Modification Instructions

Sinclair Radio Laboratories R-101 Series

30-50 MHz Low-Band Antenna Duplexers

For operation within the 50-54 MHz 6 Meter Amateur Band

D. Edwards, W2GBO
April, 1995

The Sinclair R-101 series band-reject antenna duplexers are intended for operation within the 30-50 MHz commercial low band. These duplexers are available in four, six and eight cavity versions with models for the three sub-bands of 30-37, 37-43 and 43-50 MHz. Any sub-band may be modified for operation within the 6 Meter Amateur Band, and all sub-bands require modification; Including the 43-50 MHz version. See the Sinclair specifications to determine which model is required for your TX/RX frequency separation.

The basic modification discussed in this paper was written for the eight cavity version, and includes the following operations:

A. Removal of turns from each cavity helical resonator for resonance within the 50-54 MHz band.
B. Cutting the cavity interconnect cables to electrical 1/4 wavelength at the cavity reject frequencies.
C. Determining the correct open-circuit stub lengths for the low-pass and high-pass frequencies.
D. Duplexer notch cavity tuning adjustments.

Please thoroughly read the following sheets, including the attached Sinclair CI-051 Duplexer Tuning Instructions. *Become as familiar as possible with your duplexer before you attempt this procedure.*

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1. Using a Magic Marker, number each of the 8 cavities and their bottom covers (1-8) directly below the 'N' connector. These marks will be used to indicate which parts are associated with each cavity, and for mechanical alignment of the cavity bottom covers during re-assembly.

2. Drill and remove the rivets which attach the bottom cover to each cavity. The cavity bottom covers each have a spring loaded mechanism in the center which is used to secure the helical resonator assembly into position. The covers were pressed into position during manufacture with no intent of future removal, therefore some difficulty may be encountered. The use of *Channel-Lock* pliers to flatten the internal pressed edge around the cavity bottom cover perimeter may help.

3. Using a fine tip Magic Marker, number each exposed helical resonator ground end plate, and upper body (after step 4 is completed) to match those placed on each cavity in step 1.

4. Remove the two screws which attach the ground end plate of each helical resonator assembly to the interior cavity wall. Carefully remove the assemblies by pulling them out of the cavity bottom. The resonator inductor is wound with 1/4 inch copper tubing and is tuned to resonance with the *'piston tuning capacitor'* which is formed at the top of each cavity.

5. The number of turns which are present on each helical resonator will depend on the manufactured frequency sub-band. *Five turns* are required for resonance within the 6 Meter band. Some number of turns must be *'cut out'* of each resonator such that 5 will remain. Two cuts will be made, one near the ground end plate and another further up toward the tuning capacitor. After this is done, the ground end piece will be re-attached such that 5 turns of resonator remain. Place a mark on each resonator *1/4 turn* from the ground end plate. This will be where the first cut is made. Determine the number of *full turns* which must be removed for a remainder of 5, and place a mark on each resonator at this point. ***Double check your calculation before you make any cuts.*** Use a 40 tooth-per-inch hacksaw or similar to make the cuts. Use a fine file to generally clean and square-up the cut edges of the resonator pieces which will be soldered back together. The turns of resonator which were cut-out will not be used and may be discarded.

6. Cut eight 1.5 inch lengths of 8 gauge solid copper wire. Shape and insert each 3/4 inch into the cut ends of the remaining resonator pieces to hold them together while they are being soldered. Mechanically align each resulting 5 turn resonator assembly by twisting and bending the cut pieces as necessary for the best possible mechanical alignment of the helix. Clamp the pieces into position, and cover the exposed polystyrene rod with a length of 3/4 inch conduit for protection from the torch flame. ***Silver solder*** the joint on each resonator assembly to make a smooth void-free connection. The use of standard tin-lead solder ***is not*** recommended for this operation. ***ALLOW THE ASSEMBLIES TO COOL BEFORE PROCEEDING.***

7. Evenly stretch the turns of each resonator assembly such that the tapped holes in the ground end plates are in correct alignment with their mounting holes in each cavity side wall near the 'N' connector.

8. File each soldered joint with a fine file for a smooth surface. Thoroughly clean each resonator assembly with an SOS pad and warm water to give a bright shiny tarnish-free appearance. Rinse, and allow the assemblies to dry.

9. Reassemble each resonator assembly into its respective cavity. Carefully align each bottom cover over the polystyrene rod. Align the marks which were placed on the bottom covers in step 1, and secure them into place using 6-32 x 3/8 inch Stainless-Steel screws, lock-washers and nuts.

10. The cavity interconnect cables are most certainly too long for this application, and must be cut such that they present an electrical 1/4 wavelength from the center of one cavity 'T' connector to the next, at the cavity *reject frequency.* This length should be calculated as closely as possible, however there is some margin for error which will have little effect on the proper operation of the duplexer. There will be about 3/4 inch difference in cable length between the reject low and reject high sides of the duplexer for a 1 MHz reject low to reject high separation.
Use the formula: **Length in inches =** $\frac{1947}{\text{f in MHz}}$

This formula will calculate the electrical 1/4 wavelength of coaxial cable with a 66% velocity factor. Ignoring the difference in velocity between that of coaxial cable and that of connectors and adaptors, the actual cable length will be that which is calculated *minus* the length which is added by the 'N' male connector and *one half* of the 'T' adaptor on each end. This added length is approximately 2 1/4 inches total per cable. Therefore, your cables would actually be cut about 2 1/4 inches *shorter* than that which is calculated. It is certainly acceptable to cut the cables which you currently have and use them, provided that they are in good condition, as this will save considerable time and resources. Calculate the proper length of your interconnect cables for both the reject low and reject high frequencies. Each side of the duplexer has 4 cables which will be cut to a specific length. (One from the antenna 'T' connector to the first cavity, and 3 cavity interconnect cables.) Once the cables are cut to the proper length, replace the 'N' connectors on the cut ends. Save the lengths which were cut off, as they already have a male 'N' connector on one end, and *may* be long enough to be used as stubs; (Step 13.) The cables which connect the duplexer transmit and receive ports to the repeater transmitter and receiver may be any length.

11. There are 8 open circuit stubs, one of which is connected to each cavity. There are 4 of *one specific length* connected to the reject low cavities, and 4 of a *different specific length* connected to the reject high cavities. More than likely you will have to cut and/or replace both sets. You may get lucky and find one set which is correct! When the duplexer was modified for the 53.41 W2GBO repeater in Albany, New York, it was found that the stubs on the reject high side were the correct length for the reject low cavities. This saved a fair amount of work and time. Refer to the attached Sinclair CI-051 'DUPLEXER TUNING INSTRUCTIONS', procedure B, page 3. As a marker for you to start with, the correct stub lengths for a duplexer tuned for a reject low frequency of 52.41 MHz and a reject high frequency of 53.41 MHz are as follows: The stubs on the *reject low* cavities are 22 3/16 inches, and will *decrease in length for increased frequency separation.* The stubs on the *reject high* cavities are 16 7/8 inches, and will *increase in length for increased frequency separation.* These lengths are measured from the end of the 'N' male connector to the end of the shield braid at the open circuit end. *(See the open circuit stub detail)*

    To determine the correct stub lengths for each side of the duplexer, you will need to work with one cavity from the reject low side, and then one cavity from the reject high side. Once you have determined the correct length for one cavity, the remaining 3 *for that group* will be cut to the same length.

    You will need a stable RF signal source capable of at least +10 dBm output level within the frequency range of interest, and an RF power meter which will measure approximately -50 to +10 dBm. This meter must be graduated such that level differences of 0.1 dBm may be accurately measured. A 50 Ohm, -10 dB pad is also required.

12. Connect the signal generator output through the -10 dB pad to the RF power meter input. Adjust the signal generator output level to read exactly 0 dBm on the power meter, at the cavity *reject frequency.* Remove the cavity interconnect cable(s) and

the existing stub from one cavity in the *reject low* group. Connect the signal generator output through the -10 dB pad to one side of the 'T' connector, and the RF power meter input to the other side. Tune the cavity for the deepest notch. Change the frequency of the signal generator to the high pass frequency. (You should reconnect the generator and pad again directly to the power meter to verify the level is still at 0 dBm.) Read the RF power mater to determine the insertion loss. The reading will probably be quite high, possibly over -1 dB. You are looking to reduce this reading as much as possible, to a reading of -0.2 dB or better. The open circuit coaxial stub *length* will determine this loss.

13. Obtain a quantity of 'Type N' double male (UG-57B/U), and double female (UG-29B/U) coaxial adaptors. Start by connecting a double male adaptor to the 'T' connector where the stub would normally be placed. Now, start adding alternate adaptors in succession until your insertion loss is at the lowest level. Change the signal generator back to the cavity reject frequency and re-tune the notch to be sure it is accurately tuned. Return the signal generator back to the pass frequency, check your level again to be sure you still have 0 dBm, then check the insertion loss again. Try adding and subtracting adaptors to vary the stub length to be sure you are at the null. At this point, measure the length of the *'coaxial adaptor stub'* you have created. Since the velocity factor of the adaptors is not quite the same as that of coaxial cable, the measured length o the adaptors *will not* be exactly accurate. Obtain a length of RG-213/U coaxial cable with a Type N male connector on one end which is several inches longer than that of the 'adaptor stub'. Cut the open end a little at a time, until you reach the correct length which gives the lowest insertion loss. You may be able to use the cut ends from the cavity interconnect cables (step 10) for stubs if they are long enough. Once you have one stub cut to the final length, cut 3 more exactly the same for the other 3 cavities in the reject low group. Dress the ends of your new stubs using the same method used by Sinclair for the original ones. Each stub must be insulated such that the open circuit end shield or center conductor <u>*cannot*</u> short circuit together or to ground. *(See the open circuit stub detail.)*

14. Repeat the above operation with one cavity from the reject high group of cavities. Once you have determined the correct stub length for this group, cut 3 more for the remaining cavities. Wire the cavities in duplexer configuration with all stubs in their proper position, and tune the duplexer to your reject low, and reject high frequencies.

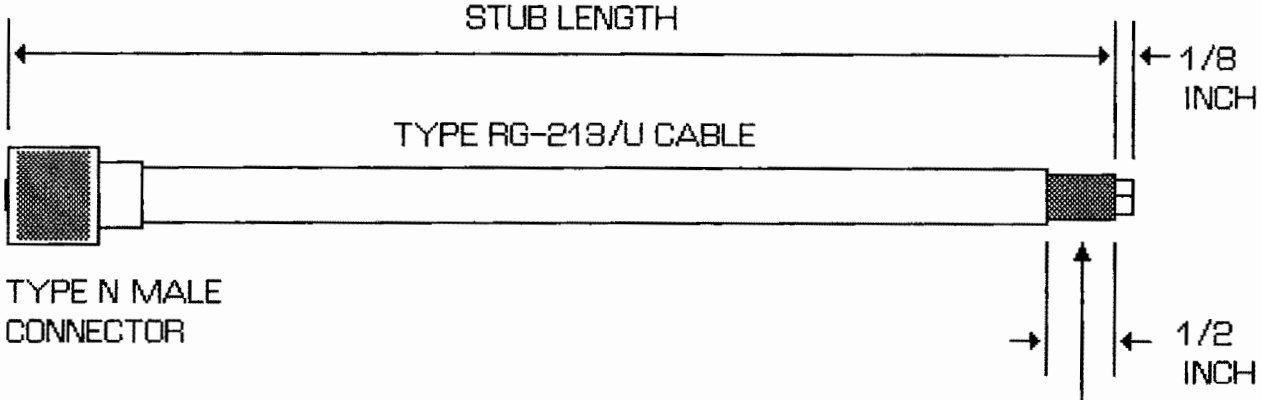
    For this operation, a Hewlett-Packard 8920A RF Communications Test Set was used. This instrument, equipped with the Spectrum Analyzer and Tracking Generator options will allow easy and accurate tuning of the cavity reject low and reject high frequencies.

    You should be able to easily obtain an insertion loss of less than -0.8 dB, and a reject of -100 dB or more for each side. The modified duplexer for use at the 52.41/53.41 MHz W2GBO Albany, New York repeater started life in the 37-43 MHz sub-band. The final figures obtained were an insertion loss of -0.75 dB, and a reject of -106 dB for each side.

I wish to thank WA2AAU for his knowledge and assistance with this project, and Sinclair Radio Laboratories for providing the necessary information about this Duplexer and the open circuit stubs.

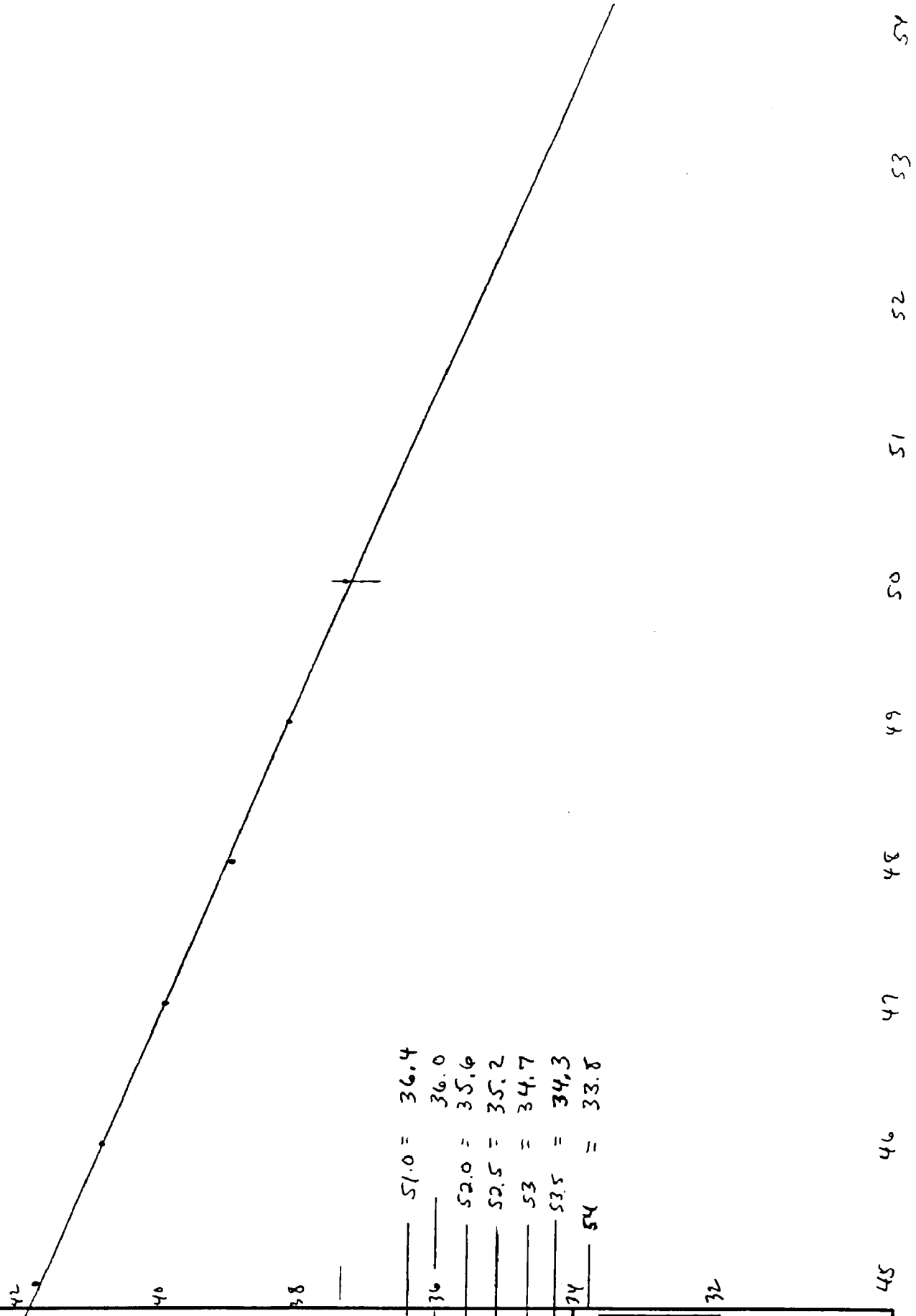
April, 1995
W2GBO

OPEN CIRCUIT STUB DETAIL



SHIELD BRAID IS COATED WITH STANDARD TIN-LEAD SOLDER, AND ELECTRICALLY INSULATED TO PREVENT CONTACT WITH OTHER METAL PARTS.

THE STUB LENGTH IS DETERMINED AS DETAILED IN THE TEXT.



SYSTEM DIAGRAM

MODEL _____ PAGE _____ OF _____

DESCRIPTION 6 MTR IC CABLE LENGTHS FOR R1** DPLXRS

QUOTE NO. _____

DWN	DATE	DWG NO.	ISSUE
APPD	DATE		

SINCLAIR RADIO LABORATORIES
675 Ensminger Rd., Tonawanda, NY 14150
Phone: 800-288-2763
716-874-3682
FAX 716-874-4007

SINCLAIR RADIO LABORATORIES INCORPORATED
675 Ensminger Road
Tonawanda, New York 14150

DUPLEXER TUNING INSTRUCTIONS CI-051 1 of 4

General Description

The duplexer is made up of four, six or eight reject type cavities, depending on the model. Half of the cavities reject the high duplex frequency and pass the low and are interconnected by one-quarterwave cable (RG-213/U). The other half of the cavities reject the low duplex frequency and pass the high. They are also interconnected with one-quarterwave cables. The two halves are connected to the antenna junction with one-quarterwave cables to form the duplexer.

The cavity used in the duplexers is a six inch diameter aluminum shell with a semihelical center resonator. Tuning the cavity is accomplished by a sliding tuning plunger which is locked in position by a 10-32 x ¼" Allen Hex Set Screw. The reject notch is adjusted by tuning the cavity tuning rod. The pass band is positioned by using an open circuited stub on the cavity input, and determined at the factory on order.

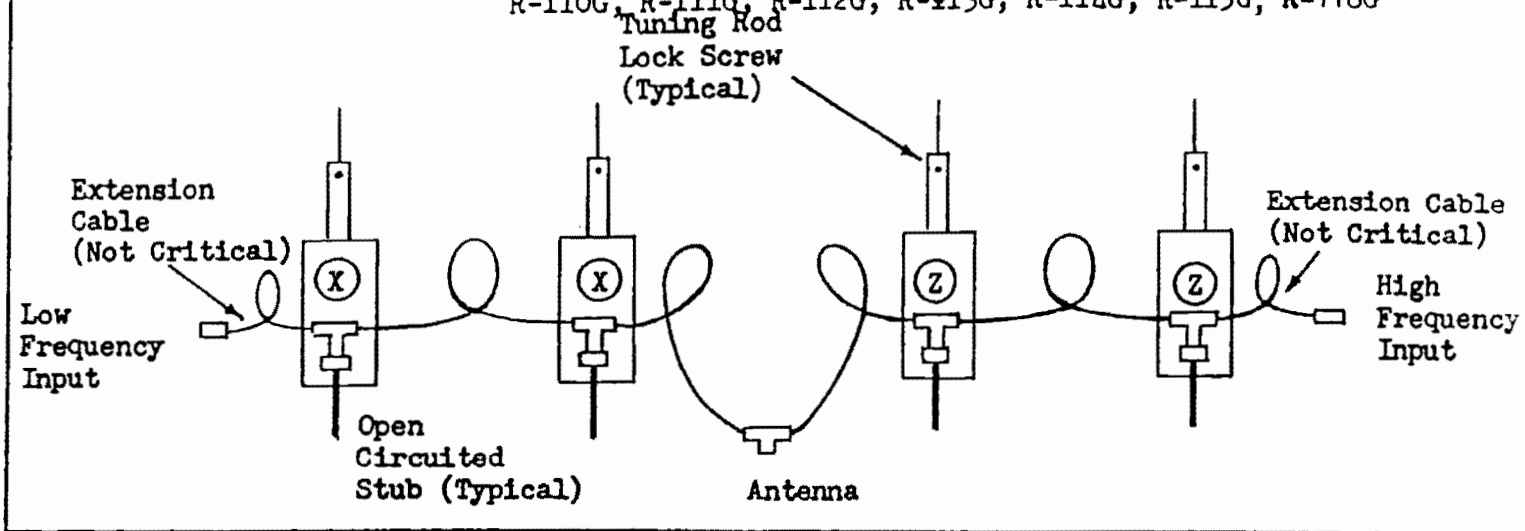
The frequency band of 30 to 50 MHz is divided into three tuning segments because of mechanical limitations of the cavity design. The three sub-bands are 30-37 MHz, 37-43 MHz and 43-50 MHz. Models from one sub-band cannot be tuned to work in another sub-band without extensive factory reworking. The frequency band of 66 to 88 MHz is divided into two sub-bands, 66-77 MHz and 77-88 MHz. The frequency band of 25-30 MHz is covered by one cavity. The table below lists the duplexer models giving the number of cavities, tuning range, minimum duplex frequency separation, and electrical specifications.

MODEL	TUNING RANGE (MHz)	MINIMUM FREQ. SEPARATION (MHz)	NUMBER of CAVITIES	MAX. INSERTION LOSS (db)	MINIMUM ISOLATION (db)	POWER WATTS
R101 R-101G	30-37	0.3	8	1.6	95	350
R-102G	37-43	0.3	8	1.6	95	350
R-103G	43-50	0.3	8	1.6	95	350
R104 R-104G	30-37	0.5	6	1.6	80	350
R-105G	37-43	0.5	6	1.6	80	350
R-106G	43-50	0.5	6	1.6	80	350
R-107G	30-37	0.5	4	1.0	65	350
R-108G	37-43	0.5	4	1.0	65	350
R-109G	43-50	0.5	4	1.0	65	350
R110 R-110G	30-37	1.0	4	1.0	70	350
R-111G	37-43	1.0	4	1.0	70	350
R-112G	43-50	1.0	4	1.0	70	350
R-113G	30-37	1.0	4	1.0	70	350
R-114G	37-43	1.0	4	1.0	70	350
R-115G	43-50	1.0	4	1.0	70	350
R-1C01G	66-77	1.0	4	1.0	65	350
R-1C02G	77-88	1.0	4	1.0	65	350
R-1A01G	25-30	2.0	4	1.0	60	350
R-116G	30-37 split 37-43 band	1.0	4	1.0	70	350

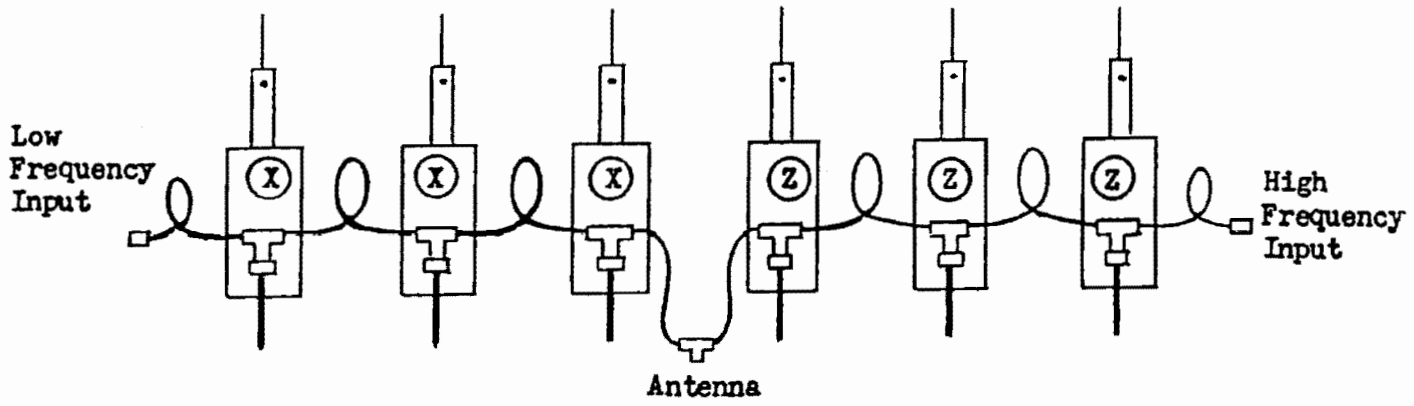
Wiring Diagrams

(X) Cavities Reject High Duplex Frequency and Pass Low
(Z) Cavities Reject Low Duplex Frequency and Pass High

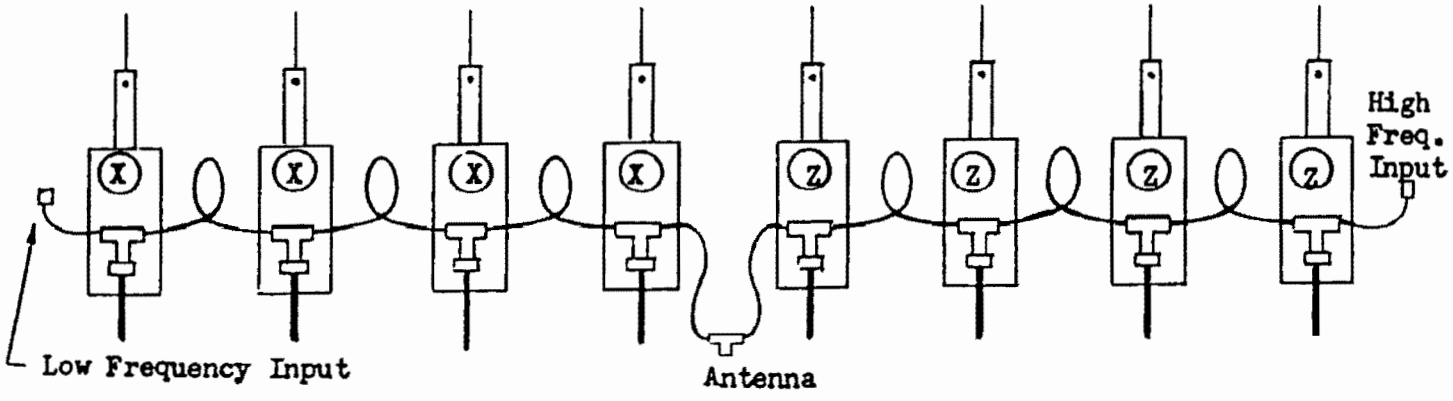
1. Four Cavity Duplexer: R-107G, R-108G, R-109G , R1C01G, R-1C02G, R-1A01G R-110G, R-111G, R-112G, R-113G, R-114G, R-115G, R-116G



2. Six Cavity Duplexer: R-104G, R-105G, R-106G



8. Eight Cavity Duplexer: R-101G, R-102G, R-103G



Tuning Procedure

Important notice: When retuning, please observe the minimum separation from chart for your model. You CANNOT tune the duplexer closer than stated. AND, you CANNOT tune the reject notch outside the sub-band of the duplexer.

A. PROCEDURE FOR PEAKING UP DUPLEXER TO ORIGINAL FREQUENCIES OR TO SOME WHICH ARE LESS THAN APPROXIMATELY 40 KHz DIFFERENT IN SEPARATION FROM ORIGINALS

Since you are not shifting frequencies much, the open circuited stubs will not have to be changed. Tuning the duplexer consists of setting the rejection notches on each cavity in the unit. Minimum equipment requirements are: FM Signal Generator (Measurements Model 560 M or equivalent), Receivers on each of the duplex frequencies (or one which will tune both) and a first limiter monitor meter. (See CI-096 for basic test circuit).

1. Set the signal generator on the high duplex frequency, inject this signal into the low frequency input terminal and detect it at the high frequency terminal. Terminate antenna port with 50 ohms. Tune the rods on the reject high (pass low) cavities, (X) , for minimum signal (attenuate). Adjust the output of the signal generator as necessary to maintain a readable but unsaturated level on the first limiter monitor. The tuning rods are sliding type and are locked in position by a 10-32 HEX socket type Allen Set Screw.

2. Set the generator to the low duplex frequency, inject this signal into the high frequency terminal and detect it at the low frequency terminal. Terminate antenna port with 50 ohms. Tune the rods on the reject low (pass high) cavities (Z) for minimum signal (attenuate). Lock rods in position.

The duplexer is now tuned, measurements can be made by techniques described on Sheet CI-096.

B. PROCEDURE FOR RETUNING DUPLEXER TO A DIFFERENT SEPARATION, GREATER THAN APPROXIMATELY 40 KHz OF ORIGINAL, OR SHIFTING TO ANOTHER SET OF FREQUENCIES IN OPPOSITE END OF SUB-BAND.

In general we advise that the above type of retuning be done at our plant because of the critical length changes in the open circuited stubs which set the pass bands. The techniques used for determing the correct stub length requires equipment which must be able to measure insertion losses of 0.2 to 0.4 db . For those of you who have such equipment available, and would try this procedure the following discussion is offered.

The cavities you have are set for a certain separation in some part of the sub-band. If you are staying in the same part of the sub-band and only changing separation the length of the stubs will change according to the following rule:

* A. For reject low cavities (high pass) - the greater the separation the shorter the stub length.

* B. For reject high cavities (low pass) - the greater the separation the longer the stub length.

Example:

You have an R-101G working at 31.40 and 31.70. You wish to retune to new frequencies of 31.80& 32.50. The old separation was 300 KHz. The new one is 700 KHz. Therefore, the high pass cavity (rejection) stub will want to be shorter, and the low pass cavity (reject high) will want to be longer.

To determine the actual length needed you will be working with one cavity from each side of the duplexer. First tune a reject high cavity to reject your new high frequency, leave the existing stub on. Now go to your low frequency (pass) and read the insertion loss. It should be fairly high 0.5 to 1.5 db. This stub will want to be longer. Either add elbows to lengthen it, or cut a new piece of Rg 213/u or RG 8 A/u about 10" longer than that stub. Put the new stub on and trim it off about ½" at a time, until the insertion loss is minimized (.2-.4db). Now go back to the reject frequency and peak up the notch. Then read the insertion loss at pass frequency again, it should not have changed. You can now cut more stubs for each of the other reject high cavities the same length as the one you just worked out.

Next do the same tuning procedure on the reject low cavity (high pass). In this case the stub will want to become slightly shorter. First tune to new reject low frequency then read insertion loss with existing stub. Then trim back on stub until insertion loss is minimized. Then repeak reject notch and check insertion loss. You can now cut more stubs the same length for the other reject low cavities.

After cutting and installing new stubs on all cavities in the duplexer, follow the previously outlined procedure for tuning.

When shifting from one end of sub-band to the other, it may require stub length changes even though the separation is the same. The reason for this is that percentage-wise, the .300 MHz or .500 MHz minimum separations are different from one end of the sub-band to the other (an example of this is a .300 MHz separation at 37 MHz is equivalent to a .405 MHz separation at 30 MHz)

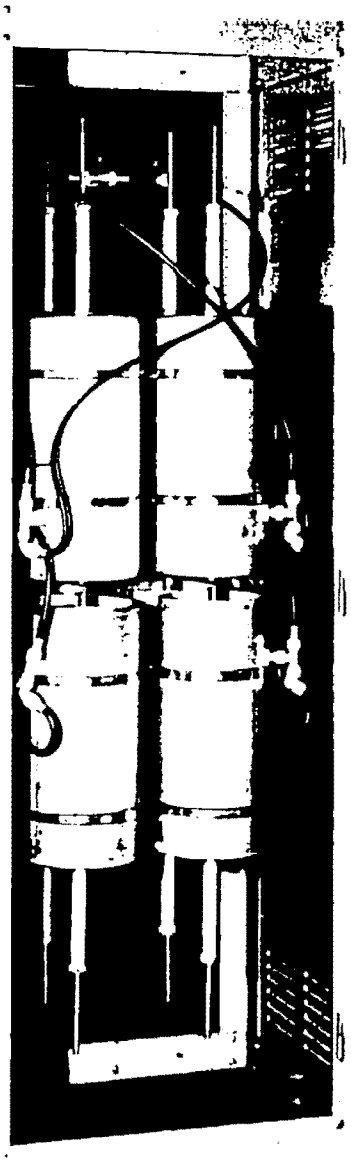
30-512 MHz

STANDARD NOTCH (BAND REJECT) BASE STATION DUPLEXERS

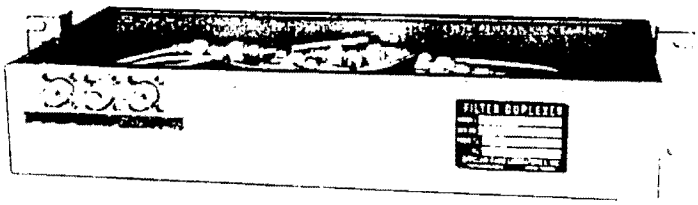
SUPERIOR COMMUNICATIONS EQUIPMENT THROUGH ADVANCED RESEARCH

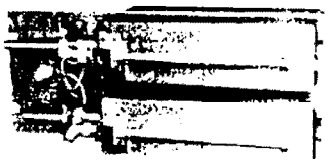
- BEST ISOLATION-TO-SIZE RATIO
- 95 DB ISOLATION AT 300 KHz DUPLEX LOW BAND
- LOW, HIGH, UHF DUPLEXERS AVAILABLE
- HIGHEST QUALITY CONSTRUCTION

R-101G R-102G R-103G
R-104G R-105G R-106G



R-202C R-216C
R-217C R-312C

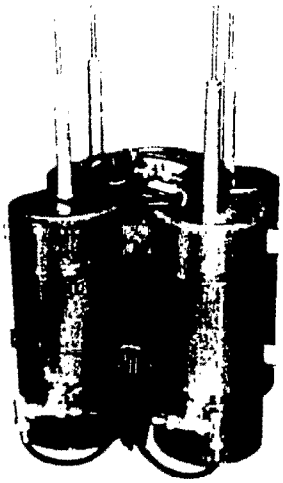




R-215D

R-313C R-314C

R-110G R-111G R-112G



TYPICAL RACK MGT

NEW
ALTERNATE
ENCLOSURES
FOR RACK
MOUNTING

Band Reject Duplexer R-101GC • R-104GC

30-50 MHz

R 101GC

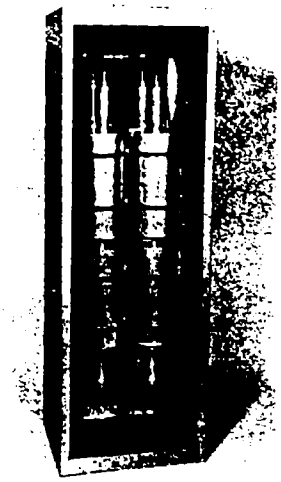
Description

The R-101GC Band Reject Duplexer provides extremely high isolation for separations at a minimum of 300 kHz in the 30-50 MHz frequency range. The use of carefully temperature-compensated helical resonators, in conjunction with the reject notch design, allow the eight-cavity duplexer to be housed in a cabinet 22 inches wide, 18 inches deep and only 66 inches high. Comparable performance utilizing conventional quarter-wave resonators would require a cabinet nearly twice as high, with four times the volume.

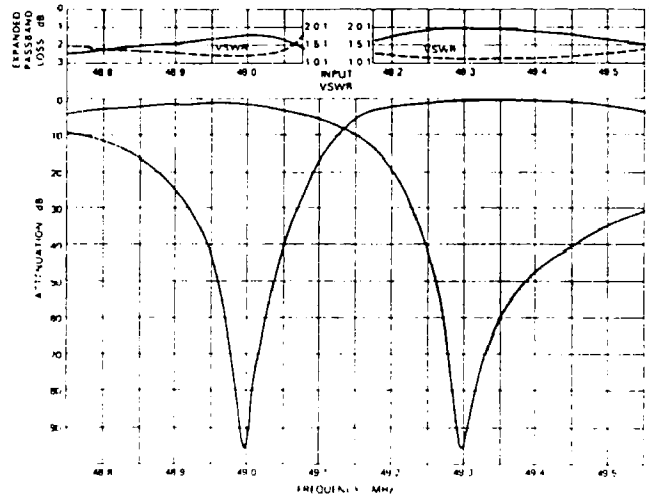
R-104GC

Description

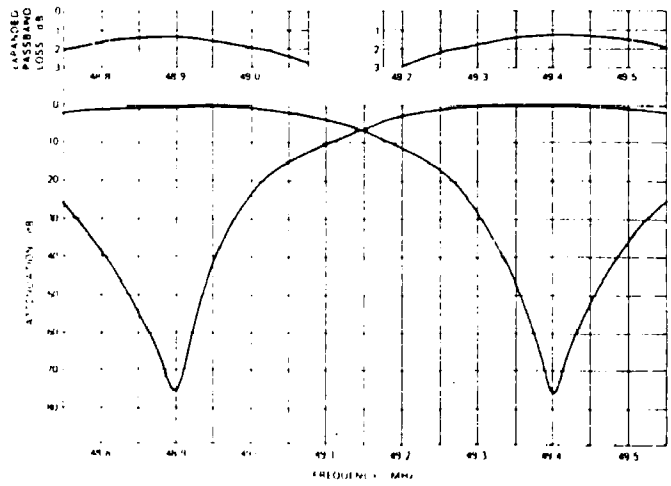
The R-104GC Band Reject Duplexer utilizes the same helical resonators described above, in a six-cavity configuration for application in those systems where the close separation and high isolation of the R-101GC are not required. Minimum spacing for the R-104GC is 500 kHz.



R-101GC



R-101GC



R-104GC

Electrical Specifications	R-101GC	R-104GC
Frequency Range - MHz	30-37, 37-43 or 43-50	30-37, 37-43 or 43-50
Frequency Separation - MHz	0.3 min.	0.5 min.
Insertion Loss		
TX to antenna - dB	1.6 max.	1.6 max.
RX to antenna - dB	1.6 max.	1.6 max.
Isolation		
TX noise suppression at RX dB	90 min.	75 min.
RX Isolation at TX dB	90 min.	75 min.
VSWR	1.5:1 max.	1.5: max.
Power Rating - watts	250	250
Temperature Range	-40°C to +60°C	-40°C to +60°C

Note: 1. VSWR is referenced to 50 ohms.
2. Standard terminations are Type N Female.
3. Specify transmit and receive frequencies when ordering

Mechanical Specifications	R-101GC	R-104GC
Dimensions		
Height - in. (mm)	66.4 (1687)	66.4 (1687)
Width - in. (mm)	22.0 (559)	22.0 (559)
Depth - in. (mm)	18.0 (457)	18.0 (457)
Weight - lb. (kg)	210 (95.3)	180 (81.6)
Mounting Information	Cabinet provided	Cabinet provided

SINCLAIR

SINCLAIR STANDARD NOTCH DUPLEXERS CONTINUE TO OFFER THE BEST ISOLATION-TO-SIZE RATIO AVAILABLE FOR DUPLEXING WHERE METROPOLITAN CONGESTION PROBLEMS DO NOT REQUIRE "SPURIOUS SUPPRESSION" OR "BAND PASS" TYPE MODELS. STANDARD NOTCH DUPLEXERS ARE SUCCESSFULLY APPLIED AT FREQUENCY SEPARATIONS OF ABOUT 1% OR GREATER.

APPLICATION

LOW BAND

Three basic divisions by frequency separation are available in the 30-50 MHz band. Depending upon the extent of broadband Tx noise, low band duplexers can be supplemented easily with Sinclair's 10" diameter full quarterwave Tx band pass filters (0.5 to 1.0 db adjustable loops) for 0.3 and 0.5 MHz spacing. Also, the use of a crystal filter in the receiver may be helpful and more economical than a receiver cavity when the minimum 3 db loss can be tolerated. Models R-113G, R-114G and R-115G are available in low band for internal radio cabinet mounting when space permits.

VHF and UHF

Sinclair's complete line of VHF and UHF standard notch duplexers fill the various unique frequency separation and power rating requirements. The R-215D is a proven high power-rated VHF duplexer for internal radio cabinet mounting and applicable at 3.0 MHz or greater frequency spacing. The R-202C is the smallest 250 watt VHF duplexer available. It is IDEAL FOR IMTS BASE STATION USE. UHF models R-312C, R-313C and R-314C fulfill most commercial applications, in this band, where standard notch duplexers are applicable.

SINCLAIR STANDARD NOTCH DUPLEXER SPECIFICATIONS

ELECTRICAL						MECHANICAL								
							DIMENSIONS						WEIGHT	
MODEL NO.	FREQ. RANGE (MHz)	MIN. FREQ. SPACING Tx to Rx (MHz)	POWER (WATTS)	INSERTION LOSS (DB) Tx OR Rx	ATTENUATION (DB) Tx OR Rx		HEIGHT INCHES (mm)		WIDTH INCHES (mm)		DEPTH INCHES (mm)		LBS. (KG.)	
R-101G	30-37	0.3	350	1.6	95	C	66.4	(1686.6)	22	(558.8)	18	(457.2)	210	(95)
R-102G	37-43	0.3	350	1.6	95	C	66.4	(1686.6)	22	(558.8)	18	(457.2)	210	(95)
R-103G	43-50	0.3	350	1.6	95	C	66.4	(1686.6)	22	(558.8)	18	(457.2)	210	(95)
R-104G	30-37	0.5	350	1.6	80	C	66.4	(1686.6)	22	(558.8)	18	(457.2)	180	(82)
R-105G	37-43	0.5	350	1.6	80	C	66.4	(1686.6)	22	(558.8)	18	(457.2)	180	(82)
R-106G	43-50	0.5	350	1.6	80	C	66.4	(1686.6)	22	(558.8)	18	(457.2)	180	(82)
R-110G	30-37	1.0	350	1.0	70	R	30.0	(762)	19	(482.6)	± 7.5	(190.5)	50	(23)
R-111G	37-43	1.0	350	1.0	70	R	30.0	(762)	19	(482.6)	± 7.5	(190.5)	50	(23)
R-112G	43-50	1.0	350	1.0	70	R	30.0	(762)	19	(482.6)	± 7.5	(190.5)	50	(23)
R-113G	30-37	1.0	350	1.0	70	C	40.4	(1026.2)	22	(558.8)	17.2	(436.9)	122	(55)
R-114G	37-43	1.0	350	1.0	70	C	40.4	(1026.2)	22	(558.8)	17.2	(436.9)	122	(55)
R-115G	43-50	1.0	350	1.0	70	C	40.4	(1026.2)	22	(558.8)	17.2	(436.9)	122	(55)
R-202CB	**132-148**	**4.5**	**250**	**0.6**	**60**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**+2.0-4.5**	**(+50.8-114.3)**	**16**	**(7.0)**
R-210DB	**"**	**3.0**	**375**	**0.6**	**65**	**R**	**7.0**	**(177.8)**	**19**	**(482.6)**	**± 6.0**	**(152.4)**	**14**	**(6.4)**
R-211CB	**"**	**2.0**	**125**	**1.3**	**70**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**+2.0-4.5**	**(+50.8-114.3)**	**11**	**(5.0)**
R-212CB	**"**	**4.5**	**125**	**0.6**	**60**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**+2.0-4.5**	**(+50.8-114.3)**	**10**	**(5.0)**
R-215D	148-174	3.0	375	0.6	65	R	7.0	(177.8)	19	(482.6)	± 6.0	(152.4)	14	(6.4)
(Above Model)	"	5.0	375	0.3	65	R	7.0	(177.8)	19	(482.6)	± 6.0	(152.4)	14	(6.4)
R-216C	"	2.0	125	1.3	70	R	3.5	(88.9)	19	(482.6)	+ 2.0-4.5	(+ 50.8-114.3)	11	(5.0)
(Above Model)	"	5.0	125	0.8	70	R	3.5	(88.9)	19	(482.6)	+ 2.0-4.5	(+ 50.8-114.3)	11	(5.0)
R-202C	"	4.5	250	0.6	60	R	3.5	(88.9)	19	(482.6)	+ 2.0-4.5	(+ 50.8-114.3)	16	(7.0)
R-217C	"	4.5	125	0.6	60	R	3.5	(88.9)	19	(482.6)	+ 2.0-4.5	(+ 50.8-114.3)	10	(5.0)
R-311CA	**406-420**	**5.0**	**125**	**0.8**	**65**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**+2.0-4.5**	**+50.8-114.3)**	**13**	**(6.0)**
R-312CA	**"**	**3.0**	**125**	**1.4**	**75**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**± 4.75**	**(± 120.7)**	**16**	**(7.0)**
R-313CA	**"**	**5.0**	**250**	**0.7**	**75**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**± 4.75**	**(± 120.7)**	**16**	**(7.0)**
R-313C	450-470	3.0	125	1.4	75	R	3.5	(88.9)	19	(482.6)	± 4.75	(± 120.7)	16	(7.0)
(Above Model)	"	5.0	125	0.8	75	R	3.5	(88.9)	19	(482.6)	± 4.75	(± 120.7)	16	(7.0)
R-312C	"	5.0	125	0.8	75	R	3.5	(88.9)	19	(482.6)	+ 2.0-4.5	(+ 50.8-114.3)	13	(6.0)
R-314C	"	5.0	250	0.7	75	R	3.5	(88.9)	19	(482.6)	± 4.75	(± 120.7)	16	(7.0)
R-401C	**470-512**	**3.0**	**125**	**1.4**	**75**	**R**	**3.5**	**(88.9)**	**19**	**(482.6)**	**± 4.75**	**(± 120.7)**	**16**	**(7.0)**

OTHER SPECIFICATIONS — ELECTRICAL

VSWR: 1.5 to 1 or less; Impedance: 50 ohms; Temp. Range: —40°C to + 80°C. Insertion loss and isolation values are for minimum frequency separations shown. Typically, isolations and insertion losses decrease with greater frequency separations.

OTHER SPECIFICATIONS — MECHANICAL

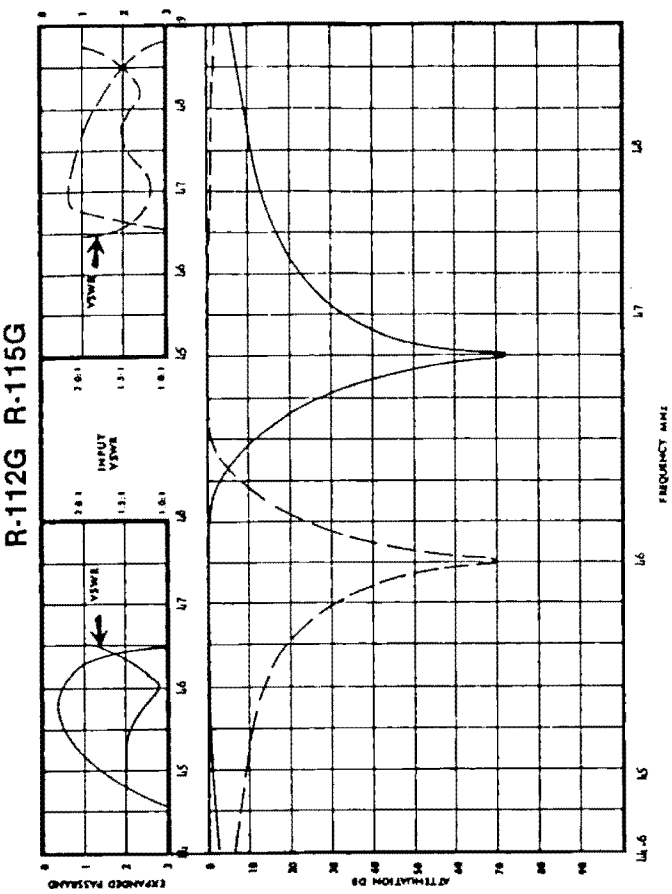
Connectors: Base N type; Mobile/Base UHF type unless otherwise specified. C—Cabinet; R—Rack; I—Integral Enclosure; ± —Distance either side of mounting flange; RE—Rack Enclosure, Consult Factory.

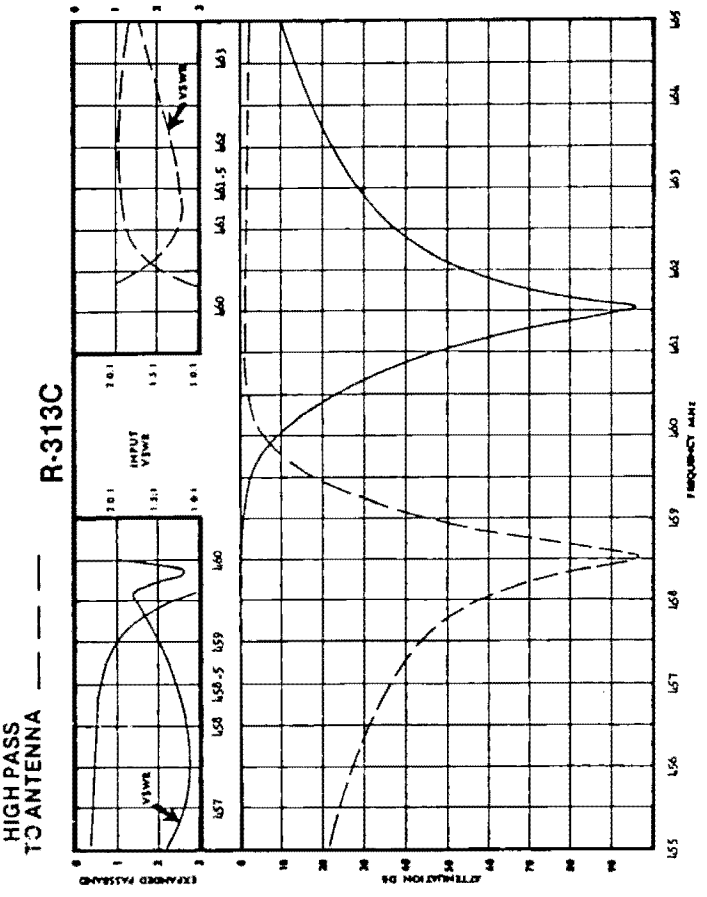
NOTES: A margin of safety allows application ar frequency separations about 5% less than the published minimum for approximately 20% degradation in insertion loss only.

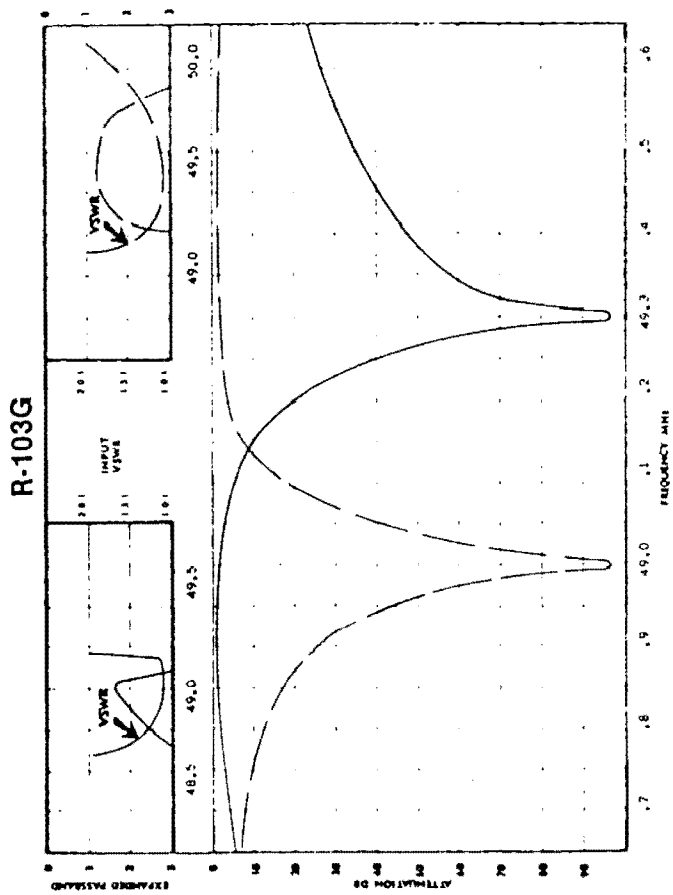
For 60 watts and 4.5 MHz or more separation, consider the Mobile/Base Duplexer Model MR-204B. See separate Mobile/Base Duplexer brochure.

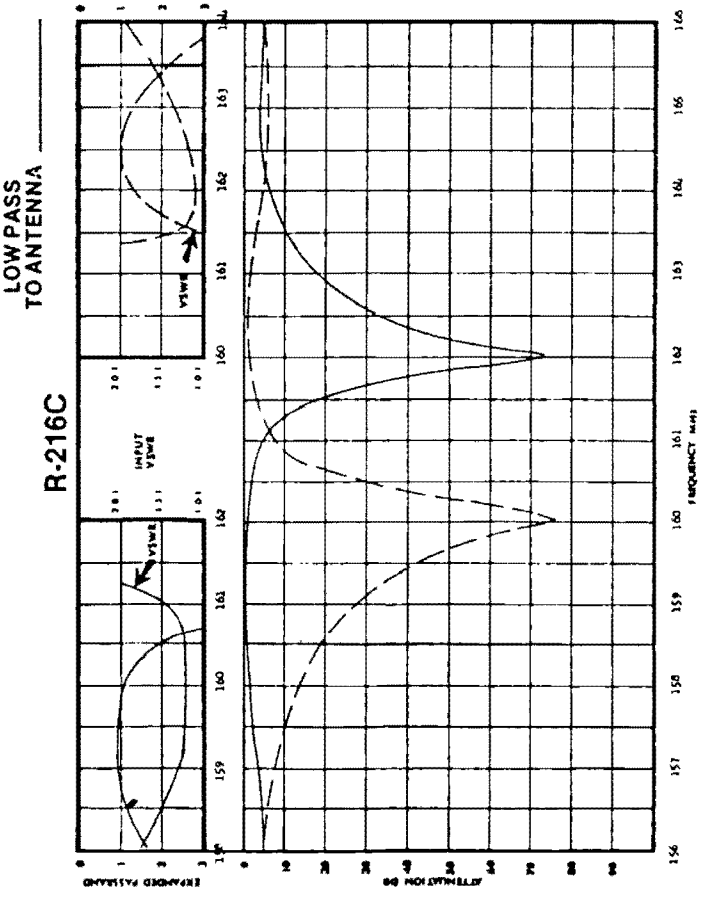
In UHF, for greater than 250 watts power, the Q-322 is applicable.

TYPICAL STANDARD NOTCH BASE STATION DUPLEXER PERFORMANCE CURVES









ISSUE	REVISION		DATE	SIG.				
2	FINISH CHG.	(387)	5/15/64	[illegible]				
	MODEL NAME & NUMBER	1044	[illegible]	[illegible]				
4	1 - 6" & 2" DIA	5382	6/---	[illegible]				

TOLERANCES UNLESS OTHERWISE SPECIFIED 0-6" FRACT. ± 1/64 DEC. ± .005" 6"-24" FRACT. ± 1/32 DEC. ± .010"

SINCLAIR RADIO LABORATORIES, INC. • P.O. BOX 23 • TONAWANDA, NEW YORK

DRAWN

CHECKED

SCALE

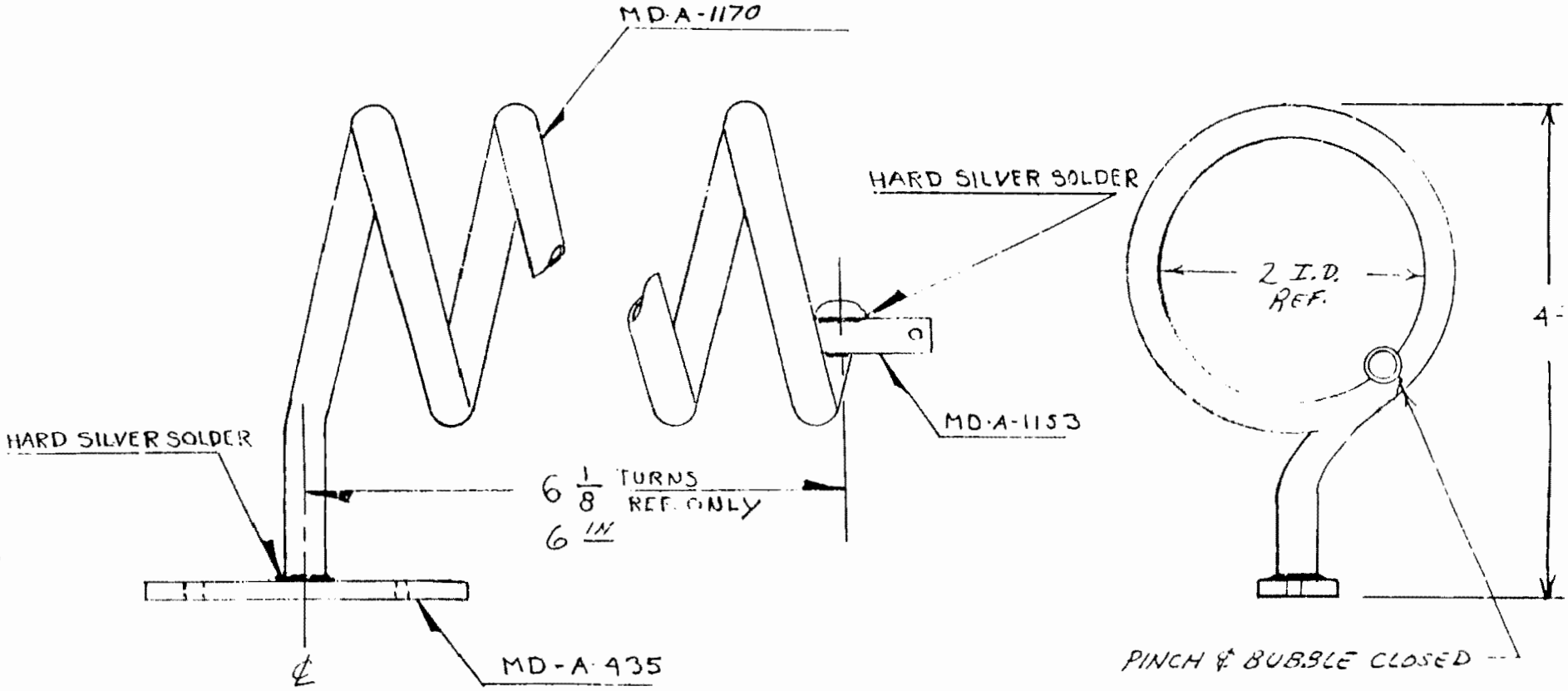
ASSY. NO.

SIG.

DWG. NO. MAD-[illegible]

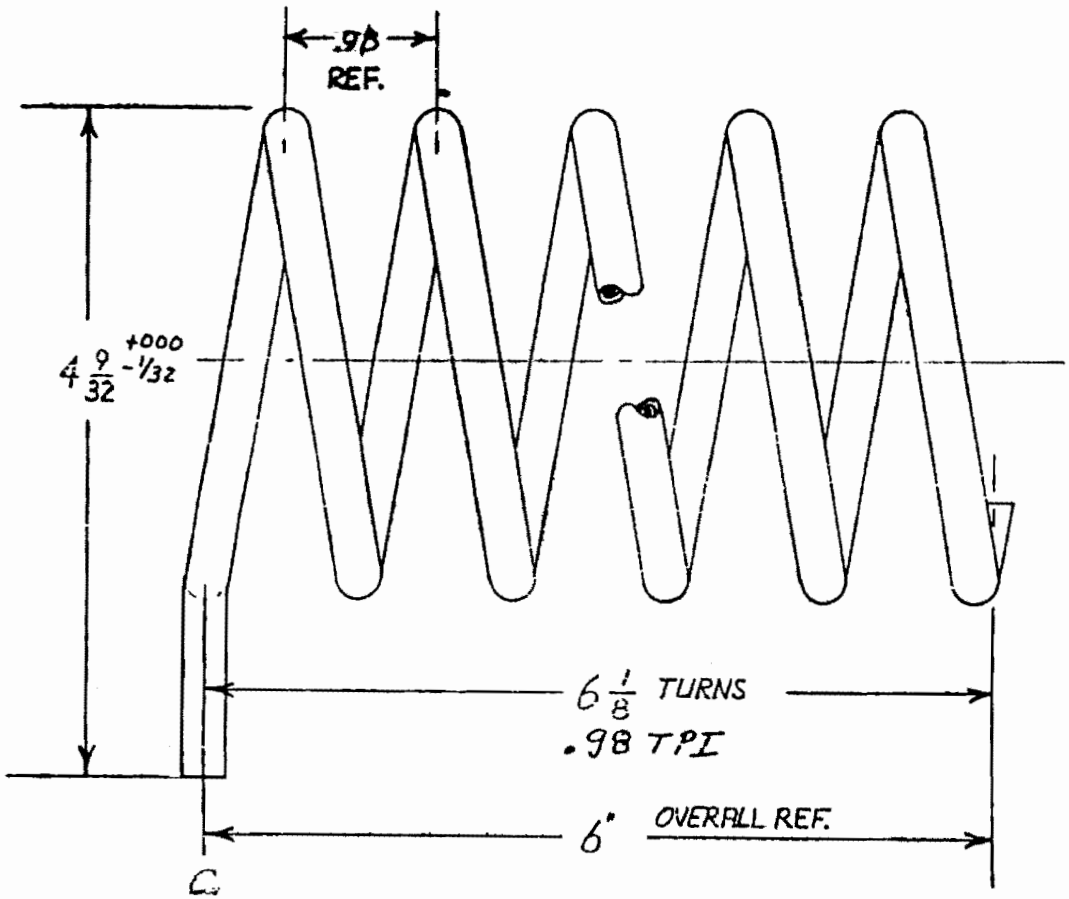
ISSUE

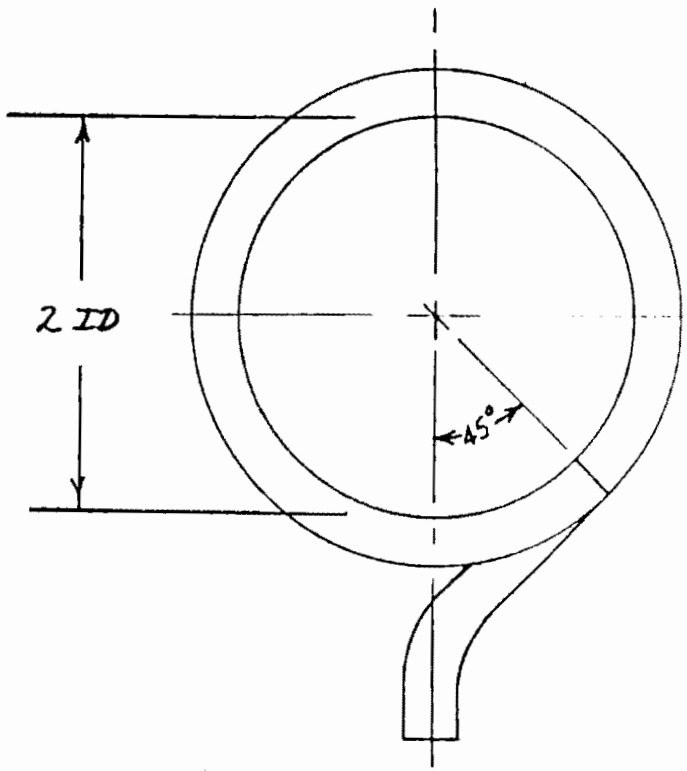
TITLE COIL ANCHOR SLEEVE ASSY. 'C' BAND (42-51 MHz)



FINISH - COPPER FLASH & CLEAR CHROMATE SEAL

TOLERANCES UNLESS OTHERWISE SPECIFIED: — 0 — 6" FRACT. ± 1/64 DEC. ± .005 6" — 24" FRACT. ± 1/32 DEC. ± .010





NOTE: WIND COIL ON 1.945 MANDREL TO PRODUCE 2" I.D. SET WINDING PITCH AT 1/.98

MAT'L: 1/4" DRYSEAL COPPER TUBE APPROX 45"

FINISH: NONE.

SINCLAIR RADIO LABORATORIES, INC. • P.O. BOX 23 • TONAWANDA, NEW YORK

DR. C. Lewis DATE 5/29/64 CH. EZ.

TITLE "C" BAND COIL (42 TO 51 MHz) 2H-30

DWG. NO. MD-A-1170

ISSUE 5

ASSY

ISSU						
2	3	4	5	6		
026 4/11/68	1705 10/24/73	Redraw	2841 4-80	5381 8/81		