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MODEL MDS - MESSAGE DISPLAY SLAVE UNIT

- *2x20 OR 1x10 TRANSMISSIVE LCD, NEGATIVE IMAGE WITH RED, OR POSITIVE OR NEGATIVE IMAGE WITH YELLOW/GREEN LED BACKLIGHTING*
- *153 DIFFERENT DISPLAYABLE CHARACTERS*
  96 Standard ASCII Characters
  57 European and Special Characters
  Fully Customizable Character Set
- *SERIAL MODE ACCEPTS AND DISPLAYS SERIAL ASCII CHARACTER STRINGS*
- *RLC MODE ALLOWS REMOTE DISPLAY OF MESSAGE DISPLAY INTELLIGENT (MDI) MESSAGES*
- *TRANSMIT MODE RETRIEVES AND DISPLAYS INFORMATION DIRECTLY FROM OTHER RLC SERIAL PRODUCTS*
- *SCROLLING AND/OR BLINKING CHARACTERS*
- *TIME AND DATE FUNCTIONS*
- *ELAPSED TIMERS:*
  Sixteen Individual Timers
  Bidirectional Timing (Up/Down)
- *SERIAL COMMUNICATIONS (Isolated 20 mA Current Loop)*
- *BAUD RATES UP TO 19.2 K*
- *OUTPUT/BUSY TERMINAL (NPN Open collector output)*
- *AC VERSION: SWITCH SELECTABLE 115/230 VAC*
- *DC VERSION: JUMPER SELECTABLE 12/24 VDC*
- *NEMA 4/IP65 SEALED FRONT METAL BEZEL*
- *IBM® PC COMPATIBLE SOFTWARE FOR PROGRAMMING*

DESCRIPTION

The Message Display Slave *(MDS)* unit is a simple-to-use, yet versatile, alphanumeric message center. The broad flexibility and functionality of the MDS make it particularly adaptable to a wide variety of applications, including:

Display of Measured Values
Indication of Warning, Error, and Alarm Conditions
Indication of Manufacturing Process Steps
Display of Machine Start-Up and Operation Procedures
Display of RLC Message Display Intelligent (MDI) Unit Messages
Display of Information from other Serial RLC Units

The MDS is capable of displaying messages up to 127 characters long. A message can include any of the 153 customizable characters, including the standard 96 character ASCII set. Individual lines of the message text can be designated to scroll in a block or character fashion. Individual characters, blocks, and lines of text, can be designated to blink.

You can configure the MDS for one of three modes of operation:

RLC Mode
Serial Mode
Transmit Mode

In the RLC Mode, the MDS receives and displays Messages transmitted in an RLC Mode compatible format from one or more Message Display Intelligent (MDI) units. An MDI unit assembles and transmits the Message text to the MDS for remote display. The Message text may include Current and Elapsed Timer values, as well as any data the MDI collects.

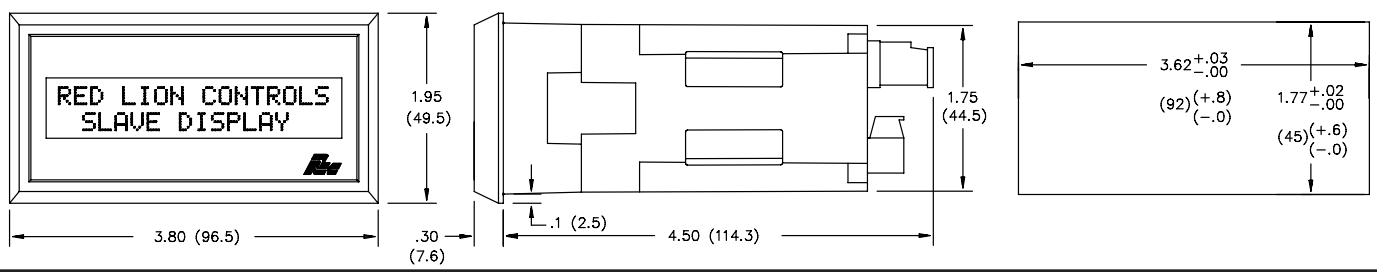
In the Serial Mode, the MDS displays any ASCII text strings it receives over its Serial Port. The ASCII text string must end with the programmed Serial Terminator. The MDS automatically scrolls any Message longer than the display width. Special control code sequences are available for accessing the blinking and scrolling features of the MDS. Other control codes are available for accessing and displaying Current and/or Elapsed Time values. You can also assign a unique unit address to an MDS unit, for applications requiring individual addressing of multiple MDS units in the Serial Mode.

The Transmit Mode requires the optional Parallel Port and allows the MDS to interface directly with other RLC products with serial communications. The MDS accepts BCD unit address and data item number over its Parallel Port. The MDS constantly gathers the selected unit and item numbers, over the Serial Port. The MDS updates its display with the information it receives from the selected RLC unit. Therefore, you can use a single MDS placed at a centralized location to retrieve and display information from multiple RLC units.

RLC supplies optional IBM® PC compatible software for configuring and programming the MDS. The MDS's non-volatile memory retains all programmed Configuration settings when power is removed from the unit. The Message Display User software (SFMD), with its easy-to-use menus and extensive prompts and on-line Help functions, greatly assists you in fitting the MDS to the application at hand. You can easily create and save Configuration Files with the SFMD software. Extensive file handling features are included, such as uploading, downloading, and printing of files.

DIMENSIONS "In inches (mm)"

Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.1" (53.3) H x 5.5" (140) W.



DESCRIPTION (Cont'd)

Message Simulation and Terminal Emulation functions are also provided with the software. Although the MDS has no Message storage capability of its own, you can use the SFMD Message Editing function to construct the Message strings you wish to transmit to an MDS in either the RLC Mode or the Serial Mode.

The Message Simulator is available to show you the actual Message string to transmit, as well as simulate the action of the Message once the MDS receives the string. You can then test the MDS unit by transmitting the assembled string to the MDS with the Terminal Emulator.

The metal front bezel of the MDI meets NEMA 4/IP65 requirements, allowing for washdown when properly installed. Modern surface-mount technology and extensive testing make the unit extremely reliable in industrial environments. Connections are made on removable terminal blocks, simplifying installation.

SAFETY SUMMARY

All safety related regulations, local codes and instructions that appear in the manual or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

SPECIFICATIONS

1. **POWER:**
   AC Version:
   115/230 VAC ±10%, 50/60 Hz, 6 VA, switch selectable.
   DC Version:
   12/24 VDC ±10%, 300 mA max., jumper selectable.
2. **DISPLAY:** *(available in various configurations)*
   2x20: 0.2" *(5 mm)* high characters *(available without Parallel Port only)*
   1x10: 0.35" *(9 mm)* high characters *(available with Parallel Port only)*
   Transmissive STN LCD with Red or Yellow-Green LED backlighting.
   The brightness of the LED backlight is software adjustable through seventeen levels.
   The viewing angle of the display may be adjusted through an on-board pot. By connecting an external pot to the Vcontrast pin, the viewing angle can be adjusted from a remote location..
3. **PARALLEL PORT:** *(optional, for use with Transmit Mode only)*
   Data Format: 8-bit BCD.
   PARALLEL PORT INPUTS:
   Data Inputs (D0 - D7) & Control Inputs (Strobe & Item/Addr):
   V_{IH} = 8 VDC, V_{IL} = 4 VDC, V_{MAX} = 30 VDC
   Data SNK/SRC: Sink or Source, switch selectable.
   Control SNK/SRC: Sink or source, switch selectable.
   Data Logic Level: Positive or negative, switch selectable.
   Control Logic Level: Positive or negative, switch selectable.
   Current Sinking: Internal 10 KΩ pull-up, I_{MAX}=1.2 mA.
   Current Sourcing: Internal 10 KΩ pull-down, I_{MAX}=3.1 mA @ 30 VDC.
   Debounce Time: 0.01 to 2.5 seconds *(programmable)*.
   Strobe Time: 3 to 255 msec *(programmable)*.
4. **SERIAL COMMUNICATIONS**: 20 mA current loop, full-duplex.
   Data Format: Four types available, switch selectable.
   11 bits: 1 start bit, 8 data bits, 1 parity bit, 1 stop bit.
   10 bits: 1 start bit, 8 data bits, 1 stop bit
   10 bits: 1 start bit, 7 data bits, 1 parity bit, 1 stop bit.
   9 bits: 1 start bit, 7 data bits, 1 stop bit.
   Data Code: ASCII
   Unit Address: Programmable from 0 to 99. *(The number of units in a single loop is limited by the hardware specifications.)*
   Baud Rate: 300 to 19200, switch selectable.
   Parity: Enabled or Disabled, switch selectable.
   Even/Odd: Selects Parity Type, switch selectable.
   7/8 BIT: Data Bits, switch selectable.
   Serial Hardware: Terminal TBA.
   +20mA SRC: Provides 20 mA @ 12 VDC.
   Note: Can power up to 7 units in a loop.
   -20mA SRC: Loop return for +20 mA SRC.
   SO/Output Transistor Rating: V_{MAX} = 30 VDC, V_{SAT} = 1VDC @ 20 mA.
   Note: Transistor rating allows for up to 28 units in a loop.
   SI/Input Diode Rating: VF = 1.25 VDC_{TYP}; 1.5 VDC_{MAX} @ 20 mA.
   Note: The compliance voltage rating of the source must be greater than the sum of the diode voltage drops around the loop. Typically a 30 VDC source (with adequate current capability) is capable of operating between 18 and 22 units in a loop.
5. **OUTPUT/BUSY PIN:** *(only accessible in the RLC and Serial Modes)*
   Solid state: NPN open-collector, current sinking, V_{MAX} = 30 VDC, I_{MAX} = 100mA, V_{SAT} = 1 V_{MAX} @ 100 mA.
   Busy Mode: Indicates the Ready/Busy status of the unit.
   Output Mode: Output Pin can be activated from a Command or Message for a specified time out value.
   Time Out: 10 msec to 63 mins or Latched.
6. **MEMORY:** Non-volatile memory retains all programmed Configuration settings when power is removed or interrupted. Customized Character sets and Day/Month names are not retained, and must be loaded on each unit power-up.
7. **ENVIRONMENTAL CONDITIONS**:
   Operating Temperature: 0 to 50°C
   Storage Temperature: -20 to 60°C
   Operating and Storage Humidity: 85% max. (non-condensing) from 0°C to 50°C.
   Altitude: Up to 2000 meters
8. **CERTIFICATIONS AND COMPLIANCES**:
   EMC EMISSIONS:
   Meets EN 50081-2: Industrial Environment.
   CISPR 11 Radiated and conducted emissions
   EMC IMMUNITY:
   Meets EN 50082-2: Industrial Environment.
   ENV 50140 - Radio-frequency radiated electromagnetic field
   ENV 50141 - Radio-frequency conducted electromagnetic field [1]
   EN 61000-4-2 - Electrostatic discharge (ESD)[4]
   EN 61000-4-4 - Electrical fast transient/burst (EFT) [2&3]
   EN 61000-4-8 - Power frequency magnetic field
   Notes:
   1. RF Conducted Immunity Power Lines:
   At 10 Vrms, from 24 to 60 MHz, random messages requested.
   a. At 10 Vrms, using a line filter (RLC# LFIL0000) on power lines, unit operated properly.
   2. EFT Immunity Power Lines:
   With a line filter (RLC# LFIL0000) unit met levels up to ±2.5 Kv.
   3. EFT Immunity I/O Lines:
   Cables routed in conduit which is grounded at both ends.
   4. ESD Immunity to Bezel:
   Metal bezel of unit connected to mounting panel with a 1/4" wide, 2" long wire braid from rear bezel screw.
   Refer to the EMC Installation Guidelines section of the manual for additional information.
9. **CONSTRUCTION:** Metal front bezel meets NEMA 4/IP65 specifications for indoor use when properly installed. Installation Category II, Pollution Degree 2. Case is black high impact plastic *(panel gasket, mounting clips and screws included)*.
10. **CONNECTIONS:** Removable terminal blocks.
11. **WEIGHT:** 1.1 lbs (0.5 Kg).

BASIC OPERATION

The MDS must be configured for one of three modes of operation:

RLC Mode
Serial Mode
Transmit Mode

The Mode you select determines the function of and the interface with the MDS. In the Transmit Mode, the MDS directly interfaces to other RLC products with serial communications, and serves as a remote display for those products.

In either the RLC Mode or the Serial Mode, the MDS displays a Message after receiving a Message string over the Serial Port, terminated by the programmable Serial Terminator. You can program the Serial Terminator for any of the characters from 01h (1) to 40h (64), excluding the BACKSPACE (08h - 8) and ESCAPE (1Bh - 27) characters, and the ASCII digit characters 30h (48) to 39h (57).

Before displaying a Message, the MDI performs the functions specified in the Message string. You can specify any combination of the following functions for a Message:

1) Display Text: The MDS displays the Message Text, which can include the Current Time and Date, and Elapsed Timer values. A special control code sequence is available for designating text for the bottom line of dual line displays. The MDS automatically character scrolls any line of text longer than the unit display width.
2) Blink and/or Scroll Message Text: Special control code sequences embedded in the Message Text control these functions.
3) Message Time Out: You can include a Time Out value for the Message. This Time Out value specifies how long the MDS should display the Message. Once the Time Out expires, the MDS automatically blanks the display.
4) Set the Current Time: The Message can set the Current Time in the MDS.
5) Configure Elapsed Timers: The Message can access one or more of the MDS's sixteen Elapsed Timers.
6) Configure the Output Pin: The Message can access the MDS's Output Pin function.

CONNECTING THE MDS TO AN IBM® COMPATIBLE COMPUTER OR ASCII TERMINAL

In order for the user to configure the MDS, the MDS must be connected to an ASCII Terminal or a computer running a terminal emulation program. RLC supplies the optional Message Display User Software *(SFMD)*, which runs on IBM® compatible PC's, and assists you, through its user-friendly menus, numerous prompts, and on-line Help functions, in interfacing with and programming the MDS.

The SFMD software allows you to program multiple Configuration files for an MDS unit and save them to disk. You can then download any Configuration file, as needed, from the computer's serial port to one or more MDS units on the communications loop.

System Requirements:

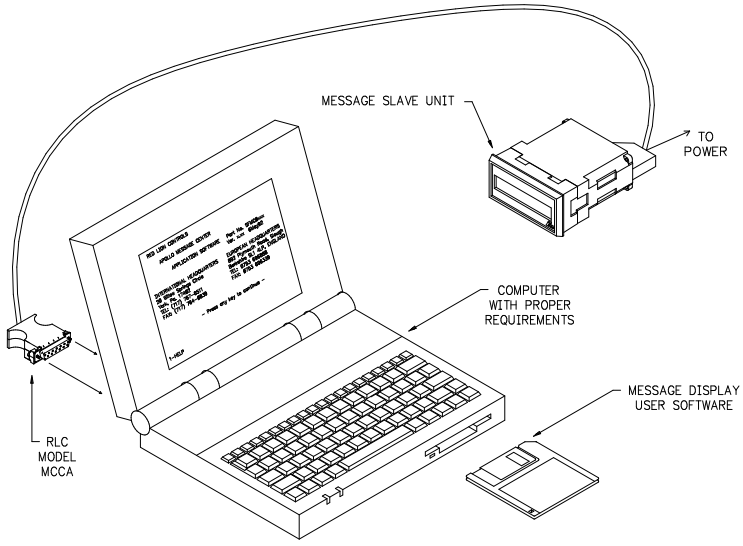
IBM® compatible PC-AT (286 or greater) with:
RS232 serial port,
640 K RAM,
DOS 3.0 or later,
Monitor with MDA, CGA, EGA, or VGA graphics card.
Note: The SFMD software will not run on a PC-XT computer.

Cabling:
RLC Model MCCA cable for single unit operation only,
Or
RLC GCM232 Serial Converter Module for setup with multiple units *(RS232/20 mA Current Loop)*,
Serial communications cable,
RLC Model APS supply or equivalent *(12 VDC power supply)*.

Message Display User Software (SFMD):
Available on 3.5" floppy disks.
Note: Setup may only be performed via the serial port.

The SFMD software also includes utilities for message simulation and terminal emulation. With the Message Simulator, the user can verify the proper operation of a Message on the computer screen without having to transmit the Message to the MDS.

The Terminal Emulator can assist the user in verifying and testing the operation of the Messages the MDS is to receive. It can also be used to monitor and trouble-shoot serial port communications.



MODES OF OPERATION

RLC MODE

The RLC Mode of the MDS unit provides an easy interface for remotely displaying Messages programmed in, and processed by, one or more Message Display Intelligent (MDI) units. An MDI unit assembles and transmits any Message designated for an MDS Unit in an RLC Mode compatable format.

You select a mode of operation through a DIP switch setting on units without a parallel port, or by tying the parallel port DATA lines to a specific value on units with a parallel port.

The Message string sent from the MDI specifies the address number of the MDS unit for which the transmission is intended. Only MDS unit's with this address will process and display the Message after receiving the transmission.

When the transmitting MDI encounters a Current Time field in the Message Text, it inserts the current value of its Real Time Clock (RTC), along with the specified format of the Current Time field in the Message string. When the MDS processes the Message string, it sets its internal software clock to this transmitted value, thus "slaving" its own clock to the transmitting MDI's RTC.

The MDI performs a similar function when encountering Elapsed Timer fields in the Message Text. In this case, the MDI inserts the current configuration and value of the designated timer, along with the specified Elapsed Time format, into the transmitted string. When the MDS processes this string, it sets its Elapsed Timers to the configurations and values specified in the Message string, thus "slaving" its own Elapsed Timers to those of the transmitting MDI.

If the Message in the MDI configures the Output Pin, this configuration information is included in the transmitted Message string. When the MDS processes the string, it configures its Output Pin to the settings contained in the Message string, thus "slaving" its own Output Pin to that of the transmitting MDI.

The MDI includes the Time Out value of the Message in the Message string, and replaces all Index and Local Embedded Data Item fields with their respective values before transmission. The MDI then terminates the assembled Message string with its own terminator, which must match that of the receiving MDS unit.

In essence, through all of the previously mentioned functions, you can use an MDS unit in the RLC mode as a "slave" display for one or more MDI units.

SERIAL MODE

The Serial Mode of the MDS unit provides an easy interface for displaying ASCII character strings. The MDS displays any ASCII text string it receives that is terminated with the MDS's Serial Terminator.

You select a mode of operation through a DIP switch setting on units without a parallel port, or by tying the parallel port DATA lines to a specific value on units with a parallel port.

All of the functions and methods described for the RLC Mode are available in the Serial Mode. In order for you to access these functions, the unit transmitting the Message strings to the MDS must be capable of transmitting the lower ASCII control characters 01h (1) to 1Fh (31).

A unit address function is also available in the Serial Mode. Unlike the RLC Mode, however, if a Message string is not preceded by a unit address identifier, all Serial Mode units on the loop receive and process the transmission. An address for a Message string must be provided only if the string is to be transmitted to a particular Serial MDS.

TRANSMIT MODE (Parallel Port units only)

In the Transmit Mode, which requires the optional Parallel Port, the MDS interfaces directly with other RLC products with serial communications. The MDS accepts the unit address and data item numbers over the Parallel Port in a BCD format, usually from a BCD thumbwheel or rotary switch. The MDS constantly gathers the data item from the designated unit, over the Serial Port.

The MDS updates its display with the information it receives from the selected RLC unit. Therefore, you can use the MDS in the Transmit Mode to interrogate multiple RLC units in remote locations from one centralized location.

SERIAL PORT

The MDS hardware includes a full duplex Serial Port implemented as an isolated, two-way 20mA current loop. Communication between devices must conform to identical Data Bit, Baud Rate, and Parity settings. A serial hardware loop-back test can easily be performed to verify proper operation of the MDI's Serial Port.

In the Transmit Mode, the MDS uses the Serial Port to collect data from the designated RLC unit. While in this mode, the MDS cannot receive Commands or other Message Text.

In the RLC and Serial Modes, all communications with the MDS must be accomplished over the Serial Port. In either of these modes, the following operations can be performed over the Serial Port:

Uploading and Downloading Files
Receiving and Transmitting Message Text
Receiving Commands and Transmitting Command Responses
Transmitting Error Conditions

Some typical devices that you can connect to the serial port are:

ASCII Terminals
Programmable Logic Controllers with Serial Communications
Host Computers
RLC Products with Serial Communications

OUTPUT/BUSY PIN (Used only in the RLC and Serial Modes)

The MDS hardware includes one NPN open-collector Output Pin which can be configured for positive or negative logic. The pin can be set to operate in one of two modes, the Busy Mode or the Output Mode.

Busy Mode: The MDS uses the pin in the Busy Mode to acknowledge Message and Command requests. The MDS sets the Output Pin to the READY level when the unit is ready to receive Message Text and Commands. The Output Pin is set to the BUSY level when the unit is processing a newly received Message or Command.

Output Mode: With the pin in the Output Mode, a Message or Command can change the status of any of the following Output Pin settings:

Lock or Unlock: The MDS only accepts changes to the pin settings while the pin is Unlocked.

On, Off, or Toggle: The MDS sets the Output pin to the specified state. In the case of Toggle, the MDS switches the current state, from ON to OFF, or OFF to ON.

Set, Halt, or Run Time Out: When the Output Time Out expires, the MDS automatically sets the pin to the OFF state. The Time Out can be Halted at any time. It can be resumed at a later time, or started from one of the following values:

1) 10-1260 msec
2) 1 to 63 secs
3) 1 to 63 mins
4) Latched ON
5) Unit Configuration value

PARALLEL PORT (Optional - used only in the Transmit Mode)

The MDS hardware can include an optional Parallel Port, which consists of eight DATA lines and two CRTL lines (the ITEM/ADDR line and the STROBE line). The Transmit Mode of operation uses the Parallel Port to accept Unit Addresses and Data Item numbers in 8-bit BCD format. The ITEM/ADDR line indicates whether a Unit Address (ADDR) or an Item number (ITEM) is present on the Data lines. The STROBE line signals the MDI to read the Parallel Port.

The DATA and CRTL line inputs are separately DIP switch selectable for either positive or negative logic and current sinking or sourcing inputs. The Parallel Port interface protocol is straight-forward:

1) Set the DATA lines and the ITEM/ADDR line to the appropriate values.
2) Apply a STROBE pulse (programmable from 3-250 msec).
3) Allow the Debounce time to expire (programmable from 10 to 2550 msec) before issuing the next request.

Among the devices that you can connect to the Parallel Port are:

Programmable Logic Controllers (PLC's)
BCD and Binary Thumb-wheel Switches
Push Buttons

MESSAGES (RLC and Serial Modes only)

You can program a Message string to perform many functions. A Message can simply display text. In addition, you can choose to have the Message blink and/or scroll its text, configure one or more Elapsed Timers, access the Output Pin, and display the Current Time and/or any of the Elapsed Timer values.

Even though the MDS cannot save the Messages it receives, the Message Editing feature of the SFMD software can greatly simplify the task of assembling Messages for the MDS. The Message Editing screen is laid out in a logical, easy-to-understand order and displays all of the possible functions that a Message can perform. The software displays numerous prompts and on-line Help functions throughout the Message editing process.

MESSAGE FEATURES

Message Time Out:
- Immediate Time Out (0 secs)
- 10 to 1260 msecs
- 1 to 63 secs
- 1 to 63 mins
- No time out

Message Scrolling:
- Static (none)
- Character (horizontal)
- Block

Output Pin:
- Can access the Output Pin

Elapsed Timers:
- Can access up to 16 timers

Message Text:
- **Characters**:
  - **Standard**: 20h to 7Fh
  - **European and Special**:
    - 80h to B8h
    - All Characters Customizable
    - ASCII Control Codes
    - Current Time and Date
    - Elapsed Timer Values
    - Scrolling Text
    - Blinking Text

MESSAGE TEXT

A Message string can contain up to 127 characters in Serial Mode, and 122 characters in RLC Mode. In addition to any of the characters in the MDS's character set, you can also include the Current Time and Date and/or Elapsed Timer values through the inclusion of special control code sequences. The text can also include lower ASCII control codes, such as CR and LF, although the MDS does not display them.

You can select among several different scrolling techniques for each line of text by specifying certain control code sequences. The MDS can display text statically, scroll the text horizontally across the screen, or you can break the text into blocks, which the MDS displays one after another. In the Serial Mode, the MDS automatically character scrolls any Message with a line of text longer than the unit display width. You can also designate individual characters, blocks, and whole lines of text for blinking.

Each of the previously mentioned control code sequences consists of two characters, the '^' (5Eh - 94) character immediately followed by a specific ASCII punctuation character in the range from 20h (32) to 2Fh (47). If your application does not require any of the special functions previously mentioned, the control code sequences need not be entered.

DISPLAYABLE CHARACTER SET

The MDS can display 153 different characters. The standard ASCII character set, from 20h (32) to 7Fh (127). comprises the first 96 characters. The remainder of the character set, from 80h (128) to B8h (184), includes many European and special characters. The SFMD software allows the user to customize all 153 characters.

The MDS does not contain enough non-volatile memory to permanently store a customized character set. Therefore, if your application requires custom characters, the custom character file must be downloaded to the MDS after every unit power-up. If you are using the MDS in an application with an MDI, you can program the MDI to automatically perform this function for you.

CURRENT DATE AND TIME

The MDS contains an internal software clock. This clock keeps the Time and Date only when power is applied to the unit. Whenever power is removed, the Current Time and Date are lost, and must be reloaded after the next power-up. Even though the MDS stores the Current Date, it does not contain a calendar function and can not update the date when the Current Time rolls-over to midnight. If you are using the MDS in an application with an MDI, you can program the MDI to automatically update the Current Time and Date on a periodic basis, as well as on every unit power-up.

You can insert the Current Time and/or Date in the Message Text in any desired format through the use of specific control code sequences and format characters.

Date Formats:

Day of the Week: Full *(e.g., MONDAY)* or Abbreviated *(e.g., MON)*.

Day of the Month: Numeric *(e.g., 1-31)*.

Month: Full *(e.g., JANUARY)*, Abbreviated *(e.g., JAN)*, or Numeric *(e.g., 1 = January)*.

Year: Full *(e.g., 1993)* or Abbreviated *(e.g., 93)*.

Time Formats:

12 Hour Clock: In Hours, Minutes, Seconds, Tenths and/or Hundredths of seconds. The AM or PM designator may be included *(e.g., 4:30 PM)*.

24 Hour Clock: In Hours, Minutes, Seconds, Tenths and/or Hundredths of seconds *(e.g., 16:30)*.

Field Separators: Any character NOT used in the Date and Time fields can be used to separate the fields *(e.g., "- : /")*.

Format examples: Monday, April 26, 1993 4:30 PM
26Apr93 16:30.7
4:30 PM
16:30.75

MESSAGE SCROLLING AND BLINKING

You can designate individual lines of text for various forms of scrolling. A Message programmed for a 2x20 unit can specify separate scrolling methods for each line of the Display. The Message designates whether to scroll the text for a line, while the appropriate Configuration setting determines the rate at which the MDS scrolls the text. The user can specify separate blink and scroll rates for the top and bottom lines of a 2x20 unit.

Character Scrolling: A line of text designated for Character scrolling repeatedly moves across the Display from right to left at the rate specified by that line's Character Scroll setting. You can also choose to separate the text into blocks, which would then scroll across the Display separately, one after another. In this case, you delimit the individual blocks by inserting control codes at the desired locations in the Message Text.

Block Scrolling: A line of text designated for Block scrolling repeatedly displays blocks of information, one after another, at the rate specified by that line's Block Scroll setting. You delimit the individual blocks by inserting control codes at the desired locations in the Message Text.

Blinking: Characters designated for Blinking in a line blink at the rate specified by that line's Blink setting. You designate individual characters and/or blocks of text for Blinking by inserting control codes at the desired locations in the Message Text.

DISPLAYING MESSAGES

The MDS can display only one Message at a time. The most recently received Message is always placed on the display, replacing any Message that may currently have been displayed.

You can provide an optional Time Out value for a Message. A Message's Time Out value specifies how long the MDS should display the Message. The MDS automatically cancels a Message and blanks the display once the Messages's remaining display time reaches zero. A Message not designated to Time Out remains on the display until the MDS receives another Message, or until the Message is explicitly cancelled with a Command.

ELAPSED TIMERS

The MDS has sixteen independent Elapsed Timers. Elapsed Timers only run while power is applied to the unit and on every unit power-up the MDS halts and clears them. The Elapsed Timer functions can be accessed through both Messages and Commands. One of the functions the MDS performs when processing a Message string is to configure the appropriate Elapsed Timers to the specifications in the Message. You can also issue Commands to access any of the Elapsed Timer functions.

You can display the value of an Elapsed Timer in any desired format. The following features are available for the Elapsed Timers:

Timer Status: Each Timer can independently run (ON) or be halted (OFF).

Timer Direction: Each Timer can run Up or Down. The direction of the Timer can be changed without stopping or resetting the Timer.

Timer Value: The Timer can be set to any value within the range from 0000:00:00.00 to 9999:59:59.99.

Timer Overflow/Underflow: The Timer value rolls-over on Overflow or Underflow. A user resettable flag indicates the event.

COMMANDS (RLC and Serial Modes only)

A full set of Commands is available to the user for both configuring and interrogating the MDS. Commands are available for changing the configuration of the MDS on-line. Commands can also cause the MDS to transmit any of its current configuration settings in an easily readable mnemonic form. Commands are provided for setting the internal software clock's Time and Date, for configuring and interrogating the Elapsed Timers and the Output Pin, and for causing the MDS to transmit the text of the Message on its Display over the serial port.

You can issue any of the Commands to the MDS "on-line" over the serial port. Thus, you can configure the MDS to the changing requirements and demands of your system.

CONFIGURATION SETTINGS

The various Configuration settings of the MDS determine the method in which the unit processes and displays Messages. These Configuration settings include the Function settings for the unit, it's communications parameters for the Serial Port and the Parallel Port, and the Output/Busy pin and Display settings.

The Configuration settings can be programmed in the Configuration menu of the Message Display User Software (SFMD). A programmed Configuration file can be downloaded to one or more MDS's over the serial port. It is also possible to change individual Configuration settings in an MDS through the use of Commands. You can issue Commands to the MDS in the Terminal Emulator function of the SFMD software, as well as through other terminal emulation software, or any ASCII terminal.

CONFIGURATION SETTINGS

Unit Address:
0 to 99
Error Handling:
Display
Transmit
Display & Transmit
Ignore
Parallel Port:
(Transmit Mode only)
Data Type:
BCD - 8 bits
Debounce Time:
10 to 2550 msecs
Sample Time:
3 to 255 msecs
Serial Port:
Transmit Delay:
10 to 2550 msecs
Terminator:
1-7, 9-26, 28-47, 58-64 decimal
Embedded Data Time Out:
(Transmit Mode only)
On or Off
Time Out Value:
Immediate
0 to 254 secs

Output/Busy Pin:
Output mode
Busy mode
Disabled
Logic Level:
Positive
Negative
Time Out Value:
10 to 1260 msecs
1 to 63 secs
1 to 63 mins
Latched On
Display Settings:
Backlight Intensity:
0 (Off) to 16 (Full On)
Blink Time:
Top line: 10 to 1270 msecs
Bottom line: 10 to 1270 msecs
Block Scroll Time:
Top line: 10 to 1270 msecs or 1 to 127 secs
Bottom line: 10 to 1270 msecs or 1 to 127 secs
Character Scroll Time:
Top line: 10 to 1270 msecs
Bottom line: 10 to 1270 msecs

SELF-TEST FEATURES

With the appropriate DIP-switch settings applied at unit Power-Up, you can have the MDS perform any of the following functions:

Display the Hardware Configuration Setup
Display the Configuration Parameter Settings
Display the Parallel Port Configuration and Pin Values
Perform a Serial Loop-Back Test
Perform a Memory Self Test
Set the RLC Mode (Units without Parallel Port only)
Set the SRL Mode (Units without Parallel Port only)
Restore the Default Factory Settings

APPLICATIONS

TRANSMIT MODE APPLICATION

The customer has a process that is temperature sensitive and needs to monitor temperatures at various stages in the process from a single location. One or more RLC IMT (Intelligent Meter - Temperature) units have been installed at the necessary locations in the processing equipment. An MDS unit, configured for the Transmit Mode, is installed in the centralized process control panel. The MDS transmits to and receives data from the IMT's.

With an 8-bit (2 digit) BCD thumbwheel switch and pushbutton connected to the MDS's parallel port, the operator inputs the address of the desired unit by dialing in the address and pushing the button. The MDS interrogates the selected IMT and retrieves and displays the latest temperature reading.

RLC MODE APPLICATION

A manufacturing process is split between two buildings. Building #1 contains the test lab, and building #2 contains the actual process mixing equipment. When the lab has completed an analysis of the current mix, any formula changes must be transmitted to the mixing department. An intercom system was originally installed between the two buildings, but the mixing room is very noisy, and the formulae received over the intercom were frequently misinterpreted, or not heard at all. A more reliable method of communication needs to be established.

RLC proposes installing a Message Display Slave (MDS) unit configured for the RLC Mode of operation at each mixer. In the RLC Mode, an MDS unit receives and displays messages from one or more Message Display Intelligent (MDI) units. In this system, each MDS is assigned a unique address and connected to an MDI unit located in the lab, which is attached to the lab PC via a serial port. The lab technician calls up the appropriate message number on the MDI, which then asks the technician to supply the appropriate values for the revised mix from the PC's keyboard. The MDI inserts these values into the formula contained in the message and then transmits the completed message over the serial port to the MDS unit located at the appropriate mixer.

SERIAL MODE APPLICATION

Presently, the customer uses a software package to control the many processes throughout a manufacturing plant. The software performs data acquisition and logging, and makes decisions based on the collected information. Information on current plant conditions is transmitted to various printers located around the plant. Plant operators review the information on the printers and take whatever action is appropriate for the given condition(s). The system works well for the customer, and control of the plant is reliable and consistent.

However, the customer is concerned with the upkeep and maintenance of the printers, the cost of the paper and ribbons, and the downtime due to mechanical failures. RLC addressed these concerns by replacing the printers with Message Display Slave (MDS) units configured for the Serial (SRL) Mode of operation. An MDS in the SRL Mode displays any ASCII character string it receives which is terminated with the programmed Serial TERMINATOR character. The programmability of the TERMINATOR is essential when the MDS is interfaced with a third party software package, especially if the software cannot be progammed to transmit a specific termination character.

In addition, with unique unit addresses assigned to the MDS units, the host software can then transmit information to specific unit(s). It is also possible to override the unit address and programmed TERMINATOR functions so that the same information can be transmitted to all MDS units in a system, regardless of their respective address and TERMINATOR settings.

With a wide variety of baud rate, parity, and data bit selections, the many display types, and several power supply options, the MDS unit is an ideal choice for replacing printers and other more cumbersome methods of providing plant wide system information.

ORDERING INFORMATION MDS

MODEL NO.	DESCRIPTION	PARALLEL PORT	PART NUMBERS	
			12/24 VDC	115/230 VAC
MDS	1x10 Red, Negative Image	YES	MDS1R01D	MDS1R01A
	1x10 Yel/Grn, Negative Image	YES	MDS1Y01D	MDS1Y01A
	1x10 Yel/Grn, Positive Image	YES	MDS3Y01D	MDS3Y01A
	2x20 Red, Negative Image	NO	MDS2R00D	MDS2R00A
	2x20 Yel/Grn, Negative Image	NO	MDS2Y00D	MDS2Y00A
	2x20 Yel/Grn, Positive Image	NO	MDS4Y00D	MDS4Y00A

ORDERING INFORMATION FOR MESSAGE DISPLAY ACCESSORIES

MODEL NO.	DESCRIPTION	PART NUMBERS
SFMD	Apollo Message Display User Software (3 1/2";1.44M)	SFMD0
MCCA	AC Communications Adapter	MCCA0000
	DC Communications Adapter	MCCA1000
GCM232	Serial Converter Module RS-232	GCM23201

Note: Only one copy of SFMD software is required for multiple units.