DATE / SH. 1 OF 8 / COMPILED BY G.T.O	TMC SPECIFICATION NO. S-186	
	TITLE: RCR SYSTEMS DESCRIPTION	JOB 170
APPROVED G.T.O	10/13/53	

OBSOLETE 11/24/54 S-186 1-8 WE

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INTRODUCTION:

The primary aim of the RCR System is to remotely control a radio receiver (such as the FFR) by the FM principal. A chief advantage to the FM type control is its immunity to noise impulses. This superior type of control now out modes amplitude control systems. This technique was originated and developed at the TMC research and engineering department.

Before discussion of the RCR System is taken up, reference should be made to the accompanying block diagrams. It is seen from these diagrams that the system is flexible enough to accomodate from 1 to 5 receivers. The number of controlled receivers per one syst m cannot exceed 5, since 15 tone frequencies spaced 170 cycles apart has been allocated for this purpose. Each controlled receiver requires 3 tone frequencies to provide the necessary control. Hence under this system the following number of units are required.

SENDING END STATIONS	RECEIVING END STATION
5-RSC-1	1-RSA-1
5-RSF-1	5-RSD-1
1-RSM-1	5-FFR

It is easily seen from the block diagram (Fig. 1) that any system containing only one controlled receiver requires only one each of the above units. Controlled receivers between these two extremes can very easily be determined from the block diagram.

Reference to the block diagram shows that the complete RCR System is divided into two sections. These sections are separated by a microwave link or a telephone land line and are; the sending end stations (the point where the station operator is located) and the receiving end stations (the point where the controlled receiv rs are located).

At the operators control panel, the RSC-1 generates 3 tones each differing by 170 cycles at the center frequency. These tone oscillators are labelled BFO, HFO and RF gain. A change in frequency in any one of these tone oscillators causes a corresponding change in receiver function. For example: a change in the HFO tone oscillator frequency will cause a frequency change in the receiver HFO. Likewise a frequency change in the RF gain tone oscillator will cause a corresponding change in receiver gain; increase or decrease in receiver gain depends upon the directional change of the tone oscillator.

The RSC-1 tone oscillator output is coupled to the Model RSF-1 filter panel. Each of the 3 tones filtered results in a distortionless sinusoidal voltage. Output of each filter is coupled to a mixer (Model RSM-1) where thes tones combine linearly forming a composite voltage; and then amplified so that an output of 0 dbm (.78 volts) is maintained across a 600 ohm line.

Mixer output may be sent along telephone land lines or a microwave link to the receiving end station. At the receiving end stations the composite signal is further amplified in the Model RSA-1. Any signal amplitude fade in the course of transmission from sending to receiving end is maintained constant by AVC control in the RSA-1.

Output from the RSA-1 is applied to the RSD-1 where filters serarate tones from the composite voltage. The tones are then rectified in the discriminator circuits. The output of the discriminator is a D.C. potential which is proportioned to the deviation of the tone from its center frequency. This DC is then used to control a reactance tube, which in turn controls the BFO or HFO of the receiver. DC is also used to control the RF gain and AVC on-off.

Signal monitoring of the FFR is accomplished by sending its audio over a microwave link or telephone lines to the monitoring amplifier located in the RSC-1.

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TMC SPECIFICATION NO. S-186

TITLE: BLOCK DIAGRAM OF RCR SYSTEM

JOB 170

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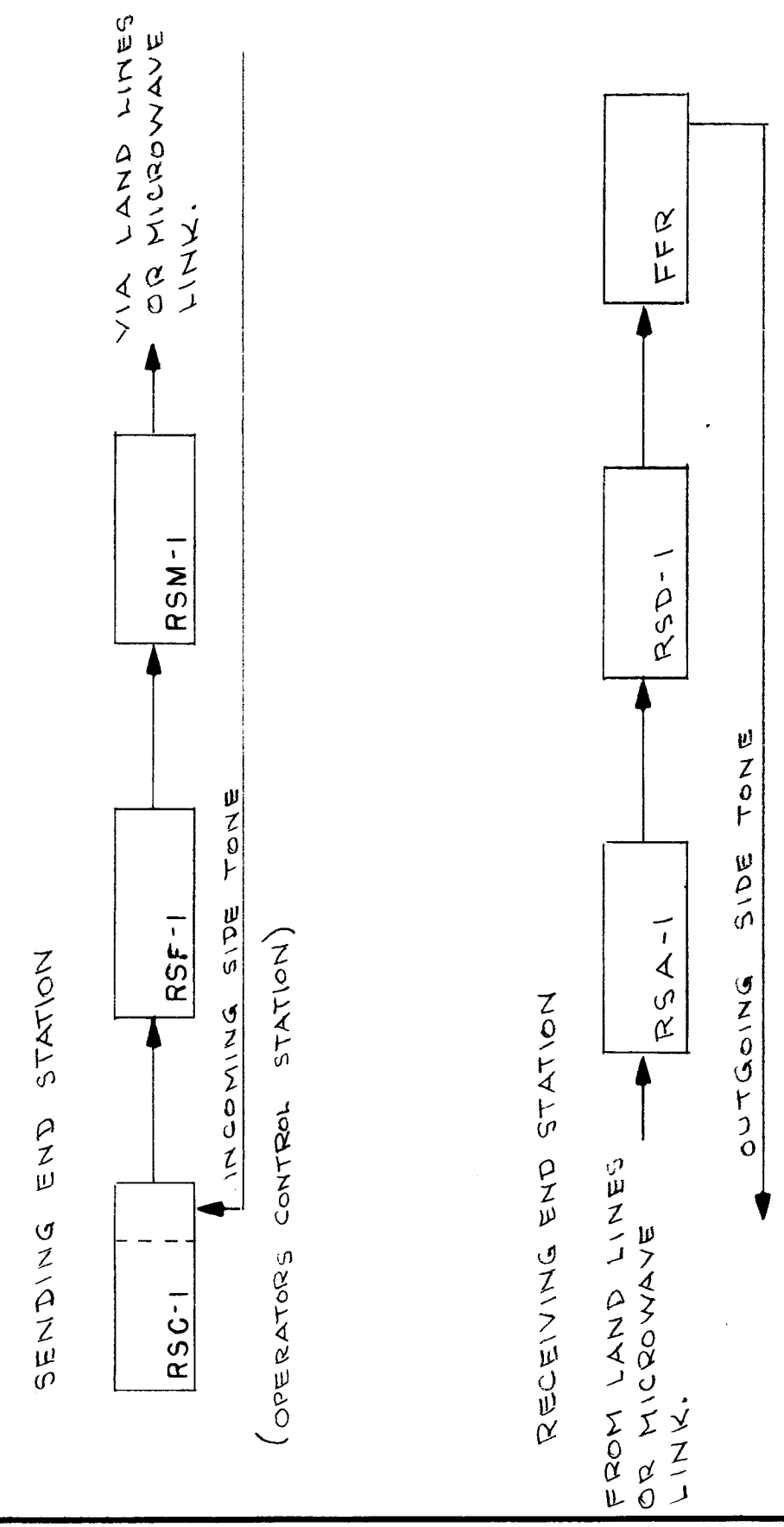

FIGURE 1

LEAST NUMBER OF UNITS

FORM — 100

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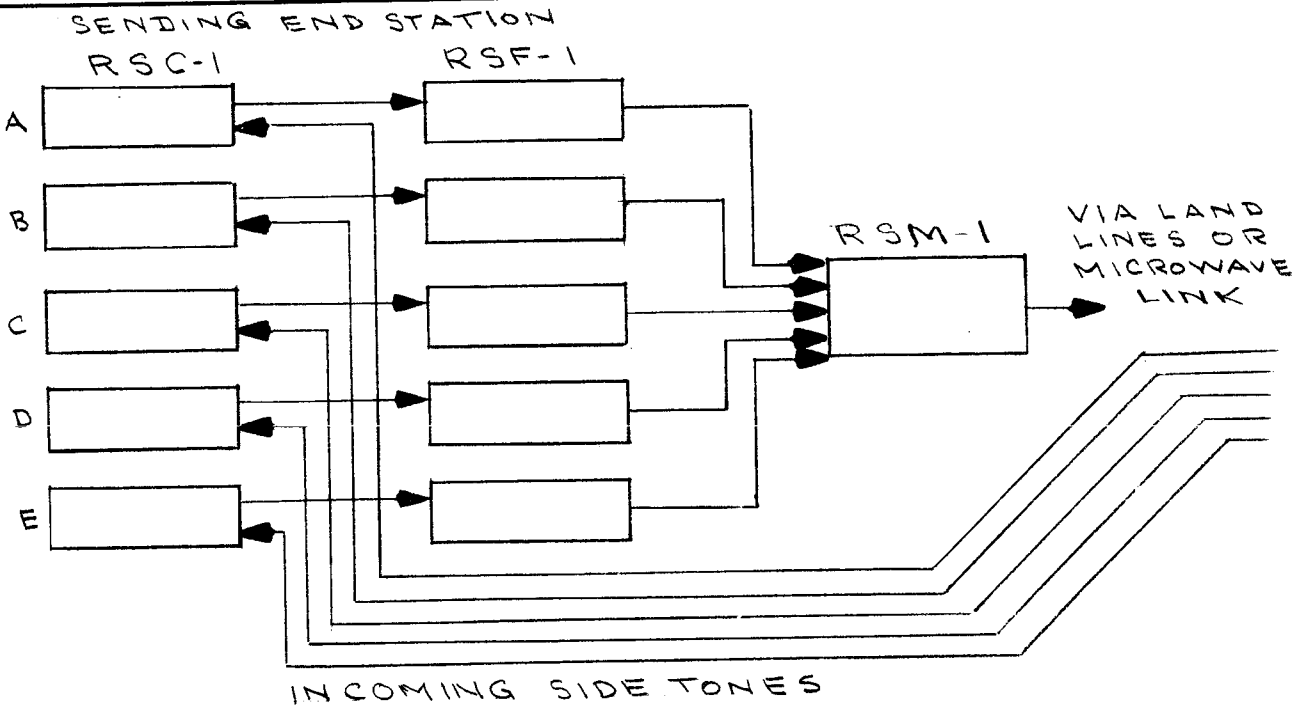
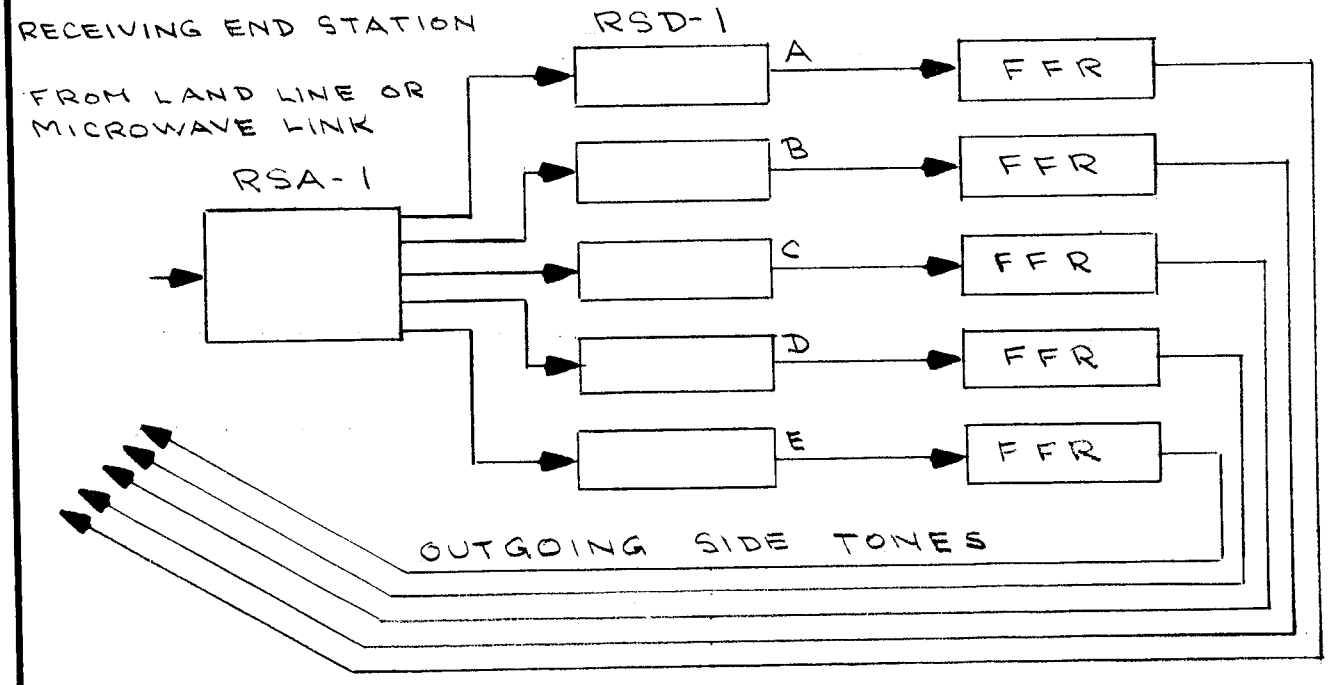


FIGURE 2

MAXIMUM NUMBER OF UNITS



I. INTRODUCTION

The model RSC, a unit of the RCR (Remote Controlled Receiver) is a device by which the station operator can affect receiver operative functions i.e., HFO, BFO, and RF gain from a remote point. Three tone generators are required to perform these functions. Included in the RSC is a monitoring amplifier for side tone listening tests.

THEORY

Tone generation is accomplished by means of RC-oscillators, (resistance-capacity tuned oscillator), sometimes called Wein bridge oscillator. A simple RC-oscillator appears below with its equivalent bridge circuit. Frequency of oscillator is determined by the formula

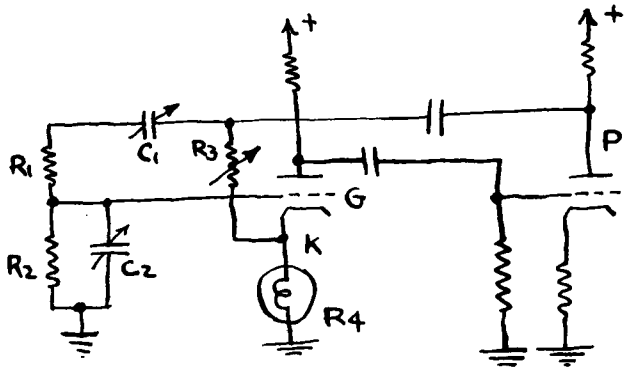
$$F = \frac{1}{2\pi\sqrt{C_1 C_2 R_1 R_2}}$$

and if C1=C2, R1=R2 it simplifies to

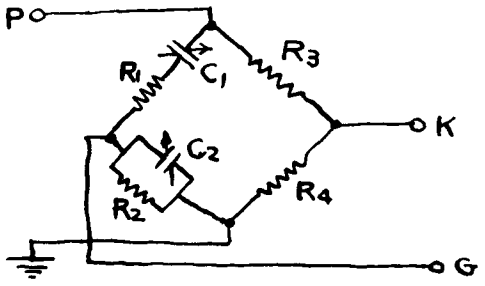
$$F = \frac{1}{2\pi C_1 R_1} = \frac{1}{6.28 C_1 R_1}$$

where

F= cycles per second
C1= capacitance in farads
R1= resistance in ohms



a simple Wein bridge osc.



Bridge Equivalent

In the RSC the frequency determining elements such as R1, R2, C1, C2 are contained in a plug-in network assembly. The resistor R4 (I1) provides automatic amplitude control over wide frequency limits. Coupled to the oscillator is a cathode-follower amplifier which prevents frequency instability in case of load variations.

The monitoring amplifier consists of push-pull output driven by a push-pull driver. Audio tone selection and audio peaking are provided in the input circuit. Acoustical howls during transmission time may be prevented by the operator with a muting control (whose range is adjustable) at the amplifier output. A switch located on the microphone causes the muting control to take over.

II TEST EQUIPMENT REQUIRED

(A) 1-Scope: Dumont 304H with 2507 probe.
(B) 1-Audio Signal Generator: Hewlett Packard 200.
(C) 1-Frequency Counter: Berkeley Model 5556.
(D) 1-V.T.V.M. (DC type) Heathkit V6.
(E) 1-V.T.V.M. (AC type) Heathkit AV2.
(F) 1-RSP-1 with necessary power cord and interconnecting cable.
(G) 3-Frequency determining assemblies, one for each osc.

III PRELIMINARY TESTS

(A) Set and maintain line voltage at 110V throughout entire test.
(B) Observe if pilot light is on, all filament light up and VR's glow.
(C) Check B+ lines, should be +150V on regulated and +270V unregulated.

IV ELECTRICAL TEST AND CALIBRATION

Set the following controls to mid-range.

(A)

	FUNCTION	BFO	HFO	RF Gain
1.	Osc. tuning	C3/C4	C8/C9	C17/C18
2.	Output level	R14	R29	R46
3.	Freq. Adj.	R1/R2	R17/R18	R33/R34

(B) BFO Calibration:

1. Connect scope and frequency counter to J1 (BFO output).
2. Adjust R7 feedback control until tone oscillator just breaks into oscillation. Too much feedback results in large waveform distortion.
3. Set control R1/R2 to frequency marked on assembly NF-100.
4. Turn R14 to voltage level as listed in Note A, measure voltage with Heathkit AC voltmeter at J1.
5. Repeat steps 1,2,3,4.

(C) Calibrate and test HFO and RF Gain in similar manner.

V. MONITOR AMPLIFIER

Connect audio generator to terminals 3 & 4 on barrier strip E1. Plug into J7 a dummy plug and measure E out across R63 (180 ohms). Perform the indicated operations:

GENERATOR FREQ.	TONE SELECTOR	E IN	E OUT
1000 cycles	Off	.5 V.	3.1 V.
Tune generator to approx. 2000 cycles	2000 cycles	.5 V.	Observe Peak
Tune generator to approx. 1500 cycles	1500 cycles	.5 V.	Observe Peak
Tune generator to approx. 1000 cycles	1000 cycles	.5 V.	Observe Peak
Tune generator to approx. 500 cycles	500 cycles	.5 V.	Observe Peak

VI. Check speaker for sound reproduction and possible cone rattles.

NOTE: A

It is to be noted that the output voltage is determined by the number of channels per system in use.

CHANNELS	NO. OF TONES	OUTPUT VOLTAGE OF TONE GENERATORS J1,3,5
1	3	.1 V.
2	6	.06 V.
3	9	.05 V.
4	12	.04 V.
5	15	.04 V.

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TEST DATA SHEET

(A) Maximum Output J1 _____ volts with R14 maximum position.
Maximum Output J3 _____ volts with R30 maximum position.
Maximum Output J5 _____ volts with R46 maximum position.

(B) Reset controls R14,30,46 according to Note A.

(C) BFO Freq. _____ cycles Output J1 _____ volts
HFO Freq. _____ cycles Output J3 _____ volts
RF Gain Freq. _____ cycles Output J5 _____ volts

(D) Monitor Amplifier:

GENERATOR FREQ.	TONE SELECTOR	E in Term. 3&4	E Out For No Distortion	Voltage Limits	
1000 cycles	Off	.5 V	_____ V	2.8V.	3.2 V.
Tune generator to peak at approx. 2000 cycles	2000 cycles	.5 V	_____ V	2.4V.	2.8 V.
Tune generator to peak at approx. 1500 cycles	1500 cycles	.5 V	_____ V	1.2V.	1.6 V.
Tune generator to peak at approx. 1000 cycles	1000 cycles	.5 V	_____ V	0.8V.	1.2 V.
Tune generator to peak at approx. 500 cycles	500 cycles	.5 V	_____ V	0.2V.	0.6 V.

(E) Speaker Test _____

SERIAL NUMBER: _____

TESTED BY: _____

DATE: _____

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TMC SPECIFICATION NO. S-186

TITLE: TESTING OF MODEL RSC

JOB 170

APPROVED

TEST DATA SHEET

(A) Maximum Output J1-------volts with R14 maximum position
Maximum Output J3-------volts with R30 maximum position
Maximum Output J5-------volts with R46 maximum position

(B) Reset controls R14,30,46 to designated voltage (See chart.)
Output J1-----volts
Output J3-----volts NO of channels-------
Output J5-----volts

(C)
BFO Freq.-------cycles High------cycles Low-------cycles
HFO Freq.-------cycles High------cycles Low-------cycles
RFG Freq.-------cycles Hige------cycles Low-------cycles

(D) Monitor Amplifier;
Voltage across R63 with .5v input-------volts.

(E) Tone Selector;

Input voltage	Frequency	Voltage peak
.5	500 cycles	---------
.5	1000 cycles	---------
.5	1500 cycles	---------
.5	2000 cycles	---------

(F) Speaker check.
Check Speaker for rattle,ect.-------

(G)Final Freq. check.
BFO-------cycles
HFO-------cycles
RFG-------cycles

(H) Mutting check.
----------OK.

SERIAL NUMBER:----------

TESTED BY----------

DATE----------