



# NATO 40FM

40-Channel  
Citizen Band  
FM Transceiver

"Roger Beep Facility"



## WARNING

Do not attempt to operate this unit until the antenna has been connected and fully extended. Failure to do so can cause damage to this unit.

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## **1. LICENCE**

No radio equipment may be installed or used except under the authority of a licence.

Please complete licence application form and take it with the appropriate fee to your local post office, whereupon a licence will be issued. Please read the conditions of the licence very carefully, it also covers the use of an aerial.

## **2. GENERAL DESCRIPTION**

The NATO 40FM is an advanced solid-state 2-way CB radio designed primarily for mobile operation. It employs the very latest technology to provide 40 channels of operation by means of digital frequency synthesis with phase lock loop (PLL) circuitry FM channel on the citizens band of 26.965 to 27.405 MHz.

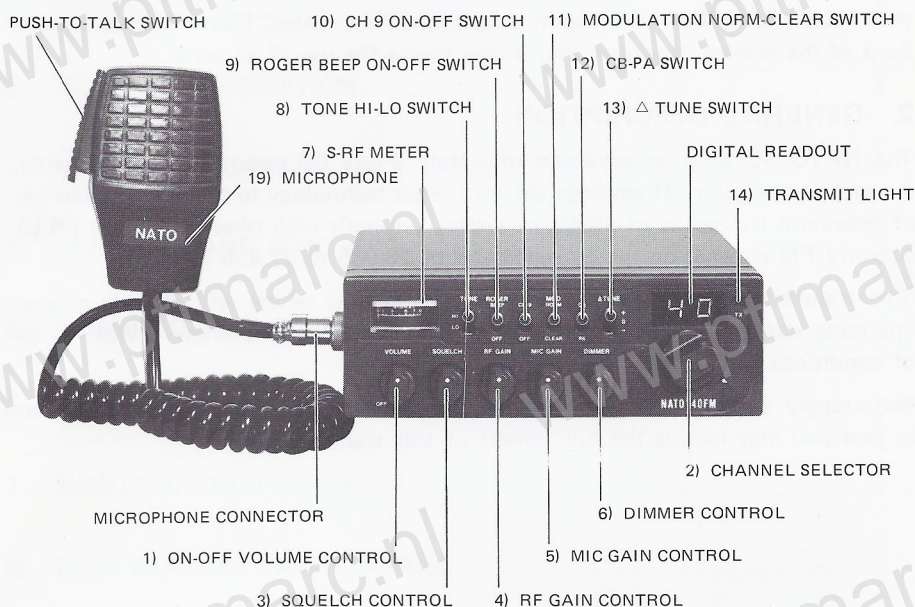
This transceiver also includes many unique features which will provide greater operating convenience and assure optimum communications under a wide range of conditions.

We strongly suggest you read this operating manual carefully before operation so that you may receive the full benefit of this transceiver.

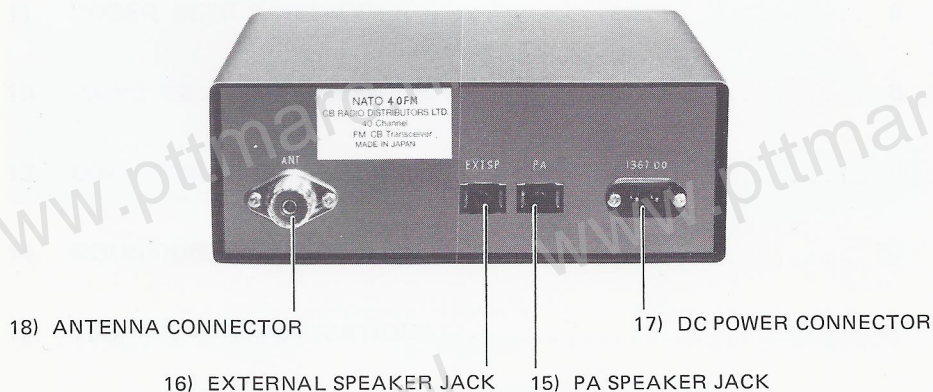


### 3. CONTROLS LOCATION

#### FRONT PANEL



#### REAR PANEL



## 4. FEATURES AND CONTROLS

### 4.1 Volume/Power On-Off

This combination control supplies power to the unit and adjusts the receiver volume. The switch should be turned clockwise from the "off" position. You will hear an audible "click". The L.E.D. channel display and meter will light. To increase the volume continue advancing the control in a clockwise direction.

### 4.2 Channel Selector

The channel selector switch is used to select the channel frequency. It automatically adjusts both the transmitter and receiver frequencies. Channels are displayed by large L.E.D. (light emitting diodes).

### 4.3 Squelch Control

The squelch control is used to eliminate background noise when there are no signals present strong enough to overcome the noise. To adjust the squelch control, select a channel where there is no signal. Turn the volume up to normal listening levels. Rotate the squelch control clockwise until the background noise disappears.

### 4.4 Variable RF Gain Control

The RF gain control lets you control the sensitivity (receiving range) of your unit. For maximum range reception the control must be turned fully clockwise (to the right). In some instances, you may be extremely close to another station that is emitting very strong signals. This can overload your receiver and distort the signal. Should this condition occur, simply turn the RF gain control counter-clockwise (to the left) to reduce the receiver sensitivity.

### 4.5 Microphone Gain Control

Rotating this control counterclockwise reduces the sensitivity of the microphone amplifier and requires 'close-talking' into the microphone. When operating from a noisy vehicle, reducing the **Mic Gain** setting will usually improve your transmitted voice clarity.

### 4.6 Dimmer Control

Changes the brightness of the digital channel display. Set to **Dimmer** counterclockwise during night-time driving.

### 4.7 S/RF Meter

This unit is equipped with a large, easy-to-read combination meter with a built-in transmit indicator light.

In the receive position, the meter reads the level of the incoming signals. In the transmit position, it indicates relative power output.

### 4.8 Tone Hi-Lo Switch

Set this to the position that provides most pleasing sound to you.

#### **4.9 Roger Beep On-Off Switch**

When switch is ON position, each time the PTT lever is released, a tone is transmitted to the receiver though it will not be audible at your transmitter. This is for those receiving your signal who will know when your transmission has ended.

#### **4.10 CH-9 On-Off Switch**

Your transceiver has the facility for immediate selection of channel 9, particularly useful when this channel is required quickly for monitoring or transmitting.

Pressing the Channel 9 Switch in, will immediately switch the set to Channel 9, (providing the unit is turned on) and the channel indicator will register this.

Remember to return the switch to the out position for normal transmission — the channel indicator will revert to the previous channel selected.

#### **4.11 Modulation Norm-Clear Switch**

This switch allows you to vary the Audio tone (Bass or Treble) of the signals you are transmitting to produce intelligibility or listening comfort at your partner receiver side.

#### **4.12 PA-CB Switch**

The PA-CB switch converts the unit into a powerful Public Address System. The "PA" function requires use of an optional 4 — 8 Ohm paging speaker. This

#### **4.13 $\Delta$ Tune Switch**

The delta tune switch is an electronic tuning circuit which allows you to shift the frequency of your receiver. This allows you to compensate for an incoming signal which may be slightly off frequency. Adjust the tuning control for maximum "S" meter reading.

#### **4.14 Transmit Light**

Your transceiver is equipped with modern light emitting diode (LED) transmit indicator light. This light will be lighted red when the transceiver is in the transmit mode.

#### **4.15 PA Speaker Jack**

For attaching optional 4 — 8 Ohm PA speaker, use 3.5mm jack.

#### **4.16 External Speaker Jack**

You may add any 4 — 8 Ohm external speaker. Simply plug your accessory speaker into the jack. Inserting the 3.5mm plug will automatically disconnect the internal speaker.

#### **4.17 DC Connector**

This connector is used to supply power to your unit. The plug-in feature allows easy removal for switching vehicles.

#### **4.18 Antenna Connector**

A Standard SO-239 type connector is supplied for attaching either mobile or base antennas fitted with a PL259 plug.



#### **4.19 Microphone**

The receiver and transmitter are controlled by the press-to-talk switch on the microphone. To transmit, simply press in this switch. Release the switch to receive. When transmitting, hold the microphone three to four inches from your mouth and speak clearly at normal voice levels.

#### **5. POWER SUPPLY**

Almost all cars and most trucks currently operating in the U.K. are negative earth. There are some large trucks and construction equipment which do operate on positive earth. Your unit will operate on either. In the negative earth systems the minus (—) pole of the battery is attached to the car body, engine block, etc.

##### **Negative Earth Hookup:**

Attach the red (fused) wire to the fuse block terminal or any convenient plus (+) lead. Devices operated by the ignition key such as the radio, light, etc. are best since when you turn the ignition off, the unit will be turned off. Attach the black lead to the car body via any convenient method.

**Note:** Many newer cars use plastic dash facias. Make sure the screw or contact you choose is attached to the metal framework of the car.

##### **Positive Earth Hookup:**

In the event that you do have a positive earth vehicle, the following hookup must be made. Attach the red (fused) lead to the car body via any convenient screw, bolt, etc. Attach the black lead to the terminal block or any convenient wire which goes to the minus (—) pole of the battery.

Failure to make the proper connection could result in unit damage.

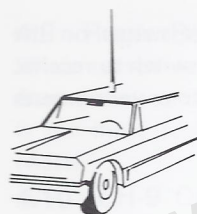
#### **6. ANTENNA REQUIREMENT**

This transceiver will operate with any standard 52 ohm ground-plane, vertical, mobile whip, long wire or other CB antenna. A standard SO-239 type connector is provided on the back panel for use with popular PL-259 antenna plug. Licence conditions require that the antenna shall be a single rod or wire, not exceeding 1.5m in overall length.

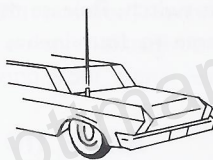
##### **Mobile Antennas:**

A vertical whip antenna is best suited for mobile use. A non-directional antenna must be used for best results in any case. The base loaded whip antenna will normally provide effective communication. The antenna uses the metal car body as a ground-plane and the shield of the base lead as well as the metal case of the transceiver should be earthed. A standard antenna connector (type SO-239) is provided on the transceiver for easy connection to a standard PL-259 cable termination.

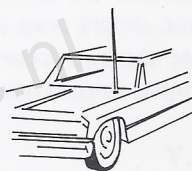
The antenna's mounted location on the vehicle affects the operation of the transceiver. Transmission and reception characteristics vary for different antenna locations. Four most popular antenna mounting shown below:



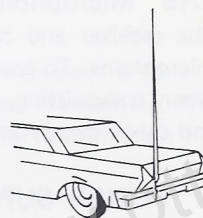
ROOF MOUNT



REAR DECK



FRONT COWL MOUNT



BUMPER MOUNT

### **Front Cowl Mounting**

Front cowl mounting offers a number of advantages. The CB antenna can be mounted in place of the regular auto radio antenna and will thus provide the minimum of installation problems. The antenna can then be used for both the CB and standard auto radio by employing any of the commercially made two-way couplers available. In this location you can install a short loaded whip, with only a small loss of efficiency.

The horizontal radiation pattern in such a location is slightly irregular, radiation being slightly greater in the direction of the rear fender opposite to the side on which the front cowl antenna is mounted.

### **Roof Mounting**

Roof mounting is usually the best location because it provides an almost perfect omnidirectional radiation pattern. However, the use of a 1.5m base loaded antenna on the roof of a vehicle is fairly impractical and a shorter, loaded whip is usually installed in this location, even though this type offers lower efficiency.

### **Rear Deck Mounting**

Rear deck mounting permits the use of a 1.5m, or a base loaded, shorter antenna. The radiation pattern in such a location is somewhat irregular, radiation being slightly greater in the direction of the front fender opposite to the side on which the rear deck antenna is mounted.

### **Bumper Mounting**

This arrangement uses the rear bumper of the car and is by far the most practical for use with full 1.5m base loaded whips. Another advantage is that removal of the antenna is simple and leaves no holes in the car body. The radiation pattern produced by an antenna mounted on the left rear bumper is fairly irregular, with greatest radiation being in two directions — one to the right and forward slightly, the other to the rear and left slightly.



### **Base Station:**

When this unit is used as a base station, any Citizens Band, ground-plane or vertical antenna may be used. A ground-plane type will provide greater coverage, and since it is essentially non-directional, it is ideal in base station to mobile operation. From base station to base station, the range of the transceiver depends basically on the height of the antenna, and whenever possible, select the highest location within the licence conditions.

## **7. MOBILE INSTALLATION**

A location in the car or truck should be chosen carefully for convenience of operation and non-interference with normal driving functions. Mounting may be under the dash or instrument panel or any place a secure installation can be made. The carrying handle again serves as the mounting bracket or additional perforated straps or brackets may be used as desired. The 12 Volt cable may be connected to any convenient terminal but preferably to the ignition switch to prevent unauthorized persons from operation of your unit. With this method the unit will only operate when your key is turned on. Engine ignition interference should not be a problem and vehicles equipped with standard broadcast radios will have enough suppression to eliminate ignition interference. If interference is present, any skilled auto radio repairman should be able to eliminate it for you.

## **8. BASE STATION INSTALLATION**

To operate your CB radio in the home, a suitable 12V DC stabilised power supply must be used as the source of power. The 12V DC power supply is plugged into the mains and the CB radio's red and black leads are connected to the terminals on the power supply. Be sure to connect them correctly following the instructions supplied with the transformer. NEVER CONNECT A CB RADIO DIRECT TO 220V AC MAINS. Consult your dealer to ascertain which 12V DC power supplies are suitable.

## **9. GENERAL OPERATING PROCEDURE**

Check to see if the proper connections have been made on the power cable, antenna system, and microphone.

### Receiver

- a. Put PA-CB switch to the CB position.
- b. Plug in microphone.
- c. Set Channel Selector to the desired channel
- d. Turn the volume and squelch controls fully counter-clockwise.
- e. Rotate the volume control clockwise. You will hear an audible "click" and the meter and channel LED lights will come on. Continue rotating clockwise to desired listening level.
- f. With no signal present, rotate the squelch control clockwise until the rushing noise disappears.

### Transmitter

**Caution:** Never operate this unit without an adequate antenna system or load. Antenna SWR should not exceed 3:1. Failure to follow these recommendations could result in damage to the RF output transistor.

To transmit, depress the Push-To-Talk switch on the microphone. Hold the microphone 3 to 5 inches from your mouth and talk at a normal level.

## 10. PUBLIC ADDRESS

Attach an optional paging speaker to the P.A. jack on the back of the unit.

Put the PA-CB switch to the "PA" position. To activate circuit, simply depress the Push-To-Talk switch on the microphone.

In some cases, feedback may occur if there is not enough separation between the microphone and paging speaker. Rotate microphone so it is 180 degrees from speaker. If this does not solve the problem, you may have to move the speaker further away.

## 11. ROGER BEEP FACILITY

Your transceiver has the built in Roger Beep Facility. Each time the PTT lever is released, a tone is transmitted to the receiver though it will not be audible at your transmitter. This is for those receiving your signal who will know when your transmission has ended.

## 12. USING CB IN AN EMERGENCY

Channel 9 is the officially recognised emergency channel in your local area. This channel will very likely be monitored by REACT (Radio Emergency Associated Citizens Teams), other voluntary organizations or independent CB users.

Before you have an emergency of your own to report, it is useful to listen to Channel 9 to get an idea of the way in which an emergency message is exchanged.

### 13. UNDERSTANDING SWR (Standing Wave Ratio)

In theory, your transceiver has a 50 ohm output and your antenna is 50 ohms. If a 50 ohm cable (such as RG58/U or RG8/U) is used, all the power from your transceiver will be transmitted via the coaxial cable and radiated by the antenna. Under these conditions, the SWR (standing wave ratio) of your antenna system would be 1:1. In practice, the antenna must be 50 ohms and tuned to the exact channel. This condition seldom exists and standing waves are set up on the cable. This SWR robs you of power and likewise range. While 1:1 is not always possible to attain, you should tune your antenna system so the SWR does not exceed 1.5 to 1 or at maximum 2 to 1. Here are some examples of the power losses for various SWR ratios:

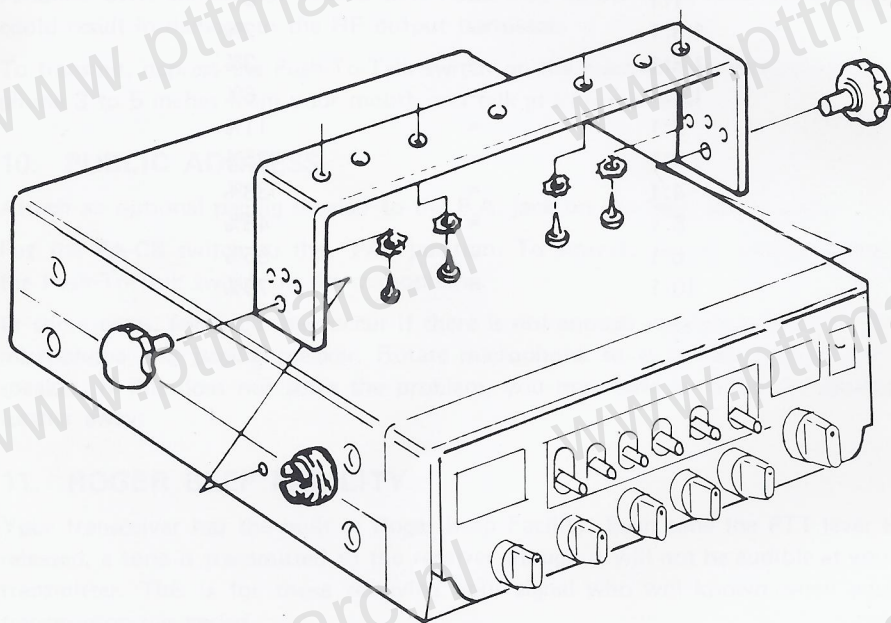
SWR		Power Losses
1:1	=	0
1.3:1	=	2%
1.5:1	=	3%
1.7:1	=	6%
2:1	=	11%
3:1	=	25%
4:1	=	38%
5:1	=	48%
6:1	=	55%
10:1	=	70%



## 14. MOUNTING INSTRUCTIONS

### Mobil Installation

Before installing the transceiver in a car, truck, boat, etc., be sure to choose a location which is convenient to the operating controls, and will not interfere with the normal functions of the driver. The transceiver may be mounted to the underside of the instrument panel or dashboard of a car, truck, etc., by means of the special bracket that is supplied with the transceiver.



## 15. TECHNICAL SPECIFICATIONS

### General

#### Operating Frequencies:

Channel	1	26.965 MHz	Channel	21	27.215 MHz
"	2	26.975 "	"	22	27.225 "
"	3	26.985 "	"	23	27.255 "
"	4	27.005 "	"	24	27.235 "
"	5	27.015 "	"	25	27.245 "
"	6	27.025 "	"	26	27.265 "
"	7	27.035 "	"	27	27.275 "
"	8	27.055 "	"	28	27.285 "
"	9	27.065 "	"	29	27.295 "
"	10	27.075 "	"	30	27.305 "
"	11	27.085 "	"	31	27.315 "
"	12	27.105 "	"	32	27.325 "
"	13	27.115 "	"	33	27.335 "
"	14	27.125 "	"	34	27.345 "
"	15	27.135 "	"	35	27.355 "
"	16	27.155 "	"	36	27.365 "
"	17	27.165 "	"	37	27.375 "
"	18	27.175 "	"	38	27.385 "
"	19	27.185 "	"	39	27.395 "
"	20	27.205 "	"	40	27.405 "

Type of Emission: F3

Channel Spacing: 10 KHz

Frequency Composition: PLL Synthesizer

Power Source: 12V DC Negative or Positive Earth

Operating Temperature Range:  $-10^{\circ}\text{C}$  —  $+55^{\circ}\text{C}$

### Electric Specifications

#### Receiver Section

- a. Receiver System : Dual Conversion Superheterodyne
- b. Intermediate Freq. : 1st IF: 10.695 MHz  
2nd IF: 455 KHz
- c. Sensitivity :  $0.5\mu\text{V}$  (20dB S/N) nominal
- d. Adjacent Channel Selectivity : 45dB nominal  
(@+10 KHz)
- e. Squelch Threshold Sensitivity : less than  $-10$  dB NQ level nominal  
(approx 0.15 to  $0.2\mu\text{V}$ )

- f. Squelch Tight Sensitivity : 50 $\mu$ V maximum nominal
- g. Spurious Response Attenuation : 60dB nominal
- h. Image Rejection : 45dB nominal
- i. Receiver Spurious Emissions : less than 20nw
- j. Audio Output Power : 4 watts at 4 ohm  
(@10% THD at 1 KHz) 2 watts at 8 ohm
- k. Audio Freq. Response : +2  
-8 dB per 6dB/OCT at 0.3 — 3 KHz
- i. Current Drain : Stand-by 0.25A nominal  
Receiving max. 0.8A nominal

### Transmitter Section

- a. RF Output Power : 2 watts max.
- b. Freq. Deviation (@ 1 KHz) :  $\pm$ 1.5 KHz max.
- c. Audio Freq. Response : +2  
-5 dB per 6dB/OCT  
at 0.3 — 3.0 KHz pre-emphasise
- d. Spurious Emission : less than 50uw  
41 — 68 MHz  
87.5 — 104 MHz  
162 — 230 MHz  
470 — 862 MHz
- Other Freq. : less than 0.25 $\mu$ W
- e. Adjacent Channel Power : less than 10 $\mu$ W
- f. Current Drain @12.0V : 2A nominal