

4. GENERAL REQUIREMENTS

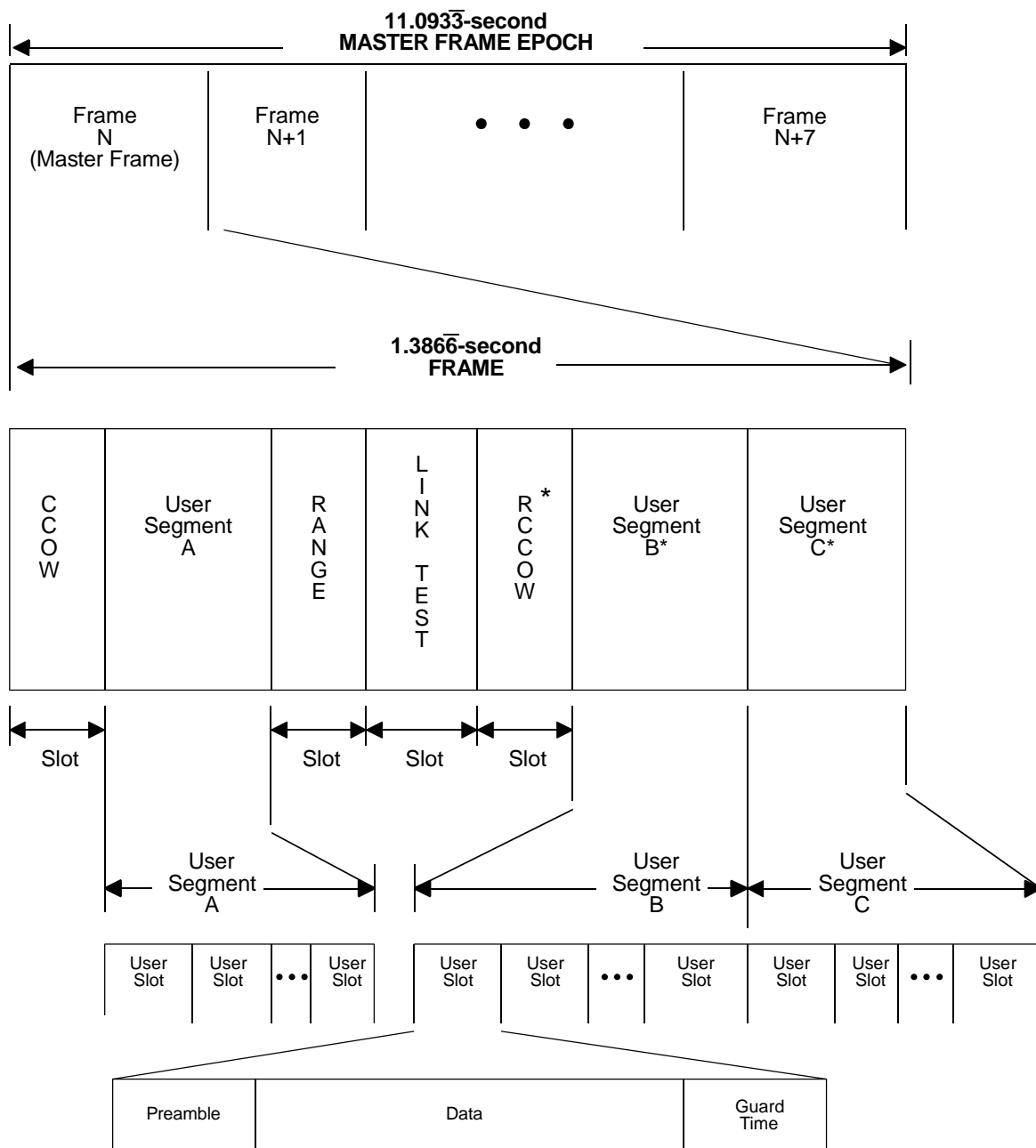
4.1 TDMA/DAMA. The waveform defined in this MIL-STD allows multiple users to use a single, nonregenerative satellite transponder. The waveform also allows an automatic controller to have either preassigned or real-time control of the channel. This MIL-STD defines minimum interoperability requirements for a terminal to function in the AC and DC waveform modes, and specifies minimum optional requirements for a terminal to operate as a DC-mode channel controller. The waveform accommodates multiple input/output (I/O) bit rates and radio frequency (rf) symbol burst rates, as well as dynamic assignment of users between channels. Operation of the waveform is transparent to the user baseband equipment, except for TDMA frame-time delays. Requirements for implementing communications security (COMSEC) transmission security (TRANSEC) integrated circuit (CTIC)-compatible COMSEC for orderwire encryption are identified in Appendix D (Confidential), which is a stand-alone document.

4.2 General waveform structure. The 25-kHz TDMA/DAMA waveform is organized as a repetitive frame structure with 1.3866-second frames, as depicted in Figure 1 (sample frame format number 2 is depicted). Format numbers 1 and 2 are discussed in 5.1.1.1 and 5.1.1.2. Frames are subdivided into slots assigned for (a) orderwire communications [channel control orderwire (CCOW) and return channel control orderwire (RCCOW)]; (b) system support functions (range time slot and link-test time slot); and (c) user segments A, B, and C. User segments A, B, and C each comprise multiple user slots, as specified in 5.1.1. Master frames, identical in frame format to nonmaster frames, are located periodically within the waveform at 8-frame intervals [master frames occur when the three least significant bits (LSB) of the received frame count are all zeros]. A set of 8 contiguous frames, beginning with a master frame, defines a master frame epoch. Each of the 5 slot types required for interoperability in the 25-kHz TDMA/DAMA waveform is identified below:

a. CCOW slot. The channel controller broadcasts a CCOW during the CCOW slot in each frame time. The CCOW contains information required for controlling the waveform.

b. RCCOW slot. The RCCOW slot provides time for users to send information, including requests for access to the waveform, to the channel controller.

c. Range slot. The range slot provides time for users (including the channel controller) to transmit and receive their own data stream for the purpose of calculating range to the satellite, based on measured round-trip delay time.



* Sample frame format 2 shown here for illustration purposes. Position and length of these segments/slots vary, depending on selected frame format.

FIGURE 1. General TDMA/DAMA Waveform

d. Link test slot. The link test slot provides time for users (including the channel controller) to transmit and receive a test data stream to determine the current operating conditions, based on the measured bit error ratio (BER). The link test slot is also used to perform dedicated range measurements, as specified in 5.1.4.1.2, when the link test slot is in an even-numbered receive frame. This is known as an even link test (ELT) slot.

e. User slot. User slots are allocated for transferring data between users. User slots have associated with them specific baseband, coding, and burst rates.

4.2.1 Time-slot structure. Each slot within the waveform consists of three elements: (1) a preamble for receiver carrier, bit, and data synchronization; (2) data; and (3) guard time to avoid user-to-user interference. The receiving equipment achieves carrier and bit synchronization for each slot in the waveform.

4.2.2 User access and waveform control. The method of user access to the communications slots within the waveform depends on whether the waveform is operated in the automatic control (AC) or distributed control (DC) mode.

4.2.2.1 AC Mode. In the AC mode, terminal access to waveform communications slots is allowed through CCOW messages from the controller. Terminals request communications access to other terminals or terminal nets by sending RCCOW messages to the controller. In the AC mode, the waveform frame format is unknown to the terminal's operator, since the format is dynamically adjusted by the controller to reflect changing communications demands and priorities.

4.2.2.2 DC Mode. In the DC mode, access to communications slots is prearranged. The waveform frame format is known to the terminal operator in this mode. Communications slots are uniquely numbered and preassigned for specific purposes. The terminal operator interface is used to directly connect the data port(s) of the terminal to communications slot(s).

4.2.3 System timing. The terminal shall achieve CCOW acquisition for network entrance and synchronization data.

4.3 Orderwire commands. The terminal shall be able to receive and process the CCOW commands (see Tables IA and IB) and generate the RCCOW requests/responses (see Table IIA and IIB).

TABLE IA. CCOW Command listing, AC mode.

| COMMAND | PURPOSE |
|--|---|
| Master Frame | Allows user net entry. |
| Slot Disconnect | Cancels user slot assignment. |
| Slot Connect | Assigns user slot. |
| Link Test and Range Frame-Number Assignment | Authorizes use of link test slots or assigns new dedicated range slot. |
| Channel Control Handover Request | Coordinates handover of control to new controller. |
| Special Format Change Order | Directs waveform change. |
| Call Canceled | Notifies user that call is canceled. |
| Channel Reassignment | Changes channel assignment. |
| Timed Channel Assignment | Directs a channel assignment for the duration of a call or until a timer expires. |
| Enter Guard List | Enters guard numbers into list |
| Delete from Guard List | Deletes guard numbers from list. |
| Call Waiting | Notifies user that call is waiting. |
| Call In Queue | Notifies user that call has been placed in queue. |
| Computer Data Transfer | Transfers data (4 bytes) to user request port. |
| Information Request | Asks user for status information report. |
| Zeroize | Zeroizes orderwire encryption device. |
| Time-Slot Preparation | Causes change in orderwire encryption device preparation. |
| Requested Party Out-of-Service | Notifies user that requested party is not available. |
| Transmit Control | Enables or inhibits all user transmissions. |

TABLE IB. CCOW Command listing, DC mode.

| COMMAND | PURPOSE |
|-----------------------|---|
| Master Frame | Allows user net entry. |
| Information Request | Asks user for status information report. |
| Zeroize | Zeroizes orderwire encryption device. |
| Time-Slot Preparation | Causes change in orderwire encryption device preparation. |
| DC CCOW #1 | Contains format and frequency code data for channels 1, 2, and 3. |
| DC CCOW #2 | Contains format and frequency code data for channels 4, 5, and 6. |
| DC CCOW #3 | Contains format and frequency code data for channels 7, 8, and 9. |

TABLE IIA. RCCOW Requests/Responses listing, AC mode.

| COMMAND | PURPOSE |
|-------------------------------------|---|
| Status Report B | Reports terminal port status. |
| Data Transfer | Transfers data between users. |
| Link Test Request | Requests access to link test slot. |
| Call Complete | Notifies controller of call finished. |
| Out-of-Service | Notifies controller of reason for leaving service. |
| Information Report | Responds to information request. |
| Two-Party Request | Requests slot connect to one party or to a preestablished network. |
| Conference Request | These two RCCOWs request the establishment of a conference call with up to five other terminals. |
| Conference Party List | |
| Link Test Results | Reports link test results. |
| Status Report A | Reports terminal status. |
| Acknowledge Channel Control Request | Acknowledges channel handover request. |
| Guard list Report | Reports current guard lists. |
| Paging | Requests paging up to three parties through the CCOW, when slot connect has been made but communication has not been established. |
| Cancel Call | Requests cancellation of call. |

TABLE IIB. RCCOW Requests/Responses listing, DC mode.

| COMMAND | PURPOSE |
|---------------|------------------------------------|
| Data Transfer | Responds to data transfer request. |

| | |
|--------------------|----------------------------------|
| Information Report | Responds to information request. |
|--------------------|----------------------------------|

4.4 Terminal performance requirements. The waveform defined in this MIL-STD have been designed to operate on 25-kHz nonprocessed channels of current and planned UHF SATCOM satellites. The terminal transmit power received at the satellite shall be at least -163 decibels relative to 1 watt (dBW). The terminal receiver system shall be designed to provide error-free reception of the CCOW burst for at least 999 of 1000 CCOW bursts, with a confidence of 98 percent. To satisfy this requirement, it shall be assumed that the controller power received at the satellite is at least -163 dBW, and error-free reception implies both successful acquisition of the burst and error-free reception of all data covered by the CRC. Terminal specifications shall define the parameters that must be met for them to comply with the requirements of this paragraph.

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