Microair Avionics

MA-760 TRANSCEIVER INSTALL & USER MANUAL
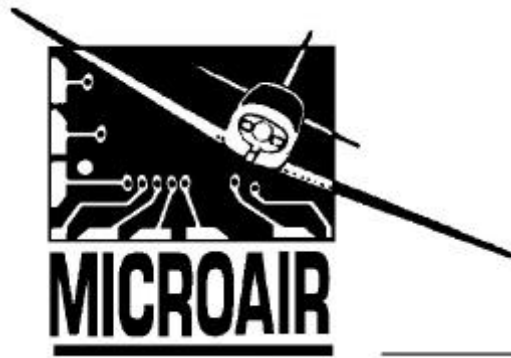
About This Document

This manual describes the various installation configurations available for the Microair MA-760 Transceiver. The Transceiver's controls and design features are described and illustrated.

Microair reserves the right to amend this manual as required, to reflect any enhancements or upgrades to the MA-760 Transceiver.

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MICROAIR MA-760 ACCESSORIES

RB-01 SWITCH MODULE
RB-02 SWITCH MODULE
WIRING HARNESS
MA-700 HEADSET
MA-700 ANR HEADSET
FLEXIBLE BOOM MICROPHONE

CURRENT REVISION STATUS

Revision	Date	Change
K	31/01/2000	Initial release
L	18/11/2001	Additional install data and wiring diagram added

Table of Contents

Introduction

Thank you for purchasing this Microair product. The MA-760 is a 760 channel VHF aircraft transceiver, packaged to fit a standard 57mm (2 ¼") instrument hole. The MA-760 has been produced in accordance with APMA E2000-004.

Unpacking

The MA-760 is boxed in polystyrene for physical protection, and wrapped in an anti-static bag for electrical protection. Once the box is opened and the radio unwrapped, the owner is responsible for physical and electrical protection.

Enclosed with the radio are: User / Install Manual
Warranty Card
CASA form 1 – release certificate
DB15 solder plug and backshell

User / Install Manual

Please read this manual completely before attempting to install or operate this radio. There are several installation options you may wish to consider, which are clearly laid out in the installation section.

The MA-760 has all of the basic radio operations, and many other management and programming options, which are described in the operation and memory sections of this manual.

Warranty Card

Please complete the warranty card and post it back to Microair. The obvious benefit is to ensure your 12 month warranty is recognised (refer to the limited liability warranty statement on the back cover of this manual).

Another benefit of returning the card is, it allows Microair to send you service data directly, should the need arise. Microair monitors all feedback on its products. Should the need arise to alert or advise customers of a potential problem, good installation ideas, or things to avoid, Microair will despatch a service bulletin to the customer address list on file.

Release Note

The CASA form 1 – release note is an internationally recognised document which clearly identifies the part/component the form 1 is associated with. Please keep this certificate with the aircraft's file or log book.

Description

The MA-760 VHF Transceiver has a 57mm (2 ¼") round face to fit a standard small instrument hole. The case is 59mm high x 65mm wide x 135mm long.

Front Face   Rear Face
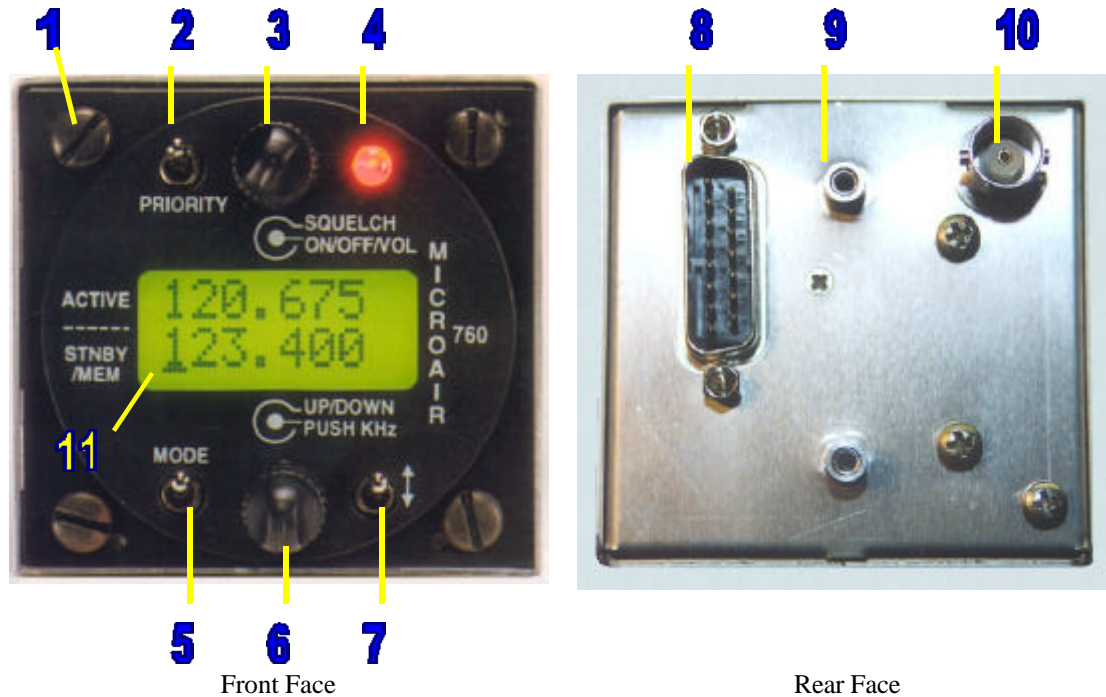
| ITEM	CONTROL	DESCRIPTION
1	M4 Machine Screw	
2	Priority Switch	Momentary push down switch
3	Volume / On / Squelch	Click On - Rotate knob for volume Rotate ring for squelch
4	Receiver / Transmit Annunciator	Red / Green LED
5	Mode Switch	Momentary push down switch
6	Frequency Adjust	Rotate for MHZ adjust Push briefly to change to KHZ Rotate for KHZ adjust
7	Toggle Switch	Momentary push down switch
8	DB15 Connector	Push in fit with lock nuts
9	M3 mounting stud for Switch module	
10	BNC Coaxial Connector	
11	LCD Display	Two lines of eight characters each

Installation

Physical Installation

The MA-760 is very simple to physically install in an aircraft's instrument panel. Select or cut a 57mm (2 ¼") instrument hole for mounting. Present the MA-760 to the rear face of this hole. The stepped round face will insert through the hole, and should appear flush with the front of the instrument panel when correctly positioned. Rotate the MA-760 to align the four M4 machine screws.

For installations where the existing instrument panel screw holes are 1/8", the hole will need to be enlarged to 5/32" to fit the M4 machine screws.

Insert and tighten all four M4 machine screws. The MA-760 requires no rear support, the M4 screws provide all of the physical mounting required.
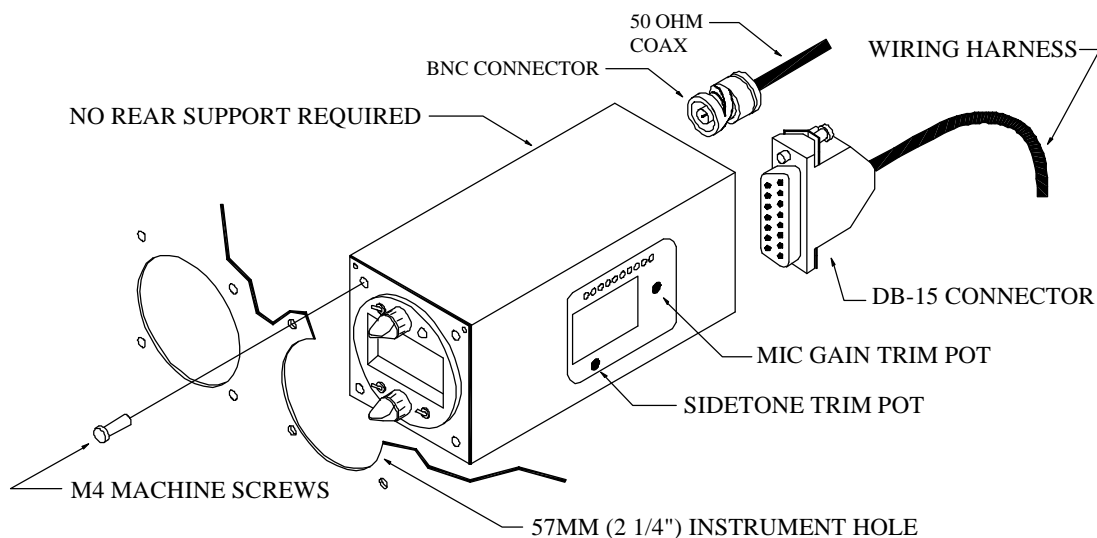
MICROAIR MA-760
PANEL INSTALLATION

The MA-760 should be located in the aircraft within view of the pilot seated in the pilot-in-command position, and afford this pilot good access to the front face controls.

Warning

Do NOT oversize the mounting holes in the front face of the radio, to an imperial size. Drilling will damage internal components.

Do NOT replace the M4 machine screws supplied with the radio with longer screws. Over-length screws will touch or even crush internal components and cause damage.

Either of these actions will void the warranty.

Electrical Installation

Microair recommends the use of the wiring in the table below for the various parts of the radio harness:

Line	Wire
Power & Ground	Tefzel 18 awg wire
Intercom	Tefzel 22 awg wire
PTT	Tefzel 22 awg wire
Memory	Tefzel 22 awg wire
Signal Ground	Tefzel 22 awg wire
Speaker	Tefzel 22 awg single core shielded
Microphone	Tefzel 22 awg single core shielded
Headphone	Tefzel 22 awg single core shielded
Aerial	RG58C/U 50 ohm Coaxial Cable

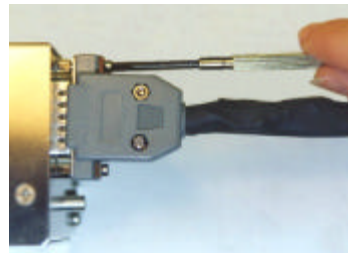All wiring is connected by soldering to the DB15 connector.

Strip the insulation back 2mm (1/16"), and "tin" the exposed conductor with solder. Slide a 5mm length of 3.2mm (1/16") heatshrink tubing over the end of the wire. After checking the wiring diagram for the correct pin number, push the "tinned" end into the terminal, and solder into place. Check the soldered joint has been made, by gently pulling on the wire. Slide the heatshrink tubing down over the soldered pin, to completely cover the conductor.
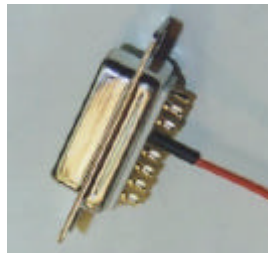
"Tinned" wire	Soldered with heatshrink	Locking bolts tighened

Cover the soldered joints with the grey plastic backshells. Ensure that the locking bolts are in place before closing the backshells. Connect to the rear of the radio with a push fit, and secure the locking bolts (top and bottom).

The coax is cut to length and terminated in a BNC connector. Soldered or crimp type connectors are preferred to the solderless variety, as they have lower signal loss and better shielding.
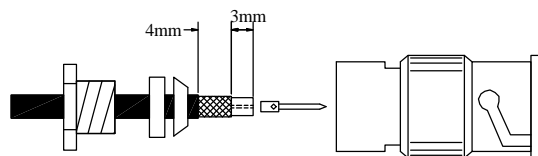
BNC Connector

The MA-760 can be wired in several different configurations, to suit the various needs. The wiring diagrams located in Appendix A cover the most commonly used variations.

Antenna

For certified aircraft the MA-760 should only be operated with a TSO DO-160D compliant antenna. The antenna may be ¼ wave whip or ½ wave dipole, using 50ohm coaxial cable and a BNC connector for connection.

For non-certified aircraft using a non-TSO compliant antenna, the VSWR must be checked to ensure the ratio does NOT exceed 1:3:1 across 118.000 – 136.975Mhz range. A VSWR of 1:5:1 can be tolerated by the MA-760 without injury, but transmission performance starts to become impaired. If an external ¼ wave whip antenna is used, ensure that the whip has a sufficient ground plane at the base of the whip. The whip element should be positioned as close to vertical as possible, with the ground plane as horizontal as possible (flat).

Do not use the stubbie "rubber duckie" antennas meant for use with handheld radios.

Backlighting

The backlighting is activated, by taking input supply voltage to pin 8. This line can be individually switched outside the DB15 connector to enable the backlighting to be turned off. If the backlighting is wired but not switched, the backlighting will come on when the master switch is turned on. The aircraft may be started with the radio off, but with the backlighting active, without the possibility of injury to the radio.

To ensure complete protection for the MA-760, take both power input lines (pin 9 & 10) and the backlighting line (pin 8) to the *Avionics Master*.

Power savings

For installations, operating from a battery only, Microair recommends saving battery power by *NOT* wiring the backlighting – do *NOT* wire pin 8. The backlighting will draw an additional 80mA of power. This nearly doubles the standby power demand. Hence not connecting the backlighting can effectively double the running time on your battery.

Another small power saving can be made by closing the sidetone. This is an option for operators using a cabin speaker only (eg sailplanes).

The operator should remember that the minimum operating voltage is 10.7 volts. This is the *loaded* voltage (ie the voltage when the radio is transmitting). For battery operators, check the battery voltage level, then press the PTT briefly to note the voltage drop. If the loaded voltage dips close to 11 volts, change the battery.

Microphone

The MA-760 can be operated with an Electret Insert or Amplified Dynamic microphone. These alternatives cover most aviation headsets and hand microphones.

For operators wanting to use a dynamic microphone, a mic amplifier must be used. Microair recommends the installation of the Microair MD-01a amplifier. This amp is only 46mm x 12mm (1.8"x 0.5") in size, and is connected in line with the existing mic lines.
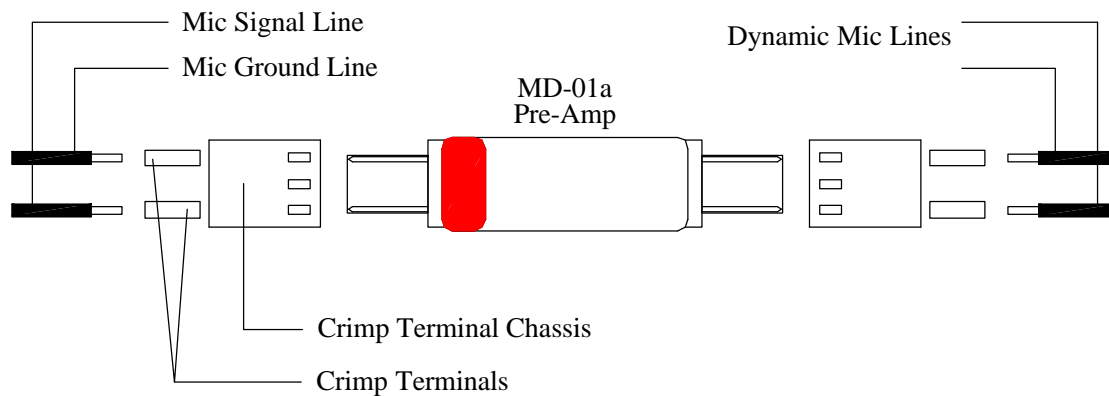
Speaker

Microair recommends using a 5 watt minimum speaker of either 4 or 8 ohm impedance. Check your speaker choice by ensuring the audio is clear up to at least ¾ volume.

Intercom

The MA-760 utilises the sidetone facility, to produce a "hot mic" intercom. This means the mics are "live" at all times, to the pre-set levels of the sidetone and the mic gain. Both pilot and co-pilot can speak and be heard at all times. Hot mic operation is *not* a VOX system where the mics only come on when a pre-set noise threshold is reached (ie when you speak the mic comes on).

It is therefore important to ensure that the sidetone and mic gain are set to the correct levels, so that the mics do not pick up large amounts of ambient noise. The sidetone and mic gain are pre-set in the factory to levels which should suit most general aviation needs. Microair recommends that mic-muffs be fitted to all microphones, as a principal way of reducing the pick up of ambient noise.

If, after installing, and trying the intercom, there is too much background (ambient) noise, re-set the sidetone and the mic gain in the following way:

1. Connect headset(s) to the radio
2. Turn down headset volume to minimum
3. Close sidetone trim pot, and adjust mic gain to approx 50% of available range
4. Speak into microphone with a constant "Laaaa" tone, and increase the sidetone setting
5. When the threshold point is reached the "Laaaa" tone will be heard in the headphones. Stop turning the sidetone trim pot when the threshold is reached
6. Adjust the mic gain until good volume, with clear audio can be heard
7. Check this level again with the headset volume at maximum to ensure it is not too loud or distorted.

Please refer to the figure below to see how the trim pots are adjusted. The trim pots have a total movement of only 270 degrees (3/4 turn). The heads of the trim pots are plastic, and can be distorted or broken off unless adjusted with great care. A small straight blade screwdriver with an insulated shaft is required. Ensure the radio is turned off before punching the hole under the black dot, and probing for the slot in the head of the trim pot. Once the screwdriver is engaged on the trim pot, the radio can be turned on, and the adjustment made.
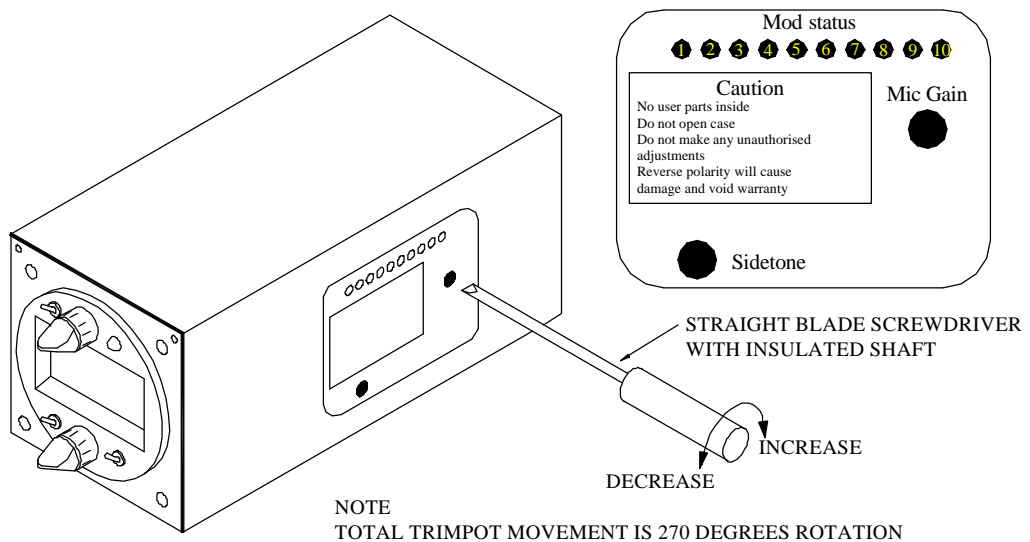
MICROAIR MA-760
TRIMPOT ADJUSTMENT

Warning
Do not attempt to adjust the modulation or power output. These adjustments can only be set correctly by a qualified technician. Adjustment of the power output or modulation by anyone other than Microair or their approved agent will void the warranty.

Control Functions

Priority Switch

The priority switch is a push down switch. When pushed down *briefly*, the radio will go into memory mode, and select the frequency stored in memory 25. Memory 25 should be considered the *priority* channel, which the user can quickly select when required. Memory 25 must be programmed for the priority switch to operate. Memory 25 is set at the factory as the international distress frequency 121.500MHz. Memory 25 can be programmed the same way as any of the other channels (refer memory programming), hence the factory default can be edited.

Volume / Squelch Knob

The MA-760 is turned on, by rotating the volume knob. A positive "*click*" is heard and felt at the start of the rotation to indicate the on/off position. The volume is increased by rotating the knob clockwise, and decreased by rotating counter clockwise.

The squelch is adjusted by rotating the ring behind the volume knob. There is no automatic level set for the squelch, however the ring affords a large manual adjustment to suit all situations. Rotate the ring clockwise to increase the squelch threshold, and counter clockwise to lower the threshold. When the squelch is "*broken*" (ie the static hiss can be heard), the annunciator LED lights green.

Note: This does NOT mean you are receiving a signal!

Annunciator LED

The LED operates red or green, and indicates the following states:

Clear (off)	Radio is squelched above the threshold, and is not receiving a signal
Green	Squelch is broken or a signal is received
Red	Radio is transmitting
Flashing Red	Radio has transmitted for over 30 seconds (warning)

The flashing red signal may draw the user's attention to the fact that the aircraft may have a stuck PTT button! Transmissions in excess of 30 seconds should be avoided.

Mode Switch

The mode switch is a push down switch. When pushed down *briefly* the radio will step to the next operating mode. The MA-760 has four operating modes:

Toggle mode

The display shows the active or in use frequency on the top line. The standby frequency is displayed on the bottom line.


Memory Mode

The top line displays the memory or **MEM** number, and the lower line displays the frequency for that memory. The displayed memory becomes the frequency the moment it is displayed. The user can scroll through the programmed memories by rotating the frequency adjust knob, or by pressing the remote memory button.
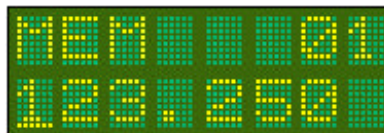
Program Mode

The **MEM** is replaced with **PROG** on the top line. The frequency stored in each memory can be set, changed, or cleared in this mode (refer memory programming).
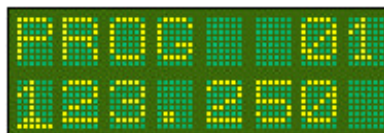
Scan Mode

By holding down the toggle switch for 3 seconds, the MA-760 goes into scan mode. The programmed memories are cycled quickly across the display. The MA-760 checks each memory in turn for any signal. If there is no signal the radio moves to the next programmed memory. When a signal is detected, the scan locks to that memory to receive the signal. This memory is held for 10 seconds after the signal finishes to afford the user an opportunity to reply on that memory channel. The user can stop the scan operation by pressing down *briefly* the toggle key, or the PTT button.

Frequency Adjust Knob

The standby frequency can be changed by scrolling the frequency adjust knob. Rotate knob to scroll the MHz half of the standby frequency. Press the knob in briefly to move the cursor to the KHz half of the standby frequency. Rotate the knob again to scroll the KHz. After 5 seconds of inactivity the cursor will move back to the MHz side of the standby frequency.

Only the standby frequency can be changed directly, the active frequency cannot be directly altered by the frequency adjust knob.
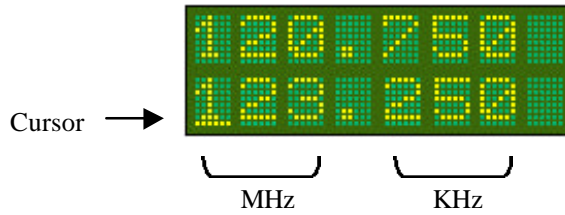
Toggle Switch

The toggle switch is a push down switch. When pushed down *briefly*, the active and standby frequencies exchange places. Hold the toggle key down for 3 seconds to activate the scan function.
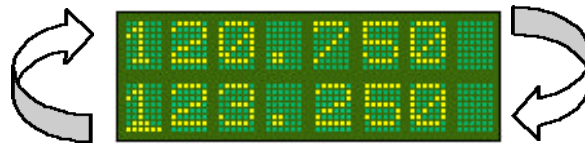
Memory Programming

The MA-760 has 25 programmable memories, for storing commonly used frequencies.

Use the mode switch to move the display to the program mode. The word PROG will appear on the top line, with the memory number on the right hand side. On the lower line is the currently stored frequency in that memory.

The cursor can be cycled through the MHz, KHz, and memory number by pressing the frequency adjust knob.

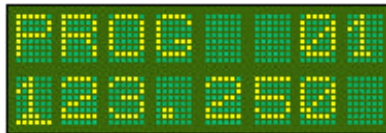Move the cursor to the memory number and select the memory number for programming, by rotating the frequency adjust knob.

Press the frequency adjust knob to move to the MHz section. Rotate the frequency adjust knob to scroll to the desired value.

Press the frequency adjust knob to move to the KHz section. Rotate the frequency adjust knob to scroll to the desired value.

Cycle cursor between program number, MHz, and KHz, by pressing the frequency adjust knob inwards briefly. Rotate the frequency adjust knob to change value.

With the memory number, and frequency set to the correct values, press down the toggle switch *briefly*. The word **STORE** appears briefly on the top line.

To clear a memory, scroll to the desired memory, and press down the priority switch. The word **CLEAR** appears on the top line.

The user can now move to another memory for programming. Press the frequency adjust knob to move the cursor back to the memory number, and scroll to next memory for programming.

When all programming is complete, press the mode switch to move on from the program mode, back to the active/standby toggle display.

When operating in memory mode, the programmed channels can be scrolled through, by rotating the frequency adjust knob, or by pressing the remote memory button. Only programmed memories are displayed.

Operating the priority switch in either toggle or memory mode will move the MA-760 to memory 25. The user should consider carefully what frequency to program in memory 25. The factory default is the distress frequency 121.500MHz.

Operation

The MA-760 should always be turned off, before starting the aircraft to protect the radio from transient voltages. After starting, the radio can be turned on, and the squelch adjusted so the static hiss can be heard through the headphones. The LED annunciator will light green while the hiss is heard. Use the hiss tone to adjust the volume to an appropriate level. With the volume set, turn the squelch ring to break the squelch and eliminate the hiss. The LED annunciator light will go clear.

The intercom volume is pre-set, and not affected by the volume knob.

The MA-760 can now be adjusted to the correct active and standby frequencies, by scrolling and pressing the frequency adjust knob.

The MA-760 will transmit when the PTT button is held down. The LED annunciator will light red. When transmitting the user will hear themselves speaking through their own headphones via the sidetone system.

If the transmission lasts longer than 30 seconds, either because you have a lot to say, or because the PTT has stuck, the LED annunciator will flash red. When this happens, check the PTT immediately. If you find no obvious fault, turn the radio off, and then on again. If the LED is still red, turn the radio off and leave it off.

Remote Memory Button

If fitted at installation, the remote memory button will allow the user to toggle (exchange) the active and standby frequencies. The remote memory button is typically mounted next to the PTT on the stick.

If the user elects to operate in memory mode, the remote memory button will step through the programmed memories. If the Remote memory button is held down for 5 seconds, the MA-760 will go into scan mode, and automatically scroll through the programmed memories, searching for a signal.

To terminate the scan operation, the PTT is pressed *briefly*.

The remote memory button is highly recommended. It allows the user to be able to keep hands on the controls during flight, while changing channels or scanning.

Operation with Switch Modules

Microair offers the option to install either the RB-01 or RB-02 switch modules to the MA-760. The switch module plugs into the DB-15 connector on the rear of the MA-760, and is secured by 2 x M3 machine screws to the M3 studs on the rear face of the radio.
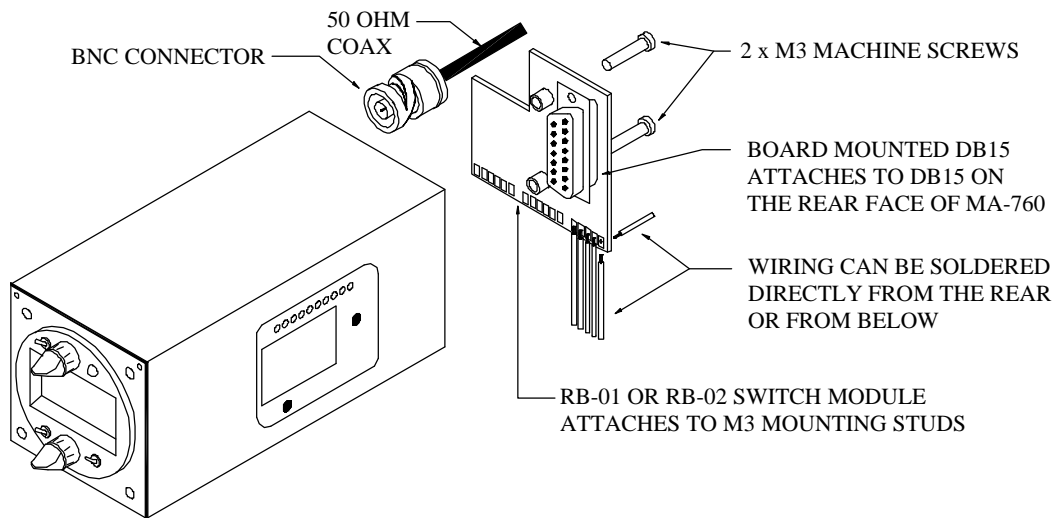
MICROAIR MA-760
FITTING OF RB SWITCH MODULES

RB-01 Switch Module

The two relays on the switch module are triggered to separate PTT lines for the pilot and co-pilot. The relays are configured to allow the pilot's PTT to "cut-in" over the operation of the co-pilot's (student's) PTT. This feature allows the pilot to interrupt the co-pilot's/student's radio call if required.

The RB-01 has inputs for a second comm radio. The second comm can be an aviation radio or any VHF/UHF band radio. The second input can also be used for music equipment (ie CD player).

The second comm inputs can be used to adapt certain types of cellphone if installed with a full car kit. Microair recommends the installer takes appropriately qualified advice regarding the installation of cellular equipment before proceeding.

The RB-01 has a trimpot for the adjustment of the mic gain from the second comm's microphone. There are two more trimpots to adjust the audio level for the MA-760, and the second comm.

RB-02 Switch Module

The RB-02 is a simpler version of the RB-01, with just the two relay operation on the PTT lines. The relays are configured to allow the pilot's PTT to "cut-in" over the operation of the co-pilot's (student's) PTT. This feature allows the pilot to interrupt the co-pilot's/student's radio call if required.

Appendix A

MA-760 DB-15 CONNECTION

Pin	Signal
1	MICROPHONE
2	MIC GROUND
3	MICROPHONE
4	NOT WIRED
5	INTERCOM
6	NOT WIRED
7	PTT
8	LED BACKLIGHTING
9	+ 10-16 VOLTS IN
10	+ 10-16 VOLTS IN
11	GROUND
12	GROUND
13	REMOTE MEMORY
14	HEADPHONE
15	SPEAKER

MICROPHONE — PILOT MICROPHONE
MIC GROUND
MICROPHONE — CO-PILOT MICROPHONE

INTERCOM ON/OFF SWITCH

PILOT HEADPHONES
CO-PILOT HEADPHONES

BACKLIGHTING ON/OFF SWITCH

CO-PILOT PTT
PILOT PTT

REMOTE MEMORY BUTTON
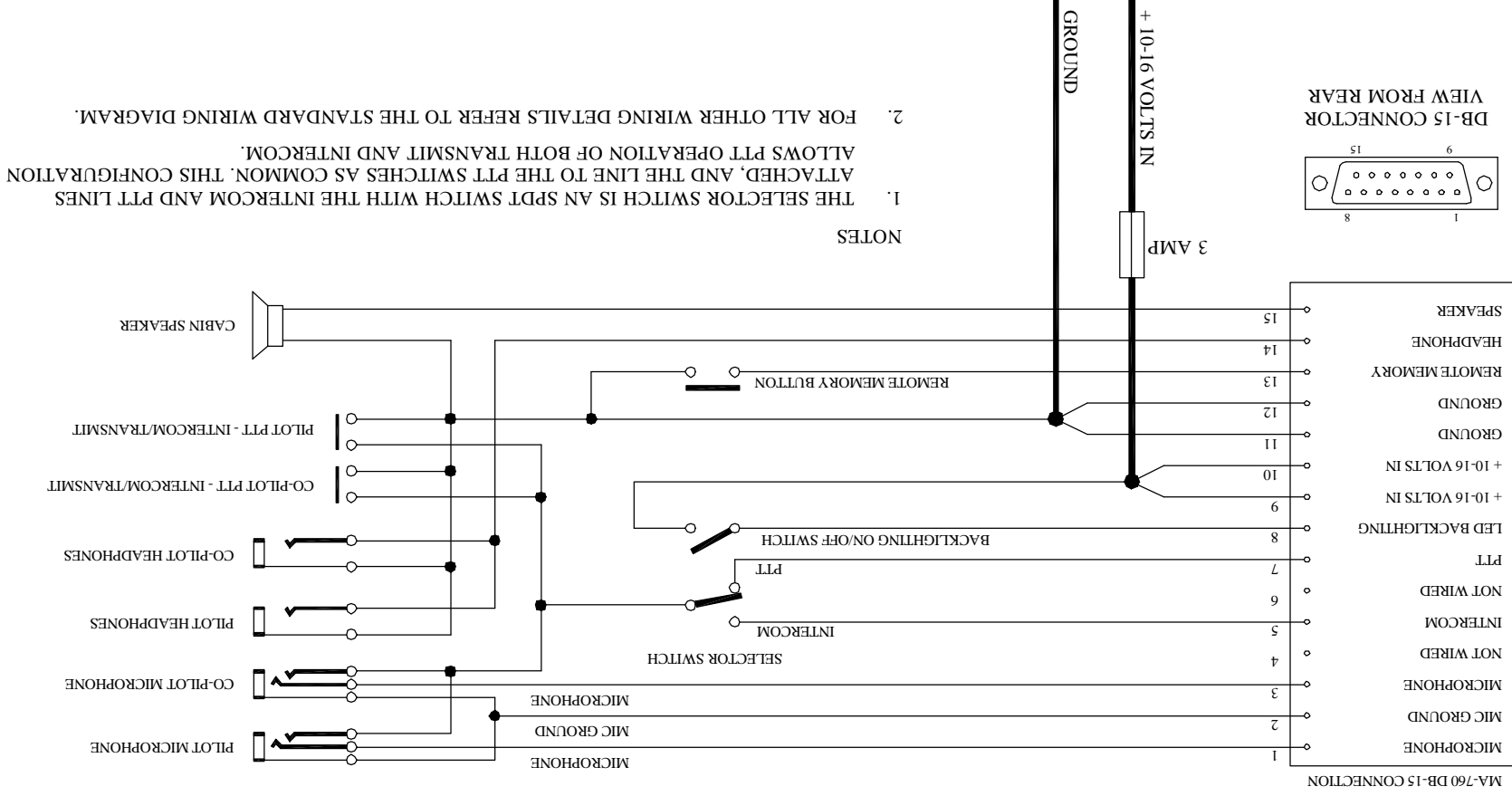
CABIN SPEAKER

3 AMP

+ 10-16 VOLTS IN

GROUND

1 8
9 15

DB-15 CONNECTOR
VIEW FROM REAR

NOTES

1. THE PTT AND REMOTE MEMORY BUTTON ARE TO BE MOMENTARY IN THEIR ACTION.
2. THE SPEAKER CAN BE EITHER 4 OR 8 OHM, BUT SHOULD BE MINIMUM 5 WATTS.
3. THE MICROPHONES SHOULD BE GROUNDED TO PIN 2 ONLY. THE MICROPHONE GROUND SHOULD NOT BE CONNECTED TO THE POWER GROUND.
5. POWER FUSING SHOULD BE MINIMUM 3 AMP, AND NOT GREATER THAN 10 AMP.
6. FOR OPERATION WITH DYNAMIC MICROPHONES, THE MD-01 MICROPHONE AMPLIFIER MUST BE USED.
8. THE INTERCOM AND BACKLIGHTING SWITCHES ARE SPST ON/OFF SWITCHES.
9. WARNING - REVERSE POLARITY WILL INJURE THE MA-760 AND VOID THE WARRANTY.

MICROAIR MA-760 TRANSCEIVER
WIRING DIAGRAM
STANDARD INSTALLATION

Appendix B

Specifications

Radio Type	Amplitude Modulation (AM) Aircraft Transceiver
Channels	760 channels, 25KHz spacing 118.000 – 136.975MHz
Frequency Selection	VFO dial
Frequency Display	2 line alpha/numeric LCD display (with backlighting)
Frequency control	PLL frequency synthesis, which is microprocessor controlled Memory is store in non-volatile EPROM
Memories	25 programmable memories with scan function
Power consumption	Receive (no signal) 86 mA Transmit 1.2 A
Input Voltage	10.7 – 18 Volts Warning damage will occur above 16 Volts
Power output	4 watts (carrier power 3.8 watts nominal - 12 watts PEP)
Receiver sensitivity	12dB for 1.0 uV 30% modulation (KHz audio)
Receiver Selectivity	-70dB
Squelch Threshold	0.6uV – 5.0uV
Speaker volume output	Nominal 5 watts output to 4 ohms
Headset volume output	Nominal 100milli-watts output to 600 ohms
Temperature range	-30 - +60 degrees Celsius
Stability	+/- 3.00ppm
Dimensions	W-65mm H-59mm D-135mm (plus 35mm for harness) W-2.6" H-2.3" D-5.3" (plus 1.5" for harness)
Exposed dial face	57mm diameter 2 ¼" diameter
Weight	400 grams 19.4 ounces

Limited Liability Warranty

If you do not accept this warranty, return the product immediately to Microair Avionics Pty Ltd.

Microair Avionics Pty Ltd warrant that this product shall be free from defects, in material and workmanship, for a period of one year, under normal use. Our obligation under this warranty is limited to repair or exchange of the product, or any defective part of the product if the product or part is returned to us, shipping pre-paid.

Due to the substantial number of problems that can arise, due to installation errors, we do not accept liability for labour charges or services charges for removal, reinstallation, and adjustment, which are the responsibility of the purchaser, and are not covered by this warranty. Consequential damages and freight costs are also not covered by this warranty.

This warranty is void, should the product be subject to misuse, accident, damage caused by negligence, damage in transit, handling or modification, which in the opinion of Microair Avionics Pty Ltd, has altered or repaired the product in any way that affects the reliability or detracts from the performance of the product.

This warranty is lieu of all other warranties, expressed or implied, and neither assumes or authorises any person to assume any other liability for Microair Avionics Pty Ltd.

Warranty repairs do not extend the original warranty period. The warranty is limited to one year from the date of purchase.

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Supplied by: