

MICROPROCESSOR REMOTE CONTROL

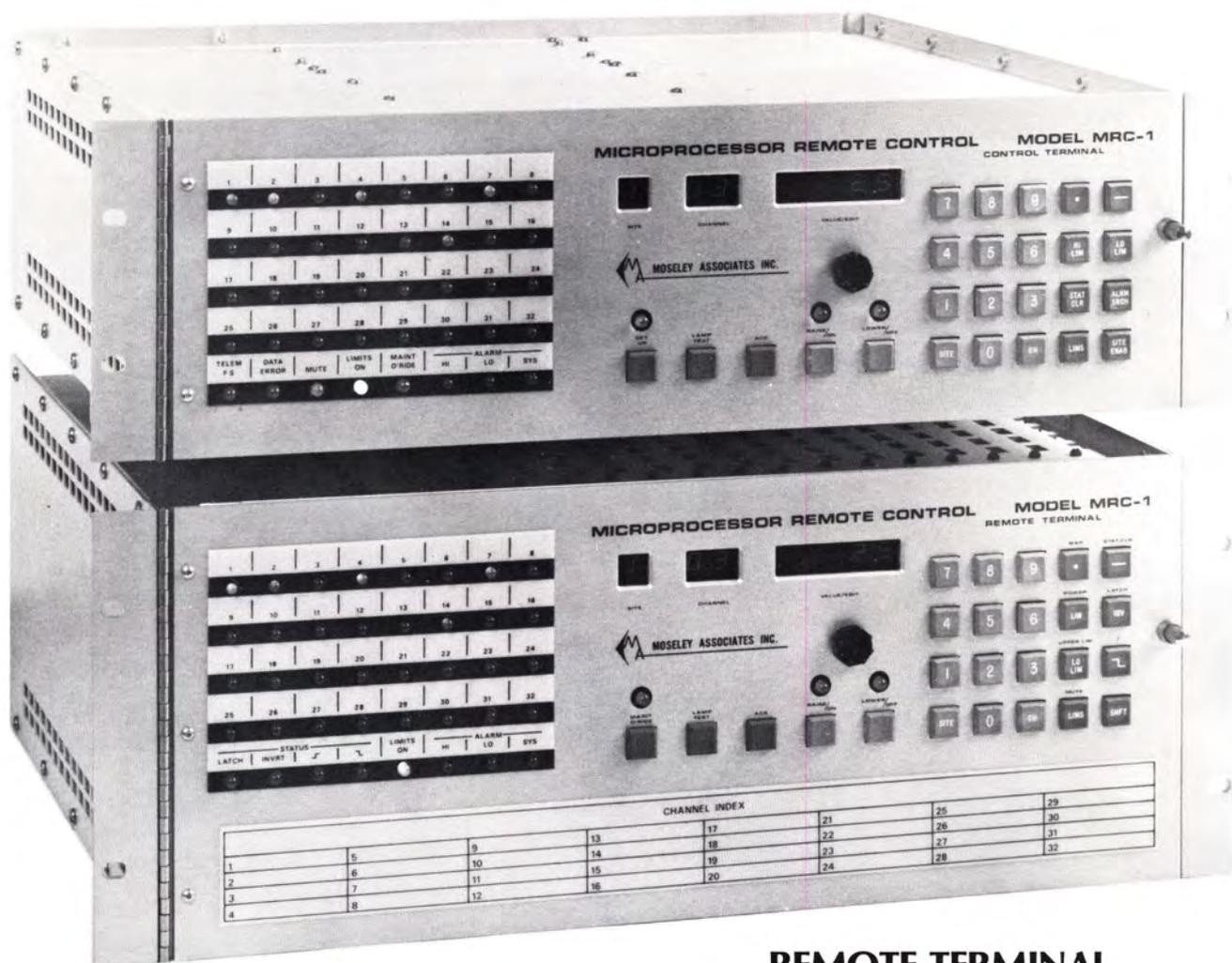


TM

MODEL MRC-1

Bulletin 267B

CONTROL TERMINAL



REMOTE TERMINAL

MOSELEY ASSOCIATES, INC.

THE MRC-1: A MICROPROCESSOR-BASED SYSTEM IN STEP WITH TODAY'S TECHNOLOGY

The MRC-1 is a modular, solid-state, microprocessor-based remote control system. Consisting of a control terminal and up to nine remote terminals, it obtains remote indications of analog telemetry and status information, and provides reliable remote control of equipment. The use of a microprocessor as the main control and logic element of each terminal allows many features to be conveniently incorporated into the system.

Each remote terminal may access up to 64 command outputs, 32 status inputs and 32 telemetry inputs. The control terminal communicates with each remote terminal over a single communications circuit which connects all locations. The circuit may be either a two-wire or four-wire telephone line, an STL subcarrier, aural STL subcarrier, or a combination of private radio/microwave links.

Operation of the MRC-1 is segregated into routine operation and maintenance/setup functions.

Convenience and Simplicity

Routine operation of the MRC-1 system is simple and straightforward. The color-coded front panel keyboards are similar to those of existing remote control systems.

In operation, one of the remote sites is chosen for display at the control terminal. All status inputs are simultaneously displayed on a set of 32 LEDs, and vital system conditions are shown at a glance. Internally calibrated telemetry (analog) inputs are presented digitally, one at a time. To display the value of a selected channel as a four digit number, the operator uses the CHANNEL SELECT button.

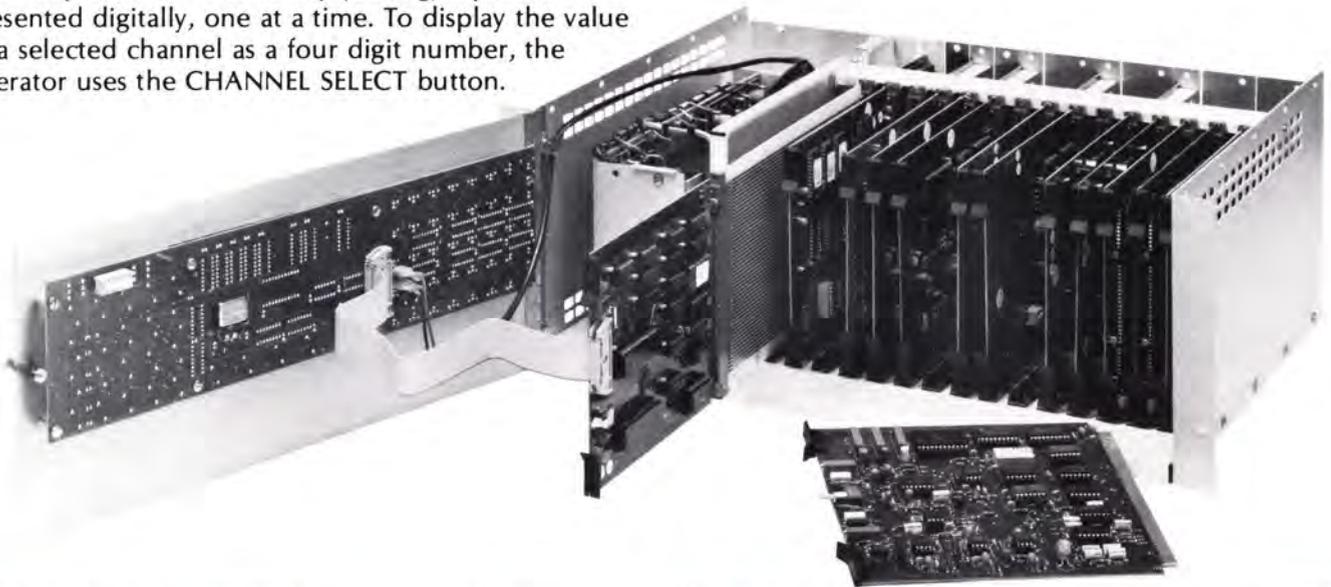
RAISE/ON and LOWER/OFF buttons are used to activate and deactivate command lines at the selected remote terminal. Audible alarms call immediate attention to any undesired conditions. Pushing the ACKNOWLEDGE button gives the operator complete information about the problem.

Flexibility in System Setup

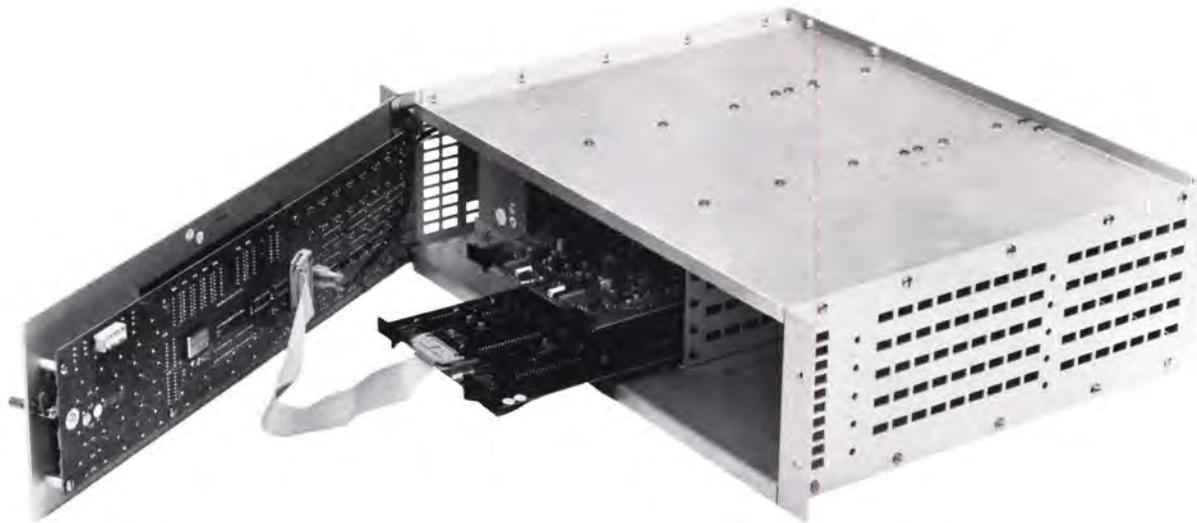
Much of the power of the MRC-1 is due to the flexibility available to the user in setting up the system. When the system is installed, calibration data, alarm criteria, command line assignment, etc., are entered at each remote terminal keyboard. These may be changed during operation. A password may optionally be set up to control access to restricted functions at the control terminal.

To calibrate the system, the user simply applies a sample voltage, enters the desired display value, and from then on scaling is done automatically. Telemetry channels may be calibrated in three modes:

1. Linear calibration – the value displayed is directly proportional to the input voltage.
2. Power calibration – the value displayed is proportional to the square of the input voltage.
3. Indirect calibration – the value displayed is proportional to the product of the two input voltages.



Interior front view of MRC-1 remote terminal (with top removed for photograph). The modular design allows easy access to all components. Modem board has been removed and CPU board is shown on service extender board. All boards plug into a double-sided mother board minimizing chassis wiring.



Interior view of MRC-1 control terminal with front panel open. Plug-in boards, which are common to both remote and control terminals, are mounted horizontally in the control terminal minimizing rack height.

Upper and lower tolerance limits may be established for each calibrated telemetry channel at either remote or control terminal. If limits have been established, the input is sampled and compared against the limits. Any violation causes an alarm.



Rear view of MRC-1 remote terminal. Plug-in interface modules are fully shielded for superior RFI suppression. A Gel Cell® battery mounted on the rear of the chassis maintains user-programmed memory during power failures.

A muting function is provided for telemetry channels where no alarm is desired. Through the use of this function, main and auxiliary transmitters may be controlled from a single remote terminal, and tolerance checking can be defeated automatically on the transmitter not currently in operation. If the mute status is ON, the telemetry data is displayed and limit checked normally. If the mute status is OFF, limit checking is suppressed.

Each individual status channel may be assigned attributes causing it to latch or to be inverted before display. Each status input may be set up to trigger an alarm on either rising edge, falling edge, or both.

When the system is set up, any command output may be assigned to function as the raise or lower output for any specified telemetry channel. Latching command lines may also be specified, eliminating the need for external latching hardware.

Modular Design

The heart of the MRC-1 is the 6802 microprocessor chip. The companion 6821 Peripheral Interface Adaptor provides bi-directional access to the entire front panel. The memory board and the central processing unit (CPU) board utilize electrically-programmable read-only memory (EPROM) to establish the basic operating architecture. Memory requirements are filled by 1K, 4505-45 random access memory (RAM) devices.

The CPU, memory, input/output, modem and subcarrier boards are identical for control and remote terminals. The compact modular design allows easy access for maintenance. The remote terminal utilizes a vertical insertion card cage design with the mother board accepting cards from the front and rear. The control terminal accepts many of the same boards mounted horizontally.



Teletype model 43 printer with full keyboard for programming and header preparation is used in the Auto Logger option.

OPTIONS MAY BE ADDED AT ANY TIME ALLOWING EASY EXPANSION

A number of options for the MRC-1 have been designed to fit the individual broadcaster's needs. They may be added at any time to an existing MRC-1 system allowing expansion or modification.

CRT Terminal

The CRT option duplicates all of the panel functions of the MRC-1 control terminal, and, in addition, allows simultaneous display of data from all 32 channels at a selected site. The CRT displays the site number (from one to nine), data for the channels at that site, the time of day, and other messages.

Messages include the number of any site with alarm conditions, and indication of data link transmission error, a limit check indication, a control function enable indication, and an indication from the displayed site that maintenance-override is in effect. For television telemetry fail-safe applications, the time until shutdown is also shown.



ADDS Regent 40 terminal, used in the CRT option, duplicates full operational capabilities of the MRC-1 control terminal.



The MDC-1 provides ten individual buttons for immediate access to selected command functions.

Multiple Direct Command

The MDC-1 multiple direct command option is designed to provide simplified access to pre-selected channels in the MRC-1 system. The site and channel selection steps are eliminated; the operator simply pushes the button for the desired control function. This reduces the time required to control critical functions to less than one second.

Each unit provides access to ten channels. Up to nine units may be interconnected in a loop-through configuration to allow access to a maximum of 90 channels. The MDC-1 incorporates RFI filtering to reduce susceptibility to high intensity RF fields.

Automatic Logger

The automatic logging option provides automatic printing of operation logs on a Teletype Corporation model 43 printer. Any telemetry and status data from a selected remote terminal may be chosen for printout at intervals ranging from one minute to 24 hours.

Power Fail Memory (Moseley Memory)

The power fail memory option offers security against data loss during an extended power failure or maintenance shutdown. In the standard MRC-1, user-entered data such as telemetry scaling factors and command line assignments are stored in RAMs in the remote unit. This data is held in memory for up to three hours by a six-volt battery, but is lost during an extended power failure.

The power fail memory option causes a backup copy of the RAM to be created in an electrically-alterable read-only memory chip (EAROM), giving protection for up to ten years. When power is reapplied, the EAROM is automatically read and the system resumes regular operation.

The power fail memory option is also used to protect instructions entered in the automatic logging option when installed in the same terminal as the logger.

Additional Options

Optically isolated status inputs and command outputs are also available.

When more than two options are incorporated into the control terminal, the larger MRC-1A replaces the standard terminal, allowing the use of up to four options.

For further information please contact our Marketing Department.

SPECIFICATIONS

Type of System:

Microprocessor-based
Remote Site Capability: One to nine sites, coded protocol

Command Lines:

Programmable momentary or latching, via "raise/lower" keyboard functions
Command response time: 250 ms, nominal
Open collector output standard (will switch up to 48 VDC at 250 mA, user-supplied voltage)
Front panel tally back LED indicators
16, 32, 48 or 64 lines per site
Optically isolated and relay interfaces optional
Dedicated/direct command switches optional

Telemetry Channels:

One person digital calibration, via remote terminal keyboard
Fully tolerance alarmed, high and low limits
Linear, power to linear conversion, indirect power calibration
Full four-digit LED display with decimal point and polarity sign
Resolution: one part in 1024
Overall measurement accuracy better than 0.5%
Response time: 500 ms, nominal, independent of channel load
Nominal, full scale input level: ± 3.5 VDC, ± 5 VDC above common, maximum
16 or 32 channels per site

Status Channels:

User-programmable N.O./N.C. activating front panel LEDs
Status response time: 250 ms, nominal
TTL compatible input standard (± 5 VDC switched by external contacts)
16 or 32 channels per site
Optically isolated input optional

Wire Interconnection:

Two-wire or four-wire, 600 ohm, balanced
Series 3002 (unconditioned) data channel per Bell System Technical Reference Publication 41004 (FCC tariff no. 260)
Two-way, non-simultaneous
Nominal send level: 0 dBm, minimum receive level: 30 dBm

Radio Interconnection:

Single or duplex, internal subcarrier systems available on standard frequencies between 26 and 185 kHz
Nominal levels: 1.5 V P-P at 2K ohm
Specify frequency and exact radio link when ordering

Data Transmission:

Seven bit ASCII with parity plus LRCC
1200 baud each direction
Two-way, non-simultaneous via FSK, 1200/3300 Hz

Maintenance Override:

Remote terminal front panel button
Provides remote terminal "go home" relay closure and control terminal alert lamp

Aural Alarms:

Control and remote terminals, defeatable and remotable

Failsafe:

Control: Complies to FCC AM, FM, TV
Telemetry: Internal timer for FCC TV compliance

Operating Temperature Range:

0° - 50°C

Power Requirements:

Control terminal: 120/240 VAC, 50/60 Hz, 50 watts
Remote terminal: 120/240 VAC, 50/60 Hz, 100 watts

Physical Size:

Control terminal: 13.3 cm H x 48.3 cm W x 38.1 cm D (5.25" H x 19" W x 15" D), depth less battery or connectors
Remote terminal: 17.8 cm H x 48.3 cm W x 39.4 cm D (7" H x 19" W x 15.5" D), depth less battery or connectors

OPTIONS

Optically Isolated Command Outputs:

16 output lines per module, optical isolators driving high-current Darlington
Switches up to 48 VDC, 250 mA at up to ± 50 VDC from ground, user-supplied

Relay Isolated Command Outputs:

16 output lines per module, one SPDT relay per line
240 VAC, 5A contacts

Optically Isolated Status Inputs:

16 lines per module, LED optical isolator
Input 10-48 VDC, (3-15 V strappable), 5-30 mA current, user-supplied
Maximum voltage to ground: ± 50 VDC

Multiple Direct Command:

Ten buttons per unit, mounted in 1 rack unit panel
Each switch individually programmable for site, channel and function (raise/lower)

CRT Terminal

ADDS Regent 40 terminal with full keyboard and 12 inch CRT
15 foot cable, interface cards and software
9600 baud (960 characters/second)

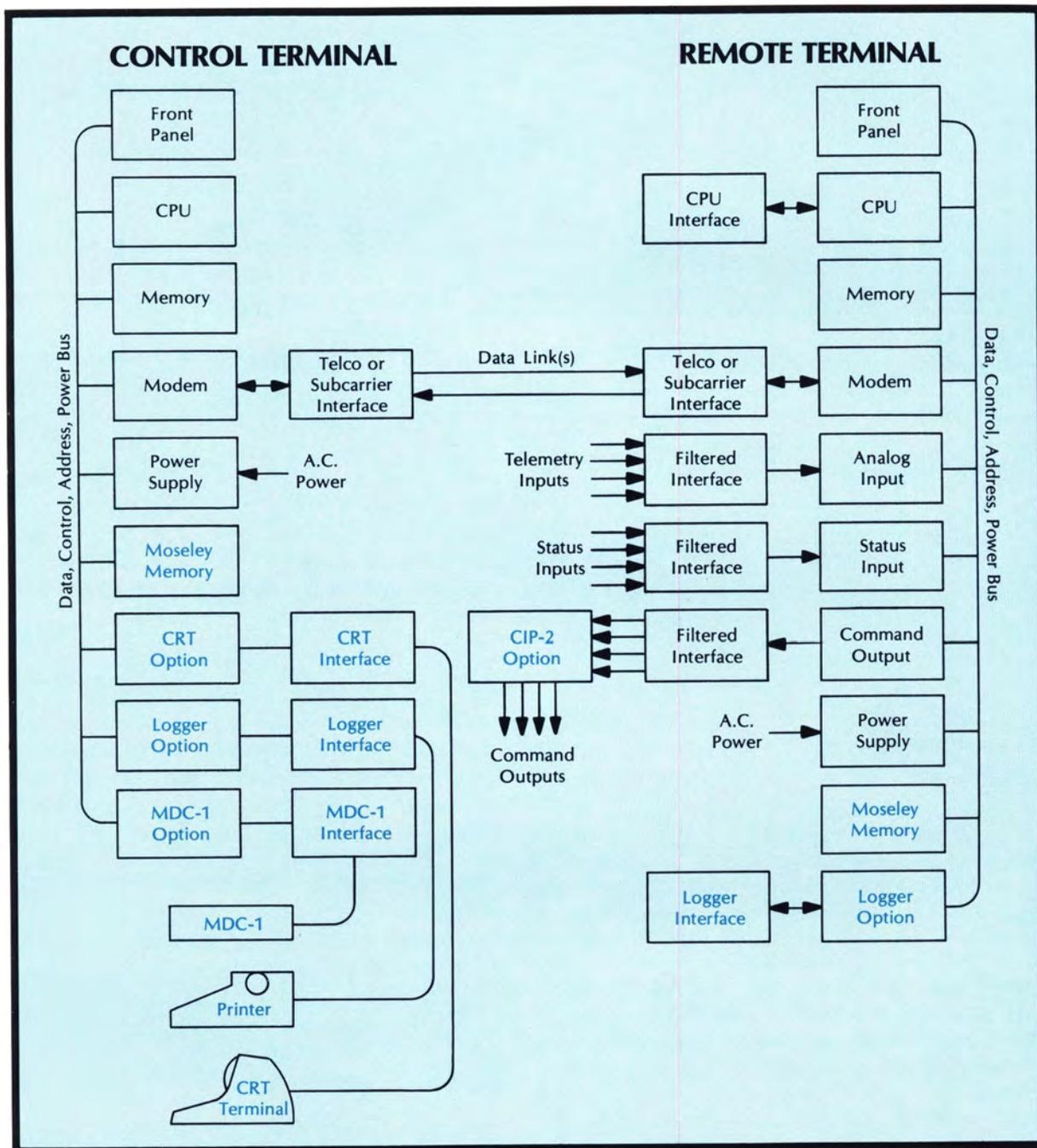
Automatic Logging:

Teletype model 43 KSR printer with full keyboard
15 foot cable, interface cards and software
Provides logging of all parameters at several sites, user-programmable
Multiple header lines, records tolerance violations and status alarms of logged channels

Moseley Memory:

Long-term electrically-alterable read-only memory (EAROM), data retained for ten years minimum
Holds calibration factors, status and command assignments, logging information when installed in remote terminal
Holds password, logging information when installed in control terminal

MRC-1 SYSTEM BLOCK DIAGRAM



Specifications subject to change without notice.



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