

**INSTALLATION AND
TUNING INSTRUCTIONS
"C" SERIES
MULTICOUPLERS
CM-1016**

**ENCLOSURES
"C" SERIES**

DescriptionCI-1115
Typical Systems.....CI-1116
Electrical Specifications.....CI-1117
Mechanical Specifications.....CI-1118
Typical Response Curves.....CI-1119
Typical VHF/Tx/Rx Systems.....CI-1120
Tuning Instructions.....CI-1121
Tuning Instructions and Equipment.....CI-1055
Tuning - Bandpass Filters.....CI-1056
Tuning - Reject (Notch) Filters.....CI-1057
Tuning - "Q" Circuit Filters.....CI-1058
Replacement Parts and Installation.....CI-1122

"C" Series Multicouplers

Description

Sinclair "C" Series Multicouplers offer excellent performance with ease of expandability required in many multicoupling systems. Each series consist of a reject cavity and one or more bandpass cavities depending upon the selectivity required.

Standard cavities consist of 7" dia. aluminum by 1/4 wave length and chemically coated to prevent oxidation. All cavities consist of temperature compensating materials to prevent changes in frequency at extreme temperature variations.

The "C" Series is also available in Sinclairs Res-Lok configuration where space is limited and when less selectivity is required.

The "C" Series System utilizes plug-in units which can easily be added to or taken out of the multicoupler string. This allows changes to be made at the site with very little down time.

The "C" Series are available in the following frequency ranges: 132-174, 406-512, 806-960 MHz.

The low band frequency of 30-50 MHz is not recommended due to the physical size of the cavities required.

The following pages in this manual cover the VHF, & UHF bands only although the tuning instructions also apply to the 806-960 MHz band.

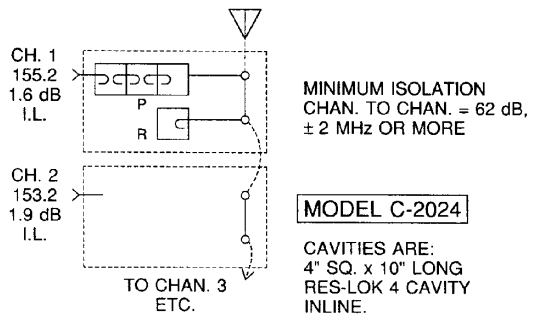
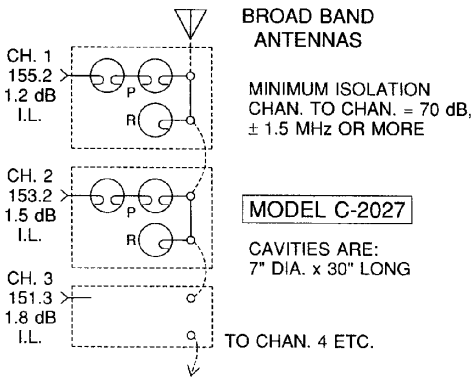
All "C" Series are tuned and delivered to the exact specifications as ordered by the customer. Due to the many variations of system capability, the installations enclosed apply to the basic returning procedures and various mounting arrangements.

Consult Sinclair representatives, sales, or engineering departments for variations available, or special systems which may be required.

"C" Series Multicouplers

Typical Systems

- Shown below are typical "C"-Series modules using 2 or more band pass filters and a reject cavity (notch filter) which acts to connect only the channel frequency to the antenna line, passing all other frequencies along the antenna line to subsequent channels.
- The band pass filters pass only their channel, rejecting all others, which means that additional channels may be added without modifying existing channels as long as the minimum frequency separation as set by the system isolation requirements and filter performance is not exceeded.
- The band pass filters isolate the system from others in the multicoupler. The reject filter is used for matching the input port to the antenna output (low insertion loss from input to antenna and visa versa).

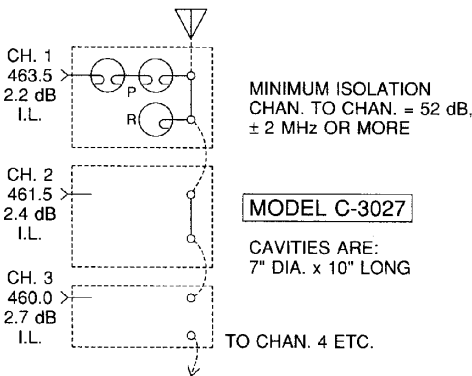


NOTES:

1. Each band pass cavity is tuned from 0.5 to 1.5 insertion loss and the reject cavity is tuned to a reject notch of 20-25 dB at the pass frequency, depending upon isolation required.
2. Dotted enclosures represent standard channel packages on 19" rack or panel mounting.
3. All cables in each series are critical lengths and should not be altered.

The interconnect cables between series are non critical lengths and consist of RG-213/u or RG-214/u cables.

4. The last channel added to the system should be terminated with a 50 ohm, 30 to 60 watt load.
5. Refer to page CI-1117 for other electrical specifications and for other insertion loss and isolation values.



**"C" Series
Multicouplers**

Electrical Specifications



		Models		
		C-2017,	C-2027,	C-2037
FREQUENCY RANGE MHz		132-174		
SEPARATION (MIN) MHz		0.8		
INSERTION LOSS Tx TO ANT.	dB	TYPICAL SETTINGS: 1.2 3.2		
ISOLATION Tx to Tx	dB	DETERMINED ACCORDING TO INS. LOSS SETTINGS		
MAX. INPUT POWER WATTS EQUIPMENT PORT:		C-2017	C-2027	C-2037
AT 1.2 dB INS. LOSS		210	400	NA
AT 3.2 dB INS. LOSS		90	150	210

7" DIA
CAVITY
SERIES



		Models		
		C-3017,	C-3027,	C-3037
FREQUENCY RANGE MHz		406-512		
SEPARATION (MIN) MHz		0.8		
INSERTION LOSS Tx TO ANT.	dB	TYPICAL SETTINGS: 2.2 3.2		
ISOLATION Tx to Tx	dB	DETERMINED ACCORDING TO INS. LOSS SETTINGS		
MAX. INPUT POWER WATTS EQUIPMENT PORT:		C-3017	C-3027	C-3037
AT 2.2 dB INS. LOSS		NA	300	NA
AT 3.2 dB INS. LOSS		80	150	185

7" DIA
CAVITY
SERIES



		Models			
		C-2024	C-2034	C-3024	C-3034
FREQUENCY RANGE MHz		132-174		406-512	
SEPARATION (MIN) MHz		0.8		1.0	
INSERTION LOSS Tx TO ANT.	dB	TYPICAL SETTINGS: 1.6 3.1			
ISOLATION Tx to Tx	dB	DETERMINED ACCORDING TO INS. LOSS SETTINGS			
MAX. INPUT POWER WATTS EQUIPMENT PORT:		C-2024	C-2034	C-3024	C-3034
AT 1.6 dB INS. LOSS		NA	400	300	NA
AT 3.1 dB INS. LOSS		NA	210	NA	160

RESLOK
SERIES

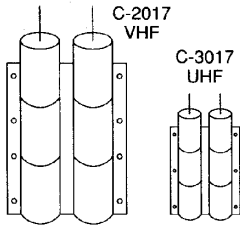
1 Typical isolation curves are shown on page CI-1119.

Maximum input VSWR _____ 1.5 : 1
 Termination _____ "N" Female
 Temperature Range _____ -40°C to +60°C

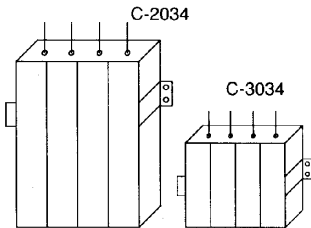


"C" Series Multicouplers

Mechanical Specifications



TYPICAL 2 CAVITY ASSEMBLY



TYPICAL 4 CAVITY RES-LOK ASSEMBLY

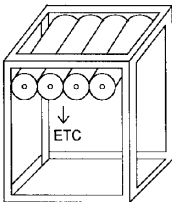
Standard Production Models

		VHF			UHF		
		C-2017	C-2027	C-2037	C-3017	C-3027	C-3037
Height	IN	32.5			16		
Width	IN	19			19		
Depth	IN	7.5	15		7.5	15	
No. Cav's		2	3	4	2	3	4
Weight	LB	30	41	51	18	26	32

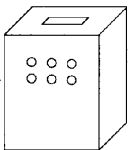
Cavities are oriented vertically on 19 in. rack mount panels.

		VHF		UHF	
		C-2024	C-2034	C-3024	C-3034
Height	IN	31		14	
Width	IN	19		19	
Depth	IN	(4.2) 5.25 Rack Space			
No. Cav's		3	4	3	4
Weight		30		13	

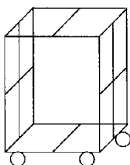
All models are 4 cavity one piece Res-Lok construction and can be mounted either vertically or horizontally.



UNISTRUT OPEN FRAME MODELS:
EQR-1
EQR-2
EQR-4
ETC



ENCLOSED CABINETS MODELS:
CAB-1
CAB-2



OPEN FRAME PORTABLE EQUIPMENT RACK
NO. AD-4456-2

Equipment Racks And Cabinets

The above models are furnished as standard single channel "C" Series multicouplers. For expanding to 2 or more channels, Sinclair can furnish various types of enclosures as diagramed.

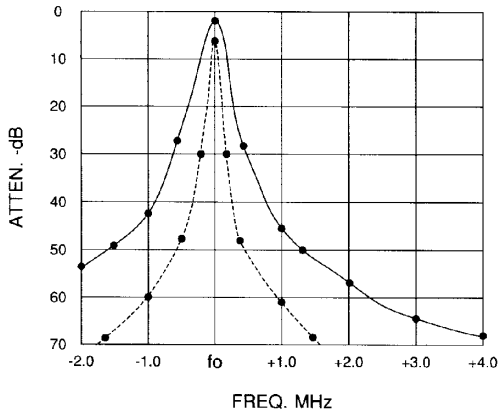
The unistrut open frame rack can hold from 20 to 80, 7" dia. cavities depending upon model number and VHF or UHF versions.

The enclosed cabinet or open frame portable versions will accept either VHF or UHF from 4 to 8 models depending upon the models required into CAB-1 or CAB-2.

Consult Sinclair sales or engineering for special mounting arrangements required.

"C" Series Multicouplers

Typical Response Curves



C-2027

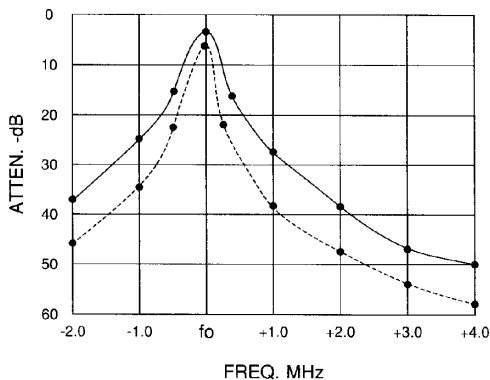
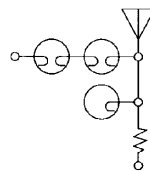
132 - 174 MHz

INSERTION LOSS:

———— 1.2 dB

----- 3.2 dB

7" DIA. CAVITIES



C-3027

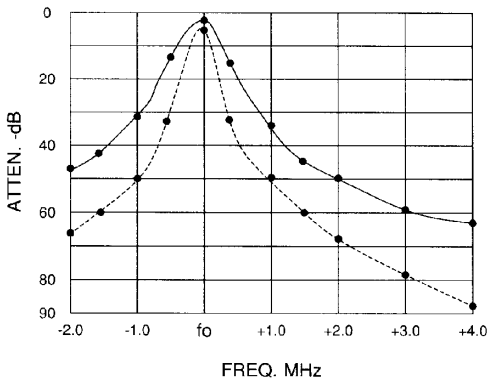
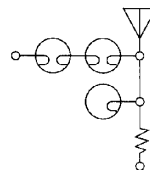
406 - 512 MHz

INSERTION LOSS:

———— 2.2 dB

----- 3.2 dB

7" DIA. CAVITIES



C-2034

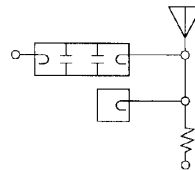
132 - 174 MHz

INSERTION LOSS:

———— 1.6 dB

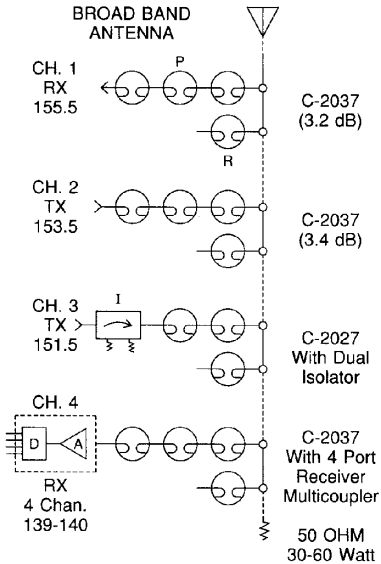
----- 3.1 dB

4" SQ. RES-LOK CAVITIES

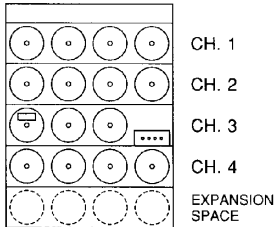


"C" Series Multicouplers

Typical VHF Tx/Rx Combining System



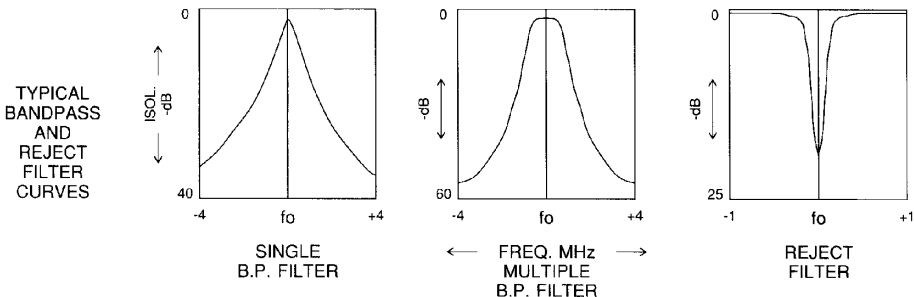
- Typical 4 channel "C" Series multicoupler combining both Tx and Rx frequencies.
- Channel / Assembly at 155.5 Rx will provide typically 75 dB isolation from other frequencies greater than 1 MHz away and typically 80 dB noise isolation from Tx 153.5.
- Note that a dual stage isolator is used on Channel 3 at 151.5 MHz to provide additional protection from IM.
- In the case of the Channel 4 at 139-140 MHz, a receiver multicoupler is used to amplify and split into 4 Rx frequencies using a 4 way power divider.
- The last channel is terminated with a 50 OHM, 15-60 watt load OR additional "C" Series modules can be added.
- Typical broad band antennas to cover 138-174 MHz are Sinclair models 210-4 or 235 with a 36 MHz band width at 1.5:1 VSWR.



Typical installation of the above Tx/Rx combining system into a unistrut open frame rack. Cavities are mounted horizontally.

Shown: EQR-4 VHF Rack
XAP-506-2

H — 45
W — 33%
D — 38



"C" Series Multicouplers

Tuning Instructions

- All "C" Series units are tuned and shipped to frequencies, insertion loss, and isolation values as requested by the customer at time of order.
- Minor retuning in the field can be accomplished by following the tuning procedures as shown on the following pages CI-1055 thru CI-1058.
- Each "C" Series can be retuned through the system, but if major changes are to be made, it is recommended that each cavity in the system should be retuned individually.
- In either case the critical cable lengths in each "C" Series should not be altered. The cables between series are not critical lengths but should be kept as short as possible in order to keep insertion losses low from each channel to antenna, or visa-versa.
- **CAUTIONS:**
Do not use a transmitter as a signal source for tuning filters unless the transmitter will supply power to a short circuit or an open circuit without damage to the transmitter.

Do not change the lengths on any of the associated cables within each "C" Series channel.

- When adding additional channels to the existing system, maintain the minimum separation as required for each series as shown on Page CI-1117.

Replacement Parts

Replacement parts for the "C" Series can be furnished upon request including:

Cavities, Loops, and Cables: (Ref. Pg. CI-1122)

Consult Sinclair Sales or Manufacturing Departments for part numbers, prices and delivery.

“FP”, “FR”, “FQ” Series Filters

Tuning Instructions

All three “F” Series of the 7 and 10 inch cavity filters can be field retuned across their complete specified frequency range,

The cavities are equipped with adjustable coupling loops to facilitate insertion loss or notch reject changes without removal or replacement of the loop. The loops are locked into place with three holding screws and have been preset at the factory upon delivery to the customer specifications.

Tools Required:

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

Recommended Equipment (or equivalent)

Fig. A - Network analyzer

Hewlett Packard - Model 8752 A

300 KHz-3 GHz

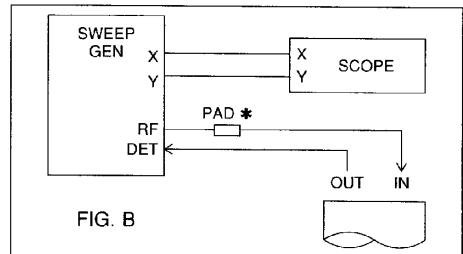
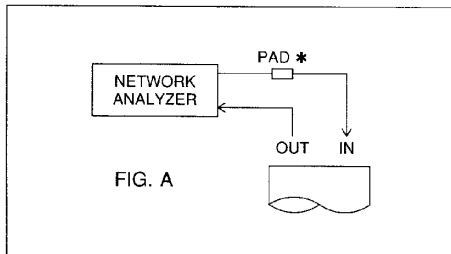
Fig. B - Sweep generator

Hewlett Packard - Model 8754

Oscilloscope

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

Typical test equipment setups are shown in Figures A and B. Refer to the following pages for tuning of the “FP”, “FR” and “FQ” filters.



* It is recommended to use A 6-10 dB attenuator pad in the input lines in order to reduce VSWR reflections which may be introduced in the test equipment being used.

“FP” Series Bandpass Filter

General Information

Refer to CI-1055 for tools required and recommended test equipment and setup.

Refer to CI-1052 for electrical specifications and typical response curves for various models.

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.

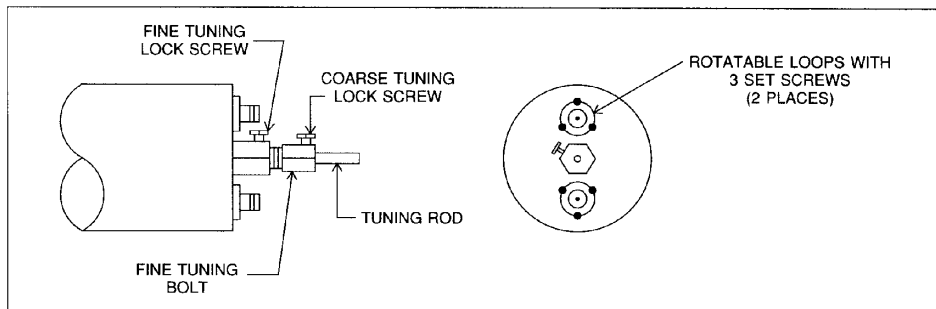
If the insertion loss setting is changed, fine tuning will be necessary because changes in coupling affects resonance.

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.

After final tuning, both the fine and coarse tuning lock screws must be tightened down securely.

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



The recommended test equipment for tuning is described on Page CI-1055.

If using a transmitter, a low power setting is required unless it is known the output can withstand short durations of extreme mismatch.

“FR” Series Notch Filters

General Information

Refer to CI-1055 for tools required and recommended test equipment and setup.

Refer to CI-1053 for electrical specifications, typical response curves, and the various input and output configurations which are required to obtain the passbands optimized above, below or equally with reference to the notch frequency. The various response paths are determined at the factory by the input and output configurations at the time of order and should not be changed.

A notch or rejection null is created at the unwanted frequency by adjusting the cavity tuning rod.

The insertion loss at the frequency to be passed is optimized by the type of response path used.

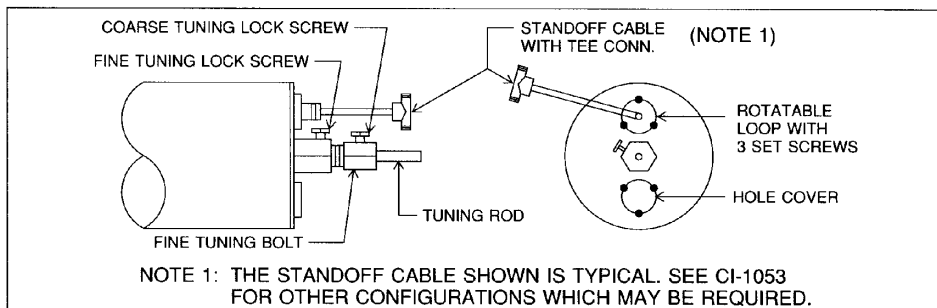
The amount of notch attenuation is dependent upon the size and position of the coupling loop, which is a factory adjustment. If a change in the field is required, loosen the 3 set screws holding the loop and rotate the loop to the desired notch depth. Then lock the loop back into place with the 3 set screws.

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.

After final tuning, both the fine and coarse tuning lock screws must be tightened down securely.

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



“FQ” Series Q-Circuit Filters

General Information

Refer to CI-1055 for tools required and recommended test equipment and setup.

Refer to CI-1054 for electrical specifications and typical response curves for various models.

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 frequently 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.

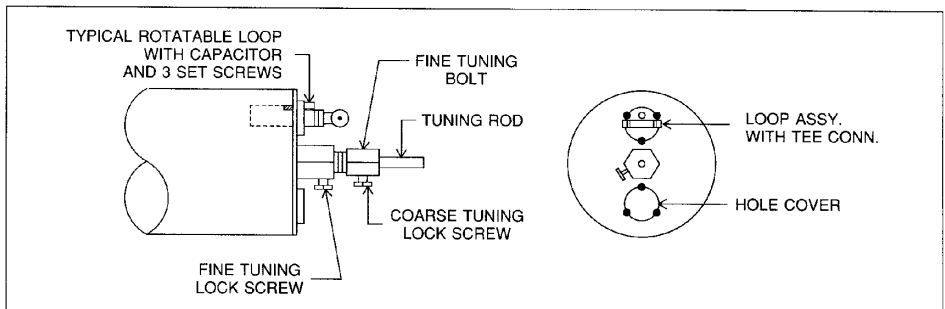
Tuning Procedure

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.

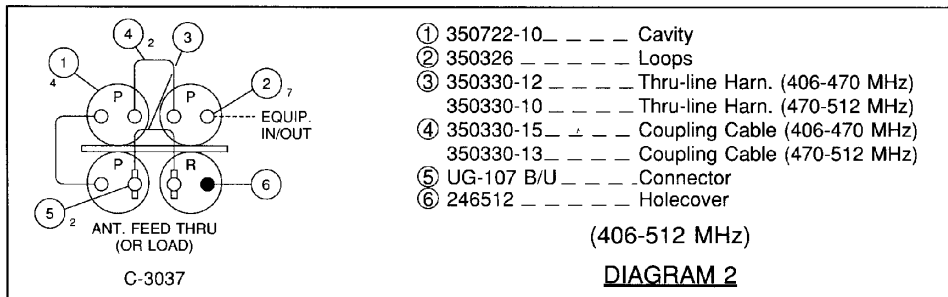
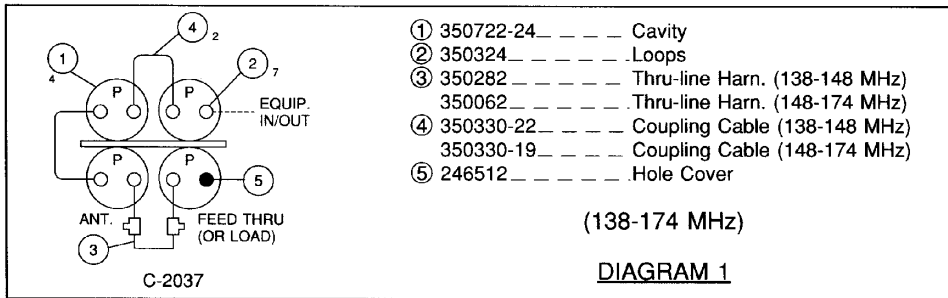
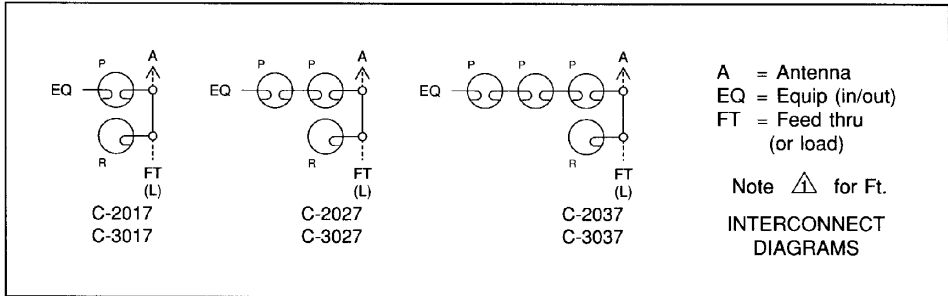
The tuning of the rod and capacitor should be repeated until both passband and reject frequency are obtained.

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



"C" Series Multicouplers

Replacement Parts and Instructions



Shown in diagrams 1 & 2 are typical installation and parts lists for the C-2037 and C-3037 "C" Series multicouplers for standard 19 inch rack or cabinet mounting.

The parts lists listed are also applicable to the other "C" Series models. Only the quantities of cavities and cables differ.

\triangle The FT (Feedthru) terminal is connected to the next series of multicouplers or terminated with 50 OHM loads.

Loads available are: AL-030-0_ _ _ _ _ 50 OHM, 30 Watts
BL-060-0_ _ _ _ _ 50 OHM, 60 Watts

Consult Sinclair Sales for prices and delivery of replacement parts.