TCR-8

SUPERVISORY
CONTROL
SYSTEM
Type AQ-SCS-5

DESCRIPTION

The Aquidata Supervisory Control System type AQ-SCS-5 is specifically designed for the remote control, over a 600 ohm line, of the TMC Exciter type SME-5, which in turn controls a TMC Communications Transmitter. It is derived however, from standard building modules used for a variety of Supervisory Control systems.

The AQ-SCS-5 system provides for the remote control of 25 front panel selections as listed in the technical specification; it also provides for the simultaneous transmission of audio (voice range) signals, and a Press to Talk (PTT) function over the same 600 ohm transmission line.

Audible and visual alarm indicators are provided to warn the operator of faulty received data or missing transmissions, and a number of fail-safe features are also incorporated.

PHYSICAL DESCRIPTION

The control system is physically composed of two separate units: a Send unit (AQ-SCS-5S) and a Receive unit (AQ-SCS-5R). These units are designed for mounting in a standard 19 inch rack.

All operating controls are provided on the front panels, as are tone and signal monitor jacks. Input and output connectors are provided on the rear panels.

The front panel of each unit contains a hinged panel secured by thumbscrews, providing access to the printed circuit cards, which are themselves, functionally isolated plug-in modules.

TECHNICAL SPECIFICATIONS

Functions:

Selection by illuminated push button switches of:
- 8 RF channels
- 5 Transmitter Modes
- 5 LSB Inputs
- 5 USB Inputs

Control of - High Voltage on/off
- Retune on/off

Provision of - Simultaneous transmission of audio signals.
- Separate PTT channel (on same transmission line).

Line Level: O dBm nominal, operational to -25 dBm.

Alarm Indications: Audio and visual alarm indications on occurrence of parity error in received data, open or broken line, power failure at Send Unit, low line level.

Tone Receiver cards incorporate "Mark Hold" circuitry with adjustable threshold, to hold the outputs of these cards in the "Mark" (high) state during low line level conditions.

"Fail Safe" Provisions: Data transfer from memory in Receive unit is inhibited on any alarm condition.condition.

Scanning Rate:	50 bits per second..
Scan Cycle Period:	0.8 second
Synchronization: etc.	System features :"instant" lock-on when unit is turned on, line connected, etc.
Input Impedance:	600 ohms nominal.
Output Impedance:	600 ohms nominal.
Headphone Impedance:	600 ohms or greater.
Environmental:	-5°C to 60°C up to 95% relative humidity.
Storage:	-25°C to 70°C, 95% relative humidity.
Overall Size:	Each Unit: Height: 7 in. (17.8 cm) Width: 19 in. (48.3 cm) Depth: 15.25 in. (39 cm)
Weight:	Each Unit: Approximately 20 lb. (9 kg)
Power Requirements:	Each Unit: 115 VAC, 60Hz, 1/4 Amp. nominal.

Technical Analysis

of

TRANSMITTER REMOTE CONTROL SYSTEM

Series RCMT-1

General Description and Features

Physical Description

Functional Description

Operating Procedures
- Normal Conditions
- Emergency Conditions
- Maintenance Conditions

Maintainability
- Technical Manual
- Preventive Maintenance
- Troubleshooting and Repair (MTTR)

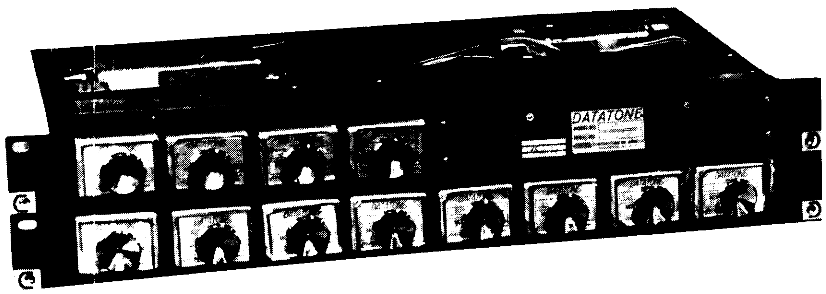
Reliability
- Equipment and Circuit Design
- Mean Time Between Failure (MTBF)

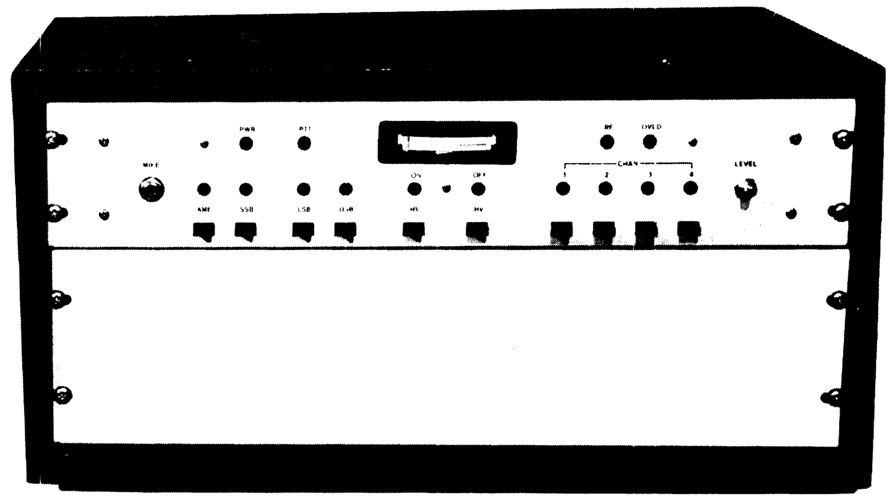
Technical Specifications

Test Equipment and Special Tools

Replacement Parts

A2.0102
1076


DATATONE


MIKE
PWR
PTT
AME
SSB
LSB
USB
ON
OFF
RF
OVLD
CHAN
1
2
3
4
LEVEL

GENERAL DESCRIPTION AND FEATURES

The RCMT-1 series of transmitter remote control systems are designed to provide the facility for controlling all operational functions of a multi-channel transmitter. In addition, the system provides a readback capability to indicate the current status of the transmitter under control. These operations of command and readback are performed by two basic units:

Remote Control Sub-System
 RCMT-1/P Data Programmer/Readback
Transmitter Control Sub-System
 RCMT-1/D Data Decoder

Each unit performs a specific function in the control chain and serves to cross-check each operation to assure maximum reliability of the system.

The Remote Control Sub-System is normally housed in a cabinet at the operations control site located at some distance from the transmitter site. The link between remote and transmitter sites is a 3kHz audio tone channel, hardwire or microwave. Additional channels are required to carry the audio intelligence to the transmitter. These latter channels are normally allocated to upper/lower sideband voice, teletype, or facsimile inputs. The remote control subsystem is designed to program and interrogate one multi-channel transmitter system. One decoder is required for each transmitter system controlled.

All parts and assemblies, including tone packages, are accessible from the front of each unit to facilitate repair. Interconnect cables are of sufficient length to permit full operation of the equipment under maintenance conditions when the control units are removed from the cabinet. All components of the system are solid state; no electromechanical devices are used in the system.

The following sections describe in detail the physical and electrical characteristics of the RCMT-1.

PHYSICAL DESCRIPTION

The RCMT-1 transmitter remote control system consists of a data programmer/readback unit (RCMT-1/P) and a data decoder unit (RCMT-1/D). The RCMT-1/P is located at the remote control site at a distance from the transmitter site and is normally mounted in a standard control rack or console. The RCMT-1/D is located in or adjacent to the transmitter cabinet at the other end of the control link.

Data Programmer/Readback

The data programmer/readback unit, RCMT-1/P, contains both the control and indicator assemblies as well as the tone generator packages. These tone packages serve to make up the binary-type code for controlling the transmitter functions and to interpret the readback codes from the transmitter for presentation at the front panel. There are nine tone generators, three tone receivers, and two power supplies in the tone package. The control and indicator assemblies translate the information processed for both the command and the readback operations.

The RCMT-1/P Programmer/Readback is housed in a standard chassis suitable for 19-inch rack mounting. Its maximum dimensions are:

3.5" high x 6" deep x 17" wide
8.9cm high x 15cm deep x 43cm wide

The tone package adds an additional 3.5" (8.9cm) to the overall height. If there is a restriction in available rack space, the tone package is transferred to the rear of the programmer/readback and the depth dimension becomes 12" (30.5cm). The maximum weight of the RCMT-1/P is 26 pounds (11.8 kg).

Data Decoder

The data decoder unit, RCMT-1/D, contains the translator circuits and audio tone packages needed to interpret both the command and readback operations. The tone package consists of nine tone receivers for command, three tone generators for readback, and two power supplies. The translator circuit is used to interact with the controlled transmitter and provide the necessary voltages for dc switching of such functions as channel, mode, carrier suppression, and high voltage. All terminations for intelligence input and tone control are made at the rear of the chassis on terminal strips.

The RCMT-1/D Decoder is housed in a standard chassis frame suitable for 19-inch rack mounted. Its maximum dimensions are:

3.5" high x 12" deep x 17" wide
8.9cm high x 30.5cm deep x 43cm wide

The maximum weight of the RCMT-1/D is 20 pounds (9.1 kg).

FUNCTIONAL DESCRIPTION

The RCMT-1 system provides the controls, control signals, and readback indications so that an operator at a remote station some distance from the transmitter site can operate a multi-channel transmitter as easily as if he were at the transmitter location. The system consists of a data programmer/readback unit at the remote station and a data decoder unit at the transmitter station. The two units are linked by either a standard, shielded pair of 600-ohm transmission lines or at least one 3kHz microwave channel to carry all data and intelligence between the two locations.

The following paragraphs describe the operation of the control system in detail. Reference should also be made to the supplementary diagrams at the end of this section which cover various elements of the system.

The outputs generated by the RCMT-1/P programmer are all in the form of tone signals of various frequencies. Each frequency represents a specific bit of an 8-bit binary-type code. Reference to the tables (ff.) will clarify the code bit/frequency relationship.

The control signal outputs of the RCMT-1/D decoder are all ground closures (ground signals). The readback signals generated by the decoder are three specific tone frequencies, all above the audio range. Two of these signals (HV and RDY) are transmitted back to the programmer. The third operates a control circuit in the decoder. All of the tone frequency signals are supplied by tone modules.

RCMT-1/P Data Programmer/Readback

Mode Selection - The desired operating mode is selected by positioning the selector switch on the front panel of the programmer and pressing the MODE pushbutton. The mode switch is a two wafer rotary type, the contact arm of which is positioned by the shaft movement. The actuating switch is a two pole momentary contact pushbutton. If it is desired to operate in the suppressed carrier mode, a second rotary switch is positioned and the pushbutton again depressed. This provides a ground signal to the switch which is carried to the control assembly in the programmer.

The design of this assembly is such that these ground signals actuate two tone generator modules: the which generates a tone frequency of 852Hz and the one which generates a tone frequency of 1633Hz. These tone signals are then transmitted to the transmitter site over the 600-ohm interconnecting line.

Sideband Selection - The selection of sideband operation is made in a manner similar to the mode selection since both the selector switches and the pushbutton switches are functionally the same. Since the USB and the LSB selections are made in a like manner - only the tone frequency codes transmitted are different - just one selection in the upper sideband circuit will be traced.

When MIC/KEY operation in the upper sideband is selected and the push-button is pressed, a ground signal is routed through the switch to control circuit board. These ground signals activate the 941Hz and the 1633Hz tone units and the tone signals sent to the transmitter site.

Channel Selection - The selection circuit for picking the proper channel to accommodate the operating frequency and causing the transmitter to tune to that frequency is slightly more complex. The selector switch is a three wafer switch, two of which are used to develop the tone codes indicative of the channel selection. The third wafer is used to control the operation of the LED (light emitting diode) channel indicators. Again, the tone signals are generated when ground signals appear at certain terminals of the PC plug-in connection. In addition to generating the channel codes, pressing the TUNE pushbutton provides a +24 VDC pulse which causes an SCR to fire providing a supply voltage to the LED representing the selected channel. The appropriate LED is lighted through the switch setting and the action of SCR's for each channel selection. Pressing the TUNE button grounds out the supply voltage for the READY LED. This ground circuit also holds the FAULT circuit in a quiescent state until the TUNE pushbutton is released at which time it is activated.

During the tune cycle, the RDY readback signal and the HV ON signals from the transmitter are lost, so the associated indicators go out during this period. When the cycle is complete the RDY readback signal is again received, and normal indications are again available. If elapsed time of the tune cycle exceeds that which is considered a normal maximum of 30 seconds, the fault circuit of the programmer will be activated and the FAULT indicator will light.

FAULT indication - Under normal conditions either the RDY readback or the auxiliary PTT ground circuit prevent the fault timing circuit from being activated. During the tune cycle the RDY signal is lost and no ground is being supplied by the PTT auxiliary circuit. With the absence of these ground signals the 24 VDC supply immediately begins to charge the fault timing circuit. If circuit conditions are not changed by the return of a ground circuit this will result in a unijunction switch conducting after 30 seconds have elapsed. Under normal conditions, this electronic switch does not conduct since at the end of the tuning cycle the "ready" readback ground signal will again provide a path to ground for the charging voltage. Should a malfunction in the tuning cycle prevent the "ready" signal from being received, the 24 VDC will continue to charge the switch until a positive potential of approximately 16 volts is reached. When the switch conducts, a triggering voltage is provided to the fault SCR and a positive fault signal will be sent to the fault indicator which will then light.

PTT Operation - When the push-to-talk switch on the microphone or handset is actuated, a ground signal is provided to an auxiliary relay. When this relay is actuated, one set of contacts provides a ground to lock out the fault timing circuit, the other set of contacts activates tone module and the resultant tone signal is directed to the transmitter to activate the push-to-talk circuit. The ground signal supplied when the PTT switch is closed also ensures that correct status indications will be maintained. This ground keeps the HV indicator lighted, and lights the PTT LED indicator. The RDY indicator will go out as an indication that the push-to-talk circuit in the transmitter is properly activated.

RCMT-1/D Data Decoder

The tone signals from the remote site programmer are received at the transmitter where they are directed to the tone receiver section of the decoder. Each tone frequency will activate but one receiver. Two receivers are therefore activated for each command in accordance with the 8-bit code. When activated the receivers provide input signals to the logic system. This logic system consists of three printed circuit boards which support all of the solid-state logic necessary to translate the tone signals to ground output signals to the transmitter. The channel and mode selection are provided by one circuit board; a second controls the sideband and line selection; and the high current switching and the push-to-talk control is provided by a third circuit board.

Mode Selection - Tone frequencies of 852Hz and 1633Hz are received from the remote station when the suppressed carrier mode is selected. The receipt of these frequencies will activate two receiver modules. The output signals from these two activated modules is directed to the integrated circuits of the logic system. The system operates on these signals and provides a ground signal output which is carried to the transmitter.

Sideband Selection - When MIC/KEY operation was selected, the programmer transmitted tone frequencies of 941Hz and 1633Hz to the transmitter site. These signals activate two receiver modules. In the decoder the logic system interprets the outputs of the receiver modules and provides a ground signal to the transmitter.

Channel Selection - As in the programmer discussion, we are assuming one channel operation. The programmer transmits two tone frequencies. When received, these frequencies activate two receivers. The logic circuit translates the outputs of these tone receivers to an output ground which appears at the transmitter circuit to adjust the internal band switches for the selected channel. When a channel signal has been obtained, it also activates the logic circuitry in such a manner that a "tune" signal is provided to the transmitter after a split-second delay. This "tune" signal is also in the form of a ground signal which initiates the tune cycle of the transmitter.

High Voltage Control - The logic system also interprets the input signals from the programmer to control the high voltage supply to the amplifier tubes of the transmitter. The high voltage is turned on when a ground signal appears at the transmitter. This ground is obtained when two receiver modules are activated. The receipt of tone frequencies of 1209Hz and 1336Hz simultaneously will activate these receivers. If tone frequencies of 1209Hz and 1477Hz are received, two other modules will be activated. With these two receivers activated, the logic circuit acts to remove the ground signal which opens the high voltage supply circuit of the transmitter shutting off the high voltage.

Status Signals (Readback) - Activating the transmitter modules in the decoder provides the remote operator with the information as to the operational status of the transmitter. When the high voltage circuit in the transmitter is completed, a ground signal is supplied through the transmitter wiring harness to the decoder logic which activates the 2700Hz tone signal, sending it to the remote site. A ground signal which will activate the 2600Hz transmitter module is furnished to the decoder when the tuning cycle of the transmitter is complete. This tone, when received at the remote site, will activate the RDY indicating circuit of the programmer. When the push-to-talk circuit in the transmitter is activated, a ground signal will shut off any readback signals being transmitted to the remote site.

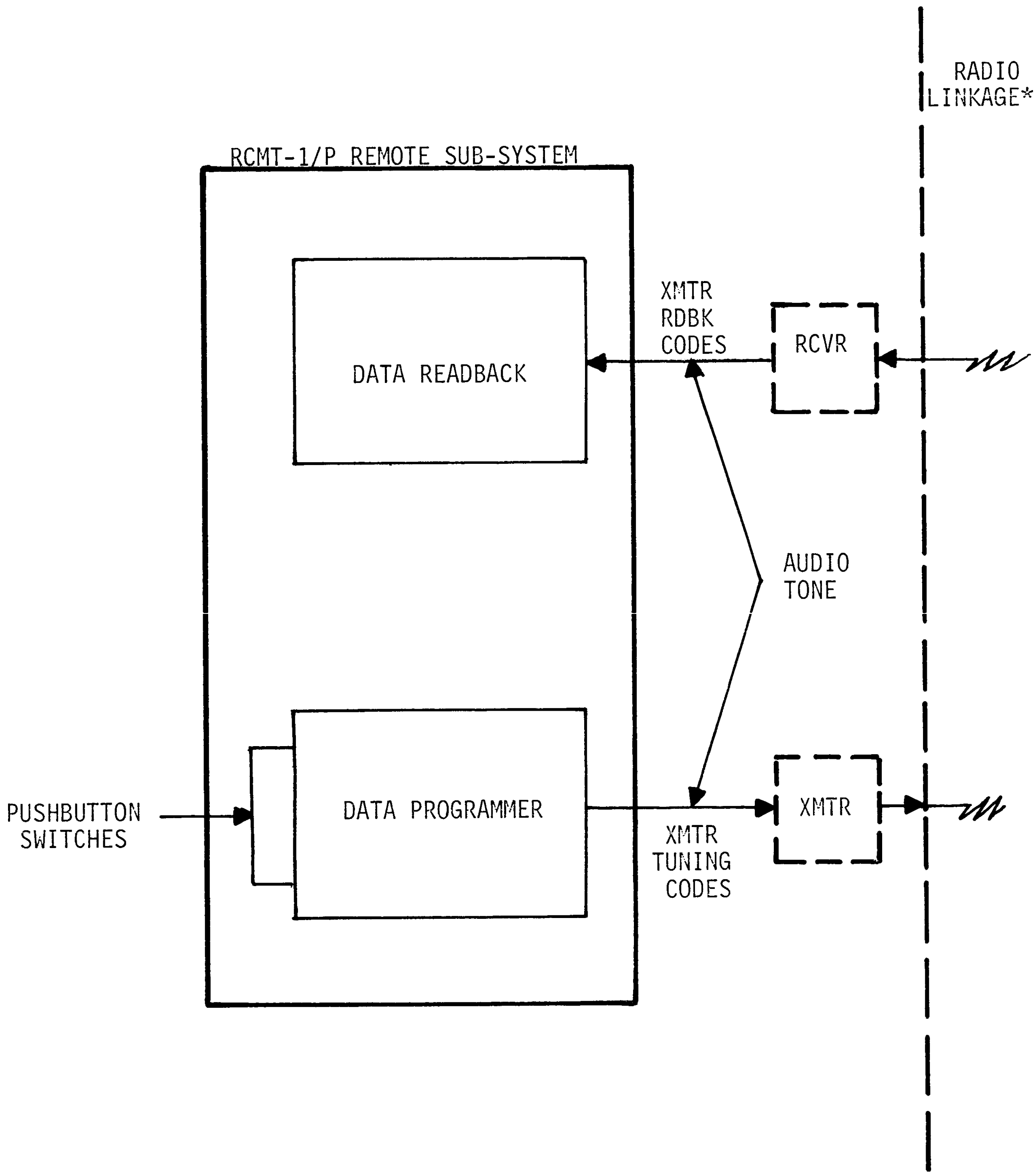
PTT Operation - The push-to-talk control signal from the remote site will activate a ninth tone receiver in the decoder. This receiver module is sensitive only to the frequency of the PTT tone signal. The activation of this module will furnish a ground signal to the transmitter to activate the PTT relay in the transmitter circuit.

TABLE 1-1. TONE FREQUENCY VS SIGNAL BIT

Bit No.	Frequency Designation	Tone Frequency Hz
1	H1	1209
2	H2	1336
3	H3	1477
4	H4	1633
5	L1	697
6	L2	770
7	L3	852
8	L4	941
PTT	RD BK	2500
RDY	RD BK	2600
HV ON	RD BK	2700
Spare	RD BK	2800

Table 1-2. Function Code

	Binary Code							
Function Bit No.	1	2	3	4	5	6	7	8
Channel Select								
1	H1				L1			
2		H2			L1			
3			H3		L1			
4				H4	L1			
5	H1					L2		
6		H2				L2		
7			H3			L2		
8				H4		L2		
Mode Select								
CW	H1						L3	
AME		H2					L3	
PC			H3				L3	
SC				H4			L3	
MCW	H1							L4
USB								
Line 1		H2						L4
Line 2			H3					L4
Mic/Key				H4				L4
FSK					L1	L2		
LSB								
Line 1					L1		L3	
Line 2					L1			L4
Mic/Key						L2	L3	
FSK						L2		L4
HV-ON	H1	H2						
HV-OFF	H1		H3					



*WIRE OR DIRECT CABLE LINKAGE MAY BE SUBSTITUTED

OPERATING PROCEDURES

Normal Operations

The RCMT-1 is designed to control all functions, including channel selection, on a multi-channel TMC transmitter system. The control system is designed to operate continuously, 24 hours per day, and when not in use can be completely shut down. A visual inspection of the control system, including connection to any immediate communications equipment, should be made by the operator. Primary power can be applied to the RCMT-1 once all is determined in order by the operator. Sequenced tuning of each transmitter is accomplished as follows:

1) Select the transmitter to be tuned at the RCMT-1/P unit;
2) Check readback for an indication that transmitter is ready for tuning;
3) Check readback for present transmitter settings;
4) Program new settings as required;
5) Energize the transmitter's automatic tuning system;
6) Verify new transmitter settings on readback.

If an overload occurs, a light will identify the fault condition. The tuning sequence should be repeated until it is determined that maintenance is required. A VSWR overload will appear on the readback unit as a fault if the condition results from improper antennae or antenna connections. Other fault indications such as transient error or power interruptions may also force a repeat of the tuning cycle.

Emergency Conditions

The probability of line or copy failure in the control system is extremely small. However, should there be a failure, all functions can be controlled locally, by the on-site operator. The transmitter system as previously discussed, is designed to protect itself first by kicking down if the malfunction could cause electrical or mechanical damage. This protection occurs for such conditions as loss of a primary power phase, excessive heat buildup in the final amplifier, overload at the output, or accessing the equipment when it is in operation. No damage can occur if the control system fails to operate properly or command signals are lost.

The control system consists of interchangeable building blocks which work equally well in any transmitter system. This feature of commonality of units and compatibility between systems reduces the treat posed by failure of any one sub-system. By interchanging assemblies or complete sub-systems, an emergency condition can be handled with ease.

Maintenance Conditions

The RCMT-1 Transmitter Remote Control system is designed so that maintenance can be performed in place without moving equipment. A qualified technician can isolate any malfunction and correct it while the transmitter is in an operating test condition. This can take place only if the control system interlocks are overridden mechanically by the technician. Access to the equipment is through the front panel. Input/output terminal strips are provided in convenient locations if it becomes necessary to check out the system with an external programmer. Troubleshooting is covered in the next section.

MAINTAINABILITY

Technical Manual

TMC technical manuals perform an important function in successfully maintaining Remote Control Systems. As a minimum, each manual consists of seven sections:

1) General Information
2) Installation
3) Operating Procedure
4) Principles of Operation
5) Maintenance and Troubleshooting
6) Replacement Parts
7) Drawings and Schematics

This breakdown simplifies the maintenance function by providing a ready reference for both operator and technician. Each manual is based on the actual equipment supplied and is updated by addenda sheets as changes in design occur. The manual can also be used as a training guide and as a reference for the ordering of spare parts.

Preventive Maintenance

A key factor in the successful operation of this system is the degree to which preventive maintenance is performed. Dust, dirt or other destructive elements can cause the equipment to fail if conditions are allowed to continue over an extended period of time.

At periodic intervals, the equipment should be pulled out on its slides for internal cleaning and inspection. The wiring and all components should be visually inspected for accumulations of dirt, dust, corrosion, grease and other harmful substances. Removal of these elements by dusting or treating with a solvent is essential to extending the useful life of the equipment.

Troubleshooting and Repair (MTTR)

An important feature of the TMC control system is the number of front panel indicators visible to the operator. The use of these indicators simplifies the troubleshooting process by directing attention to a specific area. Corrective action can then be taken immediately with a minimum of down time.

The technical manual also assists in troubleshooting by devoting attention to fault indications, to probable causes, and to suggested remedies. All test points and adjustment controls are normally covered to protect both the operator and the equipment. All low power circuits are mounted on removeable circuit cards mounted on slide-retainers. The higher power circuits are composed of a series of interlocking assemblies that can easily be removed. Test points are located in full view of the technician at specific locations throughout the system. These test points are clearly shown on technical manual schematics. The Mean-Time-To-Repair (MTTR) is nominally fifteen (15) minutes for the entire system and is based on actual test times taken in the engineering laboratory under operating conditions. This MTTR figure will vary depending on the degree of the failure and the availability of spare parts. Interchangeable assemblies can be used to reduce MTTR further.

RELIABILITY

Equipment and Circuit Design

Designed into all TMC products is quality. From the time a circuit is first sketched on a drafting table, meticulous attention is given to minimizing the number and density of components while maximizing the functions performed. Whenever possible, solid-state components including large scale integrated (LSE) circuits are used. All of the modern TMC equipment is solid state except for the final tube circuits in the higher power linear amplifiers (1KW and above). Maximizing the use of solid state components increases overall reliability by reducing the number of components needed to perform a given function and reducing the power requirement (stress) on the system. This improvement in reliability is reflected in a higher MTBF value (see below). Costs also decrease as the overall reliability improves since downtime, maintenance and the requirement for spare parts are all reduced. With each proven advance in modern technology, TMC modifies its designs to reduce cost and improve reliability while maintaining compatibility with older systems. Consequently, the reliability of TMC equipment, already well-known, improves with age as modern technologies are incorporated in designs. This attention to designing reliability into its transmitter systems is one reason why TMC equipment is selected more often to perform the most demanding jobs.

The reliability of electronic equipment is defined as the probability the equipment will perform properly for a desired length of time under the conditions (operational and environmental) for which it is designed. There are basic assumptions which underlie the construction of a mathematical model to be used to predict the reliability of equipment:

(1) Part failure rates are constant;
(2) Probability of part survival or part reliability follows a Poisson or exponential distribution;
(3) Parts within a particular equipment or the equipment within a particular system have a series relationship. That is, each part or each equipment must operate properly so that the function for which they are used can be performed.

Mathematically, the reliability of an item of equipment or a complete system is a function of the sum of the failure rates of the parts constituting the equipment or the equipment constituting the system. Normally, failure rates can be predicted for specific parts. However, for equipment in systems, failure rates are less precise since the time interval for which the equipment reliability is being determined is usually not well defined. Mean-Time-Between-Failure (MTBF) is used in this latter case and is equal to the reciprocal of the failure rate for the equipment.

The following steps were taken to calculate the reliability and the MTBF of the transmitter system:

(A) A list of all parts used in the design of the control system was compiled from material lists stored on magnetic disks on an IBM computer system.

(B) The failure rate of each part was determined using MIL-HDBK-217 Reliability Stress and Failure Rate Data for Electronic Equipment. In the case of equipment for which adequate test time was not available, a list of components with typically average failure rates was used. This list appears at the end of this Section.

(C) The predicted failure rate of each part was recorded on a magnetic disk. The summation of these failure rates yielded the failure rate for the entire equipment.

(D) The MTBF was then calculated by taking the reciprocal of the summation of the failure rates. Since the transmitter system has been operating well over 10,000 hours in the field, failure rates were calculated by computer and then modified to reflect actual performance.

The data for MTBF on the RCMT-1 control system was derived from actual installations in the following areas:

Ottawa, Canada	Government of Canada
Athens, Greece	Government of Greece
Santiago, Chile	Government of Chile

Experienced over a period of 1,000 to 10,000 hours after acceptance, the transmitter average failure rates in terms of percent per 100,000 hours of operation is 0.081. The calculated MTBF is 12346 hours. Calculated from a computer analysis of the transmitter system using known stress values, the MTBF becomes:

11982 hours

The difference in values can be attributed to the type of service the system is used in. The computer analysis assume 24-hour per day operation at fully rated loads under severe environmental conditions. In actual fact, these systems are routinely shut down for periodic maintenance such as cleaning and minor adjustment. This procedure serves to extend the useful life of the system.

Two important factors further affect MTBF values: (1) the age of the equipment, and (2) the degree of preventive maintenance. TMC has found through experience that new equipment (less than one year operating) and old equipment (greater than seven years operating) have more failures than normal for a given period of time. The "burning in" of new parts and the normal wear of old parts are the primary factors which contribute to this condition. Once corrected, the system gives extremely reliable service particularly if the basic preventive maintenance procedures are conscientiously followed throughout the 20-year life of the equipment.

TYPICAL AVERAGE FAILURE RATES*

Components	Estimated Failure Rates % per 100,000 Hours of Operation
Capacitors (general purpose)	0.01 - 0.6
Capacitors (electrolytic)	0.02 - 2.0
Crystal diodes	0.05
RF inductors	0.05
Integrated circuits	0.1
Meters	0.2
Motor/generators	0.04
Potentiometers	0.3
Relays	0.001 - 0.5
Resistors, fixed	0.01 - 0.3
Switches	0.01 - 0.1
Transformers	0.05 - 2.0
Transistors	0.2
Tubes (receiver types)	1.0 - 2.0
Tubes (high power, transmitting)	1.0 - 20.0
Soldered joints (dipped)	0.0001
Wrapped joints	less than 0.0001

*Based on actual performance from TMC field engineering and maintenance records

TECHNICAL SPECIFICATIONS

The RCMT-1 Transmitter Remote Control System consists of two sub-systems, each divided into functional units. The electrical and mechanical characteristics change only if accessory equipment is added to modify the specifications. The following are the RCMT-1 system specifications.

Remote Control Sub-System, RCMT-1/P

Tuning Code Output

8-bit codes in binary-type format, serial. Audio tone in 3kHz channel. Programming codes per attached table under Functional Description section.

Readback Code Input

8-bit codes in binary-type format, serial. Audio tone in 3kHz channel. Readback codes per attached table under Functional Description section.

Primary Power

115/230 volts AC, single phase, 50/60Hz
50 watts maximum consumption

Size and Weight (without console cabinet)

RCMT-1/P Programmer/Readback

17 inches wide x 3.50 inches high* x 6 inches deep
43cm wide x 8.9cm high x 15cm deep
26 pounds (11.8 kg)

*With tone package add 3.50 inches to height or 6" to depth.

Environmental

Operates continuously in any ambient between 0°C and +50°C at any value of humidity up to 90%. Will not be materially affected if stored between -30°C and +85°C at any value of humidity up to 90%.

Transmitter Control Sub-System

RCMT-1/D Decoder

Instruction Code	8-bit code in binary-type format, serial. Audio tone in 3kHz channel.
Readback Code	8-bit code in binary-type format, serial. Audio tone in 3kHz channel.
Power	115/230 volt AC, single phase, 50/60Hz. 40 watts maximum.
Size and Weight	17 inches wide x 3.5 inches high x 12 inches deep 43cm wide x 8.9cm high x 30.5cm deep 20 pounds (9.1 kg)

TEST EQUIPMENT AND SPECIAL TOOLS

The RCMT-1 control systems do not normally require special tools or test equipment for operation. Installation and maintenance personnel on site may wish to supplement the station test equipment with the following:

Volt-Ohm Meter	Simpson 260
Frequency Counter	H-P5244L
Oscilloscope	Textronix 541A

REPLACEMENT PARTS

TMC will support the equipment proposed with replacement parts as required for a period of 10 years after installation. If exact duplicates are not available, TMC will provide the equivalent part that will equal or better the characteristics of the original part. Replacement parts can be furnished on a component basis, a sub-assembly basis, or a combination of both. The normal warranty of 12 months will apply to all replacement parts supplied by TMC (excludes tubes, fuses, semi-conductors, and other fragile materials).

The parts lists contained on the next pages represent those parts recommended by TMC as spares. The recommended parts cover two years operation of the equipment under normal conditions. Fire-up or interim spare parts are included in this list.

RECOMMENDED SPARE PARTS LIST

____ 01 OPERATING SPARE PARTS
____ 02 OPERATING P.C. BOARDS
XXX 03 MAINTENANCE SPARE PARTS /2 Years
____ 04 MAINTENANCE P.C. BOARDS
____ 05 SPECIAL SPARE PARTS

LIST No. S2.0102 REV. ____
TMC MODEL No. RCMT-1
COMPILED ON 10/76 BY NdP
PRICED ON ____ BY ____

ITEM	QUANTITY PER UNIT	PART NUMBER	DESCRIPTION	QUANTITY RECOMM'D	UNIT PRICE	TOTAL
01	13	BI132	LIGHT EMITTING DIODE	6		
02	2	IN100	SEMICONDUCTOR, DIODE	2		
03	5	IN914	SEMICONDUCTOR, DIODE	3		
04	5	IN3022B	SEMICONDUCTOR, DIODE	3		
05	9	2N3646	TRANSISTOR	5		
06	1	2N1595	TRANSISTOR	1		
07	1	2N1671	TRANSISTOR	1		
08	1	FU100-0.250	FUSE, CARTRIDGE	3		
09	1	NW193	MICROCIRCUIT	1		
10	2	CE105-100-25	CAPACITOR, ELECTROLYTIC	1		
11	6	SW563	SWITCH, PUSHBUTTON	2		

All prices subject to change without notice.
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THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, NEW YORK

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