaxial cables must not be altered. If the rf coaxial cables are too long, loop the spare cable and tie it safely out of the way.

There is a limit to the radius of bend of the antenna RG-213/U coaxial cable, which must be taken into account when planning the cable routing between the exit from the pipe, the entry hole through the vehicle wall, and the connections to the front of the Radio Unit. The antenna cables should not have bends of less than 100-mm (4-in.) radius, because sharp bends will affect the electrical properties of the cable and cause deterioration in signal quality.

Consider the most convenient way for the coaxial cables to exit the pipe and enter the vehicle. Grommets must be used to protect the cables whenever they pass through holes; and split grommets will be the most convenient type to use. The entry hole to the vehicle must be large enough to accept the elbow-connectors, and must be weather-proofed after the cables are in place.

The exposed cables must be protected from rough wear and abrasion, and must be tied to prevent them from vibrating against rough surfaces, putting undue strain upon connections to the Radio Unit, or from being snagged when tools or equipment are being moved in the vehicle.

The Radio Unit should be mounted in a protected area, away from hot surfaces, so that there will be clear access to its front panel for connecting the cables, replacing the fuse, and viewing the indicator lamps, and to the sides to allow attachment of the radio unit to the mounting tray. There should be free access to both sides of the surface it is to be mounted on. The length of the coaxial cables is fixed as part of the system design. Therefore, if the Antenna is to be mounted high, particular attention must be paid to the location of the Radio Unit.

The Antenna can be mounted at any height – *up to a maximum of 4.12 m (13 ft 6 in.)* above the road surface – as long as it is not in the 'shadow' of the vehicle box or trailer (Figure 1). The vehicle must be on a flat level surface when the antenna support pipe is being installed. The support pipe must be vertical and located so that there will be no obstructions between the Antenna and the satellite, which is in a geostationary orbit above the equator. There should be free access to both sides of the surface that the pipe brackets are to be mounted onto, and the pipe must have a good electrical connection to the vehicle ground.

Before mounting the Antenna and Pipe, ensure that there is enough door height clearance for the vehicle to leave the work area.

## INSTALLATION PROCEDURES

### A ANTENNA PIPE

- A1. With the vehicle on a level surface, mark the vehicle to show where the bottom of the pipe will be to place the top of the Antenna at a predetermined height no more than 4.12 m (13 ft 6 in.) above the road surface.
- A2. Install two suitable pipe mounting brackets so that one is as high as possible and the other low on the flat surface of the vehicle. Use a plumb line or level to ensure that the pipe is vertical. Note that the upper bracket must be grounded to the metal of the vehicle: clean the paint from the vehicle in the contact area and apply an anti-oxidant.
- A3. Use an existing access hole, or drill a clearance hole far enough away from the pipe to allow for the minimum 100 mm (4-in.) bending radius of the coaxial cables between their exit from the pipe, entry into the vehicle, and connection to the front of the Radio Unit.

### B ANTENNA

#### CAUTION

The Antenna is a sealed unit containing a spiral antenna and a printed circuit board. Its radome (cover) and base are made of plastic and it should not be dropped, treated roughly or struck with hard objects. The mounted Antenna may be up to 4.12 m (13 ft 6 in.) above ground. Ensure there is sufficient clearance for the vehicle to leave the work area.

Refer to Figure 2.

- B1. Thread the two rf coaxial cables through the mounting pipe so that the straight connectors are at the antenna end and the elbow-connectors are at the vehicle end.
- B2. Apply a thin film of silicone grease to the outer surfaces of the two Antenna fixed coaxial connectors.
- B3. Slip the Stepless Ear Clamp over the Antenna skirt, then connect the two cable connectors to the two fixed connectors in the Antenna base by pushing and twisting the knurled outer ring on the connectors. (The connectors are different sizes and can not be cross-connected.)
- B4. A metal grounding strip is attached to the Antenna skirt and it must make good electrical contact with the pipe. Clean the pipe at the contact point with fine emery paper and apply an anti-oxidant.

- B5. Slide the Antenna skirt over the pipe until it 'bottoms'; position the Clamp about quarter-way up the skirt slots, then crimp it tight with the Model 1079 I Pincers.
- B6. With a No. 42 or 43 drill bit, carefully drill through the grounding strip hole into the pipe (so as not to damage the coaxial cables) and insert the self-tap screw provided in the Installation Kit.
- B7. Clean a portion of the pipe near the Antenna skirt and apply the Antenna EMR Warning Label such that it can be easily seen and read.
- B8. There must be a good electrical ground between the pipe and the vehicle. Ensure that the pipe surface is clean and coated with an anti-oxidant where the clamps will contact it. Raise the antenna and pipe assembly and secure the pipe into the mounting brackets on the vehicle, with the bottom of the pipe aligned with the mark made in Step A1.
- B9. Install any cable protection measures and feed the large connector into the vehicle, followed by the smaller one.
- B10. Use an ohm-meter to confirm a good electrical connection to the vehicle frame.

## C RADIO UNIT

- C1. Remove the four  $\frac{1}{4}$ -inch by  $1\frac{1}{4}$  inch-long bolts, washers and nuts from the Radio Unit Mounting Plate.
- C2. Position the plate so that there will be clear access to the front of the Radio Unit, then mark four places through the mounting bolt holes.
- C3. Drill four  $\frac{5}{16}$ -inch (8 mm) clearance holes.
- C4. Secure the mounting plate with four,  $\frac{1}{4}$  inch by  $1\frac{1}{4}$  long bolts, washers and nuts.
- C5. The Radio Unit is fitted with vibration isolator mounts and the necessary mounting hardware. Loosen the bolts in each rubber mount.
- C6. Place the Radio Unit into the slots in sides of the mounting plate, with the metal plates outside the tray. Slide the vibration isolator threaded studs to the end of the slots.
- C7. Position the locking plate tabs into the rectangular openings in the mounting plate and torque the nuts to 61 cm-kg (53 lb-in).
- C8. In mobile dc-powered installations, one-point grounding through the antenna is preferable, so the front panel stud should not be used to ground the unit. In ac-powered installations the front panel stud should be used to ground the unit for safety reasons.

**D DATA TERMINAL**

- D1. Mount the Data Terminal in a dashboard bracket (if permitted), or as alternatively decided.

**E POWER CONNECTIONS**

- E1. Connect the power cable and in-line fuse as shown in Figure 2:
1. Brown (or black) wire to battery negative terminal;
  2. Violet wire to ignition switch (after the vehicle fuse); and
  3. Yellow (or red) wire to one end of the 30-A in-line fuse. The other end of the fuse wire must be connected directly to the battery positive terminal.

(The violet switch connection signals the Radio Unit that the ignition is on: the Radio Unit draws its 30-A operating current through the 10-AWG yellow {or red} wire.)

**F CABLE CONNECTIONS**

- F1. Refer to the interconnections shown in Figure 2 and install the cables. Roll and tie cables if they are too long.
- F2. The DB25 connectors are secured to the Data Terminal and Radio Unit by two slot-head screws each. *Do not move the terminal by pulling on the cable.*
- F3. The coaxial cable connector collars are of the push-and-twist type.
- F4. The power cable has a screw-collar to secure it to the Radio Unit.
- F5. Secure cables so their their weight does not strain the connections.

**G ALTERNATOR FILTER**

Install the alternator filter in accordance with the manufacturer's recommendations.



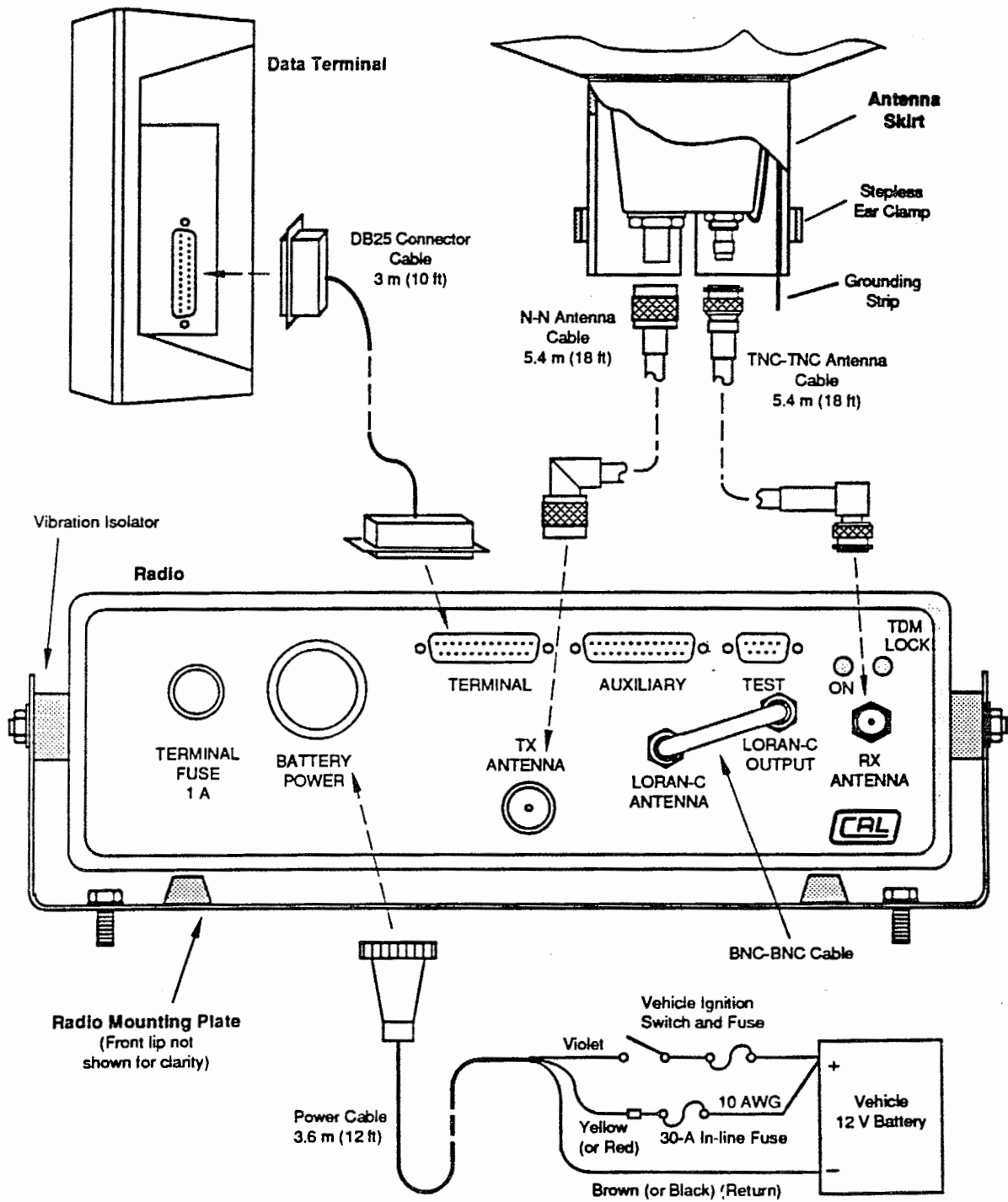


Figure 2 Cable Interconnections

## TESTING

### WARNING

Although the intermittent microwave radiation from the Antenna is minimal at the Radio Unit power output level of 50 W, it is recommended that if the vehicle ignition is ON, and the Radio is connected and operational, personnel should stay more than 60 cm (2 ft) away from the Antenna.

**NOTE:** If the Data Terminal is cold ( $-15^{\circ}\text{C}$  and below) the display will have poor contrast and will operate slowly until it has had time to warm up.

When the main power is initially applied to the Radio the Data Terminal will automatically perform four power-up self-tests while displaying a "Self-test in progress" message.

As each of the tests is successfully completed a dot (.) will appear after the message and an internal beeper will sound. When a sequence of four dots is displayed after the message, the self-tests are complete and the display will then show the following:

MDT 4001 (c) '90 Gandalf Technologies		
WARNING -	Do not operate terminal	
	while vehicle is in motion	
[READ-MSG]	[SND-CODE]	[SND-TEXT]

It may take several minutes before the Data Terminal green LINK indicator lamp will glow (because of satellite protocols), and only then if there is a clear communications link between the antenna and the satellite.

The display screen will be back-lit for 30 seconds, then turn itself off if no keys are pressed. The screen intensity can only be adjusted by the keyboard  $\uparrow$  and  $\downarrow$  keys if the Data Terminal is displaying the above message.

If the screen does not illuminate there may be a poor connection between the Data Terminal and the Radio Unit. If fault messages appear, refer to the RoadKIT In-cab Terminal Maintenance Manual, Section 3, for further test procedures.

The Radio Unit ON lamp will indicate when power is applied to the unit, and the TDM LOCK when there is a good 'connection' to the satellite.



# Road KIT™ MET-100A Installation Manual

Issue 1: 8 March 1991

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## INTRODUCTION

This manual provides information relevant to the installation of Mobile Road KIT components, and also notes the precautions to be taken to prevent damage to the equipment. (Road KIT is a registered trademark of Telesat Mobile Inc.)

A description of the function of the Road KIT is given in the User's Manual (CAL-MN-491-10029).

The installation of the Road KIT components will vary from company to company, therefore the procedures given below can only act as a guide. Thus, it is the responsibility of the installing company and their personnel to ensure that the mounting of the Antenna support pipe and the Radio, and the drilling of holes in the cab walls, comply to any conditions stated by the truck owners or lessors, and that the installation is conducted by competent people.

Figure 1 is a line drawing of a typical installation showing dimensions that must be considered when planning an installation.

## ROAD KIT COMPONENTS

The Road KIT components are shown in Figure 2 and listed in Table 1. Some items, such as the aluminum pipe that supports the antenna, brackets to secure the pipe, and cable protection devices, are to be supplied by the customer.

## INSTALLATION REQUIREMENTS

The installing company must provide the following items.

1. Pipe, ASA Schedule 40 of sufficient length so that the top of the antenna is not more than 13 ft 6 in. (4.12 m) above the road surface. The top of the installed antenna will be 9 inches (23 cm) above the top of the pipe. The pipe has a nominal diameter of 2-1/2 inches, a wall thickness of 0.203 inches, and weighs about 2 lb per foot.
2. Two sturdy brackets and backing plates to hold the antenna support pipe.
3. Split grommets and cable ties as necessary.
4. 30-A fuse assembly and 8 AWG cable.
5. 1-A in-line fuse.
6. Silicone Grease
7. Dashboard mounting bracket for the terminal, if permitted.
8. 120-amp alternator filter is mandatory. An example of such a filter is from Marine Technology International, Long Beach, California. Its part number is MAR-120A.



Table 1 Road KIT Components

Qty	Description	CAL Part Number
1	Radio Unit	0491-A-0002
1	Antenna Assembly	0491-A-0003
1	Data Terminal	0491-F-0004
1	Terminal Cable Assy	0491-F-0083
1	Installation Kit comprising:	0491-A-0027
1	Antenna N-N Cable Assy	0491-A-0010
1	Antenna TNC-TNC Cable Assy	0491-A-0011
1	BNC-BNC Cable Assy	0491-A-0012
1	Power Cable	0491-A-0015
1	Label, Antenna EMR Warning	0491-D-0100
1	Radio Unit Mounting Plate	0491-A-0024
4	Thread-forming screws, stainless steel, 10-32 x 1/2 in. long, with flat and lock washers	223-00001

## RELATED DOCUMENTATION

Road KIT Maintenance Manual	CAL-MN- 0491-10030
Road KIT User's Manual	CAL-MN- 0491-10029
Road KIT Terminal User Manual	Gandalf Doc. No. 5873G
Road KIT Terminal Maintenance Manual	Gandalf Doc. No. 5874G





## INSTALLATION CONSIDERATIONS

A suggested sequence of events is: ignition switch connections, Radio Unit location, Data Terminal location, Antenna installation, then cable interconnections.

When planning the installation, note the lengths of the supplied cables as shown in Figure 2 (page 7). The power cable can be shortened to suit the installation and to reduce the voltage drop between the battery and the transceiver. The length of the Data Terminal cable and the two Antenna rf coaxial cables must not be altered.

There is a limit to the radius of bend of the antenna RG-213/U coaxial cable, which must be taken into account when planning the cable routing between the exit from the pipe, the entry hole through the cab wall, and the connections to the front of the Radio Unit. The antenna cables should not have bends of less than 4-inch (10 cm) radius. Sharp bends will affect the electrical properties of the cable and cause deterioration in signal quality.

Consider the most convenient way for the coaxial cables to exit the pipe and enter the cab. Grommets must be used to protect the cables whenever they pass through holes; and split grommets will be the most convenient type to use. The entry hole to the cab must be large enough to accept the elbow-connectors, and must be weather-proofed after the cables are in place.

The exposed cables must be protected from rough wear and abrasion against other parts of the truck. The cables should also be tied wherever possible to prevent them from vibrating against rough surfaces, putting undue strain upon connections to the Radio Unit, or from being snagged when other tools or equipment are being moved in the truck.

The Radio Unit should be mounted in a protected area, away from hot surfaces, so that there will be clear access to the front of the unit for connecting the cables, replacing the fuse, and viewing the indicator lamps, and to the sides to operate the retaining latches. There should be free access to both sides of the surface it is to be mounted on. The length of the coaxial cables is fixed at 15 ft (4.57 m) as part of the system design. Therefore, if the Antenna is to be mounted high, particular attention must be paid to the location of the Radio Unit.

The Antenna can be mounted at any height — up to a maximum of 13 ft 6 in. (4.12 m) above the road surface — as long as it is not in the 'shadow' of the truck box or trailer (Figure 1). The truck must be on a flat level surface when the antenna support pipe is being installed. The support pipe must be vertical and located so that there will be no obstructions between the antenna and the satellite, which is in a geostationary orbit above the equator. There should be free access to both sides of the surface the pipe brackets are to be mounted onto. Before mounting the Antenna and pipe, ensure that there is enough door height clearance for the truck to leave the work area.

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## INSTALLATION PROCEDURES

### A IGNITION SWITCH

- A1. Connect the power cable through the ignition switch and a 30-A fuse using 8 AWG wire, as shown in Figure 2. (The violet switch connection signals the Radio Unit that the ignition is on: the Radio Unit draws heavy operating current through the 30-A yellow connection.)

### B RADIO UNIT

- B1. Remove the four 1/4 inch by 1-1/4 inch-long bolts, washers and nuts from the Radio Unit Mounting Plate. Take care not to lose the spacers inside the mounting grommets.
- B2. Position the plate so that there will be clear access to the front of the Radio Unit, then mark four places through the mounting bolt holes.
- B3. Drill four 5/16-inch (8 mm) clearance holes.
- B4. With the spacers inside the grommets, secure the mounting plate with the four 1/4 inch by 1-1/4 long bolts, washers and nuts.
- B5. Place the Radio Unit in the mounting plate and close the four mounting latches.

### C ANTENNA PIPE

- C1. With the truck on a level surface, mark the cab to show where the bottom of the pipe will be to place the top of the Antenna at a predetermined height, but no more than 13 ft 6 in. (4.12 m) above the road surface.
- C2. Install two suitable pipe mounting brackets so that one is as high as possible and the other low on the flat surface of the vehicle. Note that the upper bracket must be grounded to the metal of the vehicle. Use a plumb line or level to ensure that the pipe is vertical.
- C3. Use an existing access hole, or drill a clearance hole far enough away from the pipe to allow for the minimum 4-inch bending radius of the coaxial cables between their exit from the pipe, entry into the cab, and connection to the front of the Radio Unit.

### D DATA TERMINAL

- D1. Mount the Data Terminal in a dashboard bracket (if permitted), or as alternatively decided.

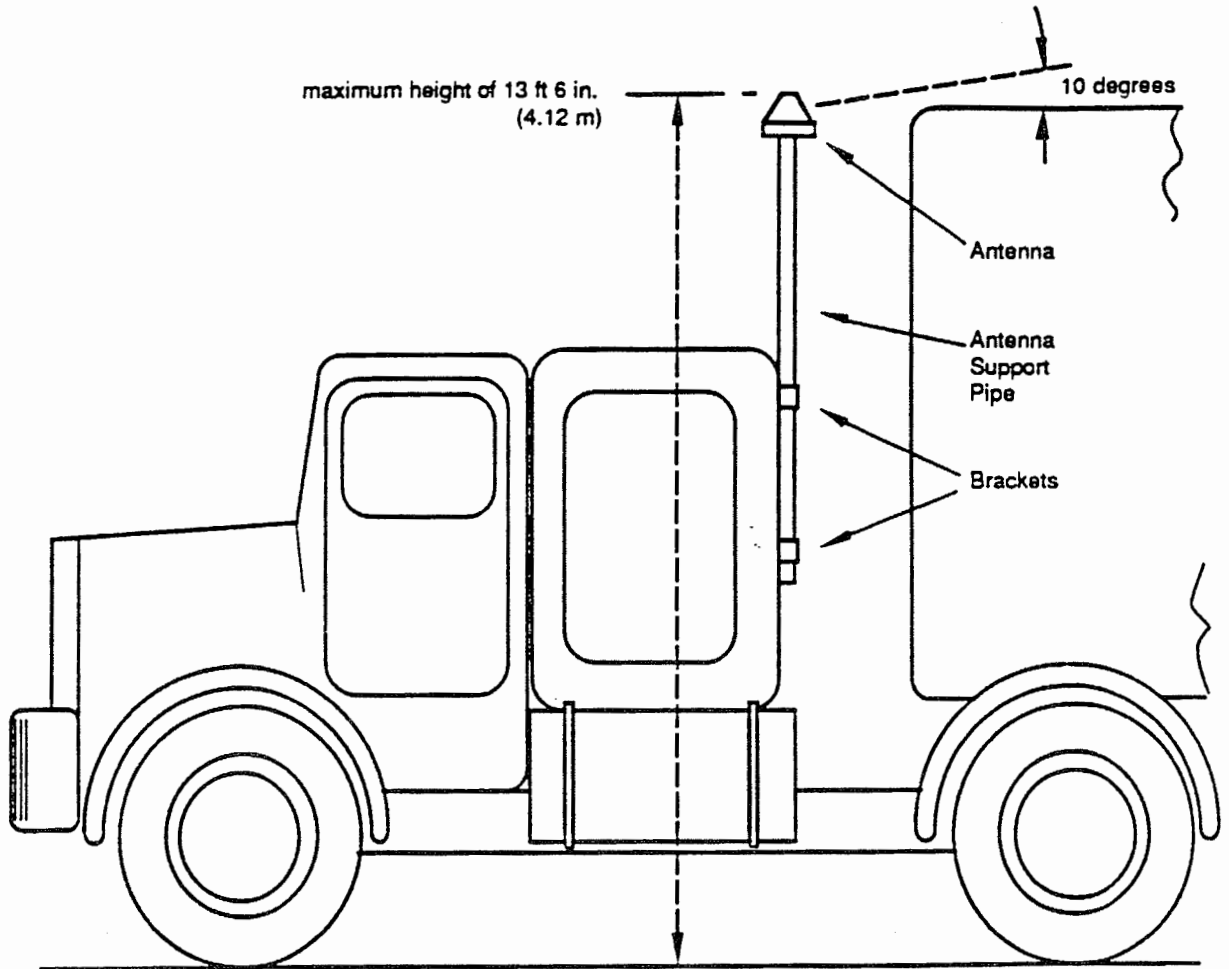


Figure 1 Typical Antenna Location



## E ANTENNA

### CAUTION

The Antenna is a sealed unit containing a spiral antenna and a printed circuit board. Its radome (cover) and base are made of plastic and should not be dropped, treated roughly or struck with hard objects.

The mounted Antenna may be up to 13 ft 6 in. (4.12 m) above ground. Ensure that there is sufficient clearance for the truck to leave the work area.

Refer to Figure 2.

- E1. Thread the two coaxial cables, Part No. 02000008 and 02000009, through the mounting pipe so that the straight connectors are at the top end and the elbow-connectors are at the truck cab end.
- E2. Apply a thin film of silicone grease to the outer surfaces of the two Antenna fixed coaxial connectors and to the inner surfaces of the two coaxial cable connectors. Push and twist the knurled rings to connect the two cable connectors to the two fixed connectors in the base of the Antenna (they are different sizes and can not be cross-connected). Note the clearance between the inside of the antenna skirt and the coaxial connector enclosure.
- E3. Slide the antenna skirt over the pipe.

### CAUTION

In the following step, do not continue drilling after breaking through the pipe wall such that the drill bit contacts and damages the coaxial connector enclosure.

- E4. Carefully drill an 11/64-inch (0.172 inch; 4.4 mm) hole through one of the clearance holes in the skirt and through the pipe.
- E5. Insert one of the hex-head stainless steel 10-32 x 1/2 inch thread-forming screws, with flat and lock washers, through the skirt into the hole. Align the screw with the hole and tighten the screw securely. Note that it will take considerable torque to start the screw cutting into the pipe wall.

- E6. Repeat Steps E4 and E5 for the opposite hole, then for the remaining two holes.
- E7. Clean a portion of the pipe near the Antenna skirt and apply the Antenna EMR Warning Label such that it can be easily seen and read.
- E8. A metal strip, which acts as a ground, is attached to the antenna skirt. The strip must make contact with the pipe. To ensure proper contact, clean the pipe at the contact point and apply an anti-oxidant such as NOALOX. Fine emery paper is recommended for cleaning.
- E9. Raise the antenna and pipe assembly and secure the pipe into the mounting brackets on the truck cab, with the bottom of the pipe aligned with the mark made in Step C1.
- E10. Install any cable protection measures and feed the large connector into the cab, followed by the smaller one.

### CABLE CONNECTIONS

Refer to the interconnections shown in Figure 2 and install the cables.

The DB25 connectors are secured to the Data Terminal and Radio Unit by two slot-head screws each. **Do not move the terminal by pulling on the cable.**

The coaxial cable connectors are of the push and twist type.

The power cable has a screw ring to attach it to the Radio Unit.

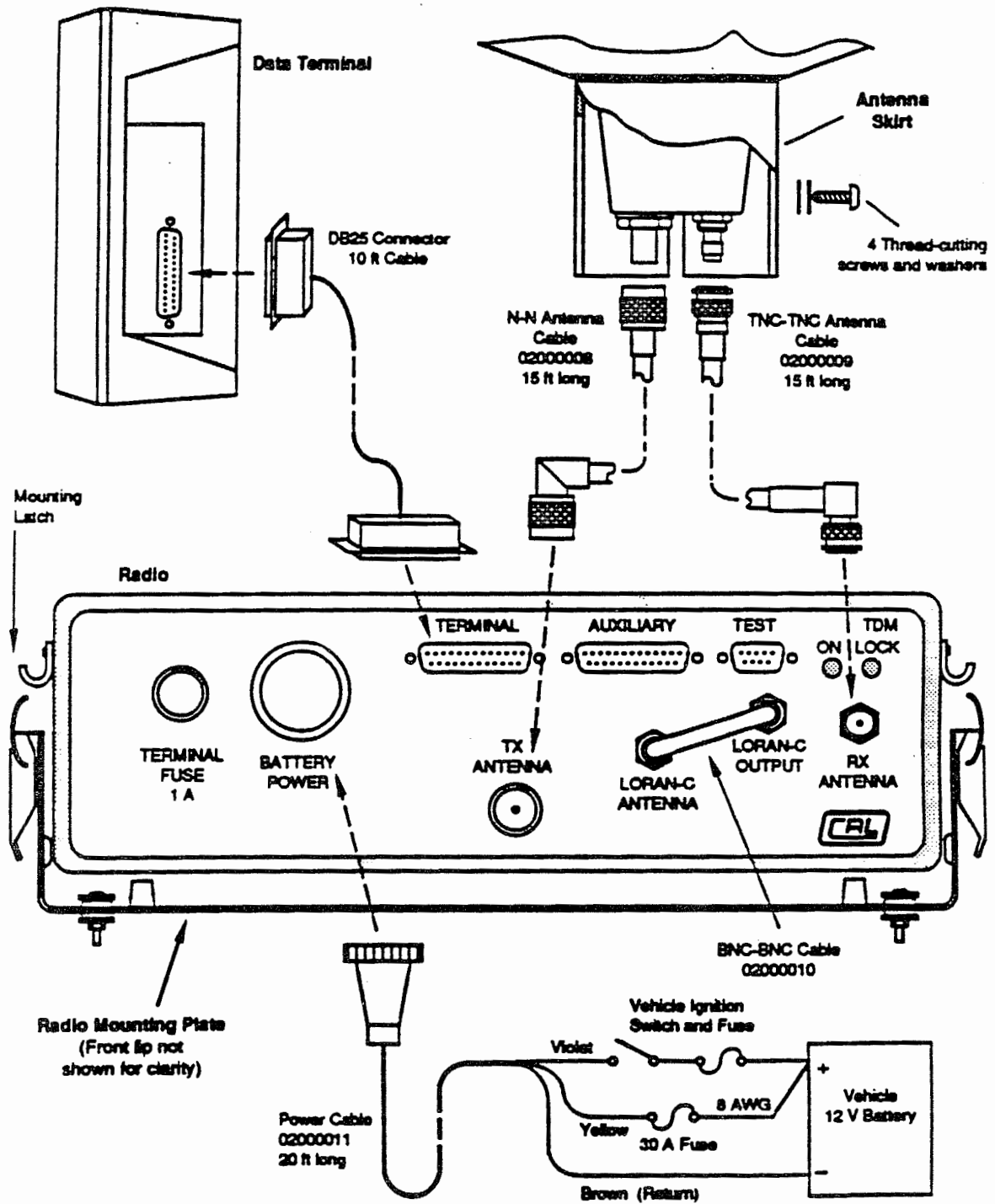


Figure 2 Cable Interconnections

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**TESTING****WARNING**

Although the intermittent microwave radiation from the Antenna is minimal at the Radio Unit power output level of 50 W, it is recommended that if the truck ignition is on, and the Radio is connected and operational, personnel should stay more than 2 ft (60 cm) away from the Antenna.

**NOTE:** If the Data Terminal is cold ( $-15^{\circ}\text{C}$  and below) the display will have poor contrast and will operate slowly until it has had time to warm up.

Power is automatically supplied to the Radio Unit and Data Terminal when the vehicle ignition is switched on.

The Data Terminal will automatically perform four power-up self-tests and the screen will display the message:

self test in progress

during this time. As each of the tests are successfully completed a dot (.) will appear after the message and the internal beeper will sound. When a sequence of four dots appears after the message the self-tests are complete. If the green LINK indicator lamp is lit, the screen will change and the top line will display:

GANDALF MDT nnnn

where the 'nnnn' represents the vehicle terminal number allocated by the relevant Dispatch Centre.

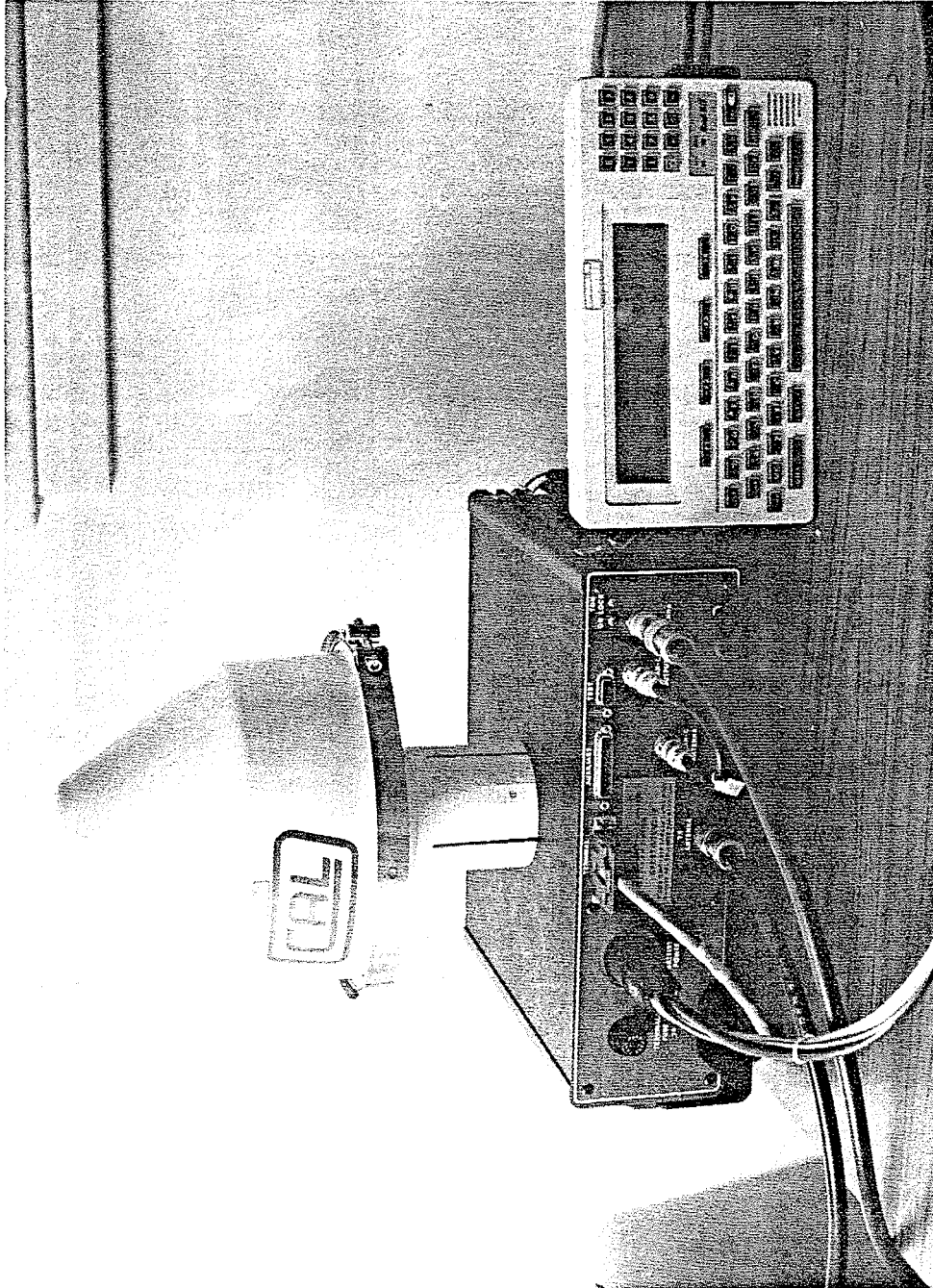
It may take several minutes before the green LINK indicator lamp will glow (because of satellite communication protocols), and only then if there is a good 'connection' between the antenna and the satellite. The display screen will be back-lit for 30 seconds, then turn itself off if no keys are pressed. The screen intensity can only be adjusted by the keyboard  $\uparrow$  and  $\downarrow$  keys if the LINK and MSG indicator lamps are lit.

If the screen does not illuminate there may be a poor connection between the Data Terminal and the Radio Unit. If fault messages appear, refer to the Data Terminal Maintenance Manual, Section 3, for further test procedures.

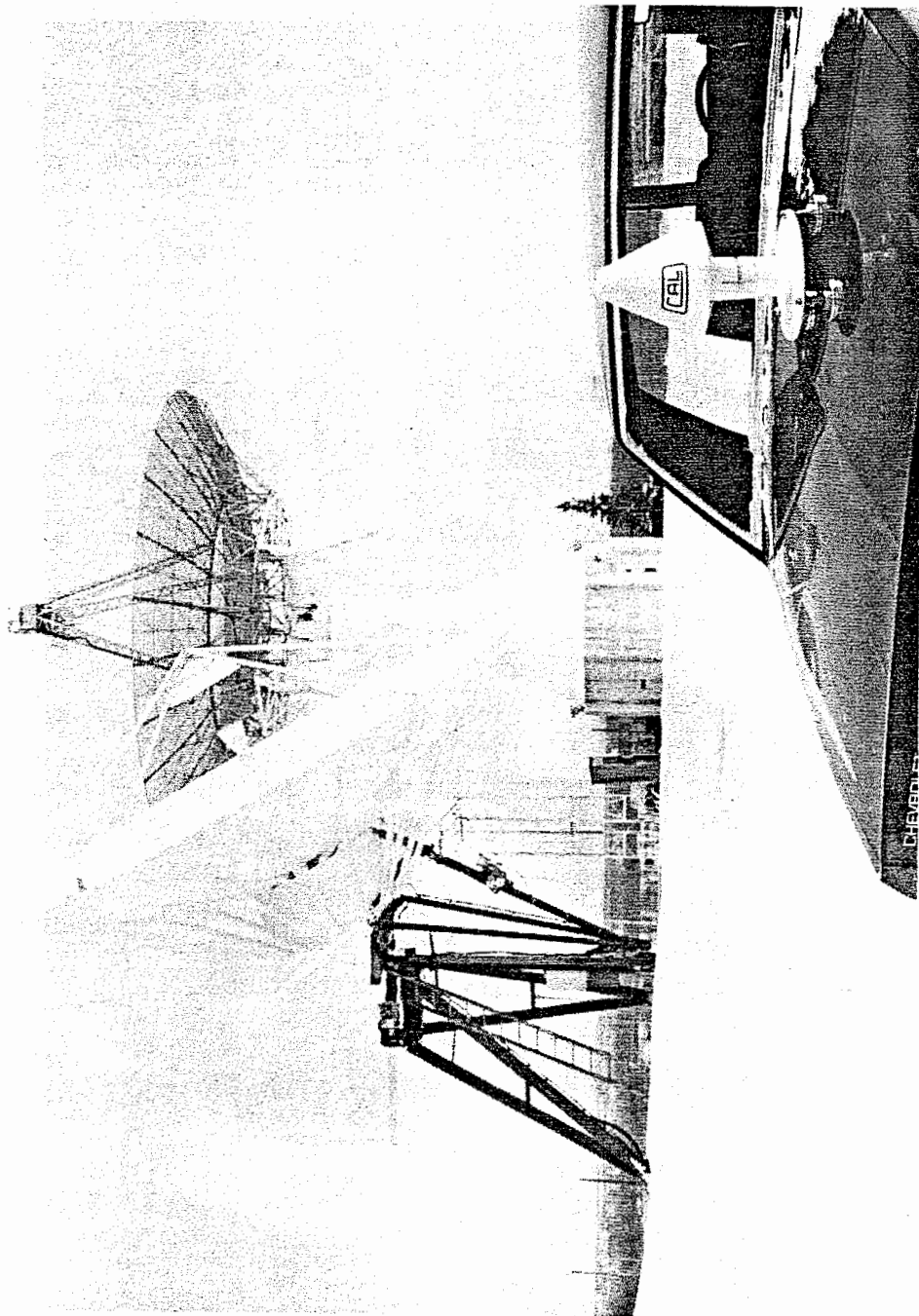
The Radio Unit ON lamp will indicate when power is applied to the unit, and the TDM LOCK when there is a good connection via the satellite to the Dispatch Centre.



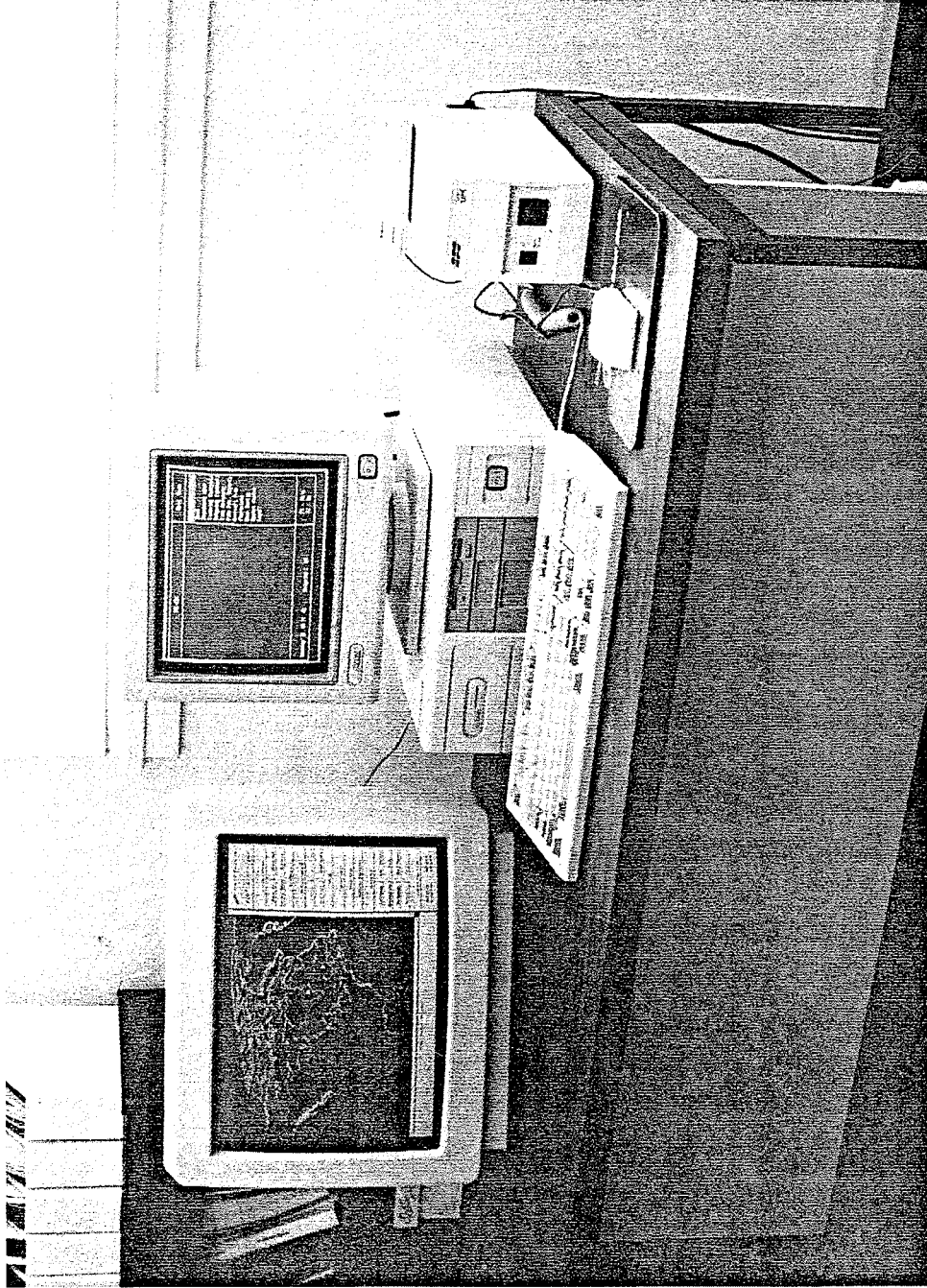
Appendix C



Photograph 1 - AVL-Loran-C system showing antenna, radio, and data terminal



Photograph 2 - antenna mounted on vehicle truck deck



Photograph 3 - computer equipment used to analyze position of tracked vehicle

