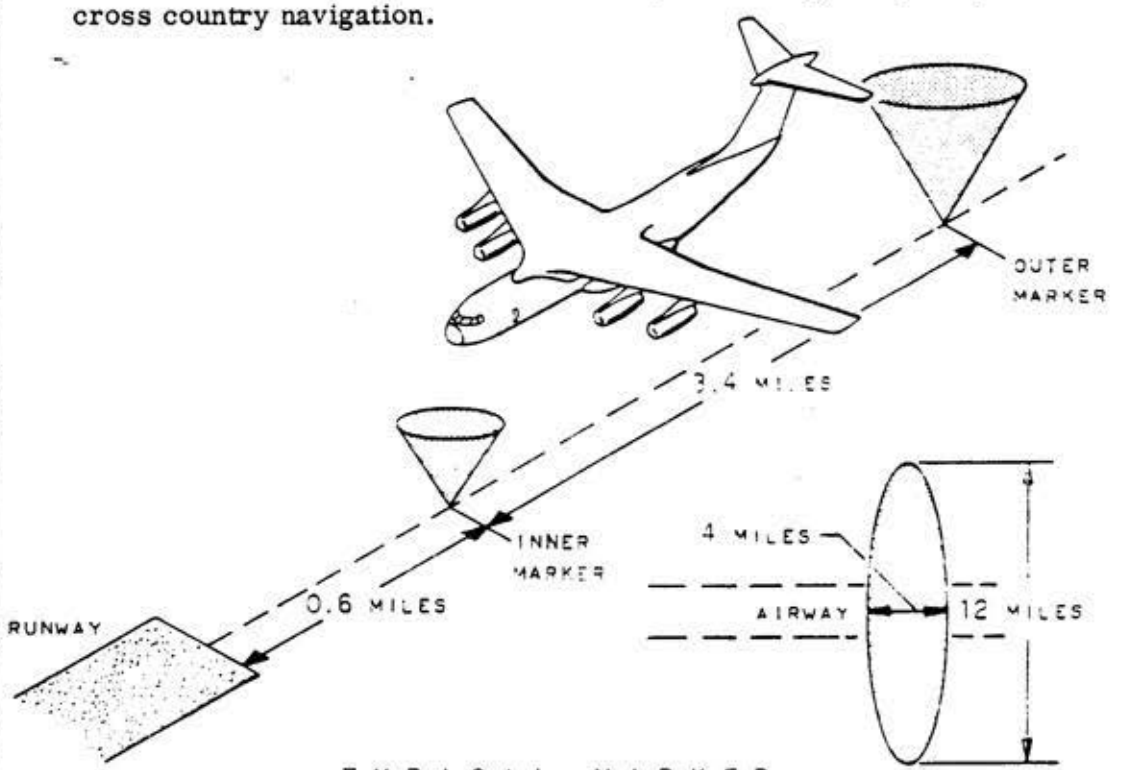
MARKER BEACON SYSTEM

GENERAL

The Marker Beacon system is used to provide an aural and visual indication to the pilot and copilot when the aircraft passes over a marker beacon ground station. Inner and outer marker beacons are located at the end of runways to indicate passage during instrument landings. Airways marker beacon stations are located along air routes, aiding the pilots in cross country navigation.



TYPICAL MARKER
BEACON GROUND STATIONS

All marker beacon stations transmit a 75 MHz carrier modulated at different audio tones which identify the type station. An airways station

A modulates the 75 MHz carrier with a 3,000 Hz tone, which is interrupted by Morse code providing the pilots aural station indentification through the interphone system. The outer marker O carrier is modulated with a 400 Hz tone and the inner marker I carrier with a 1300 Hz tone.

AIRCRAFT INSTALLATION

The marker beacon system, having no power switch, is on whenever power is applied to the main D-C avionics bus No. 1. The system outputs are are audio to the interphone system and illumination voltage to lamps on the instrument panel.

SYSTEM COMPONENTS

The components of the marker beacon system are as follows:

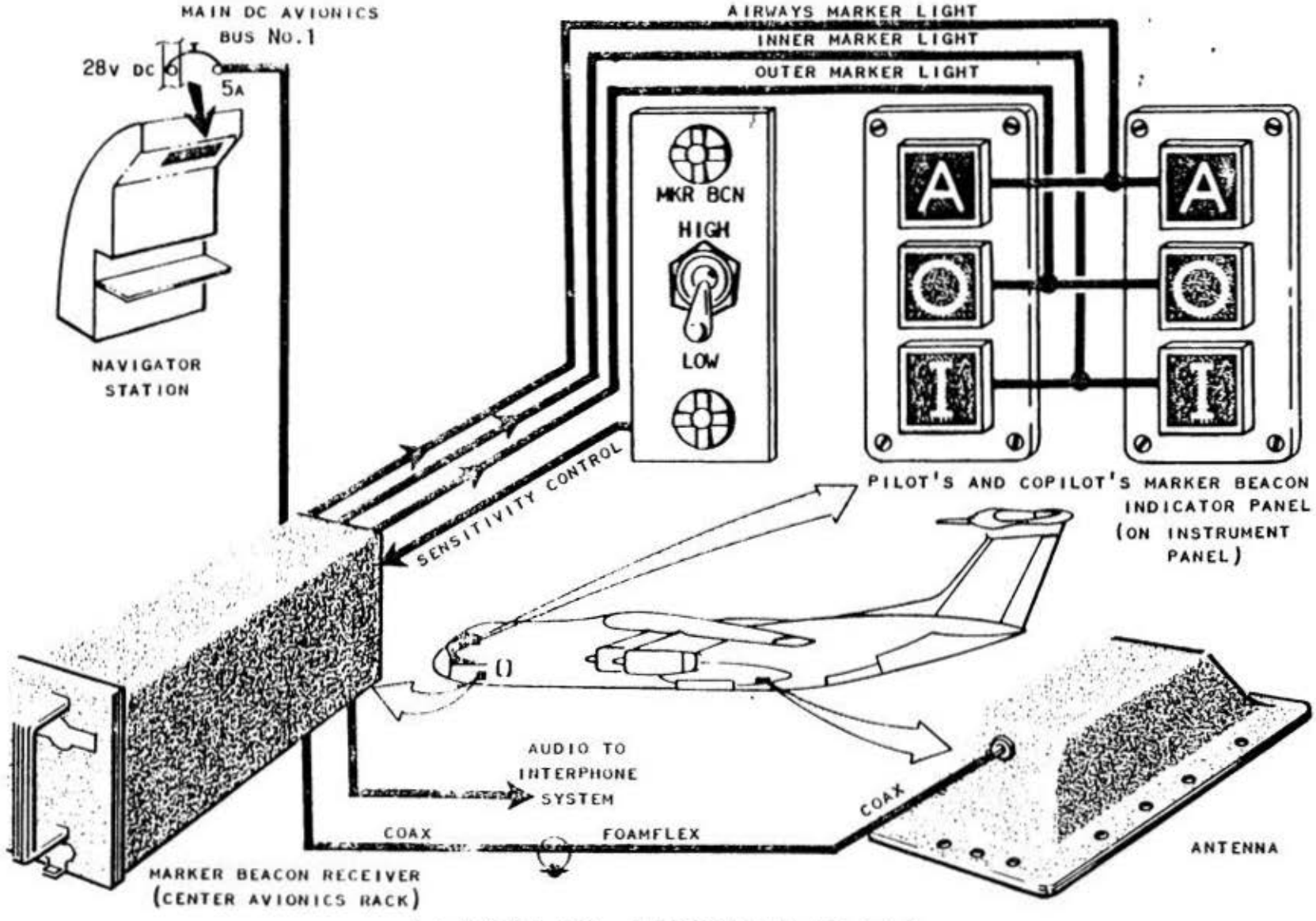
- Marker Beacon Receiver 51Z-3
- Antenna AT-536/ARN
- Light Assembly (2 ea)
- Marker Beacon Sensitivity switch

SYSTEM OPERATION

With the marker beacon system operating, an aircraft flying over an airways station will receive a signal which will cause the white airways A lamp to illuminate. A 3000 Hz identification tone will be heard through the interphone when the interphone "BCN" monitor switch is on.

During ILS operation when the aircraft passes over the outer marker, the blue outer marker O lamp will illuminate and a 400 Hz audio tone will be heard through the interphone. When the inner marker is passed over the amber inner marker I lamp will illuminate and a 1300 Hz audio tone will be heard through the interphone.

A Marker Beacon HIGH-LOW switch is used to control the receiver sensitivity when receiving weak or strong signals. "HIGH" for weak signal reception and "LOW" for strong signal reception. With "HIGH" selected, the lamp will illuminate in the fringes of the signal during passage. Selecting "LOW" at this time will extinguish the lamp permitting it to relight when the aircraft is more directly over the beacon.



AIRCRAFT INSTALLATION

SPECIFICATIONS

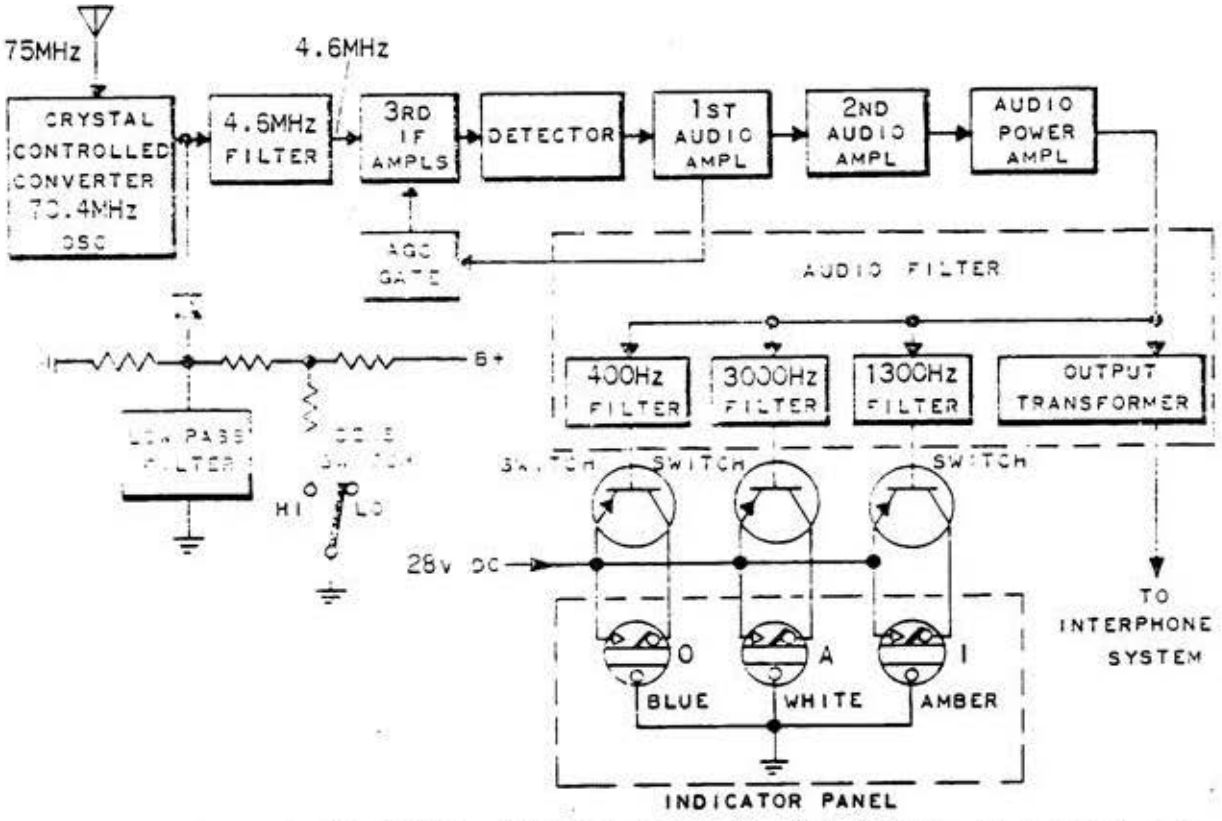
51Z-3 MARKER BEACON

CHARACTERISTIC	SPECIFICATION
Power reg.	28 volts, DC 4.4 watts normal, 11 watts passing over marker beacon
Type reception	AM at 400 Hz, 1300 Hz or 3000 Hz
Operating frequency	75 MHz
Indications	Audio by tone Visual by indicator lights
Sensitivity	200 UV, 75 MHz signal modulated at 95 percent will light two No. 47 lamps in parallel
Selectivity	40 KHz min. at 6 db down, 250 MHz max at 60 db down
Antenna input impedence	50 ohms unbalanced
Audio output and impedance	150 MW, 600 ohms balanced

BLOCK DIAGRAM THEORY OF OPERATION

The 51Z-3 is a transistorized, single conversion, crystal controlled receiver operating on a fixed frequency of 75 MHz. Signals appearing on the antenna are fed to the converter. The 75 MHz signal is mixed with the 70.4 MHz signal generated by a crystal-controlled oscillator. A 4.6 MHz filter selects the difference frequency and passes it to the three IF amplifiers which increase the signal level. The detector separates the audio component (400 Hz, 1300 Hz or 3000 Hz) from the IF signal. The 1st audio amplifier is also the Automatic Gain Control (AGC) amplifier. AGC voltage is applied through the AGC gate to the three IF amplifier stages. The 1st audio amplifier is an emitter follower and supplies audio drive for the 2nd audio amplifier. The output of the 2nd audio amplifier is transformer-coupled to the audio power amplifier. The audio power amplifier supplies audio power to the output transformer and to the three audio filters. The output transformer supplies audio to the interphone system.

The output of the three filters, 400 Hz, 1300 Hz, and 300 Hz, are used to drive lamp switch transistors. A lamp switch transistor, when turned on by one of the three filters, will provide a low-impedance path for lamp current which will cause the proper lamp to illuminate indicating passage over a marker beacon station.



MARKER BEACON RECEIVER BLOCK DIAGRAM

Shown on the block diagram is a simplified sensitivity circuit. In the "LOW" sensitivity switch position the diode anode voltage is positive enough to cause diode conduction. Diode conduction allows the low pass filter to shunt the IF signal reducing the receiver sensitivity. In the "HIGH" switch position the anode voltage is less reducing conduction. Less IF signal is shunted to ground through the filter allowing receiver sensitivity to increase.