FLIGHT LINE

FL-760
VHF Aircraft Transceiver

136.9750
108.0000

Installation / Operations Manual

FL-760 series

Flightline

12830 E. Mirabeau Parkway
Spokane Valley, WA 99216
Toll free tel.: 1-800-235-3300
Toll free fax: 1-800-828-0623
http:// www.edmo.com

VHF AM Aircraft Radio
FCC ID: VOSFL760 A

ATTENTION
READ ME FIRST

FCC WARNING

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTICE
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Properly shielded a grounded cables and connectors must be used for connection to host computer and / or peripherals in order to meet FCC emission limits.
(AC adaptor)   with ferrite core must be used for RF interference suppression.

The Flightline transceiver has been factory preset and in most cases the transmitted audio should be correct. A 15 pin connector is supplied for connection to the electrical system and microphone/speaker.

Notes to the installer / user.

- This is a 14-volt or 28-volt DC radio, voltages greater than 33 volts DC or AC voltage will severely damage it.

- When making adjustments to the transmitter, ensure that you are not on an occupied channel.

- Do not transmit on 121.500MHz, as this is the international distress frequency.

- Do not transmit into an unterminated antenna line as a suitable antenna must be connected. Transmitting without being connected to an antenna may damage the radio.

- Ensure that the supply voltage is regulated and does not fall below 11.7 volts DC or exceed 31 volts DC.

- The transceiver is not waterproof. Do not allow it to get wet.

- Speaker impedance must be either 4 or 8 ohms (4 ohms preferred) at 5 watts.

- Use of electret microphones highly recommended.

About this document.

Due to our policy of continuous improvement to our products and services, technical specifications and claims are correct at time of going to printing, however they are subject to change without notice.

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TABLE OF CONTENTS

1 INTRODUCTION

Thank you for purchasing this quality product from Flightline.

This transceiver has been designed and manufactured in Japan specifically for Ultralights, Gliders and General Aviation Aircraft and Helicopters with size and power consumption as the main considerations. Ease of operation was another primary achievement.

Please follow this manual closely to ensure optimum performance, we do hope you have many hours of trouble free communication and safe flying.

2 INSTALLATION INSTRUCTIONS

This manual contains all of the necessary instructions for installation and operation. After installation please keep this manual in a safe place for future reference.

3 INSTALLATION CONSIDERATIONS

As with all aircraft radios, successful communications start with the installation. After unpacking the transceiver verify all parts against the parts list. Select a suitable mounting area within a maximum 30 degree viewing angle and select a suitable location for operation of ancillary controls, backlight, intercom etc.

The use of aviation quality shielded cable is recommended at all times.

Avoid running or wrapping other wires around the antenna lead and keep lengths as short as reasonably possible. Ensure that the radio is not exposed to direct rajn or moisture (we do not accept liability for water damage).

Make sure the transceiver is connected to a 11.7-16.8 volt or 23-33 volt battery system. Do not use AC volts from a Rotax lighting coil.

4 GENERAL

The following section is a guide for individual types of aircraft installations.

4.1 Sailplanes

Due to the inherent space restriction on most glider instrument panels the FL-760's 57-mm front panel makes it an excellent choice for confined spaces. Generally the radio is mounted at the bottom of the panel with essential instruments at the top. Location of the ancillary switches should be convenient to the pilot.

The Press to Talk (PTT) can be a normally open push-button located on the control column or a handheld microphone.

Speakers are normally located at the rear of the pilot's head.

If not using a handheld microphone, then a boom mike with an electret microphone is preferred.

If this radio is to be installed in a motor glider then ensure that the ignition leads are shielded. This will reduce ignition noise considerably. The FL-760 has noise limiting circuitry incorporated and works well in most cases but two stroke interference can be difficult to suppress.

4.2 Ultralight

Most ultralights like sailplanes suffer from space restriction. Locate the transceiver with a good viewing angle. Ensure that it is protected from rain (No liability is accepted for water damage).

Use shielded aviation quality wire for the headphones, microphone, and speaker.

As nearly all Ultralights use two-stroke engines ignition noise can be a problem. Again ensure that all engine high voltage cabling is shielded and grounded. There is almost certainly some background ignition noise with these engines, however, the FL-760 noise limiter will eliminate nearly all of the noise (except for levels around 5 uV).

In tandem or side by side seating, use of the intercom provided will work well providing you switch it on. The intercom uses the side-tone feature of the radio and therefore may pick-up some ambient noise.

Another feature is the fitting of the external memory toggle switch which when fitted (normally on the control column) allows the pilot to scroll through the memory channels and select scan without reaching for the main channel controls on the radio. This is particularly useful for the rear pilot or instructor in tandem Ultralights or for Helicopter/Gyroplane pilots.

4.3 Microlight / Home built / G.A.

In general the same as for ultralights with particular care taken for ignition screening and exposure to rain.

5 BEFORE BEGINNING INSTALLATION

Again check through the supplied parts list.

5.1 Installation parts identification

All connectors are supplied for installation of this transceiver. Parts include a J001 socket and backshell. Certified aircraft must use approved materials.

5.2 Transceiver installation and removal

The following section describes the proper installation and removal of the FL-760 transceiver.

5.3 General

The following information is provided as a guide for installation in uncertified aircraft. If the FL-760 is to be installed in a certificated aircraft, the installation must be done by a certified repair station.

5.4 Pin connections

Pin No.	Function
1	Microphone Element
2	Microphone Ground
3	Microphone Element
4	Music input
5	Intercom (ground to activate)
6	Squelch output (for limited applications)
7	Press to talk (PTT) (Microphone Key)
8	LED backlight (ground to activate/brightness adjustment by the variable resistor)
9	Positive 12V/24V DC
10	Positive 12V/24V DC
11	Negative ground
12	Negative ground
13	Memory change
14	Headpohne output
15	Speaker output

Note: If you intend using a dynamic mike (non amplified) you must provide amplification. A simple 2 transistor amplifier with gain control will do.
The backlight can be adjusted and dimmed. (Refer to user setting of page10).

5.5 Mechanical installation

- Carefully measure the proposed mounting site for clearance. Allow for rear cabling and connectors. Use the template supplied to carefully drill a 58mm hole.
- Drill the mounting holes (4mm)
- The mounting holes support the weight of the transceiver and should not be oversized.
- Run all wires that will be required for your particular installation.

Following are the recommended configurations for use in Gliders and Ultralights:

5.6 Electrical installation

· **Single seat sailplanes:**
Power, speaker, microphone (prefer electret), PTT located on control column, backlight switch or volume (for viewing)

· **Two place sailplanes:**
Additional wiring should include the memory toggle switch for the rear seat, rear PTT switch and microphone.

· **Motor Glider:**
Jack for headset microphone and speaker.

· **Ultralights / Microlights:**
Power, Speaker (not for open cockpit design), PTT located on control column, headset microphone (prefer electret), backlight switch or volume, antenna coax type RG58U (recommend vertical 1/4 wave antenna with ground plane).

· **Tandem/ side by side:**
Additional rear seat PTT and headset wiring, memory toggle switch, intercom switch.

Having run all the wires we will now terminate them. First connect the power cable to a 14-volt or 28-volt source. It is advisable to run this via a circuit breaker or fuse (2-amp max).

NOTE-
The FL-760 has an internal 10 amp fusible link which is not field replaceable. If the radio fails it must be returned to a Flightline approved repair facility.

RED is POSITIVE! (Pins 9 and 10)   **GROUND** (Pins 11 and 12)

It is advisable to connect the power cable through a radio master switch and not direct to the battery. Solder the PTT cable to the J001 with the shield connected to ground and the center conductor to pin 7. The other end of the cable should be connected to the common and normally open contact on the push button switch. If using two switches simply wire them in parallel.

Now solder the microphone cable center conductor to pin 3 or 1 (both if two mics are used) on the J001 socket and the shield to ground (Pin2).

You can now connect the microphone. If using an electret mic please check that the red wire is connected to the center conductor as these are polarity sensed and reverse polarity will severely damage the mic.

If using two microphones then wire to the 2 separate inputs. **NOTE** both mics are active on transmit. For pilot/copilot isolation order the optional relay board.

Now connect the backlight switch using two wires, one to ground and the other to pin 8. You can use volume instead of backlight switch (for brightness adjustment). The switch (volume) is wired center conductor to common and the other side to ground. **THIS IS NOT A MOMENTARY SWITCH, it needs to be switched on or off.**

For Motor Glider and Ultralights install the following intercom switch wiring. Wire the center conductor to PIN 5 and the shield to ground. The switch is the same as for the backlight switch described previously or when the switch is not used, you can use voice operation (VOX function).

Memory toggle center conductor to PIN 13 and the shield to ground. The memory toggle switch is momentary type with the center conductor to common and the shield to normally open.

You may have noted that nearly all switch connections are to ground, this was done to simplify wiring and avoid any possible shorts to positive voltages.

5.7 Antenna Installation

The following section refers to proper antenna installation.

NOTE: In certified aircraft approved antennas must be used.

5.8 Tuning

Before any tuning can be attempted you must have a VSWR meter which can measure the antenna's reflected power. The lower the SWR reading the higher the output and the radiated signal. High SWR degrades performance and can cause damage.

An SWR of <1.5:1 is desirable.

5.9 On air testing

Before transmitting check all connections and switch on. Operate controls as per section 6. A simple on air test for audio quality on transmit and receive should be done.

Have someone monitor your signal on another radio. Transmit and speak into the microphone at normal level. If the received signal is quiet then the mike gain control will need to be adjusted. If the signal is loud and distorted then it will need to be turned down. These adjustments should be done using a comm. test set.
Have another radio transmit a test call and monitor the audio quality. With the volume control turned to the 3/4 position the audio should be loud and not distorted. Distortion could be caused by the choice of speaker. A 4 watt speaker is recommended as a minimum power rating. Set the squelch and have the station transmit, the squelch should break crisply and without delay.

Note;
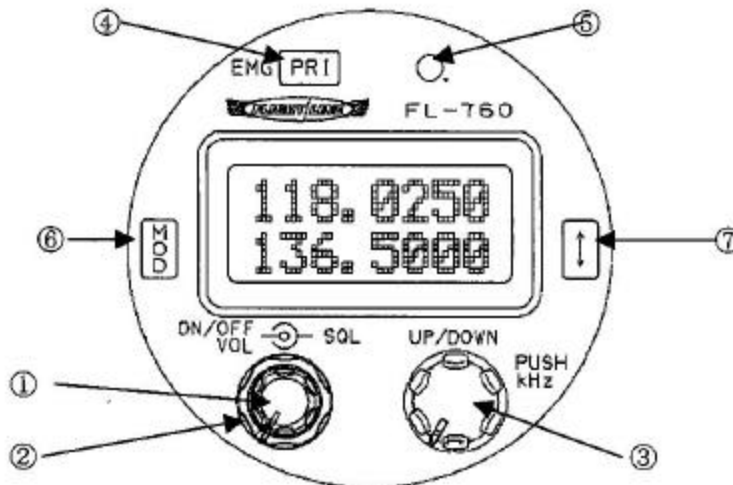Do not transmit on 121.500MHz, as this is the international distress frequency.

6 OPERATION OF EQUIPMENT

6.1 General

Please read this section for the correct description and operation of this equipment.

6.2 Control Description

Following diagram shows the position of the controls.

① **Volume and On/Off control**
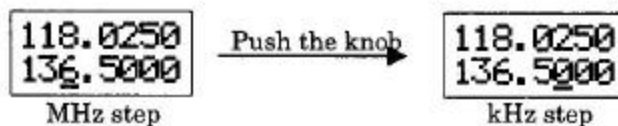Turn fully anticlockwise to switch off. Turn clockwise to switch on and adjust volume.

② **Squelch (mute) control**
The outer ring control adjusts the mute threshold.

③ **Up/Down /Push kHz**
Turn clockwise or counter-clockwise to change the frequency.
Push knob to adjust kHz.

④ **Priority/Emergency**
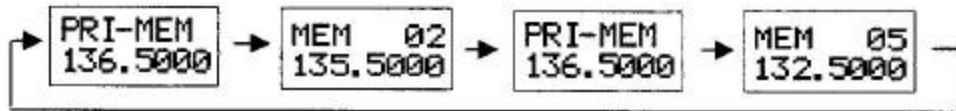Activating this control will switch to priority memory.

It also doubles as memory channel delete.

Press and hold this key for two seconds to activate the emergency frequency.

```
EMG
121.5000
```

If the external memory button is pushed after the priority memory is called, it becomes a priority scan.

```
PRI-MEM  →  MEM    02  →  PRI-MEM  →  MEM    05
136.5000    135.5000      136.5000    132.5000
```

⑤ **LED Indicator**
- A clear display indicates a muted receive condition.
- Steady green indicates Squelch open or a signal present.
- Steady red indicates a transmit condition.
- Flashing red indicates that the PTT has been on for longer than 50 seconds.

   If the radio senses that the PTT has been pressed for more than five minutes (three minutes or one minute is also selectable) the radio will automatically cease transmission.

   (This is helpful for indicating a possible stuck PTT or mike switch).

⑥ **Mode**

   Selects five display pages.

A   Default is 2 line frequency displays. The top line is the active frequency and the bottom line is the standby frequency. Tuning the dial left or right will channel the MHz and pressing the knob once will activate the kHz channeling (after 5 seconds of inactivity it will revert to MHz). To transfer the standby frequency to the active simply hit the transfer button (arrowed switch) once. Remember, the top line is always the active frequency.

B   Push in the mode button again to access the VFO scan display. To VFO scan hit the arrow key.

```
VFO SCAN  →  SCAN       →
118.0250     118.0500
```
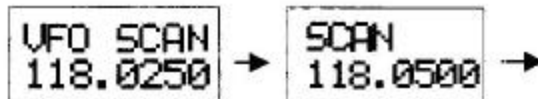
C   Push the mode button again to access the memory channel display. There are 32 memory channels that can be displayed. Turn the dial left or right to move the channels up or down. To scan, hit the arrow key. To stop scanning, hit the arrows or activate the PTT.

Note: If the memory channel is empty it will not be displayed.

```
MEM    02  →  MEM    05
135.5000      132.5000
```
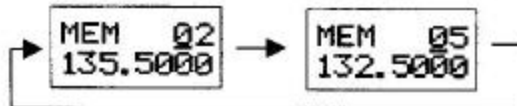
D   Push the mode button again to access the priority memory channel display. To priority scan, press the arrow key. The unit will now scan between the memory channel and priority channel.
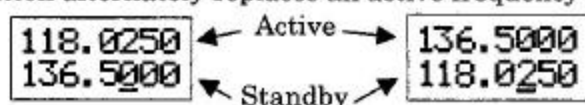
```
PRI-MEM  →  SCAN   02  →  PRI-MEM  →  SCAN   05
136.5000    135.5000      136.5000    135.5000
```
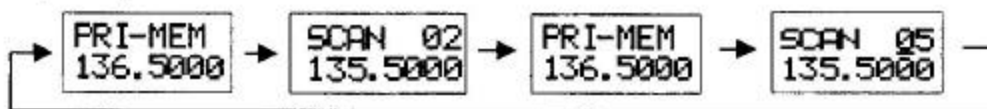
E   Push the mode button again to access the program page.

```
PRG    15
118.0250
```

⑦ **External memory toggle**
This button alternately replaces an active frequency and the standby frequency.

| 118.0250 | ← Active → | 136.5000 |
| 136.5000 | ↖ Standby ↗ | 118.0250 |

6.3 Memory programming

1   The top line should read memory channel 1 (1 to 32 and PRI).
2   Select the required memory number with the up/down dial.
3   Next push the dial to select the bottom line MHz.
4   Now enter the desired frequency.
5   Push the dial again to enter the kHz and adjust.
6   Next push the arrows button, the memory number will flash then programmed will appear. You now have a programmed memory channel.
7   Repeat this operation for other memory channels.
8   Up to 32 channels can be programmed.
9   Only programmed channels will be displayed.
10   By programming a frequency into Memory "PRI" this will give you a priority selection.

6.4 Memory delete

1   The top line should read memory channel 1 (1 to 32 and PRI).
2   Select the required memory number with the up/down dial.
3   Push the "PRI" button, the memory channel is deleted.

6.5 Operation of intercom

Internal adjustment of the sidetone volume may need to be done to set the correct level. In a noisy environment reducing the microphone gain may also be required. **Do not adjust the modulation!** A wind sock over the mike will also help reduce noise.

The VOX operation can be used and sensitivity can be set in the user setting mode.
Note: VOX (Voice-operated Transmission)

6.6 User setting

You can set the use of this radio.
· Continuous on of the backlight.
    ① Hold down the "MOD" button and power on.
    ② Push the "MOD" button and select the LAMP.
    ③ Push the dial switch and select the OFF or ON.
    ④ Push the arrow key, enter the backlight function.
        Note: If you select the on, you can not adjust the dimmer.
· Automatic voice operation control gain for intercom.
    ① Hold down the "MOD" button and power on.
    ② Push the "MOD" button and select the VOX.
    ③ Push the dial switch and select the HI, MID1, MID2 or LO.
    ④ Push the arrow key, enter the VOX sensitivity.
· Time out time of transmit.
    ① Hold down the "MOD" button and power on.
    ② Push the "MOD" button and select the TOT.
    ③ Push the dial switch and select the OFF, 01, 03 or 05 (minutes).
    ④ Push the arrow key, enter the TOT time.

· Busy lockout of transmit. (If the radio is receiving a signal then it can not transmit)
    ① Hold down the "MOD" button and power on.
    ② Push the "MOD" button and select the BLO.
    ③ Push the dial switch and select the OFF or ON.
    ④ Push the arrow key, enter the busy lockout function.
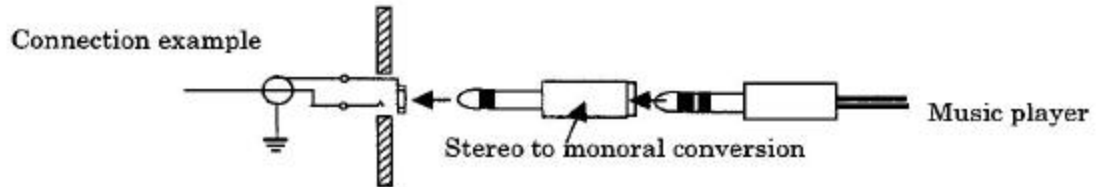
6.7 Music input

You can listen to music.

The music will automatically mute when radio or intercom traffic is detected.

Connection example

Stereo to monoral conversion

Music player

Music will remain muted for three seconds after the last transmission.

7 SPECIFICATIONS

General
- Frequency range   : 118.00 to 136.975MHz (Receive:108.00 to 136.975MHz)
- Channel spacing   : 25kHz
- Mode   : AM (6K00A3E)
- Number of memory channels   : 32
- Acceptable power supply   : 11.7 V or 33 VDC   (Negative ground only)
- Usable temp. range   : -20℃ to +60℃
- Frequency stability   :+/- 5ppm
- Current drain   : TX: 3A(max)   RX 0.8A(max)   Standby: 300mA
- Dimensions   : W61 X D159 X H61 (mm)
- Weight   : 430g
- Exposed dial face   : 56.4mm   2 1/4.5 inches

Transmitter
- Output power   : 5 W (carrier),   16W (pep)
- Modulation   : small stage modulation
- Modulation limiting   : 70 to 100%
- Audio harmonics distortion   : Less than 15% (at 85% modulation)
- Hum and noise ratio   : More than 40dB
- Spurious emissions   : -16dBm or less
- Antenna impedance   : 50 Ω

Receiver
- Receive system   : Double conversion superheterodyne
- Intermediate frequency   : 1st : 38.85MHz (Upper)   2nd : 450kHz (Lower)
- Sensitivity (at 6dB S/N)   : Less than 1uV
- Squelch sensitivity   : 0.5uV (Threshold)
- Selectivity   : More than $\pm$8kHz (at 6dB)
                                   : Less than $\pm$25kHz (at 60dB)
- Spurious response rejection   : More than 60dB
- Audio output power   : More than 4W (at 4 Ω)
- Side tone   : More than 100mW (at 600 Ω)
- Hum and noise   : More than 30dB
- Audio output impedance   : Ext. SP 4 Ω (4 to 8 Ω)
                                   Side tone 600 Ω

Accessories
- D-SUB-15 connector (female) and cover   X 1
- Screw for mount (6-32)   X 4
- Installation/Operations Manual   X 1

8 HELPFUL HINTS

- Installing an inline power filter consisting of an LC network may reduce stubborn ignition noise. These are readily available and are commonly used to suppress noise getting into stereo systems.
- Use shielded spark plug leads.
- Try to avoid mounting the dial face in direct sunlight – the plastic may melt. (It is designed to withstand 80 deg C however cockpit temperatures can well exceed this).
- Notes on using the ICOM boom microphone – this mike will not perform well compared to a pure electret, there is not a great deal that can be done other than replacing the microphone.
- Make sure your microphone has a wind sock as this will substantially reduce background noise.

General

The key to a successful radio installation is an effective antenna system. Antenna selection and proper termination and tuning will make a difference.

The following antennas are recommended:

Sailplanes:
Vertical 1/2 wave coax dipole mounted in the tail. Another choice is a 1/4 wave vertical mounted in the fuselage for wooden or fiberglass and externally on the top for metal. If mounted in wooden or GRP aircraft you must provide a ground plane.

Ultralights:
The 1/4 wave ground plane is by far the most popular and makes an effective antenna. Again a proper ground plane is essential.
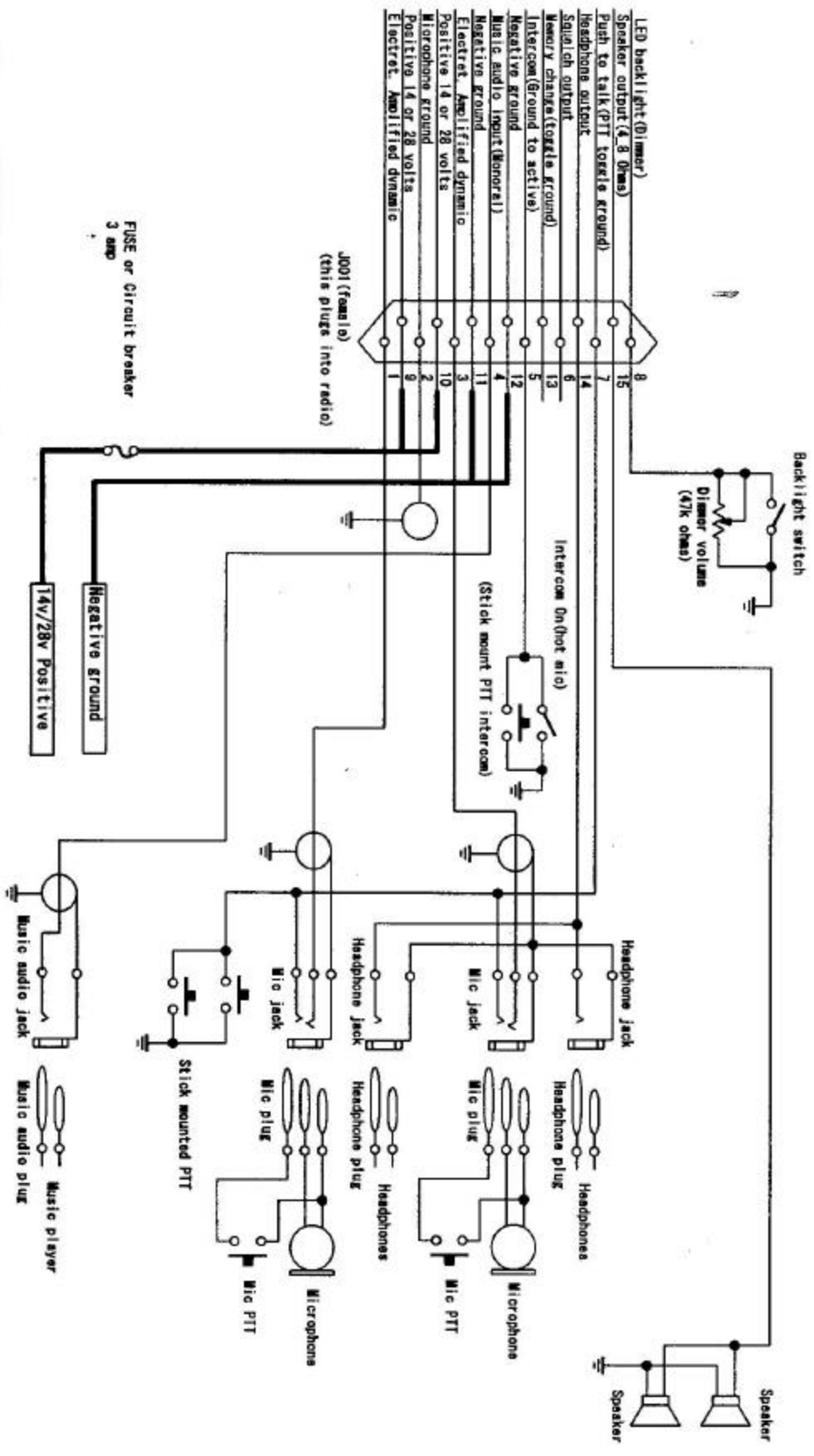
Homebuilt aircraft:
As above.

FLIGHT LINE

Addendum

The setting procedure of VOX sensitivity (page 10, 6.6 User Setting in Instruction Manual) is improved as follows;

Improved Procedure

① There are 2 way to enter the User Setting mode.

   a. Turn the radio on while holding down the [MOD] button, or

   b. Press and hold the [UP/DOWN] knob more than 2 seconds while the radio is in VFO mode / MEMORY mode / PRIORITY mode.

② Select the VOX by pushing the "MOD" button.

③ Push the [UP/DOWN] knob to select the VOX sensitivity from HI, MID, LO or OFF.

④ Push the arrow key to store the VOX sensitivity, the radio will show the "STORE" for two seconds,then return to User Setting mode.

⑤ To exit the User Setting mode after completion of the User Setting;

   a. Turn the radio OFF then ON, or

   b. Press and hold the [UP/DOWN] knob more than two seconds.

Speaker output(4_8 Ohms)
Push to talk(PTT toggle ground)
Headphone output
Squelch output
Memory change(toggle ground)
Intercom(Ground to active)
Negative ground
Music audio input(Monoral)
Electret_Amplified dynamic
Negative ground
Microphone ground
Positive 14 or 28 volts
Electret_Amplified dynamic
Positive 14 or 28 volts
LED backlight(Dimmer)

FUSE or Circuit breaker
3 amp

J001(female)
(this plugs into radio.)

Backlight switch

Dimmer volume
(47k ohms)

Intercom On(hot mic)

(Stick mount PTT intercom)

14v/28v Positive

Negative ground

Music audio jack

Music audio jack

Music audio plug

Music player

Stick mounted PTT

Stick mounted PTT

Mic jack

Mic jack

Mic plug

Mic PTT

Microphone

Headphone jack

Headphone jack

Headphone plug

Headphones

Mic jack

Mic jack

Mic plug

Mic PTT

Microphone

Headphone jack

Headphone plug

Headphones

Speaker

Speaker

When using electret or amplified dynamic mic you
must use the individual inputs(1 and 3). Do not
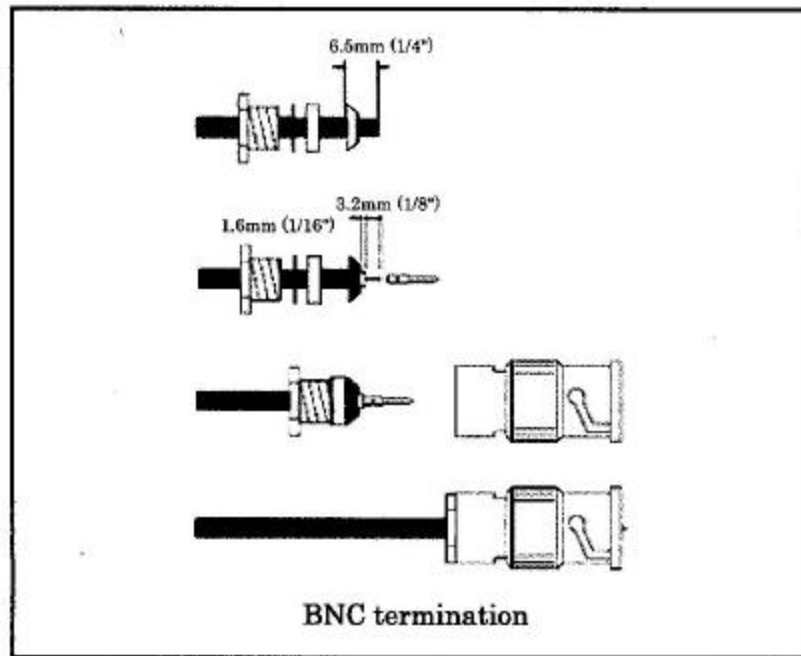parallel more than one per input.

Note: On transmit both mics are LIVE, to have
pilot/Co pilot isolation the optional relay board
can be purchased. Contact your Flightline dealer
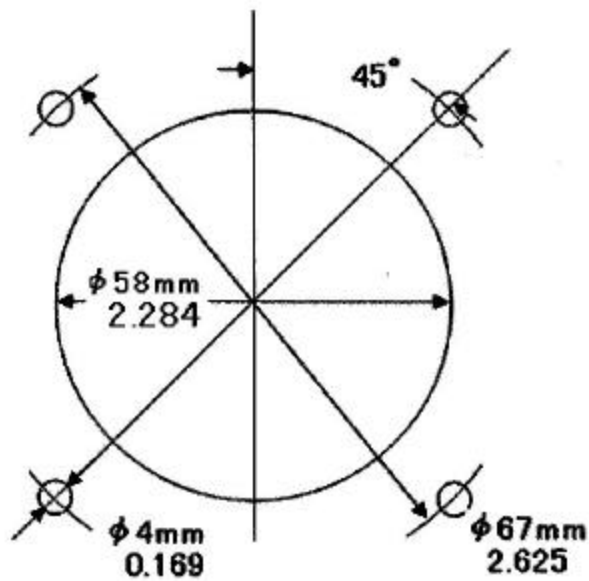for details.

FL-760 External Connections

Customer		
	FILES/AIRCRAFT/FL-760EC SCH	
	Feb.07.'08	DRAWN BY	Flightline
		1 OF 1

Certified Aircraft: Any approved VHF communications antenna

BNC termination

Coaxial cable termination

Radio hole cutout dimensions (drawing not to scale)

Limited Liability Warranty

Flightline warrants this product to be free from defects in materials and workmanship for 1 year from the date of purchase or the minimum period described by applicable consumer law. If the unit is installed by an organization which holds an avionics installation approval from the FAA, and that organization has co-signed and dated the warranty card, the warranty period shall be deemed to commence from the date of installation.

The customer shall be responsible for any transportation costs for return of this product to Flightline.

This warranty does not cover failures due to abuse, misuse, accident, unauthorized alteration, or repairs carried out by parties other than Flightline or an approved Flightline service center. This warranty does not cover failures where the product has not been installed or operated, in accordance with the provisions of the User and Installation manual(s).

It shall be at Flightline sole discretion to decide if a defect is a result of material or workmanship failure.

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Flightline may at it discretion, refer product returns for repair or service, to a service facility closest to you. Flightline reserves the right to repair or replace the unit or software or offer a full refund of the purchase price at it's sole discretion.

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WINGS AND WHEELS Soaring Supplies
2049 Shadyside Road, Lakewood, NY 14750
Telephone (716)763-3213 Fax (716)763-3214
http://www.wingsandwheels.com

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