TUNING INSTRUCTIONS
SINCLAIR MODELS:

Q-202G, Q-208G, Q-218G
Q-2B01G, Q-2B02G, Q-2B17G

Manual CM-112

& UHF TYPES

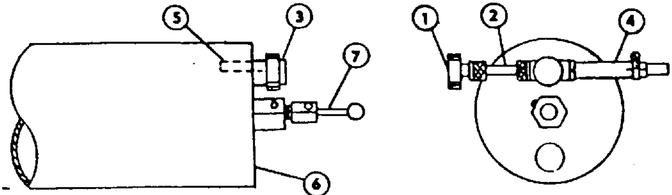
STUB TYPE

SINCLAIR RADIO LABORATORIES

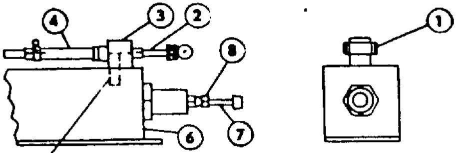
P.O. Box 23 675 Ensminger Road, Tonawanda, New York 14150 (716) 874-3682

SINCLAIR RADIO LABORATORIES
675 Ensminger Road, Tonawanda, New York 14150 (716) 874-3682

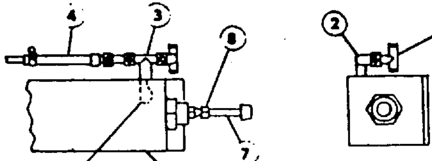
Q-CIRCUIT FILTERS



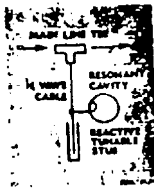
7 AND 10 INCH DIA. CAVITIES
132-512 MHz



3 INCH SQ. CAVITIES
406-512 MHz



3 INCH SQ. CAVITIES
800-960 MHz



SCHEMATIC REPRESENTATION

1. MAIN LINE TEE CONNECTOR ACROSS WHICH THE FILTER SECTION RESPONSE OCCURS.
2. 1/4 WAVE (APPROX) STAND OFF CABLE.
3. TEE JUNCTION ACROSS THE CAVITY INPUT OR Q-SWITCH BOX.
4. ADJUSTABLE REACTIVE TUNABLE STUB SECTION. (REFER TO DS-1025 FOR TUNABLE STUB DESCRIPTION.)
5. LOOP WHICH COUPLES INTO THE CAVITY. THE SIZE AND POSITION OF THE LOOP DETERMINES THE INSERTION LOSS OF THE FILTER SECTION. IN GENERAL, THE LARGER THE LOOP, THE SMALLER THE INSERTION LOSS.
6. RESONANT CAVITY BODY.
7. SLIDING TUNING ROD WITH KNOB.
8. TUNING ROD LOCK NUT.

TUNING INSTRUCTIONS

MODELS: Q-202G, Q-208G, Q-218G
Q-2801G, Q-2802G, Q-2817G

IN GENERAL

THE DUPLEXERS CAN BE RETUNED TO A MINIMUM OF 500 KHZ SPEARATION IN THEIR RESPECTIVE BANDS (Q-202G AND Q-208G - 148-174 MHZ; Q-2801G AND Q-2802G - 132-148 MHZ). BOTH BANDS ARE SPLIT IN HALF FOR PURPOSES OF OPTIMIZING STANDOFF CABLES, L2, SEE ID-3099. THEREFORE, IF THE DUPLEXER YOU ARE RETUNING HAS TO BE SHIFTED OUT OF ITS ORIGINALLY ORDERED FREQUENCY SUB-BAND (AS STATED ABOVE) YOU WILL HAVE TO CHANGE L2 CABLES TO REALIZE OPTIMUM SPECIFICATIONS.

WHEN RETUNING A DUPLEXER TO FREQUENCIES VERY CLOSE TO THE ORIGINALS (APPROXIMATELY ± 1 MHZ OF MEAN FREQUENCY) FOLLOW STEPS (1) THROUGH (6) TO COMPLETE TUNING. WHEN A GREATER SHIFT IS NEEDED THEN FOLLOW STEPS (1) THROUGH (6) THEN REPEAT (3)(4)(5)(6) IN THIS ORDER.

EQUIPMENT

MINIMUM EQUIPMENT REQUIREMENTS FOR TUNING ARE: FM SIGNAL GENERATOR (MEASUREMENTS MODEL 560M OR EQUIVALENT), RECEIVERS ON EACH OF THE TWO DUPLEX FREQUENCIES (OR ONE WHICH WILL TUNE BOTH) AND A FIRST LIMITER MONITOR METER. SEE CI-096 FOR BASIC TEST CIRCUIT. SHEETS ID-3099 AND ID-3019 GIVE CIRCUIT DIAGRAM AND INDIVIDUAL CAVITY DETAIL RESPECTIVELY.

PROCEDURE

AS YOU FOLLOW BELOW STEPS BE CERTAIN TO ADJUST THE OUTPUT OF THE SIGNAL GENERATOR AS NECESSARY TO MAINTAIN A READABLE BUT UNSATURATED LEVEL ON THE FIRST LIMITER MONITOR.

1. INJECT HIGH DUPLEX FREQUENCY INTO HFT (HIGH FREQUENCY TERMINAL) AND DETECT IT AT ANTENNA TERMINAL. (MONITOR 1ST LIMITER OF RECEIVER ON THAT FREQUENCY.) ADJUST THE CAVITY TUNING ROD OF C1 AND C2 FOR MAXIMUM SIGNAL TO RECEIVER.

2. INJECT LOW DUPLEX FREQUENCY INTO LFT (LOW FREQUENCY TERMINAL) AND DETECT IT AT ANTENNA TERMINAL. ADJUST THE CAVITY TUNING ROD OF C3 AND OF C4 FOR MAXIMUM SIGNAL TO RECEIVER.

3. INJECT LOW DUPLEX FREQUENCY INTO HFT AND DETECT IT AT LFT, ADJUST THE DIELECTRIC STUBS ON CAVITIES C1 AND C2 FOR MINIMUM SIGNAL TO RECEIVER. LOCK STUBS IN POSITION. OR TUNE CAPACITORS

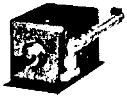
4. INJECT HIGH DUPLEX FREQUENCY INTO LFT AND DETECT IT AT HFT, ADJUST THE DIELECTRIC STUB ON CAVITIES C3 AND C4 FOR MINIMUM SIGNAL TO RECEIVER. LOCK STUBS IN POSITION. OR TUNE CAPACITORS

5. REPEAT STEP (1) THEN LOCK TUNING RODS IN POSITION.

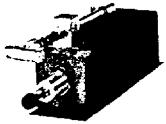
6. REPEAT STEP (2) THEN LOCK TUNING RODS IN POSITION.

132-960 MHz

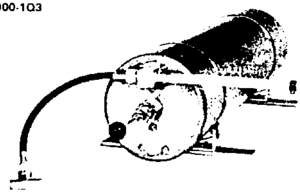
SINCLAIR Q-CIRCUIT FILTERS



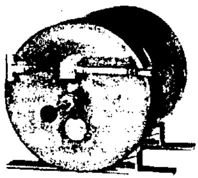
1-900-1Q3
2-900-1Q3



1-450-1Q3
2-450-1Q3



1-150-1Q7
2-150-1Q7
(Mounting clamps optional)



1-450-1Q10
2-450-1Q10
(Mounting clamps optional)

THE Q-CIRCUIT

- A SUPERIOR NOTCH FILTER, OFFERING
- BROAD ISOLATION CHARACTERISTICS
- PASSBAND SELECTIVITY
- VARIABLE PERFORMANCE OPTIONS

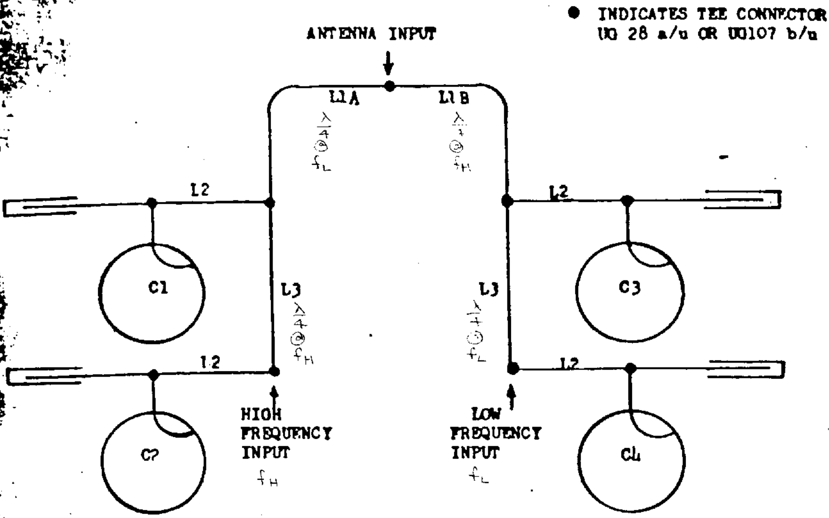
The advantages of the Q-circuit have been proven in its application to Sinclair's reputable line of close-spaced duplexers.

Attenuation of multiple frequencies relatively close to the operational channel can usually be accomplished with less channel loss and expense than by employing various combinations of bandpass and standard notch filters. The Q-circuit will be a valuable aid in solving your complex system design problems.

U.S. Patent Nos. 3717827, 3815137   Canadian Patent No. 836164
Patented also in Great Britian, France and Australia

INTERCABLING DIAGRAM

Q-2020, Q-2080, Q-2180
Q-2B010, Q-2B020, Q-2B170



L2 CABLE LENGTHS:
Q-2020: 148-161 = 10.5" / 161-174 - 9.5" Q-2080: 148-161 = 11.1" / 161-174=10.1"
Q-2B010: 132-140 = 12.0" / 140-148 = 11.0" Q-2B020: 132-140=12.7" / 140-148=11.6'

SEE ID-3019 FOR INDIVIDUAL FILTER SECTION DESCRIPTION
AND TUNING PROCEDURE

C1 and C2 ARE TUNED TO REJECT THE LOW FREQUENCY AND PASS THE HIGH FREQUENCY
TYPICAL VALUES ARE: 35 db REJECT .6 db INSERTION LOSS

C3 and C4 ARE TUNED TO REJECT THE HIGH FREQUENCY AND PASS THE LOW FREQUENCY
TYPICAL VALUES ARE: 35 db REJECT .6 db INSERTION LOSS

TYPICAL SPECIFICATIONS FOR THIS UNIT ARE:

INSERTION LOSS TX 1.5 db Rx 1.5 db

ISOLATION TX NOISE AT RX FREQUENCY 80 db
TX FREQUENCY AT RX TERMINAL 80 db

MINIMUM ISOLATION BETWEEN TX AND RX FREQUENCIES: 50 db

MINIMUM SEPARATION 500 KHz

GENERAL THEORY

The filter section response appears across tee connector 1 . A notch or rejection null is created at the unwanted frequency with the adjustable open circuited stub. The cavity probe is adjusted for minimum insertion loss at the desired pass frequency. (It will be noted that this filter operates in a reverse manner as compared with a conventional notch filter where the cavity probe tunes the rejection notch.)

PROCEDURE FOR RETUNING Q-SWITCH FILTER SECTIONS TO ORIGINAL DESIGN FREQUENCIES

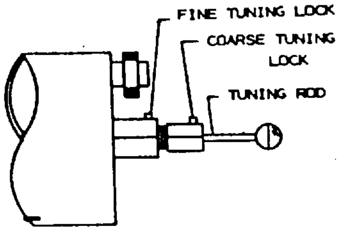
1. Feed the frequency to be passed across tee 1 and tune cavity prove for minimum insertion loss, the position of the adjustable stub has no effect on this step.

2. Feed the frequency to be rejected across tee 1 and tune the adjustable stub for a maximum attenuation of this signal.

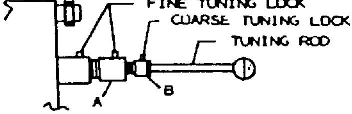
3. Repeat Steps 1 and 2 as a final check. The stub is always set last. The stub has no appreciable effect on the setting of the cavity probe for the pass frequency, but the setting of the cavity probe will affect the required setting of the rejected frequency. It is for this reason that the stub is set last. Lock cavity probe and stub in place.

TUNING OF 7 AND 10 INCH DIAMETER CAVITIES

The cavity has a coarse tuning adjustment for large changes in frequency and a fine tuning adjustment for very small changes in frequency. To use the coarse tuning adjustment, unlock the set screw (10-32x¼" Allen set screw) and push or pull the tuning rod. To use the fine tuning adjustment, lock the coarse tuning screw and loosen the fine tuning lock (10-32x¼" Allen set screw) then, turn the tuning bolt. (Pushing the rod in or turning the fine tuning bolt in, lowers the resonance of the filter.)

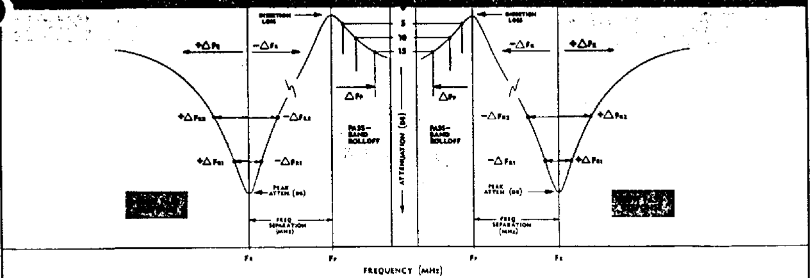


An optional fine tuning bolt is available on 7" and 10" diameter filters, i.e. all model numbers ending in S7 and S10. The rotational movement of fine tuning is converted into longitudinal movement of the center probe. This prevents potential abrading of the moveable probe which could occur from very frequent fine tuning. This option should only be ordered when the filter will be frequently tuned.



Coarse tuning adjustment is as stated above. To make fine tuning adjustments, first lock coarse tuning set screw lock. Next, loosen both fine tuning locks and rotate fine tuning bolt to tune. Then lock both fine tuning set scres.

For measurement techniques, see FIELD FILTER TEST CIRCUIT CI-096 AND CI-099



TERMINOLOGY

F_P designates the tuned pass frequency in MHz. The filter attenuation at this frequency is referred to as insertion loss.

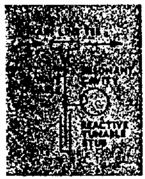
F_R designates the tuned notch frequency in MHz. The filter produces its peak attenuation at this frequency.

ΔF_P is the difference, in MHz, between F_P and any point of attenuation on the response curve in the region indicated as passband roll-off. ΔF_P is tabulated for three selected attenuations in this brochure.

$+\Delta F_R$ is the difference, in MHz, between F_R and any point of attenuation on the response curve in the shaded notch region, which defines the notch attenuation moving away from the tuned passband. Two points on the curve are tabulated and identified as $+\Delta F_{R_1}$ and $+\Delta F_{R_2}$.

$-\Delta F_R$ is the difference, in MHz, between F_R and any point of attenuation on the response curve in the area between the shaded notch region and the shaded passband roll-off. Two points on the curve are tabulated and identified as $-\Delta F_{R_1}$ and $-\Delta F_{R_2}$.

Q-CIRCUIT OPERATION



The Q-circuit, in effect, inverts the characteristic of a standard notch filter, and uses the narrow resonance notch to create the circuit passband while allowing the lower "Q" elements, as the loop and stub reactances, to produce the relatively broad isolation notch.

When the cavity is resonant, the short circuit produced at the junction is transformed to a high impedance a quarterwave away and allows energy to pass by the Tee on the main line.

When the cavity is off resonance, the stub reactance is tuned in parallel with the loop reactance to create a broad anti-resonant condition or high impedance at the cavity junction. This is transformed by the quarterwave cable to a short circuit across the Tee on the main line and produces the broad notch of isolation.

DATA FORMAT

The characteristic response of the Q-circuit makes it well suited for the attenuation of multiple frequencies, and it is superior to conventional bandpass or standard notch filters when the frequencies to be attenuated are relatively close to the channel or pass frequency. Applying the circuit to different size cavities ('Q' factor) and varying the insertion loss will produce various response curves which can be cascaded to achieve a desired overall attenuation versus frequency response.

In general, as any combination of the following, frequency separation, insertion loss, or cavity 'Q' (size), is increased, the notch attenuation will increase, the notch width will increase, and the passband roll-off rate will increase. The reverse of this is also true.

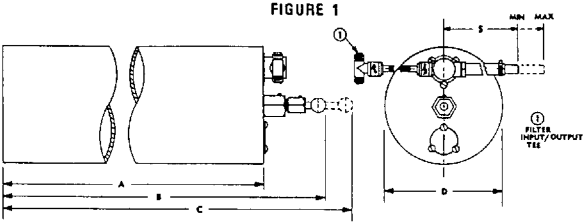
Only key points on the response curve have been tabulated allowing essentially 52 filter responses to be presented. The data shown has basically two limits. The first is the minimum frequency separation which can be tuned, the second is the frequency separation at which point the peak notch attenuation saturates.

Theoretically, any separation greater than the minimum may be tuned, but factory assistance may be required when frequency separations other than those originally ordered are to be tuned. This is due to the variations in dynamic range of the notch-tuning stub designs.

The attenuation of frequencies between the tabulated points can be linearly interpolated to within 2 or 3 db. Notch values will tend to be optimistic and passband roll-off values pessimistic due to the response curvature. For a more accurate estimate, the key points may be plotted on any graph paper and the approximate response curve drawn. Pass-band roll-off toward the notch (not tabulated) will always be equal to or exceed the tabulated roll-off.

Multiple passband frequencies can also be accomodated, but conditions vary so widely that the factory should be consulted. Supplementary data will be provided on request.

FIGURE 1



Maximum Tuning Rod Extension

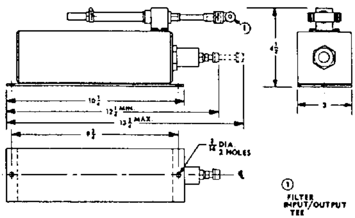


FIGURE 2

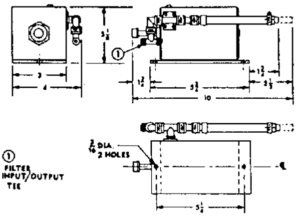
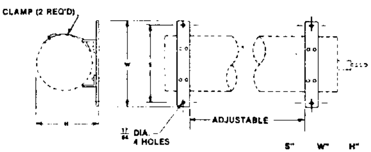
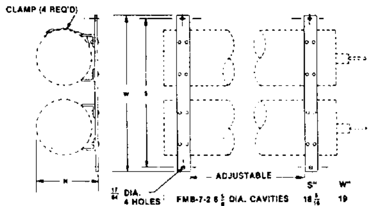


FIGURE 3



	S"	W"	H"
FMB-7-1 $6\frac{5}{8}$ DIA. CAVITY	$18\frac{5}{16}$	19	$7\frac{1}{8}$
FMB-10-1 10" DIA. CAVITY	$23\frac{5}{16}$	24	$10\frac{1}{2}$

FIGURE 4



	S"	W"	H"
FMB-7-2 $6\frac{5}{8}$ DIA. CAVITIES	$18\frac{5}{16}$	19	$7\frac{1}{8}$
FMB-10-2 10" DIA. CAVITIES	$23\frac{5}{16}$	24	$10\frac{1}{2}$

FIGURE 5

ORDERING INFORMATION

Specify pass and reject frequencies on order. Mounting clamps for 6-5/8" and 10" diameter filters must be ordered separately. UHF adaptors are available to convert the N female input and output connectors of a filter assembly to UHF female. Order number UG-146/U N to UHF adaptors as required. Interconnection cables for cascading single filter sections are detailed on the price list. Refer to the brochure section, "Cascading Filter Sections", for information concerning model numbers of multiple cavity filters.

SINCLAIR RADIO LABORATORIES

MONTREAL
Sinclair Radio Laboratories Limited
719 Lajoie Avenue
Dorval, Quebec H9P 1G7
(514) 636-1979
Telex No. 05822578

BUFFALO
Sinclair Radio Laboratories Inc.
675 Ensminger Road
Tonawanda, New York 14150
(716) 874-3682
Telex No. 00919198

TORONTO
Sinclair Radio Laboratories Limited
122 Rayette Road
Concord, Ontario L4K 1B6
(416) 669-1244
Telex No. 06964598

VANCOUVER
Sinclair Radio Laboratories Limited
4975 Regent Street
North Burnaby, B.C. V5C 4H4
(604) 291-7726
Telex No. 04354780

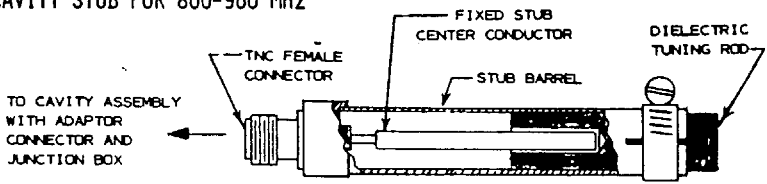
PRINTED IN CANADA

Q-SWITCH OPEN CIRCUITED STUB

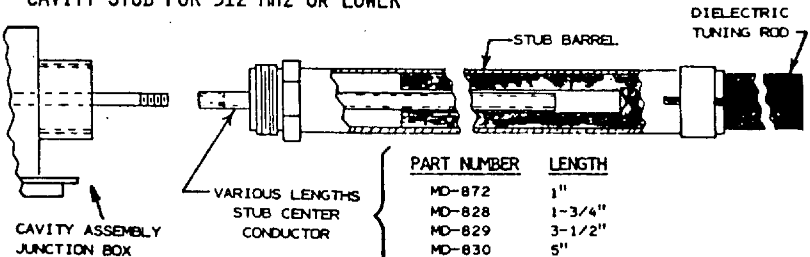
The stub is an open circuited section of coaxial transmission line, whose electrical length can be varied. Two types of stubs are shown. The one for 800-960 MHz cavities does not have changeable center sections. The second stub shown for cavities of 512 MHz or lower has two adjustments. A vernier adjustment is accomplished by sliding the dielectric tuning rod over the center conductor. A fixed change in the center conductor length is accomplished by changing center sections.

Depending on the particular Q-Switch Filter, the lengths and number of removable center sections vary. The removable center conductor lengths are chosen so that a continuous electrical length adjustment can be achieved with a slight overlap. Inserting the dielectric electrically lengthens the stub and withdrawing the dielectric shortens the stub. For example: when tuning the reject notch of the filter, if the dielectric pushes all the way in as a null is approached but not peaked, the stub center section wants to be longer. Remove the existing section and screw on the next longer one. Conversely, if the dielectric pulls out all the way as a null is approached but not peaked, remove the existing section and install the next shorter one. (The one inch section can be screwed on from either end thus giving the smallest length possible for the stub.) Stub center conductor sections for each filter are available if they are required for retuning. Please contact factory. When adjusting the stub in any filter circuit, the fixed center conductor section should be used where a minimum of 1/8" of dielectric rod covers an end of the center conductor at final setting. This is to insure mechanical stability.

CAVITY STUB FOR 800-960 MHz



CAVITY STUB FOR 512 MHz OR LOWER



PART NUMBER	LENGTH
MD-872	1"
MD-828	1-3/4"
MD-829	3-1/2"
MD-830	5"
MD-1555	6-7/16"

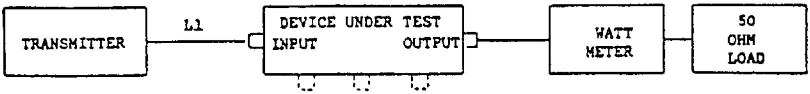
ATTENTUATION AND INSERTION LOSS FIELD MEASUREMENT TECHNIQUES

These instructions are intended to provide reasonably accurate insertion loss and attenuation measurements on filters, duplexers and multicouplers in the field using minimum test equipment.

INSERTION LOSS MEASUREMENTS

Two methods are presented, the first is used for measuring transmitter insertion loss using the transmitter and a wattmeter. The second method is general and can be used for either transmitter or receiver insertion loss measurements.

TRANSMITTER INSERTION LOSS MEASUREMENTS - The VSWR of the wattmeter should be 1.2:1 or less and the use of numerous adaptors in making connections should be avoided because the VSWR of these is often poor and will degrade the measuring system. UHF adaptors and connectors should be avoided when ever possible because their impedance characteristics vary widely with frequency.



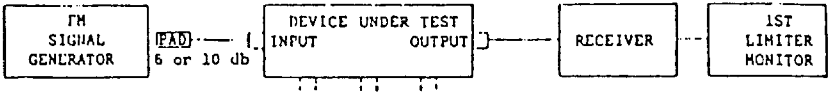
Install the device to be measured in the circuit as shown above, tune the transmitter for maximum power out. If the reflected power is not zero or near zero, then cable L1 should be adjusted to give the highest output power (lowest reflected power) when tuning the transmitter into the device. There will be some VSWR looking into the device and length L1 will determine the reactive component reflected to the transmitter. Because the adjustment range of the transmitter output is limited, it has been found that adjustment of L1 for maximum output can prove advantageous for lowest insertion loss.

An arbitrary length for L1 may be chosen and then varied by the addition of 1/8, 1/4, or 3/8 wavelengths, each time retuning the transmitter. The addition of one of these lengths, or the initial length of L1 will give maximum power out with a minimum of plate current. The trial lengths for polyethylene dielectric (solid) cables can be computed from these formulas.

$\lambda g/8 = 973/\text{freq. in MHz}$, $\lambda g/4 = 1946/\text{freq. in MHz}$, $3\lambda g/8 = 2919/\text{freq. in MHz}$

When maximum power output has been obtained through the device, note this power, then disconnect the device from the final length of L1 and connect directly to the wattmeter and load. Retune the transmitter, maintaining the same coupling and note the power output. You can now compute the power ratio, which is equal to power out (with device)/power out (without device). Page CI-099 will give the insertion loss value for the calculated power ratio.

SUBSTITUTION METHOD FOR INSERTION LOSS MEASUREMENT - Assemble the test set up as shown on the next page. The remaining terminals need not be terminated if the device under test is a duplexer or multicoupler. Inject the frequency and obtain a reference level on the first limiter monitor, taking care not to saturate the limiter circuit. Note the microvolt signal level and the generator output (dbm). Next, inject the signal directly into the receiver and decrease the signal generator output until the same reference level is obtained. The insertion loss is the difference in dbm as taken from the generator dial or the ratio of microvolts, using the following relationship,



and then referring to the table on CI-099.

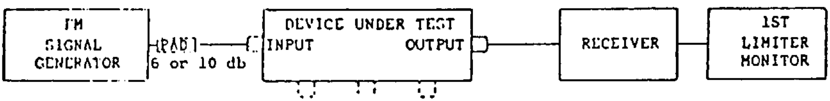
Voltage ratio = microvolts (w/o device)/microvolts (w/device)

A step attenuator providing small db increments (0.1, 0.2, 0.5, 1.0) can be used to provide more accurate readings. The attenuator should be connected to the generator output. Snap in and leave in about 6 db to pad the generator output. Take the reading with the device in the circuit, then remove the device and connect the two leads together. Snap in attenuation to bring the level down to the same reference level. The insertion loss is the equal to the amount of dbs snapped in (do not count in the value you had for padding purposes).

EQUIPMENT NOTES:

1. Quick slip connectors can be made by sawing off the outer barrel of male plugs. They can then be inserted in a variety of female contacts such as "N", "BNC", or "TNC" jack.
2. Use a minimum of adaptors in test cables, especially UHF and conversion types between "N", "UHF", or "BNC". The VSWR and associated phase shift of "UHF" type connectors can cause erroneous readings, especially when measuring low lues of insertion loss.
3. FM signal generator may be measurements model 560 H or equivalent. The step attenuator is one providing 0.1 db increments for measurement of low insertion losses using the substitution method. This may be omitted and the attenuator on the signal generator substituted, but with substantial loss of resolution. (Kay model 1/432 C or equivalent).
4. The length between the duplexer and the receiver may have some effect on insertion loss and may be adjusted if desired, but it has been found that the receiver is not as sensitive or as easily disturbed by slight mismatches.

ATTENUATION MEASUREMENTS



Insert the two terminals, between which the attenuation is to be measured, into the test circuit above. If the device has more than two terminals, as a duplexer or multicoupler, terminate all remaining terminals with 50 ohms before making measurements.

Using a signal generator and receiver on the test frequency, set the signal generator drive for a readable but unsaturated level on the list limiter monitor. Note a reference level on the first limiter monitor and the dbm level on the signal generator attenuator or the microvolt reading on the generator attenuator. Remove the filter terminals and connect leads of the test circuit together. Reduce the output on the signal generator until the reference level on the 1st Limiter monitor is obtained. Note the dbm level on the signal generator attenuator. The difference between this and the previous level represents the filter attenuation in db. If the microvolt readings are used, the attenuation can be obtained from the ratio of the two readings, then referring to the chart on CI-099 using the closest tabulated value.

Voltage ratio = microvolts (w/o device)/microvolts (w/device)

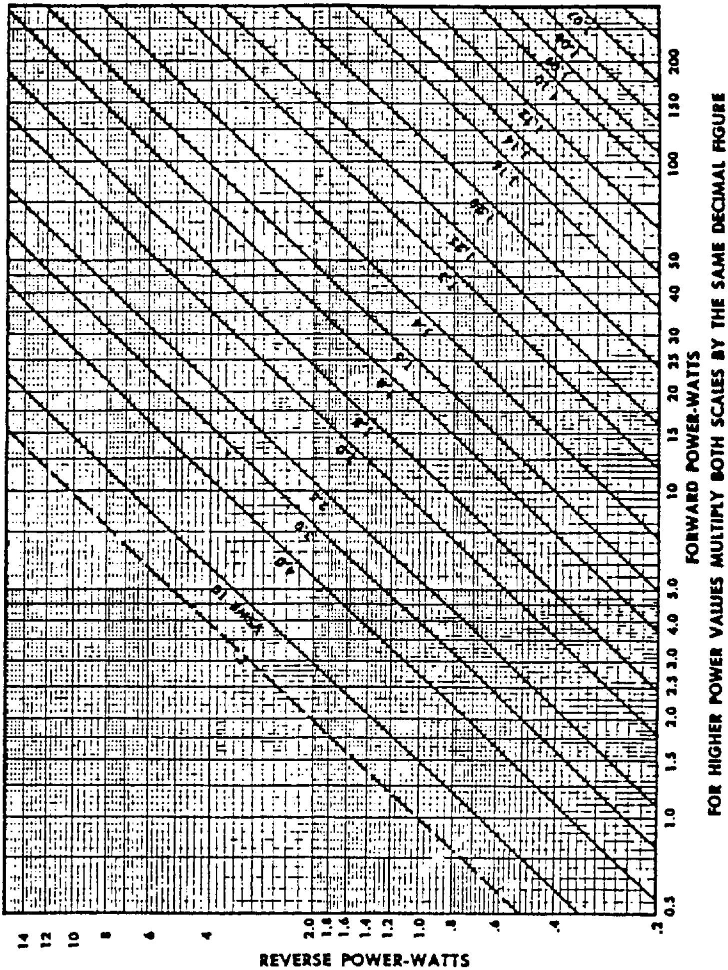
Consult the data Sheet or Detailed Tuning Procedure of the particular model under test for typical values of Insertion loss and attenuation.

PRECAUTIONARY MEASURES FOR MORE RELIABLE MEASUREMENTS - RF leakage is occasionally a problem when measuring filter attenuations in the area of 60 db or greater. When measuring attenuations over 80 db, RG-58/u cable should not be used because of excessive radiation. RG-8A/u or RG-213/u cable will permit measurements of 100-110 db only if input and output filter cables are not in close proximity. Double shielded cable, as RG-9/u or RG-142/u, is advised for measurements over 80 db. Occasionally, RF leakage occurs because of excessive radiation from the signal source, insufficient shielding of the receiver or a combination of all the above. If the measurements of a filter section indicates a lower level of attenuation than expected, a parallel path of lower attenuation (RF leakage) may be the reason. If this occurs, you will not be able to measure attenuations greater than the leakage path. If leakage is suspected, a simple test can be made as follows: insert the terminals of the filter under test and obtain a reference level on the first limiter monitor, using sufficient generator drive for a readable but unsaturated level. Note the dbm level of drive on the signal generator. Now insert a known level of attenuation in series with the filter section, as a 6 or 10 db pad. It should be necessary to increase the signal generator drive, in dbm, by the amount of attenuation added to obtain the previous reference level on the first limiter monitor. If RF leakage is occurring, the signal generator drive will be practically the same, indicating a path for RF other than thru the filter section. It can be easily shown if the filter section is responsible for the RF leakage. The results of the leakage test should be unaffected by placing the additional attenuation before or after the filter section in the test circuit, allowing for slight variation due to possible VSWR level of the attenuator. The 10 db pad should be left on the generator output at all times since the generator is looking into an unmatched line at this frequency. In actual practice, the cable length connecting the transmitter to the duplexer will affect the total amount of noise suppression, since the transmitter is an unmatched source of receiver noise power on the receiver frequency and is looking into a reflective load. The cable length which gives the greatest mismatch at the receiver frequency will provide the best noise suppression. Likewise, an adverse length can be chosen which will actually reduce the noise suppression by about 6 db less than the value measured, using a padded signal source. Unfortunately, this length is already adjusted for the best transmitter output through the duplexer. Since there are a few other uncontrollable factors affecting noise suppression such as varying frequency separations and internal extension cable lengths in the duplexer, the best solution is to provide an adequate safety margin of 10-15 db above the theoretical value specified by the manufacturer or systems supplier.

CONVERSION OF VOLTAGE AND POWER RATIOS TO DECIBELS

VOLTAGE RATIO	POWER RATIO	DB
1.0000	1.0000	0.0
.9886	.9772	0.1
.9772	.9550	0.2
.9661	.9333	0.3
.9550	.9120	0.4
.9441	.8913	0.5
.9333	.8710	0.6
.9226	.8511	0.7
.9120	.8318	0.8
.9016	.8128	0.9
.8913	.7943	1.0
.8810	.7762	1.1
.8710	.7586	1.2
.8610	.7413	1.3
.8511	.7244	1.4
.8414	.7079	1.5
.8318	.6918	1.6
.8222	.6761	1.7
.8218	.6607	1.8
.8035	.6457	1.9
.7943	.6310	2.0
.7852	.6166	2.1
.7762	.6026	2.2
.7674	.5888	2.3
.7586	.5754	2.4
.7499	.5623	2.5
.7413	.5495	2.6
.7328	.5370	2.7
.7244	.5248	2.8
.7161	.5129	2.9
.7079	.5012	3.0
.6998	.4898	3.1
.6918	.4786	3.2
.6839	.4677	3.3
.6761	.4571	3.4
.6683	.4467	3.5
.6607	.4365	3.6
.6531	.4266	3.7
.6457	.4169	3.8
.6383	.4074	3.9
.6310	.3981	4.0
.6237	.3890	4.1
.6166	.3802	4.2
.6095	.3715	4.3
.6026	.3631	4.4
.5957	.3548	4.5
.5888	.3467	4.6
.5821	.3388	4.7
.5754	.3311	4.8
.5689	.3236	4.9
.5623	.3162	5.0

VOLTAGE RATIO	POWER RATIO	ATTENTUATION DB
.5012	.2512	6
.3162	1×10^{-1}	10
.1778	$.3162 \times 10^{-1}$	15
1×10^{-1}	1×10^{-2}	20
$.5623 \times 10^{-1}$	$.3162 \times 10^{-2}$	25
$.3162 \times 10^{-1}$	1×10^{-3}	30
$.1778 \times 10^{-1}$	$.3162 \times 10^{-3}$	35
1×10^{-2}	1×10^{-4}	40
$.5623 \times 10^{-2}$	$.3162 \times 10^{-4}$	45
$.3162 \times 10^{-2}$	1×10^{-5}	50
$.1778 \times 10^{-2}$	$.3162 \times 10^{-5}$	55
1×10^{-3}	1×10^{-6}	60
$.5623 \times 10^{-3}$	$.3162 \times 10^{-6}$	65
$.3162 \times 10^{-3}$	1×10^{-7}	70
$.1778 \times 10^{-3}$	$.3162 \times 10^{-7}$	75
1×10^{-4}	1×10^{-8}	80
$.5623 \times 10^{-4}$	$.3162 \times 10^{-8}$	85
$.3162 \times 10^{-4}$	1×10^{-9}	90
$.1778 \times 10^{-4}$	$.3162 \times 10^{-9}$	95
1×10^{-5}	1×10^{-10}	100
5623×10^{-5}	$.3162 \times 10^{-10}$	105
$.3162 \times 10^{-5}$	1×10^{-11}	110
$.1778 \times 10^{-5}$	$.3162 \times 10^{-11}$	115
1×10^{-6}	1×10^{-12}	120



POWER VALUES vs. VSWR

CONVERTING TO CAPACITOR "Q" TYPE BANDPASS/BANDREJECT DUPLEXER.

TO ACCOMPLISH THIS CONVERSION, FIRST CHECK THE HOLE SIZE LOCATED AT THE TOP OF CAVITY. HOLE SIZE MUST BE 1 1/4" TO MAKE THE CONVERSION FROM REJECT TO BANDPASS/BANDREJECT TYPE.

ONCE YOU HAVE ESTABLISHED THAT HOLE SIZE IS 1 1/4", YOU'LL NEED TO REPLACE THE LOOP WITH "Q" TYPE LOOPS. THE PART NUMBER FOR REPLACEMENT LOOP IS 350714. YOU'LL NEED ONE LOOP FOR EVERY CAVITY.

THE CABLE HARNESS ALSO NEEDS TO BE REPLACED. SUB-BANDS ARE 132-148 MHZ AND 148-174 MHZ. REPLACEMENT HARNESS PART NUMBERS ARE AS FOLLOWS:

PART #	FREQUENCY	# OF CAVITIES	YOUR COST
BAD-4252-3	132-148 MHZ	4 CAVITY	$126.00
BAD-4252-1	148-174 MHZ	4 CAVITY	$126.00
BAD-4253-2	132-148 MHZ	6 CAVITY	$218.15
BAD-4253-1	148-174 MHZ	6 CAVITY	$218.25
350714	ALL		$ 27.00

FOLLOW THE TUNING INSTRUCTIONS ATTACHED TO RETUNE THE DUPLEXER ONCE YOU HAVE COMPLETED THE CONVERSION.

NOTE: SINCLAIR DOES NOT SUPPLY CABLE LENGTHS IF YOU DECIDE TO MANUFACTURE THE HARNESS ASSEMBLY. CABLE LENGTHS ARE NOMINALLY 1/4 WAVELENGTH BETWEEN CAVITIES.