

Prepared	By	Document no.
ERU/XMR GREGORY WHITE	G.W.	XM-92331
Approved	Checked	Date
		11/13/92
		Rev
		A
		File reference
		E:\WPDOC

I. DESCRIPTION

This unit is designed to satisfy requirements for up to 200 watts/channel for the RBS 500 HP Cellular system base station transmitters. The complete system includes a transmitter channel filter which can handle the 2000 watts average power which a 16 channel system is capable of delivering to the filter. The unit is supplied with mounting plate intended for installation into the Ericsson rack and with interconnect cabling to the star network. A data sheet is included giving the module final test data.

II. SPECIFICATIONS

Frequency Range	869-894 MHz
Frequency Separation	630 KHz
Insertion Loss	1.75 dB Max.
Max. Power Handling	200 W/Cavity
Rejection of 849 MHz	35 dB Min.
Input & Output Return Loss	14 dB Min.
Channel-Channel Isolation	14 dB Min.
Physical Dimensions	8.75" X 8.75" X 15"
Connector Type	"N" Female

III. INSTALLATION

The combiner unit should be installed in the Ericsson rack in the designated rack space. The filter is detached for shipping purposes, but should be re-attached to the rack at the designated location. The cable to connect combiner junction and filter is also supplied, and may be installed after the filter is attached. The unit can now be tuned to selected frequencies.

IV. COMBINING SYSTEM TESTING

Regardless of the number of modules used, the system testing procedure is the same. The most easily verified parameter is insertion loss. To measure, attach a load termination of at least 150 watts rating through a power meter of known accuracy to the antenna junction. Connect the station transmitter for the channel under test through a second wattmeter of known accuracy. Using the relation $\text{insertion loss} = 10 \log \text{Power Out/Power In}$, the insertion loss may be calculated - subject to the accuracy limitations on the power measuring equipment.

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Best performance from this combiner will be obtained, if it is operated into an antenna circuit having a return loss of at least 14 dB (1.5:1 VSWR). Verify the VSWR by using a forward/reflected-type of wattmeter of known accuracy. This VSWR is the accepted maximum value for most antenna manufacturers and it is unlikely that a higher value will be encountered. If a higher value is encountered, the condition should be corrected, as the efficiency of the combiner can be greatly degraded.

V. RETUNING AND ADJUSTMENTS

It will be necessary to retune the combiner to the unit, at frequencies other than those specified on the order. If one channel is off frequency, it may be re-tuned simply by using its associated transmitter on the correct frequency, and the technique described below.

The "Observation Ports" (O/P) provided at the high power amplifiers provide a convenient means of tuning the combiner for maximum power transfer using the station transmitters. With a spectrum analyzer connected to this port, it is possible to tune a particular channel for minimum reflected power at the desired frequency while any number of channels are energized. This allows periodic maintenance or retuning of active combining systems to be performed without having to turn off all the channels other than the one being adjusted or checked. The normal suggested procedure for tuning involves the use of a directional wattmeter interposed between the cavity at the frequency of interest and its associated isolator. The meter is set to read the power reflected from the cavity and the cavity is tuned for a minimum under these conditions.

The RF test port located in the high power amplifiers is a simple capacitive tap, which samples the channel energy reflected from the system beyond the isolator or any energy entering from the system beyond the isolator or any energy entering from the other channels of the system. The coupling factor of this tap is -34 dB at 900 MHz, -40 dB at 450 MHz and -50 dB at 150 MHz.

Any selective radio frequency detector may be used to pick out the desired frequency component, if tuning under actual operation conditions is to be performed. A spectrum analyzer is probably the most commonly available device to use.

Start with either end channel if only "touching up" the tuning. If moving all channels up in frequency, start with the highest channel. If moving all channels down, start with the lowest frequency. Loosen the knurled locknut on the associated cavity sufficiently to allow the tuning knob to be turned, then tighten the locknut to provide noticeable "drag" on the tuning knob. Turn on the transmitter of that channel and

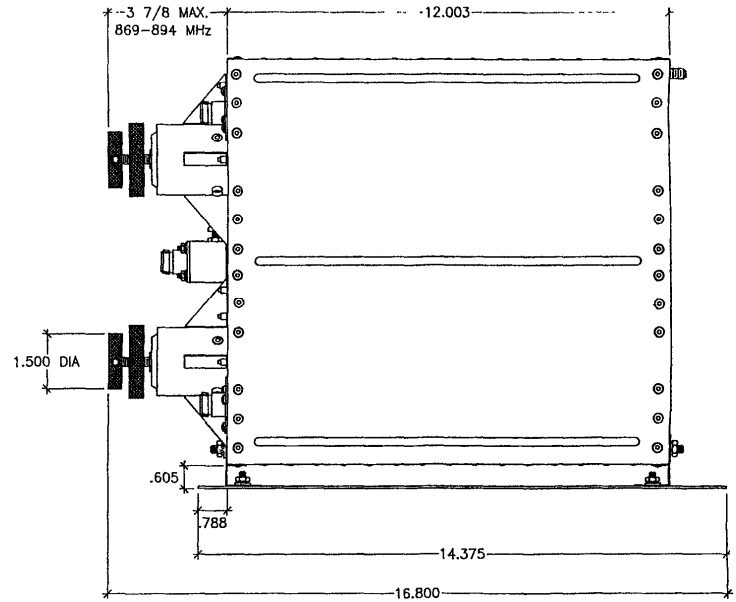
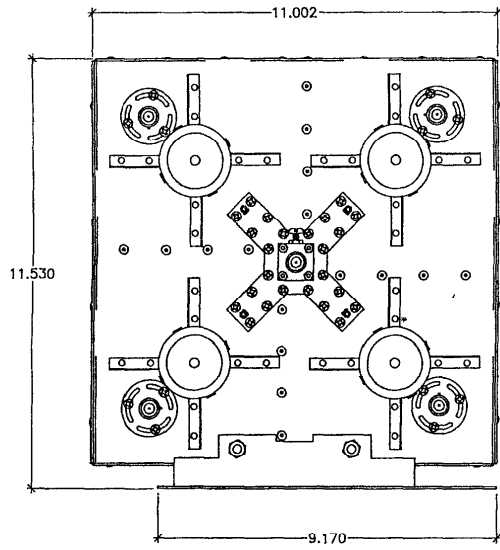
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adjust the cavity for minimum reflected energy on the display. After the adjustment tighten the locknut an additional amount. The adjustment may change slightly, requiring a two-handed combination of simultaneously tuning and locking. If a more sensitive scale than 10 dB/div. is available on the spectrum analyzer, use it in association with any offset control for a more sensitive indication. Repeat the process on all channels and then re-check the first channel tuned. If all cavities have been retuned more than one channel spacing it will probably be necessary to repeat the procedure.

In a combining system having no isolators in the combiner itself, an alternative procedure would be to use a directional coupler in one channel at a time. This would necessitate disabling one channel at a time to connect, tune and disconnect, but the technique would be as outlined above.

VI. MAINTENANCE

A periodic maintenance schedule of the site equipment should include a check of the "observation ports" on each of the transmitters. A good rule of thumb to use in determining the height of the "spike" is to make sure it is no higher than the "spikes" of the two adjacent channels, when the spectrum analyzer is connected to the channel being checked. In a 630KHz spaced system the adjacent channel "spikes" are about 14dB below the forward signal level of the channel being looked at on the analyzer. The reflected energy from the cavity of the channel being looked at is also at a level of 14dB or more below the level of the forward signal of the same channel. If the spike is 3dB or so higher than those of the two adjacent channels, retuning will be required.



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SITE NO./NAME TYPICAL		DWG. NO. 1533-IPA-1113565 B	
DRAFTER B. SORRELLS 28 JAN 92		C	SCALE NONE
CHECKER <i>Gregory White 01/21/92</i>			
APPROVAL		REV 1	