



146-174 MHz

**DB-4048**

## BAND-REJECT DUPLEXER FOR CLOSE FREQUENCY SPACING



**Model DB-4048** is designed for use with duplex stations operating with close frequency spacing in the 146-174 MHz band. This duplexer includes the use of quarter-wave coaxial cavities interconnected in a band-reject configuration with double shielded coaxial cable. Frequency stability over a wide temperature range is achieved by use of a threaded Invar rod to control the length of the center conductor in each cavity. It is designed to handle transmitter power up to 400 watts. A sturdy steel cabinet is included.

The **DB-4048** is a 6-cavity duplexer with three cavities in the transmitter section, three in the receiver section. It is generally suitable for use with most tube type and many solid state type stations when the separation between transmit and receive frequencies is 0.5 MHz or more. Under certain conditions, it is also suitable for coupling two transmitters, two receivers or two simplex stations into a common antenna when the two frequencies involved are separated by more than 0.5 MHz.

The duplex response curves on the back illustrate the typical isolation provided by the duplexer when operated at minimum frequency separation. Another curve shows the transmitter and receiver insertion

loss versus frequency separation. At greater separation between transmit and receive frequencies, the rejection remains the same but the transmitter and receiver losses are less.

In any duplex system, it is important that the duplexer and other components provide and maintain a high degree of isolation between the transmitter and receiver in order to prevent degraded receiver performance. Isolation becomes even more critical at close frequency spacing. Accordingly, it is mandatory that double shielded coaxial cable (or solid outer conductor cable) be used to interconnect this duplexer to the transmitter and receiver chassis. Double shielded cable will minimize the coupling of RF energy between the interconnecting cables. A suitable duplexer interconnecting cable kit (No. 11621) is available as an optional item.

The duplexer is factory tuned to the exact operating frequencies and shipped ready for immediate installation. No further field tuning or adjustment is normally required.

A Hoffman model A-30-24-16LP weather proof outdoor cabinet is offered as an option.

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Figure 1

## TYPICAL DUPLEX RESPONSE CURVES

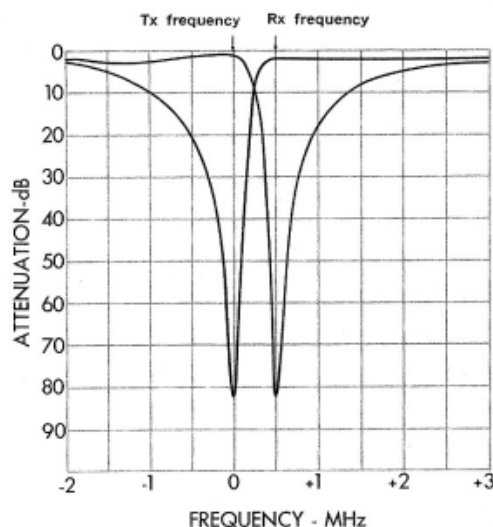
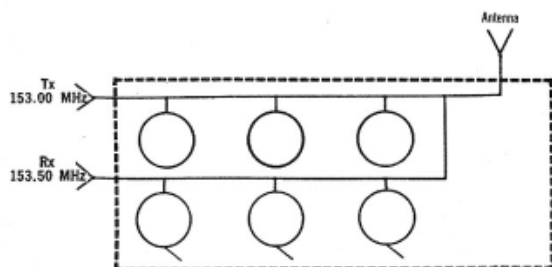
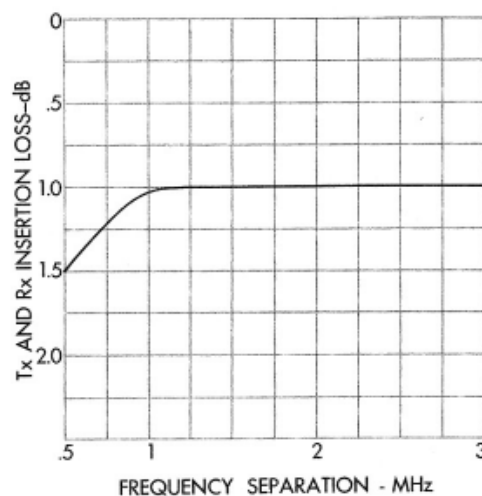


Figure 2

## INSERTION LOSS VS FREQUENCY SEPARATION

TYPICAL OPERATION  
(150-174 MHz)

The block diagram illustrates the use of a DB-4048 close spacing duplexer in a duplex system with a separation of only 500 KHz between transmit and receive frequencies.

## TRANSMIT OPERATION

The transmitter section of the duplexer consists of three quarter-wave cavities and harness and is adjusted to pass the transmitter carrier signal to the antenna with a low insertion loss while rejecting that part of the transmitter carrier which occurs at the receive frequency.

## RECEIVE OPERATION

The receiver section of the duplexer also consists of three quarter-wave cavities and harness and is adjusted to pass the received signal from the antenna to the receiver with a low insertion loss while rejecting the transmitter carrier which would otherwise pass through the relatively broad receiver front-end to desensitize and/or cause intermodulation interference.

## ORDERING INFORMATION

DB-4048	Duplexer	Exact frequency of the transmitter and the receiver must be specified
DB-4048	W/DB-5028	Duplexer W/Hoffman #A-30-24-16LP weather proof outdoor cabinet

## ELECTRICAL DATA

Frequency range	146-174 MHz
Frequency separation	0.5 MHz or more
Maximum power input (continuous duty)	400 watts
Insertion loss—transmitter to antenna— at 0.5 MHz separation	1.5 dB
Insertion loss—receiver to antenna— at 0.5 MHz separation	1.5 dB
Transmitter noise suppression at the receive frequency	80 dB
Receiver isolation at transmit frequency	80 dB
Maximum VSWR (referenced to 50 ohms)	1.5 to 1
Temperature range	-30° to +60°C
Number of cavity filters	6

## MECHANICAL DATA

Cabinet dimensions:	
Height	30"
Width	19 1/4"
Depth	14"
Connector terminations	UHF Female
Finish	Beige vinyl enamel
Net weight	95 lbs
Shipping weight	120 lbs.

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SP67 9-73  
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## DB4048 HAM VERSION 2-METER DUPLEXER

**OVERVIEW:** The Amateur radio version DB4048 consists of new critical length cables (nine) and possibly new loops (six). There is no transmit or receive side - there is only a high frequency and low frequency side of the ham duplexer. The duplexer is a all notch type. There are no bandpass cavities. This means that the duplexer only looks out after itself. It is not good for a crowded site.

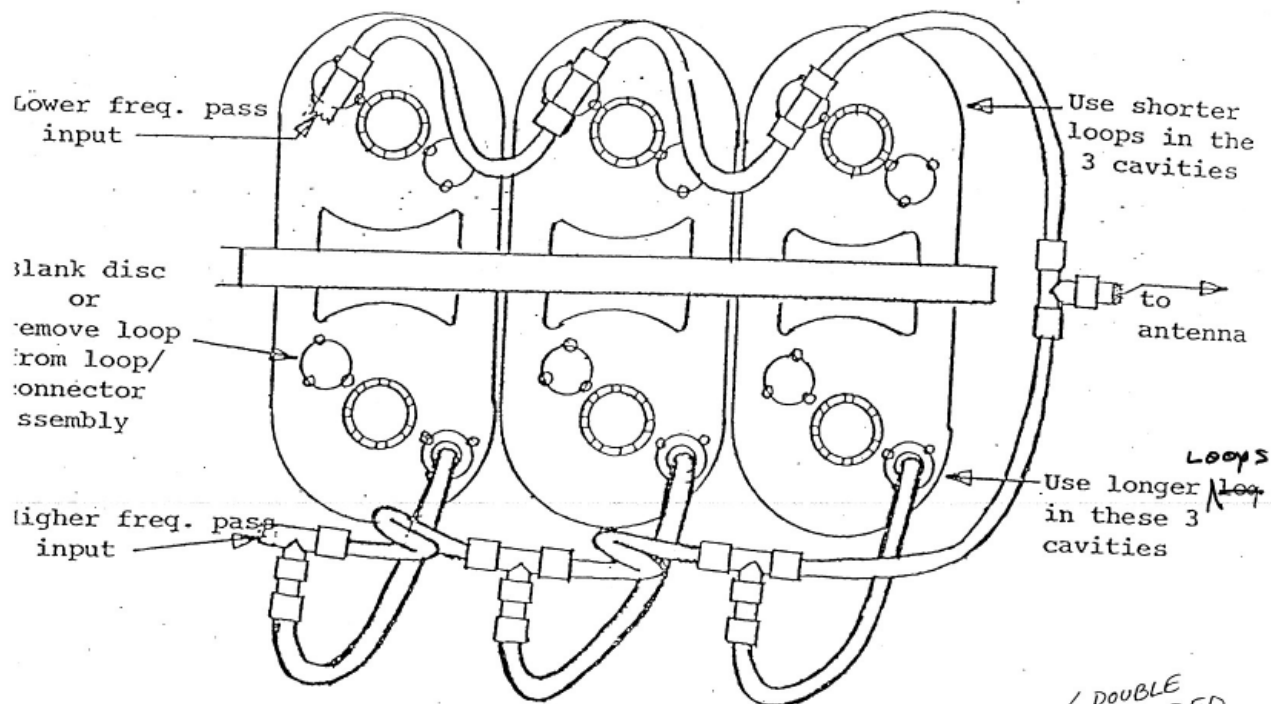
**Part 1: CABLE MODIFICATION-** Cut nine RG214 doubly shielded cables to exactly 12.5 inches and then put on the UHF connectors. The cables lengths are based on the coax having a velocity factor of 66 per cent.

**Part 2: LOOP MODIFICATION-** The loop is the antenna like device which is part of the connector and extends inside each cavity. Remove each loop (3 screws) and check it length according to the loop spec drawing. The ham duplexer needs three short loops (about 1 inch) on the low frequency side and three long loops (about 1.5 inches) on the high frequency side. You have the information to make the loops yourself.

**Part 3: CHECK CAVITIES-** It is a good idea to check each cavity for its ability to notch the TX or RX frequency - depending on where it is to be used. All the cavities on the TX side of the duplexer notch the RX frequency. And, all of the cavities on the RX side of the duplexer notch the TX frequency. The cavities should tune smoothly and each cavity should notch by -20dB. If at all possible, check each cavity under power. Cavities may tune great using a signal generator but degrade under 100 watts. In case of problems with the cavities consider the following:

1. Drill out the three rivets around the top side of the cavity.
2. Clean the center silver plated rods.
  - a. remove any cleaner used
  - b. scrub using Scotch-brite
3. Inspect the whole assembly.
  - a. replace the tie-wrap around the center rods
  - b. reassemble the cavity using rivets or short machine screws.

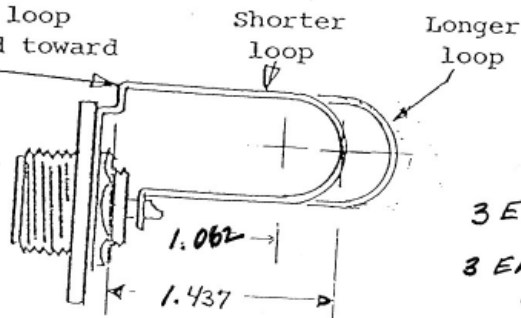
Modification to commercial model for HAM use.  
JB4048 - HAM DUPLEX 2



DOUBLE SHIELDED COAX  
RG-214

All cable lengths are 12½ inches, for best results use RG-9 cable

Grounded side of loop should be pointed toward cavity center conductor



Loop/connector assembly  
Full scale drawing

CAVITY-DB4015  
LO FREQ SIDE  
3 EA SHORT LOOP 048017-003  
3 EA LONG LOOP 048017-002  
HI FREQ SIDE

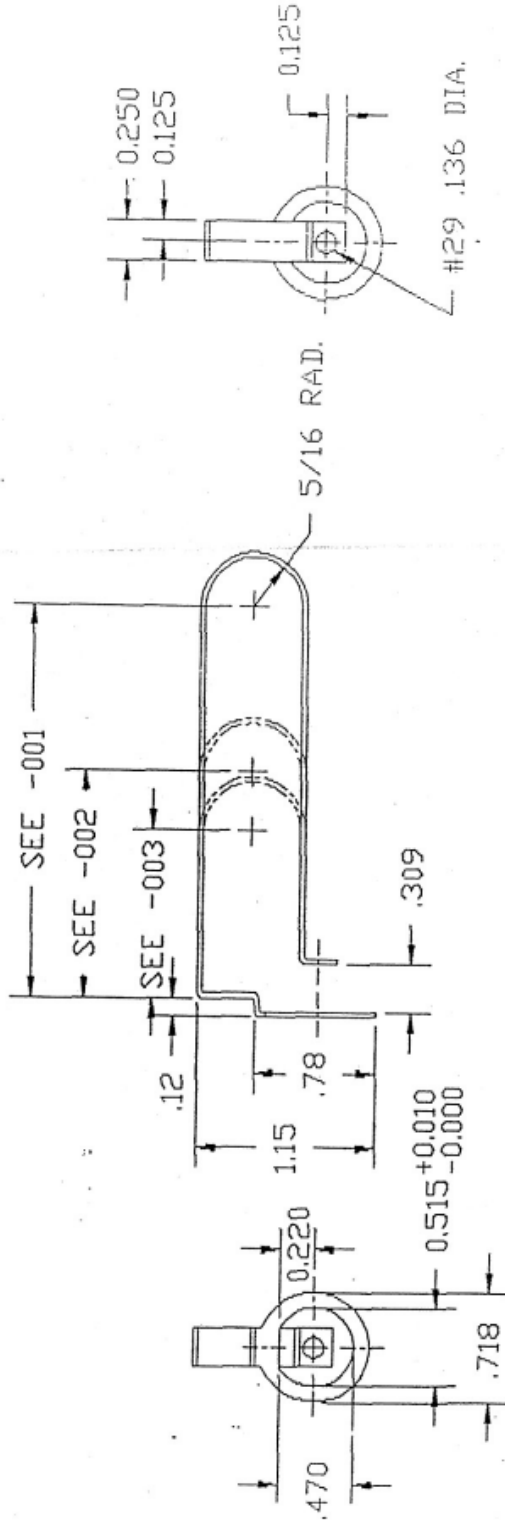
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3184 Quebec Street  
Dallas, Texas 75247

# NOTES:

1. MAT'L: COLD ROLLED COPPER SHT. .031 THK. (009043-006)

IMPORTANT

- A ECN 313
- B ECN 317
- C ECN 330
- D ECN 2697
- E ECN 3689
- F ECN 3846
- G ECN 3888
- H ECN 5403



DASH NO.	LENGTH
-001	2.500
-002	1.437
-003	1.062

QTY

Make Loops { 3 x -  
3 x -

HAM LOOPS

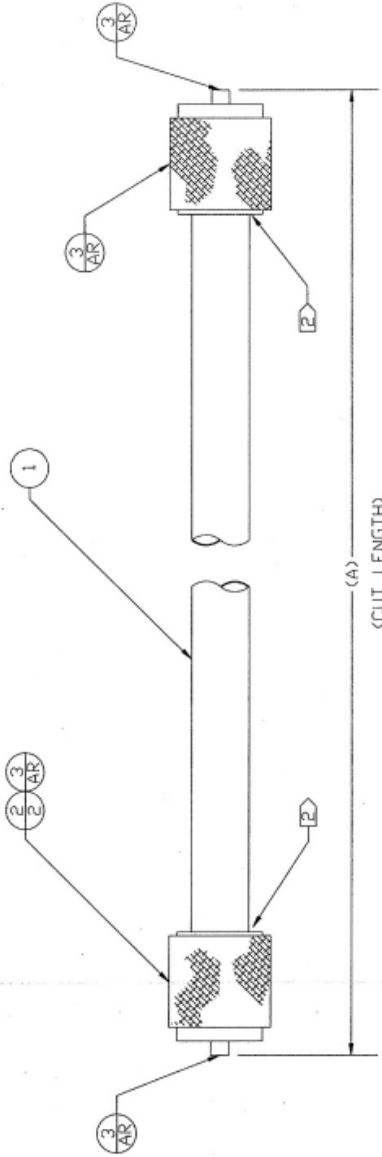
TOLERANCES		TITLE LOOP COUPLING		MATERIAL SEE NOTE 1		FINISH	
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES		5" ALUM. CAVITIES				DECIBEL PROD.	
FRACTION DECIMAL		DRAWN M.H.		DATE 6/12/68		REV.	
±1/32		CHK. R.C.T.		DATE 3/11/69		SIZE	
±1/8		DESIGN		DATE		A 048017 -001	
REMOVE ALL BURRS AND SHARP EDGES PART SHALL CONFORM TO DB STANDARD PRACTICES		MFG.		DATE		H	
048023		RELEASED F.D.S.		DATE 3/12/69		DO NOT SCALE	
NEXT ASSEMBLY						SMT. 1 OF 1	

REV.	DESCRIPTION	DATE	APP.
	SEE SEPARATE SHEET FOR REVISIONS		

REV.	DESCRIPTION	DATE	APP.
	SEE SEPARATE SHEET FOR REVISIONS		

NOTES:  
 1. FOR PROPER CABLE TRIMMING AND CONNECTOR ASSEMBLY REFER TO CONNECTOR ASSEMBLY INST. 090001-000.  
 [2] DO NOT REMOVE EXCESSIVE JACKET MATERIAL AND EXPOSE SHIELD BRAIDING.

DASH NO.	(DIM "A")
-001	54
-002	30 1/2
-003	29 1/2
-004	12
-005	8
-006	16 1/2
-007	14 3/4
-008	4
-009	59
-010	49
-011	41
-012	7 1/2
-013	6
-014	12 1/2
-015	3
-016	43 1/2
-017	23 1/2
-018	29 1/4
-019	41 3/4
-020	8 1/2
-021	9
-022	14
-023	6 3/4
-024	9 1/2
-025	14 1/2
-026	42



QTY.	ITEM	PART NO.	DESCRIPTION	U/M
2	002003-042	SOLDER, .063 DIA CRYSTAL 502		LB
2	001011-003	CONNECTOR - UHF - (PL259)		EA.
1	009006-081	CABLE, COAXIAL - (RG214)		IN

<b>ALLEN TELECOM</b> DECIBEL PRODUCTS 8635 STEMMONS FRWY. DALLAS, TEXAS 75356-9610		TITLE: CABLE ASSEMBLY BANDPASS CAVITY 5 IN AL CAVITIES/DB4030/32	
MATERIAL: N/A FINISH: N/A DATE: 02-19-69 DATE: 03-10-69		SIZE: A DRAWING No. 048117-001/026 REV. P	
DRAWN BY: MH CHECKED: N/A ELEC. ENG.: N/A MECH. ENG.: N/A RELEASED: RCT		DATE: 03-10-69 REMOVE ALL BURRS AND SHARP EDGES. PART SHALL CONFORM TO DB STANDARD PRACTICES.	
SEE WHERE USED NEXT ASSEMBLY			

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# DB-4048

## DUPLEXER

IMPORTANT: TO MAINTAIN MAXIMUM ISOLATION USE DOUBLE SHIELDED OR SOLID OUTER CONDUCTOR COAXIAL CABLE FROM THE DUPLEXER TO THE TX AND RX CHASSIS.

### GENERAL

Model DB-4048 duplexer is designed for use with duplex stations or repeaters operating with close frequency spacing in the 146 – 174 MHz band. This model is primarily designed to provide minimum insertion loss and maximum isolation when used in systems having a frequency separation of 500 KHz – 2 MHz but can be used beyond these limits. Under certain conditions, it is also suitable for multiplexing two transmitters, two receivers or two push-to-talk stations into a common antenna.

or may be field-tuned if the following equipment is available:

1. A signal generator (50 ohms) capable of producing a signal at the transmitter and receiver frequencies.
2. A receiver tuned to the desired lower frequency signal.
3. A receiver tuned to the desired higher frequency signal.
4. Two 50 ohm pads.

### FIELD TUNING

The duplexer is factory-tuned to the exact operating frequencies and shipped ready for immediate installation. No further field tuning or adjustment is required. If it becomes necessary to change the operating frequencies of the duplexer it may be returned to the factory for retuning.

### FIELD TUNING PROCEDURE

1. Connect equipment as shown in Figure 1.  
Note: If receivers are not 50 ohms place 50 ohm pads as shown.

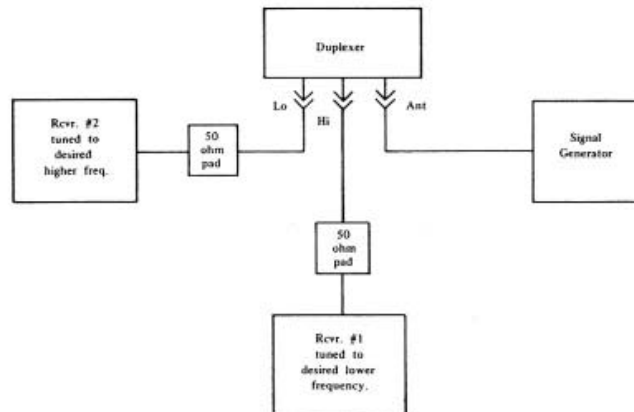
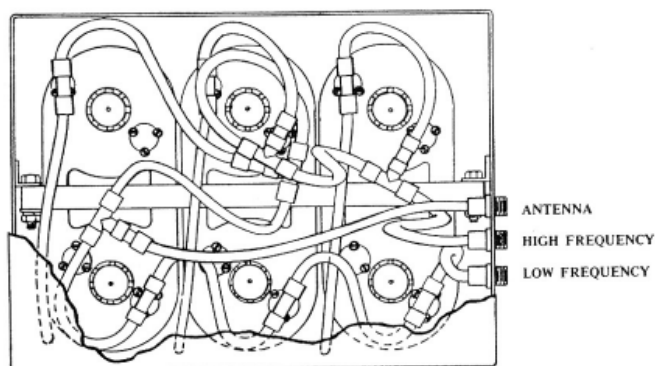


Figure 1

NOTE: Lo and Hi refer to the pass frequency inputs, transmitter or receiver, depending upon which is the lower or higher frequency.

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2. See Figure 2, for location of low frequency and high frequency cavities in the duplexer.
3. Tune the signal generator to the desired low frequency. Tune each high frequency cavity for minimum signal into receiver #1. (Clockwise on tuning screw decreases resonant frequency of cavity.)
4. Lock tuning screw shaft nut after tuning each cavity.
5. Tune the signal generator to the desired high frequency. Tune each low frequency cavity for minimum signal into receiver #2.
6. To summarize: tune the high frequency cavities to reject the low frequency; and tune the low frequency cavities to reject the high frequency.



NOTE:

1. Cavities 1, 2, and 3 are high frequency cavities.
2. Cavities 4, 5, and 6 are low frequency cavities.

Figure 2. Duplexer Lay Out

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