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FUNCTION ENGINEERING MANAGER FUNCTION ENGINEERING MANAGER

MOBILE TRACKING RECEIVER

M7101 AND M7101/10

OPERATOR HANDBOOK



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## 1 INTRODUCTION

### 1.1 General Arrangement

The Tracking Receiver is designed to track and locate a VHF target transmitter fitted to a vehicle, package or person. The Tracking Receiver is fitted to a tracking vehicle (normally a passenger car or small van), and consists of a Receiver Unit and a Display Unit. The Receiver requires a 4 element antenna, the standard version of which takes the form of a roof rack. The Display Unit indicates the relative direction and approximate range of the target transmitter on a solid-state display. It also supplies an audio signal which gives auxiliary information on the status of the target.

### 1.2 Notes and Cautions

Only a fuse with the required rated current and of the specified type should be used for replacement. The use of mended fuses and the short circuiting of fuse holders must be avoided.

Even though the equipment is protected against reverse polarity, correct polarity must be observed when connecting to the vehicle supply as cables may be damaged due to high current continuity to the vehicle chassis.

For correct direction finding operation, the antenna elements must be connected to the correct sockets on the receiver with cables of equal length. A damaged cable should be replaced with a cable of the same length.

### 1.3 Accessories and Related Equipment

The M7101(/10) Mobile Tracking Receiver comprises the following:-

M7111(/10)	Mobile Tracking Receiver Unit
M7112(/10)	Control and Display Unit
M7120C	Display Unit Cable
M7120E	Display Unit Extension Cable
M7120P	Power Supply Cable
M7122	Receiver Unit Case and Fittings

#### Optional Accessories

M7113	Auxiliary Display Unit
M7114	Beacon Status Display

#### Essential Related Equipment

4 Element Antenna including matched antenna cables

eg M7101A Mobile Tracking Receiver Antenna  
M7101AA Ski Rack Antenna

#### Optional Related Equipment

- Various beacons



## 2 INSTALLATION

- 1 Place the Receiver Unit in any convenient position in the vehicle.
- 2 Connect the Display Unit to the Receiver Unit using the Display Unit Cable (M7120C) and the Extension Cable (M7120E), if required, first passing the cable(s) through any bulkheads as necessary.
- 3 Plug in the power supply cable (M7120P) and connect to the vehicle battery supply, the brown wire to the battery positive supply and the blue wire to the negative supply.

NOTE that the equipment is suitable only for negative-earth nominal 12 Volt battery supplies.

- 4 Switch on the Receiver using the ON/OFF - Volume Control on the Display Unit. The display should show a short and randomly moving vector and have all or most of the range LED's illuminated.
- 5 Install the antennal and perform the cable continuity test (see Antenna Operator Handbook).

When the cable test is positive for all four antenna cables, connect the cables to their respective sockets.

## 3 OPERATION

### 3.1 Adjustments

Note: It is assumed that the transmitter has been deployed.  
All controls are located on the Control and Display Unit.

Turn on the Receiver.

Select the appropriate channel.

Adjust the volume control as required.

For a continuously operating transmitter set the mode switch to the CONT position and adjust the TUNE control to give an audio tone of about 500 Hz. There are normally two settings which can give this tone: select the more clockwise setting. Every 2-4 sec the tone should change to about 1 kHz for a short period. This is the normal identification signal form.

For a pulsed transmitter select the PULSE position and adjust the TUNE control to give a convenient pulsed tone (using the more clockwise setting, as above). Note that the bearing and range indications are temporarily stored between pulses, but that with the audio signal the intervals between pulses will normally be filled with noise.

Adjust the RANGE ADJ control to give the desired range indication.

- NOTE: 1 The RANGE ADJ control should normally be used to calibrate range display only at short range.
- 2 The RANGE ADJ control has no effect on the maximum range available from the receiver.
- 3 The position of the TUNE control does not effect the Direction

### 3.2 Vector Display

With the Tracking vehicle on an unobstructed site and the Display Unit aligned with the vehicle's longitudinal axis, the vector will normally point in the direction of the target and have a length of 6 LED's (ie maximum length).

However, when the target and tracking vehicles are both stationary in a high multi-path environment (eg a city centre), the observed bearing will not necessarily be accurate, even though the vector may be of maximum length. Bearings should therefore be taken only when movement is taking place so that spurious results may be avoided.

As maximum range is approached the vector length will reduce. Although accurate bearings may still be obtained under favourable circumstances, care should be exercised in interpreting the readings since ignition interference from the tracking vehicle's engine is sometimes sufficiently severe to cause a false bearing indication. This condition may easily be tested by switching temporarily to an unused channel: if the vector remains unchanged then ignition interference is present.

### 3.3 Range Display

The range display uses a measurement of signal strength and can therefore give only an approximate indication of target range since operating and propagation conditions can vary widely.

As a guide, and with the RANGE ADJ control fully anticlockwise, the green-amber changeover normally occurs at a range of approximately 100 m and the amber-red changeover at a range of approximately 1 km when using a 2 W transmitter and an Antenna Matching Unit (M7014) fitted with a correctly adjusted wire antenna on the target vehicle.

With other RANGE ADJ control settings the above indications will be obtained with lower power transmitters and previous experience can usually assist in improving the estimates of range for various operating conditions.

### 3.4 Audio Output

Continuously operating target transmitters normally give an audio output as described in Section 3.1 when they are stationary and are not subject to vibration.

If the target moves or vibrates (eg by the engine running or a door closing), the audio tone will be frequently modulated. The characteristics of the modulation will correspond to the movement or vibration involved eg a rhythmic warble for the engine at tickover or a continuous noise-like variation for movement of the vehicle along the road.

Previous experience will permit various states of motion to be identified from the audio signal.

When the transmitter SLOW terminal is disconnected from OV, the audio signal changes to a slow warble whose characteristics enable it to be readily distinguished from other signals.



When pulsed transmitters are deployed no auxiliary information is normally available and the audio tone is used only to confirm the operation of the transmitter. (With remotely controlled beacons auxiliary information is available using the optional M7114 Beacon Status Display - see separate Handbooks).

#### 4 FAULT FINDING

The following chart is provided to help correct problems that are not equipment malfunctions.

FAULT	POSSIBLE CAUSE	REMEDY
No LED's illuminated (after steps 1 to 4 of the installation procedure)	Blown fuse	Replace fuse
Short randomly moving vector, noisy audio and range near maximum	Wrong channel selected	Select correct channel
	Target out of range	Shorten distance from target
	Target turned off or failed	Check target
Short vector pointing mainly in one direction, noisy audio and range near maximum	As above but with ignition or other interference	As above (inter- ference will not be significant when Target signal is strong enough)
Longer than half length vector moving but giving large random bearing errors. Range normal.	Antenna cable lengths unequal	Check lengths and replace as necessary
	Antenna cables in- correctly connected or damaged	Connect cables correctly or replace as necessary
Full length vector permanently pointing in one direction and/or range static at max or min	Poorly connected or damaged display cable	Connect or replace cable



5 SPECIFICATION

Antenna Type	4 element (standard model in form of roofrack)
Antenna Polarisation	Vertical
Frequency	Crystal controlled in range 27-155 MHz
Number of Channels	4 (10 optional)
Channel Spacing	Minimum - 5 kHz between channels  Maximum - 2% of operating frequency between highest and lowest channels
Display Type	LED
Display Format	360 deg vector for target direction Resolution 11.25 deg (ie 32 sectors)  16 level linear type for target range with 3 colour bands
Sensitivity	Operational:-  Range approx 8 km in open terrain and 3 km in large cities with 2 W target transmitter in typical installation  Laboratory:-  Approx -130 dBm into each input (with suitable phasing) for half-length vector
Precision	RMS error less than 10 deg
Controls	ON/OFF - audio volume  Channel select  Fine tune  Cont/Pulse  Range Adjustment
Audio Output	1 W nom into Display Unit loudspeaker  Earphone socket on Display Unit
Power Requirements	+11 to +16 V at approx 350 mA
Fuse	20 mm, 1 Amp Fast Blow

Size	Receiver Unit 300 mm x 300 mm x 75 mm
	Display Unit 170 mm x 120 mm x 50 mm
	Units supplied in black attache case
Weight	Complete Unit 6.5 kg