

**INSTALLATION AND
TUNING INSTRUCTIONS
“P” and “Q” SERIES
CAVITY DUPLEXERS
CM-1008**

ENCLOSURES

DescriptionCI-1063
Electrical Specifications, “P” SeriesCI-1064
“Q” Series.....CI-1065
Preliminary Tuning “P” and “Q” SeriesCI-1066
Dimensions and Outlines “P” and “Q” SeriesCI-1067
Single Cavity Descriptions “FP”, “FR”, “FQ”.....CI-1051
Retuning Instructions “P” SeriesCI-1068
Retuning Instructions “Q” SeriesCI-1069A,B
Recommended Tools, Equipment
and Replaceable Parts “P”, “Q” SeriesCI-1070

“P” and “Q” Series Duplexers

Description

The Sinclair 7 inch diameter filters for installation and tuning instructions are described on the following pages as they apply to the bandpass and “Q” circuit duplexers.

Typical models and specifications are described for reference only. Other models and additional specifications are available through their catalog or by contacting sales or engineering departments but the same tuning instructions will apply.

Basic advantages for using a duplexing system.

- (a) Single antenna required-with appropriate gain and band width.
- (b) Only one transmission line required with no extra filters.
- (c) Reduced installation costs.
- (d) Reduced congestion of antennas on towers, allowing for additional antenna space.

“P” Series Duplexers

This series combines the high performance cavities into a bandpass duplexer for superior performance in the LOW, VHF and UHF MHz bands and are suitable for extremely congested areas to relieve IM from high level in receiver front ends and to reduce transmitter spurious and overall extraneous radiations.

“Q” Series Duplexers

This series also utilize the same high performance cavities, but in a Sinclair “Q” circuit design in the VHF and UHF MHz bands. These duplexeres have a broader rejection characteristic then those of a standard notch filter and have special tuning circuits which give a bandpass characteristic around the TX and RX frequencies.

“R” Series Duplexers

This series of band-reject duplexers covering the low frequency band of 30-50 MHz are also available, but because of a special helical coil design, reduced lengths, and tuning procedures, they are described in a separate manual.

“P” Series Bandpass Duplexers

CI-1064

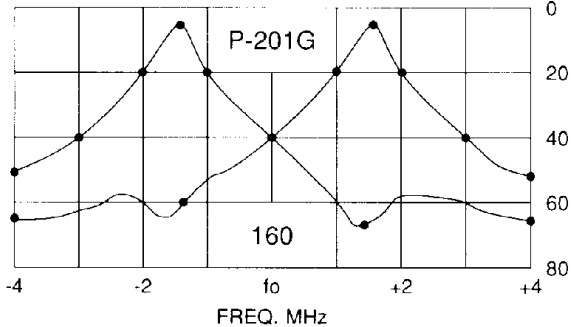
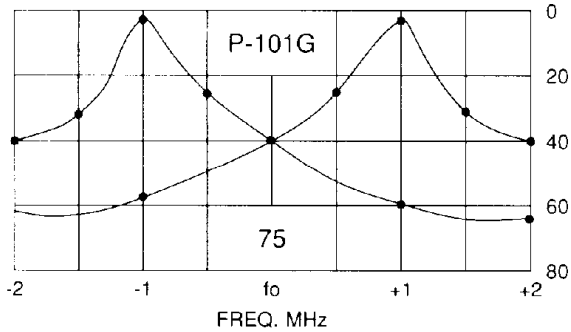
Electrical Specifications	P-101 G*	P-201G*	P-301G*
FREQUENCY RANGE MHz	66-88	132-174	406-512
FREQUENCY SEPARATION MHz	2 Min.	3 Min.	5 Min.
INSERTION LOSS dB			
Tx to ANT.	1.2 dB MAX.		
Rx to ANT.	1.2 dB MAX.		
ISOLATION dB Min.			
Tx NOISE SUPPRESSION AT Rx	52	55	53
Rx ISOLATION AT Tx	52	55	53
Between Duplex Freq.	80 min.		
Tx to Tx	80	80	80
VSWR	1.5:1 max.		
POWER RATING watts	350	400	350
TERMINATIONS	TYPE “N” FEMALE		
TEMPERATURE RANGE	-40° C TO + 60° C		
Note: (1) VSWR is referenced to 50 ohms (2) Specify transmit and receive frequencies when ordering			

* R=Rack Mount C=Cabinet Mount

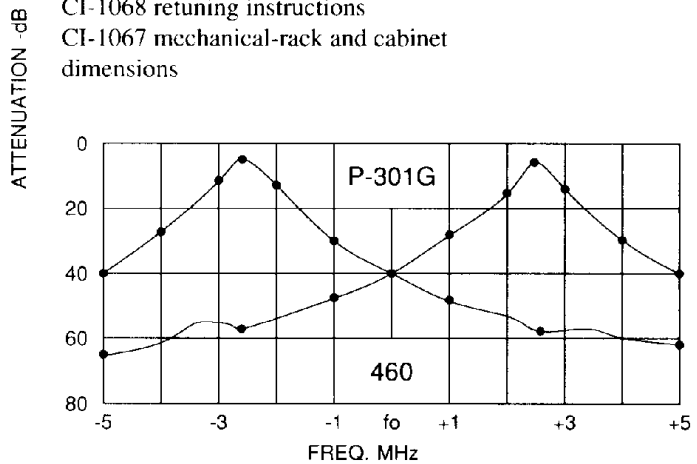
Note 1: The duplexers are furnished in the following sub-bands, and because the inter connect cables lengths change from one band to another the cables must be changed. Consult Sinclair Sales or Engineering Departments for lengths required.

Models: P-201G (132-150) (148-174) MHz

Models: P-301G (406-420) (450-512) MHz



Typical response curves are shown. Other models are also available other than those listed, but the same tuning instructions apply for bandpass duplexers. Refer to following pages:
 CI-1068 retuning instructions
 CI-1067 mechanical-rack and cabinet dimensions



**“Q” Series
Duplexers**

Electrical Specifications	Q-201G*	Q-202G*	Q-301G*	Q-318GM
FREQUENCY RANGE MHz	132-174		406-512	
FREQUENCY SEPARATION MHz (min.)	0.3 min.	0.5 min.	0.7 min.	2.0 min.
INSERTION LOSS db				
Tx to Ant.	2.2 max.	1.5 max	2.2 max.	1.5 max.
Rx to Ant.	2.2 max.	1.5 max.	2.2 max.	1.5 max.
Isolation: db				
Tx noise supression at Rx	95 min.	80 min.	100 min.	90 min.
Rx isolation at Tx	95 min.	80 min.	100 min.	90 min.
VSWR	1.5:1 max.			
Power Rating watts	350		250	
Terminations	Type “N” Female			
Temperature Range	-40°C to +60°C			
Note: (1) VSWR is referenced to 50 ohms				
(2) Specify transmit and receive frequencies when ordering				

* R=Rack Mount C=Cabinet Mount

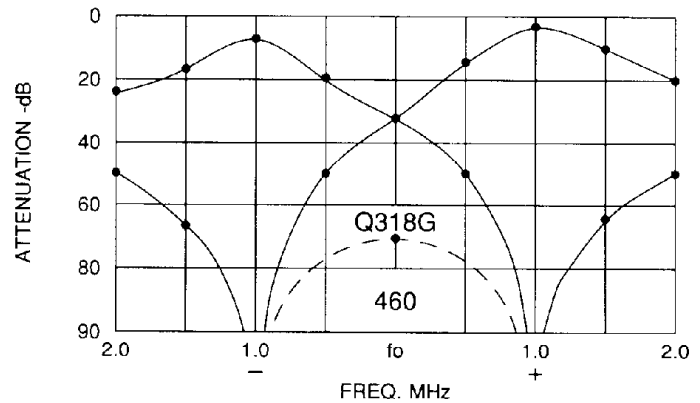
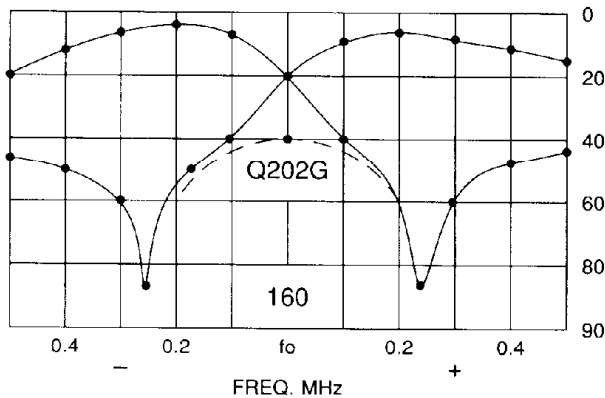
Note 1: The duplexers are furnished in the following sub-bands with one piece harness assemblies consisting of critical interconnect cable lengths. If changes are to be made from one band to another, the harness will have to be changed. Consult Sinclair Sales or Engineering Departments for new lengths required.

Models: Q-201G, Q-202G (132-150) (148-174) MHZ

Models: Q-301G, Q-318G (406-420) (450-512) MHZ

Typical response curves are shown. Other meodels are also available other than those listed, but the same tuning instructions apply for “Q” circuit duplexers.

Refer to the following pages: CI-1069A-B retuning instructions, CI-1067 rack and cabinet dimensions



MIDBAND ISOLATION

"P" and "Q" Series Duplexers

Preliminary Tuning Information

The duplexers can be field retuned in their respective sub-bands by following the tuning procedures as described on pages:

CI-1068 "P" Series

CI-1069A-B "Q" Series

The following sub-bands for the models are as follows:

(66-88) (132-150) (148-174) MHz

(406-420) (450-470) (470-512) MHz

If retuning is required outside of these sub-bands, changes in interconnect cable lengths will have to be made.

Fine tuning to within 10% of the frequencies as delivered will require a slight adjustment of the fine tuning bolt only on each cavity of the duplexer.

If retuning beyond 10% of the frequency as delivered, it will be necessary to make adjustments to both the coarse and fine tuning bolts and in some cases the loop assemblies may have to be rotated slightly to obtain the proper insertion loss settings at the new TX and RX frequencies.

In some cases, it may be advantageous and less time consuming when retuning to new frequencies to retune each cavity to the new frequency by disconnecting the cable from each cavity and retuning each to the new frequency. Then reconnect each cable into the duplexer configuration and fine tune the duplexer as described on pages CI-1068 or CI-1069A-B.

The single cavity configuration used in both the "P" and "Q" Series are described on page CI-1051.

“P” and “Q” Series Duplexers

The duplexers are available in either cabinet or rackmounted configurations as listed in the chart shown below. Other models or configurations are also available for special customer installations.

Other than the three standard cabinet versions shown, Sinclair also offers duplexer assemblies in open frame portable racks with castors for mobility, relay rack versions, or weather proof cabinets for outdoor use in floor or pole mount versions.

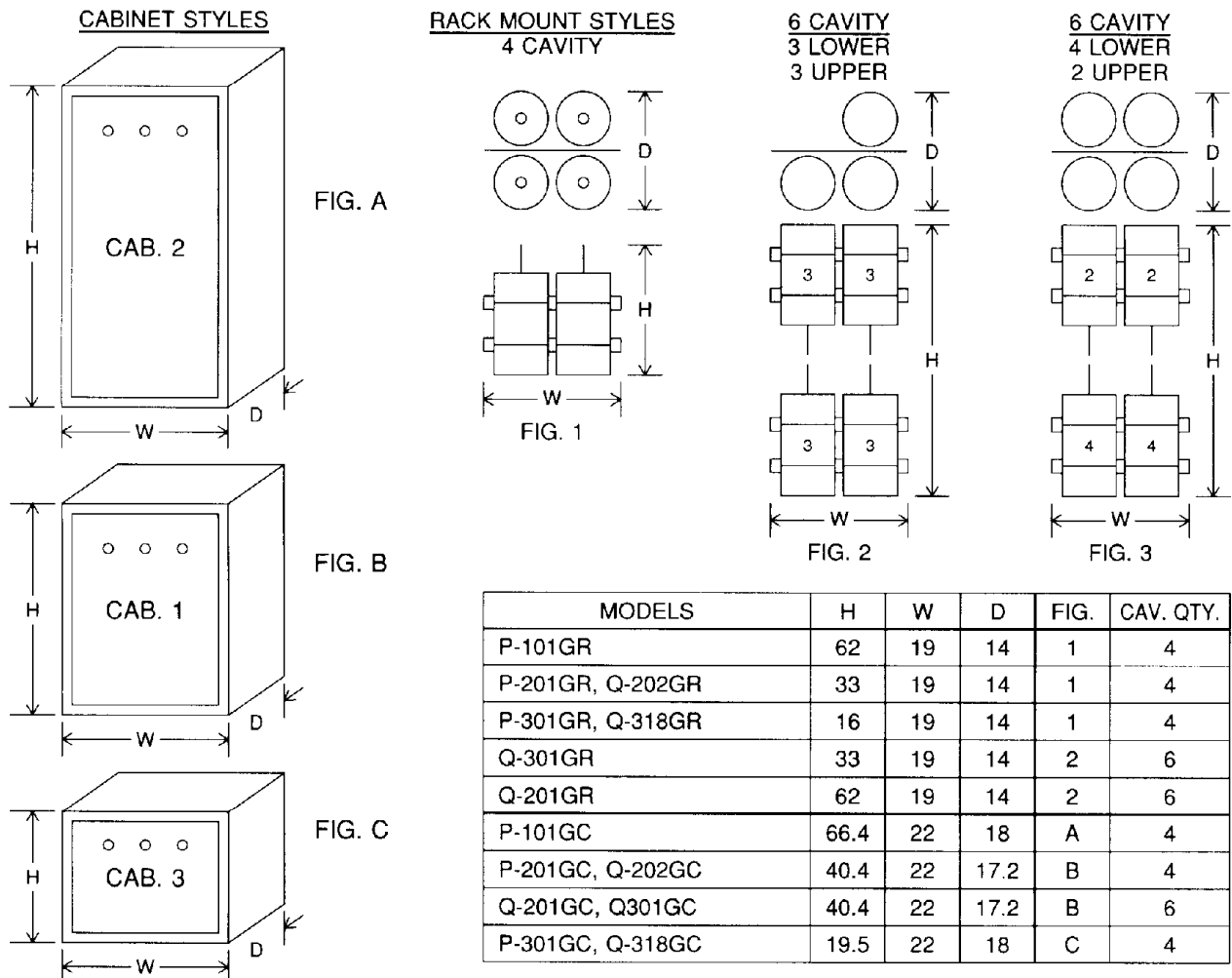
Field Conversion

Some of the models listed can be converted in the field from rack to cabinet mount or visa versa, using the existing cavities.

In either case, changes will have to be made to some of the mounting hardware, loops and interconnecting cables.

For conversion information, contact Sinclair Sales or Engineering for new parts required, prices, and instructions. In some cases it is recommended that the systems be returned to the factory to make these conversions

Standard production configurations are shown.



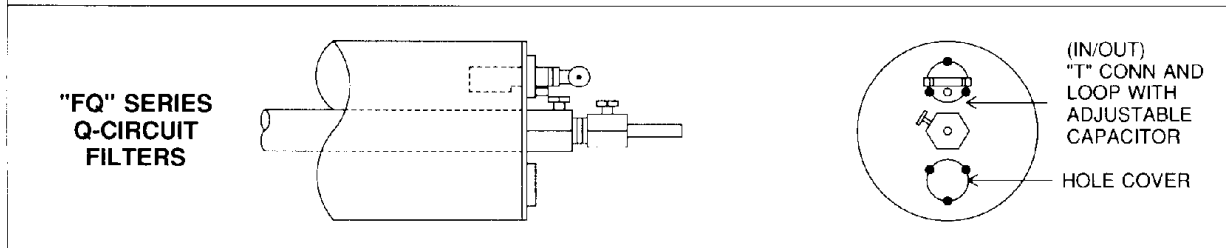
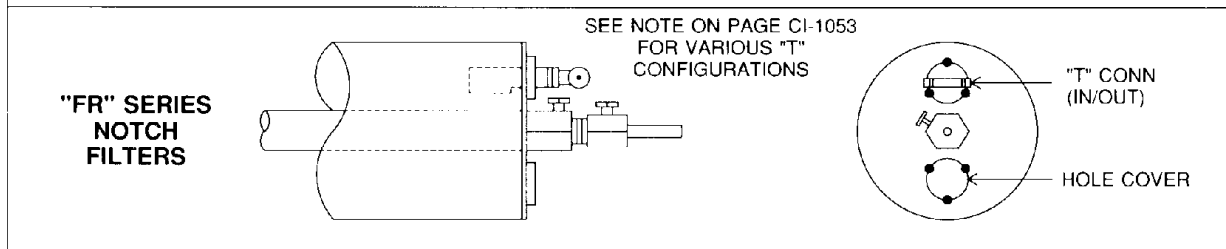
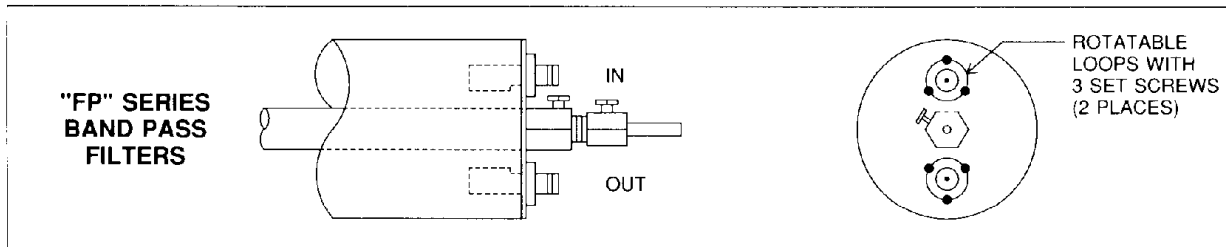
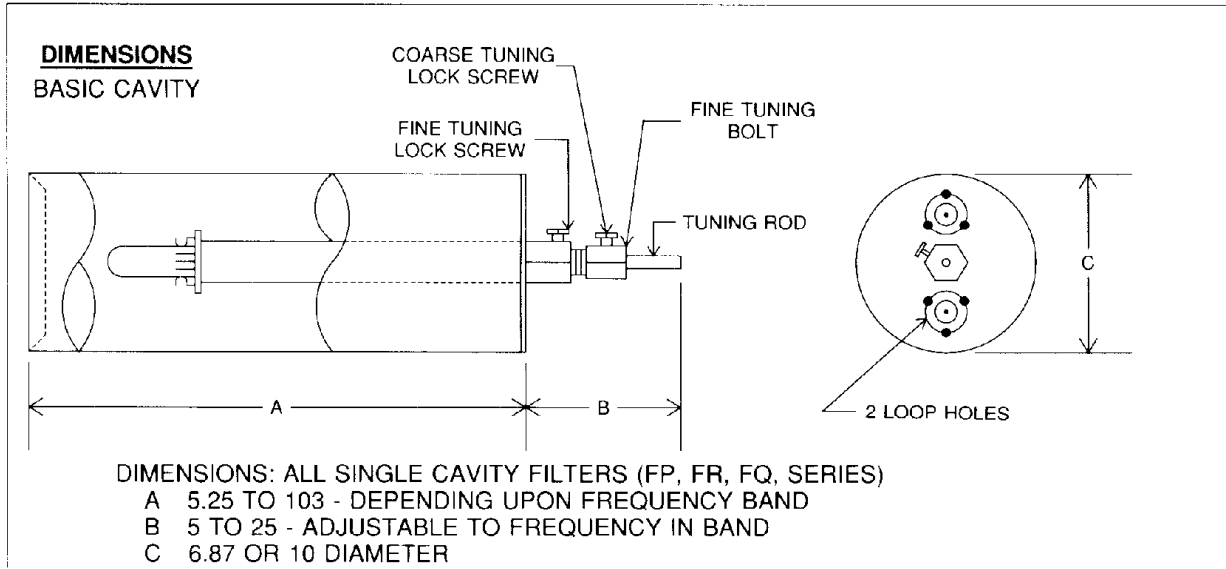
STANDARD PRODUCTION CONFIGURATIONS ARE SHOWN.



“FP”, “FR”, “FQ” Series 7 and 10 Inch Diameter Cavity Filters

Description

The basic filter is constructed of a 7-inch diameter aluminum cylinder with a coaxial inner conductor of brass and copper. Silver plating and chromate conversion coatings are used to inhibit corrosion and enhance performance. Temperature compensation is achieved through the use of an invar tubing rod, which results in extremely low frequency drift over the operating temperature range, typically 0.5 ppm/°C.

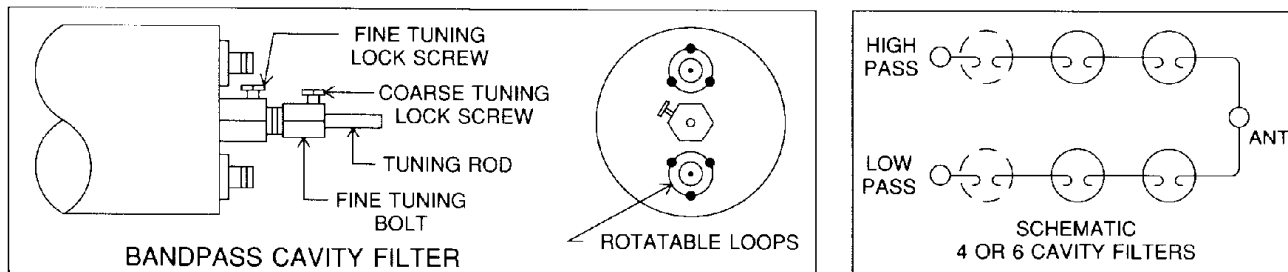


“P” Series Bandpass Duplexers

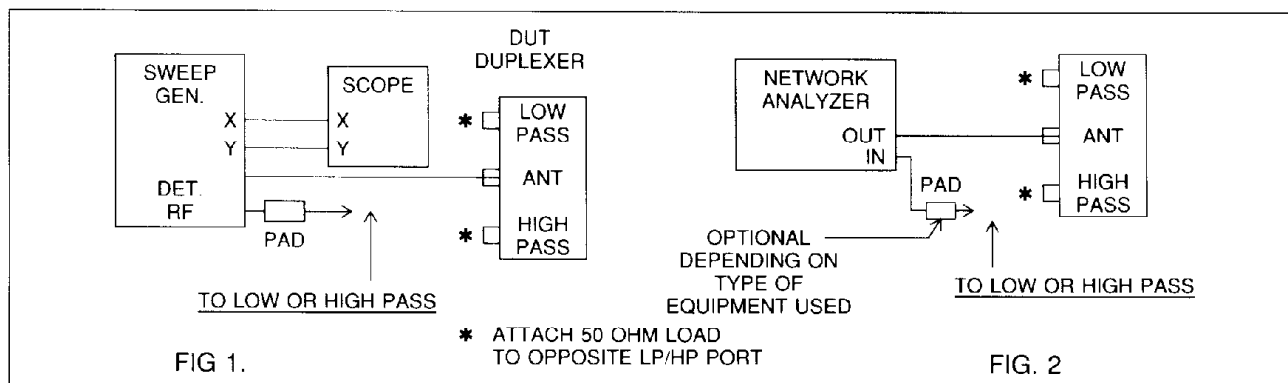
Retuning Instructions

Before attempting field retuning, refer to page CI-1066 for some precautions which should be adhered to.

The duplexer is pre-tuned to the exact frequencies as ordered. No further tuning or adjustment is required. Retuning instructions are furnished for the purpose of readjustment in the event of frequency changes in the associated equipment in the field.



The duplexer is tuned using either test setup as shown in Figures 1 or 2. It is recommended to use a 6-10 dB, 50 OHM pad in the input lines in order to reduce VSWR reflections which may be introduced in the test equipment being used. (refer to CI-1070)



The cavity filters are equipped with adjustable coupling loops to facilitate insertion loss settings without removal or replacement of the loops. To change to a new insertion loss other than as was preset at time of delivery, unlock the three holding set screws on each loop and rotate each loop equally to obtain the required insertion loss.

If the insertion loss setting is changed, fine tuning will be necessary because changes in coupling affects resonance.

Tuning Procedure

Each cavity has a coarse tuning adjustment for large changes in frequency and a fine tuning adjustment for small changes in frequency. Coarse tuning is accomplished by unlocking the coarse tuning lock screw and sliding the tuning rod in or out. Fine tuning adjustments are made by locking the coarse tuning lock screw securely and loosening the fine tuning lock screw, then rotating the fine tuning bolt.

1. Set the frequency to be passed into the high pass terminal and detect it at the antenna terminal with the low pass terminal terminated with 50 OHMS. Adjust the high pass tuning rods for maximum signal.
2. Set the frequency to be passed into the low pass terminal and detect it out the antenna terminal with the high pass terminal terminated with 50 OHMS. Adjust the low pass tuning rods for maximum signal.

Repeat steps 1 and 2 then tighten all tuning rod lock nuts securely into position. Finally check that both high and low are tuned to the new frequencies and VSWR (return loss) is 1.5:1 or greater at both frequencies.

Note: Pushing the tuning rod or turning the fine tuning bolt in, lowers the resonance of the filter.

WARNING: Do not tune with the TX keyed into the duplexer.

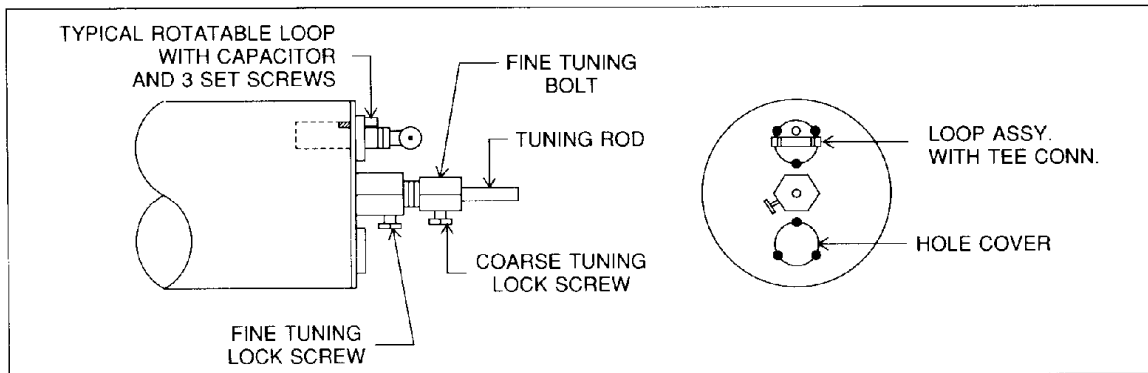
SINCLAIR

“Q” Series Duplexers

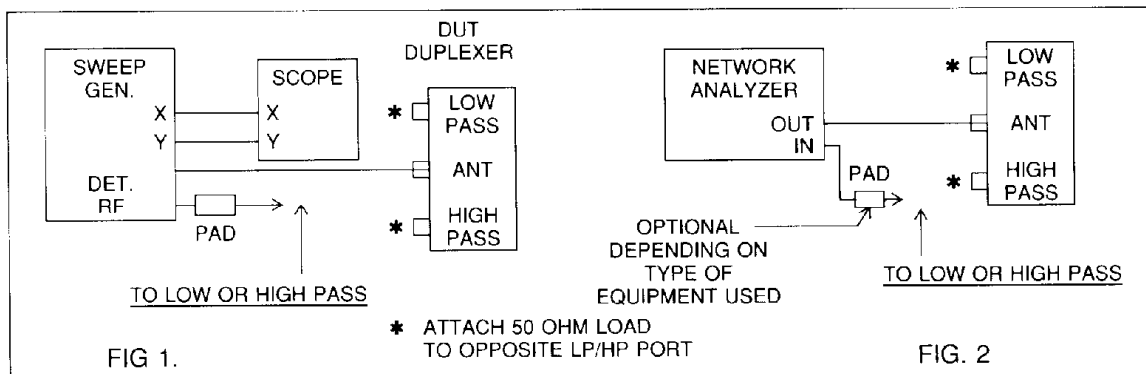
Retuning Instructions

Before attempting field retuning, refer to CI-1066 for some precautions which should be adhered to.

The duplexer is pre-tuned to the exact frequencies as ordered. No further tuning or adjustment is required. Retuning instructions are furnished for the purpose of readjustment in the event of frequency changes in the associated equipment in the field.



The duplexer is tuned using either test setup as shown in Figures 1 or 2. It is recommended to use a 6-10 dB, 50 OHM pad in the input lines in order to reduce VSWR reflections which may be introduced in the test equipment being use. (refer to CI-1070)



The cavities are equipped with an adjustable coupling loop to facilitate insertion loss setting. The loop also has a variable capacitor attached which is externally adjusted to tune to the reject frequency either high or low. The size and position of the loop determines the insertion loss of the filter. The loop is preset at the factory as determined at time of order. To change to a new insertion loss, unlock the three holding set screws on the loop and rotate it to the new insertion loss required.

Tuning of the pass frequency is accomplished by adjusting the tuning rod. Pushing the tuning rod or the fine tuning bolt in, lowers the pass frequency of the filter. The capacitor is adjusted to obtain either the low or high pass reject frequency.

continued on pg. CI-106B

"Q" Series Duplexers

Tuning Procedure

The cavity has a coarse tuning adjustment for large changes in frequency and a fine tuning adjustment for small changes in frequency at the passband required. Coarse tuning is accomplished by unlocking the coarse tuning lock screw and sliding the tuning rod in or out. Fine tuning adjustments are made by locking the coarse tuning lock screw securely and loosening the fine tuning lock screw, then rotating the fine tuning bolt, for maximum signal.

To tune to the reject frequency, remove the cover from the capacitor located on the loop and adjust the capacitor for minimum signal at the reject frequency.

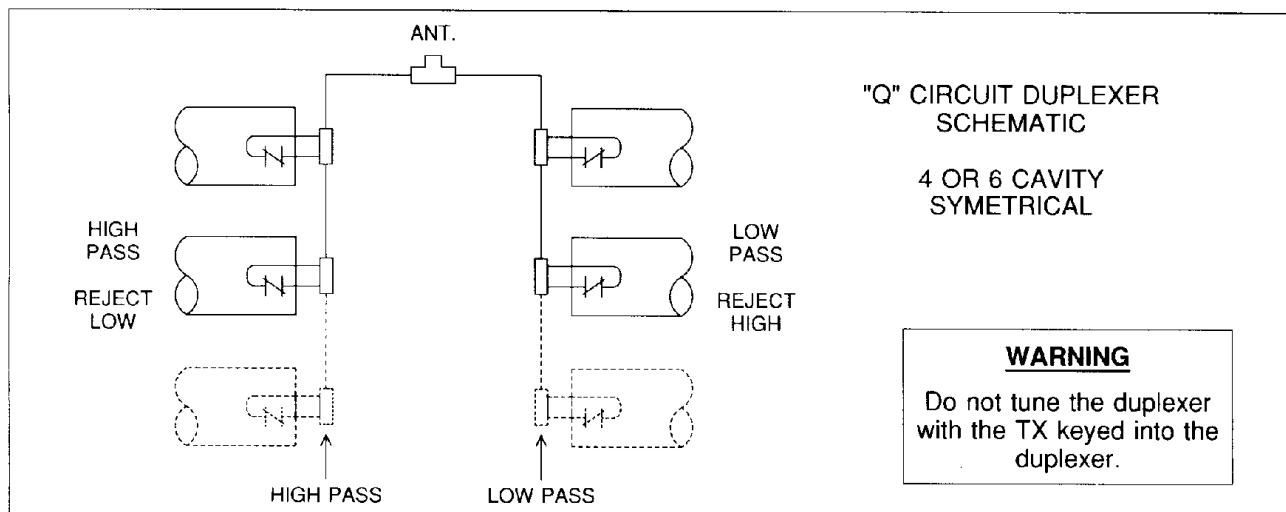
Procedure

To retune the duplexer, loosen the tuning rod lock screws reference CI-1069A.

1. Set the frequency to be passed into the high pass terminal and detect it at the antenna terminal with the low pass terminal terminated with 50 OHMS. Adjust the high pass tuning rods for maximum signal.
2. Set the frequency to be passed into the low pass terminal and detect it out the antenna terminal with the high pass terminal terminated with 50 OHMS. Adjust the low pass tuning rods for maximum signal.
3. Set the frequency to be rejected into the high pass terminal and detect at the low pass terminal - adjust the capacitors at the high pass cavities for minimum signal.
4. Set the frequency to be rejected into the low pass terminal and detect at the high pass terminal - adjust the capacitors at the low pass cavities for minimum signal.

Repeat steps 1-4 then tighten all tuning rod lock screws securely into position. Finally check that both high and low are tuned to the new frequencies and VSWR (return loss) is 1.5:1 or greater at both frequencies.

After final tuning, both fine and coarse tuning set screws must be tightened down securely and the capacitor cover is to be replaced.



“P” and “Q” Series Duplexers

Tools Required:

5/16 Hex or open end wrench
7/8 open end wrench
Phillips head screwdriver

Recommended Equipment (or equivalent)

Refer to tuning instructions pages CI-1068 or CI-1069A-B

Fig. 1-Sweep generator

Hewlett Packard-Model 8754

Oscilloscope

A/R 6-10 dB, 50 OHM attenuator (pad)

Fig. 2-Network analyzer

Hewlett Packard-Model 8752 A

300 KHz-3 HGz

Replacement Parts

Replacement parts are available for the various models of this series of filters.

Contact the Sinclair Sales or Engineering Departments for delivery, minimum order requirements, prices and replacement parts for other models of filters not described in the tuning instructions.

- Cavity assemblies less loops:
 - No. 350722-(*) 7 inch diameter cavities
 - (*) specify frequency required for all series.
- Loop assemblies for “P” Series Bandpass filters:
 - No.s 350326 406-512 MHz
 - 350324 132-174 MHz
 - 351225 30-88 MHz
- Loop assemblies for “Q” Series filters:
 - No.s AD-4350-1. 406-512
 - 350714 132-174
- Cavity Hole Cover. No. 246512
- Tee connector for the “Q” Series UG 107B/U
- Capacitors for the “Q” Series loops . . . No. 5602 VHF
 - No. 5202 UHF
- Cabinets for “P” and “Q” Series duplexers:
 - Models CAB 1 40.4 H, 22 W, 17.2 D
 - CAB 2 66.4 H, 22W, 18.0 D
 - CAB 3 19.5 H, 22 W, 18.0 D
- Cavity Filter mounting brackets:
 - 19 in. rack mount:
 - Quad 7 in. dia. cavity FMB.7-4
 - Dual 7 in. dia. cavity FMB.7-2