

FP-2004-RI

**INSTALLATION AND
TUNING INSTRUCTIONS
TJ AND CT SERIES
TRANSMITTER COMBINERS
CM-1004**

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CI-1020-RI

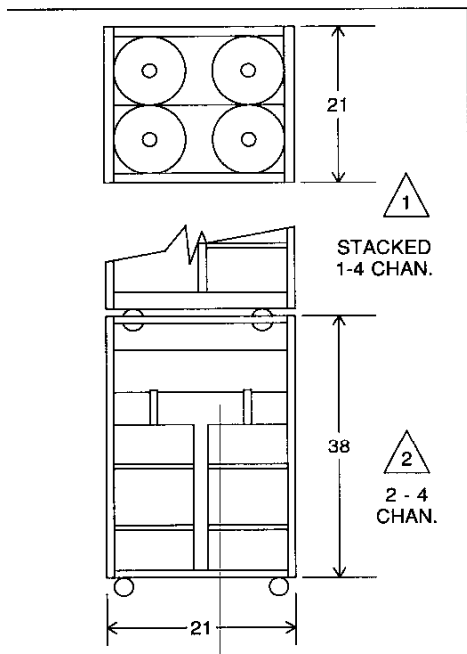
“CT”-SERIES TRANSMITTER COMBINERS

These CT-Series of cavity-ferrite transmitter combiners are furnished in two to eight channel configurations in both the UHF and VHF frequencies.

Each channel includes a dual, low-loss isolator and a 10 inch diameter, high “Q” bandpass cavity filter .

A low-loss star junction is provided to combine the channels to one antenna and double shielded cable is used throughout to ensure high isolation between channels.

These combiners are housed in open frame cabinets on castors for mobility. The cabinets may be stacked vertically to conserve space when using five to eight channel systems.



- For the VHF range (132-174 MHZ) the cavities are alodined aluminum 10 inch diameter and length of 24 inches.
- For the UHF range (406-512 MHZ) the cavities are copper plated aluminum, 10 inch diameter and length of 10 inches, to provide a high performance combiner in the UHF band.

NOTE 1 On some models the cavities are mounted in reverse as shown with tuning rod facing down when racks are stacked.

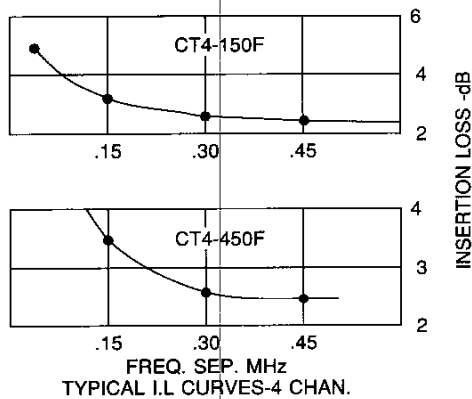
NOTE 2 VHF cavity type shown - for UHF the rack can contain up to 6 cavities.

ELECTRICAL SPECIFICATIONS		CT*-150F	CT*-450F
FREQ. RANGE	MHZ	132-174	406-512
FREQ. SEPARATION	MHZ	0.06-4.0	0.1-12
ISOL.	dB	70	
TX-TX			
		60	
ANT-TX			
INSERTION LOSS	dB	SEE TYPICAL CURVES	

*Number of Chan's 2 - 8

Consult your Sinclair representatives for additional electrical specifications.

Refer to page CI-1024 for retuning instructions.



CI-1021

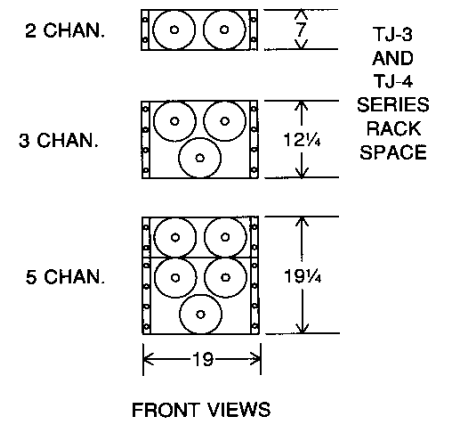
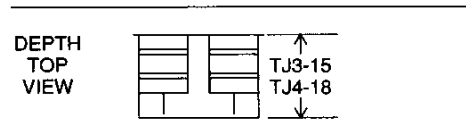
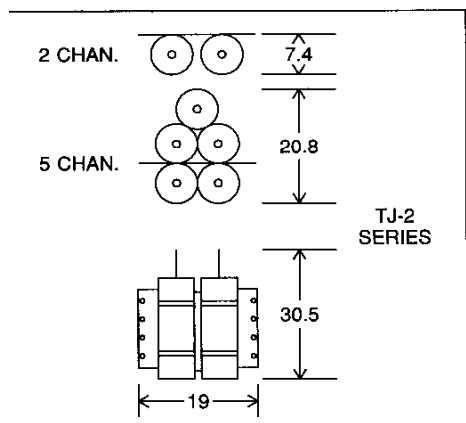
**"TJ SERIES
TRANSMITTER COMBINERS**

These TJ-Series of cavity-ferrite transmitter combiners are furnished two to five channel configurations for use in systems from 132-960 MHZ.

Each channel includes a low-loss single or dual stage isolator and high "Q" bandpass cavity filter, and a low loss star junction to combine the channels into one antenna.

All models are 19 inch rack mountable. The TJ-Series in the 806-960 MHZ utilize very high "Q" three quarter wave 7 inch diameter silver plated cavities and are especially suitable for close channel separations to 250 KHZ.

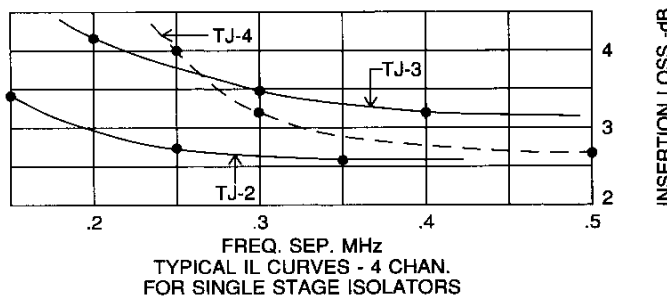
- For the TJ-2 Series (132-174 MHZ) the cavities are alodined aluminum 7 inch diameter and length of 24 to 26 inches.
- For the TJ-3 Series (406-512 MHZ) the cavities are copper plated aluminum 7 inch diameter and length of 10 1/2 inches.
- For the TJ-4 Series (806-960 MHZ) the cavities are silver plated aluminum 7 inch diameter and length of 10 1/2 inches.



ELECTRICAL SPECIFICATIONS

		TJ-2--*	TJ-3--*	TJ-4--*
FREQ. RANGE	MHZ	132-174	406-512	806-960
FREQ. SEPARATION	MHZ	0.15 - 3.0	0.20 - 5.0	0.25 - 8.0
ISOL.	dB			
TX-TX		35 (SINGLE ISOL)	70 (DUAL ISOL)	
ANT-TX		25 (SINGLE ISOL)	60 (DUAL ISOL)	
INSERTION LOSS	dB	SEE TYPICAL CURVES		

*Number of chan's 2-5



Consult your Sinclair representatives for additional electrical specifications.

Refer to Pg. CI-1024 for retuning instructions.



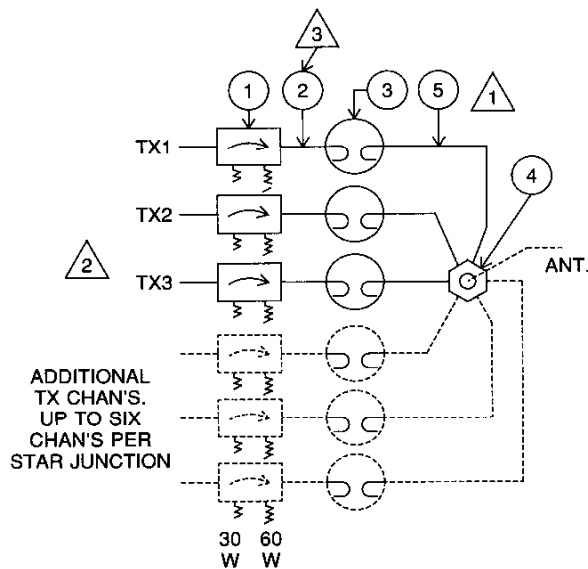
CI-1022-RI

**TJ/CT SERIES
TRANSMITTER COMBINERS**

DESCRIPTION

The Sinclair TJ and CT series transmitter combiners are used when the requirements are to combine two or more transmitters at moderate frequency separations to a single antenna.

Each channel includes a low loss single or dual isolator and a 7 or 10 inch diameter high Q bandpass cavity filter. A low loss star junction connector is provided on models which combine three or more transmitters to the single antenna.



- ① Dual or single isolators
- ② IC cables (non-critical length)
- ③ High Q, 7 or 10 inch dia. bandpass cavity filters
- ④ Low loss star junction
- ⑤ IC cables (critical lengths)
- △ 1 IC cables from filters to star junction are selected during tuning to obtain minimum insertion loss specifications on all channels, depending upon frequency separations between transmit channels

△ 2 Minimum separation: (MHz)

FREQ. BAND	CT -	TJ -
150 MHz	0.06	0.15
450 MHz	0.10	0.20
850 MHz	N/A	0.25

△ 3 Some models use a second harmonic filters in this leg when required.

TUNING INSTRUCTIONS

All Sinclair TJ and CT series multicouplers are factory assembled and tuned to customer specifications. Retuning or adding additional channels can be done in the field if the proper equipment is available for measuring insertion loss, isolation and VSWR. The tuning instructions for individual isolators and bandpass filters are included in the following pages and fine tuning adjustments can be made in the field following those instructions.

If it is necessary to change frequencies or add transmit channels to existing systems, it is recommended that the system be returned to the factory for retuning or Sinclair Engineering be contacted for special precautions which may be required pertaining to the particular system in use.



CI-1023

**TJ & CT SERIES
BANDPASS FILTERS**

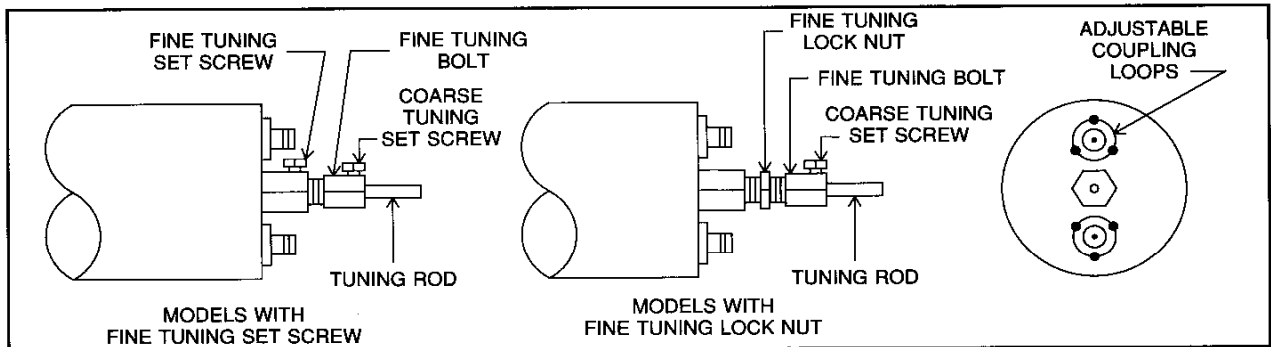
TUNING INSTRUCTIONS

Sinclair seven and ten inch diameter cavities used on all CT and TJ series transmitter combiners are equipped with adjustable coupling loops to facilitate insertion loss changes without removal and replacement of the loops. Both loops are locked into place with three holding screws.

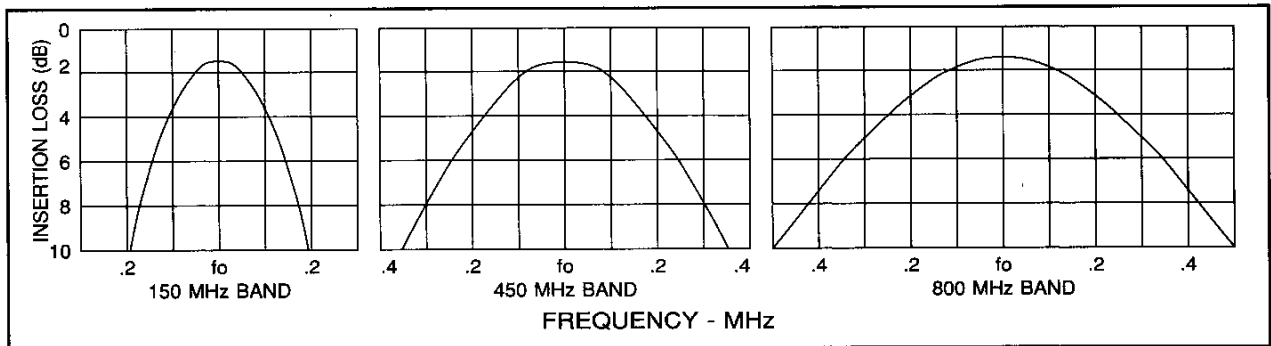
The loops for all cavities used with transmitter combiners have been factory set to a particular insertion loss between 1-2 dB depending upon the model of the transmitter combiner and the transmitter frequency separations.

Each cavity has a coarse tuning adjustment for large changes in frequency and a fine tuning adjustment for very small changes in frequency. Coarse tuning is accomplished by unlocking the coarse tuning set screw and sliding the tuning rod in and out. Fine tuning adjustments are made by locking the coarse tuning screw securely and loosening the fine tuning set screw (or lock nut on some models), then turning the fine tuning bolt. After tuning, both the coarse tuning and fine tuning set screws and/or lock nuts must be tightened down securely.

NOTE: Pushing the rod in or turning the fine tuning bolt in, lowers the resonance of the filter. Also, if an insertion loss is changed, fine tuning is necessary as changes in coupling will affect resonance.



TYPICAL BP CHARACTERISTIC CURVES



CI-1024-RI

TJ & CT SERIES TRANSMITTER COMBINERS

EXPANSION OR RETUNING INSTRUCTIONS

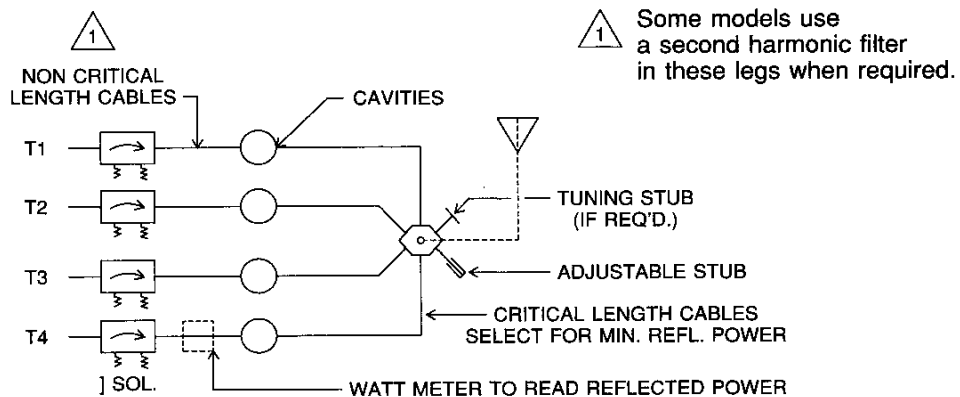
This note describes the tuning procedure to attach a new channel or to retune an existing channel in a Sinclair ferrite-cavity combiner. Bench tuning of cavity is recommended but low power tuning in combiner is possible.

The purpose of the tuning stub is to correct for the reactance of the unused connectors on the coupling star. Only when a channel is added or removed at the star should the tuning stub be adjusted. Therefore, for retuning of existing channels, the stub need not be adjusted.

Operation of these combiners can only be checked by observing the reflected power from a cavity. Therefore, a wattmeter has to be placed between the cavity and isolator and reflected power read.

Before the cavity is tuned to the new frequency, it will reflect all of the power into the isolator. Consequently, the transmitter power must be reduced to 30 watts or less during the tuning process for the TJ Series and 60 watts or less for the CT Series. Damage to the isolator is probable unless low power is used.

- A. To retune an existing channel, place the wattmeter between the isolator and cavity, and tune cavity for minimum reflected power. The stub is not to be adjusted.
- B. To add a channel to an existing combiner, Sinclair supplies 13 inch non-critical length cable between the cavity and isolator and three cables for selection of the proper critical-length cable between the cavity and star. Insert each of the three cables, tune the cavity for minimum reflected power each time and use the cable giving the smallest reflected power. Then place wattmeter in the same position on the middle frequency channel and adjust tuning stub for minimum reflected power. Place wattmeter in same position in each channel to determine the channel having the highest reflected power and adjust stub for minimum reflected power at this frequency.



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CI-1025-RI

ISOLATORS/CIRCULATORS

INSTALLATION AND TUNING INSTRUCTIONS

When used as isolators, both single and dual models are available with a variety of load terminations for the isolated ports. Retuning of these units may be performed in the field in the 2-4 MHz bandwidth by following the instructions in CI-1026RI-1027RI.

**TABLE 1 - ELECTRICAL SPECIFICATIONS**

	Freq. Band (MHz)	Insertion Loss (-db)		Isolation (-db)	
		TYP	MAX	TYP	MIN
SINGLE STAGE	132-174	0.4	0.6	35	25
	406-512	0.3	0.6	35	25
	806-960	0.3	0.4	35	25
DUAL STAGE	132-174	0.7	1.0	75	50
	406-512	0.6	1.1	75	50
	806-960	0.55	0.7	75	50

VSWR: In/out (all units) (23 db+) 1.25:1 max.

NOTE:

Ferrite isolators are subject to certain non linearities and may conduct or generate a weak signal harmonic. For proper IM protection a low pass 2nd harmonic filter is often used between the isolator and antenna to suppress the 2nd and 3rd harmonic energy of the transmitter. The SRL AF series 2nd harmonic filters are available for this purpose.

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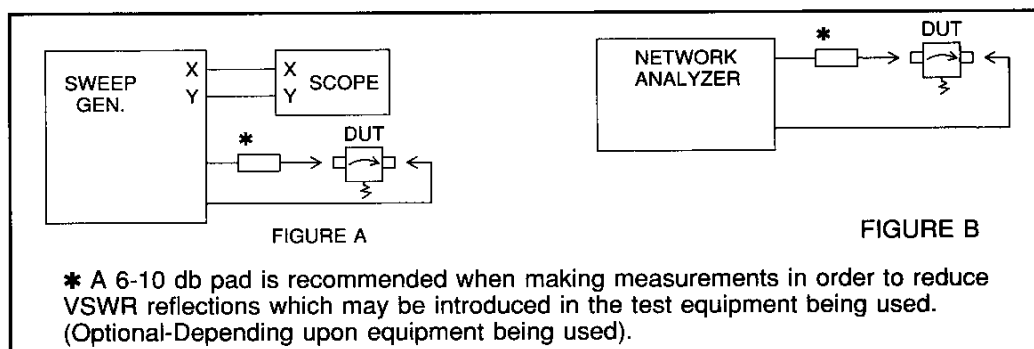
CI-1026-RI

All isolators/circulators are factory adjusted and tuned to specifications and the exact frequency as requested by the customer and have a 2-4 MHz bandwidth.

These units can be retuned within this bandwidth specification by adjusting tuning capacitors located at the front and rear of the units. Retuning beyond the bandwidth specification is not recommended in the field as this may require a readjustment of magnets located internally to the units.

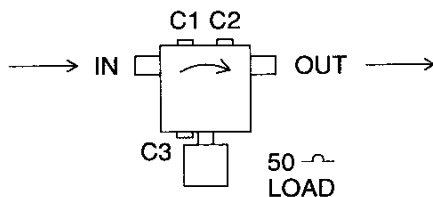
The isolators can be retuned using test setups as shown in Figures A & B or other equipment capable of measuring isolation, insertion loss, and reflected power (VSWR).

A signal source with a maximum output level of 100 MW (+20 dbm or less) is recommended. **UNDER NO CIRCUMSTANCES SHOULD A TRANSMITTER BE USED TO TUNE AN ISOLATOR.**



SINGLE STAGE ISOLATORS:

1. Connect the signal source to the input port of the isolator and monitor the output port. (The 50 Ohm load used in the system must be terminated at the isolator load port).
2. Adjust capacitors C1 and C2 for minimum insertion loss at f_0 .



3. Reverse connections to the isolator in/out ports and adjust capacitor C3 to obtain typical isolation at f_0 ($\approx 35\text{dB}$).
4. Restore the connections as in step 1 and again adjust C1 and C2 for minimum insertion loss at f_0 .
5. Fine tune C1 and C2 for best return loss (VSWR) at both input and output ports, the readings should agree with the specifications as shown in table 1 for single isolators. (Ref. page CI-1025)

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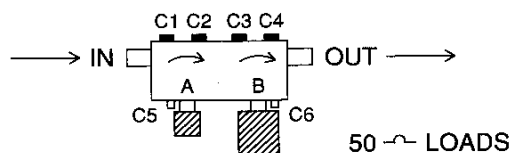
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ISOLATORS RETUNING

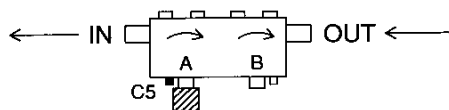
CI-1027-RI

DUAL STAGE ISOLATORS:

1. Connect the signal source to the input port of the isolator and monitor the output port. (The 50 Ohm loads used in the system must be terminated at the load ports).

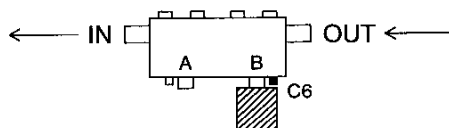


2. Adjust capacitors C1 thru C4 for minimum insertion loss at f_0 .
3. Reverse the equipment in/out connections to the isolator and remove the 50 Ohm load from the isolator port B.



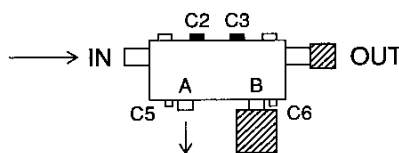
Adjust C5 to obtain maximum isolation at f_0 (≈ 35 db).

4. Remove the load from port A and connect the 50 Ohm load to port B.



Adjust C6 to obtain maximum isolation at f_0 (≈ 35 db).

5. Connect the signal source to the input port of the isolator and monitor the load port A. (Terminate the output port and port B with the 50 Ohm loads).



Adjust C2 and C3 for maximum isolation at f_0 at load port A (This may require several minor back and forth adjustments of C2 and C3).

6. Restore all connections to step 1 and check insertion loss and isolation at f_0 .
7. Optimize loss (VSWR) at input and output ports by adjusting C1 and C4.
8. Final minor optimized adjustments may be required by adjusting C5 and C6 only for isolation.

The readings obtained should agree with the specifications as shown in table 1 for dual isolators. (Ref. PG CI-1025).

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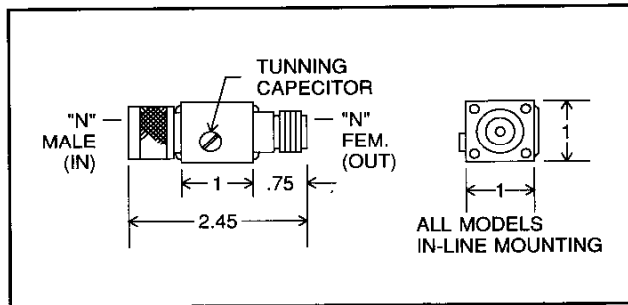
CI-1035

"AF" SERIES TUNABLE HARMONIC FILTERS

DESCRIPTION

The tunable harmonic filters are used primarily in conjunction with ferrite type transmitter combiner systems. Ferrite isolators are subject to certain inherent non-linearities and may conduct or generate a weak second harmonic. This undesired weak signal will be at least 55 db below the carrier power, but can contribute to third order IM products.

Harmonic filters provide a minimum of 36 db of second harmonic attenuation - insuring that this component will be 90 db or more below carrier.

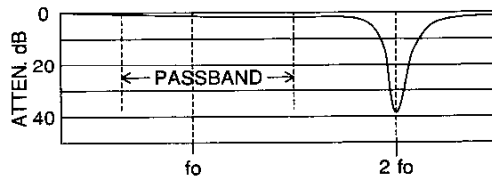


TUNING

The units may be retuned to any frequency range within the specified bands of the model being used; by using a sweep generator and visual display or equivalent equipment to measure insertion loss, attenuation, and VSWR.

Each unit is composed of an LC type tuned circuit to pass the complete frequency band of the model being used. The only adjustment required is to tune the capacitor on the unit for maximum attenuation at the 2nd harmonic. Insertion loss and VSWR across the pass band should meet specifications without further adjustments. The specifications and typical response curve are as shown:

MODEL	FREQ. BAND
AF-2140	132-174 MHz
AF-3140	406-512 MHz
AF4140	806-960 MHz
AF-1140	66-100 MHz



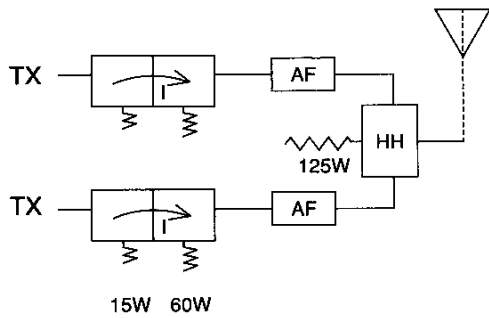
All models:

- Insertion loss @ for0.1 db max.
- Attenuation @ 2 for36 db min.
- Power rating300 Watts
- VSWR (max)1.2:1
- Impedance50 Ohms

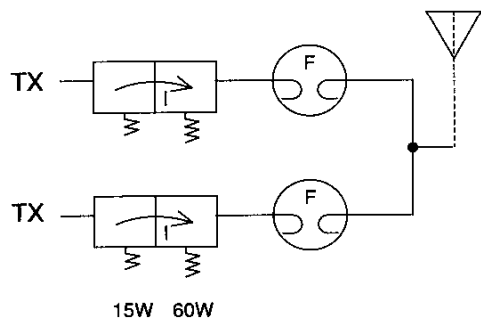


CI-1036

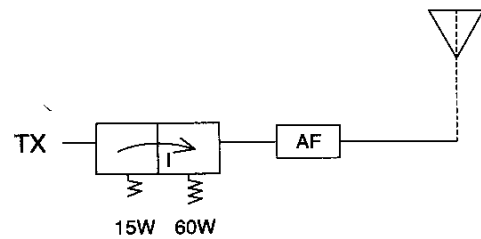
TYPICAL APPLICATIONS:



"TC" Series
Hybrid-Ferrite
Transmitter combiner system for extremely close
frequency separations



"TJ" Series
Cavity-Ferrite
Transmitter combiner system for moderate
frequency separations



"PC" Series
Combined isolator and 2nd harmonic filter for IM
control in existing base stations

- I.....Single or Dual Isolators
- AF.....Harmonic Filters
- HH.....Hybrid Couplers
- F.....Bandpass Filters

