

**MX170C NAV – COMM
OWNER'S MANUAL**

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**PART # MNO170C, REV. 1
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I. INTRODUCTION

This manual contains information on the Michel MX170(C), manufactured by TKM, Inc. The information includes installation, operation, mechanical and electrical descriptions and alignment and test considerations. The MX170(C) is authorized by the Federal Aviation Administration to TSO C34e, C36e, C37d, C38d, C40c, and has met the test requirements of RTCA/DO-160C.

A. Purpose of Equipment

The equipment is a 760 channel communication (COMM) transceiver for use in aviation services and a 200 channel navigation (NAV) receiver to provide VOR / LOC signals to navigational converters. The NAV receiver also provides frequency selection for remote mounted Distance Measuring Equipment and Glide slope Receivers.

The MX170(C) is designed to be used as a direct replacement for the King KX170/ KX175. The unit is dimensionally identical to the King units and can therefore use existing aircraft installations. Except for improved performance characteristics, the unit is electrically interchangeable with the King units and will provide the proper audio, navigation and channeling signals for existing installations. New installations can be made using KX170A installation kits. The equipment is a 760 channel communication (COMM) transceiver for use in aviation services and a 200 channel navigation (NAV) receiver to provide VOR/LOC signals to navigational converters. The NAV receiver also provides frequency selection for remote mounted Distance Measuring Equipment and Glide slope Receivers. .

B. Equipment Description

The unit features digital (LED) displays for active (yellow) frequency channel and standby (red) frequency channel for both COMM and NAV.

For channel selection a MHz knob and a KHz knob are provided. For 25 KHz increments in COMM, a 25 KHz button is provided. To activate COMM or NAV frequency selection, an N-C button is provided, a tic appears in the selected standby channel display.

Channel selection operates on the standby channel only. When the desired channel is indicated in the standby display, it may be placed into the active position by depressing the 'Flip-flop' button located left of the displays. The active channel is then placed into the standby position.

The NAV receiver features a VC-ID button to permit selection of voice or ident reception. In the Ident condition a 'tic' is displayed on the active NAV channel display.

The COMM transceiver features a test button which overrides the squelch to verify proper receiver operation and to allow reception of weak signals. Also, provided on the active COMM display is a 'tic' to indicate transmitter power output.

Power switches are incorporated with the NAV and COMM volume controls. The COMM is the master power switch and the NAV provides power switching for remote navigation units.

The MX170(C) is comprised of eight replaceable subassemblies. Five of the subassemblies are contained in shielded modules in order to reduce radio frequency interference. The five are the NAV receiver, the NAV synthesizer, the COMM receiver, the COMM synthesizer, and the Transmitter.

The remaining three subassemblies are the Rear Panel Assembly, the Front Panel Assembly and the Computer Board. The Rear Panel Assembly contains the Audio Amplifier, Power Filter, and the T/R switching. The Front Panel Assembly contains the digital displays, the function select switches and the volume controls. The Computer Board contains the microprocessor, the memory, and program storage.

Also contained on the computer board are the audio processing circuits and the channeling circuits.

The subassemblies are interconnected with plugs so that any module may be replaced without the use of a soldering iron. For equipment repair it is recommended that complete subassemblies be replaced.

As an aid to locating the defective subassembly a set of analog test points are provided. The analog test points include the receiver tuning voltages, synthesizer control voltages, and the AGC lines.

C. Specifications**MX170(C) TRANSCEIVER**

Mounting:	Panel mounted, no shock mounting required.
Size:	6.312 x 2.600 x 14.15 inches w/ connectors (16.03 x 6.60 x 35.94 cm)
Weight:	4.9 lbs excluding external connector and harness.
Power Requirements:	13.75 Vdc (or v w/CONV)
NAV and COMM Recv'r	1.7A
Max COMM Total w/ Transmit (Tone)	7.1A (6.2A unmodulated)

COMM Transceiver

Crystal Controlled:	760 channel
Frequency Range:	118.00 to 136.975 MHz
Frequency Stability:	+ .003%. -20 to 50C

Transmitter

VHF Power Output:	8 watts minimum, 50 ohm
Modulation:	85% capability with 90% limiting provided.
Microphone:	Dynamic mike containing transistorized pre-amp or carbon (must provide at least 120 m Vrms into 500 ohm load).
Side tone:	Adjustable up to 40 mw into 500 ohm headphones.
Duty Cycle:	1 minute on, 4 minutes off (20%)

Receiver

Sensitivity:	1.5 uv (soft) will provide a 6 db minimum signal plus noise to noise ratio (KHz, 30% mod).
Selectivity:	Typical 6 db at +/-7.5 KHz, 60 db at +/- 17.5 KHz,
Spurious Responses:	Down at least 70 db.
Squelch:	Noise adaptive squelch with override.
AGC Characteristics:	From 2 to 100.000 uV audio output will not vary more than 1 db.

NAV Receiver

Crystal Controlled:	200 Channels
Frequency Range:	108.00 to 117.95 MHz
Sensitivity:	1.5 uv (soft) will provide a half-flag indication.
Selectivity:	Typical 6 db at +/- 15 KHz 60 db at +/- 35 KHz,
Spurious Responses:	Down at least 70 db.
Ident Filter:	15 db minimum
AGC Characteristics:	From 26 to 100.000 uV audio output will not vary more than 1 db
NAV Receiver Accuracy:	Two sigma limit, +/- 1 degree
NAV Output:	With LOC adjusted for 0.35 Vrms VOR = 0.5 Vrms (typical) into 20K ohms or greater load impedance.

Audio

Auxiliary Audio Inputs:	Three (3) 500 ohms with 30 db isolation between any two.
Frequency Responses:	Within 6 db from 350 Hz to 2500 Hz
Headphone Output:	40 mw into 500 ohm
Speaker Output:	4.5 Vrms into auxiliary input produces 5 watts audio output.

DME Channeling

	M0	M1	M2	M3		K0	K1	K2	K3		50 KHz
108	-	-	0	-	.0X	0	0	-	-	.X0	-
109	-	-	-	0	.1X	0	0	0	-	.X5	0
110	0	-	-	-	.2X	0	0	0	0		
111	0	0	-	-	.3X	-	0	0	0		
112	0	0	0	-	.4X	-	-	0	0		
113	-	0	0	0	.5X	0	-	-	0		
114	0	-	0	0	.6X	-	0	-	-		
115	-	0	-	0	.7X	-	-	0	-		
116	0	-	0	-	.8X	-	-	-	0		
117	0	0	-	0	.9X	0	-	-	-		

NOTE: (-) = OPEN, (0) = GROUND

ILS Energize:

OPEN for VOR, GROUND for ILS

	GS	GS	GS	GS		GS	GS	GS	GS	GS
	108	109	110	111		0.1	0.3	0.5	0.7	0.9
108	0	-	-	-	.0X	-	-	-	-	-
109	-	0	-	-	.1X	1	-	-	-	-
110	-	-	0	-	.2X	-	-	-	-	-
111	-	-	-	0	.3X	-	1	-	-	-
112	-	-	-	-	.4X	-	-	-	-	-
113	-	-	-	-	.5X	-	-	1	-	-
114	-	-	-	-	.6X	-	-	-	-	-
115	-	-	-	-	.7X	-	-	-	1	-
116	-	-	-	-	.8X	-	-	-	-	-
117	-	-	-	-	.9X	-	-	-	-	1

NOTE: (-) = OPEN, (0) = GROUND, (1) = CONNECTED TO G / S
Switching Line

II. INSTALLATION

The MX170C is designed to be an exact replacement for the KING KX170A and similar units. As a replacement unit, the MX is inserted directly into the mounting tray for the KX170A and tightened down with an allen wrench (5/64).

For new installations, the installation instructions for the KX170A should be used.

Equipment removal is accomplished by rotating the clamp screw counterclockwise a few turns until it can be felt that the clamp screw is disengaged. Excessive torque on the clamp screw will result disassembly of the clamp. After the clamp has been disengaged the unit may be extracted by rocking the unit from side to side. The knobs should not be used as extraction handles. A King Extraction tool # 071-6045-00 is also an acceptable extraction device. Another method for extraction of a tight unit would be to rotate the clamp screw counterclockwise until significant resistance is noted, the clamp screw can then be pulled forward to expose the screw head. Grasp the screw head with a suitable device and extraction force can be applied. Excessive side to side motion should not be applied to the clamp screw.

**** NOTICE TO INSTALLER ****

The TKM MX170C NAV/COMM is authorized by the FAA to TSO C34e, C36e, C37d, C38d, and C40c. The product is an incomplete system. In order to achieve a complete TSO quality system, the MX170C **must** be installed to configure in conjunction with a TSO C37/C38 authorized antenna and a TSO C34e authorized navigation receiver. It is the responsibility of the installer to ensure proper installation.

****CONTINUED AIRWORTHINESS (HBA 98-18)****

Permission is hereby given to installers approved by the recognized aviation authority to reference excerpts from the installation instructions provided by TKM Inc. in order to fulfill documentation requirements for Instructions for Continued Airworthiness (ICA). Adequacy of the documents should not be assumed by this permission. ICA documentation rests solely with the ICA applicant. The MX170C product is 'Repair on Condition Only'.

MX170(B/C) INTERCONNECT

The following table lists the pin description for the MX170C external interconnect:

Pin #	Description	Pin #	Description
1	NAV A +	22	DME M0
2	GS +	23	DME M1
3	VOR/LOC Signal	24	DME M2
4	ILS ENABLE	25	DME M3
5	50 KHz GS	26	NAV A+ Switched
6	0.1 MHz GS	27	DME K0
7	0.3 MHz GS	28	DME K1
8	0.5 MHz GS	29	DME K2
9	0.7 MHz GS	30	DME K3
10	0.9 MHz GS	31	DME 50 KHz
11	108 MHz GS	32	DME Common
12	109 MHz GS	33	VOR Test
13	110 MHz GS	34	Phones, Comm
14	111 MHz GS	35	NAV Audio
15	Aux Audio -1	36	Aux Audio -1
16	Aux Audio -4	37	ICS
17	A / C Power Switched	38	Not Used
18	13.5 vdc Input	39	Mic Audio
19	Ground	40	Mic Key
20	A / C Power	41	Speaker
21	Power/Speaker Ground	42	COMM FLIP-FLOP*

- Requires addition of internal resistor R53 on computer board.

III. OPERATING THE MX170C

Operating controls for the MX170(C) are located on the unit front panel or through three access points in the case (See Figure 2)

The unit front panel is shown in Figure 1. The left-hand COMM (yellow) readout indicates the active COMM frequency and the right hand COMM (red) readout indicates the standby COMM frequency. The left-hand NAV (yellow) readout indicates the active NAV frequency and the right hand NAV (red) readout indicates the standby NAV frequency. A 'tic' readout is provided on the upper left-hand corner of the first digit of each of the four frequency readouts.

The active COMM 'tic' indicates the presence of transmitter power.

The standby COMM 'tic' indicates that the Frequency Selection knobs will control COMM standby frequency.

The active NAV 'tic' indicates that the NAV receiver is in the Ident Mode.

The standby NAV 'tic' indicates that the Frequency Selector knobs will control NAV standby frequency.

Power Application. The COMM volume control contains the master power switch and activates the COMM functions. The NAV volume control contains a power switch for the remote NAV units. In order to activate all COMM and NAV functions, both volume controls must be turned on.

Frequency Selection. The N/C button is used to activate either the COMM or the NAV frequency selection as indicated by the appropriate 'tic' display. The MHz and KHz controls can then be used to select a desired standby channel. In COMM the '25' button is used to advance the frequency by 25 KHz.

After the desired standby frequency is selected, it may be transferred to the active position by pressing the desired 'flip-flop' buttons left of the displays. The active and standby channels will be transposed each time the button is pressed.

Ident/Voice Selection. The VC-ID button can be used to select a tone filter in order to receive voice signals on the NAV receiver. The switch is also used for frequency storage as described in Frequency Storage.

Test. The TEST button is a dual function switch. In normal operation, it is used to override the squelch to verify receiver operation and to receive weak signals. The switch is also used for frequency storage as described below.

Transmit. The transmit mode on the transceiver is selected by grounding the MIC Key line on the unit's rear panel.

Clearing all frequency presets. To clear the entire memory, both NAV and COMM, except for factory presets:

1. Turn radio off.
2. While holding down the TEST button, turn the radio on. The unit will reset to factory preset default channels in both active and standby (COMM 121.50/120.00) (NAV 108.00/112.00).

Frequency Storage. The MX170C NAV COMM allows up to 50 NAV and 50 COMM preset frequencies to be stored in the memory for recall. The use of memory presets is described in the following procedures.

Examining / Changing / Inserting / Deleting frequency presets. These operations on individual frequency presets are accomplished in EDIT mode. To enter EDIT mode, turn on the power to the radio while holding the VT button depressed. When the radio is in EDIT mode, the active displays show the sequential number of the preset (1,2,3,etc.) and the standby displays show the actual preset frequency.

EDIT mode operations can be performed on either the COMM or NAV preset list, according to where the tuning tic indicator is displayed. The tuning tic appears immediately to the left of the COMM or NAV standby displays. Pressing the N-C button toggles between NAV and COMM preset editing.

Examining presets (EDIT MODE). Pressing the COMM F-F button will step to the next frequency in the preset list. Pressing the TEST button will step to the previous frequency in the preset list. Pressing COMM F-F when the last preset is displayed will cause the first preset to display. Similarly, pressing TEST when the first preset is displayed will cause the last preset to display. **Warning:** When there is only one preset in the list, the radio will not appear to "do anything" when the COMM F-F or TEST is pressed. This is because the current, previous, and next presets are all the same preset.

Changing a preset (EDIT MODE). Press COMM F-F or TEST until the preset to be changed is displayed. Dial in the new preset frequency using the tuning controls and press either COMM F-F or TEST.

Inserting (Adding) a preset (EDIT MODE). Press COMM F-F or TEST until the desired insert point is displayed (the new preset will be inserted AFTER this insert point). Dial in the desired frequency using the tuning controls and press NAV F-F. Remember that a preset list may contain a maximum of 50 entries. Inserting commands that would cause this limit to be exceeded are ignored.

Deleting a preset (EDIT MODE). Press COMM F-F or TEST until the preset to be deleted is displayed. Then press the VC – ID switch to delete. If the deleted preset was not at the end of the list, all the presets that followed it are renumbered. Each preset list

(NAV and COMM) must always contain at least one entry. If there is only one entry remaining in a preset list, it may not be deleted (It can be changed to another frequency).

Frequency preset, normal operation. At any time the radio is in normal operation (Not EDIT MODE), COMM preset frequencies may be called into the standby frequency display by pressing COMM F-F while the TEST button is depressed. During the time that both buttons are held simultaneously depressed, the reference number for the preset appears in the active window. Each time this operation is repeated, it will copy the “next” preset to the COMM standby frequency.

NAV preset operation is similar, with the exception that presets are retrieved by pressing and holding the NAV F-F while pressing the VC – ID.

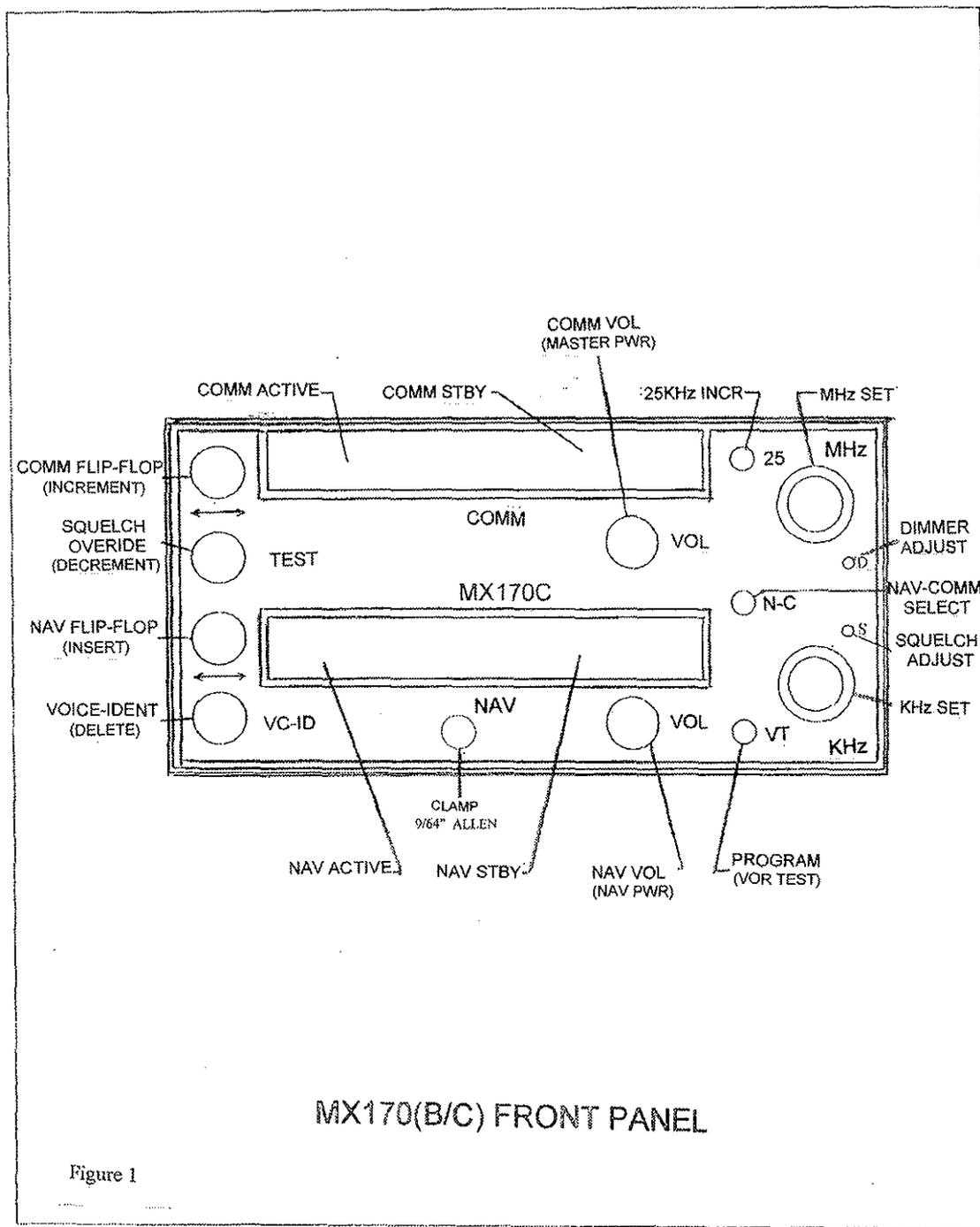


Figure 1

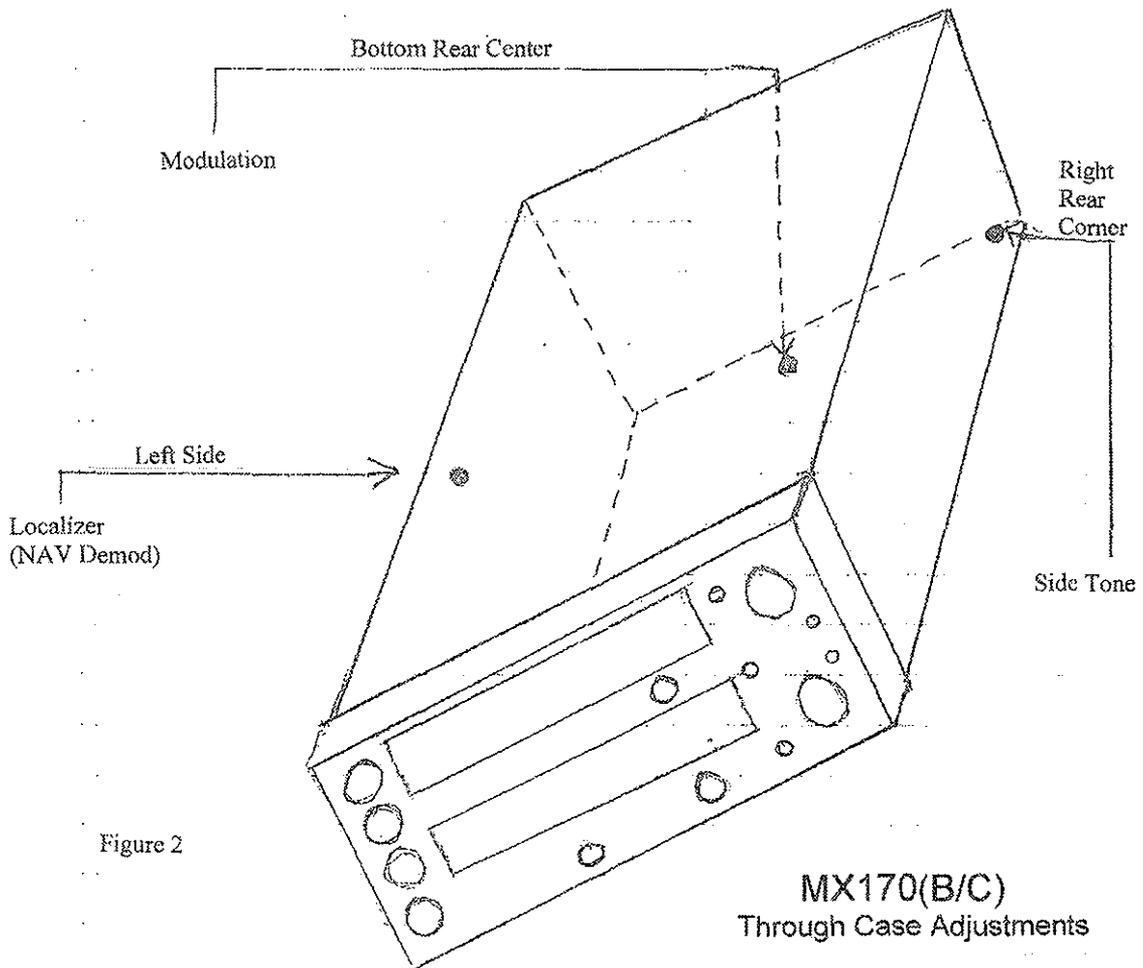


Figure 2

MX170(B/C)
Through Case Adjustments

IV. EQUIPMENT LIMITATIONS

The following limitations indicate where the MX170C may be installed and meet the applicable TSO requirements.

1. Equipment is intended for installation within a non-pressurized but controlled temperature location in an aircraft that is operated at altitudes up to 35000 feet MSL.
2. Equipment is intended for use in a Standard Humidity Environment.
3. Equipment is intended to be panel mounted in Single and Multi Engine Fixed Wing Aircraft with Reciprocating and Turboprop Engines.
4. Equipment shall not be mounted less than 0.3 m from magnetic compass.
5. Unit has not been tested with autopilots

V. ENVIRONMENTAL QUALIFICATION FORM

Model MX170C NAV / COMM as specified in MX170C Specifications manufactured by TKM, Inc., 14811 NORTH 73rd STREET, SCOTTSDALE, AZ 85260.

<u>CONDITIONS</u>	<u>D0160C para</u>	<u>DESCRIPTION OF TEST</u>
Temperature and Alt.	4.0	Category C1
Low Temperature	4.5.1	Category C1
High Temperature	4.5.2	Category C1
Altitude	4.6.1	Category C1
Decompression	4.6.2	Not Tested
Overpressure	4.6.3	Not Tested
Temperature Variation	5.0	Category C
Humidity	6.0	Category A
Shock	7.0	Tested for all Conditions
Vibration	8.0	Category S (no shock mts)
Explosion	9.0	X: Not Tested
Waterproofness	10.0	X: Not Tested
Fluid Susceptibility	11.0	X: Not Tested
Sand and Dust	12.0	X: Not Tested
Fungus	13.0	X: Not Tested
Salt Spray	14.0	X: Not Tested
Magnetic Effect	15.0	Category A

Power Input	16.0	Category B
Voltage Spike Cond.	17.0	Category B
Audio Spike Suscept.	18.0	Category B
Induced Sig. Suscept.	19.0	Category B
RF Susceptibility	20.0	Category B
RF Emission	21.0	Category B

Installation Instructions: The MX170C is designed to be a slide in replacement for ARC radios and, as such, shall be installed with all of the original equipment precautions.

MX170(B/C) QUICK OPERATION GUIDE



Controls & Indicators

Control	Use – Normal	Use – Edit
Top Left ←→ COMM F-F	Flips Active and Standby COMM frequencies	Next preset
TEST	Squelch	Previous preset
Lower Left ←→ NAV F-F	Flips Active and Standby NAV frequencies	Insert preset
VC-ID	NAV Voice filter	Delete preset
COMM Displays	Left is Active Right is Standby (Note: Tic to upper left of 121.50)	
Upper VOL knob	Power off/on, COMM volume	
NAV Displays	Left is Active Right is Standby	
Lower VOL knob	NAV power off/on, NAV volume	
25	Adds 25 KHz to Standby COMM frequency	
N-C	Toggle selection knobs between Standby NAV and COMM	
VT		Select edit mode on power up
MHz knob	Alter MHz setting on Standby display with Tic	
KHz knob	Alter KHz setting on Standby display with Tic	

Basic Operation

Refer to the photo for placement of the controls and displays.

The left hand COMM readout indicates the active COMM frequency; the right hand readout indicates the standby one.

The left hand NAV readout indicates the active NAV frequency; the right hand readout indicates the standby one.

A "Tic" readout is provided on the upper left hand corner of the first digit of each of the four frequency readouts. The meaning of each Tic is –

Position	Indication
Active COMM	Transmitting
Standby COMM	Selection knobs control COMM standby frequency
Active NAV	NAV is in Ident mode
Standby NAV	Selection knobs control NAV standby frequency

Note that the standby Tics are, therefore, mutually exclusive. The Tic indicates which frequency may be altered.

Power Application. The COMM volume control contains the master power switch and activates both COMM and NAV functions. Power off is fully counter-clockwise. The NAV volume control contains a power switch for remote NAV units.

Frequency Selection. The N-C button toggles between COMM or NAV standby frequency selection. The frequency under control is indicated by the Tic. The MHz and KHz controls can then be used to select a desired standby channel. When selecting a standby COMM frequency, the 25 button is used to advance the frequency by 25 KHz.

After the desired frequency is entered into the standby position, it may be transferred to the active position by pressing the flip-flop button between the two displays. Active and standby will be interchanged each time the button is pressed.

Ident/Voice Selection. The VC-ID button can be used to select a filter in order to receive voice signals on the NAV receiver. Its status is indicated by the Active NAV Tic. This switch is also used for frequency storage (see below).

Test. The TEST button is a dual function switch. In normal operation, it is used to override the squelch. This will verify receiver operation. It will also allow the reception of weak signals. It is also used in frequency storage (see below).

Transmit. The transmit mode on the COMM transceiver is selected by grounding the Mic Key line to the unit. This is achieved by pressing the PTT button on either the pilot or co-pilot yoke, the PTT button on a hand-held microphone, or the PTT button on a connected remote intercom.

Advanced Operation

The MX170B allows up to 50 NAV and 50 COMM frequencies to be stored in memory for recall. These preset frequencies remain in memory after the unit is powered down.

Clear Presets. To erase all frequency presets, turn on power to the unit while depressing the TEST button. Once reset, both COMM Active and Standby frequencies will be set to 121.5 MHz. NAV will be set to 112.0 MHz.

EDIT Mode. To enter EDIT mode, power up the unit while depressing the VT button. When in this mode, frequency presets may be examined, changed, inserted, or deleted. EDIT mode operations are performed on either the COMM or NAV preset list, according to where the tuning Tic is displayed. Pressing the N-C button toggles between the NAV and COMM positions.

Examine Presets. Pressing the COMM F-F button will step to the next frequency in the preset list. The list wraps round so that the next frequency after the last one is the first one. Pressing TEST will step to the previous frequency in the list.

Change Presets. Display the frequency to be changed. Dial in the new frequency using the selection knobs. Press either COMM F-F or TEST.

Insert Presets. Step to the frequency before the point at which the new one should be inserted. Dial in the new frequency. Press NAV F-F.

Delete Presets. Step to the frequency to be deleted. Press VC-ID to remove this frequency from the list. If there is only 1 frequency in the list, it will not be deleted.

Use Presets - COMM. When in normal operation, COMM presets can be called into the standby display by pressing COMM F-F and TEST together. While the buttons are pressed, the reference number is displayed in the Active frequency display. Each time the two buttons are pressed, the next preset in the list will be loaded into Standby.

Use Presets - NAV. NAV preset operation is similar to COMM, Presets are loaded into NAV standby by pressing NAV F-F and VC-ID together.