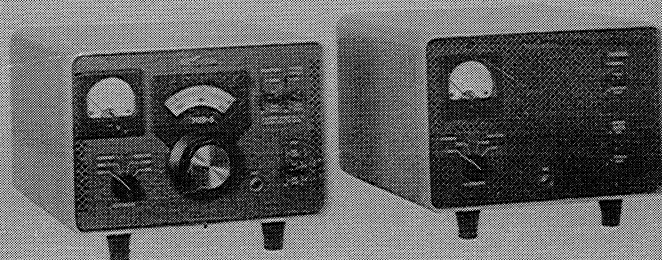


instruction book

Cedar Rapids Division | Collins Radio Company, Cedar Rapids, Iowa

312B-4 and 312B-5 Station Controls



Collins Amateur Equipment Guarantee

The Collins Amateur Equipment described herein is sold under the following guarantee:

Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to workmanship or materials and which are returned to Collins at its factory or its designated Service Agency, transportation prepaid, provided:

- (a) Buyer presents properly executed Warranty Verification Certificate.
- (b) Notice of the claimed defect is given Collins or an authorized Service Agency, or an authorized Distributor, in writing, within 180 days from the date of purchase and goods are returned in accordance with Collins instructions.
- (c) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins designs are subject to only such adjustments as Collins may obtain from the supplier thereof.
- (d) Any failure due to use of equipment for purposes other than those contemplated in normal amateur operations or in violation of Collins applicable Instruction Book shall not be deemed a defect within the meaning of these provisions.

This Warranty is void with respect to equipment which is altered, modified or repaired by other than Collins or Collins Authorized Service Agencies. However, alteration or modification in accordance with Collins Service Bulletins shall not affect this Warranty.

Collins reserves the right to make any change in design or to make additions to, or improvements in, Collins products without imposing any obligations upon Collins to install them in previously manufactured Collins products.

No other warranties, expressed or implied, shall be applicable to said equipment, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements contained in these paragraphs. In no event shall Collins have any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of the products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

NOTICE: With each equipment or set of equipments purchased, the distributor should furnish a Warranty Verification Certificate. It is necessary that this certificate accompany the equipment when it is returned for warranty repairs. Be sure that you get it from your distributor.

Warranty Repairs

On the opposite page are listed the Service Agencies authorized to perform warranty repair on Collins Amateur Equipments.

If you should wish to return material or equipment direct to Collins under the guarantee, you should notify Collins, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Amateur Product Office
Cedar Rapids, Iowa

INFORMATION NEEDED:

- (A) Type number, name and serial number of equipment
- (B) Date of delivery of equipment
- (C) Date placed in service
- (D) Number of hours of service
- (E) Nature of trouble
- (F) Cause of trouble if known
- (G) Name of distributor from whom the equipment was purchased.

Equipment returned to the Service Agency or Collins for warranty repair must be accompanied with the Warranty Verification Certificate.

Out-of-warranty Repair, Modifications, Addition of Accessories, Alignment, etc.:

For information on service of this type write to the address shown below. If you wish to return your equipment for repairs, etc., without prior correspondence, be sure to include the following information attached to the equipment inside the packing carton:

- (1) Complete instructions detailing work to be performed.
- (2) Your return address.
- (3) Method of shipment by which the equipment should be returned.
- (4) Special instructions.

DIRECT YOUR CORRESPONDENCE TO:

Collins Radio Company
Service Repair Department
Third Street Building
Cedar Rapids, Iowa

HOW TO ORDER REPLACEMENT PARTS:

When ordering replacement parts, you should direct your order to one of the listed Collins distributors.

Please furnish the following information insofar as applicable:

INFORMATION NEEDED:

- (A) Quantity required
- (B) Collins part number (9 or 10 digit number) and description
- (C) Item or symbol number obtained from parts list or schematic
- (D) Collins type number, name and serial number of principal equipment
- (E) Unit subassembly number (where applicable)

NOTE: See Distributor List.

Collins Authorized Amateur Distributors and Service Agencies

ALABAMA

Ack Radio Supply Company
3101 4th Avenue South
Birmingham 5
Phone: FAirfax 2-0588
Attn: E. C. Atkerson

***Beddow Engineering Services**
2424 Tenth Avenue South
Birmingham
Phone: ALpine 1-7582
Attn: Dr. C. P. Beddow
SEE ALSO: Atlanta, Georgia (Ack)

ALASKA

Yukon Radio Supply, Inc.
(P. O. Box 406)
645 I Street
Anchorage
Attn: A. E. Peterson

ARIZONA

Elliott Electronics, Inc.
418 N. 4th Avenue
Tucson
Phone: MAin 4-2473
Attn: Jerry Flewelling

****Southwest Electronic Devices**
(P. O. Box 3647)
140 S. 2nd Street
Phoenix
Phone: ALpine 2-1743
Attn: Herman A. Middleton

ARKANSAS

Lavender Supply Company
(P. O. Box 1168)
518-520 E. 4th Street
Texarkana
Phone: 2-4195
Attn: Joe M. Lavender

Ed Moory's Radio & Appliance
12th & Jefferson
DeWitt
Phone: WHitney 6-2820
Attn: Ed Moory

CALIFORNIA

****Amrad Electronics**
999 Howard Avenue
Burlingame
Phone: DIamond 2-5757
Attn: J. Stevenson

Amrad Supply, Inc.
3425 Balboa Street
San Francisco
Phone: SKyline 1-4661
Attn: David K. Bradley

****Calamar Electronic Co.**
2163 A. Fulton Ave.
Sacramento
Phone: 487-0633
Attn: Alex M. Hertz

***Communication Receiver Service**
5016 Maplewood
Los Angeles 4
Phone: HOLlywood 2-2429
Attn: Charles C. Messman

Elmar Electronics
140 11th Street at Madison
Oakland 7
Phone: TE 4-3311
(TXW-OA73)
Attn: Elvin Feige/M. L. Chirone

****Henry Radio Company, Inc.**
(P. O. Box 64398)
11240 W. Olympic Blvd.
Los Angeles 64
Phone: GRANite 7-6701
Attn: Ted Henry

****Henry Radio, Inc.**
931 N. Euclid
Anaheim
Phone: PR 2-9200
Attn: Mary Silva

8/1/62

***Authorized Service Agency**
only

****Authorized Distributor**
and Service Agency

Mission Ham Supplies
5474 Mission Blvd.
Riverside
Phone: OV-30523
Attn: Wm. P. Hullquist

Quement Industrial Electronics
(P. O. Box 527)
161 San Fernando
San Jose
Phone: CYpress 4-0464
Attn: Frank Quement

Radio Products Sales, Inc.
1501 S. Hill Street
Los Angeles 15
Phone: RIchmond 8-1271
Attn: Ken Rausin

Scott Radio Supply, Inc.
266 Alamitos Avenue
Long Beach
Phone: HEmlock 6-1452/7-8629
Attn: Evelyn E. Scott

Western Radio & TV Supply Company
(P. O. Box 1728)
1415 India Street
San Diego 1
Phone: BElmont 9-0361
Attn: A. W. Prather/Art Stewart

COLORADO

Radio Products Sales Co.
1237-16th Street
Denver 2
Phone: CHerry 4-6591
Attn: Walter Nettles/Willard Wright

CONNECTICUT

Corky's Division
Hafry of Hartford
100 High Street
Hartford
Phone: JACkson 7-1881
Attn: Edward C. Gedney

Radio Shack Corp. of Connecticut
230 Crown Street
New Haven 10
Phone: SPruce 7-6871
Attn: E. G. Alberino
SEE ALSO: Boston, Massachusetts

DELAWARE

Willard S. Wilson, Inc.
403-405 Delaware Avenue
Wilmington 9
Phone: OLYmpia 5-4321
Attn: Willard S. Wilson

DISTRICT OF COLUMBIA

Electronic Wholesalers, Inc.
2345 Sherman Ave. NW
Washington 1
Phone: HUDson 3-5200
Attn: Ray Avey

FLORIDA

****Amateur Radio Center, Inc.**
2805-7 N. E. 2nd Avenue
Miami
Phone: FRANKlin 4-4101
Attn: Wiley Gilkison

****Electronic Wholesalers, Inc.**
9390 NW 27th Avenue
Miami 47
Phone: OXFord 6-1620
Attn: Philip Konter

Grice Electronics, Inc.
(P. O. Box 1911)
300 E. Wright St.
Pensacola
Phone: HEMlock 3-4616
Attn: F. R. Grice, Jr.

****Kinkade Radio Supply, Inc.**
1719 Grand Central Avenue
Tampa
Phone: 8-6043
Attn: E. T. Kinkade

GEORGIA

Ack Radio Supply Co.
331 Luckie Street NW
Atlanta 13
Phone: JA 4-8477
Attn: T. E. Atkerson

***Southeastern Eng. Service**
1356 Carolyn Dr. N. E.
Atlanta 6,
Attn: Harvey Minsk

Specialty Distributing Co., Inc.
763 Juniper St. N. E.
Atlanta 6
Phone: TRinity 3-2521
Attn: J. E. Eaton/Doyle Hurley

HAWAII

****Honolulu Electronics**
819 Keeaumoku Street
Honolulu 14
Phone: 995-466
Attn: Thomas Teruya

IDAHO

Robbie's Radio & TV, Inc.
(P. O. Box 5021)
3715 State Street
Boise
Phone: 28892
Attn: W. A. Robinson, Jr.

ILLINOIS

Allied Radio Corp.
100 N. Western Avenue,
Chicago 80
Phone: HAYmarket 1-6800
Attn: Jim Sommerville/Jason Thomas

Klaus Radio & Electric Company
403 E. Lake Street
Peoria
Phone: RH 8-3401
Attn: Clifford Morris
Newark Electronics Corporation
223 W. Madison Street
Chicago 6
Phone: STate 2-2944
Attn: Les Wilkins/A. L. Poncher

INDIANA

Brown Electronics, Inc.
1032 Broadway
Fort Wayne
Phone: ANthony 3382
Attn: A. A. Brown
Graham Electronics Supply, Inc.
122 S. Senate St.
Indianapolis 4
Phone: MELrose 4-8487
Attn: G. M. Graham/D. A. Hilts/
J. F. Simpson

Radio Distributing Co., Inc.
(P. O. Box 1499)
1212 High St.
South Bend 15
Phone: ATLantic 8-4665
Attn: William A. Davidson

IOWA

Radio Trade Supply Co.
1224 Grand Avenue
Des Moines 9
Phone: 288-7237
Attn: Leo Vince Davis/Larry Woolis

World Radio Laboratories, Inc.
(P. O. Box 919)
3415 W. Broadway
Council Bluffs
Phone: 32-81851
Attn: Alan McMillan/Leo Meyerson/
C. H. Williams

LOUISIANA

****Radio Parts Inc.**
1112 Magazine Street
New Orleans 13
Phone: 522-0217
Attn: Irvine J. Levi

MARYLAND

Uncle George's Radio Ham Shack Division
Electronics Distributors, Inc.
11324 Fern Street
Wheaton
Phone: LOCKwood 5-2262
Attn: George J. Pasquale

MASSACHUSETTS

DeMambro Radio Supply, Inc.
1095 Commonwealth Avenue
Boston 15
Phone: ALgonquin 4-9000
Attn: Frank DeMambro

Graham Radio, Inc.
505 Main Street
Reading
Phone: 944-4000
Attn: Robert T. Graham, Sr.

Radio Shack Corp.
730 Commonwealth Avenue
Boston 17
Phone: REgency 4-1000
Attn: Jack Schneider/Harry Waldman

***Two-Way Radio Engineers, Inc.**
115 Ward Street
Boston
Phone: GARRison 7-3511
Attn: Sherman M. Wolf

MICHIGAN

***Communication Service Company**
201 South Lincoln
Charlotte
Phone: 1770-W
Attn: Bart Rypstra

M. N. Duffy & Co.
2040 Grand Avenue W.
Detroit 26
Phone: WOODward 3-2270
Attn: M. N. Duffy/Bill Mains

Purchase Radio Supply
327 E. Hoover Avenue
Ann Arbor
Phone: NORMandy 8-8696/8-8262
Attn: Roy J. Purchase

Radio Supply & Engineering
90 Selden Avenue
Detroit 1
Phone: TEMple 1-317
Attn: C. N. Houser

Warren Radio Company
1710 South Westnedge
Kalamazoo
Phone: FIREside 2-5720/2-7127
Attn: Frank Smith

MINNESOTA

Lew Bonn Company
1211 LaSalle Avenue
Minneapolis 3
Phone: FEderal 9-6351
Attn: Joe Hotch

****Electronic Center, Inc.**
107 3rd Avenue North
Minneapolis 1
Phone: FEderal 8-8678
Attn: Ward Jensen

MISSOURI

Walter Ashe Radio Company
1125 Pine Street
St. Louis 1
Phone: CHEstnut 1-1125
Attn: Joe Novak

Burstein-Applebee Co.
1012-1014 McGee Street
Kansas City 6
Phone: BALtimore 1-1155
Attn: R. H. Friesz/Clyde Fritz

Henry Radio Company
211 North Main
Butler
Phone: ORchard 9-3127
Attn: Bob Henry/Helen DeArmond

NEW HAMPSHIRE

Evans Radio
(P. O. Box 312)
Bow Junction, Route 3A
Concord
Phone: CApital 5-3358
Attn: Eddie Andrew

NEW JERSEY

Federated Purchaser, Inc.
1021 U. S. Rt. 22
Mountainside
Phone: ADams 2-8200
Attn: Hal Thorn

Hudson Radio & Television Corp.
35 Williams Street
Newark 2
Phone: MARket 4-5154
Attn: Joseph Prestia

*Warner Engineering Co., Inc. 239 Lorraine Avenue Upper Montclair Phone: Pioneer 6-7900 Attn: Charles K. Atwater	Pioneer Electronic Supply Co. 5403 Prospect Avenue Cleveland 3 Phone: 432-0010 Attn: J. Fred Ohman/Herb Farr	Wholesale Radio Supply Co. (P. O. Box 2223) 515 East Bay St. Charleston Phone: RA 22634 Attn: Irving Sonenshine	Hargis-Austin, Inc. (P. O. Box 716) 410 Baylor Street Austin Phone: GGreenwood 8-6618 Attn: Mrs. Paul Hargis/Joe Fooshe
NEW MEXICO *Simms Communications, Inc. 217 Camino Encantado Sante Fe Phone: YUcca 2-9502 Attn: Preston W. Simms	Selectronic Supplies, Inc. 3185 Bellevue Road Toledo 6 Phone: GGreenwood 4-5477 Attn: Glenn Ingersoll	SOUTH DAKOTA Burghardt Radio Supply (P. O. Box 746) 621 4th Street S. E. Watertown Phone: TUrner. 6-5749 Attn: Stan Burghardt/AL Hodgins	**Howard Radio Company 1475 Pine Street Abilene Phone: ORchard 2-9501 Attn: R. L. Howard
NEW YORK Adirondack Radio Supply (P. O. Box 88) 185-191 W. Main St. Amsterdam Phone: VICTor 2-8350 Attn: Ward Hinkle Ft. Orange Radio Distributing Co., Inc. 904-16 Broadway Albany 7 Phone: HEMlock 6-8411 Attn: Harry Miller	**Universal Service 114 N. Third Street Columbus 15 Phone: CAPItol 1-2335 Attn: Francis R. Gibb OKLAHOMA Radio, Inc. 1000 South Main Street Tulsa 19 Phone: LU 7-9124 Attn: E. R. Durham/Elbert V. Gunn	TENNESSEE Electra Distributing Company 1914 West End Avenue Nashville 4 Phone: ALpine 5-8444 Attn: Richard B. Harris W. & W. Distributing Company (P. O. Box 436) 644-646 Madison Avenue Memphis Phone: JACKson 7-4628 Attn: Mrs. S. D. Wooten, Jr.	McNicol, Inc. 811 North Estrella Street El Paso Phone: LO 6-2936 Attn: C. C. McNicol Radio & Television Parts Co. 1828 N. Saint Mary's St. San Antonio 12 Phone: CAPItol 6-5329 Attn: Charlie Hildebrandt
Genessee Radio & Parts Co., Inc. 2550 Delaware Avenue Buffalo 16 Phone: TR 3-9661 Attn: Martin Feigenbaum Harrison Radio Corporation 225 Greenwich Street New York 7 Phone: BARclay 7-7777 Attn: W. E. Harrison/Ben Snyder Harvey Radio, Inc. 103 W. 43rd Street New York 18 Phone: JUDson 2-1500 Attn: Harvey Sampson/George Zarrin	**Portland Radio Supply Co. 1234 S. W. Stark Street Portland 5 Phone: CAPItol 8-8647 Attn: C. B. Lucas PENNSYLVANIA Cameradio Company 1121 Penn Avenue Pittsburgh 22 Phone: EXpress 1-4000 Attn: Harry Kaplin/James W. Houston Radio Electric Service Company of Pa., Inc. N. W. cor. 7th & Arch Sts. Philadelphia 6 Phone: WALnut 5-5840 Attn: Edward Miller	TEXAS All-State Electronics, Inc. 2411 Ross Avenue Dallas 1 Phone: RI 1-3281 Attn: Walter Clayton/J. Howard Klein/ Paul W. Fain Amateur Electronics, Inc. 2802 Ross Avenue Dallas Phone: RIVerside 8-9871 Attn: Walter L. Jackson **Busacker Electronic Equipment Company, Inc. (P. O. Box 13204) 1216 W. Clay Street Houston 19 Phone: JACKson 6-2578 Attn: Garth L. Johnson	WASHINGTON C & G Radio Electronics Co. 2502-6 Jefferson Avenue Tacoma 2 Phone: BRoadway 2-3181 Attn: Lloyd Norberg C & G Radio Electronics Co. 2221 Third Avenue Seattle 1 Phone: MAIN 4-4355 Attn: Dennis Ranier Northwest Electronics Distributors East 730 First Avenue Spokane 3 Phone: KE 4-2644 Attn: J. P. McGoldrick Pringle Electronic Supply, Inc. 2101 Colby Everett Phone: ALpine 2-6303 Attn: M. U. Baker
NORTH CAROLINA Electronic Wholesalers, Inc. 938 Burke Street Winston-Salem Phone: PARk 5-8711 Attn: Wayne Yelverton **Freck Radio & Supply Co., Inc. 38 Biltmore Avenue Asheville Phone: ALpine 3-3631 Attn: T. T. Freck	RHODE ISLAND W. H. Edwards Company 116 Hartford Avenue Providence 3 Phone: GASpee 1-6614 Attn: Sal Infantolino	*Communications Service, Inc. 3209 Canton Street Dallas 26 Phone: RIVerside 7-1852 Attn: Cecil A. White, Jr. Crabtree's Wholesale Radio 2608 Ross Avenue Dallas Phone: RIVerside 8-5361 Attn: R. B. Bryan/Clayton Baker Electronic Equipment & Engineering Co. (P. O. Box 3687) 805 South Staples Street Corpus Christi Phone: TULip 3-9271 Attn: R. N. Douglas	WISCONSIN Amateur Electronic Supply 3832 West Lisbon Avenue Milwaukee 8 Phone: WEST 3-3262 Attn: Steve Potyandy/Terry Sterman Harris Radio Corporation 289 North Main Street Fond du Lac Phone: WALnut 2-4670 Attn: Terry Sterman/Harris E. Sterman Satterfield Electronics, Inc. 1900 South Park Street Madison 5 Phone: ALpine 7-4801 Attn: A. W. Satterfield/ W. E. Uhalt
OHIO Custom Electronics, Inc. 1918 South Brown Street Dayton 9 Phone: BALdwin 3-315 Attn: Richard Sauer/Jim Shupe	SOUTH CAROLINA Dixie Radio Supply, Inc. 1900 Barnwell Street Columbia Phone: ALpine 3-5333 Attn: B. W. Krell		

Collins Authorized Service Agencies

ALABAMA *Beddow Engineering Services 2424 Tenth Avenue South Birmingham Phone: ALpine 1-7582 Attn: Dr. C. P. Beddow	*Communication Receiver Service 5016 Maplewood Los Angeles 4 Phone: HOLlywood 2-2429 Attn: Charles C. Messman	GEORGIA *Southeastern Engineering Service 1356 Carolyn Drive N. E. Atlanta 6 Phone: Attn: Harvey Minsk	MINNESOTA **Electronic Center, Inc. 107 Third Avenue North Minneapolis 1 Phone: FEderal 8-8678 Attn: Ward Jensen	OHIO **Universal Service 114 North Third Street Columbus 15 Phone: CAPItol 1-2335 Attn: Francis R. Gibb
ARIZONA **Southwest Electronic Devices (P. O. Box 3647) 140 South 2nd St. Phoenix Phone: ALpine 2-1743 Attn: Herman A. Middleton	**Henry Radio, Inc. 931 N. Euclid Anaheim Phone: PR 2-9200 Attn: Mary Silva **Henry Radio Co., Inc. (P. O. Box 64398) 11240 W. Olympic Blvd. Los Angeles 64 Phone: GRANite 7-6701 Attn: Ted Henry	HAWAII **Honolulu Electronics 819 Keeaumoku Street Honolulu 14 Phone: 995-466 Attn: Thomas Teruya	NEW JERSEY *Warner Engineering Co., Inc. 239 Lorraine Avenue Upper Montclair Phone: PIONEER 6-7900 Attn: Charles K. Atwater	OREGON **Portland Radio Supply Co. 1234 S. W. Stark Street Portland 5 Phone: CAPItol 8-8647 Attn: C. B. Lucas
CALIFORNIA **Amrad Supply, Inc. 999 Howard Avenue Burlingame Phone: DIamond 2-5757 Attn: J. Stevenston *Calamar Electronics Co. 2163A Fulton Ave. Sacramento Phone: 487-0693 Attn: Alex M. Hertz	FLORIDA **Amateur Radio Center, Inc. 2805-7 N. E. 2nd Avenue Miami Phone: FRanklin 4-4101 Attn: Wiley Gilkison **Electronic Wholesalers, Inc. 9290 N. W. 27th Avenue Miami 47 Phone: OXFord 6-1620 Attn: Philip Konter	LOUISIANA **Radio Parts, Inc. 1112 Magazine Street New Orleans 13 Phone: 522-0217 Attn: Irvine J. Levi MASSACHUSETTS *Two-Way Radio Engineers, Inc. 115 Ward Street Boston (Roxbury 20) Phone: GARRison 7-3511 Attn: Sherman M. Wolf	NEW MEXICO *Simms Communication, Inc. 217 Camino Encantado Sante Fe Phone: YUcca 2-9502 Attn: Preston W. Simms	TEXAS **Busacker Electronic Equipment Company, Inc. (P. O. Box 13204) 1216 W. Clay Street Houston 19 Phone: JACKson 6-2578 Attn: Garth L. Johnson *Communications Service, Inc. 3209 Canton Street Dallas 26 Phone: RIVerside 7-1852 Attn: Cecil A. White, Jr.
*Authorized Service Agency only **Authorized Distributor and Service Agency	**Kinkade Radio Supply, Inc. 1719 Grand Central Avenue Tampa Phone: 8-6043 Attn: E. T. Kindade	MICHIGAN *Communication Service Company 201 South Lincoln Charlotte Phone: 1770-W Attn: Bart Rypstra	**Freck Radio & Supply Co. 38 Biltmore Avenue Asheville Phone: ALpine 3-3631 Attn: T. T. Freck	**Howard Radio Company 1475 Pine Street Abilene Phone: ORchard 2-9501 Attn: R. L. Howard

INSTRUCTION BOOK

312B-4 AND 312B-5 STATION CONTROLS

523-0179000-003311

3rd EDITION, 15 SEPTEMBER 1962

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1961, 1962

CEDAR RAPIDS, IOWA, U.S.A.

PRINTED IN THE UNITED STATES OF AMERICA



1.1 DESCRIPTION.

The 312B-4 and 312B-5 Station Controls contain a directional coupler and wattmeter, a pm speaker, a phone patch, and appropriate switching circuitry. The same types of directional coupler and wattmeter, phone patch, and speaker are used in both the 312B-4 and 312B-5. In addition, the 312B-5 contains a variable frequency oscillator to provide separate transmit and

receive frequencies when used with the KWM-2 or KWM-2A Transceivers.

The wattmeter indicates power levels within the ranges of 0-200 or 0-2000 watts, forward or reflected. It is accurate to within ± 5 percent over the range of 2 to 30 mc. The phone patch uses circuitry which allows VOX phone patch operation. It may also be switched manually if desired. The vfo used in the 312B-5 is a 70K-2 Oscillator which is the same as that used in

TABLE 1. ITEMS FURNISHED WITH 312B-4 AND 312B-5

QUANTITY	DESCRIPTION	FUNCTION	PART NUMBER
1	Right-angle connector, r-f type N	Antenna connection	357-9113-00
1	RG-58C/U cable with phono and N-connectors	Connect transmitter to coupler	426-6026-00
5	Audio cables with phono connectors	Interconnections	426-2027-00
1	Tubular capacitor, .5 uf, 200 vdc	Install in phone patch if required	931-0169-00
1 (312B-5 only)	RG-58C/U cable with phono connectors	External vfo connection	426-5076-00

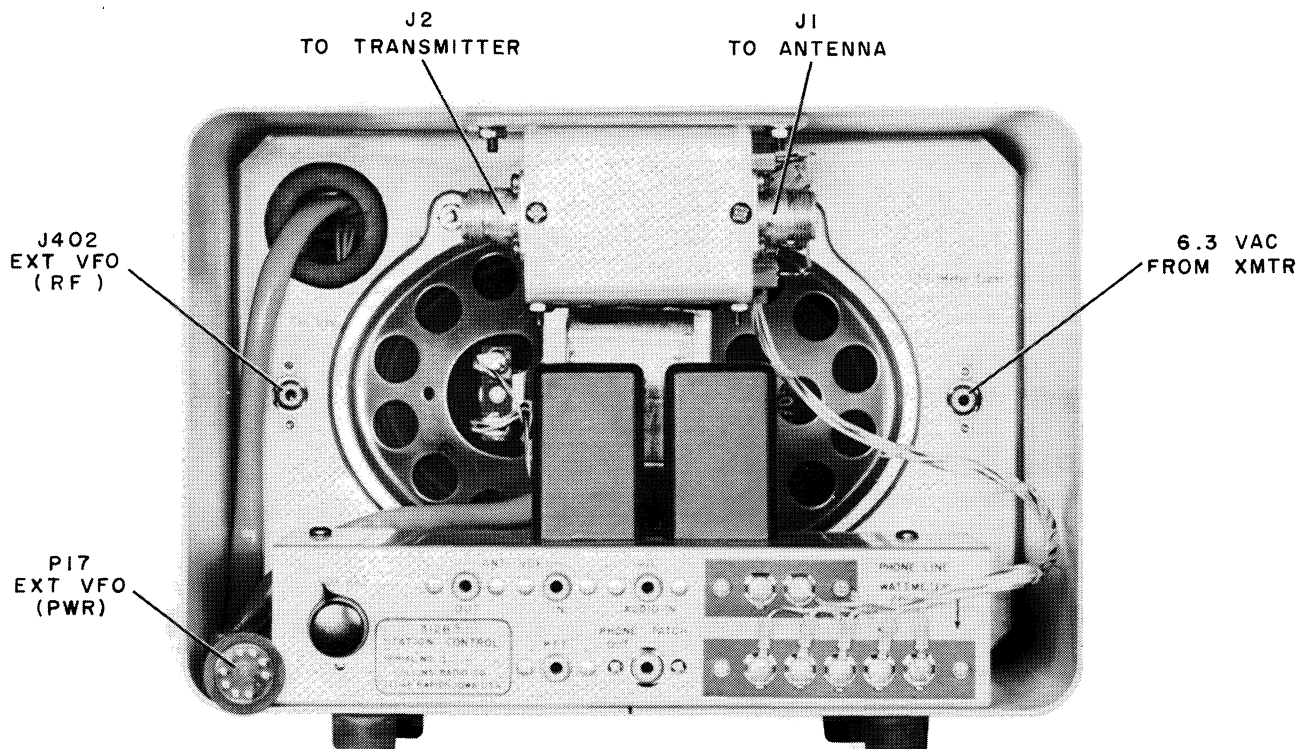


Figure 1. 312B-5, External Connections

C569-04-P

KWM-2/2A and S-Line equipment. Switching circuits are provided to allow operation of KWM-2/2A Transceivers on different receive and transmit frequencies or transmit-receive operation on the same frequency using either vfo.

Figure 1 shows the location of external connections to the 312B-5. The 312B-4 is similar except for the absence of vfo connections. Items which are furnished with each equipment are listed in table 1.

2.1 INSTALLATION.

2.1.1 312B-4 WITH S-LINE OR KWM-2/2A.

Make phone patch, speaker, and r-f connections to the receiver, exciter, and telephone lines as shown in figure 2. If desired, the directional coupler may be removed from the 312B-4 and mounted elsewhere. Figure 4 shows 312B-4 and KWM-2/2A interconnections. Figure 5 shows the proper way to reconnect the directional coupler to the indicator circuit.

NOTE

If the phone patch is to be used with a receiver other than an S-Line type, connect the ANTI-VOX IN jack on the 312B-4 to a 500-ohm audio output from the receiver. Connect to the

speaker terminals using a 500-ohm-to-voice-coil matching transformer if the receiver has no 500-ohm output. Other types of exciters may be used by connecting the PHONE PATCH OUT jack on the 312B-4 to the exciter microphone jack. The output voltage at this jack on the phone patch is approximately equal to that of the average high-impedance dynamic microphone.

2.1.2 312B-5 WITH KWM-2 OR KWM-2A.

Make power, phone patch, speaker, and r-f connections to the transceiver and telephone lines as shown in figure 3. Use the RG-58C/U cables supplied for the r-f connections. These cables are slightly larger in diameter and two inches shorter than those supplied for audio and control functions.

CAUTION

Make sure the vfo power plug is plugged into the proper socket on the KWM-2/2A chassis. This socket is J17 which, for normal operation, has a molded jumper plug inserted into it.

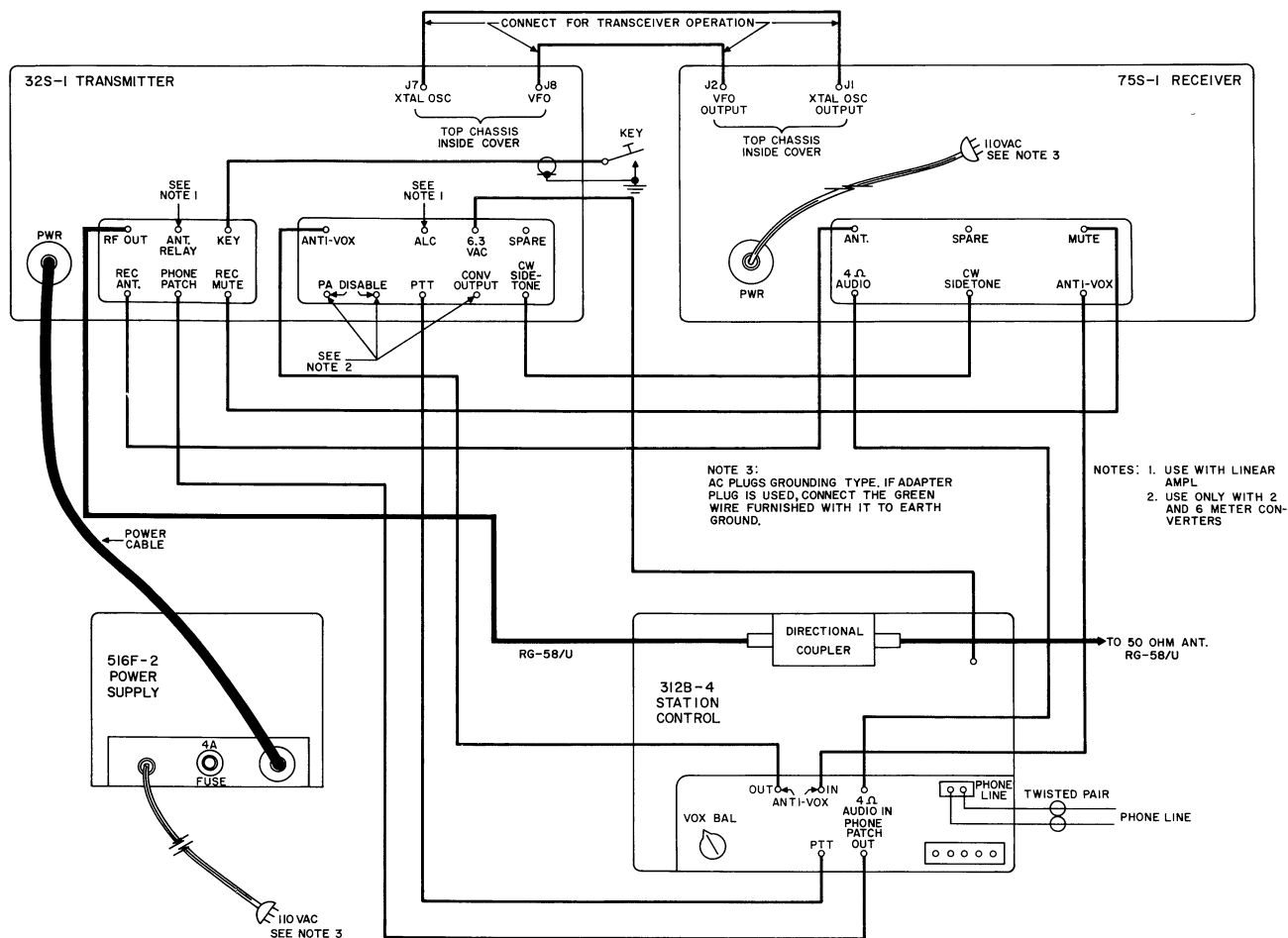


Figure 2. Interconnections, 312B-4 with S-Line

C352-01-4

3.1 OPERATION.

3.1.1 PHONE PATCH OPERATION: 312B-4 WITH S-LINE.

- If the receiver and exciter are set up for transceiver operation, disconnect the patch cables, and restore to fully independent operation.
- Tune and load the exciter into an antenna or dummy load according to the exciter instruction book.
- Set the receiver to a different band than that being used by the exciter, and tune to the calibrate signal to produce approximately a 900-cps audio tone.
- Lift telephone handset, and dial one number to remove the dial tone.
- Set 312B-4 FUNCTION switch to NORMAL position and PHONE PATCH switch to ON position.
- With the exciter set up for SSB operation, set the VOX GAIN control to the PTT ON position.
- The tone from the receiver will now feed through the phone patch and modulate the transmitter. Using the r-f wattmeter to indicate the magnitude of this

feedthrough, adjust the VOX BAL control for minimum r-f output. As the null is approached, advance the MIC GAIN control as required to produce a suitable indication on the wattmeter.

NOTE

The phone patch will balance on the average telephone line with the circuit capacities provided. Unusual line conditions may require a change in capacity to compensate for these conditions. If necessary, cut C7 loose, or add the extra capacitor (furnished) in parallel with C6 and C7 to produce a null within range of the VOX BAL control.

- Hang up telephone, set PHONE PATCH switch to OFF, and reset transmitter and receiver controls for normal VOX operation. Reconnect patch cables for transceiver operation if desired.
- The phone patch is now ready for use. The normal operating procedure is to call the third party on the

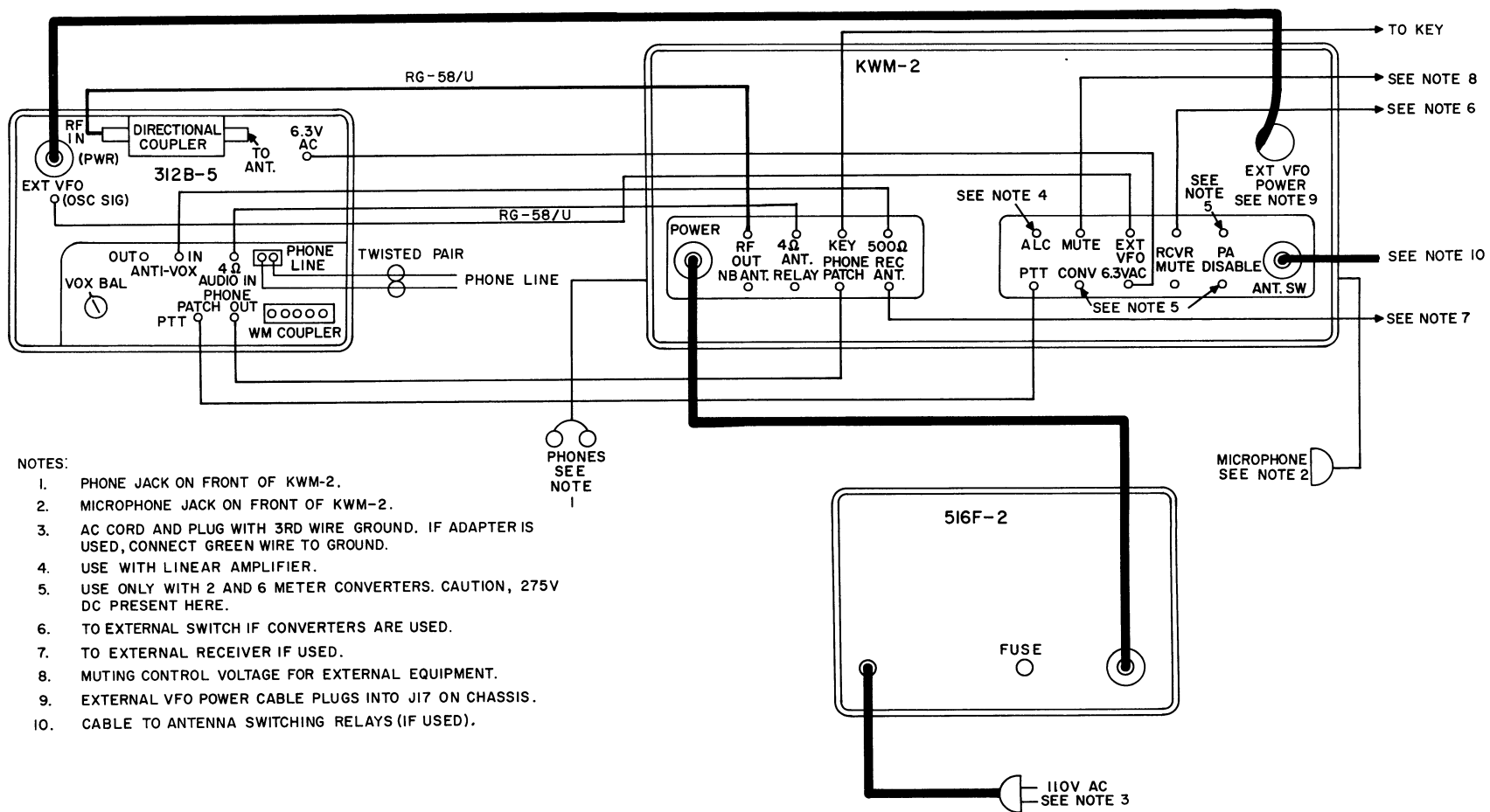
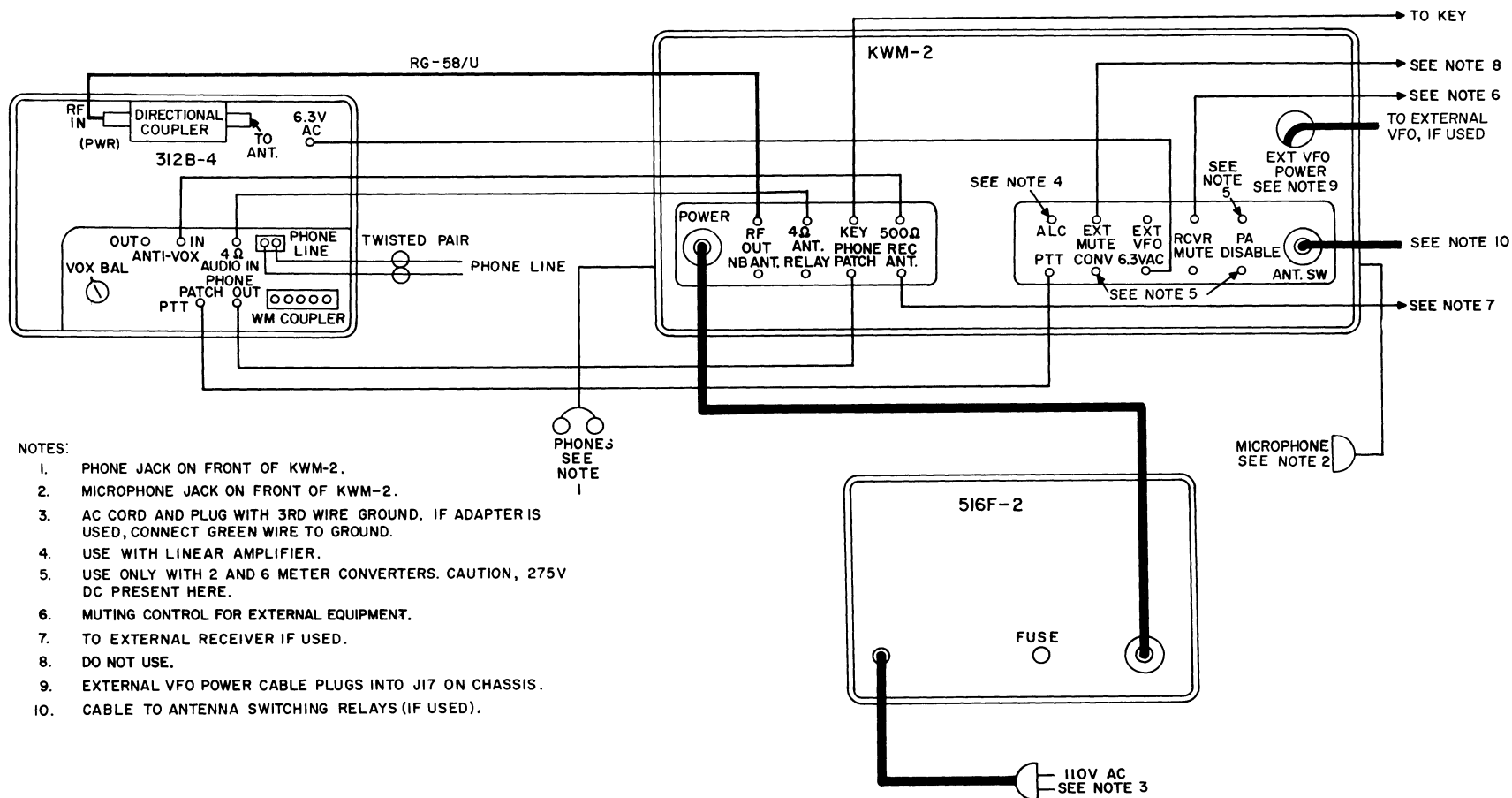


Figure 3. Interconnections, 312B-5 with KWM-2/2A

Figure 4. Interconnections, 312B-4 with KWM-2



C487-45-4

telephone, then set the PHONE PATCH switch to ON. If received signals are strong, the receiver RF GAIN may be reduced to minimize background noise. Adjust AF GAIN to provide normal telephone line level.

j. Depending upon telephone line characteristics and the voice volume of the incoming telephone signal, it may be necessary to make slight adjustments of transmitter MIC GAIN and VOX GAIN controls. In the case of extremely weak signals from the telephone line, use push-to-talk operation.

3.1.2 PHONE PATCH OPERATION: 312B-4/5 WITH KWM-2 OR KWM-2A.

a. Set EMISSION switch to LSB, ANTIVOX GAIN at minimum, MIC GAIN at minimum, VOX GAIN at minimum, and RF GAIN and AF GAIN as required for normal operation.

b. Set function switch to CAL, and tune in the calibrate signal to produce approximately a 900-cps audio tone.

c. Set VOX BAL control on 312B-4/5 to full counter-clockwise.

d. Lift telephone handset, and dial a single digit to remove dial tone.

e. Set PHONE PATCH switch to ON.

f. Advance VOX GAIN control on the transceiver until the VOX relays begin to trip back and forth between receive and transmit positions.

g. Slowly adjust VOX BAL control until the relays stop tripping.

h. Repeat steps f and g until it is no longer possible to advance the VOX GAIN control without causing the relays to trip. (If phone patch will not balance, refer to note accompanying step g of paragraph 3.1.1.)

NOTE

More precise balancing may be obtained if an a-c vtvm is used. Connect the vtvm from the PHONE PATCH OUT jack (J4 on 312B-5) to ground. Slowly adjust the VOX BAL control for a null as indicated by the vtvm.

i. Hang up telephone, turn off phone patch, and reset all transceiver controls for normal VOX SSB operation.

j. The phone patch is now ready for use. Normal procedure is to set PHONE PATCH switch to ST'N MUTE and call the third party on the telephone. Switch the phone patch on and adjust AF GAIN on the transceiver to provide normal telephone line level. If

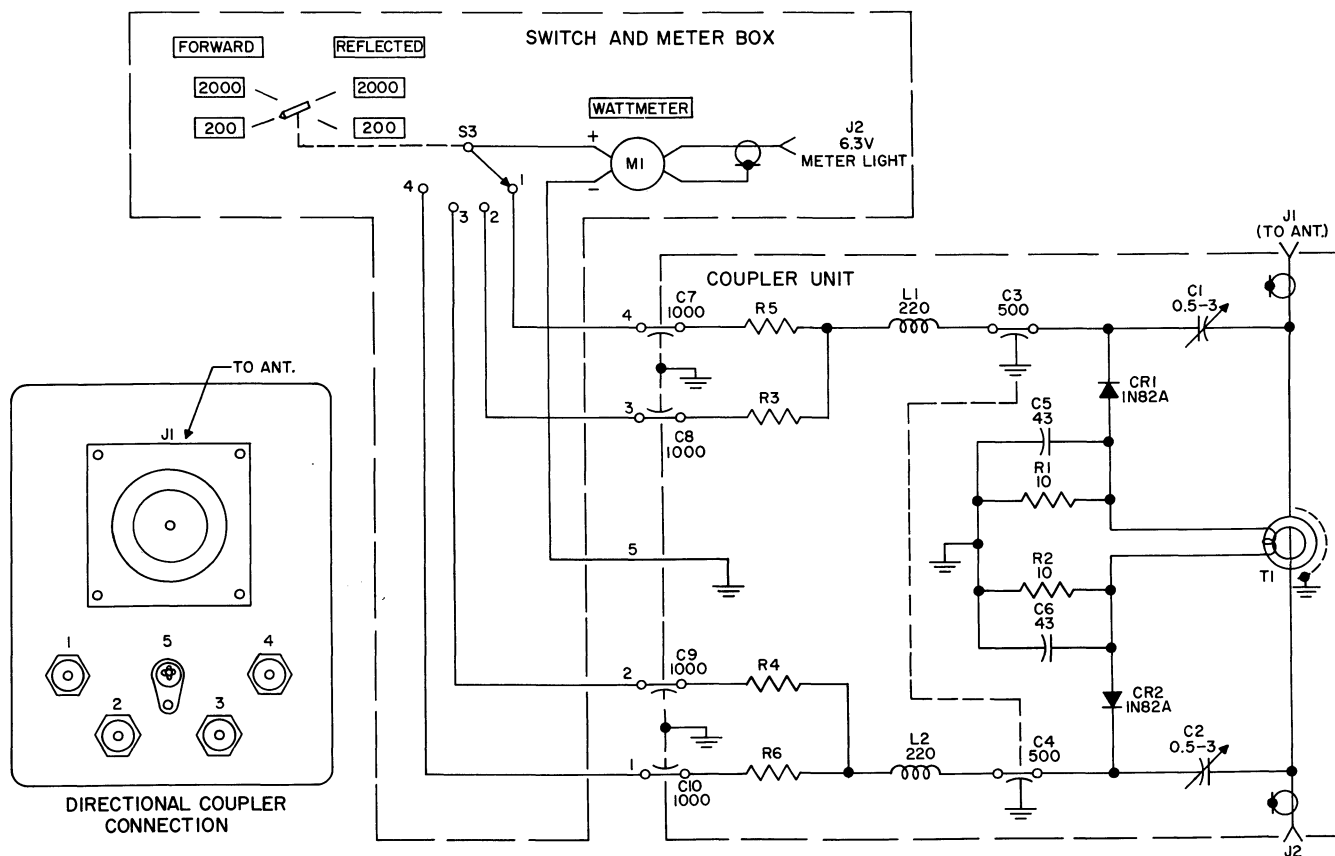


Figure 5. Wattmeter Interconnections

C487-08-4

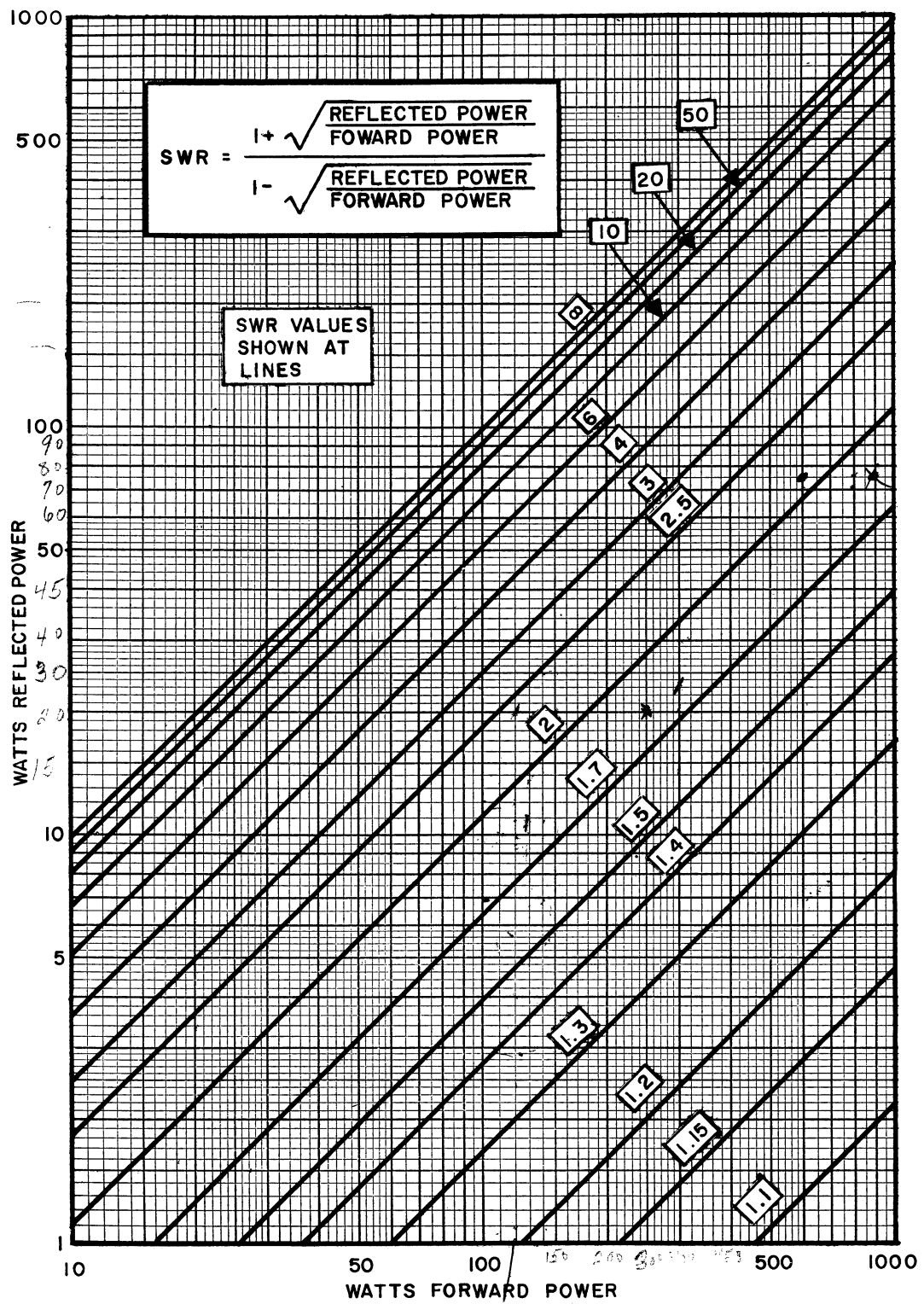


Figure 6. VSWR Graph for Forward Vs Reflected Power

C189-01-1X

received signal is strong, the RF GAIN may be decreased to reduce background noise.

k. Depending upon telephone line characteristics and voice volume of the incoming telephone signal, it may be necessary to make slight adjustments of MIC GAIN and VOX GAIN. In case of extremely weak signals from the telephone line, manually switch the phone patch back and forth from REC ONLY to XMIT ONLY.

3.1.3 OPERATION OF DIRECTIONAL COUPLER AND WATTMETER.

The transmitter output power that can be handled safely is relative to the swr on the transmission line. If the swr is extremely high, as when the line is open or shorted, it is possible to obtain a forward power indication of up to two kilowatts with very little power output from the transmitter. To avoid damage to the instrument, carefully observe the following operating procedure:

a. Set the wattmeter switch to the FORWARD 200 position. (If a linear amplifier is being used, set switch to FORWARD 2000 position.)

b. Couple r-f into the transmission line using CW emission. The meter should show a forward power indication. Note the reading.

c. Switch to the appropriate REFLECTED scale. Unless the antenna or load is perfectly matched to the transmission line (52 ohms, resistive), the meter will indicate reflected power. Note the reading.

d. The forward and reflected power readings, in conjunction with the chart of figure 6, may be used to compute vswr. In some cases, it may be convenient to multiply the forward and reflected power readings by a factor of 10. The method of reading swr from the chart remains the same. For example, 50 watts forward and 5 watts reflected result in a

value of swr slightly less than 2 to 1. Power levels of 500 watts forward and 50 watts reflected produce the same value of swr.



In applications where doubt exists in regard to expected power output from the transmitter, always select the highest wattmeter scale first and, if necessary, switch to the lower scale. This will prevent damage to the indicator.

If the reflected power indication is greater than the forward power indication, it is probable that the coupler unit has been improperly installed. Check to make sure that the coupler has not been installed backwards in the transmission line. Also make sure that the d-c meter leads have not been reversed.

e. If forward and reflected power indications are equal, or reflected power is nearly equal to forward power, the swr on the line is extremely high. This usually indicates a shorted, open, or very poorly terminated line. The coupler will respond to harmonic and other spurious output as well as to r-f output at the desired frequency. If the transmitter output contains a high level of spurious emission, a high swr indication may be obtained even if the transmission line is terminated properly.

3.1.4 OPERATION OF STATION CONTROL SWITCHES.

Table 2 lists operating conditions for the various settings of FUNCTION and PHONE PATCH switches in 312B-4 and 312B-5 Station Controls.

TABLE 2. OPERATION OF PHONE PATCH AND FUNCTION SWITCHES

FUNCTION SWITCH POSITIONS	PHONE PATCH SWITCH POSITIONS		
	ON	OFF	STATION MUTE
NORMAL	Speaker dead, MIC dead, PTT operative, VOX operative, patch connected.	Speaker live, MIC live, PTT operative, VOX operative, patch disconnected.	Speaker dead, MIC dead, transmitter input grounded*, PTT inoperative.
RECEIVE ONLY	Speaker dead, transmitter input grounded*, PTT inoperative, MIC dead, patch hears receiver.	Speaker live, PTT inoperative, transmitter input grounded*, patch disconnected.	Same as above.
TRANSMIT ONLY	Speaker dead, PTT operative, MIC dead, anti-vox voltage grounded.	Speaker dead, PTT operative, MIC live, anti-vox voltage grounded.	Same as above.
*PHONE PATCH OUT jack (J4) shorted.			

3.1.5 OPERATION OF VFO IN 312B-5.

The switch positions of the VFO switch designate the two oscillators as number 1 and 2. Number 1 is the vfo in the KWM-2 (or KWM-2A). Number 2 is the vfo in the 312B-5. The vfo switching arrangement allows tuning the receiver circuits into the foreign d-x band while keeping the transmitter frequency in the American portion of the band, instant selection of either of two preset frequencies within the American band (one for net frequency and one for net QSY frequency), scanning for a clear channel in case of severe interference, and checking the local transmitter frequency for interference while working d-x.

a. With VFO selector switch in the REC 1 - XMIT 2 position, the receiver frequency is controlled by the dial setting of the KWM-2/2A, and the transmitter frequency is controlled by the dial setting of the 312B-5. This allows the transmit circuits to be set within the American portion of the band and the receive circuits to be tuned into the d-x band. For example, with the 312B-5 dial set to 14.296 mc and the EMISSION switch on the KWM-2/2A set to TUNE, the transmit circuits may be peaked and the PA loaded. The EMISSION switch is then set back to the desired sideband or CW and the KWM-2/2A dial tuned to a desired receiving frequency between 14.3 and 14.350 mc. Refer to table 3.

TABLE 3
KWM-2/2A AND 312B-5 APPROXIMATE
VFO FREQUENCY SEPARATION LIMITS

	BANDS (MC)				
	3.4-4	7-7.4	14-14.4	21-21.6	28-30
Approximate limit of separation between 312B-5 and KWM-2/2A dials	15 kc	30 kc	50 kc	75 kc	100 kc

b. With the VFO selector switch in the REC 1 - XMIT 1 position, both the receiver and transmitter frequencies are the same and are controlled by the vfo in the transceiver.

c. With the VFO selector switch in the REC 2 - XMIT 2 position, both the receiver and the transmitter frequencies are the same and are controlled by the vfo in the 312B-5. The vfo dial in the 312B-5 can be calibrated in this position using the crystal calibrator signal and zero set knob as outlined in the KWM-2/2A instruction book. With the 312B-5 VFO switch set in REC 1 - XMIT 1 position, the KWM-2/2A may be tuned and loaded to one selected frequency within the legal

amateur band using the KWM-2/2A tuning dial. The VFO switch may then be changed to REC 2 - XMIT 2 position, and the 312B-5 dial adjusted to another selected frequency within the same band. Transceiver operation may then be changed instantly from one frequency to the other by operating the VFO switch on the 312B-5 back and forth between the two positions marked REC 1 - XMIT 1 and REC 2 - XMIT 2. This permits presetting to a net frequency and a net QSY frequency, and the instant selection of either during net operation. Frequency separation limits listed in table 1 should not be exceeded by any great extent. If they are exceeded, the result is decreased receiver sensitivity or transmitter PA grid drive (or both) due to the selectivity of the transceiver r-f tuned circuits. The best compromise for this tuned circuit attenuation effect is to tune and load the KWM-2/2A at a frequency midway between the two desired frequencies and then set the 312B-5 and KWM-2/2A dials to the required frequencies.

4.1 MAINTENANCE.

4.1.1 GENERAL.

If excessive oscillator drift is experienced, replace V301. The oscillator tube V301 can be replaced without upsetting the calibration accuracy of the oscillator.

For repairs which will affect the calibration of the directional coupler, it is recommended that the unit be returned to the factory or a Collins Authorized Service Agency. Laboratory instruments are used to assure accurate calibration.

4.1.2 VFO DIAL CALIBRATION.

The vfo alignment in the 312B-5 can be adjusted to coincide at the end points (0 and 200) with the vfo in the KWM-2/2A. If necessary, align the vfo in the KWM-2/2A before proceeding with the 312B-5 alignment. Refer to the Service Instructions section in the transceiver instruction book. Align the vfo in the 312B-5 as follows:

- Set VFO switch on 312B-5 to REC 1 - XMIT 1 position and FUNCTION switch to NORM.
- Tune to zero beat with calibrate signal at 200 end of KWM-2/2A dial.
- Set VFO switch on 312B-5 to REC 2 - XMIT 2 position.
- Tune vfo in 312B-5 to zero beat at 200 end of dial, and set hairline to 200 with zero set knob.
- Repeat steps a, b, and c at 0 end of dial in KWM-2/2A.
- Tune vfo in 312B-5 to zero beat at 0 end of dial. Do not move the hairline. Zero beat should occur within ± 1 kc of 0 on the 312B-5 dial.
- If zero beat does not occur within the limits stated in step f, reduce the end-point spread by adjusting L302 as outlined in the KWM-2/2A Instruction Book.
- If necessary, loosen the setscrews in the 312B-5 dial hub, and move the dial relative to the oscillator

shaft so that the hairline is approximately vertical when the dial is calibrated.

i. Recheck for end-point spread, and make minor adjustment, if required.

j. Make the sideband frequency shift adjustment as outlined in paragraph 4.1.3.

4.1.3 VFO SIDEBAND FREQUENCY SHIFT ADJUSTMENT.

a. Set controls of 312B-5 as follows: VFO selector to REC 2 - XMIT 2, FUNCTION selector to NORM.

b. Set controls of KWM-2/2A as follows: BAND switch to 3.6, EXCITER TUNING to approximately 1.9 on logging scale, EMISSION switch to LSB, and OFF-ON-NB-CAL switch to CAL position. Tune dial near 100 until calibrate signal is zero beat. Do not move dial for following procedure.

c. Switch to USB, and adjust trimmer C308 (top of vfo can in 312B-5) for zero beat.

5.1 SPECIFICATIONS.

5.1.1 DIRECTIONAL COUPLER AND WATTMETER.

Frequency range 2 to 30 mc

Impedance 52 ohms unbalanced

Wattmeter scales 200 watts, forward
2000 watts, forward
200 watts, reflected
2000 watts, reflected

Maximum power
handling capability 2000 watts forward
power

Power loss through
coupler Less than 0.1 percent

Swr introduced by
coupler Less than 1.05:1

5.1.2 PHONE PATCH.

Input impedance 600 ohms

Output impedance 600 ohms

5.1.3 PM SPEAKER.

Impedance 3 to 4 ohms

Size 5 by 7 inches

5.1.4 VFO IN 312B-5.

Frequency range 2.5 to 2.7 mc

Calibration accuracy Within 1 kc

Drift Less than 100 cps after
30-minute warmup

Dial backlash Less than 50 cps

Power Supplied by KWM-2 or
KWM-2A transceiver

6.1 PARTS LIST.

ITEM	DESCRIPTION	COLLINS PART NUMBER
	312B-4 STATION CONTROL	522-1167-00
	312B-5 STATION CONTROL	522-1668-00
C1	CAPACITOR, FIXED, PAPER: 1 uf +20% -10%, 200 vdcw	931-0170-00
C2, C3	CAPACITOR, FIXED, CERAMIC: 470 uuf +100 -20%; 500 vdcw	913-3007-00
C4, C5 C6	CAPACITOR, FIXED, PAPER: 0.5 uf +20% -10%; 200 vdcw	931-0169-00
C7	CAPACITOR, FIXED, PAPER: 0.25 uf +20% -10%; 200 vdcw	931-0168-00
J1	JACK, TELEPHONE: spring leaf; 2 conductor plug	358-1050-00
J2, J3 J4, J5 J6, J7	JACK, TIP: ceramic insulation; phonograph type	360-0088-00
L1, L2	COIL, RADIO FREQUENCY: 2 mh; 50,000 ohms; 100 ma current rating	240-0134-00
LS1	LOUDSPEAKER, PERMANENT MAGNET: 4-9 w, nom, 3-4 ohms, 5 x 7 in, oval	271-0215-00
M1	AMMETER: D'Arsonval movement dc; internally illuminated	458-0467-00
R1, R2 R4, R5, R6, R9 R7	RESISTOR, FIXED, COMPOSITION: 100 ohms ±10%, 1/2 w	745-1310-00
R3, R8	NOT USED	
	RESISTOR, FIXED, COMPOSITION: 820 ohms ±10%, 1/2 w	745-1349-00
R10	RESISTOR, VARIABLE, COMPOSITION: 1,000 ohms ±30%; 1/4 watt	376-7203-00
R11, R12	RESISTOR, FIXED FILM: 619 ohms ±1%, 1/2 w	705-7586-00
R13, R15	RESISTOR, FIXED, COMPOSITION: 390 ohms ±10%, 1/2 w	745-1335-00
R14, R16	RESISTOR, FIXED, COMPOSITION: 270 ohms ±10%, 1/2 w	745-1328-00
S1	SWITCH, LEVER: 3 pole, 3 position (used in 312B-4 only)	259-0986-00
S1	SWITCH, LEVER: 3 pole, 3 position (used in 312B-5 only)	259-1132-00
S2	SWITCH, LEVER: 5 pole, 3 position; (used in 312B-4 only)	259-0987-00
S2	SWITCH, LEVER: 5 pole, 3 position (used in 312B-5 only)	259-1131-00
S3	SWITCH, ROTARY: 1 circuit, 4 position, 1 section	259-0966-00
T1, T2	TRANSFORMER, AUDIO FREQUENCY: 200 to 20,000 kc freq range	667-0326-00
	<u>Directional Coupler</u>	543-8118-004
C1, C2	CAPACITOR, VARIABLE; GLASS: 0.5 uf min., 3.0 uuf max.; concentric type	922-0149-00
C3, C4	CAPACITOR, FIXED, MICA: 500 uuf ±20%; 500 vdcw	912-0667-00
C5, C6	CAPACITOR, FIXED, CERAMIC: 43 uuf ±1%; 500 vdcw	916-4675-00
C7, C8	CAPACITOR, FIXED, CERAMIC: 1000 uuf +80% -20%; 500 vdcw	913-1292-00
C9, C10 C11	NOT USED	
C12	NOT USED	
CR1, CR2	SEMICONDUCTOR DEVICE, DIODE: silicon; type 1N82A	353-2542-00
J1, J2	CONNECTOR: R-f type N, UG-58A/U	357-9003-00
L1, L2	COIL, RADIO FREQUENCY: 200 uh inductance; 1 amp	240-0037-00
R1, R2	RESISTOR, FIXED FILM: 10 ohms ±1%, 1/2 w	705-2356-00

ITEM	DESCRIPTION	COLLINS PART NUMBER
†R3, R4	RESISTOR, FIXED, FILM: 5,100 ohms to 10,000 ohms ±1%, 1/4 w; IRC type MDB	705-7130-00 to 705-7144-00
†R5, R6	RESISTOR, FIXED, FILM: 787 ohms to 1780 ohms ±1%, 1/4 w; IRC type MDB	705-7091-00 to 705-7108-00
T1	COIL, RADIO FREQUENCY: 60 turns of #30 AWG; toroidal wound;	542-0916-002
	<u>70K-2 Oscillator</u>	522-1093-00
	70K-2 Oscillator consists of the following. This equipment should be returned to Collins Radio Company for repair.	
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0053-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0054-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0055-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0056-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0057-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0058-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0232-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0233-00
*C301	CAPACITOR, CERAMIC: 20 uuf ±5%, 500 vdcw	913-0234-00
C302	CAPACITOR, MICA: 1000 uuf ±2%, 500 vdcw	912-1737-00
C303	CAPACITOR, MICA: 3000 uuf ±1%, 500 vdcw	912-1748-00
C304	CAPACITOR, MICA: 200 uuf ±2%, 500 vdcw	912-0514-00
**C305	CAPACITOR, CERAMIC: 100 uuf ±2%, 500 vdcw	913-0074-00
**C305	CAPACITOR, CERAMIC: 100 uuf ±2%, 500 vdcw	913-0246-00
C306, C307 C309, C310 C308	CAPACITOR, CERAMIC: 0.02 uf +60% -40%; 250 vdcw	913-2097-00
CR301	SEMICONDUCTOR DEVICE, DIODE: germanium; type 1N34A	353-0103-00
L301	COIL, RADIO FREQUENCY; 22 turns #28 AWG double formvar, 2.4 uh inductance	240-0652-00
L302	TRIMMER ASSEMBLY: 9 turns #28 AWG wire, 1 toroid coil and hardware	543-7323-00
L303	INDUCTOR, TUNING: 10 turns #30 AWG wire	543-7333-003
L304	COIL, RADIO FREQUENCY: single layer wound, magnet wire, 3.30 uh	240-0695-00
R301, R303	RESISTOR, COMPOSITION: 0.10 megohm ±10%, 1/2 w	745-1436-00
R302	RESISTOR, COMPOSITION: 82,000 ohms ±5%, 1/2 w	745-1432-00
T301	TRANSFORMER, RADIO FREQUENCY: pri 380 uh nom 790 kc; sec 2.7 uh nom, 2.6 mc	240-0665-00
V301	ELECTRON TUBE: type 6AU6	255-0202-00
	Following parts used in 312B-5 only:	
DS401	LAMP, INCANDESCENT: type 47	262-3240-00
J402	JACK, TIP: ceramic insulation, phonograph type	360-0088-00
P17	CONNECTOR, POWER: 9 male contacts, fits miniature tube socket	372-1822-00
R401	RESISTOR, COMPOSITION: 15,000 ohms ±10%, 1 w	745-3401-00
R402	RESISTOR, COMPOSITION: 33,000 ohms ±10%, 2 w	745-5715-00
S401	SWITCH, ROTARY: 3 pole, 3 position	259-1108-00
*Chosen per operational requirement.		
**Selected in final test.		
†Selected in manufacture to calibrate meter.		

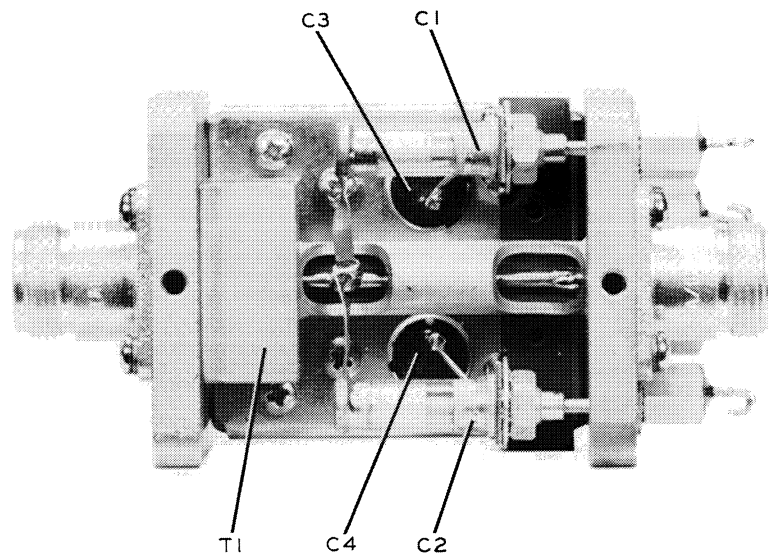


Figure 7. Directional Coupler, Top View, Parts Location C487-15-P

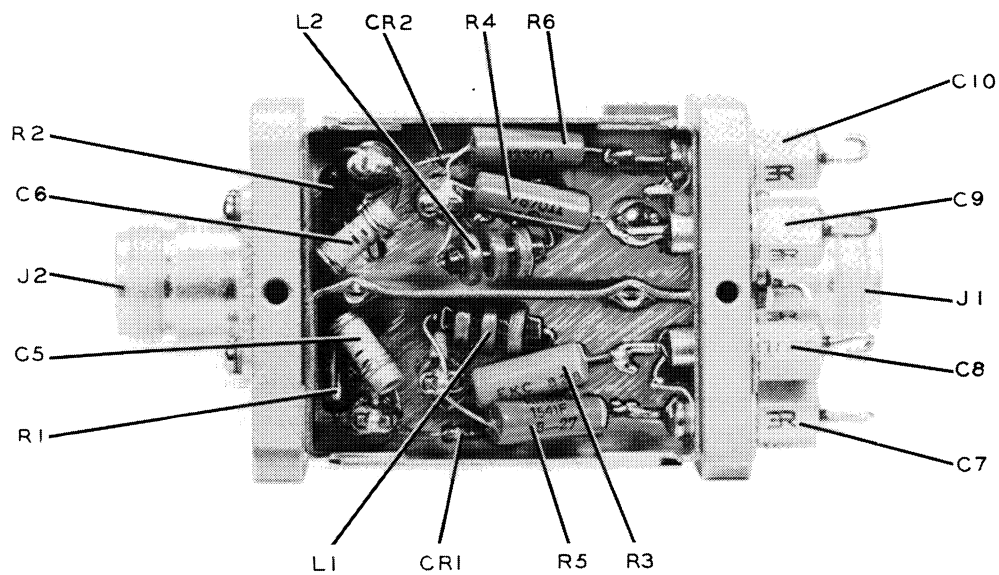
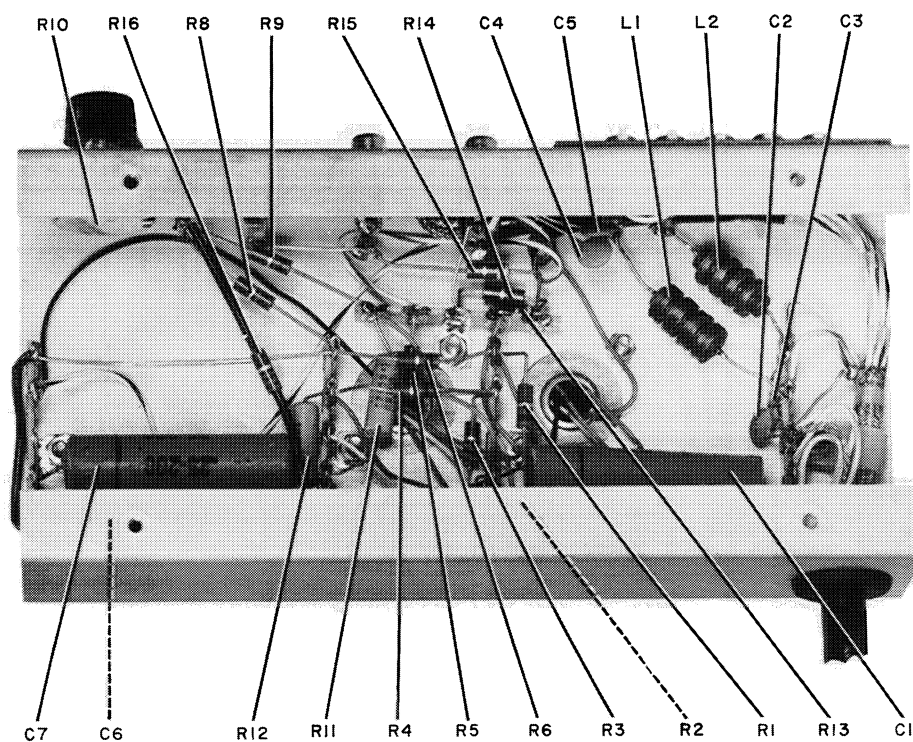


Figure 8. Directional Coupler, Bottom View, Parts Location C487-16-P



C569-05-P

Figure 9. Phone Patch, Bottom View, Parts Location



14

Electrical Wire Code

EXAMPLES:

DA 92	UNSHIELDED WIRE, POLYVINYL, NO. 22 AWG, WHITE WITH A RED TRACER				
	<u>D</u> Type of Wire	<u>A</u> Size of Wire	<u>9</u> Color of Body	<u>2</u> Color of Tracers	
DAS 9123	SHIELDED WIRE (SINGLE) POLYVINYL, NO. 22 AWG, WHITE BODY WITH BROWN, RED AND ORANGE TRACERS				
	<u>D</u> Type of Wire	<u>A</u> Size of Wire	<u>S</u> Shielded	<u>9</u> Color of Body	<u>123</u> Color of Tracers
DASJ (9) (92)	SHIELDED AND JACKETED WIRE (MULTIPLE), POLYVINYL, NO. 22 AWG, WHITE AND WHITE WITH RED TRACER				
	<u>D</u> Type of Wire	<u>A</u> Size of Wire	<u>SJ</u> Shielded and Jacketed	<u>(9)</u> First Conductor	<u>(92)</u> Second Conductor
A2A 91	UNSHIELDED WIRE, IRRADIATED POLYOLEFIN, NO. 22 AWG, WHITE WITH BLACK TRACER				
	<u>A2</u> Type of Wire	<u>A</u> Size of Wire	<u>9</u> Color of Body	<u>1</u> Color of Tracer	

TYPE OF WIRE CODE		SIZE OF WIRE		COVERING OF WIRE	COLOR CODE	
CODE	DESCRIPTION	CODE	SIZE		CODE	TYPE
A	Cotton Braid Over Plastic	A	No. 22 AWG		0	Black
A2	Irradiated Modified Polyolefin, (300 Volts)	B	No. 20		1	Brown
A3	Irradiated Modified Polyolefin, (600 Volts)	C	No. 18		2	Red
A4	Irradiated Modified Polyolefin, (1000 Volts)	D	No. 16		3	Orange
A5	Irradiated Modified Polyolefin, (3000 Volts)	E	No. 14		4	Yellow
B	Busswire, Round Tinned	F	No. 12		5	Green
C	Polyvinyl Chloride, MIL-W-16878, Type B (600 Volts) (No. 20-18-16)	G	No. 10		6	Blue
D	Polyvinyl Chloride, MIL-W-16878, Type B (600 Volts) (No. 22-26-28)	H	No. 8		7	Violet
E	Vinyl, MIL-W-5086, Type I (600 Volts)	J	No. 6		8	Gray (Slate)
E2	Vinyl, MIL-W-5086, Type II (600 Volts) (No. 22-12) Note 1	K	No. 4		9	White
E3	Vinyl, MIL-W-5086, Type II (600 Volts) (No. 0000-10) Note 2	L	No. 2		a	Clear
E4	Vinyl, MIL-W-5086, Type III (600 Volts) (No. 12-22) Note 3	M	No. 1		b	Tan
E5	Vinyl, MIL-W-5086, Type III (600 Volts) (No. 0000-10) Note 4	N	No. 0		c	Pink
G		P	No. 00		d	Maroon
H	Kel-F (Monochlorotrifluoroethylene)	Q	No. 000		e	Light Green
I	Not Available	R	No. 0000	S Shielded	f	Light Blue
J		T	No. 28			
K	Neon Sign Cable (15,000 Volts)	V	No. 26	SJ Shielded & Jacketed		
L	Silicone, MIL-W-16878, Type FF (600 Volts)	W	No. 24			
L2	Silicone, MIL-W-16878, Type FFW (1000 Volts)	X	No. 19			
L3	Silicone, Non-MIL (5000 Volts)	Y	No. 30			
L4	Silicone, Non-MIL (10,000 Volts)	Z				
L5	Silicone, Non-MIL (15,000 Volts)					
M						
N	Single Conductor Stranded (Non-Rubber)					
O	Not Available					
P	Single Conductor Stranded (Rubber Covered)					
Q						
R	Polyvinyl Chloride, MIL-W-16878, Type C (1000 Volts)					
S	Not Available					
T	Teflon (TFE), MIL-W-16878, Type E (600 Volts) Stranded					
U	Not Available					
V	Polyvinyl Chloride, MIL-W-16878, Type D (3000 Volts)					
W	Teflon (TFE), MIL-W-16878, Type EE (1000 Volts)					
X	Teflon (TFE), MIL-W-16878, Type ET (250 Volts)					
X2	Teflon (FEP), MIL-W-16878, Type K (600 Volts)					
X3	Teflon (FEP), MIL-W-16878, Type KT (250 Volts)					
X4	Teflon (TFE), Non-MIL (3000 Volts)					
Y	Telephone Type, Polyvinyl					
Y1	Teflon (TFE), Non-MIL; Solid Conductor					
Z	Telephone Type, Braided Yarn					

- Note 1 - Extruded nylon over fiber glass braid.
 Note 2 - Braided, lacquered nylon over fiber glass braid.
 Note 3 - Extruded nylon over secondary vinyl over fiber glass over primary vinyl.
 Note 4 - Lacquered extruded nylon over secondary vinyl over fiber glass over primary vinyl.

