TM 11-5826-223-35

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

DIRECT AND GENERAL SUPPORT AND DEPOT MAINTENANCE MANUAL

CONVERTER, RADIO-MAGNETIC **INDICATOR CV-1275/ARN**

This copy is a reprint which includes current pages from Changes 1 and 2.

HEADQUARTERS, DEPARTMENT OF THE ARMY
14 AUGUST 1964

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

Be careful when working on the rmi converter. This set operates on 28 volts dc and 26 volts ac, either of these voltages will directly or indirectly cause serious injury or death.

CAUTION

Do not make resistance measurements on this equipment before reading paragraph 22.

TECHNICAL MANUAL
NO. 11-5826-223-35

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON 25, D.C., *14 August 1964*

CONVERTER, RADIO-MAGNETIC INDICATOR CV-1275/ARN

***This manual supersedes so much of TM 11-1520-209-35, 15 December 1962, as pertains to maintenance of Converter, Radio-Magnetic Indicator CV-1275/ARN.**

CHAPTER 1

FUNCTION

Section I. INTRODUCTION

1. Scope of Manual

a. This manual covers direct and general support and depot maintennace for Converter, Radio-Magnetic Indicator CV-1275/ARN (rmi converter) (fig. 1). It includes instructions appropriate to direct and general support and depot maintenance for troubleshooting, testing, adjusting, and repairing the equipment, replacing maintenance parts, and repairing specified maintenance parts. It also lists the tools, materials, and test equipment required for direct and general support and depot maintenance.

b. The purpose, operation, and interoperation of the various circuits (electrical, electronic, mechanical, and electromechanical) in this equipment are explained in paragraphs 4 through 14. Familiarity with the equipment, how it works, and why it works that way are valuable tools in troubleshooting the equipment rapidly and effectively.

Note: For operator and organizational maintenance instructions, refer to the applicable aircraft maintenance manual.

2. Index of Publications

Refer to the latest issue of DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment. Department of the Army Pamphlet No. 310-4 is an index of current technical manuals, technical bulletins, supply manuals (types 4, 6, 7, 8, and 9), supply bulletins, lubrication orders, and modification work orders which are available through publications supply channels. The index lists the individual parts (-10, -20, -35P, etc) and the latest changes to and revisions of each equipment publication.

3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Damaged or Improper Shipment. Fill out and forward DD Form 6 (Report of Damaged or Improper Shipment) as prescribed in AR 700-58 (Army), NAVSANDA Publication No. 378 (Navy), and AFR 71-4 (Air Force).

c. Reporting of Equipment Manual Improvements. The direct reporting, by the individual user, of errors, omissions, and recommendations for improving this equipment manual is authorized and encouraged. DA Form 2028 will be used for reporting these improvement recommendations. This form may be completed by the use of pencil, pen, or typewriter. DA Form 2028 will be completed in triplicate and forwarded by the individual using the manual. The original and one copy will be forwarded direct to: Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-MR-MP-P, Fort Monmouth, New Jersey 07703. One information copy will be furnished to the individual's immediate supervisor (officer, noncommissioned officer, supervisor, etc).

Section II. BLOCK DIAGRAM ANALYSIS

4. General

(fig. 1)

The rmi converter automatically combines omnirange bearing information from the vhf navigation receiver with magnetic heading information from the J-2 compass set to provide continuous visual omnirange bearing information on the course indicator. The rmi converter chaasis is inclosed by an aluminum dust cover and supports three plug-in modules: modulator module Al, servoamplifier module A2, and gearing unit assembly A3. Modulator module Al converts direct current (de) deviation signals form the vhf navigation converter to a 400-cycle-per-second (cps) deviation signal. Servo amplifier module A2 modifies the 400-cps output of modulator module A1 to provide 400-cps driving voltage to the motor of two-phase 400-cps motor-generator A3MG1. The chassis also includes two relays, A4K1 and A4K2 , and the interior wiring. All electrical connections are made through receptacle J1 on the rear of the chassis. Paragraphs 5, 6, and 7 provide block diagram descriptions of the three modules of the rmi converter. Refer to the applicable module diagrams (fig. 3 and 4), to the overall block diagram (fig. 2), and to the schematic diagram (fig. 13) as the circuits of the various modules are discussed.

5. Overall Black Diagram
(fig. 2)

a. In the vhf navigation set, the vhf navigation converter applies a dc voltage to a course deviation indicator whenever the aircraft deviates from a selected course. The polarity of the dc voltage depends on the position (right or left) of the aircraft with respect to the selected course. With the rmi converter added to the vhf navigation set, the dc output of the vhf navigation converter is applied to the modulator circuits (part of modulator module A1) of the rmi converter rather than to the deviation indicator.

b. The modulator; bearing servoamplifier A2; the two-phase, 400-cps motor (part of A3MG1); and 30-cps resolver A3B2 operate with circuits in the vhf navigation converter to provide a closed-loop servosystem. If the position of the rotor in the 30-cps resolver does not agree with the position of the aircraft, a positive- or negative-de error signal

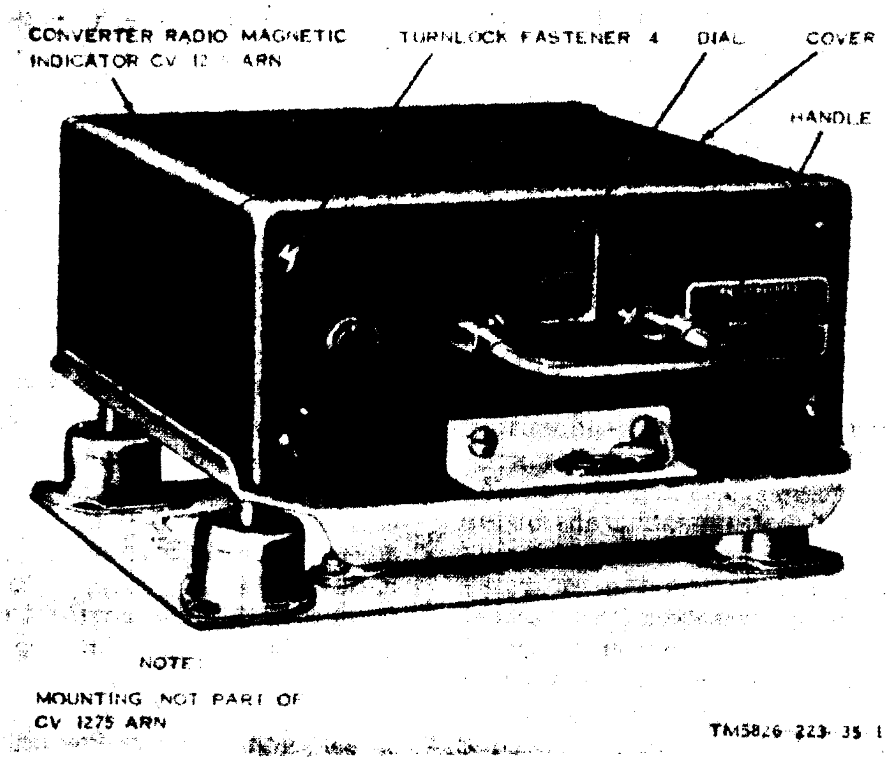


Figure 1. Rmi converter.

is applied to the circuits of rmi converter modulator module Al where it is converted to a 400-cps positive- or negative-going, pulse signal (400-cps deviation signal) that is fed to and amplified by bearing servoamplifier A2.

c. The bearing servoamplifier amplifies the 400-cps deviation signal and shifts the phase of the signal 90° to provide the control winding of the two-phase 400-cps mot or with a voltage that either leads or lags the 26-volt, 400-cps reference voltage by 90°. When a deviation signal is applied to the motor, it rotates clockwise or counterclockwise, depending on the phase of the deviation signal. As the 400-cps motor rotates, it changes the angular position of the 30-cps resolver rotor, thereby reducing the dc output of the vhf navigation converter to zero. When this output is zero, the deviation voltage produced by modulator module A1 is also zero and the two-phase, 400-cps motor stops. The two-phase, 400-cps motor is part of motor-generator A3MG1,. The output of the 400-cps generator portion of motor-generator A3MG1 is a rate feedback for serveamplifier A2 to reduce overshooting and hunting. When the output of the vhf navigation converter is very large (aircraft off course by more than 8°), the generator output is open-circuited. This allows the two-phase, 400-cps motor to run free, and thus permits the vertical pointer of the course indicator and the No. 2 pointer of the navigation indicators to follow rapid changes in the position of the aircraft with respect to the omnirange station.

d. Differential transmitter synchro A3B1 and 400-cps resolver A3B3 are mechanically coupled to motor-generator A3MG1. The differential transmitter synchro combines magnetic heading information from the J-2 compass transmitter synchro (electrical input from the flux valve) with omnirange bearing information from the 30-cps resolver (mechanical input) and provides and electrical output that represents the instantaneous bearing of the aircraft with respect to the omnirange station.

e. The 400-cps resolver A3B3 is used with the course selector deviation indicator, and TO-FROM meter of the course indicator, The rotor of the resolver is energized by the 400-cps reference voltage. This rotor voltage induces a voltage in each stator winding of the course selector; the amplitude and polarity of the induced voltage depends on the angular displacement of the rotor with respect to the individual stators. The stator voltages of the course indicator are applied to the stator windings of the 400-cps resolver where a magnetic field, identical with that produced in the course selector, is developed. The field developed by the 400-cps resolver stator produces a voltage in the rotor of the resolver when the angular displacement of the rotor is not identical with that of the course selector rotor. When the aircraft is on a selected course, the angular displacement of the course selector rotor and the 400-cps resolver rotor are identical. If the aircraft is not on a selected course, the two-phase, 400-cps motor drives the 400-cps resolver to a position different from that of the course selector rotor and an error voltage is developed in the 400-cps resolver. The error voltage is applied to the deviation phase-sensitive detector where it is converted to a dc signal that is applied to the vertical pointer of the course indicator. The error voltage developed in the resolver rotor is also applied to the to-from phase-sensitive detector where it is converted to a dc signal that is applied to the TO-FROM meter of the course indicator.

6. Modulator Module A1, Block Diagram
(fig. 3)

a. Modulator module A1 converts dc deviation signals from the vhf navigation converter to a 400-cps deviation signal. The module contains two filter circuits, a dc to 400-cps chopper, phase-sensitive detectors for the vertical pointer and the TO-FROM meter of the course indicator, and a VOR-LOC switching relay.

b. When the vhf navigation set is tuned to an omnirange frequency, the dc output of the vhf navigation converter is applied through the low-pass filter and the 30-cps

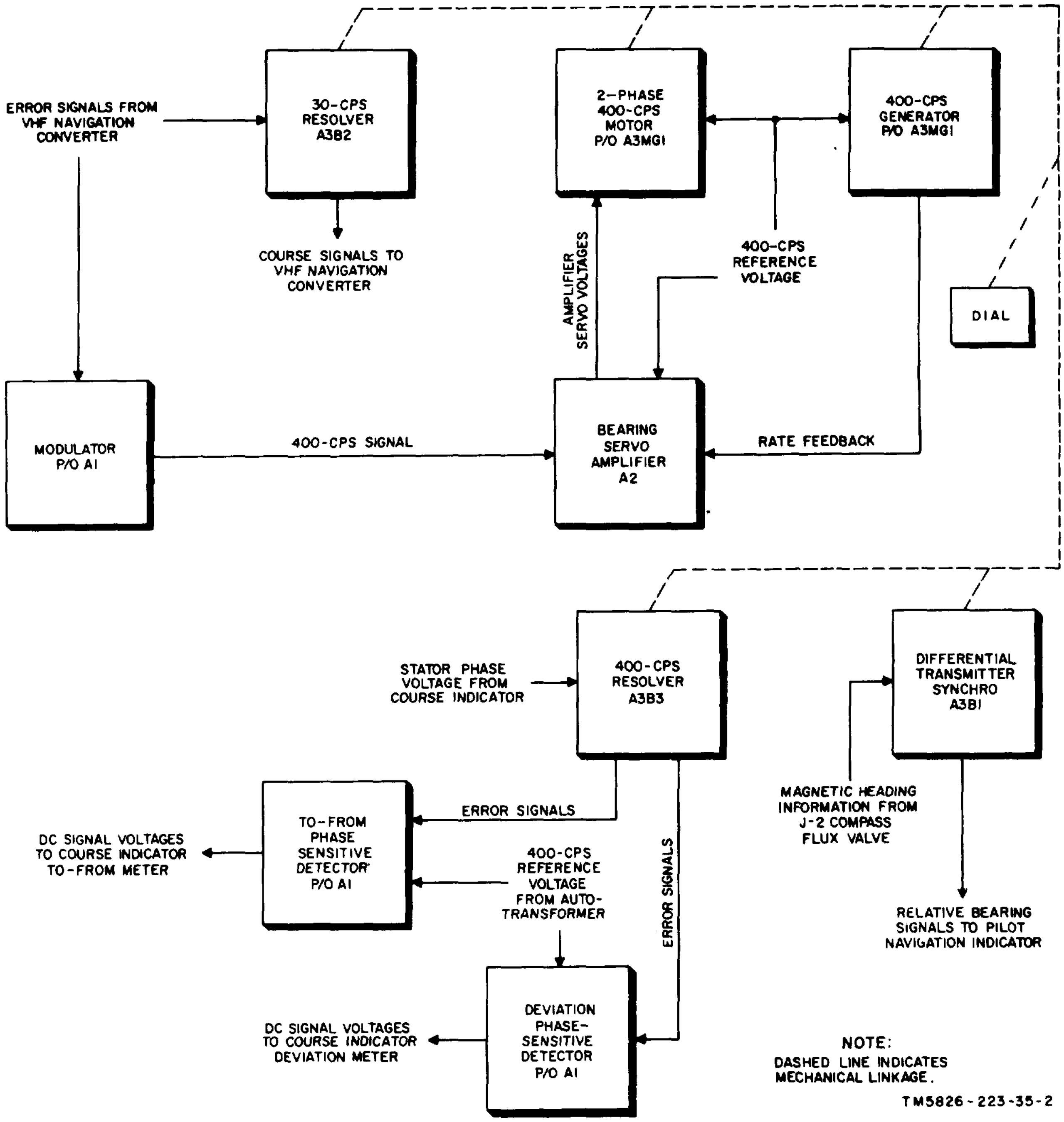


Figure 2. Rmi converter, block diagram.

twin-T filter to chopper A1Q1 and A1Q2. Chopper A1Q1 and A1Q2 operates as an automatically variable voltage divider, the resistance of which varies at the 400-cps reference voltage rate. This circuit provides a pulsed output with the same frequency as the applied reference voltage and the polarity of the applied dc voltage.

c. The 400-cps reference voltage is transformer-coupled to the bases of chopper transistors A1Q1 and A1Q2, and the filtered positive- or negative-de voltage is impressed across the emitters of transistors A1Q1 and Q2. The 400-cps voltage alternately changes the bias, and the output voltage varies between the value of the dc input voltage and zero at the 400-cps rate.

d. The pulsed output (400-cps deviation signal) of the chopper is applied through bearing servoamplifier A2 to two-phase, 400-cps motor-generator A3MG1 in gearing unit assembly A3. The 400-cps deviation signal causes the motor to rotate, changing the angular displacement of the 400-cps resolver motor A3B3, producing a 400-cps deviation error signal and a change in the 400-cps to-from input signal.

e. The deviation error signal from resolver A3B3 is applied to the deviation phase-sensitive detector (part of modulator module A1). The detector produces a dc output that is proprotional in amplitude to the amplitude of the deviation error signal; the polarity of the dc output is determined by the polarity of the deviation error signal with respect to the 400-cps reference voltage. For example, if the aircraft is flying the selected bearing to the omnirange station, the angular displacement of the 400-cps resolver motor will be the same as that of the course selector rotor; the 400-cps error signal applied to the deviation phase-sensitive detector will be zero, and the vertical pointer will be centered. If the aircraft is off course, or if an off-course radial is selected, a 400-cps deviation error signal will be developed and applied to the deviation phase-sensitive detector, a plus or minus dc voltage will be produced and applied to the vertical pointer, and the vertical pointer will move offcenter to indicate the direction the aircraft must fly to reach the desired course.

f. The operation of the to-from phase-sensitive detector (part of modulator module A1) is similar to the operation of the deviation phase-sensitive detector. The 400-cps to-from input signal, obtained from the rotor of 400-cps resolver A3B3, is always 90° out of phase with respect to the 400-cps deviation error signal, Because of this phase relationship, the to-from input signal is maximum when the deviation error signal is zero (aircraft on selected course) and zero when the deviation error signal is maximum (aircraft 90° off selected course). When the to-from input signal is maximum, the plus or minus dc output of the to-from phase-sensitive detector is maximum, and a strong to or from signal is produced.

g. When the vhf navigation set is tuned to a localizer frequency, 28-volt dc from the VHF NAV control panel is applied to the control side of the winding of relay A1K1. When this relay is operated, the dc output of the vhf navigation converter is applied directly to the vertical pointer of the course indicator and the 400-cps reference voltage is removed from the rmi converter, making the converter inoperative.

7. Servoamplifier Module A2, Block Diagram
(fig. 4)

a. Servoamplifier module A2 modifies the 400-cps output of modulator A1 to provide the motor portion of the two-phase, 400-cps motor-generator A3MG1 of gearing unit assembly A3 with a 400-cps driving voltage. The servoamplifier also contains flag control circuits that control the application of the holddown voltage to the warning flag of the course indicator and the application of the 400-cps rate-feedback signal to the amplifier circuits of the servoamplifier.

b. The 400-cps output of modulator module A1 is applied to the base of first voltage amplifier A2Q1. In addition to the modulator output signal, degenerative feedback is applied to first voltage amplifier A2Q1 to prevent the motor from overshooting its null position. First voltage amplifier A2Q1 amplifies the 400-cps signal and provides impedance matching to second voltage amplifier A2Q2. The output of first voltage amplifier A2Q1 is applied through second and third voltage amplifiers A2Q2 and A2Q3 and series-connected class B power amplifiers A2Q4 and A2Q5 to the control winding of the motor of motor-generator A3MG1.

c. The 400-cps output of the power amplifiers is shifted 90° to provide a difference in phase between the control winding (400-cps deviation signal) and the main winding (400-cps reference voltage) voltages that are applied to the motor.

d. The servoamplifier also controls the

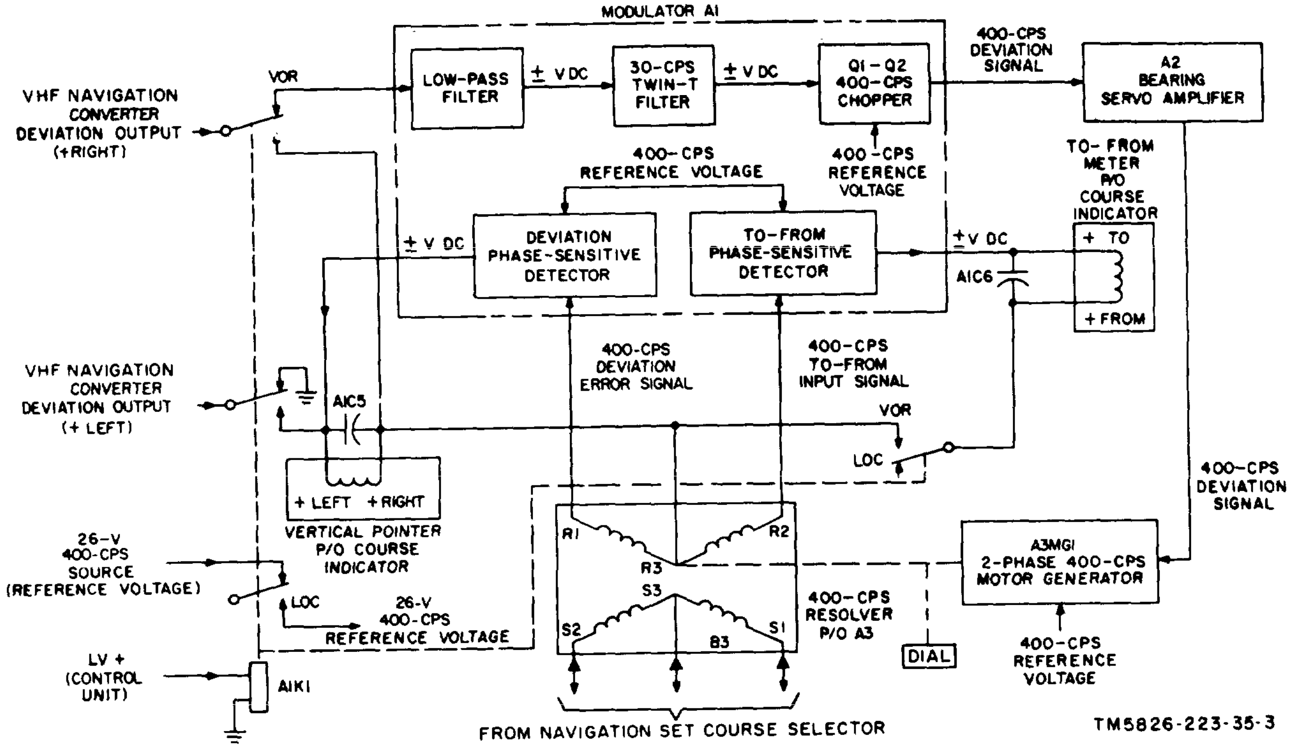


Figure 3. Modulator module A1, block diagram.

warning flag of the course indicator and the application of the rate feed signal to the servoamplifier circuits. The output of second voltage amplifier A2Q2 is applied through flag sensitivity control resistor R15 to relay control amplifier A2Q7. When the aircraft is within 8° of a selected course, relay control amplifier A2Q7 is biased to cutoff, relay switch A2Q6 conducts, flag relay A4K1 is energized, the VOR flag circuit is completed through relay A4K1, and the warning flag is held out of sight by the flag current. If the aircraft is more than 8° off course, relay control amplifier A2Q7 conducts, relay switch A2Q6 is biased to cutoff, relay A4K1 is deenergized, the flag and rate-feedback circuits are broken, the warning flag shows, and motor-generator A3MG1 is not slowed by the effects of the degenerative rate-feedback signal. The bias on relay switch A2Q6 is also controlled by the 400-cps reference voltage applied through bias control A2CR1. If the reference voltage disappears, relay switch A2Q6 will be cut off and the warning flag will show regardless of the position of the aircraft with respect to the selected omnirange course.

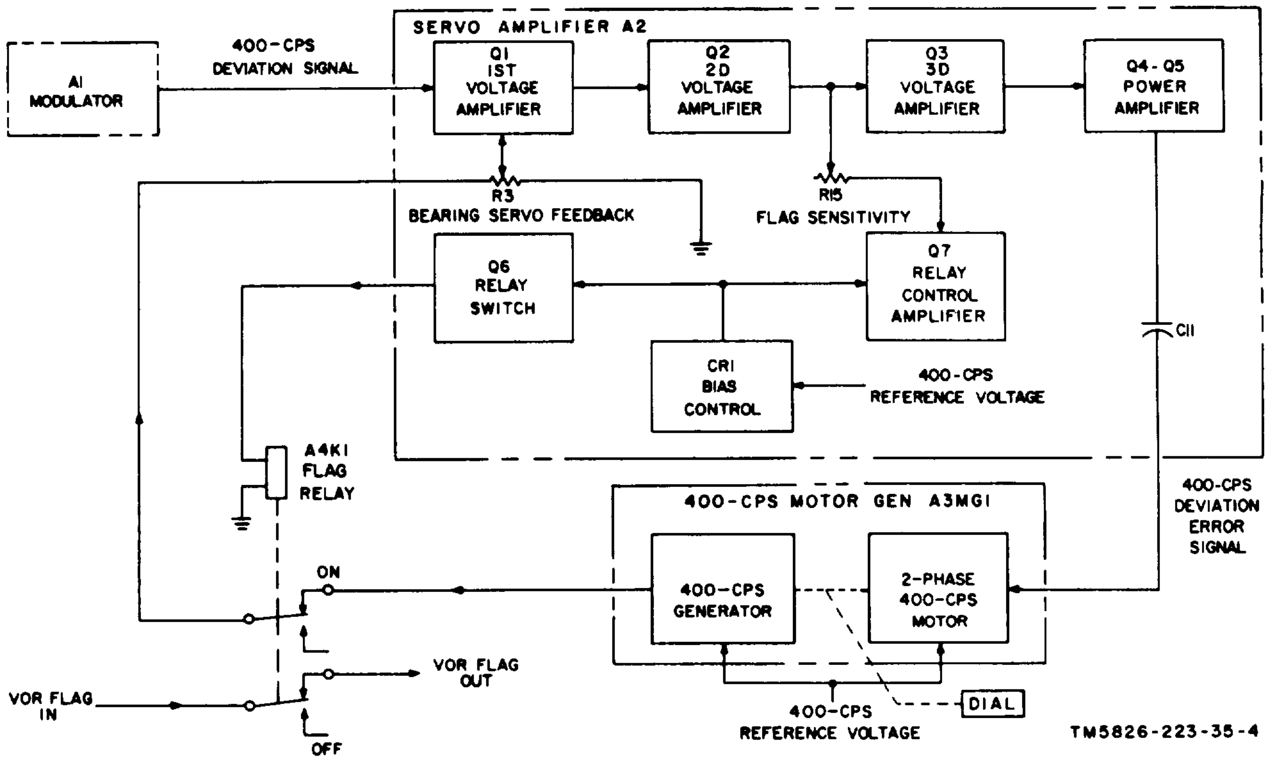


Figure 4. Servoamplifier module A2, block diagram.

Section III. CIRCUIT ANALYSIS

8. Modulator Module A1, Low-Pass and Twin-T Filters
(fig. 13)

The low-pass filter consisting of reactor A1L1, resistor A1R15, and capacitor A1C1 receives the dc voltage (+ right) output of the vhf navigation converter and applies it through a twin-T filter consisting of capacitors A1C2, A1C3, and A1C4 and resistors A1R1, A1R2, and A1R3. Any 30-cps component in the output of the vhf navigation converter is removed by these filters and the resulting dc voltage is applied to 400-cps chopper A1Q1 and A1Q2. The low-pass filter offers low impedance to frequencies near 30 cps, but attenuates any residual carrier-frequency voltage in the signal. The twin-T filter rejects any 60-cps signal component, rotor blade, or propeller modulation present.

9. Chopper A1Q1 and A1Q2
(fig. 13)

The 400-cps chopper consisting of transistors A1Q1 and A1Q2 and resistors A1R4 and A1R5 receives the dc output of the twin-T filter and provides a pulsed output at the reference voltage frequency and with the polarity of the applied dc voltage. The 400-cps reference voltage is coupled to the bases of the chopper transistors from terminals 10 and 12 of a secondary winding of power transformer A1T1 and the filtered positive or negative dc is applied to the emitters of the chopper transistors. The 400-cps reference v 01 t a g e alternately changes the bias of the transistors from a forward bias to a reverse bias. The output of the stage is taken from the transistor collectors between two series-connected resistors and is varied at a 400-cps rate.

The output voltage varies between the value of the dc input voltage and ground. The output of the chopper is applied through pins C of modulator module A1 and servoamplifier module A2 to first voltage amplifier A2Q1 of servoamplifier module A2.

10. First, Second, and Third Voltage Amplifiers A2Q1, A2Q2, and A2Q3 (fig. 13)

The 400-cps output of the chopper on modulator module Al is applied to the base of first voltage amplifier A2Q1 through dropping resistor A2R1 and coupling capacitor A2C1. In addition to the chopper output signal, a controlled amount of degenerative feedback is applied to the base of first voltage amplifier A2Q1 through pin F of servoamplifier module A2 and feedback-control resistors A2R3 and A2R2 which prevents the motor of motor-generator A3MG1 from overshooting its null position. Resistor A2R7 and capacitor A2C3 form the emitter bypass circuit and resistor A2R6 is a load resistor for first voltage amplifier A2Q1. Resistors A2R4 and A2R5 form a voltage divider for the base of first voltage amplifier A2Q1. This voltage divider supplies a base potential that is more positive than the emitter potential and provides forward bias for first voltage amplifier A2Q1. The output of first voltage amplifier A2Q1 is applied to the base of second voltage amplifier A2Q2. Resistor A2R17 is an emitter swamping resistor which provides bias stabilization for second voltage amplifier A2Q2. Resistor A2R10 and capacitor A2C4 form the emitter bypass circuit and resistor A2R9 is a load resistor for second voltage amplifier A2Q2. The output of second voltage amplifier A2Q2 is applied to the base of third voltage amplifier A2Q3, and the output of third voltage amplifier A2Q3 is applied across the primary winding of driver transformer A2T1. Capacitor A2C6 is an emitter bypass for third voltage amplifier A2Q3. Capacitors A2C2 and A2C7 are ripple filters for the 28-volt dc supply. Resistors A2R8 and A2R12 are B+ isolating resistors between the first, second, and third voltage amplifier stages and the power amplifiers. When overvoltage surges occur on the 28-volt dc input, resistor A2R11 prevents damage to third voltage amplifier A2Q3.

11. Power Amplifiers A2Q4 and A2Q5 (fig. 13)

The output of third voltage amplifier A2Q3 is applied through driver transformer A2T1 to series-connected class B power amplifiers A2Q4 and A2Q5. The output of one secondary winding of driver transformer A2T1 is applied to the base of power amplifier A2Q4 from driver transformer A2T1 terminal 3, and the output of the other secondary winding is applied to the base of power amplifier A2Q5 through driver transformer A2T1 terminal 6. When the base of power amplifier A2Q4 is positive, the base of power amplifier A2Q5 is negative and power amplifier A2Q4 conducts. When the base of power amplifier A2Q5 is positive, the base of power amplifier A2Q4 is negative and power amplifier A2Q5 conducts. The combined output of both power amplifiers supplies an uninterrupted 400-cps output. This output is shifted 90° by capacitor A2C11 to provide a phase difference between the control-winding voltage (400-cps deviation signal) and the main-winding voltage (400-cps reference voltage) of the motor portion of motor-generator A3MG1. Resistor A2R13 provides emitter bias for power amplifier A2Q4 and resistor A2R14 provides emitter bias for power amplifier A2Q5. Capacitors A2C5 and A2C8 aid in maintaining the 90° phase shift.

12. Deviation Phase-Sensitive Detector (fig, 13)

The 400-cps deviation signal from the power amplifiers of servoamplifier module A2 causes the motor portion of motor-generator A3MG1 to rotate, changing the angular displacement of 400-cps resolver A3B3, and thereby producing 400-cps deviation error signal and a change in the 400-cps to-from input signal. This deviation error signal (the output of the 400-cps resolver rotor) is applied to the deviation phase-sensitive detector consisting of diodes A1CR1 and A1CR2, resistors A1R6 through A1R11 and a secondary winding (terminals 8 and 9) of power transformer A1T1. The detector produces a dc output that is proportional in amplitude to the amplitude of the deviation error signal. The polarity of this dc output is determined by the phase of the deviation error signal with respect to the 400-cps reference voltage. With the aircraft flying the selected bearing, the output of the rotor of the 400-cps resolver will be zero. If the helicopter is off course to the right, or if an off-course radial to the left is selected, the output of the 400-cps resolver rotor will be inphase, and the signal will be applied through pin F of modulator module A1, bias control diode A1CR1, dropping resistor A1R6, balancing resistor A1R7, deviation indicator balance control resistor A1R8, deviation indicator sensitivity control resistor A1R11, and pin G of modulator module A1 through pin 9 of receptacle A4J1 to the course indicator. The vertical pointer will swing to the left to indicate the direction the aircraft must fly to intercept the selected course. If the helicopter is off course to the left, or if an off-course radial to the right is selected, the output of the 400-cps resolver rotor will be 180° out-of-phase and the signal will be applied through pin F of modulator module A1, diode A1CR2, dropping resistor A1R10, balancing resistor A1R9, balance control resistor A1R8, sensitivity y control resistor A1R11, coupling capacitor A1C5, and pin O of modulator module A1 through pin B of receptacle A4J1 to the course indicator. The vertical pointer will swing to the right to indicate the direction the aircraft must fly to intercept the selected course.

13. To-From Phase-Sensitive Detector (fig. 13)

The operation of the to-from phase-sensitive detector consisting of diodes A1CR3 and A1CR4, resistors A1R13 and A1R14, and a secondary winding (terminals 5, 6, and 7) of power transformer A1T1 is similar to the operation of the deviation phase-sensitive detector. The 400-cps to-from input signal, obtained from one side of the rotor of 400-cps resolver A3B3 is always 90° out-of-phase with respect to the 400-cps deviation error signal obtained from the other side of the rotor of the 400-ops resolver. Because of this phase relationship, the to-from input signal is maximum when the deviation error signal is zero (aircraft on a selected course), and zero when the deviation error signal is maximum (aircraft 90° off a selected course). When the to-from output of the 400-cps resolver is maximum, it is connected through pin D of modulator module A1 to the center tap of power transformer A1T1. The plus or minus dc output of the to-from phase-sensitive detector, through balance resistor A1R14 and diode A1CR4 or balance resistor A1Rl3 and diode A1CR3, is then maximum and a TO or FROM indication is obtained on the course indicator. Resistors A4R1 and A4R2 serve as course indicator deviation meter shunts, and capacitor A4C1 is a meter-protection capacitor which protects the deviation meter from damage due to possible signal surges. Resistors A3R1 and A3R2 and sensistor A3RT1, series-connected on the output of 30-cps resolver A3B2, maintain the synchro phase shift and provide temperature compensation.

14. Relay Control Amplifier A2Q7 and Relay Central Switch A2Q6 (fig. 13)

The output of second voltage amplifier A2Q2 is also applied through flag sensitivity control resistor A2R15 and coupling capacitor A2C10 to the base of relay control amplifier A2Q7. A 26-volt, 400-cps reference voltage is applied through pin L of servoamplifier module A2, current-limiter resistor A2R16 and rectifier A2CR1 to the base of relay switch A2Q6 and to charging capacitor A2C9. When the aircraft is within 8° of a selected course, second voltage amplifier A2Q2 has no output, relay control amplifier A2Q7 is cut off, and relay switch A2Q6 conducts. Flag relay A4K1 is operated by current through the relay switch circuit, the flag circuit is completed through contacts D and F of flag relay A4K1, and the warning flag is held out of sight by the flag current. When the aircraft is more than 8° off course, the output of second amplifier A2Q2 is applied to the base of relay control amplifier A2Q7 and the amplifier conducts. Relay switch A2Q6 is cut off, the control side of the flag relay winding is opened, the flag and rate-feedback circuits are broken, the warning flag appears on the course indicator, and the motor of motor-generator A3MG1 is not slowed by the effects of the degenerative rate-feedback signal. If the 26-volt, 400-cps power source fails, relay switch A2Q6 will be cut off and the warning flag will appear. Clipper diode A2CR2 prevents the base of relay control amplifier from swinging negative.

CHAPTER 2
TROUBLESHOOTING

Section 1. GENERAL TROUBLESHOOTING INFORMATION

Warning: When servicing the rmi converter, be extremely careful of the voltage. This set operates on 28 volts dc and 26 volts ac, either of these voltages can directly or indirectly cause serious injury or death. Before making internal connection or touching electrical parts in the chassis, always disconnect the input voltages.

15. General Instructions

The direct and general support and depot maintenance procedures in this chapter supplement the procedures set forth in the organizational maintenance manual covering the aircraft. The systematic troubleshooting procedure, which begins with the operational and sectionalization checks that can be performed at the organizational level, is carried to a higher level in this chapter. Paragraph 17 provides a list of equipment, test equipment, and materials required for troubleshooting the rmi converter. Paragraph 21 provides overall troubleshooting for the complete rmi converter. Paragraphs 22, 23, and 24 provide voltage and resistance measurements for each module or assembly.

16. Organization of Troubleshooting Procedures

a. General. The first step in servicing a defective rmi converter is to sectionalize the fault. Sectionalization means tracing the fault to a defective module. The second step is to localize the fault. Localization means tracing the fault to a defective part responsible for the abnormal conditions. Some faults, such as burned-out resistors or arcing and shorted transformers, can often be located by sight, smell, and hearing. The majority of faults, however, must be isolated by measuring voltages and resistances.

b. Sectionalization. Listed below is a group of tests arranged to reduce unnecessary work, and to aid in tracing trouble to a defective module. The rmi converter consists of three modules, and the first step is to locate the module at fault by the following methods:

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. All dial readings, or other visual signs should be observed and an attempt made to sectionalize the fault to a particular module.

(2) *Operational tests.* Operational tests frequently indicate the general location of trouble and, in many instances, help in determining the exact nature of the fault. If visual or operational tests do not disclose the trouble, check the adjustment of the rmi converter, Paragraphs 30, 31, and 32 provide adjustment procedures.

c. Localization. After the trouble has been sectionalized (b above), the methods listed in (1), (2), and (3) below will aid in localizing the trouble to a defective component.

(1) *Voltage and resistance measurements.* The rmi converter is transistorized. Observe all cautions given to prevent transistor damage. Make voltage and resistance measurements on the rmi converter only as specified. When measuring voltages, use tape or sleeving to insulate the entire test prod, except for the extreme tip. A momentary short circuit can destroy a transistor. Use resistor and capacitor color codes (fig. 11 and 12) and the schematic diagram (fig. 13) to find the value and tolerances of the components. Use voltage and resistance charts (para 23 and 24) to find normal readings, and compare them with readings taken.

(2) *Troubleshooting chart.* The trouble symptoms listed in the chart (para 21) will aid in localizing trouble to a component part.

(3) *Intermittent troubles. In* all these tests, the possibility of intermittent troubles should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the components. Check the wiring and connections to the modules of the rmi converter.

17. Test Equipment Required

The following charts list the equipment required in the test setup and the test equipment required for troubleshooting the *rmi* converter, the associated technical manuals, and the assigned common names.

a. Equipment.

Equipment	Technical manual	Common name
Receiving Set, Radio AN/ARN-30D components:	TM 11-5826-215-12	Vhf navigation equiptment
Receiver, Radio R-1021/ARN-30D----------	------------------	Receiver
Converter, Signal Data CV-265-A/ARN-30A	------------------	Converter
Indicator, Course ID-250/ARN---------------	TM 11-5826-211-50	Rmi

b. Test Equipment.

Equipment	Technical manual	Common name
Maintenance Kit, Electronic Equipment MK-252/ARN and test set adapter components:	TM 11-5826-210-12	Maintenance kit
Test Set Subassembly MX-2869/ARN consisting of:	------------------	Test set subassembly
Indicator, Course ID-453/ARN-30	------------------	Course indicator
Mounting MT-1046/ARN-30	------------------	Control unit mount
Interconnecting Box J-676/ARN		
Interconnecting Box J-677/ARN		
Mounting base assembly consisting of:	------------------	Navigation set mount
Mounting MT-1174/ARN-30A		
Mounting MT-1175/ARN-30A		
Base, Stand MT-2239/ARN		
Wiring Harness, Branched CX-4866/ARN	------------------	Wiring harness
Lead Test CG-1618/U	------------------	Test lead
Cycling Test Unit, ARC-23230	------------------	Cycling test unit
Control Unit, ARC type C-91A	------------------	Control unit
Cable harness, ARC-23240	------------------	Cable
Cable harness, ARC-23250	------------------	Cable harness
Harness Adapter, ARC-26115	------------------	Rmi adapter
Attenuator, Boonton Radio Type 505-B	------------------	Attenuator
Radio Test Set AN/ARM-5:	TM 11-518	
Signal Generator SG-66/ARM-5	------------------	Signal generator
Cord CG-409/U	------------------	Rf cable
Power Supply PP-1104A/G	TM 11-5126	Low voltage supply
Multimeter ME-26B/U	TM 11-6625-200-12	Voltmeter
26-volt, 400-cps supply	------------------	26v 400-cps supply

18. Connections for Test Setup
(fig. 5)

To test the rmi converter, arrange the maintenance kit, test set adapter, test equipment, and the rmi converter as shown in figures 5 and as explained below.

a. Connect the wiring harness as follows :

From		To	
Connector	Unit	Unit	Connector
P1	Wiring harness --------	Rmi adapter -----------	J4
P2	Wiring harness --------	Navigation set mount----	J305
P3	Wiring harness --------	Rmi adapter -----------	J3
P4	Wiring harness --------	Test set subassembly ---	Extreme left-hand connector
P6	Wiring harness --------	Test set subassembly ---	Connector adjacent to extreme left-hand connector

b. Connect the cable harness as follows:

From		To	
Connector	Unit	Unit	Connector
P8	Cable harness	Cycling test unit	J106
P9	Cable harness	Cycling test unit	J105
P7	Cable harness	Control unit	J2
P10	Cable harness	Control unit	J1

c. Connect the rmi adapter as follows:

From		To	
Connector	Unit	Unit	Connector
P1	Rmi adapter	Navigation set mount	J304
P2	Rmi adapter	Navigation set mount	J306
P3	Rmi adapter	Rmi	J1
P4	Rmi adapter	Rmi converter	J3
Tinned leads	Rmi adapter	26-volt, 400-cps supply	Output terminals

d. Make the following cable connections:

(1) Connect P11 of the cable to J103 on the cycling test unit and P12 to J2 on the receiver.

(2) Connect the cable assembly of the J-677/ARN to the rear of the receiver.

(3) Connect the rf cable from EXT NAV MOD connector on the J-677/ARN to DEMOD connector on the signal generator.

(4) Connect the cable assembly of the J-676/ARN to the rear of the rmi converter.

(5) Connect the ATTEN output of the signal generator through the attenuator to ANT connector J1 on the receiver.

19. Operational Check

The following checks, when used with the troubleshooting chart, will aid in locating the trouble in the rmi converter.

a. Connect the equipment as shown in figure 5 and described in paragraph 18. Remove the dust cover from the rmi converter (para 25).

b. Set the controls on the signal generator as follows:

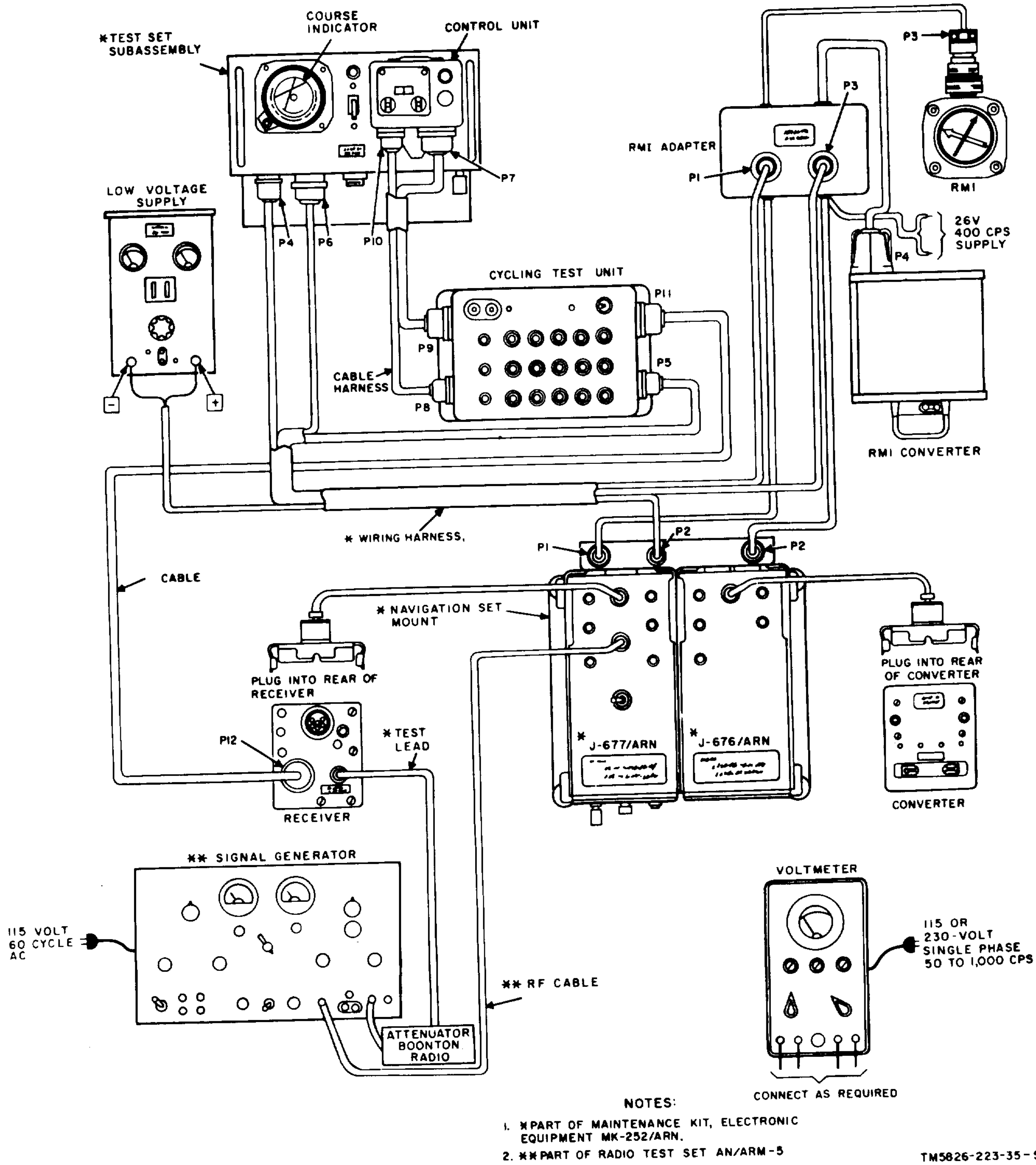


Figure 6. Connection diagram for rmi equipment tests.

(1) OMNI TRACK to 0°.
(2) MODULATION to OMNI.
(3) MC to B (114.9 mc).
(4) ATTENUATOR to 40 uv.

c. Apply power to the equipment and allow 10-minute warmup.

d. Tune the receiver to 114.9 mc. Observe the course indicator. The warning flag disappears.

e. Set the course selector dial of the course indicator to 0°. Observe the dial on the rmi converter, the pointer on the rmi, and the vertical pointer on the course indicator,

(1) The dial on the rmi converter indicates 0°.

(2) The pointer on the rmi indicates 0°.

(3) The vertical pointer on the course indicator is centered.

(4) The TO-FROM meter indicates TO.

20. Localizing Troubles

a. General. Procedures are outlined in paragraph 21 for localizing trouble to the defective module or gearing unit assembly and for localizing troubles to a stage within the various sections. Parts location is indicated in figures 6, 7, and 10. Depending on the nature of the operational symptoms, one or more of the localizing procedures will be necessary. When use of the procedures result in localization of the trouble to a stage, use the procedures outlined in paragraph 22 to isolate the trouble to the defective part.

h. Use of Chart. The troubleshooting chart is designed to supplement the operational checks (para 19). If previous operational checks have resulted in reference to a particular item of this chart, go directly to the referenced item. If no operational symptoms are known, make the performance check as described in paragraph 19.

Caution: If the operational symptoms are not known, or they indicate the possibility of short circuits within the modules or the gearing assembly, make the resistance measurement described inparagraphs 23, and 24 before applying power to the rmi converter.

21. Troubleshooting Chart

The troubleshooting chart lists the symptoms of some of the possible troubles, their probable causes, and the analysis procedures that should be used to verify each probable trouble. The various steps in the chart are referenced to the operation check (para 19). To further assist in localizing troubles, refer to the circuit analysis description (para 10 through 14), and the schematic diagram (fig. 13).

a. Preliminary Settings and Power Application. For preliminary settings and power application, refer to paragraph 19a, b, and c.

b. Troubleshooting Chart.

Oper. Test (para No.)	Symptom	Probable trouble	Correction
19*d*	Warning flag does not drop.	Defective relay A4K1.	Check for 28 volts dc at terminal E and then at terminal A relay A4K1. If the voltage is present at pin E but not at terminal A, replace relay A4K1.
		Defective relay switch A2Q6, relay control amplifier A2Q7, or flag sensitivity control A2R15.	Proceed with the steps described in paragraph 22b(2). Replace the defective part or parts.
19*e*	TO-FROM meter and vertical pointer of course indicator inoperative; rmi indications normal.	Defective relay A4K2 (fig. 14).	Check for 26-volt ac on contacts F and D of A4K2. If voltage is not on both contacts, remove wire connected to terminal F and check for continuity between terminals F and D. If continuity exists, check power transformer A1T1; if continuity does not exist, replace relay A4K2.
		Open rotor of course selector or of resolver A3B3 (fig. 8).	Remove 400-cps power from entire system. Check for an approximate resistance of 3,000

Oper. Test (para No.)	Symptom	Probable trouble	Correction
			ohms between pins O and P of the course indicator. If normal, check for an approximate resistance of 400 ohms across the rotors of resolver A3B3.
	Vertical pointer of course indicator and No. 2 pointer of rmi are unsteady.	Defective servoamplifier module A2 (fig. 7).	Adjust flag sensitivity control A2R15 (para 32d). If adjustment does not correct trouble, check voltage on pins of transistors A2Q6 and A2Q7 (para 22b). If voltages are abnormal, check transistors and associated components.
	Indications presented by vertical pointer and TO-FROM meter of course indicator are incorrect.	Improperly adjusted or defective resolver A3B2 (fig. 8).	Adjust resolver A3B2 as outlined in the chart in paragraph 32b. If adjustment does not correct trouble, check resolver A3B2, and if necessary, check 400-cps chopper Q1 and Q2 in modulator A1 and amplifier stages Q1 through Q5 in servoamplifier A2.
	Pointer indications on rmi are incorrect.	Improperly adjusted or defective differential synchro A3B1.	Zero-adjust synchro A3B1 as outlined in the chart in paragraph 32b. If Adjustment does not correct trouble, check resolver A3B2.

22. Isolating Trouble Within Modules

a. General.

(1) When trouble has been localized to a module, isolate the defective part by voltage measurements at the transistor terminals and other points related to the circuit in question.

Caution: Do not make any resistance measurements on the rmi converter unless the transistors are removed from the circuit. The battery within the multimeter can destroy the transistors by causing excessive current through them.

(2) If signals are weak and all checks fail to indicate a defective part, check the adjustments on the converter.

(3) Use the wiring diagrams (fig. 6,7, 8, and 14) to circuit-trace and isolate the faulty component.

(4) The transistor terminal voltage readings (b below) were made with a 20,000-ohm-per-volt meter. A measurement that differs widely from those in the chart, when used with the schematic diagram (fig. 13), can often localize the trouble to a specific part.

(5) Alternating current (at) and dc voltages are approximate (±20 percent) and are based on the following conditions:

(a) Values are measured with respect to chassis ground.

(b) Dc voltages are positive.

(c) A 27.5-volt dc source is applied to pin 25 of A4J1.

(d) A 26-volt, 400-cycle source is applied to pin 8 of A4J1.

(6) Ac and dc voltages are obtained with the converter installed in the aircraft with the use of appropriate extension cables or on the service bench, with the use of the test setup shown in figure 5.

(7) Ac voltage measurements are obtained with the use of Multimeter ME-26B/U or equivalent.

b. Measurements.

(1) *Modulatcr module A1* (fig. 6).

Transistor	Test point	Specific conditions	Vdc	Vac
Q1	B	Vhf navigation converter output 0	0 to 1.3	0.03
	E		0.5	1.5
	C		0 to 0.1	0.03
Q2	B	Vhf navigation converter output 0	1.0	1.4
	E		0	0
	C		0 to 0.1	0.06

(2) *Servoamplifier module A2* (fig.7).

Transistor	Test point	Specific conditions	Vdc	Vac
Q1	B	Vhf navigation converter output 0, dial of gearing unit A3 stationary.	2.5	0.021
	E		2.5	0.016
	C		4.5	0.6
Q2	B	Vhf navigation converter output 0, dial of gearing unit A3 stationary.	4.5	0.6
	E		5.0	0.12
	C		14.5	2.6
Q3	B	Vhf navigation converter output 0, dial of gearing unit A3 stationary.	14.5	2.6
	E		12.0	0.125
	C		0.5	5.9
Q4	B	Vhf navigation converter output 0, dial of gearing unit A3 stationary.	28.0	2.1
	E		27.5	0.9
	C		18.0	12.75
Q5	B	Vhf navigation converter output 0, dial of gearing unit A3 stationary.	18.0	14.0
	E		18.0	13.0
	C		0	0
Q6	B	Course indicator flag out of sight	0.2	0.005
	E		0	0
	C		28.0	6.0
Q7	B	Course indicator flag out of sight	0.2	0.4
	E		0	0
	C		0.2	0.005

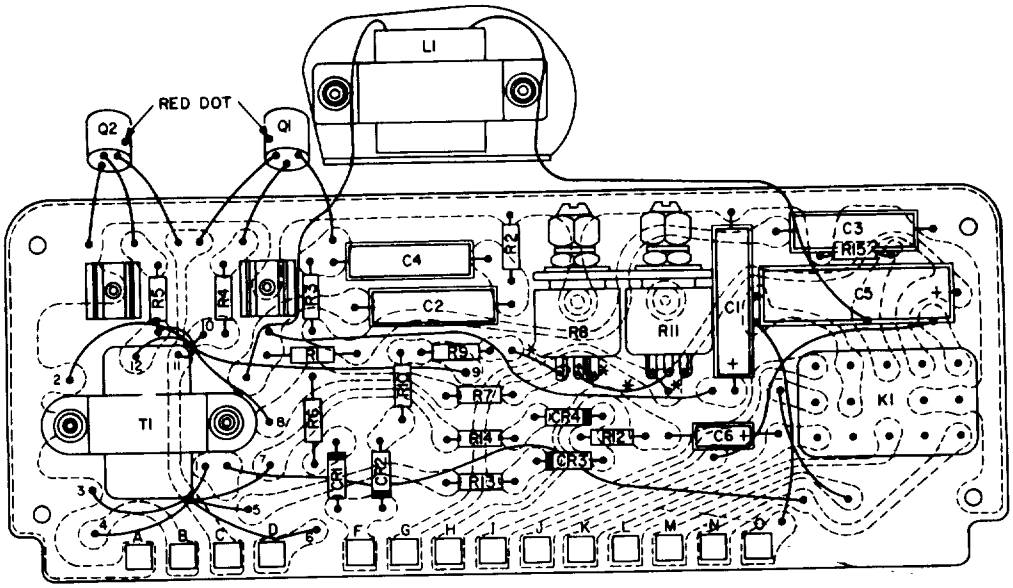
23. Gearing Unit Assembly A3 Resistance Measurements

The charts below contain the normal dc resistance of the various components of the gearing unit assembly. The resistance readings are taken at the pins of connector plugs P1 and P2 of the assembly.

Note: Two resistance readings are given for differential synchro A3B1 and for resolver synchro A3B3. The variance exists because some parts are made by different manufacturers. Although these differences exist, the units are interchangeable.

a. Motor-Generator A3MG1 (fig. 8).

Measure between pins	Part under test	Approximate dc resistance (ohms)
P2K and P20	Motor control	55
P2K and frame	Motor control	Infinity
P2N and P2V	Motor excitation	55
P2N and frame	Motor excitation	Infinity
P2L and P2X	Generator excitation	50
P2L and frame	Generator excitation	Infinity
P2M and P2X	Generator output	4,200
P2M and frame	Generator output	Infinity

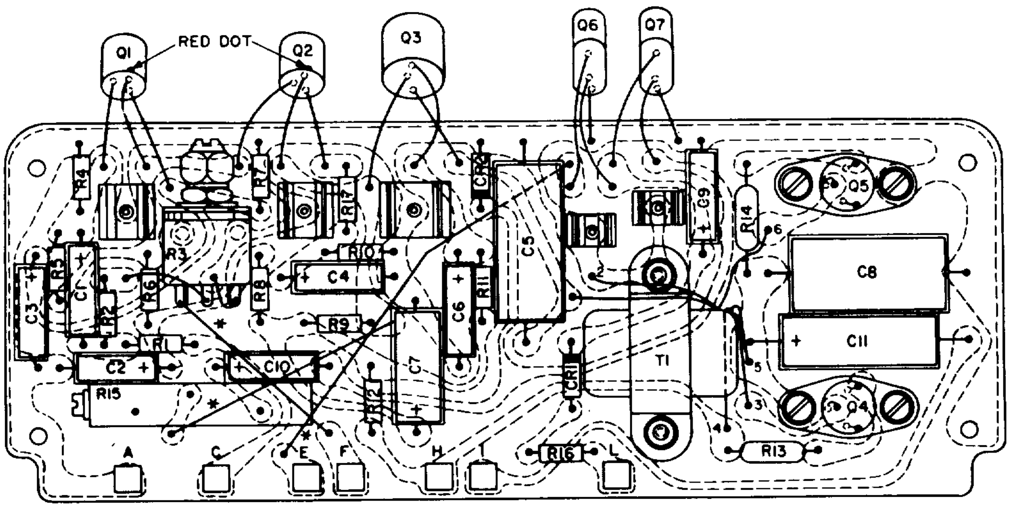


NOTES:

1. AREAS ENCLOSED BY DASHED LINES INDICATE COPPER CONDUCTORS ON OPPOSITE SIDE OF BOARD.
2. WIRES MARKED WITH AN ASTERISK (*) ARE NO. 24 BARE, SOLID, TINNED COPPER.
3. UNMARKED WIRES ARE NO. 24 STRANDED, SILVER-PLATED COPPER, TEFLON INSULATED.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION PREFIX THE PART DESIGNATION WITH ASSEMBLY DESIGNATION A1 FOR EXAMPLE: A1R5, A1T1, ETC.

TM5826-223-35-6

Figure 6. Modulator module A1, parts location and printed circuit wiring diagram.



NOTES:

1. AREAS ENCLOSED BY DASHED LINES INDICATE COPPER CONDUCTORS ON OPPOSITE SIDE OF BOARD.
2. WIRES MARKED WITH AN ASTERISK (*) ARE NO. 24 BARE, SOLID, TINNED COPPER.
3. UNMARKED WIRES ARE NO. 24 STRANDED, SILVER-PLATED COPPER, TEFLON INSULATED.
4. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION, PREFIX THE PART DESIGNATION WITH ASSEMBLY DESIGNATION A2 FOR EXAMPLE A2R1, A2C7, ETC.

TM5826-223-35-7

Figure 7. Servoamplifier module A2, parts location and printed circuit wiring diagram.

b. 400-Cps Differential Synchro A3B1 (fig. 8).

Measure between pins	Part under test	Approximate dc resistance (ohms)	
		Part No. RS941-1A	Part No. TDC-11-E-3
P1F and P1H	Stator 2 and stator 1	11	9
P1F and frame	Stator 2 and statorl	Infinity	Infinity
P1G and P1H	Stator 2 and stator 3	11	9
P1G and frame	Stator 2 and stator 3	Infinity	Infinity
P1J and P1H	Rotor 2 and rotor 3	17	11
P1J and frame	Rotor 2 and rotor 3	Infinity	Infinity
P1I and P1H	Rotor 2 and rotor 1	17	11
P1I and frame	Rotor 2 and rotor 1	Infinity	Infinit

c. 30-Cps Resolver Synchro A3B2 (fig. 8).

Measure between pins	Part under test	Approximate dc resistance (ohms)
P1A and P1C	Stator 1 and stator 2	2,150
P1E and frame	Stator 1 and stator 2	Infinity
P1D and P1B	Rotor	2,700[a]
P1D and frame	Rotor	Infinity

[a]This reading includes resistors R1 (1,500 ohms), R2 (330 ohms), and RT1 (470 ohms) in series with the rotor winding.

d. 400-Cps Resolver Synchro A3B3 (fig. 8).

Measure between pins	Part under test	Approximate dc resistance (ohms)	
		Part No. RS941-1A	Part No. TDC-11-E-3
P2P and P2R	Stator 1 and stator 2	340	280
P2S and frame	Stator 1 and stator 2	Infinity	Infinity
P2U and P2W	Rotor 1 and rotor 2	380	480
P2T and frame	Rotor 2 and rotor 2	Infinity	Infinity

24. Additional Troubleshooting Information

The chart below contains the normal dc resistances of transformers, relays, and the reactor in the rmi converter.

Part	Terminals	Approximate dc resistance (ohms)
Transformer A1T1 (fig. 6)	1 and 2	21
	3 and 4	270
	5 and 6	50
	6 and 7	50
	8 and 9	50
	10 and 11	26
	11 and 12	26
Transformer A2T1 (fig. 7)	1 and 2	120
	3 and 4	20
	5 and 6	20
Relay A1K1 (fig. 6)	M and ground	500
Relay A4K1 (fig. 14)	A and E	1,628
Relay A4K2 (fig. 14)	A and E	552
Reactor A1L1 (fig. 6)	Remove one end from circuit	140

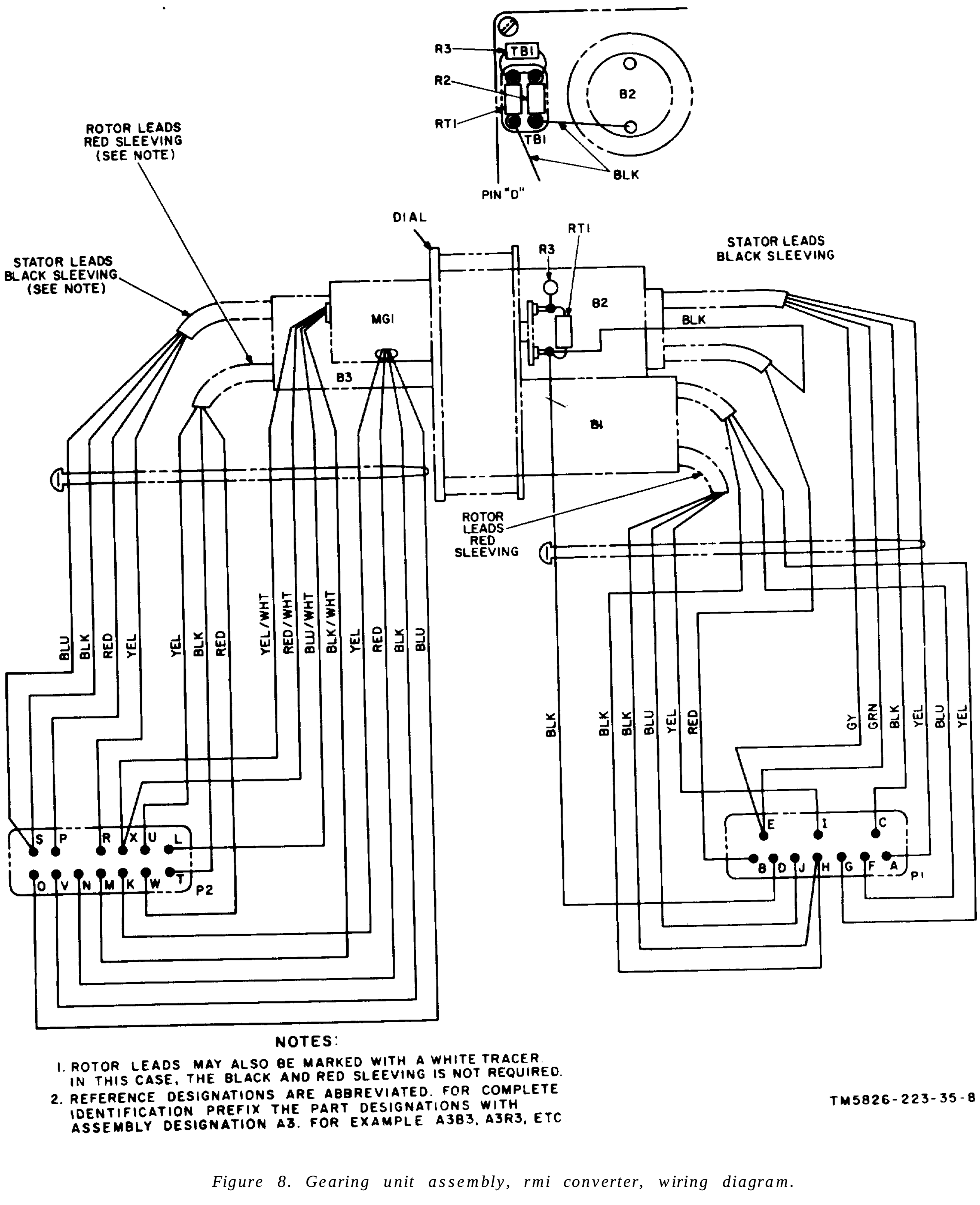


Figure 8. Gearing unit assembly, rmi converter, wiring diagram.

CHAPTER 3

REPAIRS AND ALIGNMENT

Section I. REPAIRS

25. General Parts Replacement Techniques

Paragraphs 26 through 29 contain removal and replacement procedures for the three modules and disassembly and reassembly procedures for gearing unit assembly A3. Most of the parts in the rmi converter can be reached easily and replaced without special procedures. The following precautions apply specifically to this unit.

a. Before removing a part of gearing unit assembly A3, note the position of the part. Install the replacement part in as close to the same position as possible to avoid excessive adjustment.

b. Use a pencil-type soldering iron with a 25-watt maximum capacity. If only ac-operated irons are available, use an isolation transformer. Do not use a soldering gun; damaging voltages can be induced in the transistorized circuits.

c. When soldering transistor leads, use a heat sink between the solder joint and the transistor and retain the heat sink until the soldered joint has cooled. Use approximately the same length and dress of transistor leads as used originally.

26. Replacement of Modules A1 and A2

a. Removal.

(1) Loosen the four turnlock fasteners (fig. 1) on the front of the converter and slide the cover off the chassis.

(2) Remove the two screws (one at each end of the module) that secure the module to the chassis.

Note: To remove modulator module A1, remove the screw which secures gearing unit assembly A3 to modulator module A1 in addition to the screws specified in (2) above,

(3) Insert a screwdriver blade through the slot at each end of the chassis and apply an upward force to free the module.

b. Replacement.

(1) Position the module in the chassis and gently push it into place engaging the pins on the terminal board.

(2) Reinstall the two screws, one on each end of the module. When replacing modulator module A1, install the third screw between modulator module Al and gearing unit assembly A3.

(3) Slide the cover over the chassis and tighten the four interlock fasteners.

27. Replacement of Gearing Unit Assembly A3 (fig. 9)

a. Removal.

(1) Loosen the four turnlock fasteners on the front of the converter and slide the cover off the chassis.

(2) Disconnect plugs A3P1 and A3P2 from their mating chassis receptacles.

(3) Remove the two screws that secure gearing unit assembly A3 to the chassis printed circuit board. Remove the screw that secures gearing unit assembly A3 to modulator module A1. Remove the two screws that secure gearing unit assembly A3 to the front panel of the rmi converter.

(4) Carefully lift gearing unit assembly A3 out of the chassis.

b. Reassembly.

(1) Carefully position gearing Unit assembly A3 in the chassis.

(2) Reinstall the five screws that secure gearing unit assembly A3 to the chassis, the front panel, and modulator module A1.

(3) Connect plugs A3P1 and A3P2 to their mating chassis receptacles.

(4) Slide the cover over the chassis and tighten the four turnlock fasteners.

28. Disassembly of Gearing Unit Assembly A3 (fig. 9)

To disassemble gearing unit assembly A3, proceed as follows:

a. Removal of Motor-Generator A3MG1

(1) Remove the three screws (3), the lockwashers (4), the clamps (5), and the spacers (6) that hold motor-generator A3MG1 (2) in position and carefully remove motor-generator A3MG1.

(2) Cut the plastic cable clamps (52) that hold the wires of connector A3P2 (1) together and unsolder the motor-generator wires from terminals K, L, M, N, O, V, and X of connector A3P2.

b. Removal of Differential Transmitter Synchro A3B1.

(1) Remove the two screws (14 and 48) that secure the terminals (13 and 47) and the index wire (12).

(2) Remove the three screws (21) that secure the dial (20) to the 128-tooth gear (24).

(3) Loosen the four screws (16 or 50) approximately 1/8-inch and, being careful not to go beyond the ends of the 26-tooth gear (17) the 48-tooth gear (18) and the 58-tooth gear (19), separate plates (15 and 51) until the dial (20) slides past the shaft of differential transmitter synchro A3B1 (42).

(4) Loosen the screw (23) in the clamp (22) and slide the clamp off the shaft of differential transmitter synchro A3B1 (42). Remove the 128-tooth gear (24) from the shaft of differential transmitter synchro A3B1.

(5) Remove the three screws (43), the lockwashers (44), the clamps (45), and the spacers (46) that secure differential transmitter synchro A3B1 (42) and remove differential transmitter synchro A3B1.

(6) Cut the plastic cable clamps (52) that hold the wires of connector A3P1 (30) together and unsolder the wires of differential transmitter synchro A3B1 from terminals F, G, H, I, and J of connector A3P1.

c. Removal of Resolver A3B2.

(1) Loosen the four setscrews (26) in the flexible coupling (25).

(2) Loosen the screw (28) in the clamp (27).

(3) Remove the three screws (38), the lockwashers (39), the clamps (40), and the spacers (41) that hold resolver A3B2 (37); remove the resolver and, at the same time, lift the 128-tooth gear (29) and the clamp (27) from between the two plates (15 and 51).

(4) Cut the plastic cable clamps (52) that hold the wires of connector A3P1 (30) together and unsolder the resolver wires from terminals A, B, C, D, and E of connector A3P1. Unsolder the two black wires connected to the terminals of panel assembly A3TB1 (34).

d. Removal of Resolver A3B3.

(1) Loosen the four setscrews (26) in the flexible coupling (25).

(2) Remove the three screws (8), the lockwashers (9), the clamps (10), and the spacers (11) that hold resolver A3B3 (7), and then remove the resolver.

(3) Cut the plastic cable clamps (52) that hold the wires of connector A3P2 (1) together and unsolder the resolver wires from terminals P, R, S, T, U, and W of connector A3P2.

e. Removal of Panel Assembly A3TB1.

(1) Unsolder the two black wires from the terminals of panel assembly A3TB1 (34).

(2) Remove the screw (35) and then remove panel assembly A3TB1 (34) and the lockwasher (36) from the plate (51).

Note: Defective parts, resistors R1 (32) and R2 (31) and sensistor RT1 (33), may be removed from pane 1 assembly A3TB1 (34) without removing the panel assembly. These parts can be unsoldered and removed when the panel assembly is mounted on the plate (51).

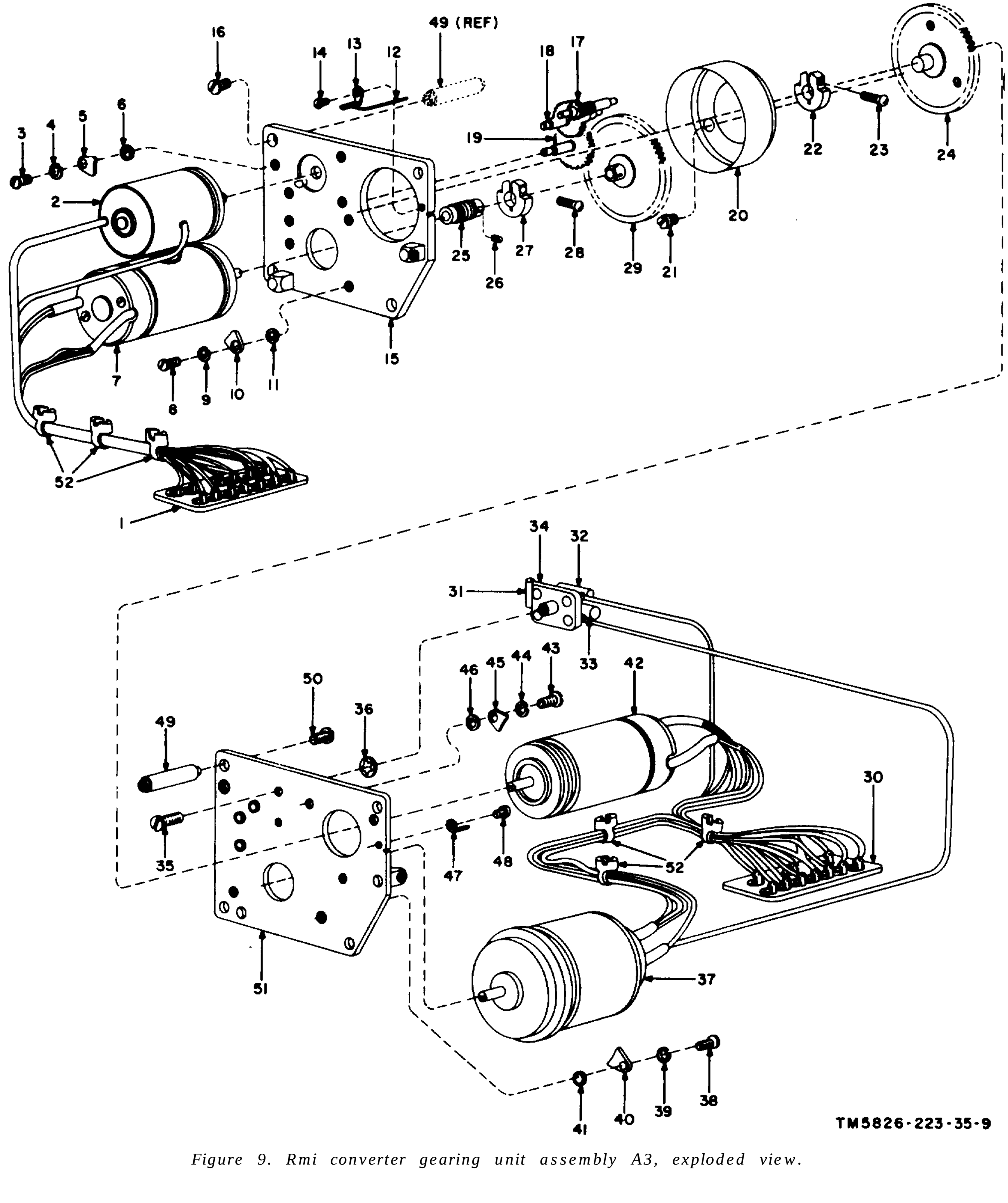


Figure 9. Rmi converter gearing unit assembly A3, exploded view.

1-Connector A3P2
2-Motor-generator A3MG1
3-Screw
4-Lockwaaher
5-Clamp
6 -Spacer
7-Resolver A3B3
8-Screw
9-Lockwasher
10-Clamp
11 -Spacer
12-Index wire
13-Terminal
14-Screw
15-Plate
16-Screw
17-26-tooth gear
18-48-tooth gear
19-58-tooth gear
20-Dial
21 -Screw
22-Clamp
23 Screw
24-128-tooth gear
25-Flexible coupling
26-Setscrew
27-Clamp
28-Screw
29-128-tooth gear
30-Connector A3P1
31-Resistor R2
32-Resistor R1
33-Sensistor RT1
34-Panel assembly A3TB1
35-Screw
36-Lockwasher
37-Resolver A3B2
38-Screw
39-Lockwasher
40-Clamp
41-Spacer
42-Differential transmitter synchro A3B1
43-Screw
44-Lockwasher
45-Clamp
46-Spacer
47-Terminal
48-Screw
49-Bushing
50-Screw
51-Plate
52-Plastic cable clamp

Figure 9 - Continued.

29. Reassembly of Gearing Unit Assembly A3 (fig. 9)

To reassemble gearing unit assembly A3, proceed as follows:

a. Installation of Panel Assembly A3TB1.

(1) Position panel assembly A3TB1 (34) on the plate (51) with the lockwas he r (36) between the panel standoff and the plate (51). Secure panel assembly A3TB1 with the screw (35).

(2) Solder the black wire from resolver A3B2 (37) to the terminal at which sensistor RT1 (33) is connected; solder the black wire from terminal D of connector A3P1 (30) to terminal at which resistor R1 (32) is connected, thereby forming a series circuit through the resistors from pin D to resolver A3B2.

b. Installation of Resolver A3B3.

(1) Solder the wires of resolver A3B3 (7) to terminals P, R, S, T, U, and W of connector A3P2 (1); refer to the wiring diagram (fig. 8) for the wiring connections.

(2) Tie the wires of resolver A3B3 (7, fig. 9) in place. To replace the plastic cable clamps (52), use lacing tape or cord.

(3) Position resolver A3B3 (7) on the plate (15) with its shaft inserted in the flexible coupling (25). Install and secure the three screws (8), the lockwashers (9), the clamps (10), and the spacers (11).

(4) Tighten the four setscrews (26) in the flexible coupling (25).

(5) Zero-adjust resolver A3B3 (para 32b).

c. Installation of Resolver A3B2.

(1) Solder the wires of resolver A3B2 (37) to terminals A, B, C, D, and E of connector A3P1 (30); refer to the wiring diagram (fig. 8) for the wiring connections.

(2) Tie the wires of resolver A3B2 (37, fig. 9) in place. To replace the plastic cable clamps (52), use lacing tape or cord.

(3) Hold the 128-tooth gear (29) and the clamp (27) in place between the plates (15 and 51); insert resolver A3B2 (37) through its mounting hole in the plate (51) and the shaft through the 128-tooth gear (29) and the clamp (27) into the flexible coupling (25).

(4) Install and secure the three screws (38), the lookwashers (39), the clamps (40), and the spacers (41).

(5) Position the clamp (27) over the flange of the 128-tooth gear (29) and tighten the screw (28).

(6) Tighten the four setscrews (26) on the flexible coupling (25).

(7) Zero-adjust resolver A3B2 (para 32b).

d. Installation of Differential Transmitter Synchro A3B1.

(1) Solder the wires of differential transmitter synchro A3B1 (42) to terminals F, G, H, I, and J of connector A3P1 (30); refer to the wiring diagram (fig. 8) for the wiring connections.

(2) Tie the wires of differential transmitter synchro A3B1 (42, fig. 9) in place. To replace the plastic cable clamps (52) use lacing tape or cord.

(3) Position differential transmitter synchro A3B1 (42) on the plate (51); install and secure the three screws (43), the lockwashers (44), the clamps (45), and the spacers (46).

(4) Install the 128-tooth gear (24) on the shaft of differential transmitting synchro A3B1 (42) and the clamp (22) on the flange of the 128-tooth gear (24). Tighten the screw (23) in the clamp (22).

(5) Position the dial (20) on the 128-tooth gear (24); install and secure the three screws (21).

(6) Insure that the 26-tooth gear (17), the 48-tooth gear (18), and the 58-tooth gear (19) are positioned properly, and tighten the four screws (16) to secure the plates (15 and 51).

(7) Zero-adjust differential transmitting synchro A3B1 (para 31b).

e. Installation of Motor-Generator A3MG1.

(1) Solder the wires of motor-generator A3MG1 (2) to terminals K, L, M, N, O, V, and X of connector A3P2 (1); refer to the wiring diagram (fig. 8) for the wiring connect ions.

(2) Tie the wires of motor-generator A3MG1 (2, fig. 9) in place. To replace the plastic cable clamps (52), use lacing tape or cord.

(3) Position motor-generator A3MG1 (2) on the plate (15); install and secure the three screws (3), the lockwashers (4), the clamps (5), and the spacers (6).

Section II. ALIGNMENT

30. Test Equipment Required for Alignment

The equipment required for alignment of the rmi converter, the associated manuals, and the assigned common names are listed in paragraph 17. Refer to the appropriate manuals for instruction on the operating procedures for the test equipment, and connecting instructions for the test setup.

31. Test Equipment Setup for Alignment

a. Remove the dust cover from the rmi converter (para 26).

b. Connect the test setup as shown in figure 5 and described in paragraph 18.

c. Set the signal generator controls as follows:

(1) OMNI TRACK to 0°.

(2) MODULATION to OMNI.

(3) MC to B (114.9 mc).

(4) ATTENUATOR to 40 uv.

d. Apply power to the equipment and allow a 10-minute warmup.

e. Tune the receiver to 114.9 mc.

32. Alignment Procedures

a. Adjustment of Feedback Control (fig. 10).

(1) Alternately turn signal generator OMNI TRACK switch to 0° and 180°; change the switch position rapidly each time.

(2) Adjust feedback control A2R3 until the dial on the rmi converter and the pointer on the rmi move to

corresponding positions and overshoot once before coming to rest for each movement of the OMNI TRACK switch.

b. Adjustment of Resolver A3B4, Differential Transmitter Synchro A3B1, and Balance Control A1R8.

***Caution:* Be extremely careful when removing gearing unit assembly A3 and when making adjustments. Do not break wire leads to A3P1 and A3P2.**

(1) Carefully remove the gearing unit assembly (para 28); leave plugs A3P1 and A3P2 connected to the chassis printed-circuit board.

(2) Turn the signal generator OMNI TRACK switch to 0°. Loosen the clamps on resolver A3B2.

(3) Turn the body of resolver A3B2 until the rmi converter dial reads 0°. Tighten the clamps.

(4) Unclamp and rotate the body of differential transmitter synchro A3B1 until the pointer on the rmi indicates 0°. Tighten the clamps.

(5) Connect a jumper between terminals T and W of plug A3P2. Adjust balance control A1R8 to center the vertical pointer of the course indicator. Remove the jumper.

(6) Unclamp and rotate the body of resolver A3B3 until the vertical pointer is centered and the TO FROM meter reads TO. Reinstall the gearing unit assembly (para 29).

c. Adjustment of Rmi Converter Sensitivity Control.

(1) Set the course selector dial on the course indicator to 10°.

(2) Adjust rmi converter sensitivity control A1R11 until the vertical pointer of the course indicator is within 1/2 dot of the last right-hand dot (150 microampere (us) meter current).

d. Adjustment of Flag Sensitivity Control.

(1) Set the course selector dial on the course indicator to 0°.

(2) Rotate the motor pinion gear (fig. 10) slowly until the vertical pointer is midway between the last two dots on either the right- or left-hand side of the course indicator.

(3) Adjust sensitivity control A2R15 to obtain the following results.

(a) The warning flag does not appear the vertical pointer is over the third dot (90 ua meter current).

(b) The warning flag is showing when the vertical pointer is over the last dot.

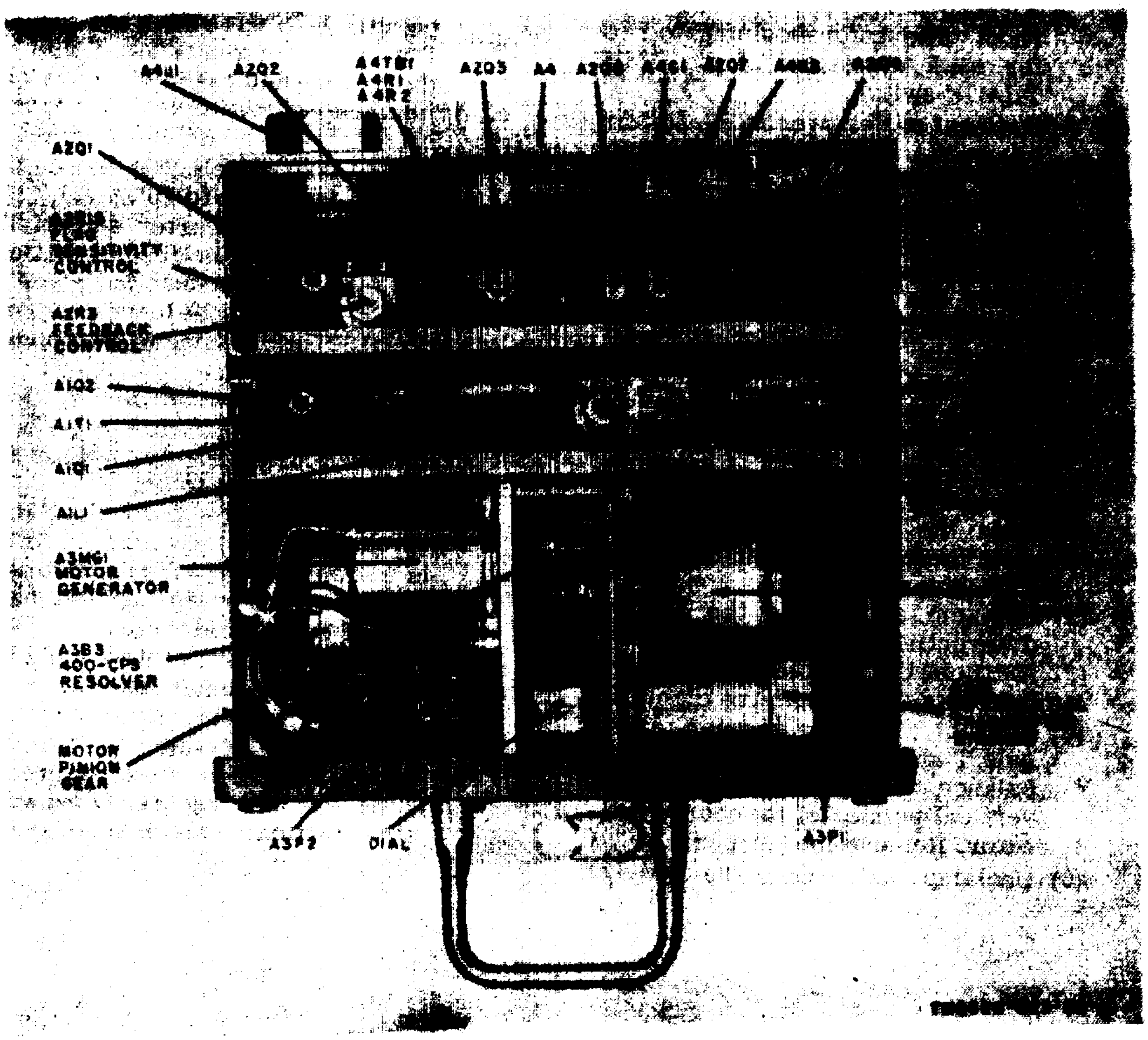


Figure 10. Rmi converter, cover removed, parts location.

CHAPTER 4
DEPOT INSPECTION STANDARDS

33. Applicability of Depot Inspection Standards

The tests outlined in this chapter are designed to measure the performance capability of a repaired equipment. Equipment that is returned to stock should meet the standards given in these teats.

34. Applicable References

a. Repair Standards. Applicable procedures of the depots performing these tests and the general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3, form a part of the requirements for testing this equipment.

b. Technical Publications. The following publication is applicable to this equipment: TM 11–5826-223-15P, Organizational, DS, GS, and Depot Maintenance Repair Parts and Special Tool Lists; Converter, Radio-Magnetic Indicator CV-1275/ARN.

c. Modification Work Orders. Perform all modification work orders applicable to this equipment before making the test specified. DA Pam 310-4 list all available MWO's.

35. Test Facilities Required

The items listed in the chart below are required for depot testing. Receiver, Radio R-1021/ARN-30E and Converter, Signal Data CV-265A/ARN-30A must meet established new equipment specifications.

Item	Technical manual	Common name
Receiver, Radio R–1021/ARN–30E.	TM 11–5826–215–12.	Receiver.
Converter, Signal Data CV–265A/ARN–30A.	TM 11–5826–215–12.	Converter.
Test Set, Radio AN/ARM–63.	--------------	Test set.
Power Supply PP–1104A/G.	TM 11–5126	Dc power supply.
Test Set, Radio AN/ARM–5.	TM 11–518	Signal generator.
Power Supply, 115-volt, 400 cps.	--------------	Ac power supply.

36. Connections

Connect the equipment as shown in figure 10.1 and as instructed in *a, b,* and *c* below.

a. Use Wiring Harness ARC 29418 (yellow, part of Test Set, Radio AN/ARM-63) to connect the test set, receiver, converter, and CV-1275/ARN as shown in the chart below.

Harness connector	Item	Item connector
P1	Test set	J103
P2	Receiver	J2
P3	Receiver	J4
P4	Converter	J204
P5	Converter	J205
P8	Rmi converter	
P9	Test set	J101

b. Use a 6 foot coaxial cable (RG-58/U with a BNC connector on each end) to connect the signal generator ATTEN jack to receiver ANT connector (J1).

c. Use Power Cable Assembly ANC 30070 (red and black, part of Test Set, Radio AN/ARM-63), to connect the test set to the dc power supply.

Caution: Observe the polarity when connetting the power cable to the dc power supply.

37. General Test Requirements

Most of the tests will be performed under the conditions given below and as illustrated in figure 10.1. Testing will be simplified if connections and panel control settings are made initially, and modifications are made as required for the individual tests.

a. Disconnect connector P8 of Wiring Harness ARC 29418 (yellow) from the rmi converter.

b. Loosen the turnlock fastener on the rear of the rmi converter and remove the dust cover.

c. Reconnect connector P8 of Wiring Harness ARC 29418 (yellow) to the rmi converter.

d. Set signal generator controls as follows:

(1) OMNI TRACK to 0°.

(2) MODULATION TO OMNI.

(3) MC to B(114.9mc).
(4) ATTEN to 50 uv.

e. Apply power to the equipment and allow 10-minutes for all equipment to warmup.

38. Operation of Course Indicator Warning Flag

a. Set the test set control selector switch to INT position and use the test set megacycle selector control to tune the receiver to 114.9 mc. The teat set Indicator, Course ID-453/ARN-30 warning flag must disappear from sight.

b. Set the course selector dial to 0° on the test set Indicator, Course ID-453/ARN–30. The dial on the rmi converter and the pointer of the test set Indicator, Course ID-250/ARN both should indicate 0° within ±3.

c. Use finger pressure to slowly rotate the rmi converter motor pinion gear mounted on motor-generator A3MG1 (fig. 10). Observe the vertical pointer of the test set Indicator, Course ID-453/ARN-30 until the indicator warning flag appears. The warning flag must not appear before the vertical pointer is over the third dot (85 ua minimum meter current). Check the meter current by placing the test set VERT-HOR switch to HOR position and observe the test set DEVIATION meter. The warning flag must show when the vertical pointer is over the last dot. If necessary, adjust rmi converter flag sensitivity control A2R15 (fig. 10) to bring sensitivity of the test set Indicator, Course ID-453/ARN-30 within the required limits..

39. Operation of Course Indicator Vertical Pointer Check

a. Check to see that the receiver is tuned to 114.9 mc.

b. Set the course selector dial to 0° on the test set Indicator, Course ID453/ARN–30. The vertical pointer of the course indicator should center within ±3°.

c. Set the cause selector dial to 10° on the test set Indicator, Course ID453/ARN-30. The vertical pointer of the course indicator must be within one-half dot of the last left-hand dot (150 μa ±15 meter current). Check the meter current by placing the test set VERT-HOR switch in the VERT position and observe the test set DEVIATION meter. If necessary, adjust rmi converter sensitivity control A1R11 (fig. 10) until the vertical pointer of the test set Indicator, Course ID-453/ARN–30 is within the required limits.

40. Operation of Course Indicator TO-FROM Meter Test

a. Check to see that the receiver is tuned to 114.9 mc.

b. Set the course selector dial to 0° on the test set Indicator, Course ID-453/ARN-30.

c. The TO-FROM meter must indicate TO on the test set Indicator, Course ID-453/ARN-30.

41. Stability of Rmi Converter Test

a. Check to see that the receiver is tuned to 114.9 mc.

b. Quickly switch the OMNI TRACK control on the signal generator from 0° to 180°.

c. The dial on the rmi converter and the pointer of the test set Indicator, Course ID-250/ARN must overshoot their respective 1800 indications once, then come to rest at the 180° indication.

d. Alternately switch the OMNI TRACK control on the signal generator to 0° and 180°, switching rapidly each time. The results should be the same as those obtained in *c* above. If necessary, adjust rmi converter feedback control A2R3 (fig. 10) until the dial on the rmi converter and the pointer of the test set Indicator, Course ID-250/ARN move to corresponding positions and overshoot once before coming to rest for each movement of the OMNI TRACK control.

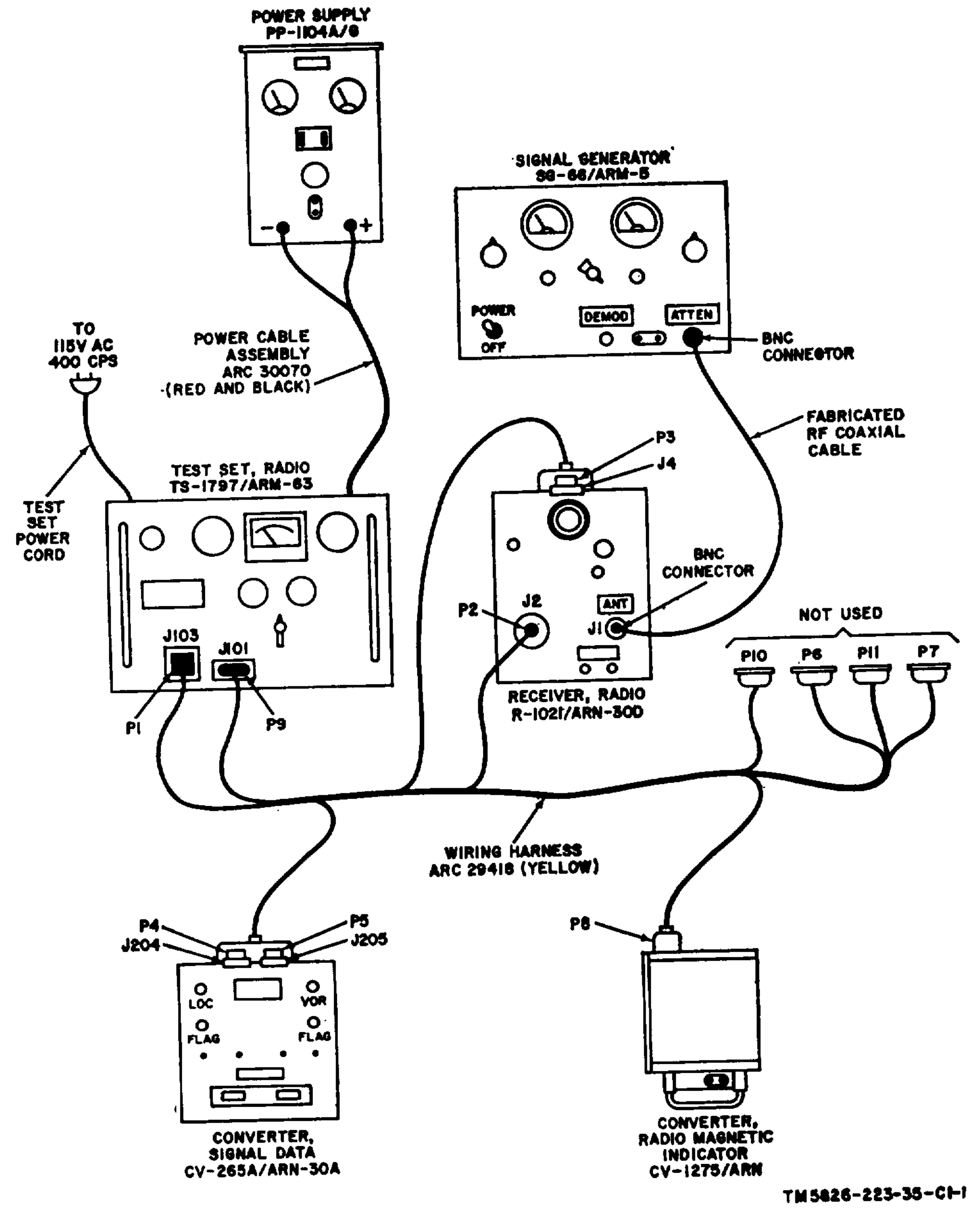


Figure 10.1. Equipment connection

APPENDIX

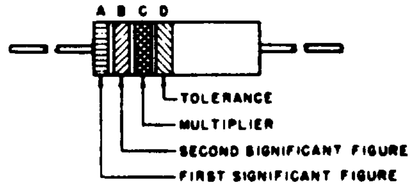
REFERENCES

Following is a list of references applicable and available to the direct and general support and depot maintenance repairmen of Converter, Radio-Magnetic Indicator CV-1275/ARN.

DA Pamphlet 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 4, 6, 7, 8, and 9), Supply Bulletins, Lubrication Orders, and Modification Work Orders.
TB SIG 364	Field Instructions for Painting and Preserving Electronic Command Equipment.
TM 11-518	Operator's Manual: Radio Test Set AN/ARM-5 and Converter, Frequency, Electronic AN/ARM-69(V) (ARC Type H-23A Glide Slope Test Unit).
TM 11-5126	Power Supplies PP-1104A/G and PP-1104B/G.
TM 11-5826-210-12	Operator's and Organizational Maintenance Manual: Maintennance Kit, Electronic Equipment MK-252/ARN and Test Set Adapter.
TM 11-5826-211-50	Depot Maintenance Manual: Radio Magnetic Indicator ID-250A/ARN; Control, Receiver C-1342/ARN.
TM 11-5826-215-12	Operator and Organizational Maintenance Manual: Receiving Sets, Radio AN/ARN-30D and AN/ARN-30E.
TM 11-6625-200-12	Operator and Organizational Maintenance Manual: Multimeters ME-26A/U and ME-26B/U.
TM 38-750	Army Equipment Record Procedures.

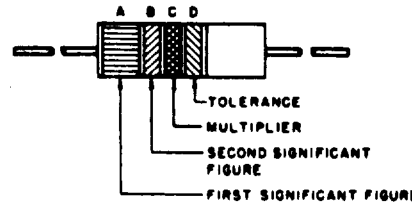
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS



BAND A— Double Width Signifies Wire-wound Resistor

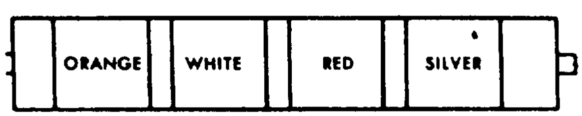
COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING

BAND

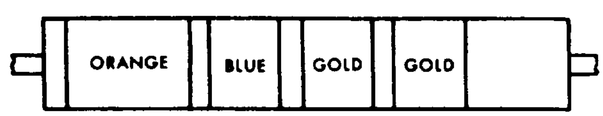
A B C D*



3 9 X100 ± 10%

BAND

A B C D*



3 6 X0.1 ± 5%

NOMINAL RESISTANCE	3,900 Ohms	3.6 Ohms
RESISTANCE TOLERANCE	± 10 percent	± 5 percent

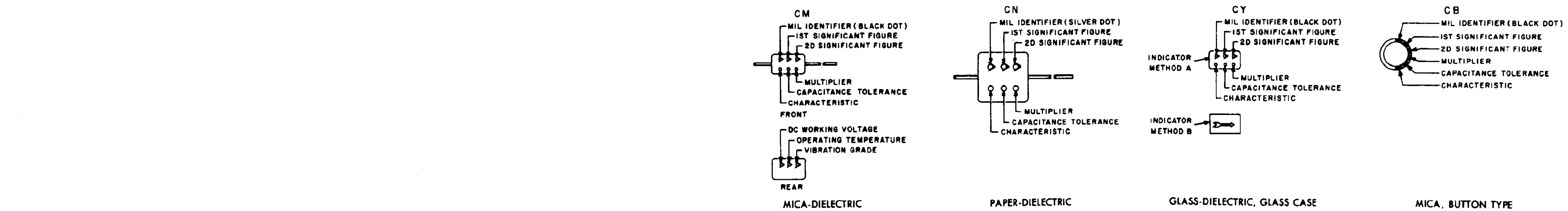
STD-R2

*If Band D is omitted, the resistor tolerance is ±20%, and the resistor is not Mil-Std.

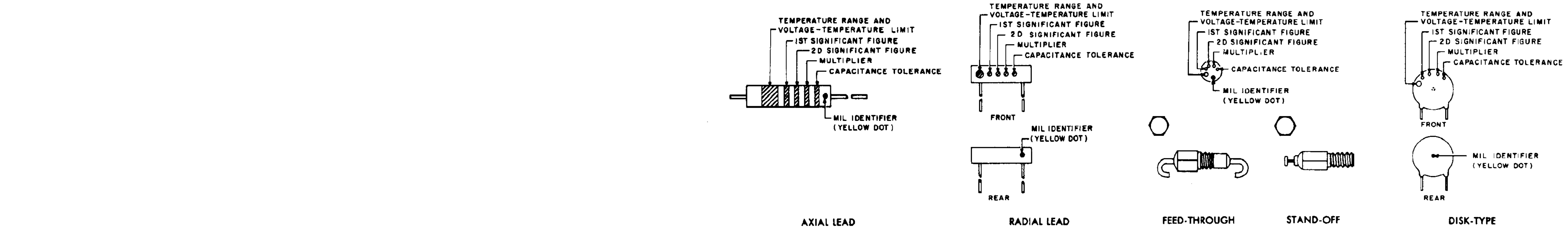
Figure 11. Color code marking for MIL-STD resistors.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

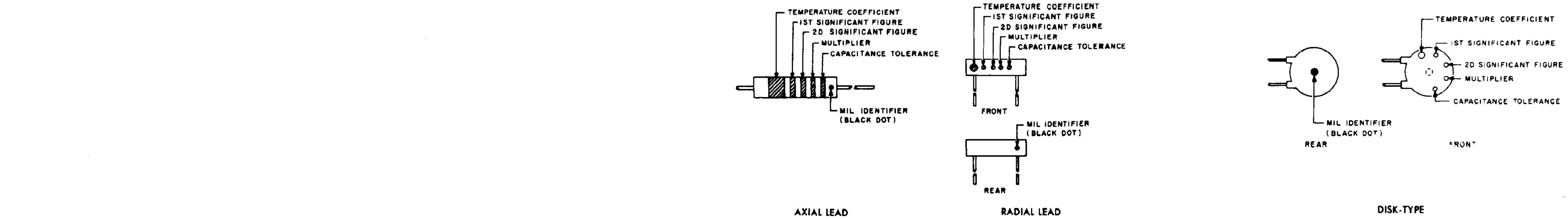
GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Stylė CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC



COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10					B	E		B			
RED		2	2	100	± 2%		± 2%	± 2%	C		C			−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD–C2

Figure 12. Color code marking for MIL-STD capacitors.

Army-Ft Monmouth,NJ-MON 524-61

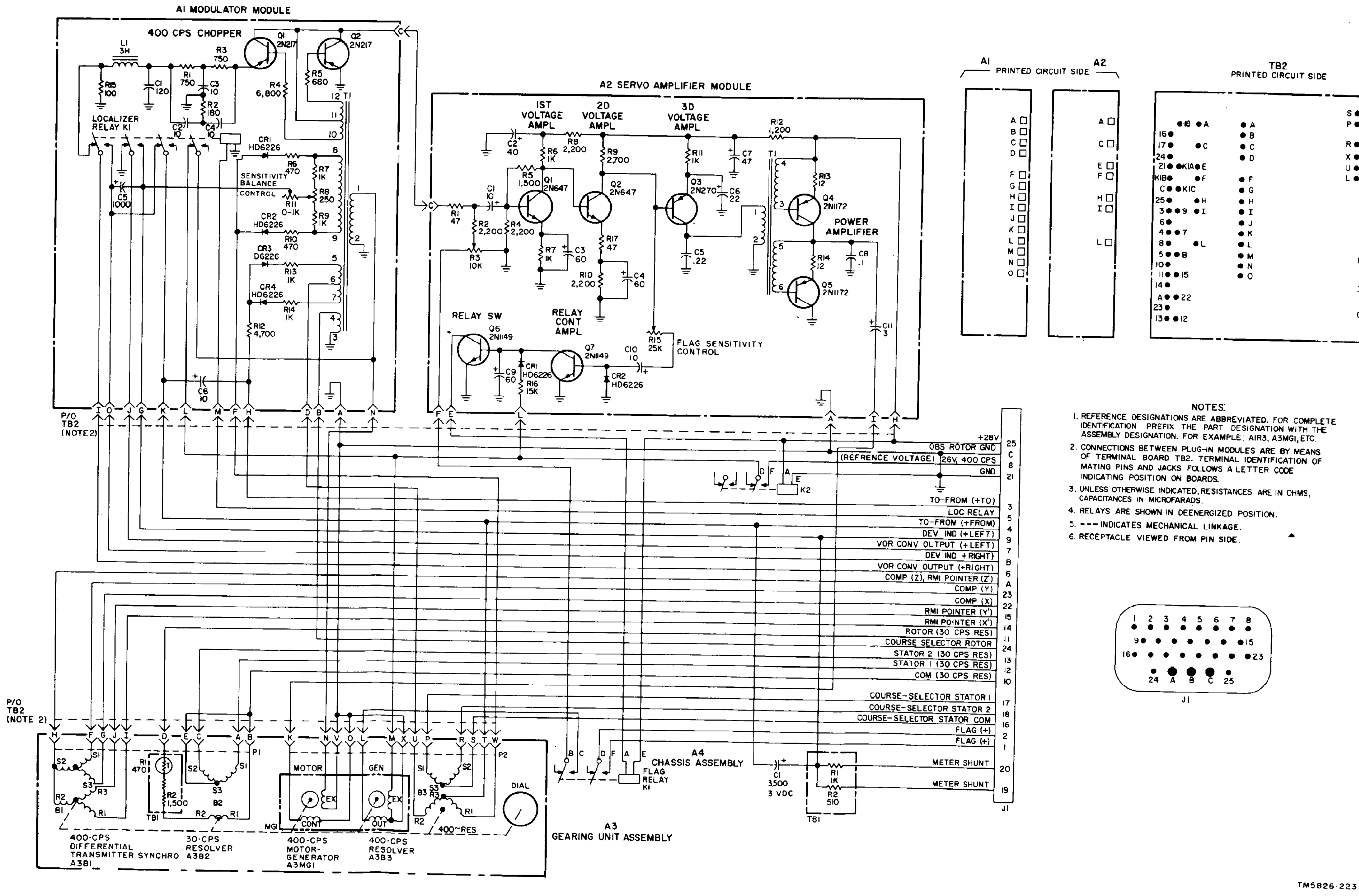
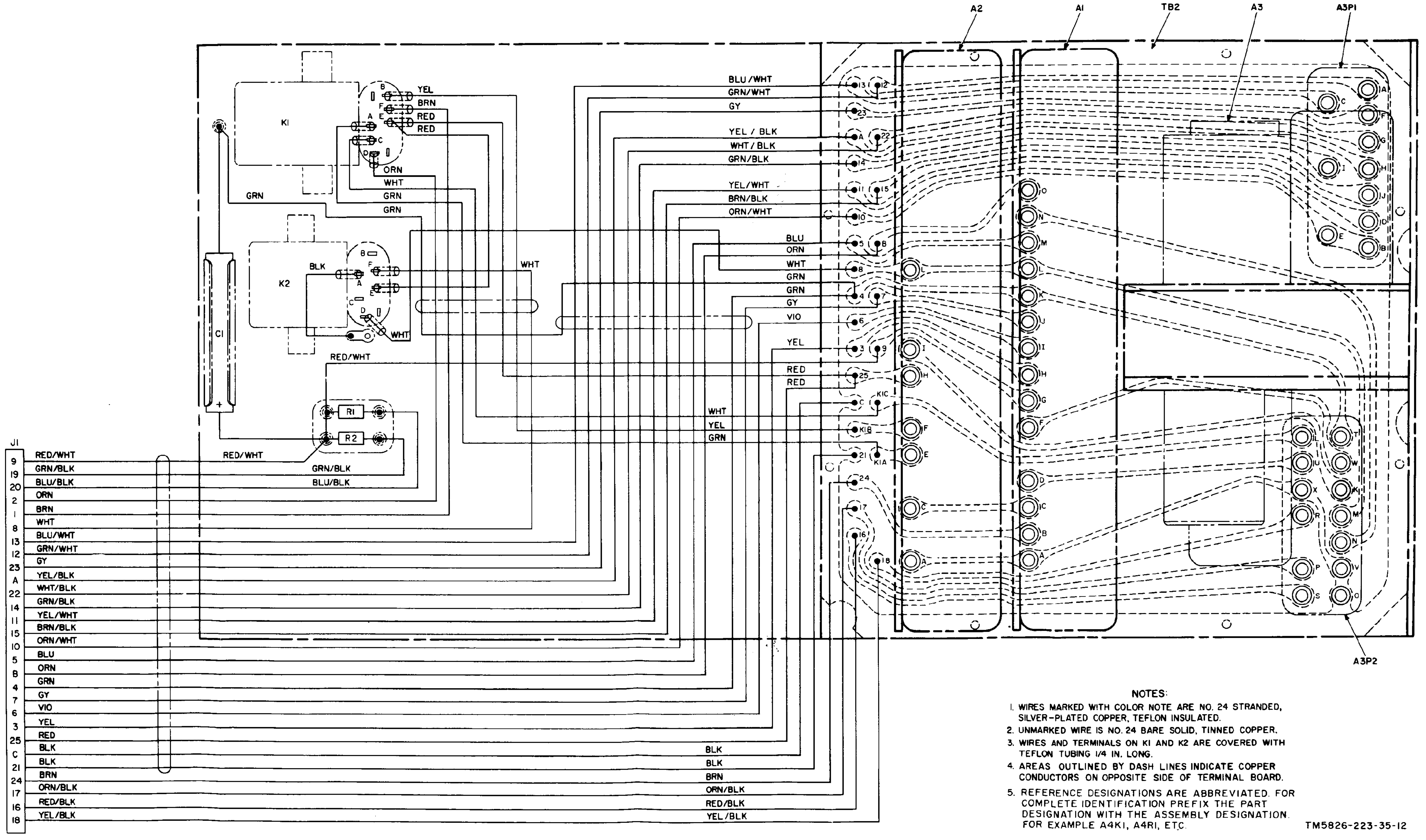


Figure 13. Rmi converter, schematic diagram.



NOTES:

1. WIRES MARKED WITH COLOR NOTE ARE NO. 24 STRANDED, SILVER-PLATED COPPER, TEFLON INSULATED.
2. UNMARKED WIRE IS NO. 24 BARE SOLID, TINNED COPPER.
3. WIRES AND TERMINALS ON K1 AND K2 ARE COVERED WITH TEFLON TUBING 1/4 IN. LONG.
4. AREAS OUTLINED BY DASH LINES INDICATE COPPER CONDUCTORS ON OPPOSITE SIDE OF TERMINAL BOARD.
5. REFERENCE DESIGNATIONS ARE ABBREVIATED. FOR COMPLETE IDENTIFICATION PREFIX THE PART DESIGNATION WITH THE ASSEMBLY DESIGNATION. FOR EXAMPLE A4K1, A4R1, ETC.

TM5826-223-35-12

Figure 14. Rmi converter, wiring diagram.

By Order of Secretary of the Army:

HAROLD K. JOHNSON,
Lieutenant General, United States Army,
Chief of Staff.

Official:
J. C. LAMBERT,
Major General, United States Army,
The Adjutant General.

Distribution:

To be distributed in accordance with DA Form 12-31 requirements for direct support maintenance instructions for CV-2, UH-1 and CH-47 aircraft.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1992 - 311-831/60948

PIN : 028224-000