MDC-1200

MDC, also known as **MDC-1200** and **MDC-600**, is a Motorola two-way radio low-speed data system using audio frequency shift keying, (AFSK). MDC-600 uses a 600 baud data rate. MDC-1200 uses a 1,200 baud data rate. Systems employ either one of the two baud rates. Mark and space tones are 1,200 Hz and 1,800 Hz. The data are sent in bursts over the radio system's voice channel.

MDC signaling includes a number of features: unit ID, status buttons, emergency button, selective inhibit, radio check, and selective calling. These features are programmable and could be used in any combination desired by the user. They are typically incorporated in high-end analog FM commercial and public safety radios made by Motorola and other manufacturers. In addition to Motorola, at least two other companies make compatible base station decoders for MDC-1200.

Motorola radios with MDC options have an option allowing the radio to filter out data bursts from the receive audio. Instead of hearing the AFSK data, the user hears a short chirp from the radio speaker each time a data burst occurs. (The user must turn on this feature in the radio's option programming settings).

A general option setting for all MDC systems is to enable or disable an acknowledgment (ack) data packet. For example, following a selective call, the called radio replies with an *ack*. This data "handshake" confirms the called radio is powered on, has received and decoded the call. The encoder beeps to confirm the call got through to the target. In computer-aided dispatch, the encoder/decoder may pass the *ack* to the dispatch computer system, flagging the selective call as having been received by the mobile radio or automatically marking the time of call. The disadvantage of using an *ack* on busy channels is that more air time is used: roughly double the air time used by the selective call data alone. The *ack* packet takes roughly the same amount of air time as the selective call itself.

Unit ID or push-to-talk ID

Many MDC-1200 systems utilize the unit ID option. With each push-to-talk press, the radio sends a data burst identifying the sending radio. Unit IDs are decoded as unique four-digit numbers. Every radio would have a unique four-digit ID, (for example: *0423* or *5990*).

Unit ID can be sent as leading or trailing a voice message. In the *leading* option, the data burst is sent at the moment a user presses the radio's push-to-talk button. An option can be set to make the radio's speaker emit a tone for the length of the unit ID data, (about 1-1.5 seconds). This reminds a user to wait until the data has been sent before talking. The leading unit ID takes slightly more air time (is longer) than a trailing ID because of a header tone and the need to delay the data burst to allow time for CTCSS decoders and voting comparators to open an audio path to the decoder. A default delay is defined with

the unit ID option. To adjust for time delay variations in each individual system, radios can be programmed to delay the sending of a radio's unit ID data by up to hundreds of milliseconds within a range. In the *trailing* option, the data packet is sent at the moment the microphone button is released. This avoids timing issues because the audio path to the base station is already open.

The standard Motorola encoder-decoder has a display which shows the most recent four-digit, push-to-talk ID. A printer can be connected. It would print the unit ID and the time it was received based on the decoder's internal clock.

In computer-aided dispatch (CAD), the four-digit ID is passed to the CAD and may be translated to a local name for the unit. For example, a tow truck with an identifier "Downtown 6" logging on at the beginning of a shift may call the dispatcher and say, "Downtown 6, in service: vehicle radio 0455, hand-held 0771." The CAD computer would translate any push-to-talk ID from either 0771 or 0455 to display "Downtown 6" on the CAD screen.

Emergency button

The emergency button option designates a button on hand-held or vehicle radios which sends the MDC-1200 unit ID with an *emergency* flag appended. The decoder notes the unit ID but interprets this data packet as an emergency message rather than a unit ID.

Options allow emergency messages to always be sent over a specific channel rather than the channel set by the operator using the channel selector. For example, a system with two channels could be programmed to send all emergency messages on channel 2. This reduces interruption of the primary dispatch channel if an emergency button is pressed.

The default setup for emergency buttons is for the sending radio to be completely silent when the emergency button is pressed. The radio will silently send the emergency message, with the four-digit unit ID embedded, three times. In hand-held radios, this increases the probability at last one packet will get through.

In a CAD environment, the button press may pop a dialog box or activate some other attention-getting device. For example, on a screen showing status summary of all units, the unit with an activated emergency button may change colors or flash.

Status buttons

Some MDC-equipped radios have buttons which allow pre-defined status messages to be sent to the base station decoder. The status messages decode as generic messages, (for example: *status 1* or *status 8*). The user defines . Typically, key caps on the status button for *status 8* may be marked with the user-defined definition of the status such as *available*. The base station may respond to a button press with a voice acknowledgment, for example, "Downtown 6, available."

In a CAD environment, the message *status 8* may be translated by the CAD system to a meaning such as *available*. *Status 1* might mean *starting a meal break*. Key caps on the radio's status buttons may be engraved with their user-defined status. The unit's status changes at the moment the button press is received. This helps take a load off the dispatcher because the status change is logged automatically. This happens even though the dispatcher may be talking on the telephone. In systems where the dispatcher is often overloaded, the use of status buttons may slightly reduce the work load and may reduce voice message traffic on a channel.

If the acknowledgment packets are enabled, every status button press gets a handshake packet in response from the base station encoder-decoder. The radio where a status button was pressed will normally beep to confirm the decoder's *ack* for a status button press.

Selective inhibit

In the event a radio is stolen, or a user's permission to access the radio system is revoked, a data packet can be sent to the radio's ID to disable the radio. This prevents the radio from transmitting or receiving until either an un-inhibit packet is sent to the radio or in some cases re-programmed using the appropriate service software. Some literature refers to this feature as 'stunning' and 'un-stunning' the radio.

Radio check

A request can be sent to the radio to determine if it is turned on, on a specific frequency, or within range. The radio will respond with an 'ack' if it hears the request containing it's individual ID. The radio can also be programmed to ignore these packets and not acknowledge them. It can also be programmed to perform this acknowledgement 'silently' (the radio user never knows that his radio has been 'pinged').

Selective calling

MDC-systems have an option for selective calling. By pressing a series of keys on the encoder-decoder, the base station operator can send a data packet that activates a lighted indicator or makes the radio beep. On some radio models with alphanumeric displays, the display may flash *CALL* until a reset button is pressed. On radio models with ten key pads, mobile radios may be programmed to selectively call one another in this manner. In order to call a radio, the calling party must know the four-digit MDC identity of the radio to be called.

In a CAD environment, a tow truck could be automatically called at the moment the driver was dispatched to respond to a call for service. The CAD system could manage the four-digit IDs so that the user did not need to know them.

Patent and Manufacturers

MDC-1200 is patented under US patents 4,457,005 4,517,561 4,590,473 and 4,517,669. During the patent period, Motorola charged heavy licensing fees for the MDC-1200 protocol. As a result, few other manufacturers produced equipment compatible with the system. This tended to produce a lock-in situation where many companies and public safety agencies were restricted to using mostly Motorola radios, in order to ensure compatibility with existing systems.

Manufacturers of third-party MDC-1200 hardware, including in-radio encoder/decoder modules (as aftermarket add-ons for non-Motorola radios), display units for dispatch centers, etc. include Midian Electronics and Cimarron Technologies. Some of these products have display screens, some are 'black boxes' with inputs for power and receiver audio, and an RS232 serial diata output.

As of February 2008, there is some discussion as to the status of the above mentioned patents. While the USPTO still shows them as active patents, a number of other radio manufacturers have begun including MDC-1200 support in their products. Vertex Standard manufactures OEM add-on boards for their mobile and portable Land Mobile Radios that support MDC-1200 ANI (or PTT ID). Icom Incorporated includes built-in MDC-1200 features on some of their newer radios including the IC-F3021/4021 portables and IC-F1721/1821 mobiles, as does [Kenwood Electronics].

WADSWORTH
SALES INC.

BRYAN WADSWORTH
TOLL FREE # (888) 280-5290
E-Mail: wb9mcw@gmail.com
CELL PHONE (815) 790-4494
SKYPE PHONE = bryan.wadsworth
FAX (815) 363-6056