AN 16-30ARN14-2

HANDBOOK
OPERATING INSTRUCTIONS

RADIO RECEIVER AN/ARN-14

THIS PUBLICATION REPLACES AN 16-30ARN14-2 DATED 13 JULY 1950

PUBLISHED UNDER AUTHORITY OF THE SECRETARY OF THE AIR FORCE
AND THE CHIEF OF THE BUREAU OF AERONAUTICS

Ross-Gould Co., St. Louis, Mo.-4200-12/20/51

15 AUGUST 1951

LIST OF REVISED PAGES ISSUED

INSERT LATEST REVISED PAGES. DESTROY SUPERSEDED PAGES.

NOTE: The portion of the text affected by the current revision is indicated by a vertical line in the outer margins of the page.

ADDITIONAL COPIES OF THIS PUBLICATION MAY BE OBTAINED AS FOLLOWS:

USAF ACTIVITIES.—In accordance with Technical Order No. 00-5-2.

NAVY ACTIVITIES.—Submit request to nearest supply point listed below, using form NavAer 140: NAS, Alameda, Calif.; ASD, Orote, Guam; NAS, Jacksonville, Fla.; NAS, Norfolk, Va.; NASD, Oahu; NASD, Philadelphia, Pa.; NAS, San Diego, Calif.; NAS, Seattle, Wash.

For listing of available material and details of distribution see Naval Aeronautics Publication Index NavAer 00-500.

USAF

TABLE OF CONTENTS

SECTION I
GENERAL DESCRIPTION

SECTION II
INSTALLATION AND ADJUSTMENT

SECTION III
OPERATION

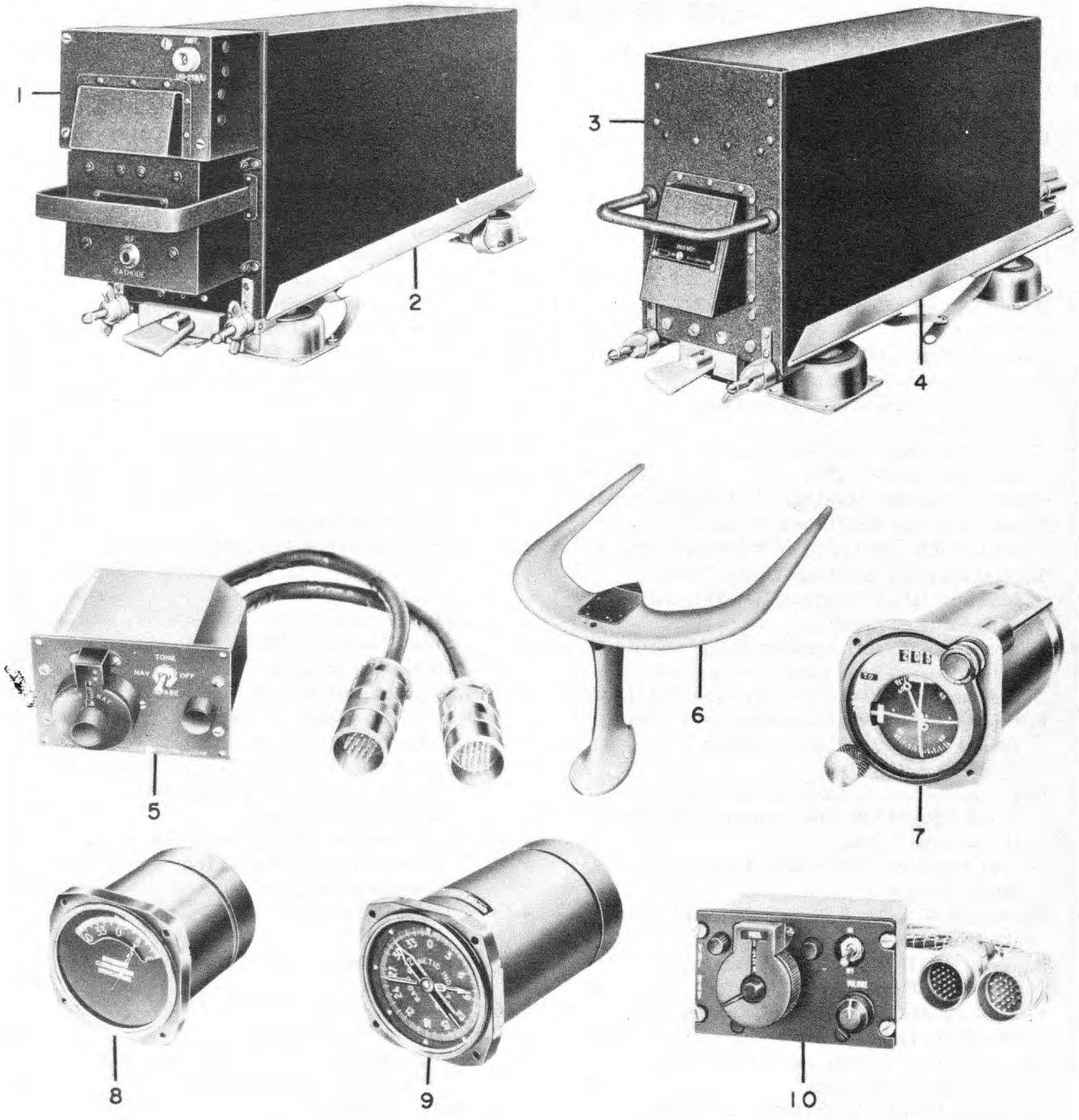
TABLE OF CONTENTS (Cont'd)

SECTION IV
SUPPLEMENTARY DATA

SECTION V
EMERGENCY OPERATION AND REPAIR

LIST OF ILLUSTRATIONS

LIST OF TABLES



1. Radio Receiver R-252/ARN-14 or R-252B/ARN-14
2. Mounting MT-627/ARN-14
3. Dynamotor DY-66/ARN-14
4. Mounting MT-628/ARN-14
5. Control Panel C-512/ARN-14
6. Antenna AT-172/ARN-14
7. Course Indicator ID-249/ARN or ID-249A/ARN
8. Radio Indicator-Control ID-251/ARN
9. Course Indicator ID-250/ARN
10. Control Panel C-760A/A

Figure 1-1. Radio Receiving Set AN/ARN-14, Composite View

SECTION I

GENERAL DESCRIPTION

1-1. GENERAL.

1-2. This handbook covers Radio Receiving Set AN ARN-14. The purpose of the handbook is to describe the equipment, its purpose, its characteristics, and proper operational procedures.

1-3. PURPOSE OF EQUIPMENT.

1-4. Radio Receiving Set AN/ARN-14 is an airborne equipment designed to provide the pilot or other members of an air crew with all of the radio aids to navigation now available in the very high frequency range of 108.0 to 135.9 megacycles, inclusive. This reception range includes both military and commercial amplitude-modulation communication channels, Omnidirectional Range Channels, 90/150-Cycle, and Two-Course VHF Visual-Aural Range Navigational Channels. (Equipment using Receiver R-252 ARN-14 is capable of receiving Phase Comparison Localizer Channels in addition to these.)

1-5. PERFORMANCE.

1-6. FREQUENCY RANGE. The frequency range covered by Radio Receiving Set AN/ARN-14 is from 108.0 to 135.9 megacycles, inclusive. The equipment provides 280 crystal-controlled communication-navigation reception channels, spaced 100 kilocycles apart in this frequency range. Frequencies are allocated in this range so that the ground stations operate only on frequencies spaced 100 kc apart starting at 108.0 megacycles. Different types of services, or ground station emission, are allocated to respective bands of frequencies. The one exception is localizer reception, which may be either Tone (90/150 cycle) or Phase comparison as selected at the control unit. Both operate in the 108.0 to 111.9 mc band. (See table 1-1.)

Table 1-1
Frequency Allocations

Frequency Band in Megacycles	*Type of Service*
108.0 to 111.9	Runway Localizer (Either TONE or PHASE comparison emission)
108.3 to 110.3	VHF Two-Course Range
111.0 to 111.9	Weather Broadcasts
112.0 to 117.9	Omnidirectional Range
118.0 to 121.9	Tower
122.0 to 135.9	General Communications

1-7. FREQUENCY STABILITY. A unique feature of this equipment is that the frequency stability is equal to that of crystal control on all 280 available channels with the use of only 34 crystals. A variable frequency oscillator is employed as the heterodyne oscillator, which is very closely controlled by the crystal circuits in the monitor chassis (part of the receiver) to maintain a tolerance of plus or minus 0.007%.

1-8. SYSTEM LIMITATIONS.

1-9. TEMPERATURE AND PRESSURE CHARACTERISTICS. Radio Receiving Set AN/ARN-14 is designed to operate satisfactorily in the temperature range from −55°C (−67°F) to +71°C (+160°F), and at altitudes up to 50,000 feet (barometric pressure of approximately 3.4 inches of mercury).

1-10. DISTANCE AND RANGE. The approximate receiving distance for various VHF frequencies at various altitudes is shown graphically in figure 1-2.

1-11. HUMIDITY. This equipment is designed to operate satisfactorily, after exposure for periods up to 48 hours, up to 95% relative humidity at +50°C (+122°F).

1-12. PRIMARY POWER. The primary power required for operation of the dynamotor unit, which is supplied as part of this equipment, is 26.5 volts dc (nominal). Additional power of 26 volts at 400 cycles ac is required for operation of the indicator circuits. These primary voltages must be maintained at the receiver within plus or minus 10% of the nominal value to insure proper operation of the equipment. (See table 1-2.)

Table 1-2
Power Consumption

	+26.5v	*26 volts 400 cycles*
Radio Receiver using maximum instrumentation (including dynamotor)	Approx. 6.5 amperes	Approx. 0.43 amperes
Radio Receiver using minimum instrumentation	Approx. 6.5 amperes	———
Maximum current drain (dynamotor starting and band-change motor running)	Approx. 20 amperes	Approx. 0.43 amperes

1-13. EQUIPMENT SUPPLIED.

1-14. Table 1-3 lists the equipment supplied with Radio Receiving Set AN/ARN-14.

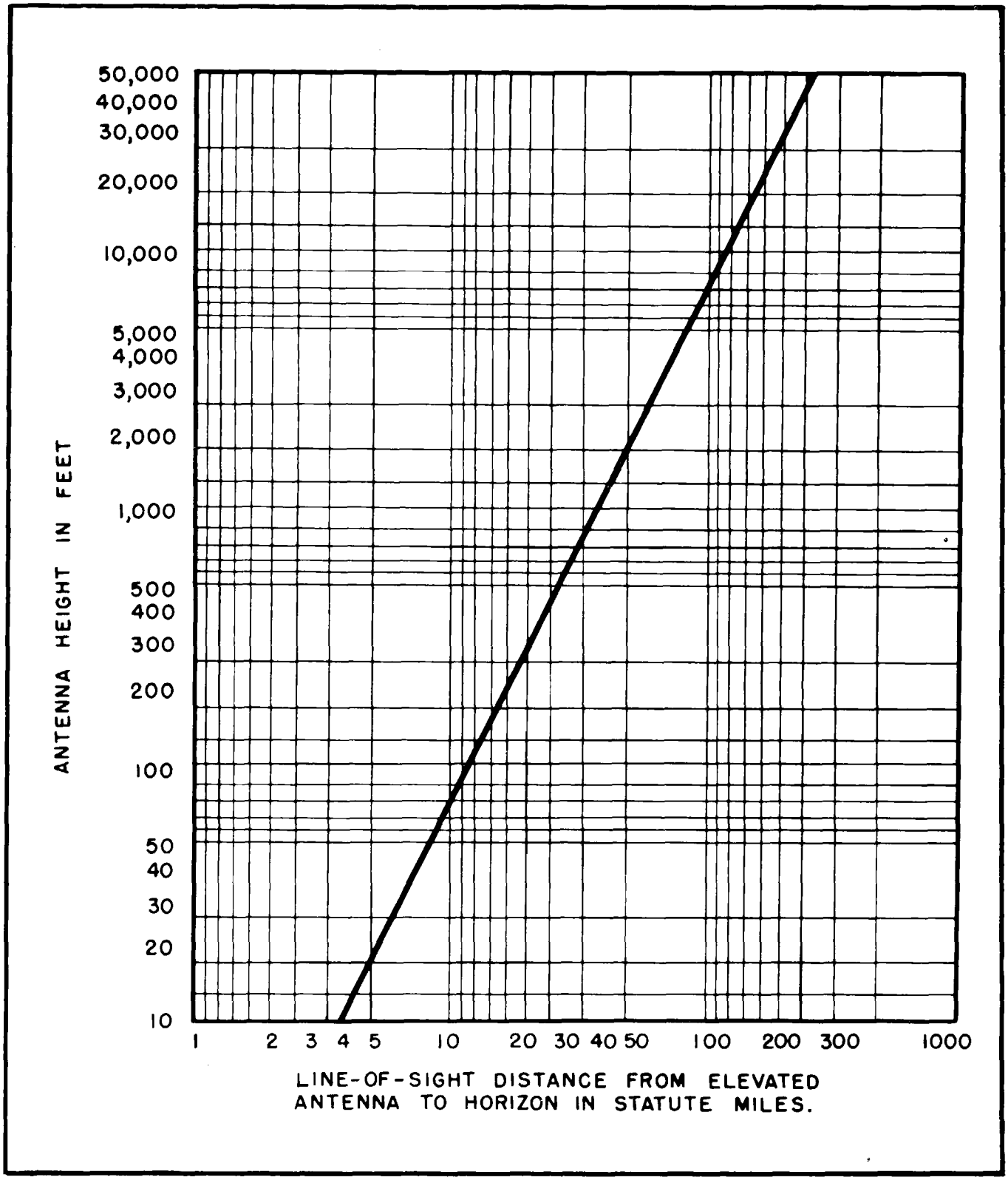


Figure 1-2. Line-of-Sight Distance to Horizon for Various Altitudes

Table 1-3
Equipment Supplied

Quantity Per Equipment	*Name of Unit*	*Air Force Designation*	*Overall Dimensions (inches)*	*Weight (lbs.)*
1	Radio Receiver including: R-f head, I-f and audio chassis, Navigation chassis, Monitor chassis (complete with tubes and crystals)	R-252/ARN-14 or R-252B/ARN-14	25.41 x 5.00 x 7.62	33.50
1 or	Control Panel	C-512/ARN-14	5.37 x 5.00 x 3.375	2.37
1	Control Panel	C-760A/A	3.375 x 4.25 x 5.75	2.80
1	Dynamotor Unit	DY-66/ARN-14	14.74 x 5.00 x 7.75	16.04
1	Mounting (for Dynamotor)	MT-628/ARN-14	17.70 x 5.90 x 5.87 (unloaded, extractor extended)	2.86
1	Mounting (for Radio Receiver)	MT-627/ARN-14	24.75 x 5.93 x 5.87 (unloaded, extractor extended)	3.18
1 or	Course Indicator	ID-249/ARN	6.21 x 3.25	3.25
1	Course Indicator	ID-249A/ARN	6.21 x 3.25	3.25
1	Course Indicator	ID-250/ARN	6.25 x 3.25	2.50
1	Radio Indicator-Control	ID-251/ARN	4.36 x 3.25	1.86
1	Antenna	AT-172/ARN-14	26.50 x 17.25 x 12.125	5.75

1-15. EQUIPMENT REQUIRED BUT NOT SUPPLIED.

1-16. Table 1-4 lists the equipment required but not supplied with Radio Receiving Set AN/ARN-14.

Table 1-4
Equipment Required But Not Supplied

Quantity Per Equipment	*Name of Unit*	*Air Force Type Designation*	*Required Characteristics*
1	Flight Path Deviation Indicator	ID-48A	Standard three inch aircraft instrument case providing cross-pointer indicator facilities.
1	Power Source		A primary power source of 26.5v dc capable of supplying 7 amperes will be required for operating the dynamotor.
1	Power Source		A primary power source of 26v at 400 cycles ac will be required for operation of the indicator circuits.
1	Antenna Changeover Relay		Coaxial relay to operate on 28v dc at 1 ampere maximum will be required if a separate antenna is to be used for the communication frequencies.
1	Gyro Flux Gate Compass Transmitter and Amplifier Unit or other remote indicating magnetic compass		Designed to provide the magnetic compass information required for operation of the Course Indicator ID-250/ARN-14.
	Headsets Cords Interphone Jack Boxes		To match 500-ohm receiver output impedance.
	Suitable Interconnecting Wires		See paragraphs 2-39 through 2-47.
1	Antenna Coaxial Connector	UG-21B/U	To mate with UG-58/U receptacle.
	Antenna Coaxial Cable	RG-8/U	52 ohm impedance.

SECTION II
INSTALLATION AND ADJUSTMENT

WARNING

Operation of this equipment involves the use of voltages which are dangerous to life. Personnel should observe all safety regulations at all times.

2-1. INSTALLATION.

2-2. GENERAL. The operational performance of any radio set depends to a great extent upon the quality of the installation. This is especially true in the case of modern aircraft installations where a number of potential interference sources exist. In the high frequency spectrum in which Radio Receiver R-252/ARN-14 operates, natural interference is almost non-existant. These frequencies, however, are quite susceptible to locally generated intereference from ignition systems, rotating electrical machinery, radar sets and the like. This radio set contains a very effective noise limiter, but any noise limiter desensitizes the receiver for the duration of the individual noise pulses. Therefore, any precautions taken during installation to minimize pickup from electrical fields existing near the installation will pay dividends in trouble-free operation. This may be accomplished by careful bonding, physical isolation and judicious location of the antenna, antenna lead-in, control cable and power cable.

2-3. PRELIMINARY PROCEDURE.

2-4. Unpack the radio set and check with the list of equipment supplied in Section I.

2-5. Remove the radio receiver chassis from its case by loosening the two thumbscrews and plug extractor screw on the front of the unit. Check to see that all of the tubes are in place.

2-6. Remove all of the indicators and the control unit from their wrappings and inspect them for visible evidence of damage.

2-7. Rotate the knobs on the indicators; operate the switch on the control, and rotate the channel selector switch to check their mechanical operation.

2-8. If any of the equipment shows evidence of defects an Unsatisfactory Report should be filled out and submitted in accordance with existing regulations.

2-9. PRE-INSTALLATION BENCH TEST.

2-10. GENERAL. To avoid the possibility of having to dismount some component of the radio set just after it has been installed in the aircraft because of trouble in the unit, and to eliminate the receiver itself as a possible source in the event that trouble occurs in a new installation, a pre-installation check may be made before the final mounting. However, in order to make these tests it will be necessary to build up a test bench equipped with the items listed in paragraph 2-11 and connected as shown in figure 4-10.

2-11. EQUIPMENT REQUIRED.

a. Primary power source of 26.5-volts dc capable of supplying seven amperes for operation of the dynamotor, filaments and control circuits.

b. Primary power source of 26-volts at 400 cycles ac for operation of the indicator circuits.

c. Appropriate cable harnesses and plugs to simulate an actual aircraft installation mounted to racks in which the equipment components may be placed for testing.

d. Signal Generator SG-13/ARN.

e. Remote indicating magnetic compass, or equivalent calibrated synchro transmitter.

f. Headset and cord.

2-12. TEST PROCEDURE.

2-13. If the previously-mentioned test bench is available, place the equipment to be tested in the test rack, connect all of the plugs and proceed to check the equipment as instructed in the following paragraphs.

a. Connect the output of Signal Generator SG-13/ARN to the antenna input of the receiver (located on the front of the receiver case).

b. Set the frequency selector on the signal generator to one of the navigation frequencies to be used after the equipment is installed in the aircraft.

c. Set the frequency selector on the Control Panel (C-512/ARN-14 or C-760A/A) to the same frequency.

d. Set the "TONE-PHASE-NAV. OFF" switch on Control Panel C-512/ARN-14 to either the "TONE" or "PHASE" position (or "ON" position on C-760/A).

e. Adjust the output of the signal generator for 1000-cycle tone 30% modulation at 10 μv.

f. Adjust the "VOLUME CONTROL" on the control panel to a comfortable level in the headsets.

g. If the audio is heard in the headsets, it may be assumed that the channel selector mechanism and the audio section of the receiver are in proper operating condition.

h. It is recommended that this check be made on all of the frequencies to be used.

i. With the switch on the control panel in the same position as in step d., set the frequency selector to 110.1 megacycles.

j. Set the frequency selector on the signal generator to 110.1 megacycles.

k. Set the output attenuator on the signal generator to 1000 μv.

l. Set the emission control on the signal generator for tone localizer output.

m. Check the 90/150-cycle balance by rotating the tone localizer course control on the signal generator to the left and to the right in the shaded area marked for the zero adjustment. If the equipment is operating properly the vertical pointer on the Course Indicator ID-249 ARN or ID-249A/ARN will pass through its center position as the tone localizer course control is moved back and forth.

n. Next set the tone localizer course control on the signal generator to the right-hand shaded area. In this position the vertical needle should line up with the extreme right-hand dot on the face of the indicator as the tone localizer course control is moved through the shaded area.

o. Repeat the same procedure for the left-hand side of the indicator by setting the tone localizer course control to the shaded area on the left of the zero adjustment shaded area.

Note

The vertical flag alarm should be out of sight during all of these indicator checks.

p. Repeat the three preceding checks, however, in each position when the needle is adjusted for exactly zero, or exactly full scale right or left deflection, vary the output attenuator on the signal generator from 20 to 50,000 μv. When this is done the vertical needle should not move appreciably.

q. These tests are made to check the 90/150-cycle balance control, the tone localizer course sensitivity and the AVC action.

Note

Steps r. to u. inclusive apply to equipments using Receiver R-252/ARN-14 *only*.

r. Next set the "TONE-PHASE-NAV. OFF" switch on the control panel to the "PHASE" position.

s. Leave the frequency selector control on the control panel at 110.1 megacycles.

t. Set the emission control on the signal generator to phase localizer output position.

u. With attenuator control on the signal generator set to 1000 μv, repeat the procedure for checking tone localizer operation.

v. Set frequency selector on signal generator to 114.9 megacycles.

w. Next set the emission control on the signal generator for omnirange operation.

x. Set frequency selector on control panel to 114.9 megacycles.

y. Set the variable phase generator control on the signal generator to 0°.

z. With signal generator adjusted to 114.9 megacycles at 100 μv output, check the operation of Course Indicator ID-249/ARN (or ID-249A/ARN) and Course Indicator ID-250/ARN. Course Indicator ID-250/ARN should read 0° plus or minus 3°. The vertical pointer of Course Indicator ID-249/ARN (ID-249A/ARN) should be centered when the course selector knob on the ID-249 is rotated until 0° plus or minus 1.5° is indicated on the "COURSE" window at the top of the face of the instrument. The ambiguity meter should be indicating "TO".

aa. Check the course sensitivity of the ID-249/ARN (ID-249A/ARN) by adjusting the variable phase control on the signal generator to 10°. This should cause full scale left deflection of the vertical pointer. Adjusting the signal generator variable phase control 350° should cause the vertical pointer to deflect full scale to the right. Full scale deflection to the right or left should be obtained within plus or minus 1.5° of the specified setting. Check the ID-249/ARN (ID-249A/ARN) versus variable phase control for every 45° throughout 360° to see that the maximum allowable error of plus or minus 1.5° is not exceeded.

bb. Next check the operation of the magnetic direction indicator on the ID-249/ARN (ID-249A/ARN) by varying the reading of the remote indicating magnetic compass and observing whether the magnetic direction indicator pointer follows. Several methods may be employed to vary the reading of the compass. One would be to move a magnet back and forth near the instrument case. Another would be to rotate the test bench on which the equipment is mounted. For this purpose it would be advisable to mount the test bench on rollers.

cc. Disconnect the signal generator from the receiver input.

dd. Reconnect the antenna to the receiver.

ee. Connect the antenna supplied with the signal generator to the generator output terminal, and place the generator about 100 feet distant from the test bench in sight of the receiver.

ff. Set the frequency selector control on the signal generator back to 110.1 megacycles.

gg. Set the emission control on the signal generator back to 1000 μv.

hh. Set the output attenuator on the signal generator to 1000 μv.

ii. Set the frequency selector on Control Panel C-512/ARN-14 or C-760A/A to 110.1 megacycles.

jj. Set the "TONE-PHASE-NAV. OFF" switch on Control Panel C-512/ARN-14 back to the "TONE" position. On Control Panel C-760A/A turn the "ON-OFF" switch "ON".

kk. Repeat the tone localizer course sensitivity check to test the operation of the antenna.

2-14. INSTALLATION OF COMPONENTS.

mounting the individual components are accessibility, 2-15. GENERAL. The principal considerations in

freedom from interference, sufficient ventilation, operating convenience, and maintenance of reasonably short interconnecting leads.

2-16. ANTENNA AT-172/ARN-14 (*See figure 4-1.*)

2-17. The antenna should be located so that the dipoles are in a horizontal plane when the aircraft is in normal flying attitude. (Use RG-8/U coaxial cable.) It should be located sufficiently far away from the propellers so that their modulation effect on incoming r-f signals is reduced to negligible proportions. Under no circumstances should the effect of propellers, at the antenna location, exceed 4% effective modulation. The antennas also should be shielded from radar and radio altimeter antennas by the aircraft structure.

Note

The length of the antenna coaxial line (use RG-8/U cable) is not critical, except when two receivers are connected to the same antenna. Then the line lengths between the junction of the lines and each receiver must be 17″ ±2″.

2-18. Before installing the antenna, cut out a rubber gasket to act as a seal between the antenna and the outer surface of the aircraft. Cut an aluminum rectangular plate, approximately 3/32-inch thick, and secure to stringers or longerons inside the aircraft, directly beneath the location selected for the antenna. Should the space between the stringers or longerons be so much that there is danger of the plate buckling when it is tightened, a vertical support should be provided between the plate and the skin of the aircraft.

2-19. Lay out and drill holes in the skin of the aircraft and the metal plate as shown in the outline and mounting dimension drawing, figure 4-1.

2-20. It is recommended that anchor nuts, which can be riveted to the aluminum plate, be used to secure the #10-32 fillister-head screws required to mount the antenna to the aircraft. It may be desirable, in high speed aircraft, to fair in the mounting holes of the antenna with a suitable material.

2-21. CONTROL PANEL C-512/ARN-14 and C-760A/A. (*See figure 4-2 and 4-2A.*)

2-22. The control box must of necessity be located near the crew member who is going to do most of the operating. Only at this position may different channels and type of operation be selected. The control box should be positioned so that it will be easily accessible and easily readable to the operator.

Note

If the control panel is mounted on a non-metallic surface, make a good ground connection to the structure of the aircraft.

2-23. DYNAMOTOR UNIT DY-66/ARN-14 AND MOUNTING MT-628/ARN-14 (*See figure 4-3.*)

2-24. When installing the dynamotor unit certain recommended practices should be followed, if possible, to minimize electrical interference.

2-25. The dynamotor unit should be located so that it will be easily accessible for servicing.

2-26. Remove the dynamotor unit from its mounting base. Lay out and drill mounting holes in the structure of the aircraft for the mounting base as shown in figure 4-3. Be sure that sufficient clearance is provided for proper ventilation of the dynamotor unit, and for access to the plug connection. When the mounting base is fastened securely in place, slide the dynamotor unit into the mounting base and secure the thumb-locking screw on the front of the unit. *Safety Wire The Thumbscrews.*

2-27. RADIO RECEIVER R-252/ARN-14 AND R-252B/ARN-14. (*See figure 4-4.*)

2-28. The location of the receiver is not critical so long as there is sufficient ventilation, sufficient clearance in front of the unit to allow removal of the unit from its mounting base, and sufficient clearance in the rear for cable connections. Care should be exercised to separate the unit from radar modulators or ignition equipment and to keep the interconnecting cables reasonably short, especially the antenna coaxial cable.

2-29. A clearance of at least one-half inch should be allowed around all sides of the unit. If possible, greater space should be allowed at the top of the unit to permit rapid intake of air for the cooling system.

2-30. Remove the receiver from its mounting base. Lay out and drill mounting holes in the structure of the aircraft as shown in figure 4-4. When the mounting base is fastened securely in place, slide the receiver into the mounting base and secure the thumb-locking screws on the front of the unit. *Safety Wire The Thumbscrews.*

2-31. COURSE INDICATOR ID-249/ARN AND ID-249A/ARN. (*See figure 4-5.*)

2-32. Course Indicator ID-249/ARN (ID-249A/ARN) is a standard three inch aircraft instrument and should be mounted in the cockpit in clear view and within easy reach of the pilot. Course Indicator ID-249A/ARN differs from the ID-249/ARN in that it includes a separate course datum synchro and an additional plug on the rear for supplying directional information to an automatic pilot.

2-33. When the indicator is to be mounted in front of the instrument panel three and one-quarter inches must be allowed at the rear of the indicator to accommodate and permit the plug to be removed without first removing the indicator from the panel. Do not flush-mount this course indicator. The greater depth and weight to be supported by the face of the unit may cause the seal to break from vibration if mounted in this manner. (See figure 4-8.)

2-34. RADIO-INDICATOR CONTROL ID-251/ARN. (*See figure 4-7.*)

2-35. The Radio-Indicator Control ID-251/ARN does not necessarily have to be mounted in the navigators compartment, depending upon the other instruments used with the system. If the indicator is used

in the navigators compartment so that the more accurate indicator readings may be used for navigation purposes, it should be mounted so that it is clearly visible to the user. However, if the unit is used solely for combining the output of the radio receiver with the output of the gyro flux gate compass for operation of the ID-250, it may be located in a remote part of the aircraft.

2-36. When the indicator is to be mounted in front of the instrument panel three and one-quarter inches additional clearance must be allowed at the rear of the indicator to accommodate the plug. When the unit is flush mounted at least four inches clearance must be provided at the rear of the unit to accommodate the plug and to permit the plug to be removed without first removing the indicator from the panel. (See figure 4-8.)

2-37. COURSE INDICATOR ID-250/ARN. *(See figure 4-7.)*

2-38. The course indicator will be used by either the pilot or navigator or both and must be located within easy reach and within view of its user. The unit is designed to be mounted in a standard three-inch aircraft instrument panel cutout.

2-39. All interconnecting wires for the indicator are connected through a plug on the rear of the unit.

2-40. When the indicator is mounted in front of the instrument panel three and one-quarter inches clearance must be allowed at the rear of the indicator to accommodate the plug. When the unit is flush mounted at least four inches clearance must be provided at the rear of the indicator to accommodate the plug and to permit the plug to be removed from the unit without first removing the indicator from the panel. (See figure 4-8.)

2-41. CABLING.

2-42. CABLE FABRICATION.

2-43. All connecting cables must be made up. The control unit cables which are already connected to the unit are approximately 18 inches long and are terminated with the proper plugs. Since the length of these cables are fixed, a junction box or connection strip of some kind must be located within 18 inches of the unit.

2-44. SHIELDING AND SHADING. The shielding and shading effect of the aircraft structure should be utilized to full advantage in routing cables.

2-45. OPEN WIRING. Open wiring may be used except in those places where metallic conduit shielding is needed for protection or where the natural shielding effect of the aircraft structure is not sufficient or cannot be readily utilized. Shielded twisted pairs as specified on the interconnecting diagram, figure 4-10, should be used.

2-46. ANTENNA COAXIAL CABLE. The antenna lead-in must be as short as possible and must run close to the aircraft structure so as not to form large area loops between the lead-in and the structure. Assembly of the RG-8/U coaxial cable to the antenna connector plug UG-21B/U is shown in figure 4-9.

2-47. BONDING. Bonding jumpers are run across each of the shockmounts in the mounting frame, and the receiver unit is bonded to the mounting frame through two pins at the rear, two fasteners at the front, and the shell of the plug.

2-48. WIRE SIZE. Wire sizes for the control unit, that is, the wires from the terminal boards to the receiver, are not particularly important as the currents through them are small. They should, however, be mechanically strong. The recommended size is A.W.G. number 20.

2-49. PRIMARY POWER WIRES. The primary power wires carry heavy current and should be of sufficient size to provide 26.5 volts at plug P301 on the rear of the receiver between pin number 2 and pin number 42 or 43, and between pin number 3 and pin number 42 or 43 (pin 42 and 43 are internally connected together). The primary voltage must be maintained at the receiver within plus or minus ten per cent of its nominal rating of 26.5 volts. A.W.G. number 10 wire is recommended as the wire size for the 26.5-volt connections between the power supply unit and the junction box terminal board. A.W.G. number 18 wire is recommended as the wire size for 26.5-volt connections between junction box terminal board and the receiver. All other wires may be number 20. If, however, the wiring run is long and an excessive voltage drop occurs, it will be necessary to resort to the use of larger wire.

2-50. INTERCONNECTION OF UNITS. *(See figure 4-10.)*

2-51. The radio set installation should be connected according to the Interconnecting Wiring Diagram, figure 4-10. This diagram shows the connections to be made between the various units in the aircraft. All connections to the units are made through a junction box in the aircraft. This junction box should have at least 85 terminals available for interconnection of the components of Radio Receiving Set AN/ARN-14.

2-52. ANTENNA CHANGE-OVER RELAY.

2-53. A coaxial relay will be required which is designed to operate on 28v dc at one ampere (maximum) to switch from the communications antenna to the navigation antenna.

2-54. ADJUSTMENTS.

2-55. GENERAL.

2-56. Only one adjustment may be required after the equipment has been installed in the aircraft. This is an adjustment of the squelch control in the receiver. In order to set the squelch control properly, the conditions under which it is checked should simulate as

nearly as possible actual flight conditions. Therefore, the check should be made with the engines running and all of the electrical equipment in the aircraft turned on.

2-57. EQUIPMENT REQUIRED.

WARNING

Operation of this equipment involves the use of voltages which are dangerous to life. Personnel should observe all *safety* regulations at all times.

2-58. One Signal Generator SG-13 ARN will be required to adjust the squelch control and one pair of headsets if there is not already a pair in the aircraft.

2-59. ADJUSTMENT PROCEDURE.

a. Remove the squelch control cover panel from the front of the receiver.

b. Set the frequency selector on the control panel to 110.1 megacycles.

c. Turn the "VOLUME" control fully on.

d. Adjust the squelch control until the background noise in the headset disappears.

e. Disconnect the antenna from the receiver.

f. Connect the output of the signal generator to the receiver input.

g. Set the frequency selector on the signal generator to 110.1 megacycles.

h. Set the emission control on the signal generator for audio modulation.

i. Using the output attenuator on the signal generator increase the output from 0 up 10 μv. If audio is not heard at 10μv the aircraft is too noisy and should be reported to the maintenance section.

j. If audio is heard below 10 μv the squelch control is properly adjusted and the antenna may be reconnected to the receiver input.

2-60. AFTER INSTALLATION CHECKS.

2-61. After Radio Receiving Set AN ARN-14 has been installed in the aircraft and the after installation adjustments have been made, a performance check should be made to insure that the equipment is still in proper operating condition before it is turned over to the operating personnel. This test should be performed in accordance with the instructions given for the pre-installation bench test. The only check that cannot be made as instructed in the pre-installation bench test is the check of the magnetic direction indicator on the Course Indicator ID-249 ARN (or ID-249A ARN). When checking the magnetic direction indicator mounted in the aircraft it will be necessary to turn the aircraft in its parking area to see if the pointer on the course indicator follows the remote indicating magnetic compass.

2-62. STARTING THE EQUIPMENT. Before turning the equipment on, check the main power supply (26.5-volt d-c supply) and the inverter power unit (26-volt or 400-cycle supply) to see that they are turned on. Then turn Radio Receiver Set AN ARN-14 on as follows:

a. Set the "TONE-PHASE-NAV. OFF" switch on Control Panel C-512/ARN-14 to the "TONE" or "PHASE" position depending upon the type of reception desired. For TONE type runway localizers the switch should be in the "TONE" position, and for all other types of reception the switch should be in the "PHASE" position.

b. Turn the "ON-OFF" switch "ON" when using Control Panel C-760A/A.

2-63. CHANNEL SELECTION. Any one of 280 crystal-controlled channels may be selected at the control panel. Since the first digit is always "1" for any frequency between 108.0 and 135.8 megacycles, inclusive, the small window at the top of the frequency indicator on the front of the control panel will always read "1". Therefore, it is necessary to select only the following three digits (two whole megacycle digits and one tenth-of-a-megacycle digit). The whole megacycle selector dial (see figure 3-5) is calibrated from 08 to 35 (28 positions) and the tenths-of-a-megacycle dial is calibrated from .0 to .9 (10 positions). The procedure for setting up the desired frequency is given in the following steps:

a. Rotate the large whole megacycle selector knob (see figure 3-1) until the second two digits of the desired frequency appear in the window. For example, if the desired frequency is 133.5 megacycles, rotate the whole megacycle selector knob until "33" appears in the window under the first digit "1" which is visible in the topmost window.

b. Then, using the small tenths-of-a-megacycle selector knob (see figure 3-1) set up the last digit, which for the example given would be ".5".

c. When the desired frequency has been set up on the control panel, the receiver will be tuned to that frequency, and the circuits that are required to function will automatically be energized.

2-64. VOLUME CONTROL. Set the VOLUME control on Control Panel C-512/ARN-14 (or C-760A/A) to feed the desired amount of audio into the aircraft interphone system. This desired level usually is that at which the pilot is able to hear intelligibly any audio signal from the receiver when he has the VOLUME control on the interphone jack box set at the same level he uses to listen to other receivers in the aircraft. If all of the receivers in the aircraft, including Radio Receiver R-252/ARN-14, are adjusted so that their audio outputs are at nearly the same level when fed into the aircraft interphone system, the VOLUME control on the jack box will not have to be adjusted each time the pilot switches from one receiver to another.

2-65. STOPPING THE EQUIPMENT. Radio Receiving Set AN/ARN-14 is turned off by placing the "TONE-PHASE-NAV. OFF" switch in the "NAV. OFF" position ("ON-OFF" switch on Control Panel C-760A/A to "OFF" position).

SECTION III
OPERATION

WARNING

Operation of this equipment involves voltages which are dangerous to life. Personnel should observe all *safety* regulations at all times.

3-1. GENERAL.

3-2. PURPOSE OF EQUIPMENT. Radio Receiving Set AN ARN-14 is airborne equipment designed to provide the pilot or other members of an air crew with all of the radio aids to navigation now available in the very high frequency range of 108.0 to 135.9 megacycles, inclusive. This reception range includes both military and commercial amplitude-modulation communication channels, Omnidirectional Range Channels, Tone (90 150-Cycle) and Two-Course VHF Visual-Aural Range Navigational Channels. (Equipments using Radio Receiver R-252/ARN-14 are capable of receiving phase comparison localizer channels in addition to these.)

3-3. PERFORMANCE.

3-4. FREQUENCY RANGE. The frequency range covered by Radio Receiving Set AN/ARN-14 is from 108.0 to 135.9 megacycles, inclusive. The equipment provides 280 crystal-controlled communication-navigation reception channels, spaced 100 kilocycles apart in this frequency range. Frequencies are allocated in this range so that the ground stations operate only on even 100-kc frequencies spaced 100 kc apart. Different types of services, or ground station emission, are allocated to respective bands of frequencies. The one exception is localizer reception, which may be either Tone (90 150 cycle) or Phase comparison as selected at the control unit. Both operate in the 108.0 to 111.9-mc band. (See table 3-1.)

Table 3-1
Frequency Allocations

Frequency Band in Megacycles	*Type of Service*
108.0 to 111.9	Runway Localizer (Either TONE or PHASE comparison emission)
108.3 to 110.3	VHF Two-Course Range
111.0 to 111.9	Weather Broadcasts
112.0 to 117.9	Omnidirectional Range
118.0 to 121.9	Tower
122.0 to 135.9	General Communications

3-5. FREQUENCY STABILITY. A unique feature of this equipment is that the frequency stability is equal to that of crystal control on all 280 available channels with the use of only 34 crystals. A variable frequency oscillator is employed as the heterodyne oscillator, which is very closely controlled by the crystal circuits in the monitor chassis (part of the receiver) to maintain a tolerance of plus or minus 0.007%.

3-6. SYSTEM LIMITATIONS.

3-7. TEMPERATURE AND PRESSURE CHARACTERISTICS. Radio Receiving Set AN/ARN-14 is designed to operate satisfactorily in the temperature range from −55°C (−67°F) to +71°C (+160°F) and at altitudes up to 50,000 feet (barometric pressure of approximately 3.4 inches of mercury).

3-8. DISTANCE AND RANGE. The approximate receiving distance for VHF frequencies are shown graphically in figure 1-2.

3-9. HUMIDITY. This equipment is designed to operate satisfactorily after exposure for periods up to 48 hours, up to 95% relative humidity at 50°C (+122°F).

3-10. PRIMARY POWER. The primary power required for operation of the dynamotor unit, which is supplied as part of this equipment, is 26.5 volts d.c. (nominal). Additional power of 26 volts at 400 cycles a.c. is required for operation of the indicator circuits. These primary voltages must be maintained at the receiver within plus or minus 10% of the nominal value

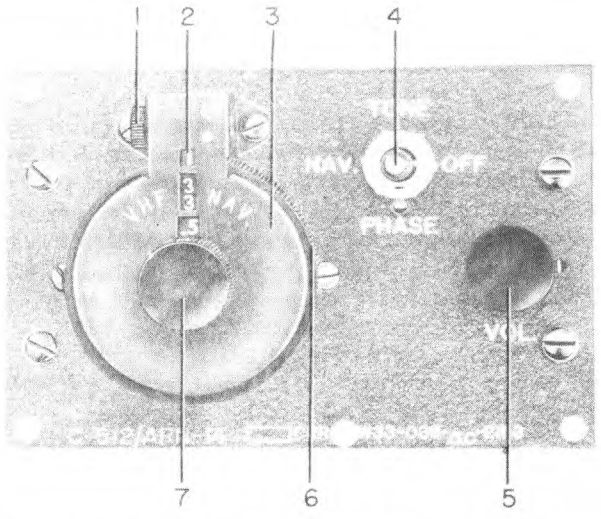
Table 3-2
Power Consumption

	+26.5v	*26 volts 400 cycles*
Radio Receiver using maximum instrumentation (including dynamotor)	Approx. 6.5 amperes	Approx. 0.43 amperes
Radio Receiver using minimum instrumentation	Approx. 6.5 amperes	———
Maximum current drain (dynamotor starting and band-change motor running)	Approx. 20 amperes	Approx. 0.43 amperes

to insure proper operation of the equipment. (See table 3-2.)

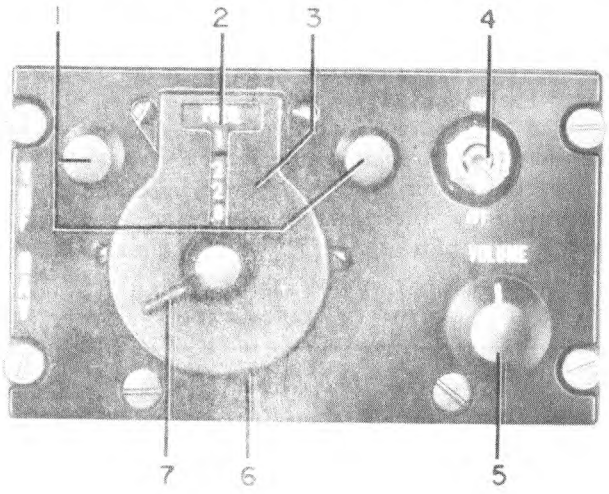
3-11. STARTING AND STOPPING THE EQUIPMENT.

3-12. STARTING THE EQUIPMENT. Before turning the equipment on, check the main power supply (26.5-volt d-c supply) and the inverter power unit (26-volt or 400-cycle supply) to see that they are turned on. Then turn Radio Receiving Set AN/ARN-14 on as follows:



1. Dial Illuminating Lamp
2. Frequency Indicator
3. Dial Mask
4. Tone-Phase and On-Off Switch
5. Volume Control
6. Whole Megacycles Selector Switch
7. Tenth Megacycle Selector Switch

A. Control Panel C-512/ARN-14, Front View



1. Dial Illuminating Lamp
2. Frequency Indicator
3. Dial Mask
4. ON-OFF Switch
5. Volume Control
6. Whole Megacycles Selector Switch
7. Tenth Megacycle Selector Switch

B. Control Panel C-760A/A, Front View

Figure 3-1. Control Panel

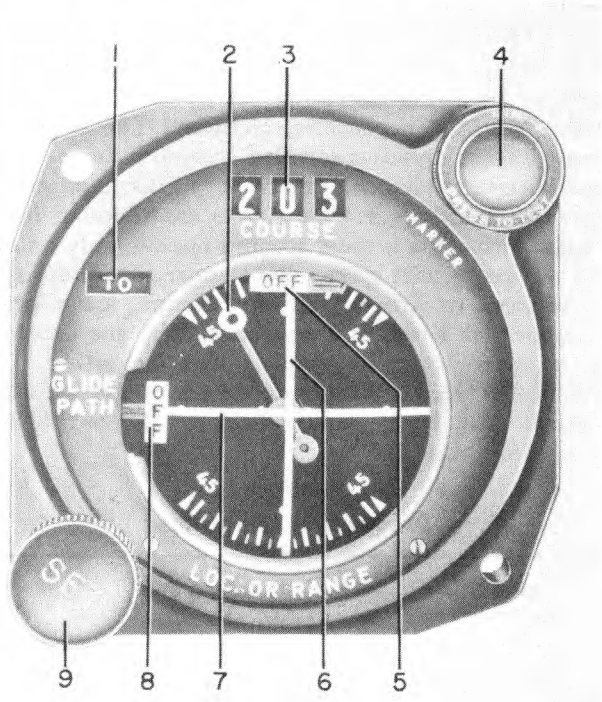
a. Set the "TONE-PHASE-NAV. OFF" switch on Control Panel C-512/ARN-14 to the "TONE" or "PHASE" position depending upon the type of reception desired. For TONE type runway localizers, the switch should be in the "TONE" position, and for all other types of reception the switch should be in the "PHASE" position

3-13. STOPPING THE EQUIPMENT. To stop operation of the equipment set the "TONE-PHASE-NAV.OFF" switch to the "NAV.OFF" position.

3-14. PREPARING THE EQUIPMENT FOR OPERATION. This equipment should have a thorough preflight check each day before being used. This preflight check should be performed in the manner described in Section II, paragraphs 2-12, 2-13, and 2-14.

3-15. LOCATION OF CONTROLS. All operating controls for Radio Receiver R-252/ARN-14 are located on Control Panel C-512/ARN-14. From the control panel it is possible to turn the equipment on and off, select the desired operating frequency, select either TONE or PHASE comparison type localizer operation, and adjust the level of the receiver's audio output, which is fed into the interphone system of the aircraft. (See figure 3-1.)

3-16. Course Indicator ID-249/ARN provides the facilities of a cross-pointer indicator, a magnetic head-



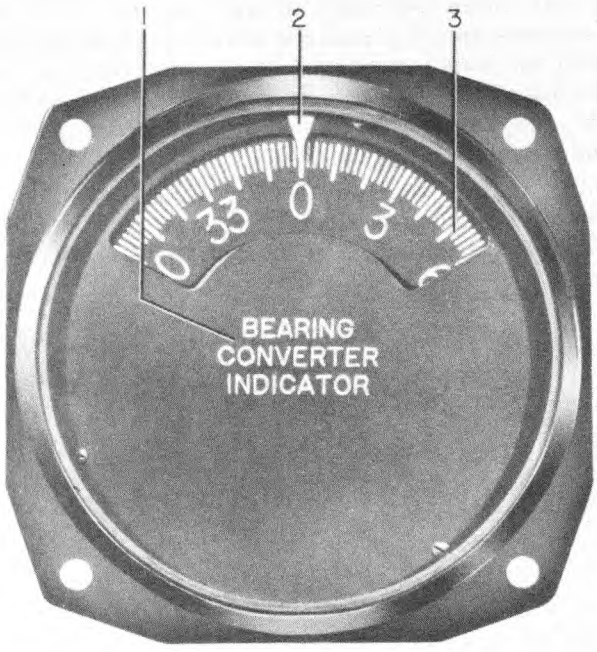
1. To-From Indicator
2. Heading Indicator (Mag.)
3. Course Indicator
4. Marker Beacon Indicator
5. Vertical Flag Alarm
6. Vertical Pointer
7. Horizontal Pointer
8. Horizontal Flag Alarm
9. Course SET Knob

Figure 3-2. Course Indicator ID-249/ARN, and ID-249A/ARN-14, Front View

ing indicator, a course selector, and a marker beacon indicator. Since the unit is primarily a pilot instrument, it will be located in the cockpit within view and easy reach of the pilot or copilot. The course selector "SET" knob and the "MARKER" beacon test knob are located on the front of the indicator. (See figure 3-2.)

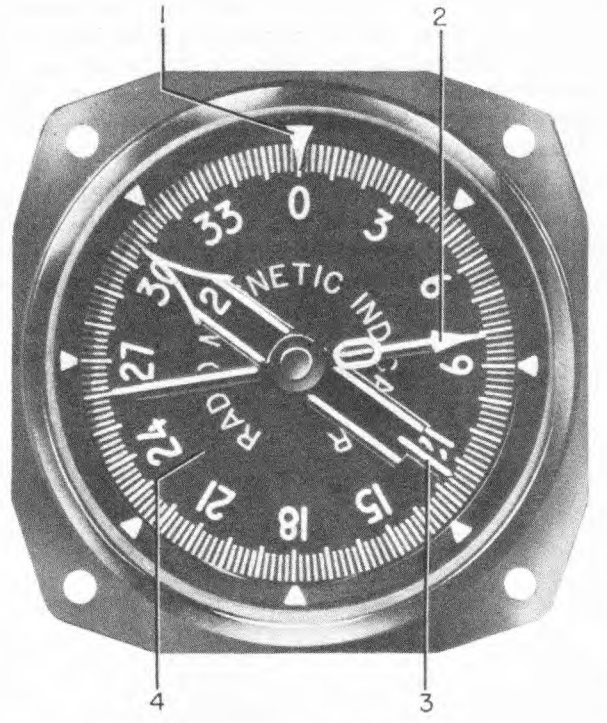
3-17. Radio Indicator-Control ID-241 ARN is used primarily for combining the magnetic heading information from a remote indicating magnetic compass with the omnidirectional range information from the radio receiver for operation of the radio magnetic indicator. Since the visual information from the radio indicator-control is used for reference purposes rather than for actual navigation operations, the unit does not have to be located near any particular member of the crew and may be located at some remote point in the aircraft. (See figure 3-3.)

3-18. Course Indicator ID-250 ARN is used for obtaining "heading-sensitive" bearings on omnidirectional range stations. The location of this unit in the



1. Mask
2. Fiducial Marker
3. Rotating Card

Figure 3-3. Radio Indicator-Control ID-251/ARN, Front View



1. Top Fiducial Marker
2. Front Pointer
3. Rear Pointer
4. Rotating Card

Figure 3-4. Course Indicator ID-250/ARN

aircraft will vary depending upon the size of the aircraft and the complement of the crew. On aircraft carrying navigators, the unit generally will be located in the navigator's compartment. On aircraft that do not carry navigators, the unit will be located in the cockpit. (See figure 3-4.)

3-19. INITIAL CONTROL SETTINGS. Set the "VOLUME" control on Control Panel C-512/ARN-14 or C-760A/A to feed the desired amount of audio into the aircraft interphone system. This desired level usually is that at which the pilot is able to hear intelligibly any audio signal from the receiver when he has the "VOLUME" control on the interphone jack box set at the same level he uses to listen to other receivers in the aircraft. If all of the receivers in the aircraft, including Radio Receiver R-252/ARN-14, are adjusted so that their audio outputs are at nearly the same level when fed into the aircraft interphone system, the "VOLUME" control on the jack box will not have to be adjusted each time the pilot switches from one receiver to another.

3-20. OPERATION.

3-21. CHANNEL SELECTION. Any one of 280 crystal-controlled channels may be selected at the control panel. Since the first digit is always "1" for any frequency between 108.0 and 135.9 megacycles, inclusive, the small window at the top of the frequency indicator on the front of the control panel will always read "1". Therefore, it is necessary to select only the following three digits (two whole megacycle digits and one tenth-of-a-megacycle digit). The whole megacycle selector dial is calibrated from 08 to 35 (28 positions) and the tenths-of-a-megacycle dial is calibrated from .0 to .9 (10 positions). The procedure for setting up the desired frequency is given in the following steps: (See figure 3-5.)

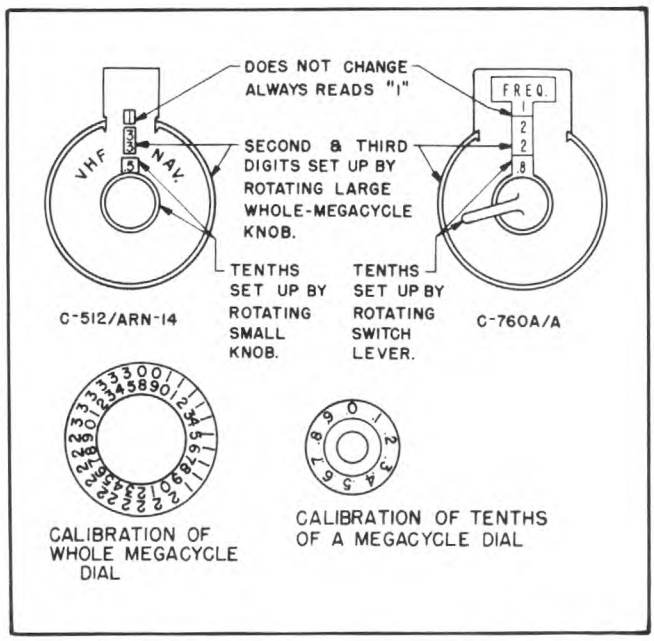


Figure 3-5. Control Panels C-512/ARN-14 and C-760A/A, Frequency Selector Dial Calibration

a. Rotate the large whole megacycle selector knob until the second two digits of the desired frequency appear in the window. (See figure 3-1.) For example, if the desired frequency is "133.5 megacycles", rotate the whole megacycle selector knob until "33" appears in the window under the first digit "1" which is visible in the topmost window.

b. Then, using the small tenths-of-a-megacycle selector knob set up the last digit, which for the example given would be ".5". (See figure 3-1.)

c. When the desired frequency has been set up on the control panel, the receiver will be tuned to that frequency, and the circuits that are required to function will automatically be energized.

Note

It makes no difference whether the frequency being set up on the control panel is approached in a clockwise or counterclockwise direction when selecting a frequency.

3-22. AUTOMATIC HEADING SENSITIVE INDICATIONS. Whenever the radio receiver is tuned to an omnidirectional range station and the aircraft is flying within receiving distance of the station, the Course Indicator ID-250/ARN constantly indicates the direction of the omnidirectional range station from the aircraft as measured from Magnetic North. Presentation of directional information is improved with this type of indicator since the magnetic heading of the aircraft is simultaneously indicated by the rotating compass card against a fiducial marker at the top of the indicator face.

3-23. As mentioned in paragraph 3-18, the Course Indicator ID-250/ARN incorporates three separate synchro motors, two which drive the two pointers and a third one which drives the rotatable compass card. The instructions given here for the operation of the ID-250 refer to the operation of the rotatable compass card and the functioning of *only* one pointer. In an installation where another source of ADF information is available so that both pointers may be utilized to obtain simultaneous bearings on two different stations, the operating instructions remain the same. (Ordinarily, in a single receiver installation, the rotors and stators of both pointer synchro motors are connected in parallel causing both pointers to rotate together and indicate the same bearing.)

3-24. The compass card, which is controlled by the remote indicating magnetic compass, rotates so that *the magnetic heading of the aircraft is indicated against the fiducial marker* at the top of the face of the indicator. The 0 degree mark on the rotating card always represents Magnetic North and the top fiducial marker represents the heading of the aircraft. (See figure 3-4.) The figure read on the rotating compass card at the pointed end of the needle may be interpreted as the magnetic bearing of the omnidirectional range station from the aircraft as measured from Magnetic North or as the zero drift magnetic heading to fly to reach the ODR station. If the pilot holds the magnetic heading toward the station and observes that the pointer tends to move away from the fiducial marker, he knows that a cross-wind exists and that he must correct the heading of the aircraft to compensate for it. The wind drift angle to be corrected is the angle between the top fiducial marker and the pointer. The direction in which the heading should be corrected in order to compensate for the wind drift may be determined by the following rules:

a. When flying toward an omnidirectional range station, movement of the pointer to the right of the fiducial marker indicates that the aircraft is deviating to the left of the desired course (wind is approaching from the right side of the aircraft) and the correction must be made to the right.

b. When flying away from an omnidirectional range station, movement of the pointer to the right of the fiducial marker indicates that the aircraft is deviating to the right of the desired course (wind is approaching from the left side of the aircraft) and the correction must be made to the left.

3-25. When the heading of the aircraft has been altered until the direction of the station, as read on the indicator, remains constant, the proper magnetic heading (corrected for wind drift) has been found and is indicated at the top fiducial marker.

3-26. To further illustrate the operation of this indicator, refer to figure 3-6(a). As may be seen from this illustration, the Course Indicator ID-250/ARN-14 is in an aircraft flying a magnetic heading of 180 degrees. A bearing is being taken on an omnidirectional range station 45 degrees to the right and ahead of the aircraft. The bearing of the station from the aircraft as measured from Magnetic North is 225 degrees. This 225-degree magnetic bearing (radial) is read at the pointed end of the needle, and the magnetic heading of the aircraft (180 degrees) is read at the top fiducial marker.

3-27. Desiring to reach the station, the pilot now alters his heading 45 degrees to the right. This causes the pointer and the compass card to rotate counterclockwise until the station is shown to be dead ahead (that is, with the pointed end of the needle toward the top fiducial marker and the bearing of 225 degrees still indicated as the direction to the station). Figure 3-6(b) shows this new condition.

3-28. If a cross wind existed, the pilot would still want to fly the 225-degree magnetic *course* to reach the station. As previously mentioned, the pilot must determine his wind drift and correct for it. Such a condition is shown in figure 3-6(c). Had the pilot desired to keep the nose of the aircraft pointed toward the station instead of flying a 225-degree magnetic course, with a magnetic heading corrected for wind drift, the condition shown in figure 3-6(d) would have resulted.

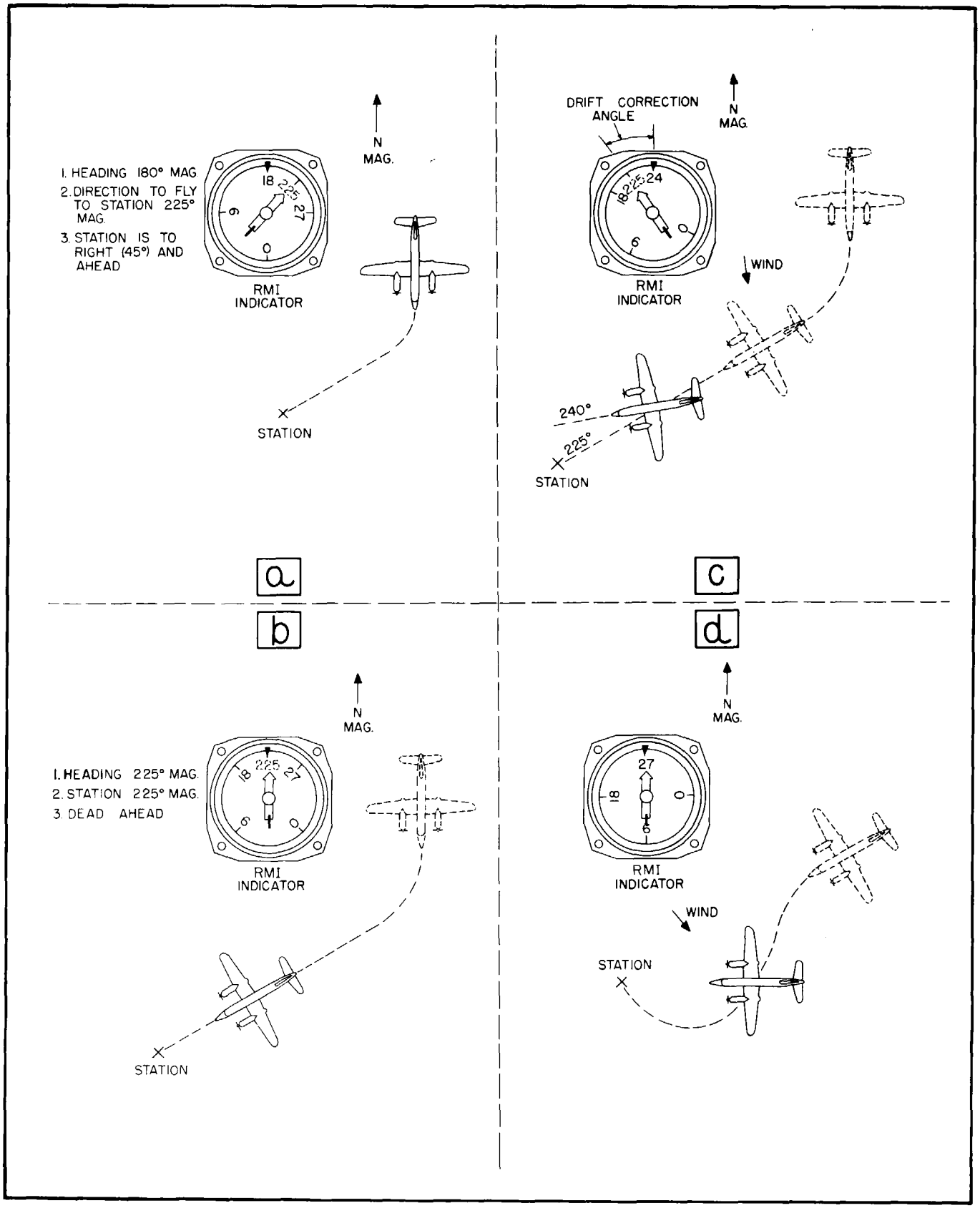


Figure 3-6. Typical Readings Using the Course Indicator ID-250/ARN

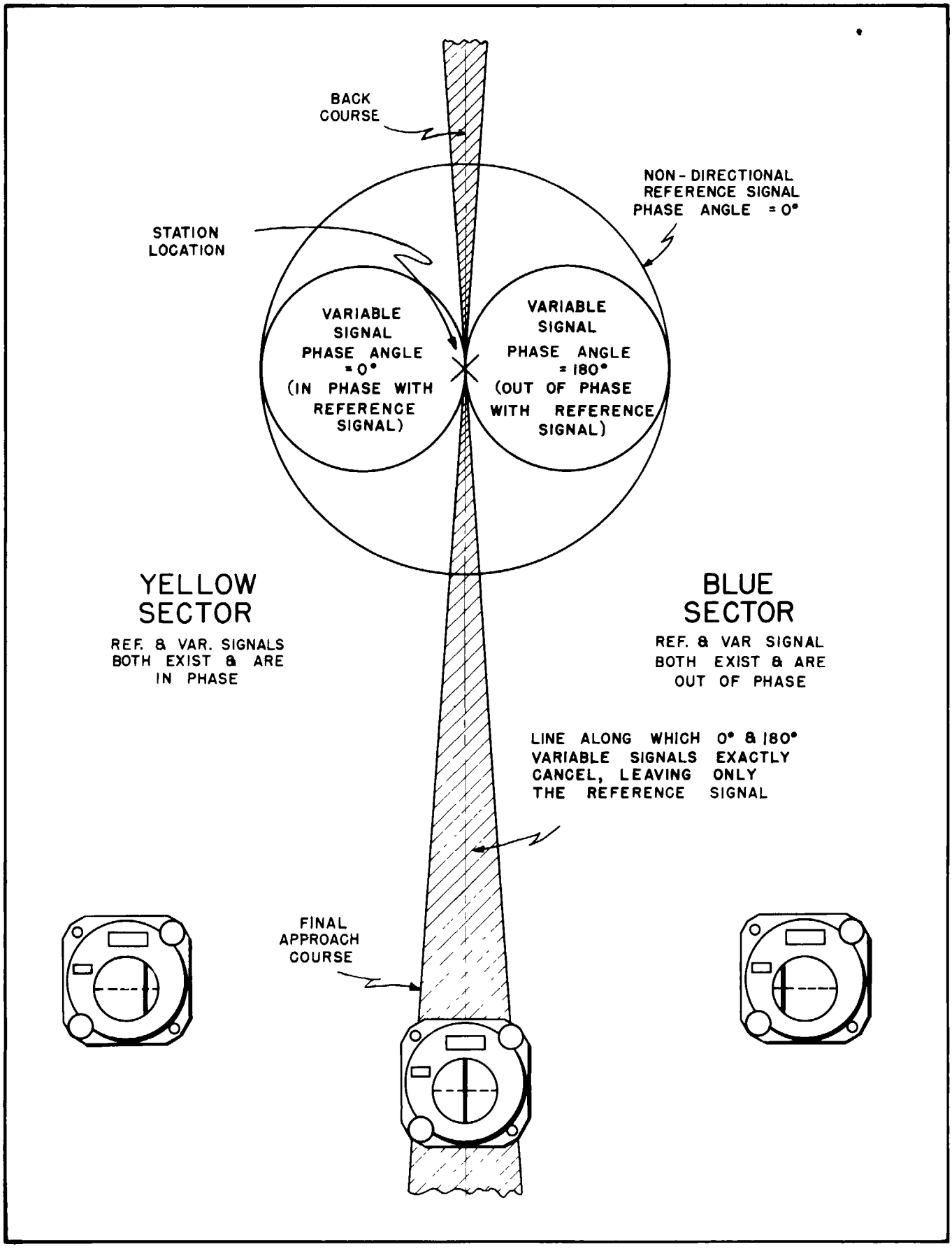


Figure 3-7. Phase Comparison Localizer Field Pattern

3-29. In order to further explain the relationship of the rotation of the compass card to the pointer, the following example is given. If an aircraft at a considerable distance from an omnidirectional range station makes a tight circle 360-degree turn (this should not change appreciably the direction of the station from the aircraft), the compass card would rotate the change in heading and the pointer would behave as if it were attached to the card. The pointer in the example given in figure 3-6 would continue to read 225 degrees to the station even though the heading of the aircraft read at the fiducial marker would be constantly changing through the 360 degrees of the turn.

3-30. PROCEDURE FOR OBTAINING AUTOMATIC HEADING SENSITIVE INDICATIONS.

a. Set the "TONE-PHASE-NAV.OFF" switch on the control panel to the "PHASE" position.

b. Set up the desired frequency as instructed in paragraph 3-21.

c. Adjust volume to the desired output level. (Refer to paragraph 3-19.)

d. Observe the heading and bearing information on the indicator.

3-31. RECEPTION OF PHASE COMPARISON RUNWAY LOCALIZER SIGNALS IN THE 108.0 TO 111.9 MEGACYCLE BAND. Whenever the radio receiver is tuned to the operating frequency of PHASE comparison type runway localizer, and the aircraft is flying within receiving distance of the station, the facilities of the runway localizer will be available to the pilot to aid him in making a safe landing under adverse weather conditions. Actually the localizer provides an imaginary vertical plane extending along the centerline of the runway in the direction of the final approach course. Course Indicator ID-249/ARN and ID-249A/ARN is used to provide the pilot with a visual indication of his positional deviation from this imaginary centerline when making the final approach to the runway. (See figure 3-3.)

3-32. As may be seen from figure 3-7, the area to the right of the centerline of the runway final approach course is designated as the blue sector and the area to the left of the final approach course is designated as the yellow sector. If, on making the final approach to the runway, the aircraft is flying directly along the centerline of the runway, the vertical pointer on the cross-pointer indicator (part of the ID-249) will be centered and it will remain centered as long as the aircraft holds the proper heading. As soon as the aircraft deviates to the left or right of the centerline of the runway, the vertical pointer deviates from its center position in the direction opposite to that in which the aircraft is moving off course. That is, the vertical pointer indicates the direction in which the heading of the aircraft must be altered in order to make final approach good. Another type of cross-pointer indicator known as the Flight Path Deviation Indicator ID-48/ARN may be used with Radio Receiving Set AN/ARN-14 but, is not part of the equipment supplied. At the bottom of the face of this indicator there is a sector split in the middle and painted blue on the left and yellow on the right, corresponding to the blue and yellow sectors shown on an Instrument Approach Chart. The readings on the flight path deviation indicator correspond to the readings obtained with an ID-249 in every respect except one, and that is that on the flight path deviation indicator the representative color of the sector is indicated. When using *either* type of indicator always *correct the heading of the aircraft in the direction that the vertical needle is pointing.*

3-33. A warning flag prevents false "on-course" readings by obscuring part of the center-pointing vertical needle of the Course Indicator ID-249/ARN (or ID-249A/ARN) or Flight Path Deviation Indicator ID-48/ARN, when the airborne equipment is not receiving the proper localizer signals. (See figure 3-8.)

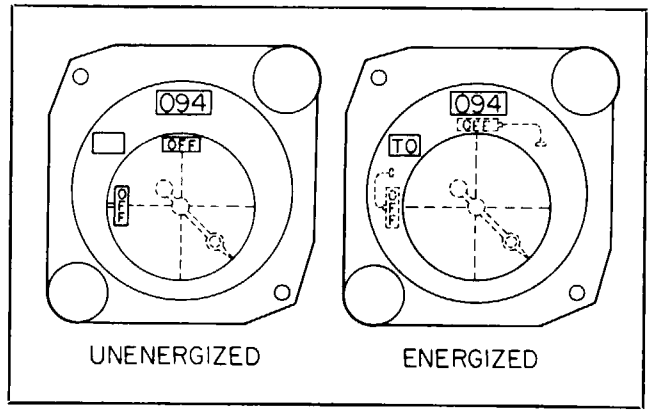


Figure 3-8 .Course Indicator ID-249/ARN and ID-249A/ARN, Showing Operation of Warning Flags

3-34. Course Indicator ID-249/ARN (or ID-249A/ARN) has an added feature, in that it provides a magnetic heading indication which may be used to observe wind drift when making the final approach to the runway. In order to utilize this facility it is necessary to first set the magnetic heading of the runway (which is found on an instrument Approach Chart) on the radial selector part of the course indicator. (See figure 3-3.) When this is done, the small needle pointer behind the vertical pointer indicates the magnetic heading of the aircraft with respect to the magnetic course to the runway. For example, if the course to reach the runway is 90-degrees magnetic, as shown in figure 3-9, and a cross wind exists which requires that the pilot "crab" to make the runway course good, the magnetic heading indicator needle will indicate the difference between the actual magnetic heading of the aircraft and the magnetic heading required with zero wind to reach the runway. However, it must be understood that the indicator reads the correct "crab angle" *only* when the vertical pointer needle of the cross-pointer indicator remains centered, indicating that the aircraft is approaching the runway on the proper magnetic course.

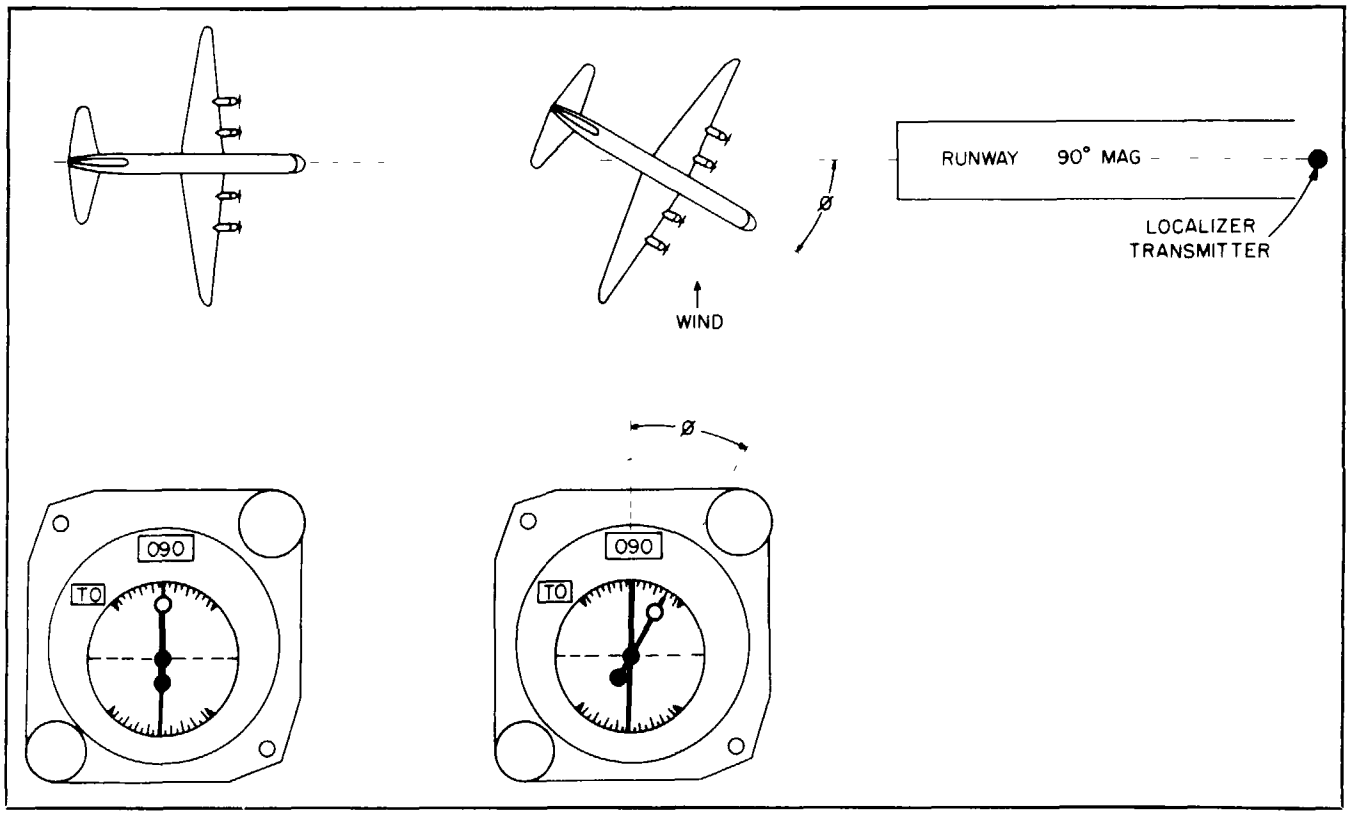


Figure 3-9. Typical Indicator Readings Using Course Indicator ID-249/ARN or ID-249A/ARN with Runway Localizer

3-35. PROCEDURE FOR RECEIVING PHASE LOCALIZER SIGNALS.

a. Set the "TONE-PHASE-NAV.OFF" switch on the control panel to the "PHASE" position.

b. Set up the desired frequency as instructed in paragraph 3-21.

c. Adjust the "VOLUME" control to the desired output level. (Refer to paragraph 3-19.)

d. Set up the magnetic course of the runway on which the aircraft will land.

e. Approach the runway localizer beam in the prescribed manner (see Instrument Approach Chart) and observe the flight characteristics on the ID-249 or on the flight path deviation indicator if one is supplied.

3-36. RECEPTION OF 90/150-CYCLE TONE LOCALIZER SIGNALS IN THE 108.0 TO 111.9-MEGACYCLE BAND. Whenever the radio receiver is tuned to the operating frequency of a TONE type runway localizer and the aircraft is flying within receiving distance of one station, the facilities of the localizer will be available to the pilot to aid him in making safe landings under adverse weather conditions. Actually the localizer provides an imaginary vertical plane extending along the centerline of the runway in the direction of the final approach course. Course Indicator ID-249/ARN (or ID-249A/ARN) is used to provide the pilot with a visual indication of his positional deviation from this imaginary centerline when making the final approach to the runway. (See figure 3-3.)

3-37. As may be seen from figure 3-10, the area to the right of the centerline of the runway final approach course is designated as the blue sector and the area to the left of the final approach course is designated as the yellow sector. If, on making the final approach to the runway, the aircraft is flying directly along the centerline of the runway, the vertical pointer on the cross-pointer indicator (part of the course indicator) will be centered and will remain centered as long as the aircraft holds the proper heading. As soon as the aircraft deviates to the left or right of the centerline of the runway, the vertical pointer deviates from its center position in the direction opposite to that in which the aircraft is moving off course. That is, the vertical pointer will indicate the direction in which the heading of the aircraft should be altered in order to make the final approach good. Another type of cross-pointer indicator known as the Flight Path Deviation Indicator ID-48/ARN may be used with Radio Receiving Set AN/ARN-14, but it is not part of the equipment supplied. At the bottom of the face of this indicator there is a sector split in the middle and painted blue on the left and yellow on the right, corresponding to the blue and yellow sectors shown on an Instrument Approach Chart. The readings on the flight path deviation indicator correspond to the readings obtained with the course indicator in every respect except that the flight path deviation indicator indicates the representative color of the sector in which the aircraft is flying. When using either type of indicator to make the final approach to a runway always

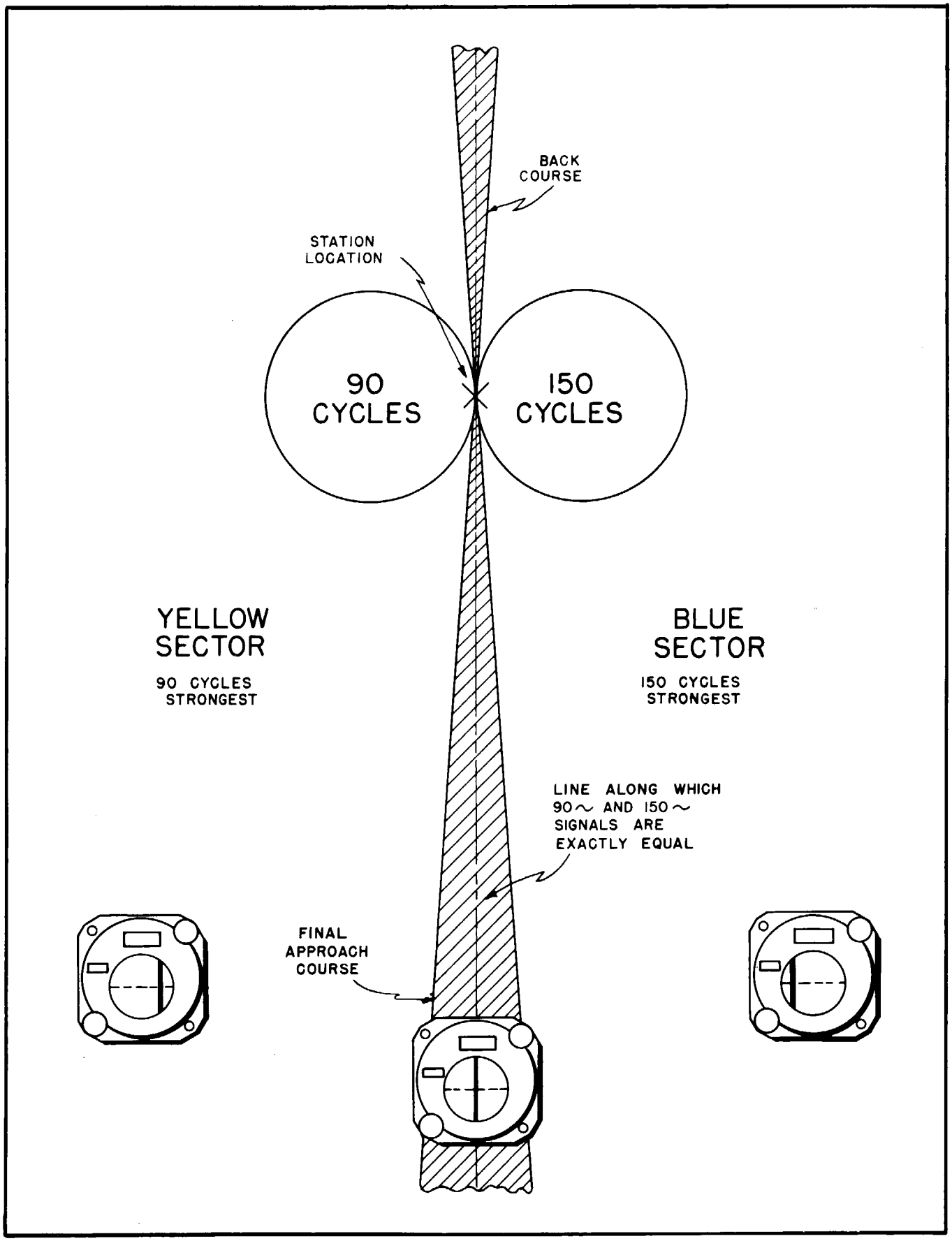


Figure 3-10. Tone (90/150-Cycle) Localizer Field Pattern

correct the heading of the aircraft in the direction that the vertical needle is pointing.

3-38. A warning flag prevents false "on-course" readings by obscuring part of the center-pointing vertical needle of the Course Indicator ID-249 or ID-249A /ARN (or Flight Path Deviation Indicator ID-48 ARN) when the airborne equipment is not receiving the proper localizer signals. (See figure 3-8.)

3-39. The Course Indicator ID-249 /ARN (or ID-249A ARN) has an added feature, in that it provides a magnetic heading indication which may be used to observe wind drift when making the final approach to the runway. In order to utilize this facility it is necessary to first set up the magnetic heading of the runway (which is found on an Instrument Approach Chart) on the "radial selector" part of the ID-249. (See figure 3-3.) When this is done, the small needle behind the vertical pointer indicates the magnetic heading of the aircraft with respect to magnetic course of the runway. For example; if the course to reach the runway is 90-degrees magnetic, as shown in figure 3-9, and a cross wind exists which requires that the pilot "crab" to make the runway course good, the magnetic heading indicator (part of ID-249) needle will indicate the difference between the actual magnetic heading of the aircraft and the magnetic heading required with zero wind to reach the runway. However, it must be understood that the indicator reads the correct "crab angle" *only* when the vertical point of the Course Indicator ID-249/ARN (or ID-249A /ARN) is centered, indicating that the aircraft is approaching the runway on the proper magnetic course.

3-40. PROCEDURE FOR RECEIVING TONE LOCALIZER SIGNALS.

a. Set the "TONE-PHASE-NAV.OFF" switch to the "TONE" position.

b. Set up the desired frequency as instructed in paragraph 3-21.

c. Adjust the "VOLUME" control to the desired output level. (Refer to paragraph 3-19.)

d. Approach the runway localizer beam in the prescribed manner (see Instrument Approach Chart) and observe the flight characteristics on the Course Indicator (ID-249) or on the Flight Path Deviation Indicator ID-48A if one is supplied.

3-41. MANUALLY SELECTED COURSE (NON-HEADING SENSITIVE MAGNETIC BEARING). The Course Indicator ID-249/ARN (or ID-249A /ARN) provides the facilities of a cross-pointer indicator, a magnetic heading indicator, a course selector, and a marker beacon indicator. The vertical pointer indicates lateral positional deviation from a selected omnirange course or from the "on-course" signal of a two-course vhf range or runway localizer. (Radio Receiver R-252/ ARN-14 receives either TONE or PHASE comparison type; Radio Receiver R252B/ARN-14, TONE only.) The relative heading indicator shows the magnetic heading of an aircraft relative to a selected omnirange course. The course "SET" knob is used to set up an omnidirectional range course on the course indicator. The "TO-FROM" indicator shows whether the aircraft is flying towards or away from an omnirange station. The output of a marker beacon receiver may be coupled directly to the "MARKER" beacon indicator lamp of the course indicator to provide visual indication of the marker beacon signals. Also, the output of a glide-path receiver may be fed into the radio receiver and from there to the horizontal pointer of Course Indicator ID-249/ARN (or ID-249A /ARN) to provide visual indication of the final approach glide angle, when landing with the aid of an instrument landing system. The flag alarms indicate when signals from an omnirange transmitter, a localizer transmitter, or a glide-path transmitter are unreliable and should not be used.

3-42. The vertical pointer of the course indicator provides a very accurate position-sensitive indications for flying an onmidirectional range course (full scale deflection to the right or left indicates that the aircraft is 7° or more off course).

3-43. An omnidirectional range course to or from a range station may be determined in two ways. If the position of the aircraft is known, the magnetic course to the station can be plotted on a chart, and that course then set up on the course indicator by rotating the "SET" knob. If the position of the aircraft is not known, the "SET" knob can be rotated until the vertical pointer is centered. If the "TO-FROM" indicator reads "TO", the figures read on the "COURSE" indicator will be: (a) the aircraft-to-station magnetic bearing; (b) the omnirange course TO the station. If the "TO-FROM" indicator reads "FROM", the figures read on the selected "COURSE" indicator will be: (a) the station-to-aircraft magnetic bearing; (b) the omnirange course FROM the station.

3-44. When the magnetic course to or from an omnirange station has been set up on the course indicator, the pilot can fly that course by centering the vertical pointer. If an aircraft is flying toward an omnidirectional range station but is actually off course to the right as shown in figure 3-11a, the vertical pointer is left of center on the indicator (assuming that, in this case, a course of 90° had been set up). The aircraft is brought on course by turning it toward the vertical pointer. As the aircraft moves closer to the selected course the vertical pointer will move closer to the center. Similarly, if the aircraft deviates to the left of the selected course, the vertical pointer will move to the right.

3-45. Now, if an aircraft approaches an ODR station off course to the right and passes over the station as shown in figure 3-11b, the pilot will observe that the vertical needle moves from the left to the right of center at the time that the aircraft passes over the station, and that the "TO-FROM" indicator changes from "TO" to "FROM".

3-46. When an aircraft approaches an ODR station

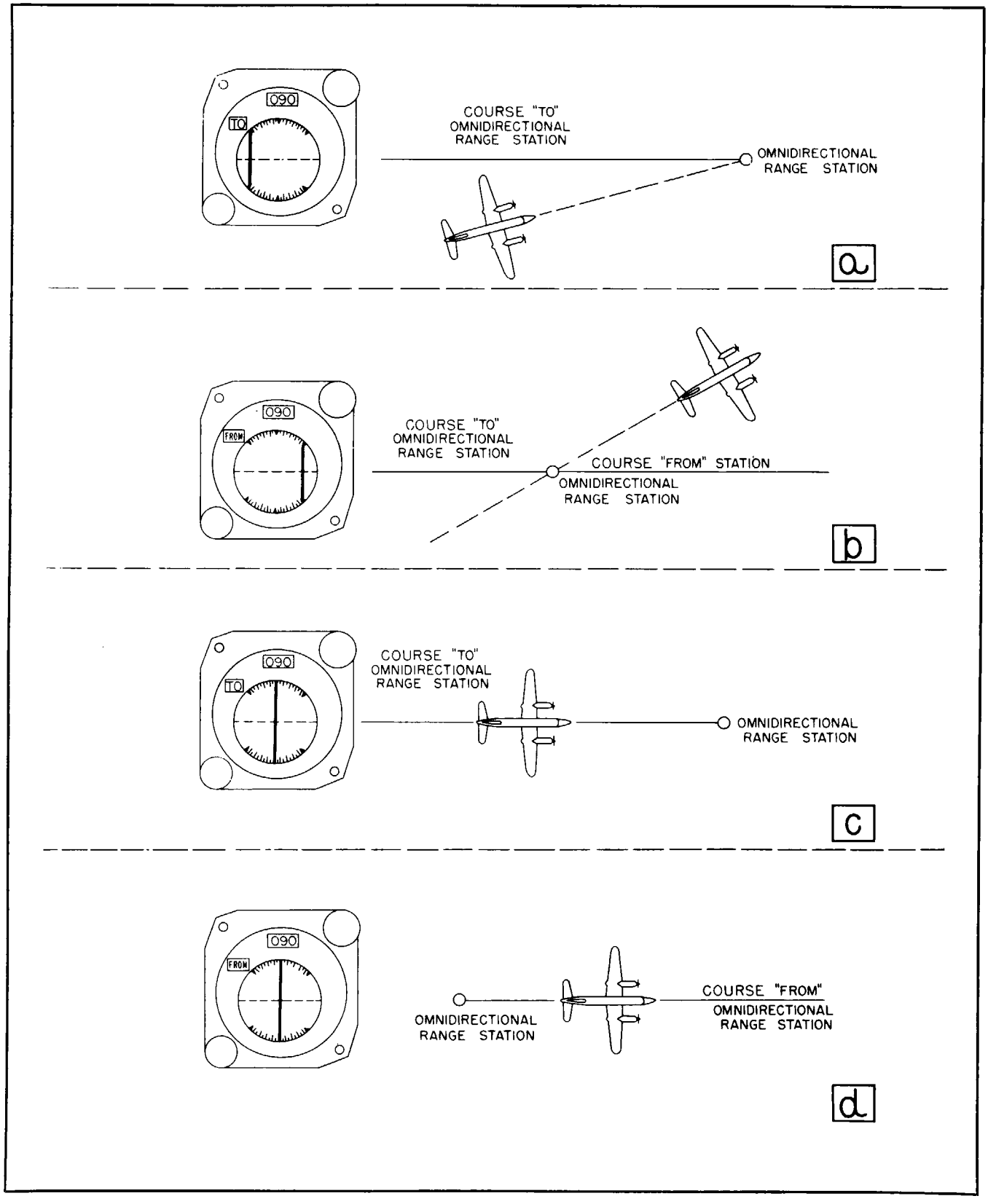


Figure 3-11. Typical Position Indications Using Course Indicator ID-249/ARN or ID-249A/ARN

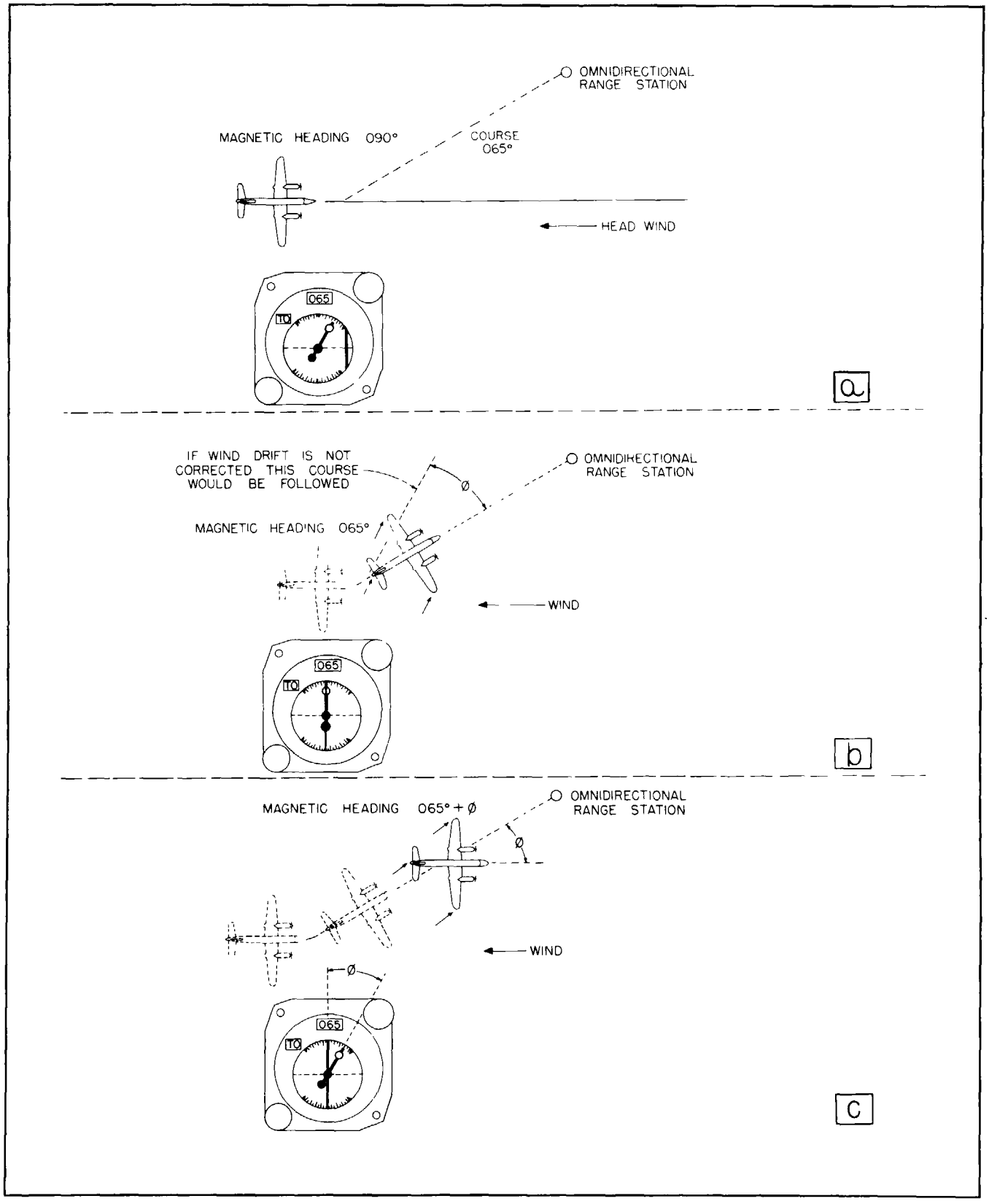


Figure 3-12. Positive Heading-Sensitive Indications with Course Indicator ID-249/ARN or ID-249A/ARN

directly on the selected course, the vertical pointer remains centered as shown in figure 3-11c. In this case the only indication that the aircraft is passing over the ODR station will be the changing of the "TO-FROM" indicator from "TO" to "FROM", as shown in figure 3-11d.

3-47. The Course Indicator, ID-249/ARN or ID-249A/ARN, in addition to omnirange position indications, provides relative heading indications when fed magnetic heading data from a remote indicating compass, such as the Gyro-Fluxgate. The relative heading indicator is the small pointer pivoted at the center of the instrument. Associated with it are scales, at the top and bottom of the indicator, which are calibrated in five-degree steps out to 45° on each side of the center or zero point. This relative heading indicator shows the magnetic heading of the aircraft with respect to the omnirange course set up on the "COURSE" indicator. It is extremely helpful in vhf navigation.

3-48. One of its functions is to automatically establish crab angle. In figure 3-12a, a magnetic course of 065° to the station has been set up on the "COURSE" indicator. The vertical pointer shows that the position of the aircraft is to the left of the course (the aircraft must fly toward the vertical pointer to get on course). The relative heading indicator shows that the aircraft is flying toward the omnirange *course* (it is deflected to the right, as is the vertical pointer). It also shows that the path of the aircraft will intersect the omnirange course at an angle of 25° (the pointer reads 25 on the 45-0-45-degree scale).

3-49. In figure 3-12b, the pilot has brought the aircraft on to the 065° omnirange course by centering the vertical pointer. The relative heading indicator reads zero, showing that the plane is *headed* toward the station. Should the 065° magnetic heading be maintained, however, the aircraft would begin to drift off course to the left because of wind, and the vertical pointer would be deflected to the right.

3-50. In figure 3-12c, the pilot has noted the tendency of the vertical pointer to be deflected to the right, and has corrected his heading to the right so that it remains centered. The aircraft now flies a straight-line course to the station, although the magnetic heading is 095° because of wind correction. The crab angle of 30° is automatically shown by the relative heading indicator.

3-51. Should the aircraft fly over the station, and the 065° course not be changed on the "COURSE" indicator, the "TO-FROM" indicator will read "FROM" but the relative heading indicator will not change.

3-52. The relative heading indicator also performs another important function in the vhf navigation. It enables a pilot to make an ideal approach to a selected course, and to get on course without bracketing.

3-53. In figure 3-13a, a course of 250° TO the station

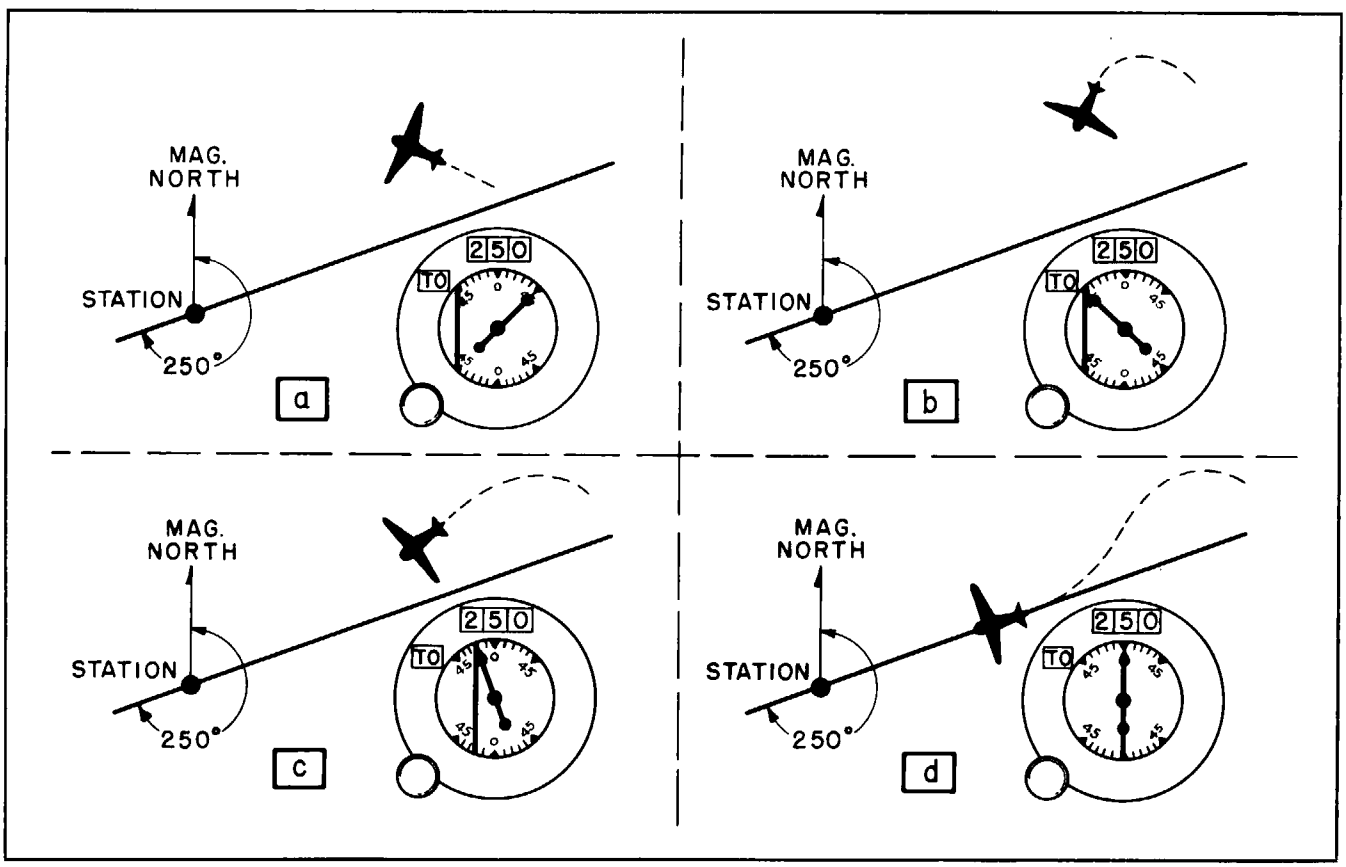


Figure 3-13. Operation of Course Indicators ID-249/ARN and ID-249A/ARN when Approaching an Omnirange Course

has been set up on the "COURSE" indicator. The aircraft is to the right of the course, and heading away from it (the vertical pointer is on the left, the relative heading indicator is on the right). At figure 3-13b, the pilot has changed heading, and is flying toward the course at an angle of 45°. He can now maintain this heading until the vertical pointer begins to move toward center. Then by gradually changing his heading, so that the vertical pointer and relative heading indicator remain overlapped, and move into the center at the same rate (figure 3-13c), the aircraft will make a smooth turn into the course. Figure 3-13c shows that the pilot has kept the two indicators overlapping, and has brought the aircraft on course without overshooting.

3-54. PROCEDURE FOR OBTAINING MANUALLY-SELECTED RADIALS.

a. Set the "TONE-PHASE-NAV.OFF" switch to the "PHASE" position. (For installations using Control Panel C-760A/A, turn the "ON-OFF" switch to "ON" position.)

b. Set up the desired frequency as instructed in paragraph 3-21.

c. Adjust the "VOLUME" control to the desired output level. (Refer to paragraph 3-19.)

d. Set up the desired course and fly the selected course observing the flight characteristics on the cross-pointer indicator.

3-55. RECEPTION OF VHF VISUAL-AURAL RADIO RANGE SIGNALS IN 108.3 TO 110.3 MEGACYCLE BAND. Whenever the radio receiver is tuned to the operating frequency of a vhf visual-aural range (VAR) station and the aircraft is flying within receiving distance of the station, the facilities of the range will be available to the pilot. The range provides an imaginary course line for guiding the aircraft along planned airways. The range transmitter emits signals, which, when interpreted by the radio receiver, provide both aural and visual indications of the aircraft position with respect to the planned course.

3-56. These visual-aural ranges are primarily intended to be flown by reference to the visual course. Therefore, the visual course always is aligned with the airway on which the range is located.

3-57. The purpose of the aural part of the system is to provide a positive means of orientation, indicating on which side of the range station the aircraft is flying. Receipt of the visual signal (blue or yellow vertical pointer indications), together with an aural signal ("N" or "A"), provides instant identification of the sector the aircraft is in, since no two sectors give the same combination of signals.

3-58. The field patterns of the vhf ranges are so oriented that on North-South (Amber-Blue) airways, the Yellow sectors are to the East of the range station, and the Blue sectors are to the west. "N" sectors are to the North, and "A" sectors to the South. (See figure 3-14a.)

3-59. On the East-West (Green-Red) airways, the Blue sectors are to the North of the range station, and the Yellow sectors to the South. "A" sectors are to the West and "N" sectors to the East. (See figure 3-14b.)

3-60. Course Indicator ID-249/ARN or ID-249A/ARN provides the visual indications necessary to fly the visual-aural ranges. It is important to remember, however, that vertical needle deflection to the right or left *does not in itself* indicate the direction in which to fly to get on course. Vertical needle deflection only indicates the color sector in which the aircraft is located.

3-61. When the vertical needle is centered the aircraft is on the airway. When the needle is deflected to the right, the aircraft is in a Yellow sector. When the needle is deflected to the left, the aircraft is in the Blue sector. (An aid in remembering this is that Blue [sector] and Left [needle deflection] both are spelled with four letters.)

3-62. The vhf visual-aural ranges should be flown with reference to the airways chart and a magnetic compass. For instance, suppose that an aircraft in figure 3-14a is approaching the range station from the South, and is to the East of the airway. The vertical needle of the indicator would be deflected to the right, showing that the aircraft is in a Yellow sector. An aural "A" signal would be heard, indicating that the aircraft is to the South of the station. The pilot then knows that he is South of the station ("A" signal), he is to the right of the airway (right or Yellow needle deflection), and that he is flying toward the station (magnetic heading). Should the pilot continue on that course, he would know when he passes by the station by the combining of the "A" and "N" signals, into a steady tone. After he has passed the station, the vertical needle would still be deflected to the right, but now an "N" signal would be heard. The pilot then would know that he is North of the station, but still to the right of the airway.

3-63. The only exception to the orientation system shown in figures 3-14a and b, is at certain terminal airports where vhf visual-aural range stations are installed. In this case, if there is no localizer, one visual course of the terminal range passes over the airport. The sector orientation of the range is then the same as for a localizer; that is, the Yellow sector is on the left, and the Blue sector is on the right when an aircraft is inbound on final approach. (See figure 3-14c.)

3-64. Aural courses are then arranged so that the "N" signal prevails until the aircraft reaches the range station. Between the station and the airport, the "A" signal is heard.

3-65. Consult your airways chart when flying these vhf ranges for visual and aural sector orientation, and remember that left deflection of the vertical needle indicates that you are in a Blue sector and right deflection indicates that you are in a Yellow sector.

3-66. PROCEDURE FOR RECEIVING VHF VISUAL-AURAL RANGE SIGNALS.

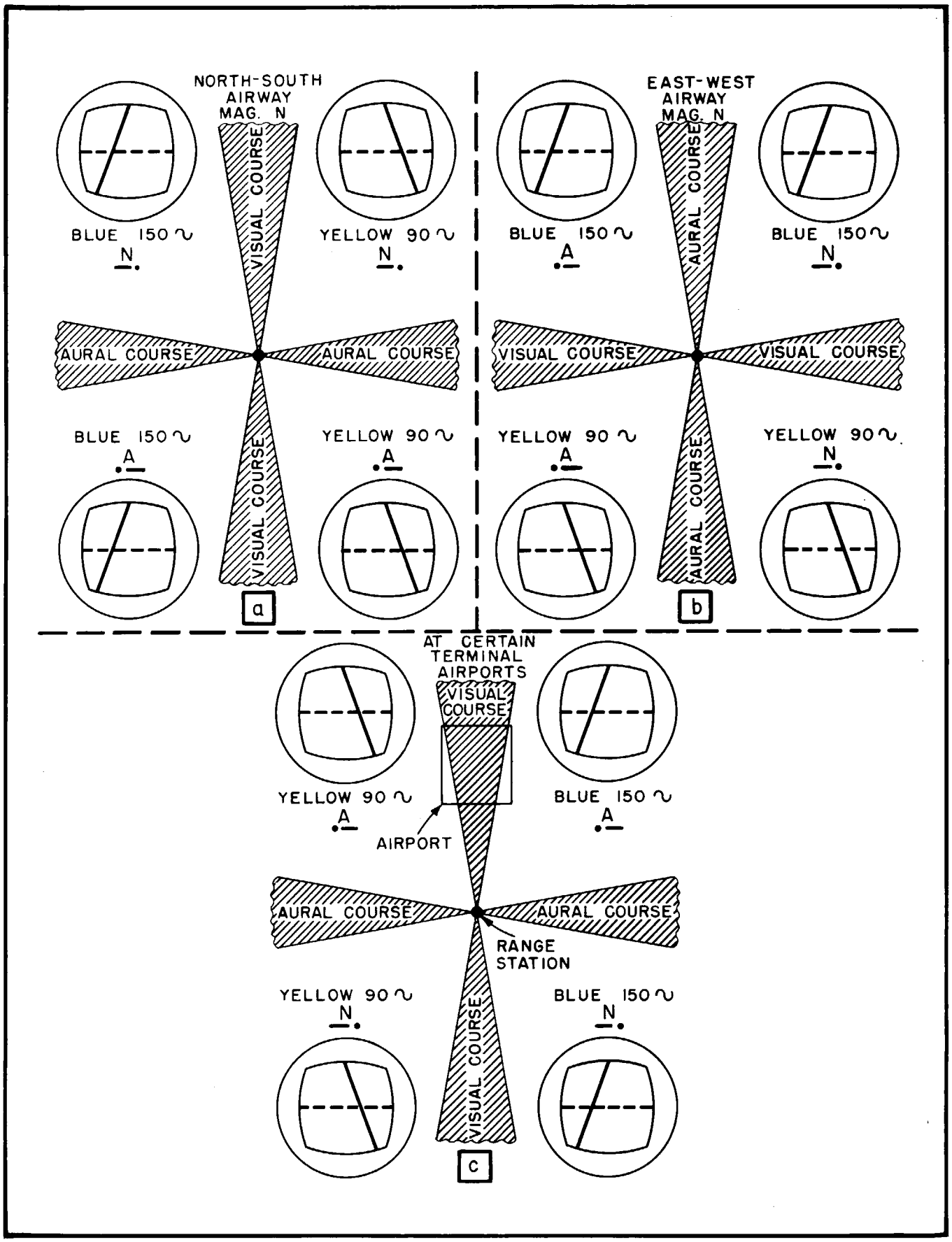


Figure 3-14. Field Patterns of VHF Visual-Aural Radio Ranges

a. Set the "TONE-PHASE-NAV.OFF" switch in the "TONE" position. (Set the "ON-OFF" switch to "ON" position in equipments using Control Panel C-760A / A.)

b. Select the channel of the vhf visual-aural range station to be used as explained in paragraph 3-21.

c. Adjust the "VOLUME" control to the desired output level. (Refer to paragraph 3-19.)

d. Use the Course Indicator ID-249 ARN (or ID-249A ARN) and the aural signals to fly the range by following the orientation rules previously given.

3-67. CONTINUOUSLY READABLE RADIAL (AIRCRAFT "TO" STATION MAGNETIC BEARING). Radio Indicator-Control ID-251 ARN provides a continuously readable magnetic bearing "TO" the ODR station on a rotating azimuth scale. (See figure 3-4.) The rotating azimuth scale automatically follows the azimuth position of the aircraft with respect to the ODR station, whenever the radio receiver is tuned to the operating frequency and the aircraft is flying within receiving distance of the station. However, in some installations the radio indicator control will not be used for obtaining magnetic bearings (radials) since the unit may be located at some remote and possible inaccessible place in the aircraft. As may be seen from figure 3-15, the heading of the aircraft has no effect on the reading obtained. The radial indicated will always be the magnetic heading (with zero wind) to fly "TO" the ODR station.

3-68. PROCEDURE FOR OBTAINING CONTINUOUSLY READABLE RADIAL.

a. Set the "TONE-PHASE-NAV.OFF" switch to the "PHASE" position. (Turn "ON-OFF" switch to "ON" in installations with C-760A A Control Panel.)

b. Set up the desired frequency as instructed in paragraph 3-21.

c. Adjust the "VOLUME" control to the desired output level. (Refer to paragraph 3-19.)

d. Observe the magnetic bearing "TO" the station (radial) on the radio indicator control.

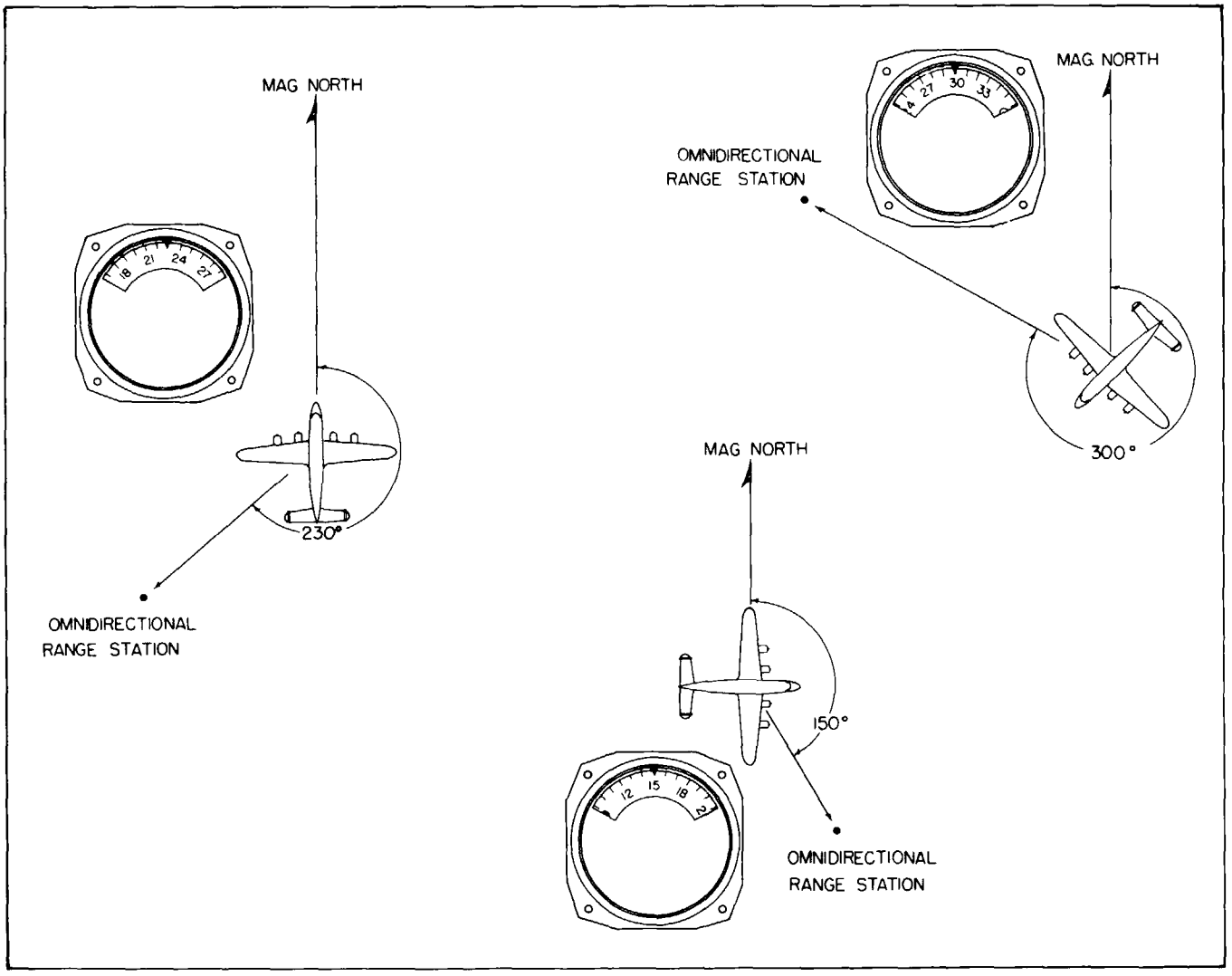


Figure 3-15. Operation of Radio Indicator-Control ID-251/ARN

3-69. RECEPTION OF COMMUNICATION SIGNALS IN THE 111.0 TO 112.0-MEGACYCLE BAND AND IN THE 118.0 TO 135.9-MEGACYCLE BAND. Reception of Communication signals in these bands may be obtained by merely setting up the desired frequency on the control panel and plugging a headset in one of the interphone jack boxes in the aircraft. Weather broadcasts are heard in 111.0 to 112.0-megacycle band; tower channels in the 118.0 to 121.9-megacycle band; commercial communication channels in the 122.0 to 131.9-megacycle band; and military communication channels in the 132.0 to 135.9-megacycle band.

3-70. PROCEDURE FOR RECEIVING GENERAL COMMUNICATIONS.

a. Set the "TONE-PHASE-NAV.OFF" switch to the "TONE" or "PHASE" position. (Turn "ON-OFF" switch "ON" in equipments using C-760A/A Control Panel.)

b. Set up the desired frequency as instructed in paragraps 3-21.

c. Plug headset into interphone jack box.

d. Set the "VOLUME" control to the desired output level. (Refer to paragraph 3-19.)

SECTION IV
SUPPLEMENTARY DATA

4-1. RECEIVER CHARACTERISTICS.

Table 4-1

Receiver Characteristics

Features	*Capabilities*
Frequency range	108.0 to 135.9 megacycles
Channels available	280 crystal-controlled channels
Channel spacing	Every 100 kilocycles
Types of service and frequency allocations	Tone type runway localizer (108.0 to 111.9 mc)
	Phase type runway localizer (108.0 to 111.9 mc) (with Receiver R-252/ARN 14 only)
	Omnidirectional range (112.0 to 117.9 mc)
	VHF two-course range (108.3 to 110.3 mc)
	Weather broadcast reception (111.0 to 112.0 mc)
	Tower reception (118.0 to 121.9 mc)
	General communication reception (122.0 to 135.9 mc)
Frequency stability	Plus or minus 0.007%
Temperature characteristics	−55°C (−67°F) to +71°C (+160°F)
Pressure characteristics	Altitudes up to 50,000 feet
Distance and range	See figure 1-2
Humidity	Relative humidities up to 95% at +50°C (+122°F)
Sensitivity	2 microvolts at a signal-to-noise ratio of 6 db
Receiver bandwidth	More than 45 kc wide at 6 db down. Less than 200 kc wide at 75 db down
Audio power output	300 milliwatts into a 500-ohm load
Audio output response	300 to 3500 cycles within 6 db
Audio output distortion	10 per cent max at 1000 cycles, 30% modulation, 1000 microvolts input. 25 per cent max at 90% modulation
Channel set-up time	5 seconds maximum
Antenna input impedance	52 ohms with less than 2 to 1 standing wave ratio
Minimum signal necessary to operate flag alarm	5 microvolts with normal modulation type and levels used in VHF two-course range, tone localizer, phase localizer and omnidirectional range

Table 4-1 (Continued)
Receiver Characteristics

Features	*Capabilities*
Automatic gain control	Maintains audio output within 2 db for variation of r-f input from 5 to 100,000 microvolts
Primary power input	
Normal	26.5v at 6.5 amperes
Max starting and channel selection	26.5v at 20 amperes
26v 400-cycle power for automatic indicators	.43 amperes
Audio output impedance	500 ohms

4-2. VACUUM TUBE COMPLEMENT.

Table 4-2
Vacuum Tube Complement

Circuit Symbol No.	*Description*	*Function*
	R-F Chassis	
V101	JAN-5654 Amplifier Pentode (ruggedized)	R-f amplifier
V102	JAN-5725 Amplifier Pentode (ruggedized)	Mixer
V103	JAN-5670 Dual Triode (ruggedized)	(1/2) variable frequency oscillator
		(1/2) reactance tube
V104	JAN-5670 Dual Triode (ruggedized)	Frequency quadrupler
V105	JAN-5654 Amplifier Pentode (ruggedized)	Isolation amplifier
	I-F and Audio Chassis	
V201	JAN-5749 Amplifier Pentode (ruggedized)	First i-f amplifier
V202	JAN-5749 Amplifier Pentode (ruggedized)	Second i-f amplifier
V203	JAN-5750 Amplifier Pentode (ruggedized)	Second mixer
V204	JAN-5749 Amplifier Pentode (ruggedized)	Third i-f amplifier
V205A	JAN-5726 Twin Diode (ruggedized) (1/2)	Detector
V205B	JAN-5726 Twin Diode (ruggedized) (1/2)	Noise limiter
V206	JAN-5670 Dual Triode (ruggedized)	1st audio and squelch
V207	JAN-5670 Dual Triode (ruggedized)	Power amplifier
V208	JAN-5749 Amplifier Pentode (ruggedized)	AVC amplifier
V209	JAN-5726 Twin Diode (ruggedized)	AVC and navigation detector
V210	JAN-5654 Amplifier Pentode (ruggedized)	Common navigation amplifier
	Navigation Chassis (Main Frame)	
V301	JAN-5654 Amplifier Pentode (ruggedized)	9960 kc f.m. amplifier and limiter
V302	JAN-5726 Twin Diode (ruggedized)	9960 kc f.m. discriminator rectifier
V303	JAN-5670 Dual Triode (ruggedized)	Phase splitter feed (cathode follower)

Table 4-2 (Continued)
Vacuum Tube Complement

Circuit Symbol No.	*Description*	*Function*
V304	JAN-5751 Dual Triode (ruggedized)	Omni-selector and phase localizer amplifier
V305	JAN-5670 Dual Triode (ruggedized)	Omni-selector and phase localizer amplifier
V306	JAN-5751 Dual Triode (ruggedized)	Variable phase amplifier
V307	JAN-5654 Amplifier Pentode (ruggedized)	Variable phase amplifier
V308	JAN-5670 Dual Triode (ruggedized)	Variable phase amplifier
V309	JAN-5751 Dual Triode (ruggedized)	Omni-converter indicator amplifier
V310	JAN-5670 Twin Diode (ruggedized)	Omni-converter indicator amplifier
V311	JAN-5726 Twin Diode (ruggedized)	Phase comparator
V312	JAN-5670 Dual Triode	D-c control amplifier
V313	JAN-OB2 Voltage Regulator Tube	Voltage regulator
	Monitor Chassis	
V401	JAN-5725 Amplifier Pentode (ruggedized)	First oscillator and mixer
V402	JAN-5654 Amplifier Pentode (ruggedized)	Monitor i-f amplifier
V403	JAN-5726 Twin Diode (ruggedized)	Discriminator
V404	JAN-5654 Amplifier Pentode (ruggedized)	Second oscillator
V405	JAN-5654 Amplifier Pentode (ruggedized)	Motor control

4-3. CRYSTALS REQUIRED.

Table 4-3
Crystals Required

Circuit Symbol No.	*Frequency*	*Purpose*
Y401	14.00625	1st Crystal Osc. No. 1 Crystal
Y402	14.50625	1st Crystal Osc. No. 2 Crystal
Y403	15.00625	1st Crystal Osc. No. 3 Crystal
Y404	15.50625	1st Crystal Osc. No. 4 Crystal
Y405	16.00625	1st Crystal Osc. No. 5 Crystal
Y406	16.50625	1st Crystal Osc. No. 6 Crystal
Y407	17.00625	1st Crystal Osc. No. 7 Crystal
Y408	17.50625	1st Crystal Osc. No. 8 Crystal
Y409	18.00625	1st Crystal Osc. No. 9 Crystal
Y410	18.50625	1st Crystal Osc. No. 10 Crystal
Y411	19.00625	1st Crystal Osc. No. 11 Crystal
Y412	19.50625	1st Crystal Osc. No. 12 Crystal
Y413	20.00625	1st Crystal Osc. No. 13 Crystal

Table 4-3 (Continued)
Crystals Required

Circuit Symbol No.	*Frequency*	*Purpose*
Y414	20.50625	1st Crystal Osc. No. 14 Crystal
Y415	11.250	2nd Crystal Osc. No. 1 Crystal
Y416	11.275	2nd Crystal Osc. No. 2 Crystal
Y417	11.300	2nd Crystal Osc. No. 3 Crystal
Y418	11.325	2nd Crystal Osc. No. 4 Crystal
Y419	11.350	2nd Crystal Osc. No. 5 Crystal
Y420	11.375	2nd Crystal Osc. No. 6 Crystal
Y421	11.400	2nd Crystal Osc. No. 7 Crystal
Y422	11.425	2nd Crystal Osc. No. 8 Crystal
Y423	11.450	2nd Crystal Osc. No. 9 Crystal
Y424	11.475	2nd Crystal Osc. No. 10 Crystal
Y425	11.500	2nd Crystal Osc. No. 11 Crystal
Y426	11.525	2nd Crystal Osc. No. 12 Crystal
Y427	11.550	2nd Crystal Osc. No. 13 Crystal
Y428	11.575	2nd Crystal Osc. No. 14 Crystal
Y429	11.600	2nd Crystal Osc. No. 15 Crystal
Y430	11.625	2nd Crystal Osc. No. 16 Crystal
Y431	11.650	2nd Crystal Osc. No. 17 Crystal
Y432	11.675	2nd Crystal Osc. No. 18 Crystal
Y433	11.700	2nd Crystal Osc. No. 19 Crystal
Y434	11.725	2nd Crystal Osc. No. 20 Crystal

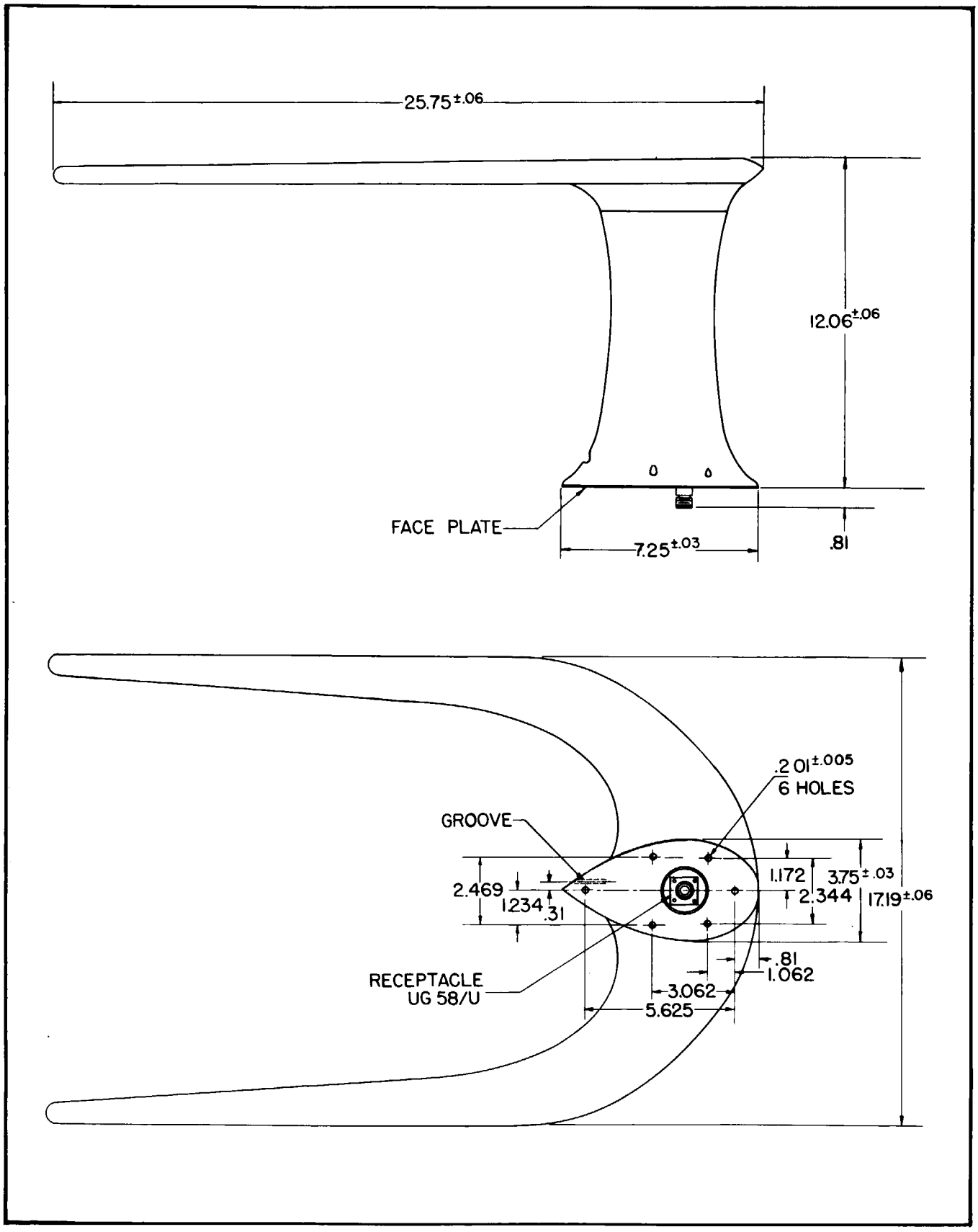


Figure 4-1. Antenna AT-172/ARN-14, Outline and Mounting Dimensions

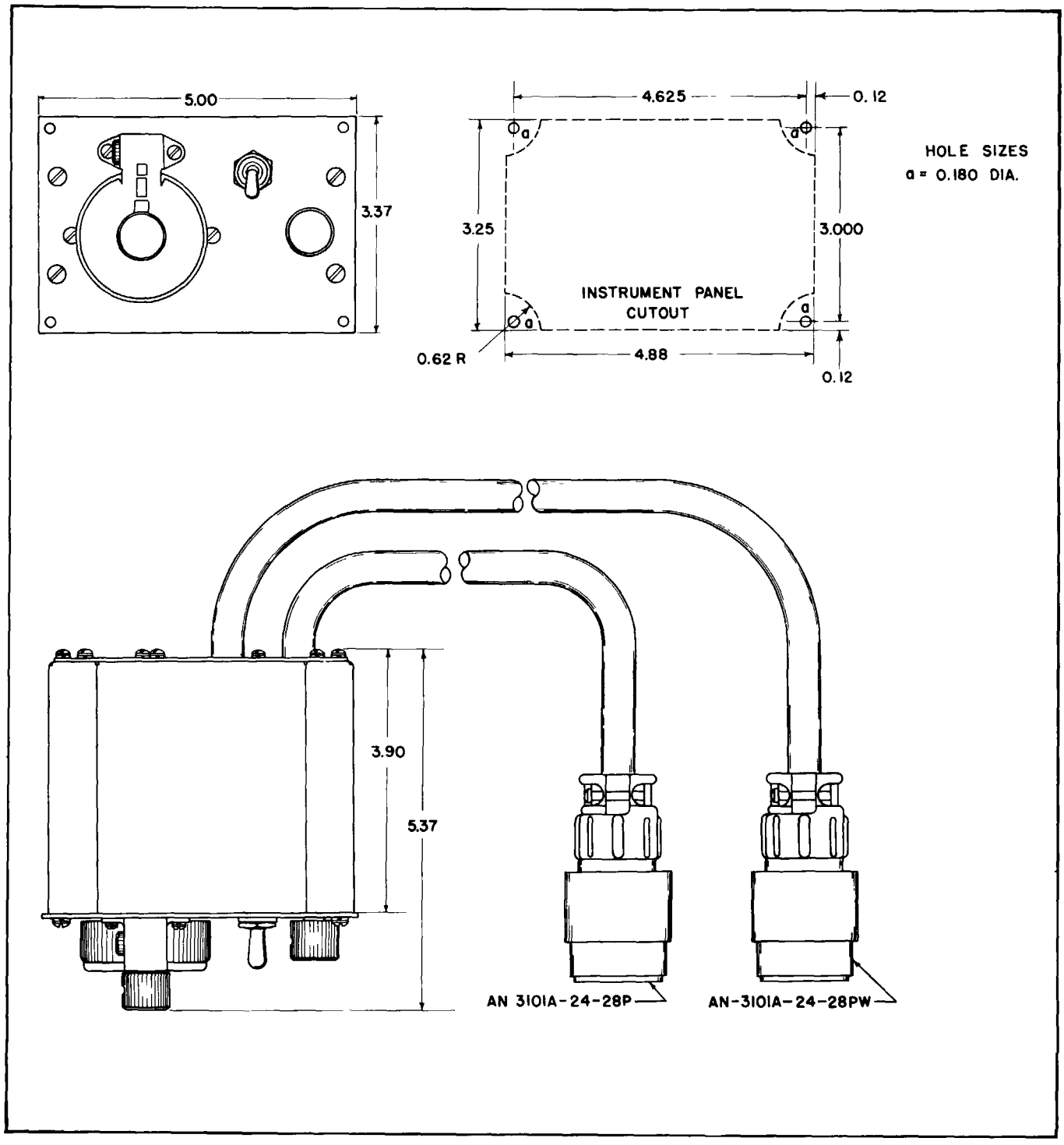


Figure 4-2. Control Panel C-512/ARN-14, Outline and Mounting Dimensions

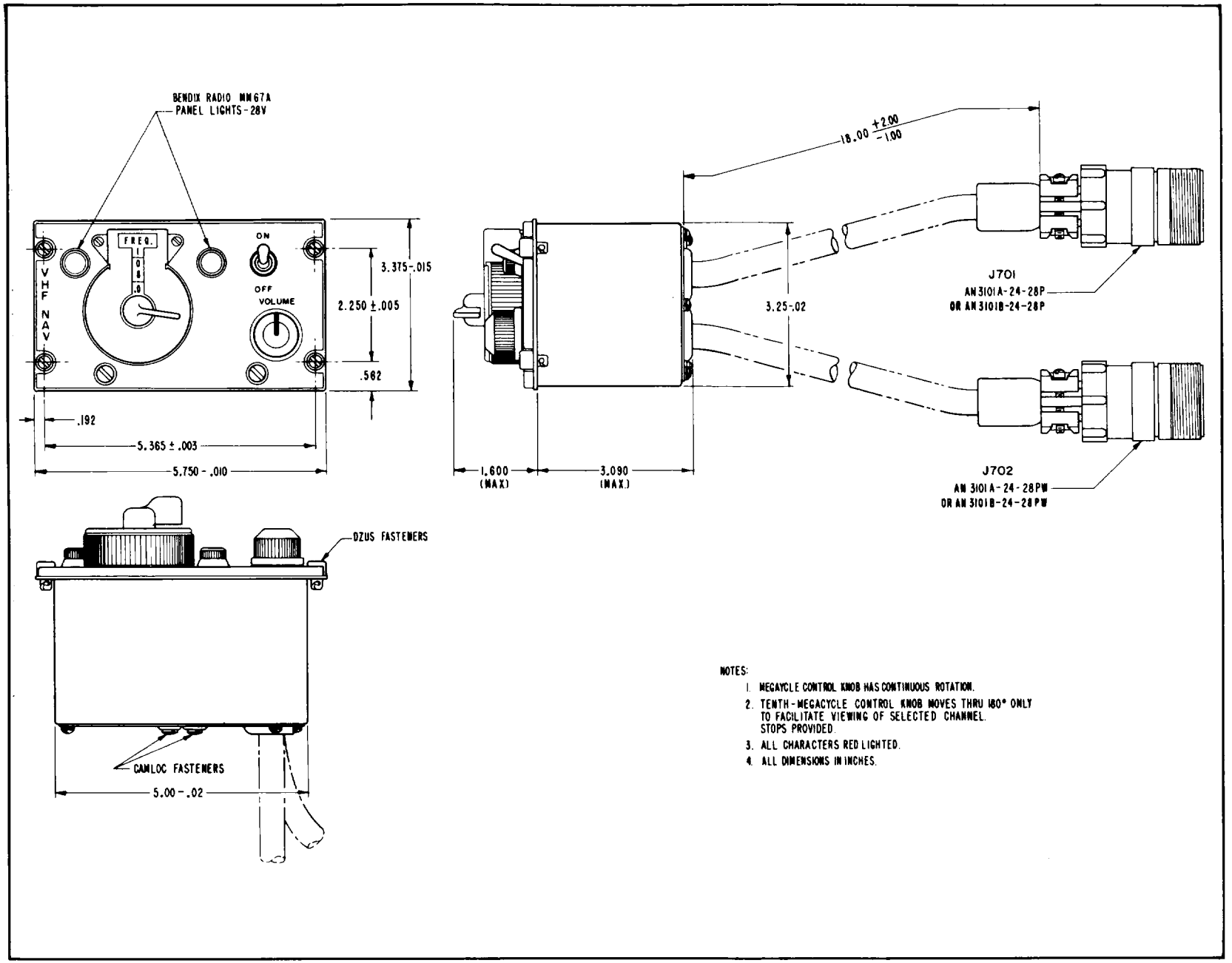


Figure 4-2A. Control Panel C-760A/A, Outline and Mounting Dimensions

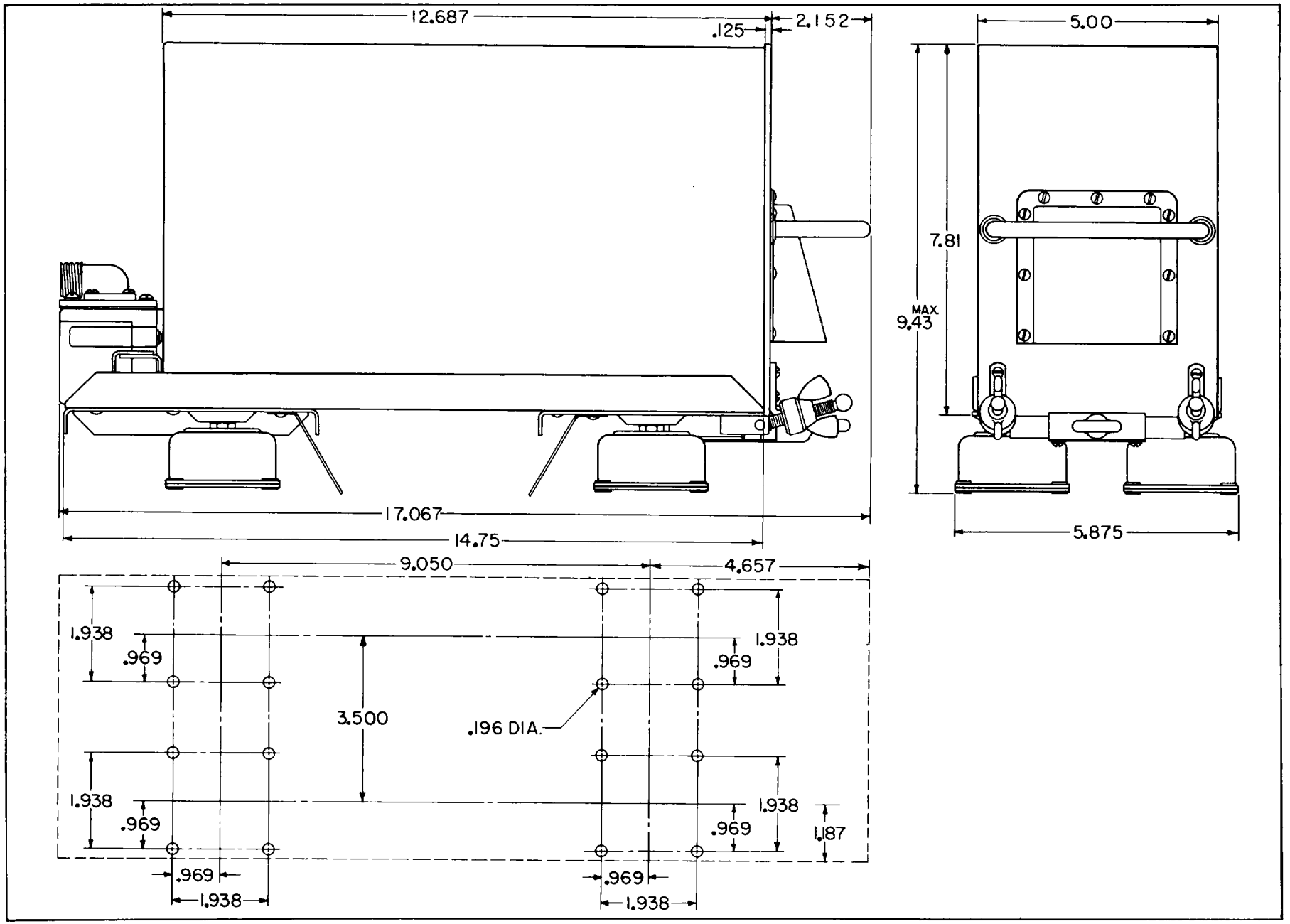


Figure 4-3. Dynamotor Unit DY-66/ARN-14, Outline and Mounting Dimensions

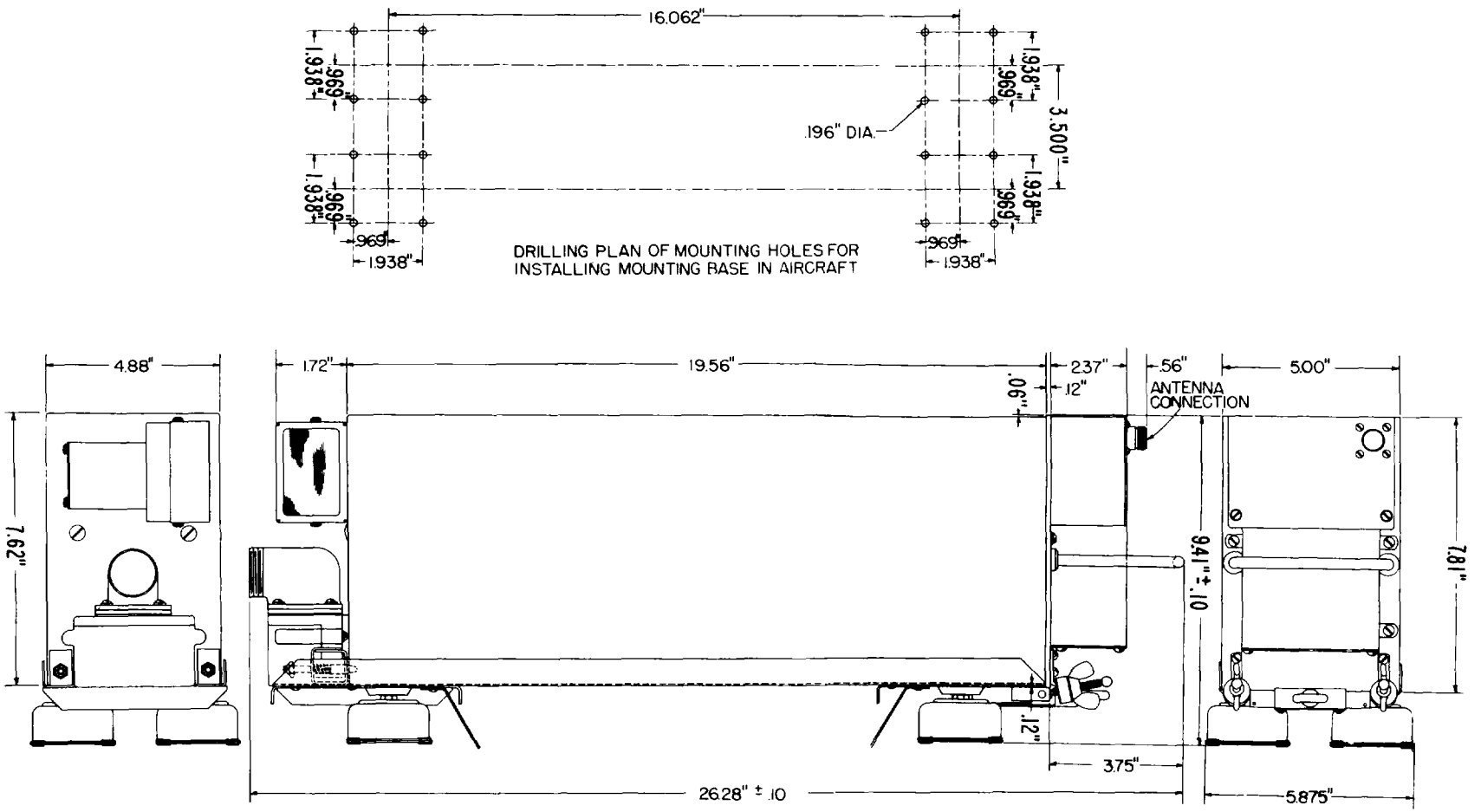


Figure 4-4. Radio Receiver R-252/ARN-14 and R-252B/ARN-14 with Mounting MT-627/ARN-14, Outline and Mounting Dimensions

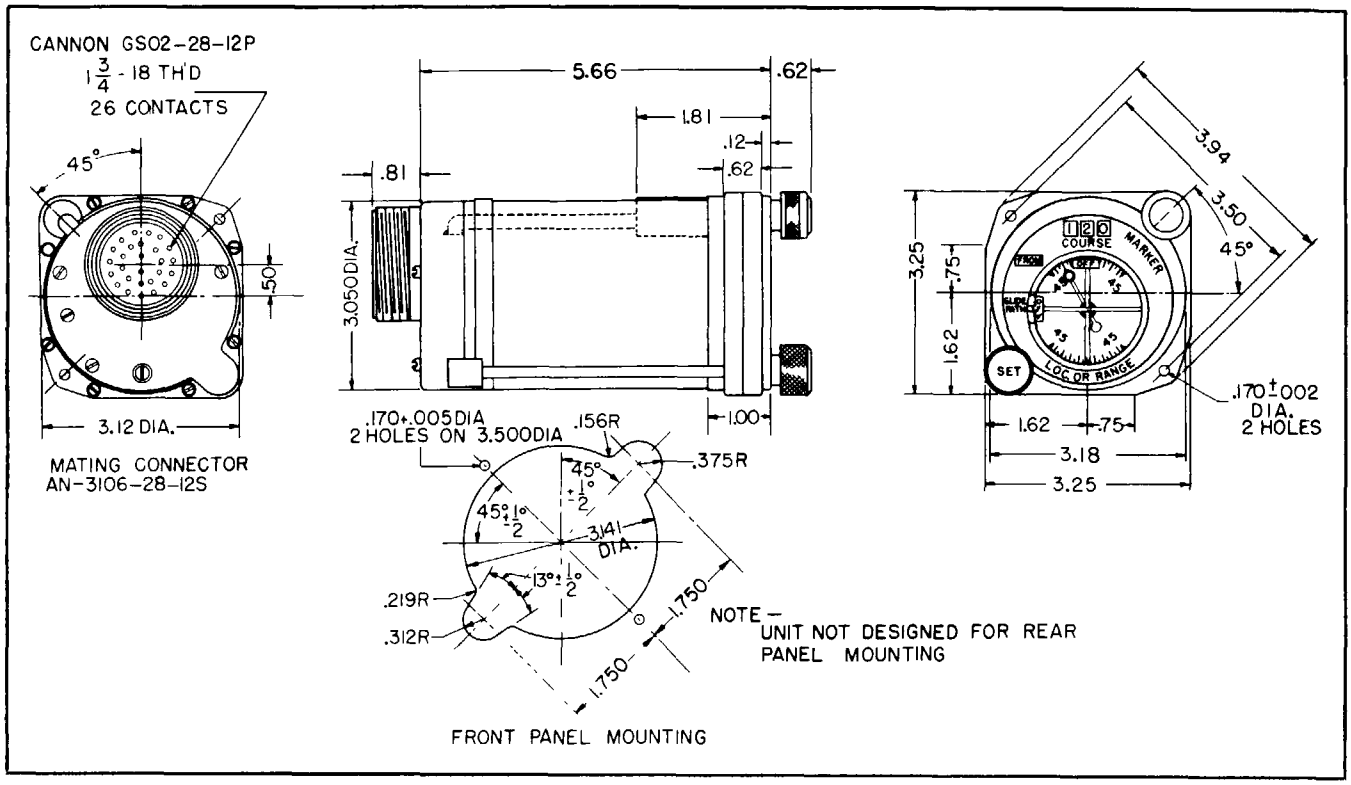


Figure 4-5. Course Indicator ID-249/ARN, Outline and Mounting Dimensions

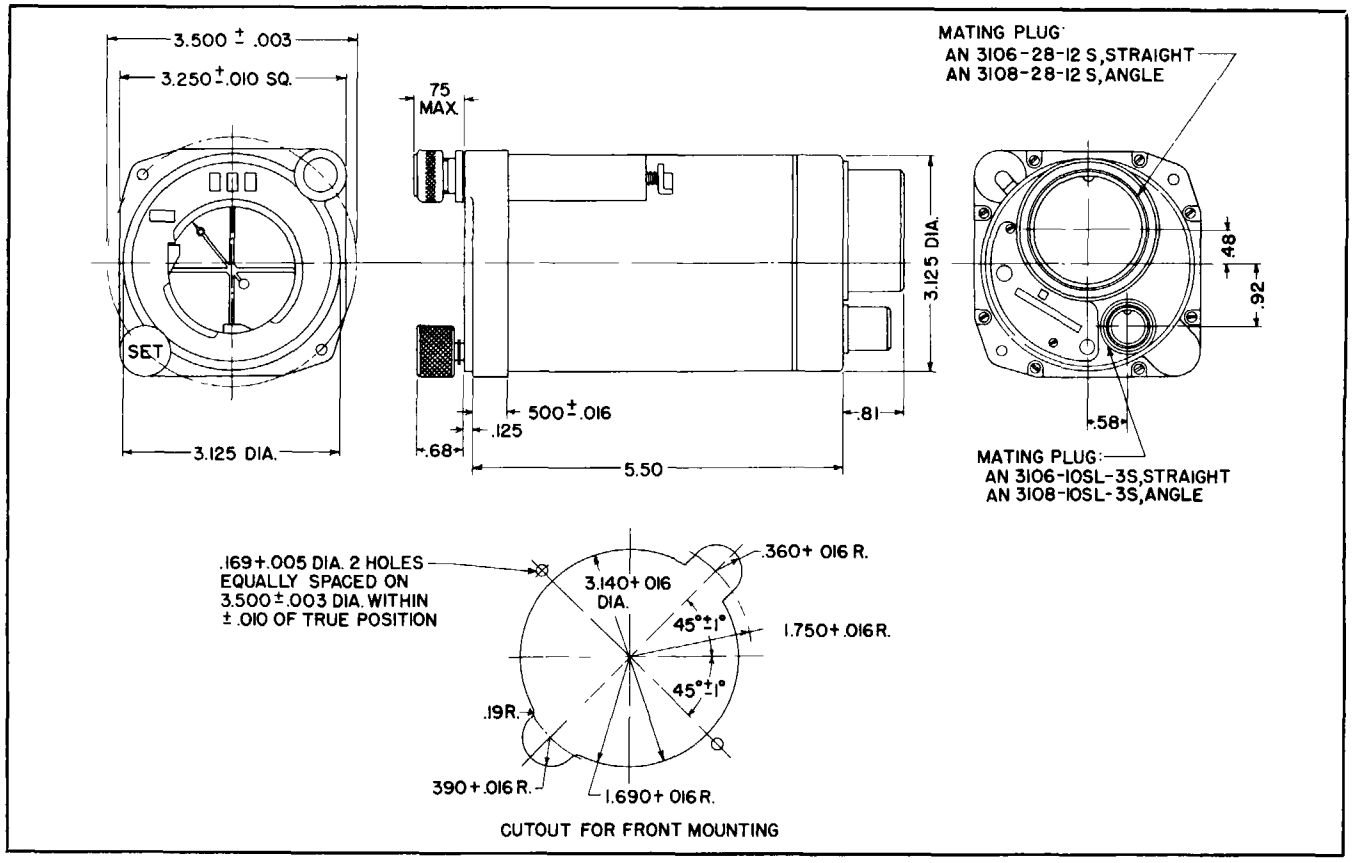


Figure 4-5A. Course Indicator ID-249A/ARN, Outline and Mounting Dimensions

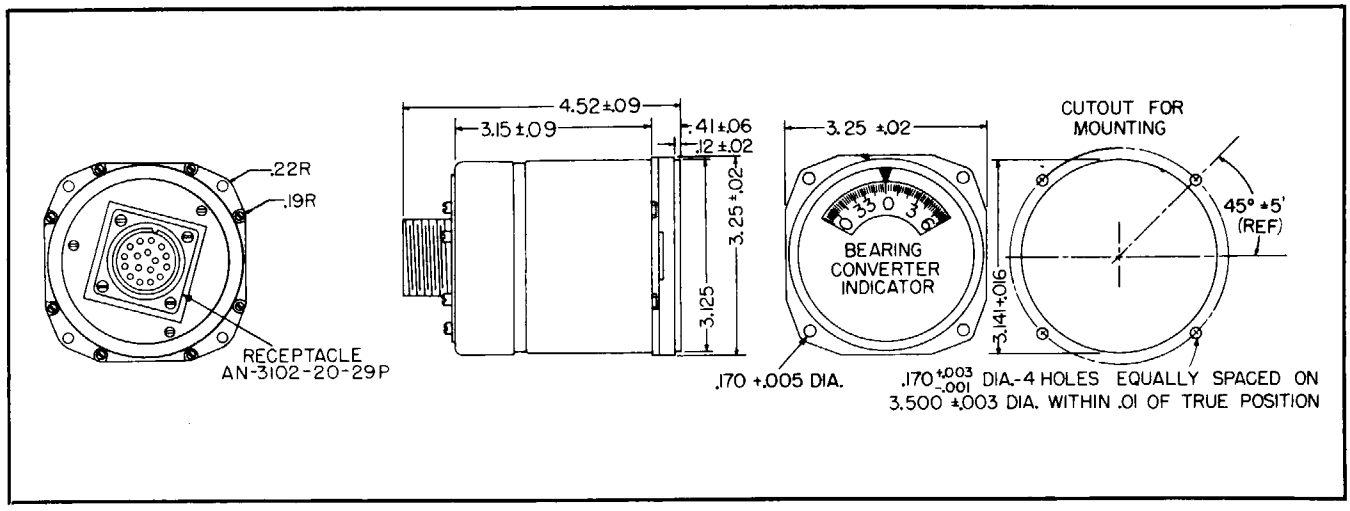


Figure 4-6. Radio Indicator-Control ID-251/ARN, Outline and Mounting Dimensions

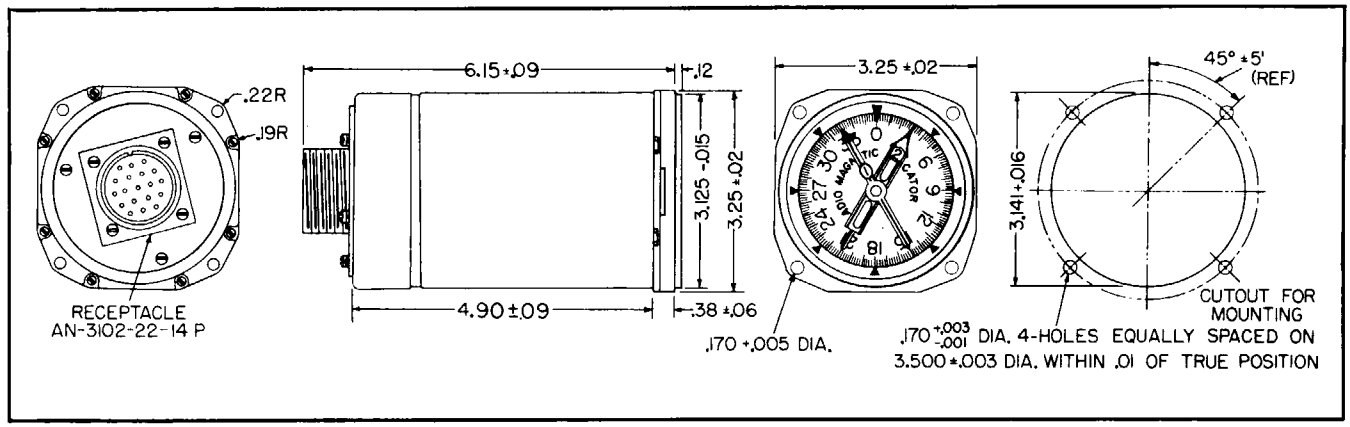


Figure 4-7. Course Indicator ID-250/ARN, Outline and Mounting Dimensions

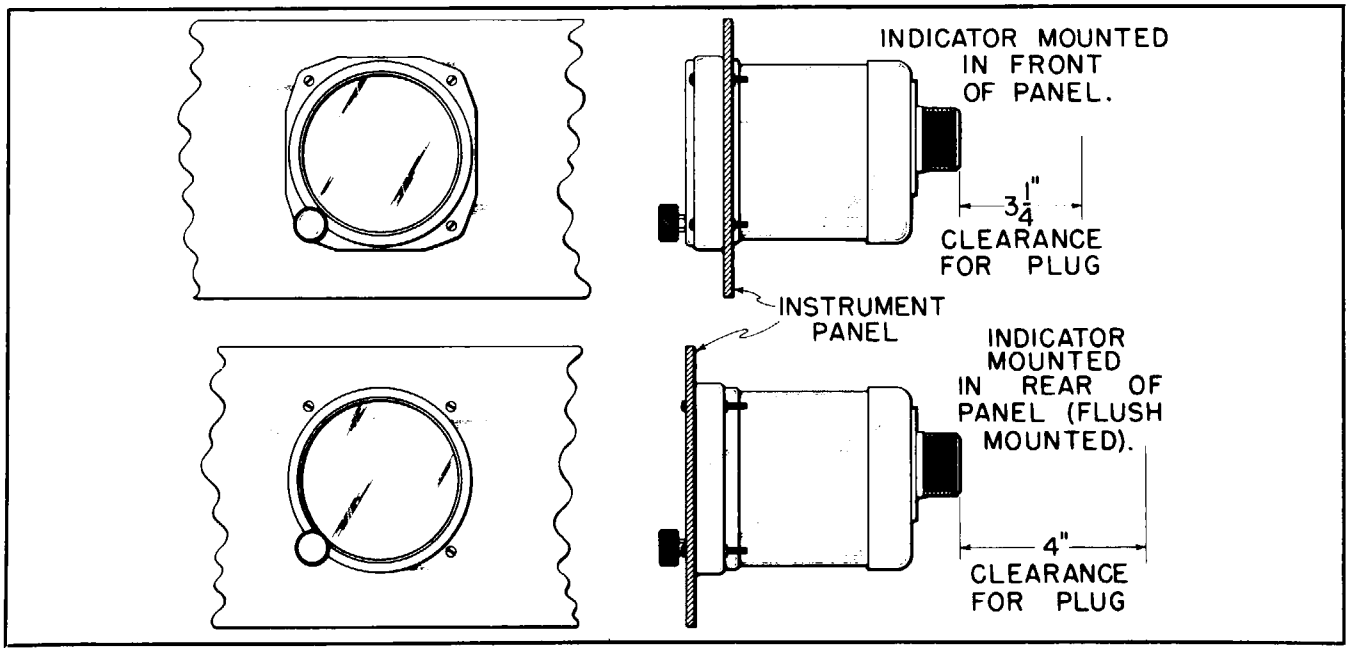
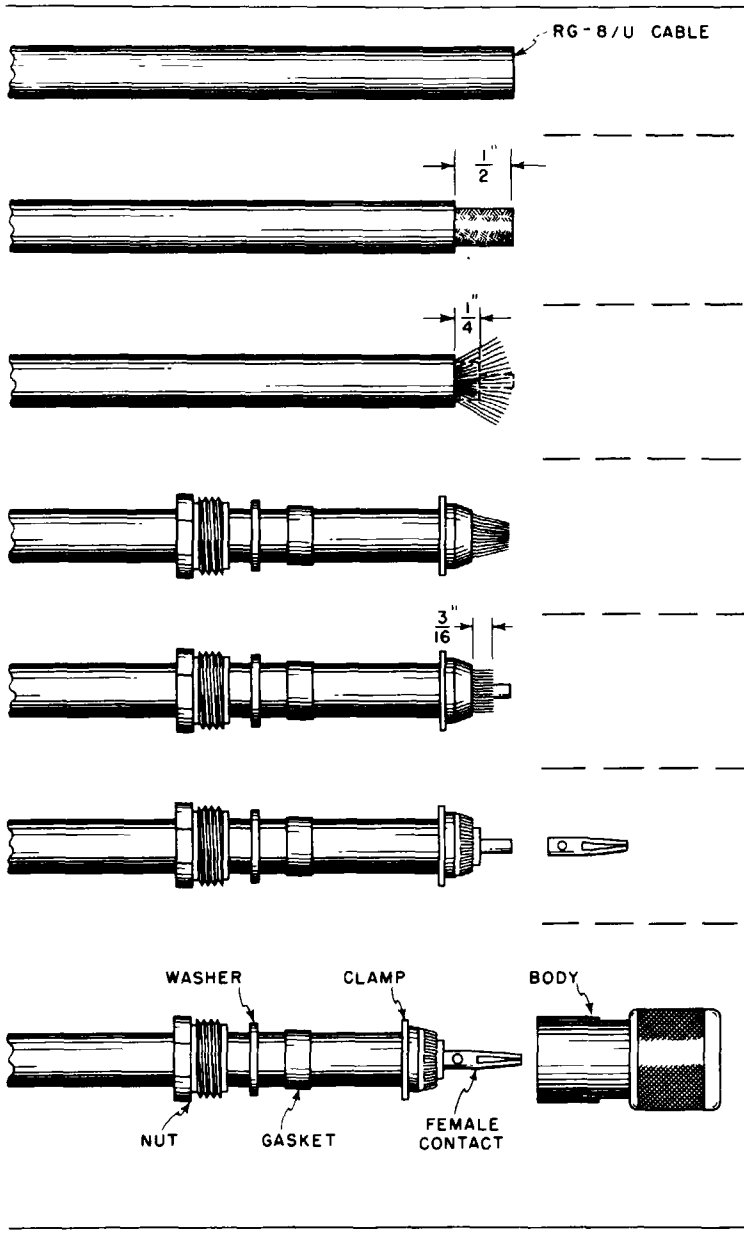


Figure 4-8. Indicator Mounting Instructions



CUT END OF CABLE EVEN.

REMOVE VINYL JACKET 1/2" – DO NOT NICK BRAID

COMB OUT COPPER BRAID AS SHOWN. BARE 1/4" OF CENTER CONDUCTOR – DO NOT NICK CONDUCTOR.

TAPER BRAID AS SHOWN. SLIDE NUT, WASHER, & GASKET ON VINYL JACKET. SLIDE CLAMP ON BRAID.

WITH CLAMP IN PLACE, TRIM BRAID AS SHOWN.

FOLD COPPER BRAID BACK ON CLAMP. TIN CENTER CONDUCTOR USING MINIMUM AMOUNT OF HEAT.

HOLDING CONTACT WITH PLIERS, SOFT SOLDER CONTACT TO CENTER CONDUCTOR. IT IS IMPERATIVE THAT BACK END OF CONTACT BE FLUSH WITH POLYETHYLENE DIELECTRIC. DO NOT USE EXCESS SOLDER. WIPE CLEAN – SEE THAT END OF CABLE INSULATOR IS CLEAN AND FREE OF SOLDER, RESIN AND FOREIGN MATERIAL.

SLIDE BODY INTO PLACE CAREFULLY SO THAT CENTER CONDUCTOR CONTACT ENTERS HOLE IN INSULATOR. FACE OF CABLE DIELECTRIC MUST FIT FLUSH AGAINST INSULATOR. PROPERLY TIGHTEN BODY AND NUT WITH WRENCHES.

Figure 4-9. Assembling Plug UG-21B/U to Cable RG-8/U, Procedure

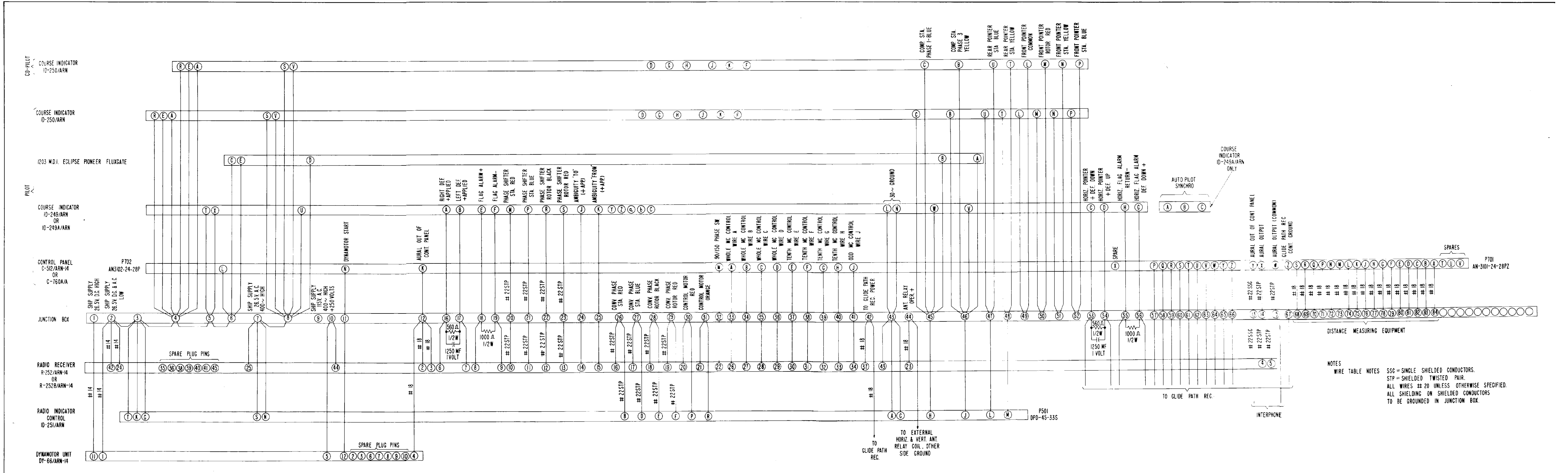
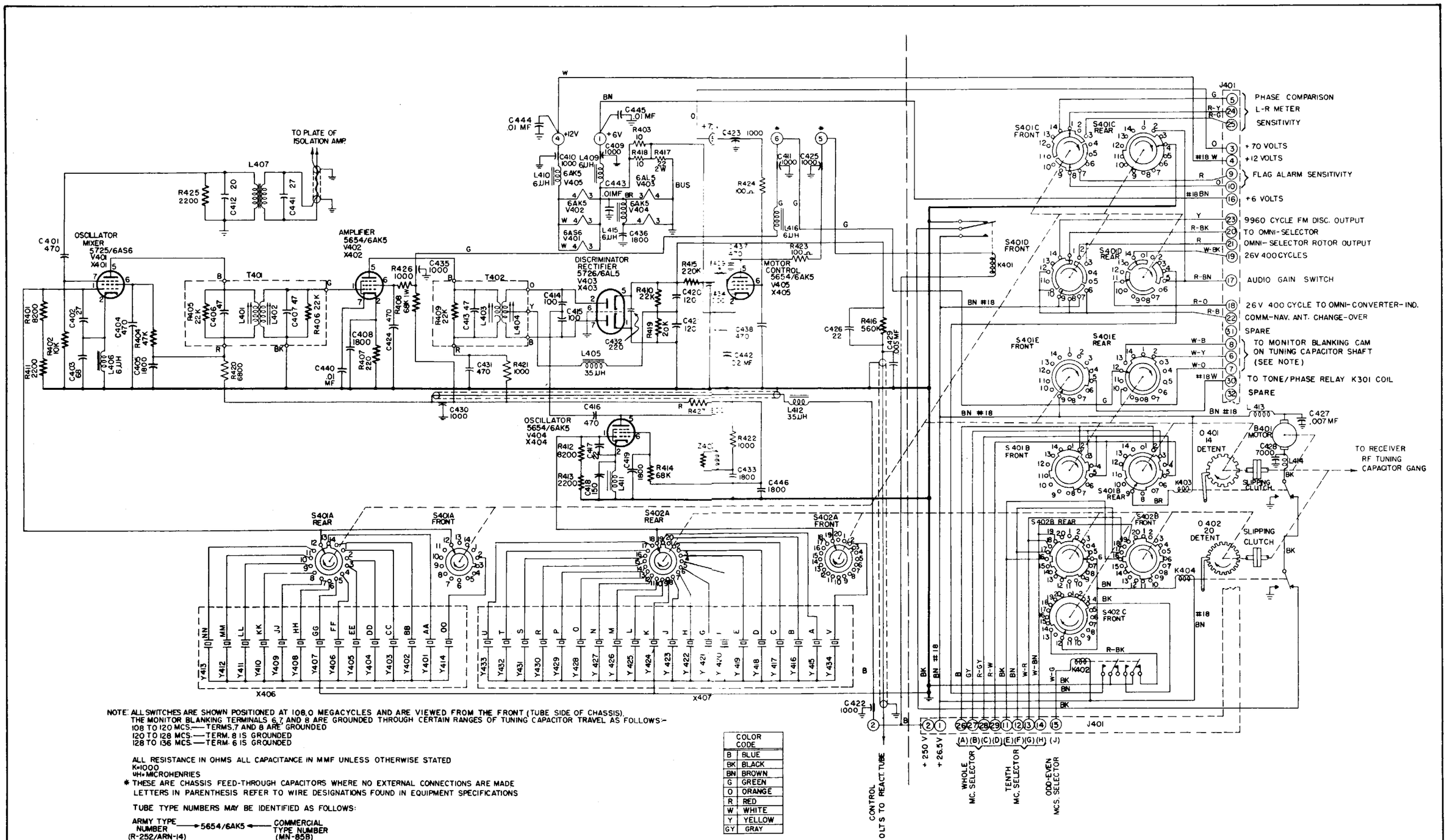


Figure 4-10. System Interconnecting Wiring Diagram



NOTE: ALL SWITCHES ARE SHOWN POSITIONED AT 108.0 MEGACYCLES AND ARE VIEWED FROM THE FRONT (TUBE SIDE OF CHASSIS).
THE MONITOR BLANKING TERMINALS 6, 7 AND 8 ARE GROUNDED THROUGH CERTAIN RANGES OF TUNING CAPACITOR TRAVEL AS FOLLOWS:-
108 TO 120 MCS.—TERMS. 7 AND 8 ARE GROUNDED
120 TO 128 MCS.—TERM. 8 IS GROUNDED
128 TO 136 MCS.—TERM. 6 IS GROUNDED

ALL RESISTANCE IN OHMS ALL CAPACITANCE IN MMF UNLESS OTHERWISE STATED
K=1000
UH=MICROHENRIES
* THESE ARE CHASSIS FEED-THROUGH CAPACITORS WHERE NO EXTERNAL CONNECTIONS ARE MADE
LETTERS IN PARENTHESIS REFER TO WIRE DESIGNATIONS FOUND IN EQUIPMENT SPECIFICATIONS

TUBE TYPE NUMBERS MAY BE IDENTIFIED AS FOLLOWS:

ARMY TYPE NUMBER (R-252/ARN-14) → 5654/6AK5 ← COMMERCIAL TYPE NUMBER (MN-85B)

COLOR CODE	
B	BLUE
BK	BLACK
BN	BROWN
G	GREEN
O	ORANGE
R	RED
W	WHITE
Y	YELLOW
GY	GRAY

Figure 4-11. Radio Receiver R-252/ARN-14 and R-252B/ARN-14, Monitor Chassis, Schematic Diagram

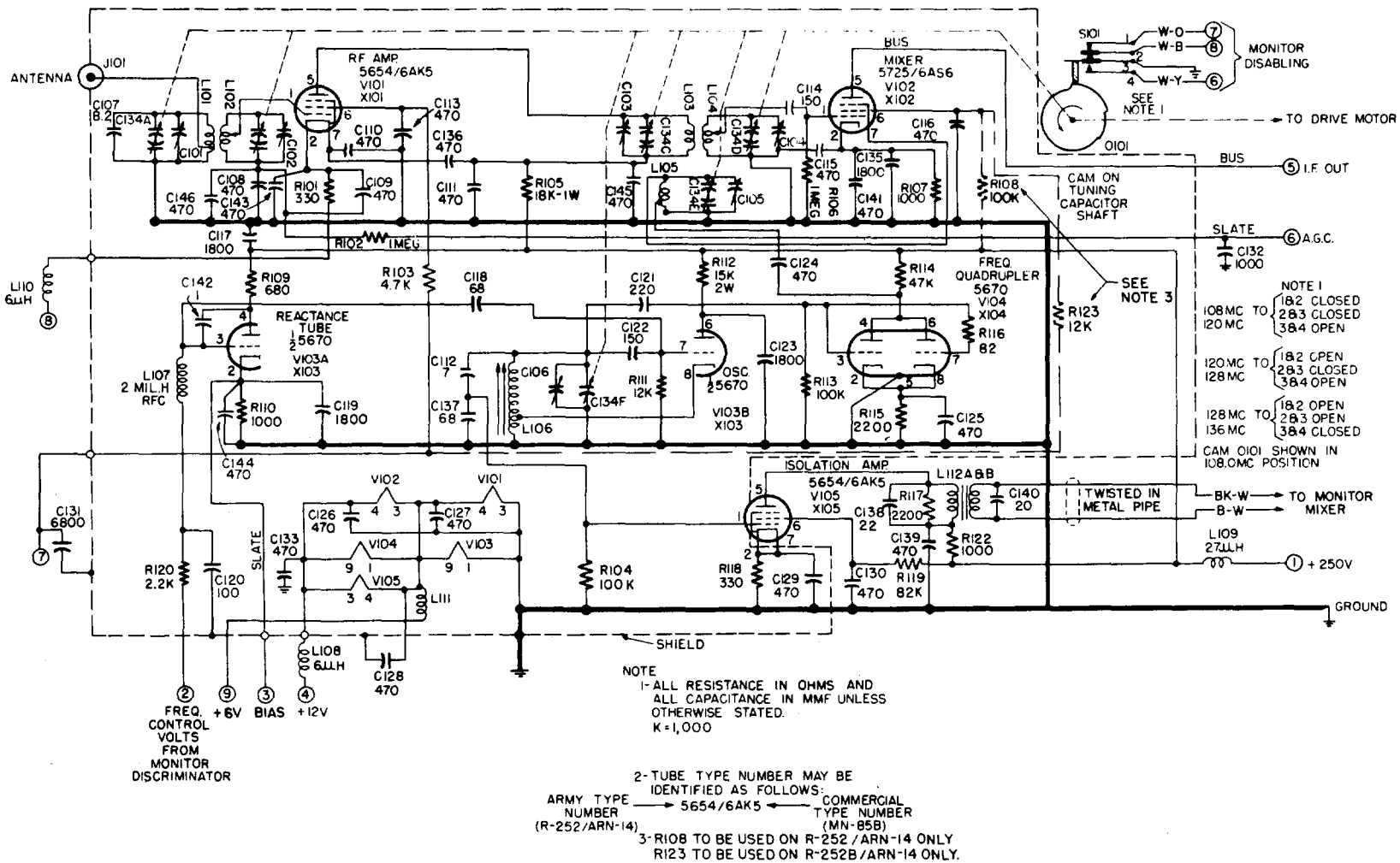


Figure 4-12. Radio Receiver R-252/ARN-14 and R-252B/ARN-14, R-F Chassis, Schematic Diagram

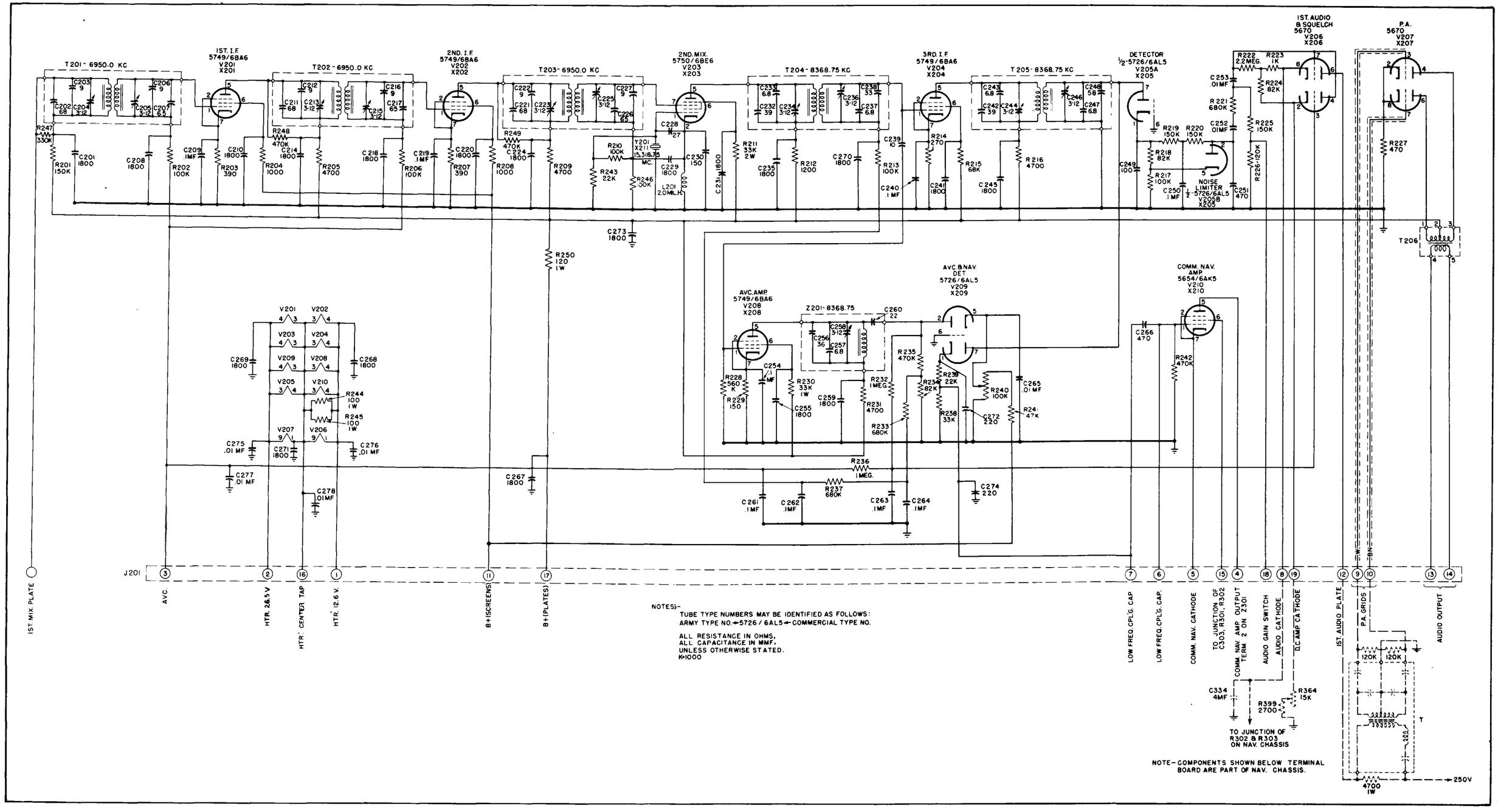


Figure 4-13. Radio Receiver R-252/ARN-14 IF, Audio and Common Navigation Amplifier, Schematic Diagram

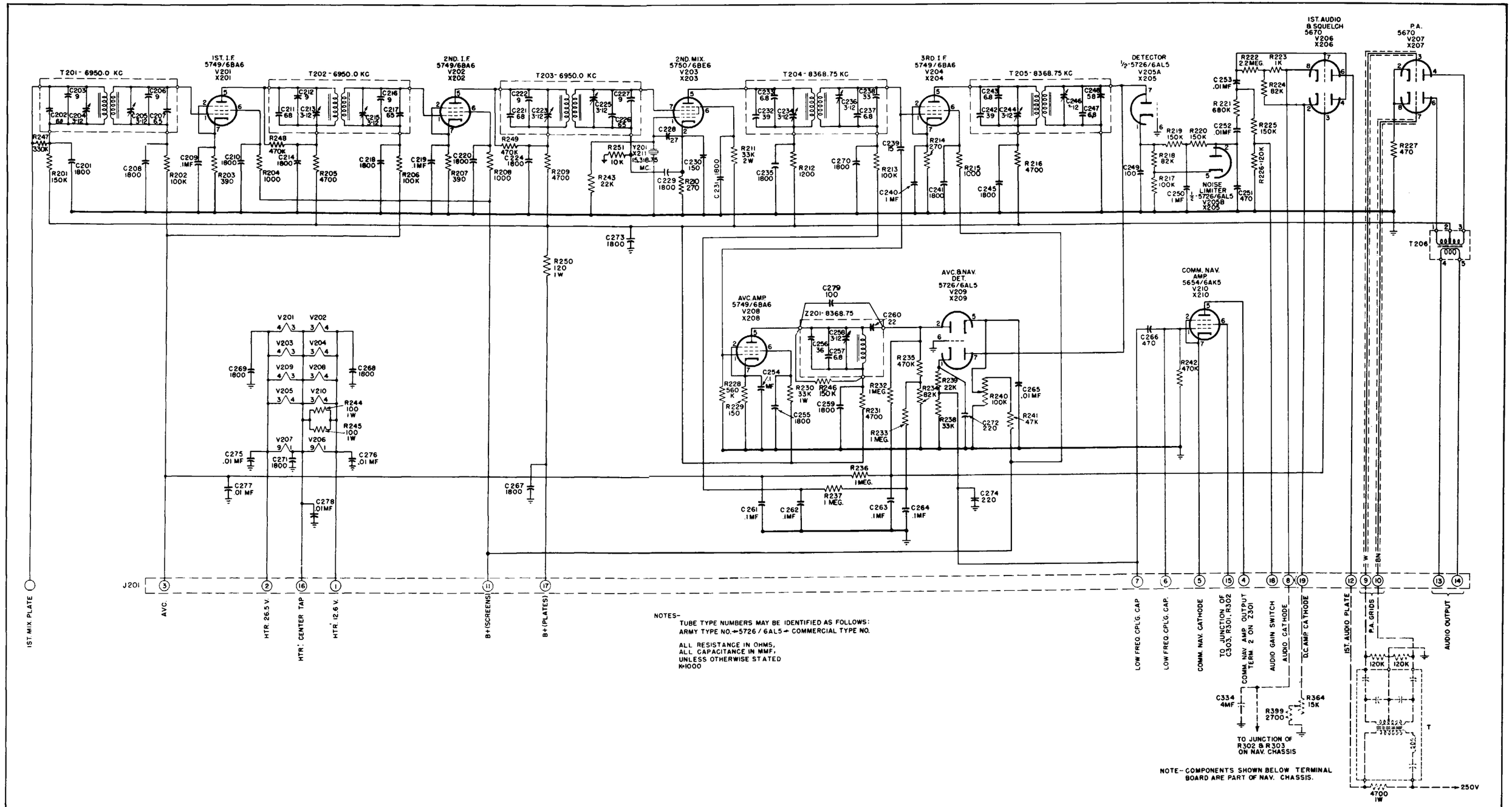


Figure 4-13A. Radio Receiver R-252B/ARN-14 IF, Audio and Common Navigation Amplifier, Schematic Diagram

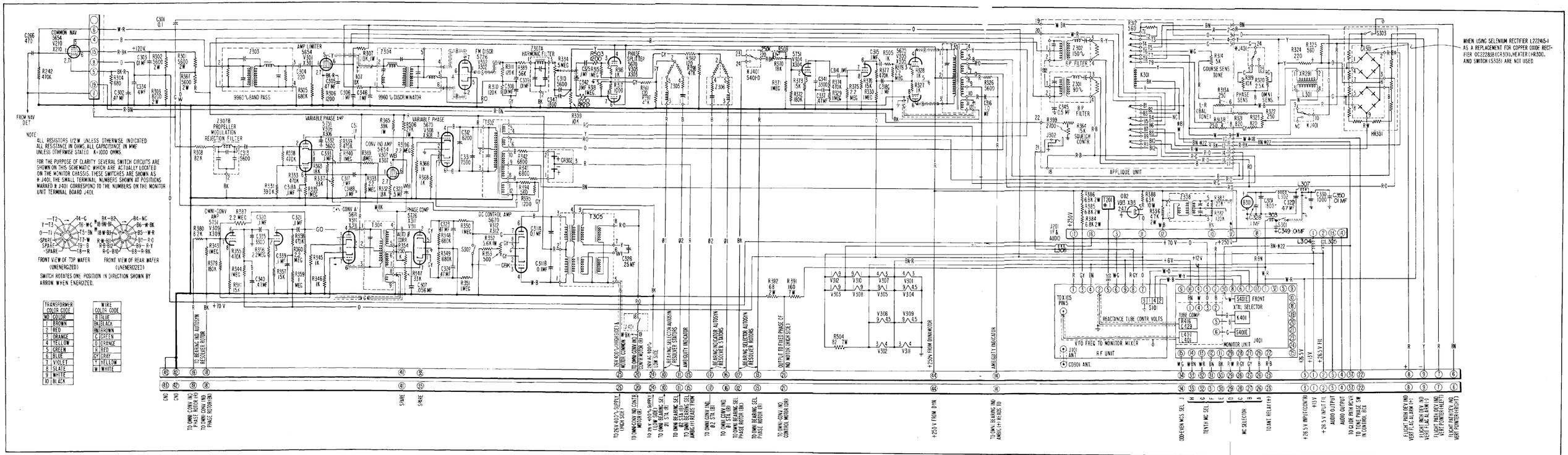


Figure 4-14. Radio Receiver R-252/ARN-14, Navigation Chassis and Chassis Interconnections, Schematic Diagram

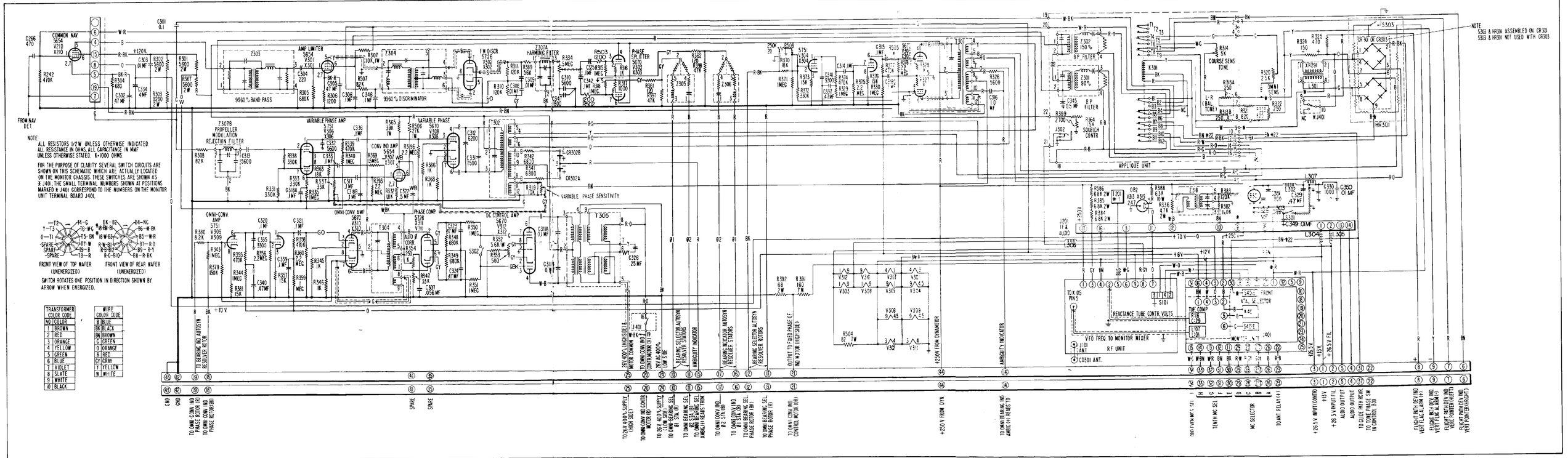


Figure 4-14A. Radio Receiver R-252B/ARN-14, Navigation Chassis and Chassis Interconnections, Schematic Diagram

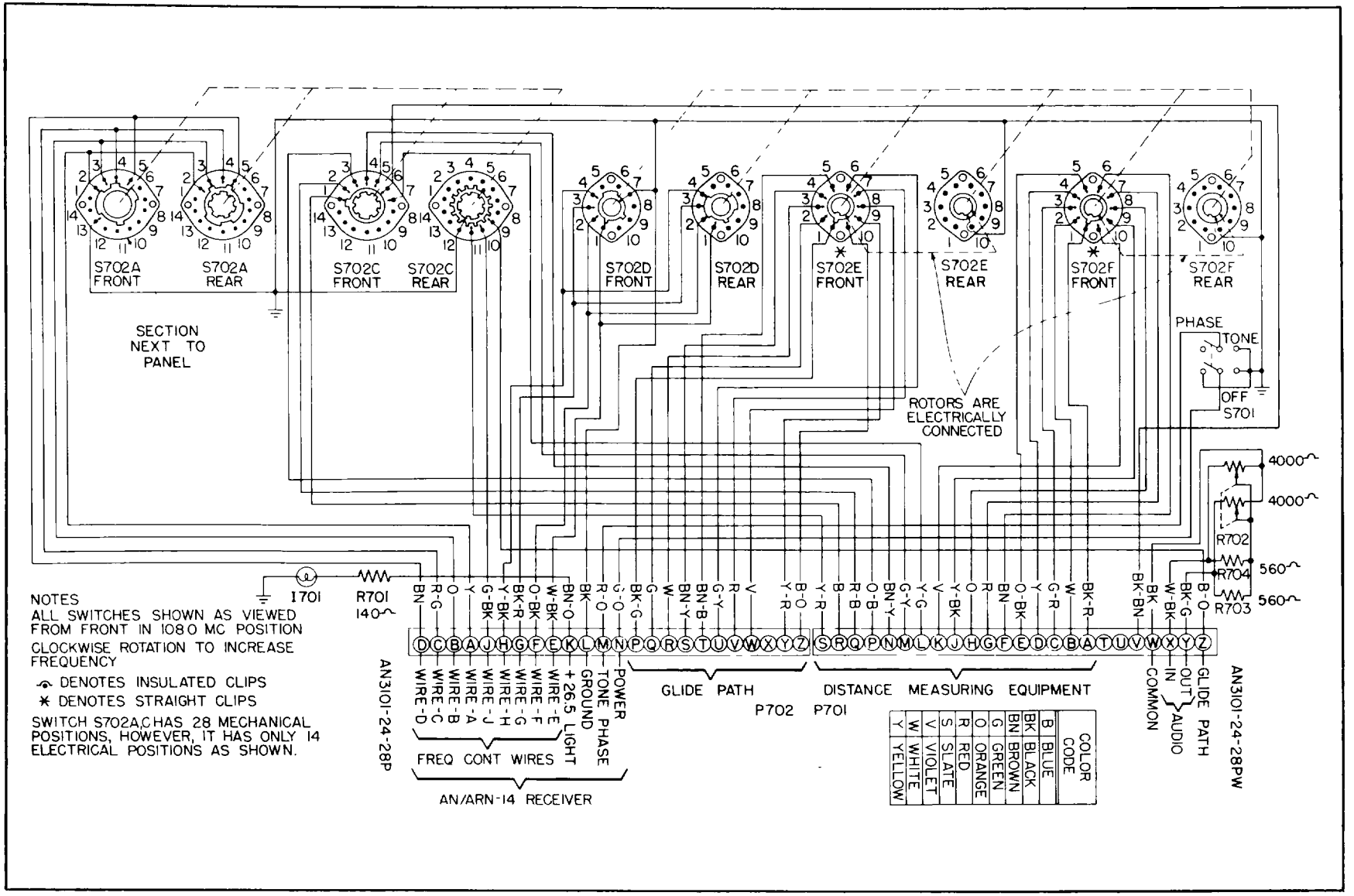
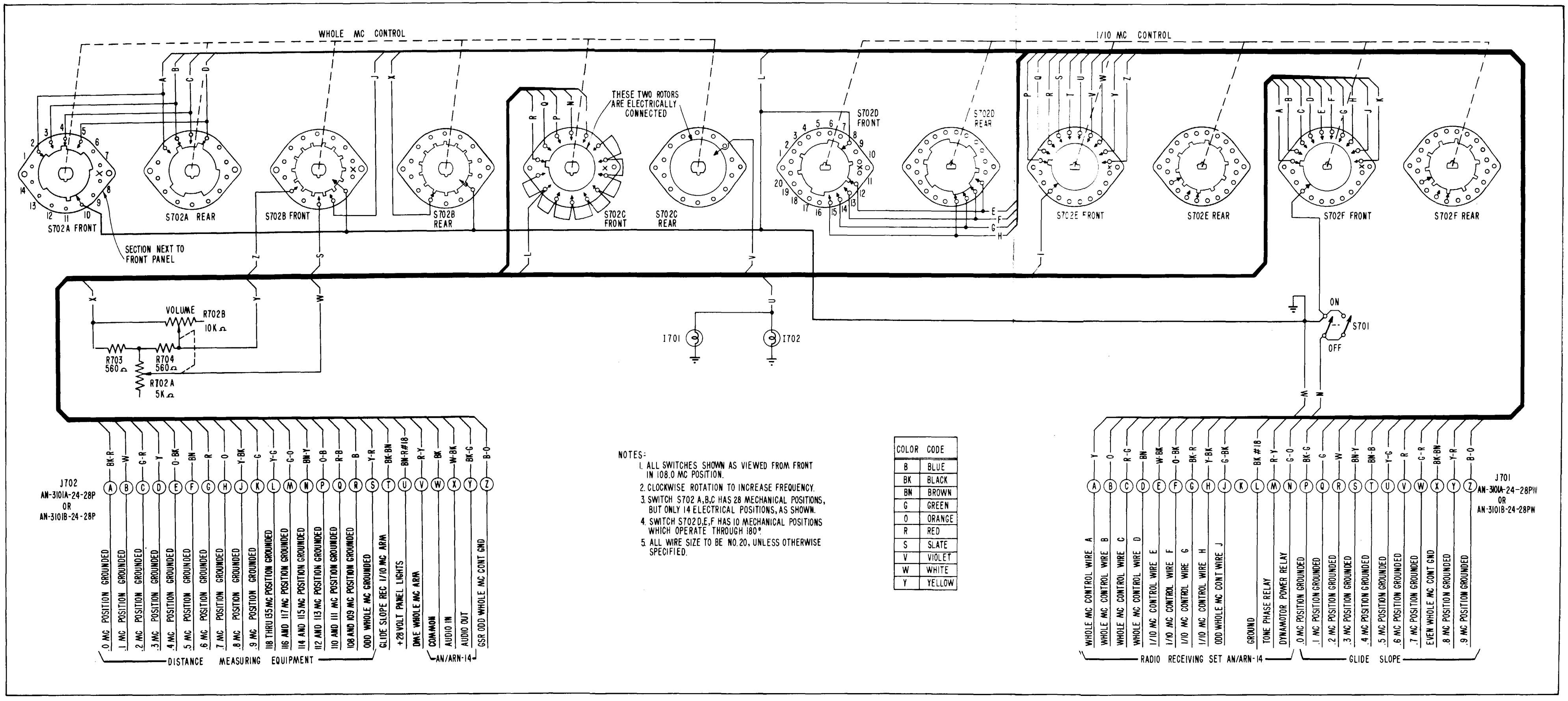


Figure 4-15. Control Panel C-512/ARN-14, Schematic Diagram



NOTES:

1. ALL SWITCHES SHOWN AS VIEWED FROM FRONT IN 108.0 MC POSITION.
2. CLOCKWISE ROTATION TO INCREASE FREQUENCY.
3. SWITCH S702 A,B,C HAS 28 MECHANICAL POSITIONS, BUT ONLY 14 ELECTRICAL POSITIONS, AS SHOWN.
4. SWITCH S702 D,E,F HAS 10 MECHANICAL POSITIONS WHICH OPERATE THROUGH 180°.
5. ALL WIRE SIZE TO BE NO.20, UNLESS OTHERWISE SPECIFIED.

COLOR	CODE
B	BLUE
BK	BLACK
BN	BROWN
G	GREEN
O	ORANGE
R	RED
S	SLATE
V	VIOLET
W	WHITE
Y	YELLOW

Figure 4-15A. Control Panel C-760A/A, Schematic Diagram

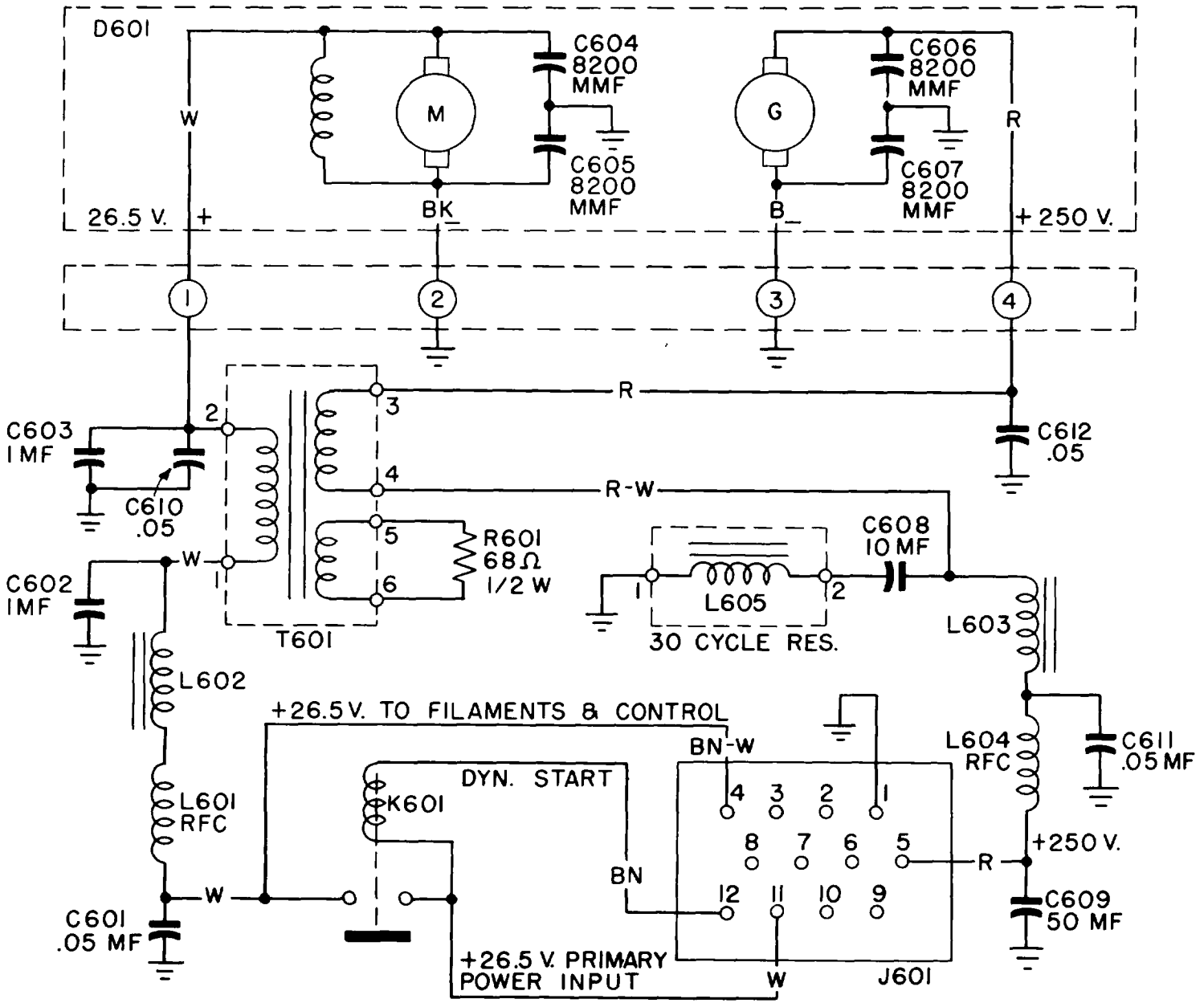


Figure 4-16. Dynamotor Unit DY-66/ARN-14, Schematic Diagram

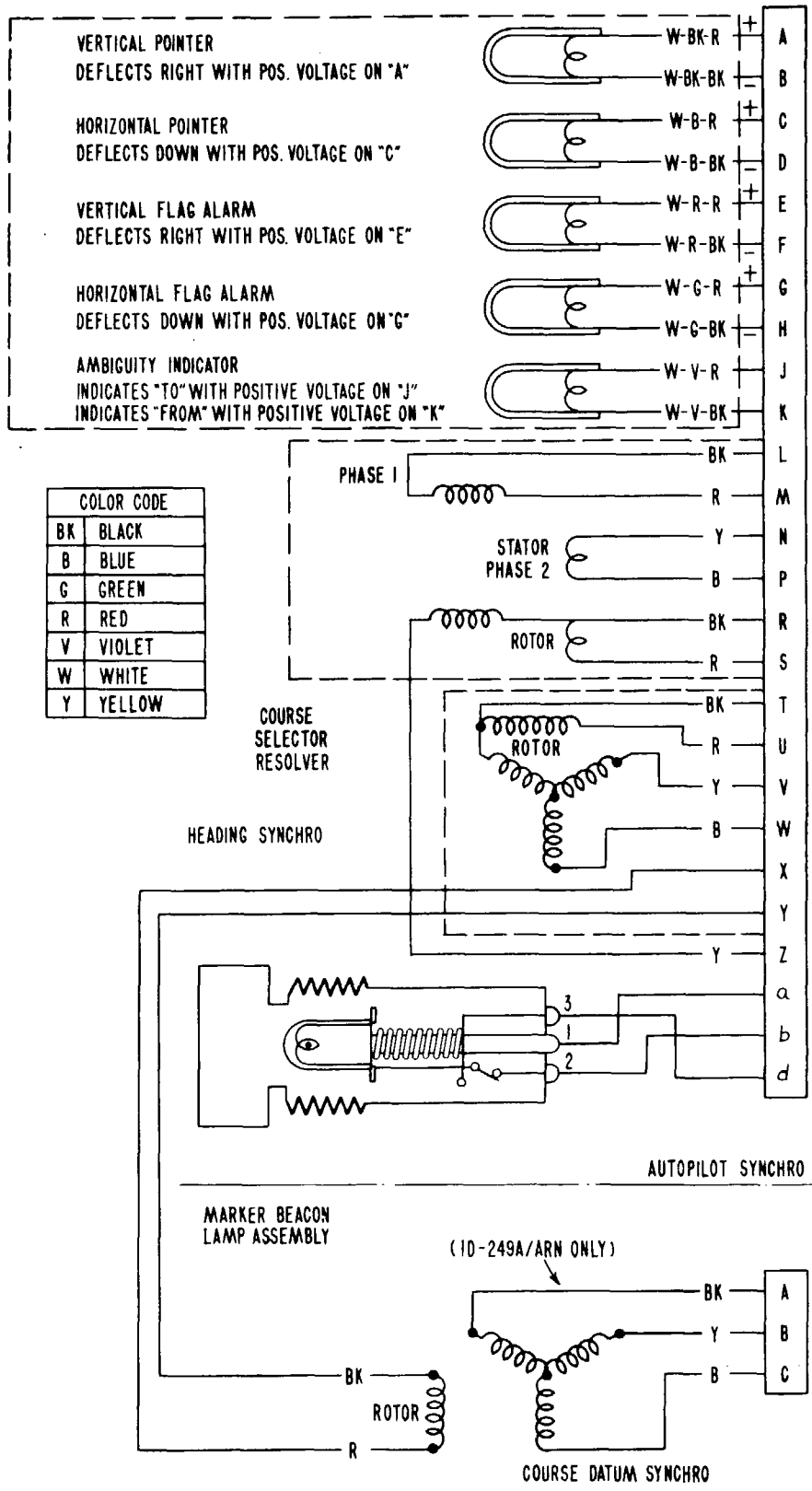


Figure 4-17. Course Indicator ID-249/ARN and ID-249A/ARN, Schematic Diagram

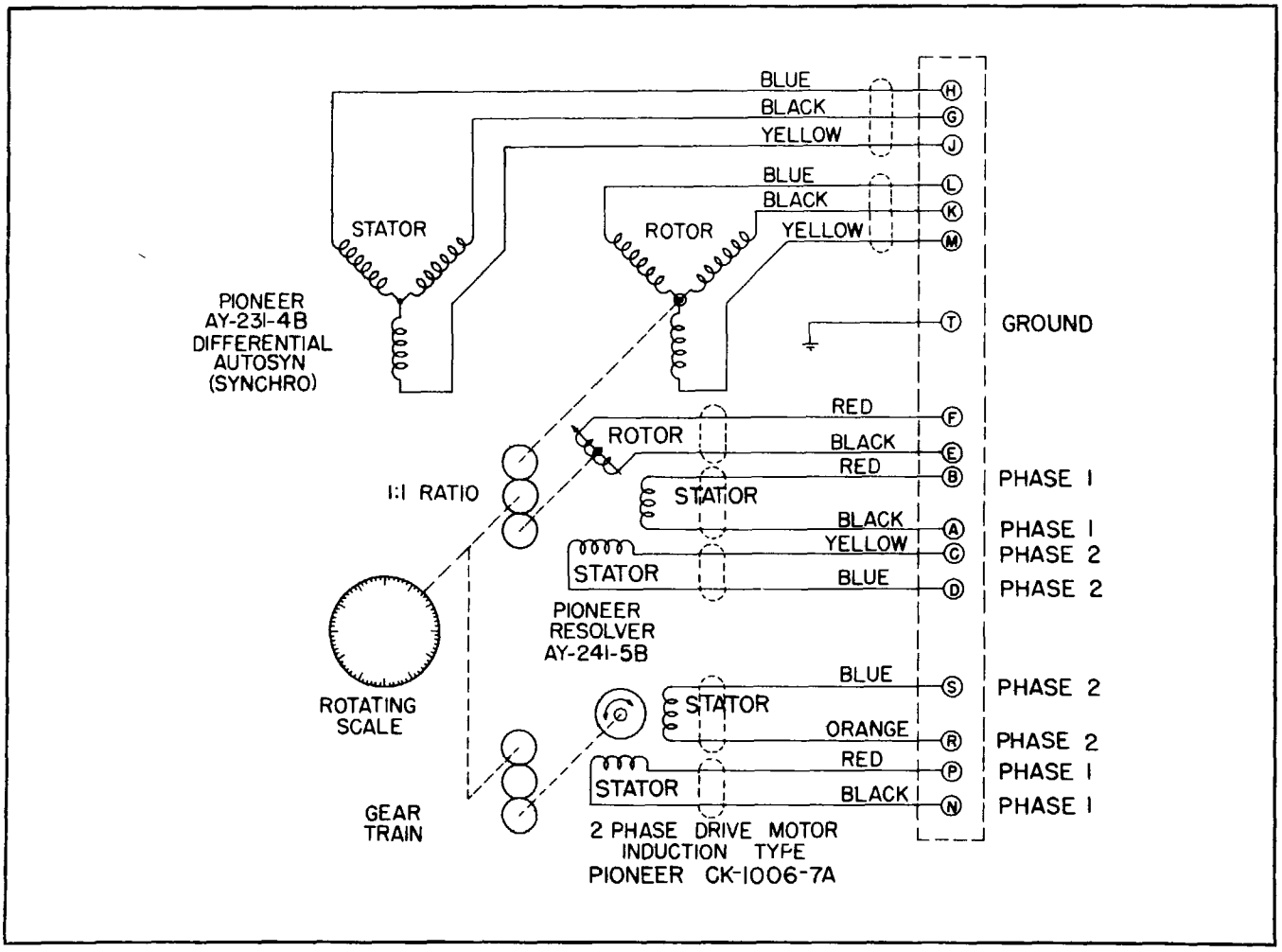


Figure 4-18. Radio Indicator-Control ID-251/ARN, Schematic Diagram

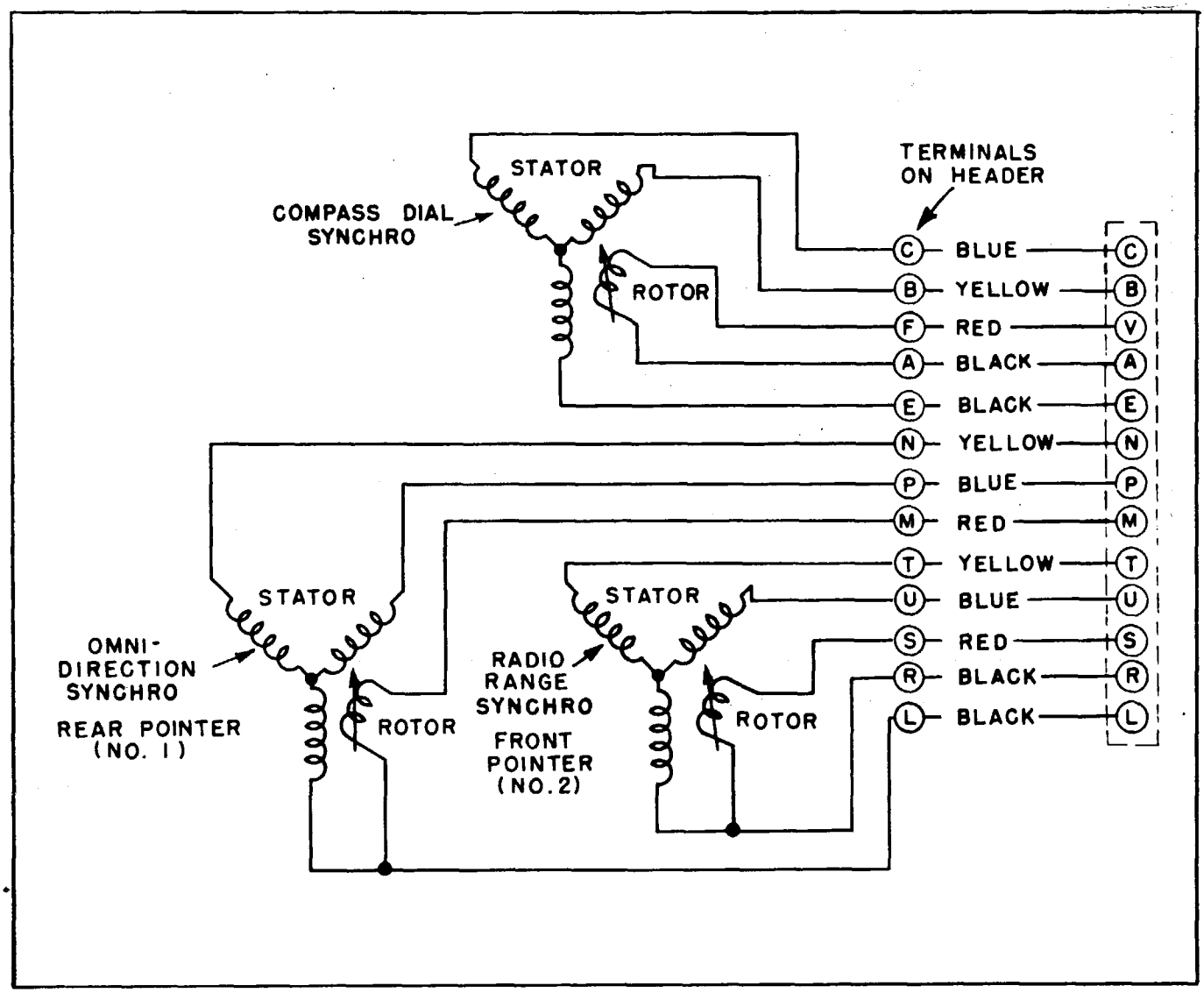


Figure 4-19. Course Indicator ID-250/ARN, Schematic Diagram