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 duplexer 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. 11521) 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.
TYPICAL DUPLEX RESPONSE CURVES

Tx frequency
Rx frequency

ATTENUATION (dB)

FREQUENCY (MHz)

-2 -1 0 +1 +2 +3

TYPICAL OPERATION
(155–174 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 the receiver is adjusted to pass the received signal from the antenna to the receiver with a low insertion loss while rejecting that part of the transmitter carrier which occurs at the receive frequency.

RECEIVE OPERATION
The receive section of the duplexer also consists of three quarter-wave cavities and the receiver 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 receive 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-5C8 Duplexer W/Hoffman #A-30-24-16LP weatherproof 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 enamal
Net weight 95 lbs
Shipping weight 120 lbs.
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 L2

Lower freq. pass
Input

Blank disc
or
Remove loop
from loop/
connector
assembly

Higher freq. pass
Input

Use shorter
loops in the
3 cavities

Use longer
loop
in these 3
cavities

All cable lengths are 12½ inches, for best results use RG-5 cable

Grounded side of loop
should be pointed toward
cavity center
conductor

Shorter loop

Longer loop

CAVITY - DB4015
1/0 FREQ SIDE
3 EA SHORO LOOP 048017-003
8 EA LONG LOOP 048017-002

Hi Freq. Side

Loop/connector assembly
Full scale drawing

DECIBEL PRODUCTS, INC.
3184 Quebec Street
Dallas, Texas 75247
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 166 – 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.

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 returning 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 PROCEDURE

1. Connect equipment as shown in Figure 1.

Note: If receivers are not 50 ohms place 50 ohm pads as shown.

![Diagram](image)

Figure 1

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

DECIBEL PRODUCTS, INC.
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