5. DETAILED REQUIREMENTS

5.1 Waveform characteristics

5.1.1 Frame format structure. The TDMA frame has a duration of 1.3866… seconds. The frame includes the following: (1) the CCOW time slot for control commands and synchronization; (2) the RCCOW time slot for terminal access requests and status reports; (3) the range time slot for ranging; (4) the link-test time slot for ranging and individual link evaluation; and (5) user communications time segments A, B, and C. These communications segments are further divided into time slots.

a. The frame contains two different format structures, as shown in Figure 2. Figures 3, 4, and 5 describe the available A, B, and C user segment subformat selections keyed to alphanumeric characters (shown circled and in sequence in the left margins of the figures, opposite each selection). The alphanumeric designations for these subformats are used to represent unique frame formats by specifying a sequence of three characters (in 4-bit hexadecimal notation in all orderwire message formats). As shown in these figures, each user time slot has an associated baseband rate [user data rate in bits per second (bps)], burst rate [over-the-air transmission rate in symbols per second (sps)], and code rate [1/2 or 3/4 for forward error correction (FEC)]. Depending on the mode of operation (AC or DC), each user time slot also has associated with it an AC slot number (1-23, represented by a 5-bit code) or DC circuit number (a 5-digit code). For example, in Figure 3, the leftmost user slot in the first row (segment A-1) has an AC slot number of 1, a DC circuit number of 10033, a baseband rate of 75 bps, a burst rate of 9.6 ksps, and a code rate of 1/2.

b. The terminal shall transmit only in a time slot that is part of the current frame format. Format configuration and restrictions shall be as described in 5.1.1.1 and 5.1.1.2. The communications terminal shall be able to operate within this frame format structure.

5.1.1.1 Format number 1. In format number 1, the B segment is divided into two subsegments, B-1 (A) and B-1 (B), to eliminate contention for those half-duplex terminals (at rf) that may require communications on two 2400-bps circuits. For a half-duplex terminal, reception of the CCOW can occur without contention, except in those frames when the terminal is ranging or conducting a link test. Format number 1 is used whenever subformat B-1 is selected. Any of the subformats of segments A and C may be selected.

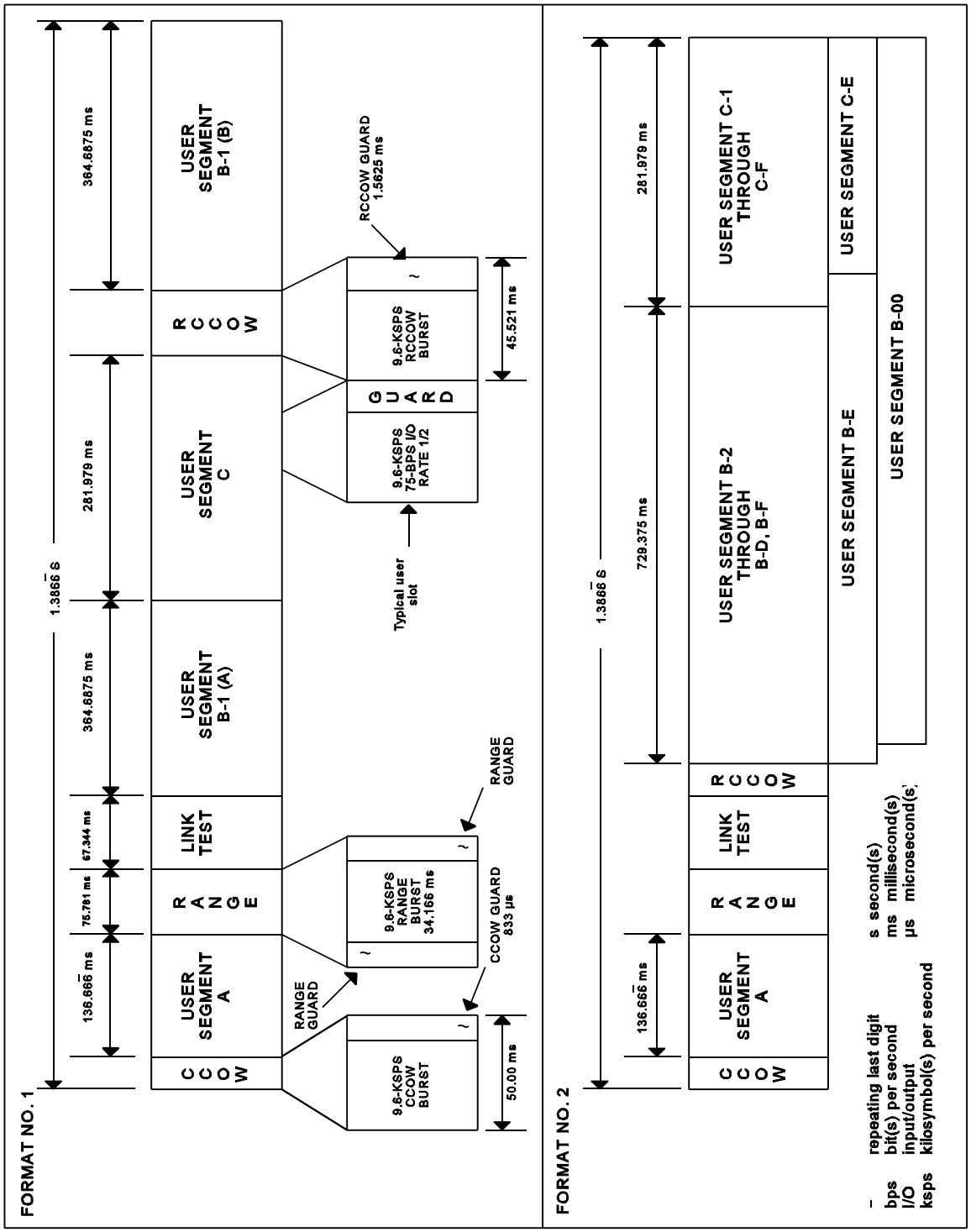

FIGURE 2. TDMA frame formats.

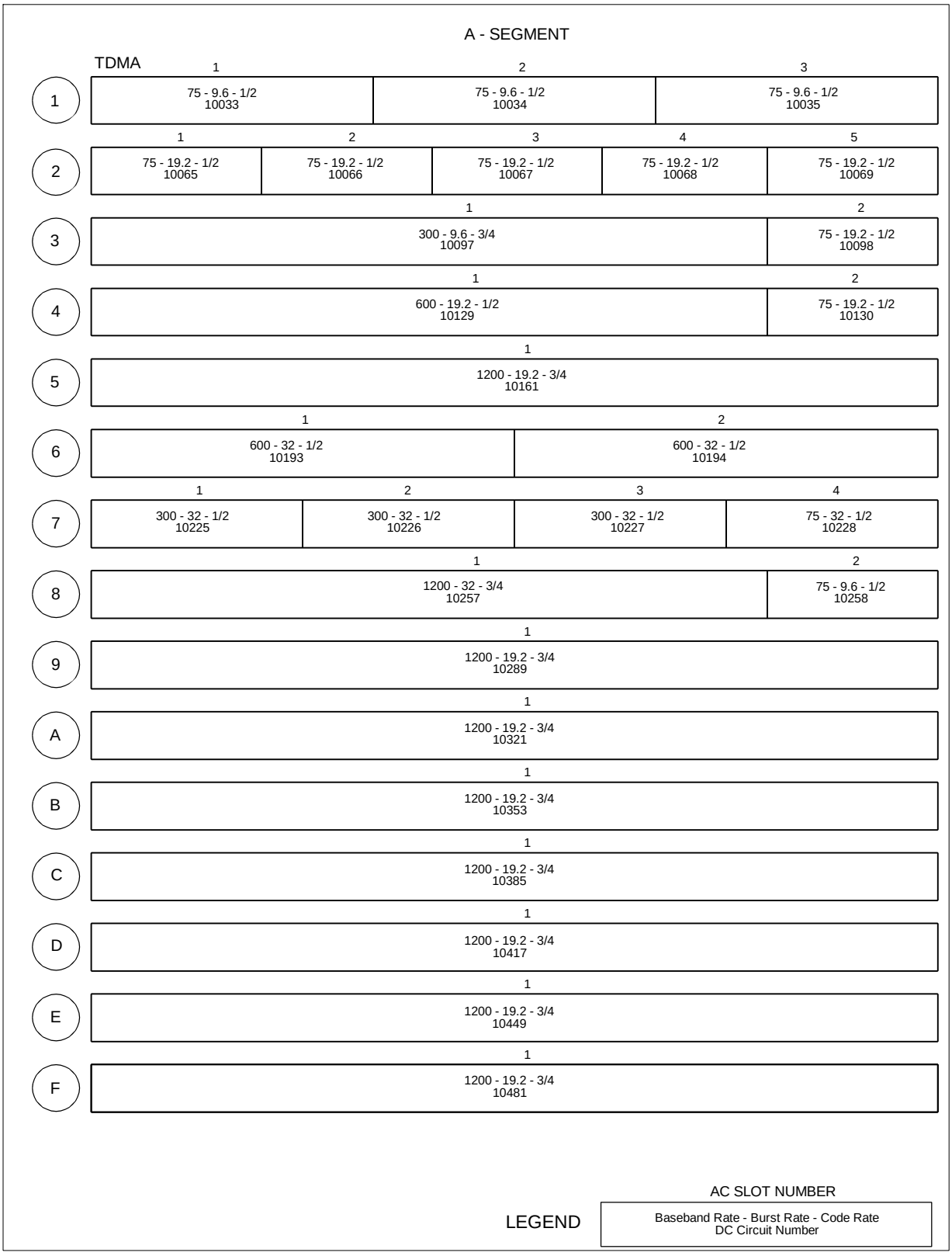

FIGURE 3. Segment A slots.

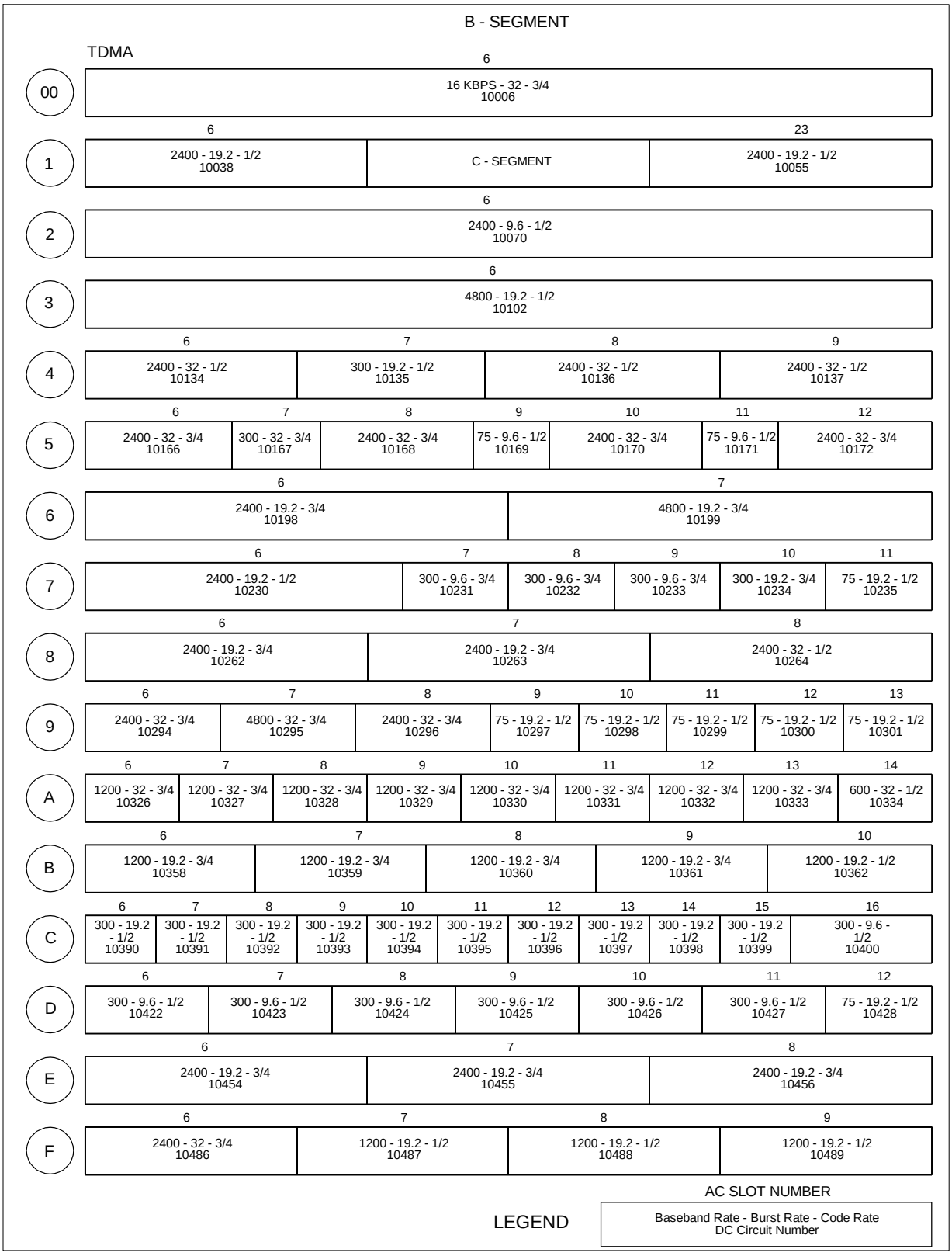

FIGURE 4. Segment B slots.

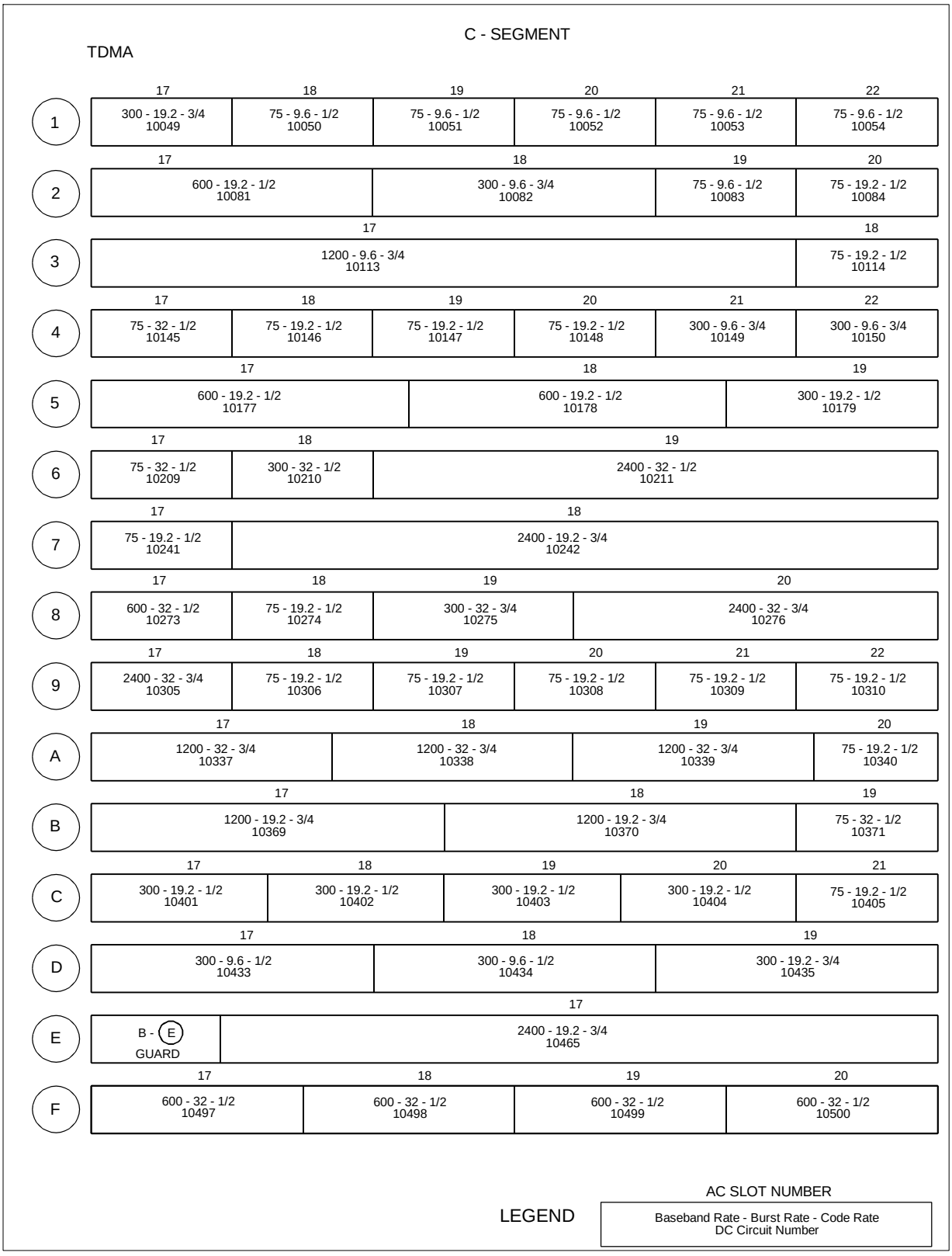

FIGURE 5. Segment C slots.

5.1.1.2 Format number 2. Format number 2 is used whenever subformat B-1 is not selected. Any of the subformats of segment A may be selected. When subformat B-00 is selected, segment C is not used. The selection of subformat B-E restricts the C segment to an E selection as well. There are no other restrictions on selection of the C-segment subformat.

5.1.2 Preamble structure. Each rf transmission shall begin with a synchronization preamble. The preamble structure, as it relates to the burst rates and slot types, shall be in accordance with Figure 6. The latter portion of the synchronization preamble shall be a Legendre polynomial (LPN) whose length is defined in Figure 6 and whose content is specified in Table III. The terminal's specification for bit error ratio (BER) and acquisition performance under degraded link conditions shall be used to determine how many LPN bits must be correctly received for a burst to be considered acquired. The first symbol following the LPN shall be the first data symbol.

5.1.3 Timing requirements. To operate within the waveform, each terminal has receive and transmit timing requirements. Each 1.3866… second TDMA frame is subdivided into 26624 time chips, where each time chip has the duration of a 19.2-kHz clock's single clock cycle. All timing within the frame is specified in units of time chips. Receive timing for the terminal is based on achieving frame lock. Frame lock is achieved by the terminal when it correctly receives two consecutive CCOWs. A terminal considers a CCOW to be correctly received if enough bits of each of the two 74-bit LPN sequences in the CCOW preamble are correctly correlated with the terminal's stored LPN sequence. The number of bits required for a correlation to be considered correct may be derived from the E_b/N_o performance specified for the terminal.

a. From the view of considering a terminal's receive timing to be properly established, the start of the frame is at time chip 1, which immediately follows the LPN sequence correlation. The wraparound from time chip 26624 to time chip 1 occurs within the CCOW slot, as shown in Figure 7. Consequently, each frame begins at time chip 26129 and ends at time chip 26128. Absolute time duration of any slot within the frame may be calculated by converting the duration of the slot, as specified in time chips, to a time. For example, a slot width of 500 time chips is calculated as follows: (1/19200) x (500) = 26.04 ms in duration.

b. Terminal transmit timing is based on first achieving receive timing. Through ranging, the terminal adjusts its transmit timing to compensate for its range through the satellite. See 5.1.4 for different ranging methods that a

terminal uses to determine the amount of transmit timing compensation needed.

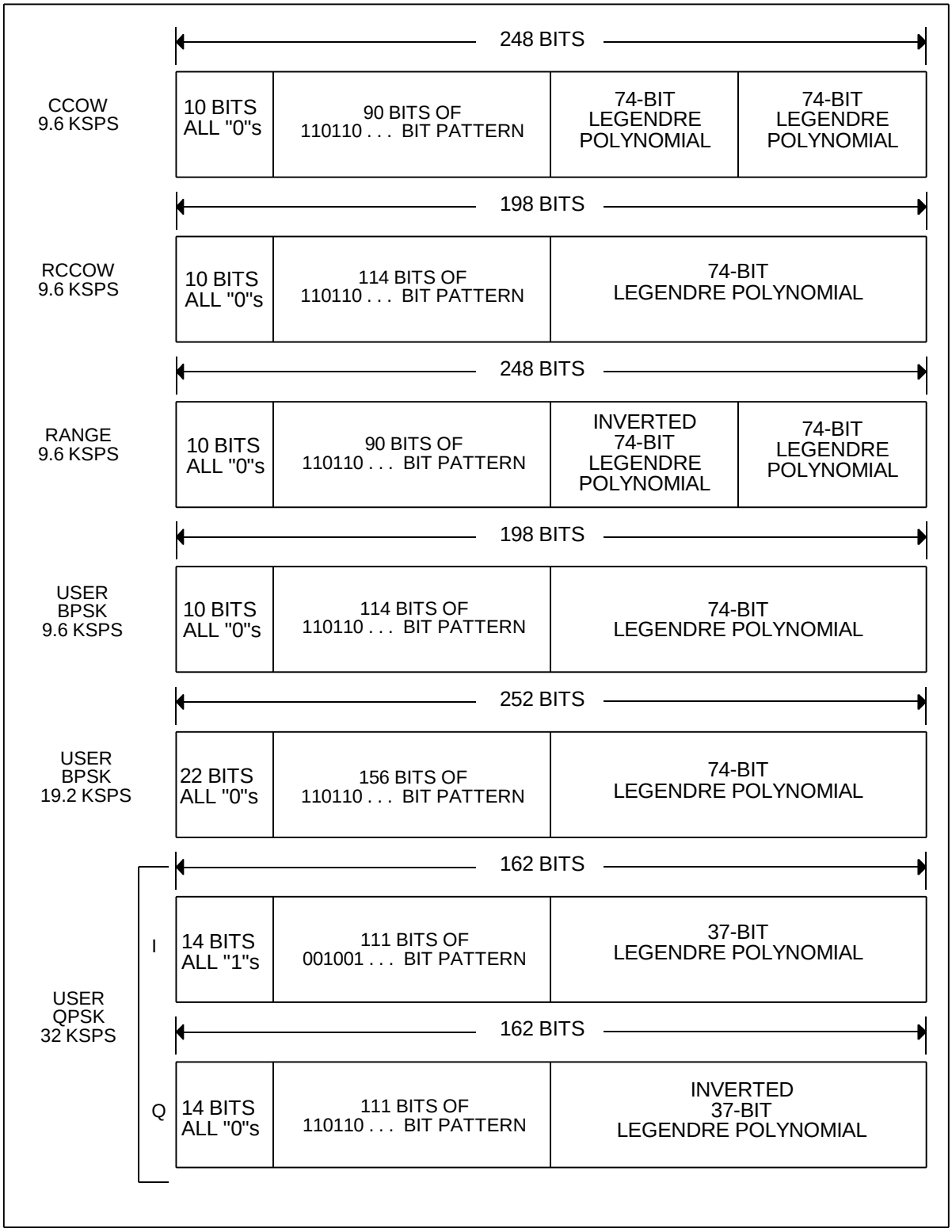

FIGURE 6. Preamble structure.

TABLE III. Legendre polynomials.

74 LPN (73-bit LPN Modified)				37 LPN	
Bit Number	State	Bit Number	State	Bit Number	State
1*	1	38	0	1	1
2	0	39	1	2	1
3	0	40	0	3	1
4	0	41	0	4	0
5	1	42	0	5	0
6	1	43	1	6	0
7	1	44	0	7	1
8	0	45	0	8	0
9	1	46	1	9	0
10	0	47	1	10	0
11	0	48	0	11	0
12	0	49	1	12	1
13	0	50	0	13	0
14	1	51	1	14	0
15	0	52	1	15	0
16	0	53	1	16	1
17	1	54	1	17	1
18	1	55**	0	18	1
19	1	56	1	19	1
20	1	57	1	20	0
21	0	58	1	21	1
22	0	59	1	22	0
23	1	60	0	23	0
24	0	61	1	24	1
25	0	62	0	25	1
26	0	63	1	26	0
27	0	64	1	27	1
28	1	65	0	28	1
29	0	66	0	29	1
30	1	67	1	30	0
31	1	68	0	31	1
32	1	69	0	32	1
33	0	70	0	33	0
34	0	71	1	34	0
35	0	72	0	35	1
36	1	73	1	36	0
37	1	74	1	37***	1

NOTES:

* This logic 1 was added to the original (73-bit LPN) sequence.

** This logic 0 was changed from a logic 1 in the original 73-bit LPN sequence.

*** This bit is not inverted in the inverted LPN.

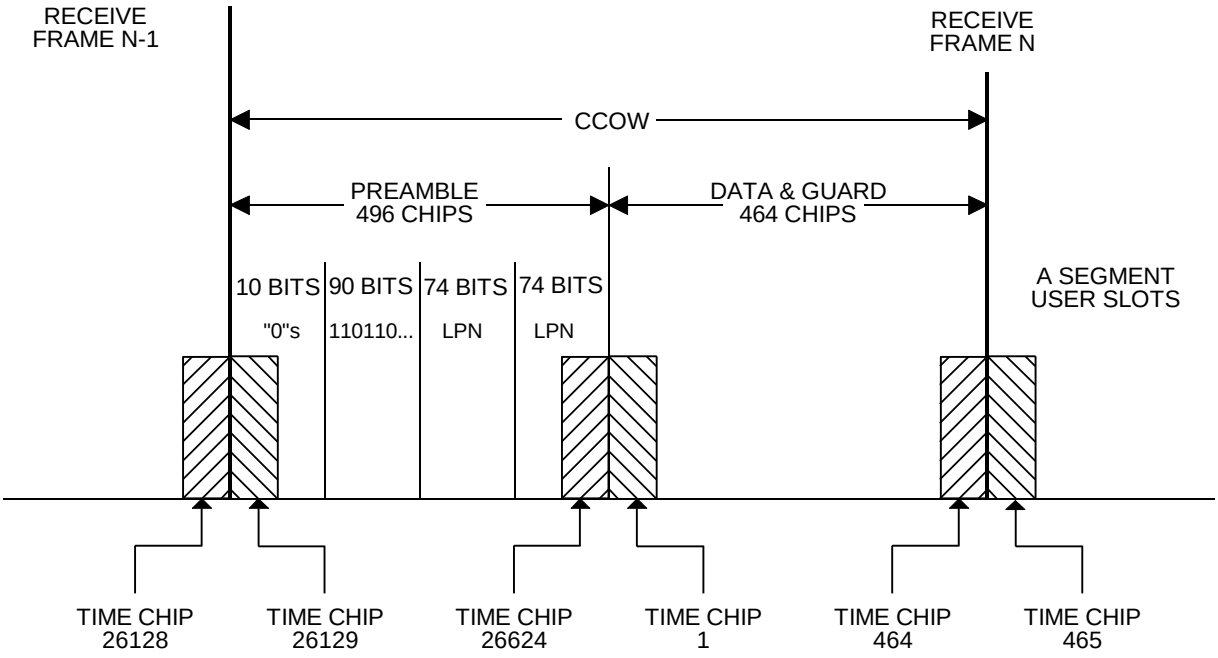

FIGURE 7. Terminal receive timing.

c. All rf transmissions shall occur within the allocated times of the slots specified in 5.1.3.1 through 5.1.3.5. The leading zeros (ones for the QPSK I channel) in the preamble structure shown in Figure 6 allow time for the terminal's receiver/transmitter (R/T) to achieve steady state rf output power and frequency when switching between receive and transmit.

This time is also allowed for the terminal to switch channel frequencies. Switching time is defined as the time required by the terminal to settle within a steady state of ± 1 dB and ± 20 Hz of destination performance (Receive-to-Transmit, Transmit-to-Receive, Receive-to-Receive, and Transmit-to-Transmit). The terminal's switching time shall not exceed 875 µs. Terminals shall inhibit transmission for at least 500 microseconds of the leading zeros (ones for the QPSK I channel) in the Figure 6 preamble structures.

d. Each specified time slot within the TDMA-1 frame format is of sufficient duration to accommodate a single burst transmission (comprising preamble, data, and guard time) in accordance with the requirements of 5.1.3.1 through 5.1.3.5. Duration of specified burst transmissions shall be a function of slot type, baseband rate, burst rate, FEC coding (see 5.4.1), and fill bits required due to interleaving (see 5.4.3). Burst timing requirements and the component parts of all bursts for all defined slots shall be as specified in Table IV. The details of the format of the range and link test bursts, including the composition of the information bits, is presented in Figure 8.

e. TDMA frame time delays. The time from when a user data bit is input to a terminal for transmission until that bit is output from another terminal is the TDMA frame time delay. The terminal's frame time delay for each baseband data rate shall not exceed the maximum corresponding values for each rate shown in Table 4-1 of FSCS-212-16D.

5.1.3.1 CCOW slot timing. CCOW slot timing is specified in Table V. The CCOW time slot is 960 time chips (50.00 ms) in duration with the last 16 time chips (0.833 ms) allocated as a guard time. CCOW reception starts at time chip 26129. Detailed requirements of the CCOW are as specified in 5.2.2.1 for the AC mode and 5.2.2.4 for the DC mode.

5.1.3.2 RCCOW slot timing. RCCOW slot timing shall be as specified in Table V. RCCOW reception shall start at time chip 18253 for format number 1 (time chip 5837 for format number 2). Detailed requirements for the contents and use of the RCCOW shall be as specified in 5.2.2.2 for the AC mode and 5.2.2.5 for the DC mode. Detailed requirements for RCCOW transmit decision shall be

as specified in 5.2.2.3 for the AC mode and 5.2.2.6 for the DC mode.

TABLE IV. Derivation of burst timing (duration) requirements.

SLOT TYPE	BURST RATE (ksps)	INFORMATION BITS (NUMBER OF BITS)			TRANSMITTED SYMBOLS* (NUMBER OF SYMBOLS)			BURST DURATION (TIME CHIPS)
		DATA	FILL	TOTAL	INFORMATION	PREAMBLE	TOTAL	
CCOW	9.6	104	8	112	224	248	472	944
RCCOW	9.6	104	8	112	224	198	422	844
RANGE & ELT SLOT	9.6	80	0	80	80	248	328	656
LINK TEST SLOTS** (ODD)	9.6	72	0	72	72	198	270	540
	19.2	296	0	296	296	252	548	548
	32.0	592	0	592	592	324	916	550

NOTES:

* CCOW and RCCOW bursts employ k = 7, rate 1/2 coding; range and link test bursts do not employ FEC coding.

** The quantity of odd-numbered frames to perform a 9.6-ksps link test, in DC mode, is 139 (10,008 bits divided by 72 total information bits per frame).

Similarly, for a 19.2-ksps link test, in DC mode, 34 odd-numbered frames are required (10,064 bits divided by 296 total information bits per frame).

For a 32.0-ksps link test, in DC mode, 17 odd-numbered frames are required (10,064 bits divided by 592 total information bits per frame).

In AC mode, link test duration is variable as assigned by the channel controller.

TABLE IV. Derivation of burst timing (duration) requirements. (continued)

FEC k = 7, Code Rate = 1/2								
DATA I/O RATE (bps)	BURST RATE (ksps)	INFORMATION BITS (NUMBER OF BITS)			TRANSMITTED SYMBOLS (NUMBER OF SYMBOLS)			BURST DURATION (TIME CHIPS)
		DATA	FILL	TOTAL	INFORMATION	PREAMBLE	TOTAL	
75	9.6	104	8	112	224	198	422	844
	19.2	104	8	112	224	252	476	476
	32.0	104	8	112	224	324	548	328.8
300	9.6	416	32	448	896	198	1094	2188
	19.2	416	32	448	896	252	1148	1148
	32.0	416	32	448	896	324	1220	732
600	19.2	832	64	896	1792	252	2044	2044
	32.0	832	64	896	1792	324	2116	1269.6
1200	19.2	1664	16	1680	3360	252	3612	3612
2400	9.6	3328	32	3360	6720	198	6918	13836
	19.2	3328	32	3360	6720	252	6972	6972
	32.0	3328	32	3360	6720	324	7044	4226.4
4800	19.2	6656	64	6720	13440	252	13692	13692

TABLE IV. Derivation of burst timing (duration) requirements. (concluded)

FEC k = 9, Code Rate = 3/4								
DATA I/O RATE (bps)	BURST RATE (ksps)	INFORMATION BITS (NUMBER OF BITS)			TRANSMITTED SYMBOLS (NUMBER OF SYMBOLS)			BURST DURATION (TIME CHIPS)
		DATA	FILL	TOTAL	INFORMATION	PREAMBLE	TOTAL	
300	9.6	416	88	504	672	198	870	1740
	19.2	416	88	504	672	252	924	924
	32.0	416	88	504	672	324	996	597.6
1200	9.6	1664	16	1680	2240	198	2438	4876
	19.2	1664	16	1680	2240	252	2492	2492
	32.0	1664	16	1680	2240	324	2564	1538.4
2400	19.2	3328	32	3360	4480	252	4732	4732
	32.0	3328	32	3360	4480	324	4804	2882.4
4800	19.2	6656	64	6720	8960	252	9212	9212
	32.0	6656	64	6720	8960	324	9284	5570.4
16000	32.0	22184	160	22344	29792	324	30116	18069.6

Insert Figure 8 (Tape Up)

TABLE V. CCOW, RCCOW, range, and link-test time slots.

SLOT TYPE		START TIME CHIP NUMBER (RECEIVE)	END TIME CHIP NUMBER (RECEIVE)	GUARD TIME AT START OF SLOT (TIME CHIPS)	GUARD TIME AT END OF SLOT (TIME CHIPS)
CCOW		26129	464	0	16
RCCOW	format #1	18253	19125	0	29
	format #2	5837	6710	0	30
RANGE*		3089	4543	377***	422
LINK TEST	even # slots	4544	**	60***	****
	odd # slots	4544	**	60***	****

NOTES:

* If range ≤ 241.87 ms, the guard time at the start of the slot shall be reduced by 62 chips to prevent overlapping a CCOW reception with a ranging transmission.

** 5835 for Format number 1 and 5836 for Format number 2.

*** Transmission is inhibited during guard time at the start of the slot.

**** Guard time of 693 time chips for a 9.6-ksps burst, 685 time chips for a 19.2-ksps burst, and 683 time chips for a 32-ksps burst. The guard time for even-numbered link test slots, when used for ranging, is 577 chips.

5.1.3.3 Range slot timing. Adjustment of terminal transmit timing is required periodically to prevent slot overlap between adjacent time slots. The user terminal shall use a range processing method discussed in 5.1.4. Burst transmissions (other than ranging) shall be inhibited by the terminal when it has been determined by any ranging method that the range uncertainty exceeds 0.875 ms.

a. Guard-time depletion at the satellite is a function of slant range change between the user terminal and the satellite (since the preceding ranging event), and is directly proportional to the slant range change. The range time slot is a shared slot and shall be used only to measure range to the satellite. Slant range uncertainty is tolerable up to a limit of 0.4375 ms [approximately 71 nautical miles (nmi)] with one-half the guard time allocated to an individual terminal. This is based on a worst-case (minimum) guard time of 1.25 ms and a transmitter turn-on time of 500 µs. If the average relative velocity between the satellite and the user terminal during a ranging interval is greater than 180 nmi per hour (approximately 71 nmi divided by 0.3944 hour; note that 1024 frames span 0.3944 hour), other methods of updating burst transmission time shall be used, including, but not limited to, any of those presented below:

1. Range calculations that use satellite position (calculated from satellite orbital parameters) and platform position on earth (including altitude).

2. Range estimates based on extrapolation of differential range changes between active range measurements (assuming heading and average platform speed relative to the satellite remain unchanged).

3. Range estimates based on measurement of average downlink doppler since the last active range measurement.

4. Active ranging during any user time slot (provided that the terminal can receive and decode its own burst, has been assigned the time slot for use, does not interfere with normal transmissions, and does not overlap adjacent slots).

b. The requirement for terminals to maintain accurate timing shall be mandatory; however, use of specific ranging algorithms specified in 5.1.4.1 is optional. Range and link-test time slots shall not be used by terminals for ranging except in accordance with the requirements specified in 5.1.4.1. Range

slot timing shall be as specified in Table V.

5.1.3.4 Link-test-slot timing. Link-test-slot timing shall be as specified in Table V. The link-test time slot shall be 1293 time chips (67.344 ms) in duration with a variable-length guard time allocated at the end of the slot. The link test reception shall start at time chip 4544. The link test slot, a shared slot, has two functions. The link test slot is dedicated to terminals performing link tests when the receive frame count is odd. Only one terminal at a time shall perform a link test. The duration of a link test (in number of frames) varies depending on its burst rate, as shown in Table IV. Requirements for using the link test slot in support of the ranging function shall be as specified in 5.1.4.1.

5.1.3.5 User-segment-slot timing. User-segment-slot timing shall be as specified in Tables VI through X. These tables cover user segments A, B (frame formats 1 and 2), and C (frame formats 1 and 2). Four parameters are specified for each time slot in Tables VI through X: (1) DC circuit number, (2) time chip number for the start of the burst reception, (3) time chip number for the end of the slot (not the end of the burst time), and (4) guard time between the end of the burst and the end of the slot time (number of time chips). All AC slot number for each time slot is specified in Figures 3, 4, and 5. All rf transmissions shall occur to allow reception within the allocated time slots specified in these tables.

5.1.4 Range processing. Active ranging and passive ranging are the two primary methods of range processing that a terminal may use. If terminals use range and link-test time slots to perform active ranging, the algorithms specified in 5.1.4.1 and its subparagraphs shall be used.

5.1.4.1. Active ranging. Random ranging and dedicated ranging are the two types of active ranging that terminals may use when operating in either the AC or DC modes. The timing for the range slot and the even-numbered-frame link test slot, both of which are used in active ranging, is shown in Table V.

5.1.4.1.1. Random ranging. When the receive frame count is odd, the range time slot is allocated for random access use by all terminals to establish their initial range, or when a terminal's dedicated ranging attempt is unsuccessful.

a. After achieving CCOW acquisition, the terminal shall select the first available odd-numbered frame to perform a range measurement in the range time slot. If the first random range measurement is unsuccessful, the terminal shall generate a random number (y) between 1 and 128, wait $2y$ frames, and perform a range measurement using the range time slot to be received in the odd-numbered frame that is $2y$ frames following the unsuccessful

measurement. If this range measurement is unsuccessful, the user terminal shall wait 256-2y frames before generating another random number (y) and shall repeat the process.

TABLE VI. Segment A slot times.

SUBFORMAT NUMBER	TIME SLOTS				
1	10033 465 1338 30	10034 1339 2213 31	10035 2214 3088 31		
2	10065 465 988 48	10066 989 1513 49	10067 1514 2038 49	10068 2039 2563 49	10069 2564 3088 49
3	10097 465 2408 204	10098 2409 3088 204			
4	10129 465 2560 52	10130 2561 3088 52			
5	10161 465 3088 132				
6	10193 465 1776 42	10194 1777 3088 42			
7	10225 465 1220 24	10226 1221 1977 25	10227 1978 2734 25	10228 2735 3088 25	
8	10257 465 2123 120	10258 2124 3088 121			
9	10289 465 3088 132				

TABLE VI. Segment A slot times. (concluded)

SUBFORMAT NUMBER	TIME SLOTS				
A	10321 465 3088 132				
B	10353 465 3088 132				
C	10385 465 3088 132				
D	10417 465 3088 132				
E	10449 465 3088 132				
F	10481 465 3088 132				

LEGEND:

The numbers in each slot (box) correspond to the following parameters:

1. DC circuit number
2. Start receive time count (time-chip number)
3. End slot time count(time-chip number)
4. Guard time (number of time chips)

TABLE VII. Segment B slot times--format 1.

User Segment B-1 (A)	User Segment C		User Segment B-1 (B)
10038 5836 12838 31	C-Segment	RCCOW	10055 19126 26128 31

LEGEND:

The numbers in each slot (box) correspond to the following parameters:

1. DC circuit number
2. Start receive time count (time-chip number)
3. End slot time count (time-chip number)
4. Guard time (number of time chips)

NOTE:

This is the configuration #1 subformat of segment B. It is used only when format 1 is selected.

Insert Table VIII

Insert Table VIII Concluded

TABLE IX. Segment C slot times--format 1.

SUBFORMAT NUMBER	TIME SLOTS					
1	10049 12839 13807 45	10050 13808 14696 45	10051 14697 15585 45	10052 15586 16474 45	10053 16475 17363 45	10054 17364 18252 45
2	10081 12839 14959 77	10082 14960 16776 77	10083 16777 17698 78	10084 17699 18252 78		
3	10113 12839 17745 31	10114 17746 18252 31				
4	10145 12839 13196 29	10146 13197 13701 29	10147 13702 14206 29	10148 14207 14712 30	10149 14713 16482 30	10150 16483 18252 30
5	10177 12839 14941 59	10178 14942 17044 59	10179 17045 18252 60			
6	10209 12839 13209 42	10210 13210 13983 42	10211 13984 18252 42			
7	10241 12839 13417 103	10242 13418 18252 103				
8	10273 12839 14154 46	10274 14155 14677 47	10275 14678 15322 47	10276 15323 18252 47		
9	10305 12839 15746 25	10306 15747 16247 25	10307 16248 16748 25	10308 16749 17249 25	10309 17250 17750 25	10310 17751 18252 26

TABLE IX. Segment C slot times--format 1. (concluded)

SUBFORMAT NUMBER	TIME SLOTS					
A	10337 12839 14457 80	10338 14458 16076 80	10339 16077 17695 80	10340 17696 18252 81		
B	10369 12839 15363 33	10370 15364 17889 34	10371 17890 18252 34			
C	10401 12839 14055 69	10402 14056 15272 69	10403 15273 16489 69	10404 16490 17706 69	10405 17707 18252 70	
D	10433 12839 15064 38	10434 15065 17290 38	10435 17291 18252 38			
E	10465 13418 18252 102					
F	10497 12839 14191 83	10498 14192 15544 83	10499 15545 16898 84	10500 16899 18252 84		

LEGEND:

The numbers in each slot (box) correspond to the following parameters:

1. DC circuit number
2. Start receive time count (time-chip number)
3. End slot time count (time-chip number)
4. Guard time (number of time chips)

TABLE X. Segment C slot times--format 2.

SUBFORMAT NUMBER	TIME SLOTS					
1	10049 20715 21683 45	10050 21684 22572 45	10051 22573 23461 45	10052 23462 24350 45	10053 24351 25239 45	10054 25240 26128 45
2	10081 20715 22835 77	10082 22836 24652 77	10083 24653 25574 78	10084 25575 26128 78		
3	10113 20715 25621 31	10114 25622 26128 31				
4	10145 20715 21072 29	10146 21073 21577 29	10147 21578 22082 29	10148 22083 22588 30	10149 22589 24358 30	10150 24359 26128 30
5	10177 20715 22817 59	10178 22818 24920 59	10179 24921 26128 60			
6	10209 20715 21085 42	10210 21086 21859 42	10211 21860 26128 42			
7	10241 20715 21293 103	10242 21294 26128 103				
8	10273 20715 22030 46	10274 22031 22553 47	10275 22554 23198 47	10276 23199 26128 47		
9	10305 20715 23622 25	10306 23623 24122 24	10307 24123 24624 26	10308 24625 25125 25	10309 25126 25626 25	10310 25627 26128 26

TABLE X. Segment C slot times--format 2. (concluded)

SUBFORMAT NUMBER	TIME SLOTS					
A	10337 20715 22333 80	10338 22334 23952 80	10339 23953 25571 80	10340 25572 26128 81		
B	10369 20715 23239 33	10370 23240 25765 34	10371 25766 26128 34			
C	10401 20715 21931 69	10402 21932 23148 69	10403 23149 24365 69	10404 24366 25582 69	10405 25583 26128 69	
D	10433 20715 22940 38	10434 22941 25166 38	10435 25167 26128 38			
E	10465 21294 26128 102					
F	10497 20715 22066 83	10498 22067 23420 83	10499 23421 24774 84	10500 24775 26128 84		

LEGEND:

The numbers in each slot (box) correspond to the following parameters:

1. DC circuit number
2. Start receive time count (time-chip number)
3. End slot time count (time-chip number)
4. Guard time (number of time chips)

b. The range estimate used to set uplink timing for a ranging transmission shall be dithered, in 1-time-chip increments, between 251.35 and 257.97 ms when in the random range mode or when range has not been determined. As long as range remains determined, the terminal's next ranging transmission shall be positioned so as to attempt to fall exactly in the center of its time slot. The accuracy of all ranges shall be ±1 time chip or better.

5.1.4.1.2. Dedicated ranging. Two methods of dedicated ranging shall be employed, depending on the terminal's ranging epoch interval requirements. These requirements will vary, depending on the speed of the platform on which the terminal operates. Terminals operating on higher-speed platforms, such as aircraft, may need additional ranging opportunities to maintain accurate timing. If so, the terminals use the method with the shorter ranging epoch interval.

5.1.4.1.2.1. Method one. For terminals configured to operate on lower-speed platforms, the ranging period is every 1024 frames, referred to in this MIL-STD as a ranging epoch (approximately 23.67 minutes). Terminals that do not require range updates within 1024 frames shall not transmit during even-numbered range slots. Upon successful completion of ranging in the random-access mode, the terminal shall continuously monitor link test slots in even-numbered frames.

a. The terminal shall maintain and update a ranging activity data base for 1024 frame times by identifying and flagging those frames with activity in the ELT slot. In other words, the terminal maintains a usage data base on the most recent 512 link test slots in receive even-numbered frames. The terminal shall then generate a random number (x) between 1 and 64, wait $2x$ frames, and identify the next unused ELT slot, based on flags set during the preceding 1024 frames. The terminal shall perform a dedicated range measurement in that unused ELT slot and, when successful, every 1024 frames thereafter.

b. In the event that a dedicated ELT range measurement is unsuccessful, the terminal may revert to the random range algorithm to perform a range measurement. If the terminal instead continues to perform dedicated ranging, it shall use the established ELT activity data base to help identify the next unused ELT slot. The terminal again shall generate a random number (x) between 1 and 64, wait $2x$ frames, and identify the next unused ELT slot, based on flags set during the preceding 1024 frames. The terminal shall perform a dedicated range measurement in that unused ELT slot and, when successful, every 1024 frames thereafter. This process shall be repeated by the

terminal, as necessary.

5.1.4.1.2.2. Method two. To provide the additional ranging opportunities needed by terminals located on higher-speed platforms, the ranging period or epoch is approximately half that of low-speed terminals. Terminals on high-speed platforms range every 512 frames for a ranging epoch interval of approximately 11.8 minutes. It is important to note that use of this method may still need to be supplemented by measures such as making burst-to-burst time tracking corrections within the ranging epoch interval.

a. Upon successful completion of ranging in the random-access mode, the terminal shall continuously monitor link test slots in the even-numbered frames. To maintain timing, the terminal may need to use random-access ranging between the time beginning when ELT slots are first monitored and ending when dedicated ranging is successful. The terminal shall maintain and update a ranging activity data base of 1024 frame times by identifying and flagging those frames with activity in the ELT slot. In other words, the terminal maintains a usage data base on the most recent 512 link test slots in receive even-numbered frames.

b. The terminal shall then generate a random number (x) between 1 and 64, wait $2x$ frames, and identify the next unused ELT slot, based on flags set during the preceding 1024 frames. The terminal shall then determine if this frame number equals $256N + 2$, where N is any positive integer. If true, this frame number shall be excluded by the terminal as a potential dedicated ranging frame, since the range slot in a frame with this number is reserved for the channel controller. In such a case, the frame for the next unused ELT slot shall be identified. The terminal shall attempt to range in the identified unused ELT slot (called frame R), or in the even-numbered frame range slot in frame R-512, whichever comes first.

c. The terminal shall then perform dedicated ranging by alternating between the ELT slot and the even-numbered frame ranging slot each 512-frame period. In the event that a dedicated range measurement is unsuccessful in either slot, the terminal may revert to the random range algorithm to perform a range measurement. If the terminal instead continues to perform dedicated ranging, it shall use the established ELT activity data base to help identify the next unused ELT slot. The terminal again shall generate a random number (x) between 1 and 64, wait $2(x)$ frames, and identify the next unused ELT slot based on flags set during the preceding 1024 frames. The process described above shall then be repeated as required.

5.1.4.1.3. Assigned ranging. In the AC mode, the terminal may be commanded by the channel controller to perform a range measurement. This is done by the CCOW Link Test and Range Frame-Number Assignment described in 5.2.2.1.7.4. When the frame count sent in this message equals the actual receive frame count, the terminal identified in bytes 8 and 9 of the message can make a range measurement by transmitting in the range time slot.

5.1.4.2. Passive ranging. The second primary method to adjust a terminal's transmit timing is passive ranging. Passive ranging measures do not require the terminal to transmit. The terminal depends on outside source information to make its passive ranging calculations.

5.2 Protocols

5.2.1 Baseband-data formatting requirements. Baseband data from any of the I/O ports shall be selectable through orderwire commands. Baseband data shall be presented to the FEC encoder in the order it is received from the baseband equipment. Baseband data bit number one shall be the first data bit sent into the encoder.

5.2.1.1 Orderwire structure. Each of the orderwires (CCOW and RCCOW) shall be composed of thirteen 8-bit bytes. The ordering of these bits and the operation of the cyclic redundancy check (CRC) shall be as described in 5.2.1.2 through 5.2.1.3. Most of the orderwire messages contain unused bits. Except for calculating CRC, terminals shall ignore these bits.

5.2.1.2 Orderwire data formatting. The thirteen 8-bit bytes of the orderwire shall be presented to the encoder in the following order: LSB of byte 1 through most significant bit (MSB) of byte 1, LSB of byte 2 through MSB of byte 2, $\cdots$, LSB of byte 13 through MSB of byte 13. Eight flush bits (all zeroes) append byte 13 of each orderwire.

5.2.1.3 Orderwire cyclic redundancy check. In addition to convolutional encoding and interleaving, orderwires shall undergo 2-byte CRCs on their 13 bytes. The parity bytes shall be sent within the structure of each orderwire. The parity of a received orderwire command shall be recalculated and compared to the received parity. If the parities do not match, the orderwire shall be discarded; otherwise, it shall be processed. To encode the message polynomial $G(x)$ using a generator polynomial $P(x)$ of order n, $G(x)$ shall first be multiplied by x^n. The result shall be divided by $P(x)$ to form both the quotient $Q(x)$ and the

remainder $R(x)$. The code polynomial $F(x)$ is the product of the generator polynomial and the quotient

$$x^n G(x) = Q(x) P(x) + R(x)$$

where

$$P(x) = X^{16} + X^{15} + X^2 + 1$$

Since, in modulo 2 arithmetic, addition and subtraction are the same,

$$F(x) = Q(x)P(x) = x^n G(x) + R(x)$$

where

$R(x)$ = parity bits

This CRC method shall be the IBM Binary Synchronous Communications (BSC) CRC-16 Protocol (GA27-3004, see 2.2). The CRC shall be calculated using thirteen 8-bit bytes. The locations that the CRC will occupy in CCOW and RCCOW messages shall be set to zeros during the CRC calculation. Then the zeros shall be replaced by the calculated CRC before the message is transmitted.

5.2.2 Detailed orderwire commands. Field definitions of the CCOW and RCCOW bursts for both AC and DC operating modes shall be as indicated in Appendixes A and B, respectively.

5.2.2.1 CCOW in the AC mode. Nineteen different CCOW formats can be issued by a controller in the AC mode. The terminal shall comply with the CCOW command no later than the next frame after receiving the CCOW. There are six common fields in CCOW formats: (1) the Call Acknowledgment (CALL ACK) field, (2) the RCCOW Assignment field, (3) the User Number field, (4) the Flag field, (5) the Parity field, and (6) the Command field. (The master frame is an exception. It does not include a Command field.) Paragraphs 5.2.2.1.1 through 5.2.2.1.7.18 define the permissible codes used in CCOW fields in the AC mode.

5.2.2.1.1 CALL ACK field (Bits 0-2, byte 1). The CCOW's CALL ACK field is used to acknowledge RCCOW messages that have been transmitted by terminal units. The CALL ACK code appears exactly

three frames after the RCCOW message is transmitted. All terminal units shall record in what frame they transmitted an RCCOW and, exactly three frames later, shall decode the CALL ACK field to find out what type of CALL ACK they have received. If the terminal does not receive a CALL ACK, it shall proceed in accordance with paragraph 5.2.2.3.3. The CALL ACK field is defined as follows:

FIELD DEFINITION	CODE
No Acknowledge	000
Spare	001
Busy	010
Call in Queue	011
Out-of-Service	100
Call Acknowledge	101
Spare	110
Spare	**111**

5.2.2.1.2 RCCOW Assignment field (Bits 3-7, byte 1). The CCOW's RCCOW Assignment field controls access to subsequent RCCOWs. The 21 codes are defined as follows:

FIELD DEFINITION	CODE
Not Allowed	00000
RCCOW Precedence Flash Override	00001
RCCOW Precedence Flash	00010
RCCOW Precedence Immediate	00011
RCCOW Precedence Priority	00100
RCCOW Precedence Routine	00101
Conference List Report	00110
Dedicated RCCOW	00111
Spare	01000
Status Report A: Group 1	01001
Status Report B: Group 1	01010

FIELD DEFINITION	CODE
Report Link Test Results	01011
Guard List Report: Group 1	01100
Guard List Report: Group 2	01101
Guard List Report: Group 3	01110
Guard List Report: Group 4	01111
Inhibit RCCOW	10000
Spare	10100-11111
Guard List Report: Group 5	10011
Status Report A: Group 2	10001
Status Report B: Group 2	10010

Terminal interpretation of these codes shall be as follows:

a. RCCOW Precedence (Codes 00001, 00010, 00011, 00100, 00101). Specifies the minimum precedence an RCCOW must have to be transmitted in the next frame. The terminal unit shall not transmit an RCCOW that is below the RCCOW precedence.

b. Conference List Report (Code 00110). Specifies that the terminal unit whose user number matches the number given by the CCOW shall transmit a conference list RCCOW in the next frame.

c. Dedicated RCCOW (Code 00111). Specifies that one particular terminal unit identified in the CCOW by its user number has been dedicated to the RCCOW slot in the next frame.

d. Spare (Code 01000).

e. Status Report A: Group 1 (Code 01001). Specifies that the terminal unit identified by its user number shall transmit a Status Report A: Group 1 RCCOW in the next frame. This report is used by terminals to inform the channel controller of the status of its first through fourth ports, or as equipped, if less than four.

f. Status Report A: Group 2 (Code 10001). Specifies that the terminal unit identified by its user number shall

transmit a Status Report A: Group 2 RCCOW in the next frame. This report is used by terminals to inform the channel controller of the status of its fifth through eighth ports. This report is only used by terminals with more than four ports.

g. Status Report B: Group 1 (Code 01010). Specifies that the terminal unit identified by its user number shall transmit a Status Report B: Group 1 RCCOW in the next frame. This report is used by terminals to inform the channel controller of the status of its first through fourth ports, or as equipped, if less than four.

h. Status Report B: Group 2 (Code 10010). Specifies that the terminal unit identified by its user number shall transmit a Status Report B: Group 2 RCCOW in the next frame. This report is used by terminals to inform the channel controller of the status of its fifth through eighth ports. This report is only used by terminals with more than four ports.

i. Report Link Test Results (Code 01011). Specifies that the terminal unit identified by its user number shall transmit a Link Test Results RCCOW in the next frame.

j. Guard List Report: Group 1 (Code 01100). Specifies that the terminal unit identified by its user number shall report the first group of numbers in its guard lists in the next frame.

k. Guard List Report: Group 2 (Code 01101). Specifies that the terminal unit identified by its user number shall report the second group of numbers in its guard lists in the next frame.

l. Guard List Report: Group 3 (Code 01110). Specifies that the terminal unit identified by its user number shall report the third group of numbers in its guard lists in the next frame.

m. Guard List Report: Group 4 (Code 01111). Specifies that the terminal unit identified by its user number shall report the fourth group of numbers in its guard lists in the next frame.

n. Guard List Report: Group 5 (Code 10011). Specifies that the terminal unit with five to eight ports guarding at least 14 numbers and identified by its user number shall report guard numbers not reported in Guard List Report: Groups 1-4 in the next frame.

o. Inhibit RCCOW (Code 10000). Specifies that terminal units shall inhibit the transmission of any RCCOW in the next frame.

p. Spare (Codes 10100 through 11111).

5.2.2.1.3 User Number field. (Bits 0-5 and 7, byte 2; bits 0-7, byte 3; and bit 5, byte 7). This field defines the user ID number to which the frame's RCCOW is assigned. However, the user number field is not used with six RCCOW assignment field definitions. The six are the Inhibit RCCOW assignment (paragraph 5.2.2.1.2.o) and the five RCCOW precedence assignments (paragraph 5.2.2.1.2.a). These six RCCOW assignments apply to all terminals and are not directed to a user identified in the User Number field. Bit 7, byte 2 is the MSB (bit 16) for all CCOW messages, except for the CCOW Master Frame. [The Master Frame has only a 15-bit User Number field. All terminals with 16-bit addresses shall assume the MSB (bit 16) is a zero when receiving the Master Frame CCOW. Terminals with ID numbers containing a one as the MSB (bit 16) cannot get an RCCOW assignment in Master Frame CCOWs. Other assignment restrictions may apply to prevent address errors between terminals.] Bit 5, byte 7 is the second MSB (bit 15) in all CCOWs with two exceptions: (a) the CCOW Master Frame, with bit 15 being bit 6, byte 8; and (b) the CCOW for Computer Data Transfer, with bit 15 being bit 7, byte 4.

5.2.2.1.4 Flag field (Bit 6, byte 2). This flag is set (logic 1) to indicate when the frame is a master frame. The flag is reset (logic 0) in all other frames.

5.2.2.1.5 Parity field (Bits 0-7, byte 5 and bits 0-7, byte 6). This field defines the 2-byte CRC derived in accordance with 5.2.1.3.

5.2.2.1.6 Command field (Bits 0-4, byte 7). The CCOW's Command field identifies which of the 19 different CCOW commands is used in this frame. The master frame is an exception. It does not include a command field and is identified by the Flag field. The commands and associated codes are listed below:

CCOW MESSAGE	COMMAND CODE
Master Frame	none
Reserved	00000
Slot Disconnect	00001
Slot Connect	00010
Link Test and Range Frame-Number Assignment	00011

CCOW MESSAGE	COMMAND CODE
Channel Control Handover Request	00100
Special Format Change Order	00101
Call Canceled	00110
Channel Reassignment	00111
Enter Guard List	01000
Delete from Guard List	01001
Call Waiting	01010
Call in Queue	01011
Computer Data Transfer	01100
Information Request	01101
Zeroize	01110
Time-Slot Preparation	01111
Requested Party Out-of-Service	10000
Transmit Control	10001
Timed Channel Assignment	10101
Reserved	10110-11111

5.2.2.1.7 Unique CCOW message fields. Paragraphs 5.2.2.1.7.1 through 5.2.2.1.7.18 identify all other bits unique to each CCOW message format that are not defined in 5.2.2.1.1 through 5.2.2.1.6.

5.2.2.1.7.1 Master Frame (Figure 10-1) (Command Field Code NONE). This CCOW is transmitted every eighth frame. The Master Frame CCOW contains data that updates orderwire status and key generator (KG) status. The status indicators are as follows:

a. Master Frame Flag (Bit 6, byte 2). This flag is set to indicate that this is a master frame. In all other frames, this flag is reset.

b. Precedence Cutoff (Bit 7, byte 2 and bits 0-1, byte 7). This field indicates the minimum precedence necessary to transmit an RCCOW with precedence. RCCOW precedence codes are operationally assigned.

c. Frame Format (Bits 0-7, byte 4 and bits 2-5, byte 7).

This noncontiguous 12-bit field identifies a 3-digit hexadecimal (HEX) number that indicates which frame format is to be used on the channel until the next master frame. If the frame format has not changed from the previous master frame, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and disconnect any that existed in the changed segment(s) of the frame format.

d. KG Memory (Bits 6-7, byte 7 and bit 7, byte 8). This data field contains the number of the KG memory location in use.

e. KG Net Number (Bits 0-4, byte 8). This data field contains the KG net number in use.

f. KG Day (Bits 5-7, byte 9). This data field contains the KG day of the week.

g. Frame Count (Bits 0-4, byte 9; bits 0-7, byte 10; and bits 0-7, byte 11). This data field contains the frame count of the current frame.

h. DC Flag (Bit 5, byte 8). This flag indicates whether the system is operating in the AC or DC mode. If the flag is reset, the terminal shall operate in the AC mode. If the flag is set, the terminal shall operate in the DC mode.

i. KG ID (Bits 0-7, byte 12 and bits 0-7, byte 13). See the COMSEC appendix.

5.2.2.1.7.2 Slot Disconnect (Figure 10-2) (Command Field Code 00001). A terminal shall disconnect its I/O port(s) when it receives a slot disconnect order. The disconnect order may apply to the slot number in use by the terminal, to the user ID number of the terminal, or to a specified time for the terminal to disconnect. The slot disconnect shall be as follows:

a. Slot Number (Bits 0-4, byte 4). If the slot number is connected to the terminal I/O port, and if the slot connect frequency is the same as the frequency on which the terminal is receiving the CCOW, the terminal shall perform a slot disconnect.

b. User #1 ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the specific I/O port number or a guard number contained in the guard lists. The terminal shall compare this ID number with the port numbers and shall also search the guard list of each

port for the number. If no match is found, no terminal action shall be taken. If a match is found, the terminal I/O port shall be disconnected.

c. User #2 ID (Bits 6-7, byte 7; bits 0-5, byte 10; and bits 0-7, byte 11). This data field shall cause the same terminal action and results for the User #2 ID number as described for the User #1 ID number.

d. User #1 All Ports Flag (Bit 7, byte 10). All ports of the terminal identified by User #1 shall be disconnected.

e. User #2 All Ports Flag (Bit 6, byte 10). All ports of the terminal identified by User #2 shall be disconnected.

f. Time #1 (Bits 0-7, byte 12). This data field is composed of a 2-bit chronological exponent and a 6-bit time field. The 6-bit time field will be binary numbers 1 through 59. The presence of nonzero data in this field indicates that the terminal I/O port identified by the User #1 ID number shall perform a timed slot disconnect; in other words, the port shall disconnect when the identified amount of time has elapsed. The chronological exponent represents the unit of time as follows:

BIT		UNIT OF TIME
7	6	
0	0	Seconds
0	1	Minutes
1	0	Hours
1	1	Days

g. Time #2 (Bits 0-7, byte 13). This data field shall cause the same terminal action for the User #2 ID number, as described in subparagraph f for Time #1.

5.2.2.1.7.3 Slot Connect (Figure 10-3) (Command Field Code 00010). A terminal shall connect its I/O port(s) when it receives a slot connect order. Slot numbers range from 1 to 23, but only up to 22 slots may be used, depending on the frame format. The slot connect shall be as follows:

a. This field contains a 3-bit code that specifies terminal port bit rate. The port, specified in c or d below, shall be configured to operate at the bit rate corresponding to the code as shown in the following:

BIT RATE (bps)	CODE
75	000
300	001
600	010
1,200	011
2,400	100
4,800	101
16,000	110
Spare	111

b. Slot number (Bits 0-4, byte 4). These bits indicate the time slot to which the terminal I/O port shall be connected. Slot numbers range from 1 to 23, depending on the frame format in use.

c. User #1 ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains a specific I/O port number or guard number. The terminal shall compare this ID number with its port numbers and shall also search the guard list of each port for the number. If a match is found, the I/O port that has been identified shall be connected.

d. User #2 ID (Bits 6-7, byte 7; bits 0-5, byte 10; and bits 0-7, byte 11). This data field contains a specific I/O port number or guard number. The terminal shall compare this ID number with its port numbers and shall also search the guard list of each port for the number. If a match is found, the I/O port that has been identified shall be connected.

e. User #1 Receive-Only Flag (Bit 7, byte 10). If this flag is set, the User #1 ID number port shall be connected with a receive-only limitation.

f. User #2 Receive-Only Flag (Bit 6, byte 10). If this flag is set, the User #2 ID number port shall be connected with a receive-only limitation.

g. Time (Bits 0-7, byte 12). This data field is composed of a 2-bit chronological exponent and a 6-bit time field. The chronological exponent represents the unit of time as described by the table in 5.2.2.1.7.2.f. The presence of zero data in this field indicates that the I/O port identified by either user number shall have an unlimited slot assignment time. If the time field is nonzero, the I/O ports identified by the user numbers shall connect for the defined time period. The ports shall disconnect when this time has elapsed.

h. Preset Channel Code (Bits 0-5, byte 13). This data field represents the preset channel code for the slot connect. When this data is received and the IDs match, the I/O port shall be checked to determine if it is connected to a slot. If the port is already connected, but not to the same preset channel code as in the CCOW, then the connect shall be ignored. If the connect order is accepted, the connect preset channel code shall be stored in nonvolatile memory. Appendix C Table 30-IB contains frequency pair information which shall be used for the terminal's preset channel code data base.

i. Time Offset (Bits 6-7, byte 13). This field defines the time offset (delay) between the start of frame at the rf channel where the terminal receives the CCOW, and the start of frame at the rf channel where the slot connect is assigned. When the value on this field is binary 00 the offset is zero (the two TDMA frames are time synchronized). A binary value of 01 defines a 6710-time-chip offset. Binary values 10 and 11 define 13312-time-chip and 19914-time-chip offsets, respectively. Chips are counted from time chip 1, as shown in Figure 7.

5.2.2.1.7.4 Link Test and Range Frame-Number Assignment (Figure 10-4) (Command Field Code 00011). This CCOW command contains one of two mutually exclusive commands: a link test assignment and a range frame-number assignment (reserved for possible future use). The CCOW contains only one of these commands at a time. The definitions of the data and results follow:

a. User Number (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the terminal's base address. Each terminal unit shall compare this ID number with its base address. If a match is found, the CCOW command shall be executed.

b. T Flag (Bit 0, byte 11). This flag, when set,

indicates that an ongoing terminal link test shall be terminated.

c. 9.6-kbps Flag A (Bit 0, byte 4). This flag, when set, indicates that the terminal link test shall be performed at 9.6 kbps.

d. 19.2-kbps Flag B (Bit 1, byte 4). This flag, when set, indicates that the terminal link test shall be performed at 19.2 kbps.

e. 32-kbps Flag C (Bit 2, byte 4). This flag, when set, indicates that the terminal link test shall be performed at 32 kbps.

f. Dedicated Range Frame-Number (Bit 0-3, byte 12 and bits 0-7, byte 13). This data field shall be 12 bits wide and shall represent the dedicated receive frame count for the terminal to range in. This field shall have a value of zero when the command is a link test assignment. When this data is received, the terminal shall store it as new status information. Every frame time this data shall be compared to the first 12 bits of the current frame count. If there is a match, the terminal shall perform a range measurement in the identified frame, unless the terminal configuration prohibits ranging.

5.2.2.1.7.5 Channel Control Handover Request (Figure 10-5) (Command Field Code 00100). This CCOW command contains data to coordinate a channel control handover. The controller uses this command to communicate with another controller. The terminal shall do no processing of this message unless it has the functional capability to become a channel controller. The data fields are as follows:

a. Order Flag (Bit 7, byte 7). The controller sets this flag to indicate that another controller will take control of a channel.

b. Request Denied (Bit 6, byte 7). The controller sets the bit in this field to deny a prospective controller's request to take channel control.

c. Current Time (Bits 0-7, byte 9 and bits 0-7, byte 10). This data field indicates to another controller the current time of day. This 2-byte field is formatted in hours and minutes as shown in Figure 10-5. The format of each byte is described in 5.2.2.1.7.2.f.

d. Handover Time (Bits 0-7, byte 11 and bits 0-7, byte 12). This data field indicates the time at which the handover is to occur. This 2-byte field is formatted in hours and minutes as shown in Figure 10-5. The format of each byte is described in 5.2.2.1.7.2.f.

e. Channel frequency (Bits 0-7, byte 13). This data field indicates the channel for which control is to be transferred. Appendix C, Table 30-IA contains the channel frequency numbers in decimal and hex. The most significant hex character is assigned to bits 4-7 and the least significant hex character is assigned to bits 0-3.

5.2.2.1.7.6 Special Format Change Order (Figure 10-6) (Command Field Code 00101). This CCOW command directs up to two terminals or all terminals on a channel to change its (their) frame format. The change of the frame format may cause a terminal to perform slot disconnects (or connects) depending on the old and new frame formats. Definitions of the data fields follow:

a. User #1 ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field indicates the terminal's base address. A terminal shall compare this number with its base address. If no match is found, no action is required. If a match is found, the terminal shall change its frame format to that which is given in the Format #1 field in subparagraph d, below.

b. User #2 ID (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field indicates the terminal's base address. A terminal shall compare this number with its base address. If no match is found, no action is required. If a match is found, the terminal shall change its frame format to that which is given in the Format #2 field in subparagraph e, below.

c. All-User Flag (Bit 7, byte 7). When this flag is set, all terminals on the rf channel shall change their frame formats. The new format shall be Format #1.

d. Format #1 (Bits 4-7, byte 4 and bits 0-7, byte 12). This data field contains the new frame format number for the User #1 ID number or for all user terminals on the rf channel if the All-User Flag is set. (See 5.1.1.a and 5.2.2.1.7.1.c.)

e. Format #2 (Bits 0-3, byte 4 and bits 0-7, byte 13). This data field contains the new frame format number for the User #2 ID number. (See 5.1.1.a and

5.2.2.1.7.1.c.)

5.2.2.1.7.7 Call Canceled (Figure 10-7) (Command Field Code 00110). This CCOW command notifies up to three terminal ports that their call requests have been canceled by the controller. Definitions of the data fields follow:

a. User #1 ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains a port number. A terminal shall compare this ID number with its port numbers. If no match is found, no action is required. If a match is found, the call request for the port shall be canceled.

b. User #2 ID (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains a port number. A terminal shall compare this ID number with its port numbers. If no match is found, no action is required. If a match is found, the call request for the port shall be canceled.

c. User #3 ID (Bits 0-7, byte 12 and bits 0-7, byte 13). This data field contains a port number. A terminal shall compare this ID number with its port numbers. If no match is found, no action is required. If a match is found, the call request for the port shall be canceled.

5.2.2.1.7.8 Channel Assignment. This waveform includes provisions for subscriber terminals to be switched automatically from one satellite channel to another. This is performed upon terminal request or as determined by the controller during satellite resource allocation. Channel Assignment shall be performed in accordance with 5.2.2.1.7.8.1 and 5.2.2.1.7.8.2.

5.2.2.1.7.8.1 Channel Reassignment (TDMA) (Figure 10-8A) (Command Field Code 00111). This CCOW command causes up to three specific terminals or all terminals on a channel to change their frequency codes. The effect of changing a terminal's frequency code is that the terminal shall transmit and receive orderwires on another rf channel. If either the terminal ID matches or all terminals are directed to change their channel, the new frequency code shall replace the existing frequency code. The new channel operates in the DAMA mode and the terminal can assume that the new channel operates via the same satellite. The terminal shall determine, based on the frequency field (subparagraph a) and Appendix C, if the assigned channel is 5- or 25-kHz. If the channel is 5-kHz, the DAMA waveform shall be in accordance with MIL-STD-188-182. If the assigned channel is 25-kHz, the DAMA waveform shall be in accordance with this document (MIL-STD-188-

183). If the terminal cannot achieve downlink and uplink acquisition within 90 seconds, the terminal shall return to the previous channel of operation. If the terminal is switching from one 25-kHz DAMA channel to another, then the terminal shall retain all RCCOWs that are held in queue prior to the change. If the terminal is switching from a 25-kHz DAMA channel to a 5-kHz DAMA channel, then the terminal shall clear (i.e., delete) all RCCOWs that are held in queue, and shall not send a ROW:Login message on the new 5-kHz channel. After a terminal is assigned to a new TDMA channel (5- or 25-kHz), it shall not return to the previous channel or change to any other channel unless directed by the channel controller. CCOW content is as follows:

a. Channel Frequency (Bits 0-7, byte 4). This data field contains the code of the new set of rf uplink and downlink frequencies that the terminal is assigned to use. The terminal shall use this code, based on Appendix C, Table 30-IA, to determine the satellite channel on which to operate.

b. All-Change Flag (Bit 7, byte 7). This flag, when set, indicates that all terminals on the channel shall change their frequency codes.

c. User #1 ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the ID of one specific terminal. If it is the same as the terminal's base address, the terminal shall change its frequency code.

d. User #2 ID (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains the ID of one specific terminal. If it is the same as the terminal's base address, the terminal shall change its frequency code.

e. User #3 ID (Bits 0-7, byte 12 and bits 0-7, byte 13). This data field contains the ID of one specific terminal. If it is the same as the terminal's base address, the terminal shall change its frequency code.

5.2.2.1.7.8.2 Timed Channel Assignment (dedicated). (Figure 10-8B) (Command Field Code 10101). This CCOW command causes up to two specific terminals or preassigned networks to temporarily change to a dedicated channel where satellite resources have been allocated for their communications. Terminals shall comply with the configuration of the assigned channel. They shall return to the channel of origin (the channel where they received the assignment) under either of the following conditions: after communications are completed; or after the timer expires. If the terminal returns to the channel of origin for a reason other than expiration of the timer, it shall respond with an RCCOW Call

Complete message after regaining transmit timing on the channel of origin. The new channel operates in the dedicated mode (per MIL-STD-188-181). The data fields of this CCOW are as follows:

a. Channel Frequency (Bits 0-7, byte 4). This data field contains the code of the new set of rf uplink and downlink frequencies that the terminal is assigned to use. The terminal shall use this code, based on Appendix C, Table 30-IA, to determine the satellite channel on which to operate.

b. All-Change Flag (Bit 7, byte 7). This flag, when set, indicates that all terminals on the channel shall change their frequency codes.

c. User #1 ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the ID of one specific terminal. If it is the same as the terminal's base address, the terminal shall change its frequency code.

d. User #2 ID (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains the ID of one specific terminal. If it is the same as the terminal's base address, the terminal shall change its frequency code.

e. Time (Bits 0-7, byte 12). This data field is composed of a 2-bit chronological exponent and a 6-bit time field. The 6-bit time field shall be binary numbers 1 through 59. The presence of nonzero data in this field indicates that the terminals identified by User ID numbers shall perform a timed slot or channel disconnect; in other words, the terminals shall return to the channel of origin when the identified amount of time has elapsed. The chronological exponent represents the unit of time as follows:

BIT		UNIT OF TIME
7	6	
0	0	seconds
0	1	minutes
1	0	hours
1	1	days

5.2.2.1.7.9 Enter Guard List (Figure 10-9) (Command Field Code 01000). This CCOW command causes the entry of up to two guard numbers into the guard list of the addressed port. Data fields in the message are as follows:

a. User ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains a port number. The terminal shall compare this ID number with its port numbers. If a match is found, the terminal shall check the total number of guard numbers for all ports. If there is less than the maximum that can be guarded by a terminal, the guard numbers defined in b and c (below) shall be entered into the specific port guard list. Guard lists shall be entered in the order received, up to the maximum number that can be guarded.

b. Guard #1 (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains a guard number. As described in a (above), it shall be entered into the port guard list.

c. Guard #2 (Bits 0-7, byte 12 and bits 0-7, byte 13). This data field contains a guard number. As described in a (above), it shall be entered into the port guard list.

5.2.2.1.7.10 Delete from Guard List (Figure 10-10) (Command Field Code 01001). This CCOW command directs a specific terminal's port to delete up to two guard numbers from its guard list. Data fields in the message are as follows:

a. User ID (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains a port number. The terminal shall compare this ID number with its port numbers. If a match is found, the terminal shall search the guard list for the guard numbers defined in b and c (below). If they are found, they shall be deleted from the guard list.

b. Guard #1 (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains a guard number that the terminal shall delete from its guard list.

c. Guard #2 (Bits 0-7, byte 12 and bits 0-7, byte 13). This data field contains a second guard number that the terminal shall delete from its guard list.

5.2.2.1.7.11 Call Waiting (Figure 10-11) (Command Field Code 01010). This CCOW command is used to notify a specific terminal's port that a call is waiting from another terminal's port. Data fields in the message are as follows:

a. Called Party (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the user number of a terminal's port or a guard number. The terminal shall compare this number with its port numbers and search the guard list of each port for the number. For the first match found, the command shall be executed.

b. Calling Party (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains the user number of the terminal port that made the call request to the Called Party ID.

c. Precedence (Bits 0-2, byte 12). This data field contains the precedence of the call request for the called party as shown below,

FIELD DEFINITION	CODE
Not Allowed	000
Emergency Action	001
Flash Override	010
Flash	011
Immediate	100
Priority	101
Routine	110
Unassigned	111

5.2.2.1.7.12 Call in Queue (Figure 10-12) (Command Field Code 01011). This CCOW command notifies up to two terminal ports that their call requests have been placed in a queue. Data fields in the message are as follows:

a. Calling Party #1 (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the number of the calling terminal port. The terminal shall compare this number with its port numbers. If a match is found, the terminal shall respond in accordance to the direction specified in the terminal system specification.

b. Calling Party #2 (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains the number of the calling terminal port. The terminal shall compare this number with its port numbers. If a match is found, the terminal shall respond in accordance to the direction specified in the terminal system specification.

c. Time #1 (Bits 0-7, byte 12). This data field contains a time value, previously defined in paragraph 5.2.2.1.7.2.f, that represents the time until the call from Calling Party #1 will be serviced.

d. Time #2. (Bits 0-7, byte 13). This data field contains a time value, previously defined in paragraph 5.2.2.1.7.2.f, that represents the time until the call from Calling Party #2 will be serviced.

5.2.2.1.7.13 Computer Data Transfer (Figure 10-13) (Command Field Code 01100). This CCOW command transfers four bytes of data to a specified terminal's remote port control interface (if one is present). Data fields in the message are as follows:

a. Called Party (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the user number of the terminal's port. The terminal shall compare this number with its port numbers. If a match is found, the terminal shall output the data with precedence, as specified in subparagraphs b and c, below.

b. Precedence (Bits 5-7, byte 7). This data field contains the precedence of the transfer data. This precedence is a portion of the message input from the remote port control interface. See table in 5.2.2.1.7.11.c.

c. Data (Bits 0-7, byte 10; bits 0-7, byte 11; bits 0-7, byte 12; and bits 0-7, byte 13). This data field contains the data to be transferred.

5.2.2.1.7.14 Information Request (Figure 10-14) (Command Field Code 01101). This CCOW command has two purposes, as defined in 5.2.2.1.7.14.1 and 5.2.2.1.7.14.2. Data fields in the message are as follows:

a. Called Party (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains one specific user ID number. The terminal shall compare this number with the user ID number assigned to each of its port numbers for a match.

b. Code (Bits 0-7, byte 10). This data field contains the information request code. It is in binary-coded decimal (BCD) format. Valid codes are 1 to 99 and are operationally defined. Code 4 is reserved for the Constant Key Alarm Information Request.

5.2.2.1.7.14.1 Operational Code Information Request. This CCOW command conveys a controller operator information-request code to the terminal. The terminal (operator) may respond to the information request by commanding the terminal to send an information report. After an information request has been received by a terminal, it shall send an information report before sending any other RCCOW. No other RCCOW messages shall be sent before the information report.

5.2.2.1.7.14.2 Constant Key Alarm Information Request. This information request message shall be used by the terminal to automatically disconnect a port that has been illegally transmitting on a slot for greater than 17 minutes. This message is commanded by the channel controller operator in response to the Constant Key Alarm Information Report message described in paragraph 5.2.2.2.4.6.2. The called party in this message is the user ID number of the terminal port that generated the Constant Key Alarm Information Report, and the valid code for this message is 4. If there is a match between the terminal's port number and the user ID number in the Called Party field of the information request, and the code is 4, the terminal shall automatically disconnect its port from the slot.

5.2.2.1.7.15 Zeroize (Figure 10-15) (Command Field Code 01110). When a terminal receives this CCOW command, it shall zeroize the key storage memories of the KG and disconnect all slot connects. This CCOW command zeroizes the key storage memories of the terminal's orderwire KG and causes all slot connects to be disconnected. Data fields in the message are as follows:

a. Called Party #1 (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the base user ID of the target terminal. The terminal shall compare this

number with Called Party #2 and with its base user ID. If all three match, the command shall be executed by

terminal control signals that cause the KG to erase stored keys.

b. Called Party #2 (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field also contains the base user ID of the target terminal. If it is not an exact copy of the Called Party #1 data field, the command shall not be executed.

5.2.2.1.7.16 Time-Slot Preparation (Figure 10-16) (Command Field Code 01111). All terminals receiving this command shall change the manner in which they prepare their orderwire KGs for CCOW and RCCOW. Data fields in the message are as follows:

a. Frame Count (Bits 0-4, byte 10; bits 0-7, byte 11; bits 0-7, byte 12). This data field contains the frame count when the action is to be initiated. The terminal action shall be either a time slot zero (TS0) preparation, or selection of new variables to prepare the KG.

b. TS0 Flag (Bit 7 byte 7). If this flag is set, all terminals shall perform a TS0 at the frame count given in this CCOW. The result shall be that new variables are used to prepare the KG and that the frame count is reset to 24.

c. Change KG Day Flag (Bit 4, byte 13). If this flag is set, all terminals shall change the KG day variable used to prepare the KG. The change shall occur at the frame count given in this CCOW, and the new KG day shall be the one given in this CCOW.

d. Change Memory Flag (Bit 0, byte 13). If this flag is set, all terminals shall change the KG memory in use. The change shall occur at the frame count given in this CCOW, and the new KG memory shall be that which is given in this CCOW.

e. KG Day (Bits 5-7, byte 13). This data field contains the new KG day variable to be used to prepare the KG.

f. KG Memory Address (Bits 1-3, byte 13). This data field contains the binary address of the KG memory.

5.2.2.1.7.17 Requested Party Out-of-Service (Figure 10-17) (Command Field Code 10000). This CCOW command notifies up to two terminal ports, which have made requests, that their requested party is out of service. Data fields in the message are as follows:

a. Calling Party #1 (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the address of a specific terminal port. The terminal shall compare this number with its port numbers. If a match is found, the command shall be executed for the specific port.

b. Calling Party #2 (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field contains the address of a specific terminal port. The terminal shall compare this number with its port numbers. If a match is found, the command shall be executed for the specific port.

c. Time #1 (Bits 0-7, byte 12). This data field contains the amount of time that Calling Party #1's requested party will be out of service. The data consists of a 2-bit chronological exponent and a 6-bit time field. If the time contains all zeros, then no estimate is available of how long the requested party will be out of service. The chronological exponent represents the unit of time as described by the table in 5.2.2.1.7.2.f.

d. Time #2. (Bits 0-7, byte 13). This data field contains the amount of time that Calling Party #2's requested party will be out of service. The data consists of a 2-bit chronological exponent and a 6-bit time field. If the time contains all zeros, then no estimate is available of how long the requested party will be out of service. The chronological exponent represents the unit of time as described by the table in 5.2.2.1.7.2.f.

5.2.2.1.7.18 Transmit Control (Figure 10-18) (Command Field Code 10001). This CCOW command causes all terminals on an rf channel either to inhibit or enable their transmissions on the rf channel. If the Transmit flag (Bit 7, byte 7) is reset, it indicates that all terminals shall inhibit their rf transmissions. The terminal shall disconnect all I/O ports connected to time slots. If this flag is set, it indicates that all terminals are enabled for rf transmission.

5.2.2.2 RCCOW in the AC mode. The terminal shall be able to send 14 different mandatory RCCOW messages in the AC mode. There are three optional RCCOW messages. If the terminal is required by its equipment performance specification to use RCCOW Data Transfer messages, it shall also receive RCCOW messages. There shall be three common fields in the RCCOW message formats: (1) the Station ID field, (2) the Message Code field, and (3) the

Parity field. Paragraphs 5.2.2.2.1 through 5.2.2.2.4.17 define the permissible codes used in the AC mode RCCOW fields. A terminal may be assigned to create an RCCOW through the RCCOW assignment portion of the CCOW. The terminal shall test the RCCOW assignment portion of the CCOW in every frame to determine if it is expected to respond with an RCCOW. The RCCOWs, which shall be created by an assignment, shall be as follows:

RCCOW	CCOW COMMANDS (RCCOW ASSIGNMENT FIELD CODE)
Status Report A: Group 1	01001
Status Report A: Group 2	10001
Status Report B: Group 1	01010
Status Report B: Group 2	10010
Report Link Test Results	01011
Guard List Report: Group 1	01100
Guard List Report: Group 2	01101
Guard List Report: Group 3	01110
Guard List Report: Group 4	01111
Guard List Report: Group 5	10011

5.2.2.2.1 Station ID field (Bits 0-7, byte 1 and bits 0-7, byte 2). This field shall identify the KG ID of the terminal that originates the RCCOW.

5.2.2.2.2 Message Code field (Bits 0-4, byte 3). The RCCOW Message Code field shall identify which of the 17 RCCOW messages is used in this frame. The messages and associated codes shall be as listed below:

MESSAGE NAME	CODE
Status Report B	00001
Data Transfer (Type B)*	00010
Link Test Request	00011
Call Complete	00100
Out-of-Service	00101
Information Report	00110

MESSAGE NAME	CODE
Two-Party Request (or Cancel Call)	00111
Conference Request (or Cancel Call) (Type B)*	01000
Conference Party List	01001

* optional message

MESSAGE NAME	CODE
Link Test Results	01010
Status Report A	01011
Acknowledge Channel Control Request	01100
Guard List Report (Type B)*	01101
Paging	01110
Data Transfer (Type A)	01111
Conference Request (or Cancel Call) (Type A)	10000
Guard List Report (Type A)	10001

* optional message

5.2.2.2.3 Parity field (Bits 0-7, byte 12 and bits 0-7, byte 13). This field shall define the 2-byte CRC for this RCCOW message, which was derived in accordance with 5.2.1.3.

5.2.2.2.4 Unique RCCOW message fields. Paragraphs 5.2.2.2.4.1 through 5.2.2.2.4.17 identify all other bits unique to each RCCOW message format that is not defined in 5.2.2.2.1 through 5.2.2.2.3.

5.2.2.2.4.1 Status Report B (Figure 20-1A for ports 1 through 4, and Figure 20-1B for ports 5 through 8) (Message Code 00001). Depending on whether the terminal is responding to a Status Report B: Group 1 or Status Report B: Group 2 RCCOW assignment code, the data in this RCCOW will be applicable to either the first through fourth ports or fifth through eighth ports of the terminal. Ports 5 through 8 are represented parenthetically in subparagraphs g through n (below). The definition of the data in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW

created by a terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Reporting Party (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the user number of the terminal port that initiated the RCCOW.

d. Configuration Code (Bits 0-7, byte 6). This field shall contain the configuration code of the terminal port that initiated the RCCOW. The configuration code shall define the port bit rate and the type of baseband equipment connected to the port. The terminal shall allow the operator to enter operationally assigned configuration codes. The data shall have a BCD format. Valid codes shall range from 1 to 99 and are operationally assigned.

e. Port Configuration Change Flag (Bit 3, byte 7). This flag, when set, shall indicate that the terminal port has changed the configuration code. This Status Report B RCCOW shall be generated whenever a terminal port configuration change is made.

f. Port Bit Rate (Bits 0-2, byte 7). This data field shall be a 3-bit code, indicating the bit rate of the I/O port that initiated the RCCOW. A list of codes versus bit rates shall be as follows:

BIT RATE (bps)	CODE
75	000
300	001
600	010
1,200	011
2,400	100
4,800	101
16,000	110
Spare	111

g. Port #1 (#5) Number in Guard List (Bits 4-7, byte 8). This field shall contain a binary count from 0 to 15, which shall be the count of guard numbers in port #1 (#5).

h. Port #2 (#6) Number in Guard List (Bits 0-3, byte 8). This field shall contain a binary count from 0 to 15, which shall be the count of guard numbers in port #2 (#6).

i. Port #3 (#7) Number in Guard List (Bits 4-7, byte 9). This field shall contain a binary count from 0 to 15,

which shall be the count of guard numbers in port #3 (#7).

j. Port #4 (#8) Number in Guard List (Bits 0-3, byte 9). This field shall contain a binary count from 0 to 15, which shall be the count of guard numbers in port #4 (#8).

k. Port #1 (#5) Guard List Change Flag (Bit 7, byte 10). This flag, when set, shall indicate that the terminal has changed the port #1 (#5) guard list. The change has occurred since the last time the terminal created a Status Report B RCCOW.

l. Port #2 (#6) Guard List Change Flag (Bit 6, byte 10). This flag, when set, shall indicate that the terminal has changed the port #2 (#6) guard list. The change has occurred since the last time the terminal created a Status Report B RCCOW.

m. Port #3 (#7) Guard List Change Flag (Bit 5, byte 10). This flag, when set, shall indicate that the terminal has changed the port #3 (#7) guard list. The change has occurred since the last time the terminal created a Status Report B RCCOW.

n. Port #4 (#8) Guard List Change Flag (Bit 4, byte 10). This flag, when set, shall indicate that the terminal has changed the port #4 (#8) guard list. The change has occurred since the last time the terminal created a Status Report B RCCOW.

o. Frame Format (Bits 0-3, byte 10 and bits 0-7, byte 11). This field shall contain the frame format in use by the terminal.

5.2.2.2.4.2 Data Transfer. The RCCOW time slot may be used to transfer data between any two terminals. The RCCOW time slot shall be received and processed by any terminal with a requirement for this data transfer capability. If the terminal is required to have this capability, it shall be capable of receiving and transmitting two types of data transfer messages.

5.2.2.2.4.2.1 Data Transfer (Type A). (Figure 20-2A) (Message Code 01111). This RCCOW is used to exchange data between 16-bit address terminals. The definition of the data in this RCCOW shall be as follows:

a. Precedence (Bit 5, byte 3). This field shall contain the precedence of the RCCOW to be transmitted. This

precedence is a portion of the message input from the remote port control interface. This bit, when set, shall indicate the message is a higher precedence than the precedence level of the RCCOW assignment field in the present frame's CCOW. When not set, the precedence levels are equal.

b. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by a terminal after its power has been turned on (AC mode only).

c. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted (AC mode only).

d. Requesting Party (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the user number of the terminal port that initiated the RCCOW.

e. Requested Party (Bits 0-7, byte 6 and bits 0-7, byte 7). This field shall contain the user number of the terminal port to which the RCCOW is directed.

f. Data Block (Bits 0-7, byte 8; bits 0-7, byte 9; bits 0-7, byte 10; and bits 0-7, byte 11). This field shall be composed of four bytes of data. It is the information that the requesting party transfers to the requested party.

5.2.2.2.4.2.2 Data Transfer (Type B) (optional). (Figure 20-2B) (Message Code 00010). This RCCOW is used to exchange data between old 14-bit address terminals, or between 16-bit and 14-bit address terminals. The definition of the data in this RCCOW shall be as follows:

a. Precedence (Bits 5-7, byte 3). This field shall contain the precedence of the RCCOW to be transmitted. This precedence is a portion of the message input from the remote port control interface. See table in 5.2.2.1.7.11.c.

b. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by a terminal after its power has been turned on (AC mode only).

c. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW

stored in queue to be transmitted (AC mode only).

d. Requesting Party (Bits 0-5, byte 4 and bits 0-7, byte 5). This field shall contain the user number of the terminal port that initiated the RCCOW. In the case of data transfer from a 16-bit address terminal to an old 14-bit address terminal, the two MSBs of the requesting party's 16-bit address are not transmitted.

e. Requested Party (Bits 0-5, byte 6 and bits 0-7, byte 7). This field shall contain the user number of the terminal port to which the RCCOW is directed. Operational constraints, such as restricted terminal address assignments, may be necessary to prevent addressing ambiguities when a 16-bit address terminal is the requested party of a 14-bit address terminal.

f. Data Block (Bits 0-7, byte 8; bits 0-7, byte 9; bits 0-7, byte 10; and bits 0-7, byte 11). This field shall be composed of four bytes of data. It is the information that the requesting party transfers to the requested party.

5.2.2.2.4.3 Link Test Request (Figure 20-3) (Message Code 00011). The definition of the data in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Requesting Party (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the terminal's base address (port #1).

d. 9.6-kbps Flag (Bit 0, byte 6). This flag, when set, shall indicate that the terminal requests a 9.6-kbps link test.

e. 19.2-kbps Flag (Bit 1, byte 6). This flag, when set, shall indicate that the terminal requests a 19.2-kbps link test.

f. 32-kbps Flag (Bit 2, byte 6). This flag, when set, shall indicate that the terminal requests a 32-kbps link test.

5.2.2.2.4.4 Call Complete (Figure 20-4) (Message Code 00100). The definition of the data in the RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Requesting Party (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the user number of the terminal port.

5.2.2.2.4.5 Out-of-Service (Figure 20-5) (Message Code 00101). The definition of the data in the RCCOW shall be as follows:

a. Precedence (Bits 5-7, byte 3). This field shall contain the precedence of the RCCOW to be transmitted. See table in 5.2.2.1.7.11.c.

b. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

c. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

d. Requesting Party (Bits 0-5, byte 4; bits 0-7, byte 5; and bits 6-7, byte 7). This field shall contain the user number of the port.

e. Time (Bits 0-7, byte 6). This field shall contain the estimated time out-of-service for the port. The data shall consist of a 2-bit chronological exponent and a 6-bit binary time field. The chronological exponent represents the unit of time as described by the table in 5.2.2.1.7.2.f.

f. Out-of-Service Code (Bits 0-7, byte 8). This field shall contain the reason code for going out-of-service. It shall have a BCD format. Valid codes shall range from 0 to 99 and are operationally assigned.

5.2.2.2.4.6 Information Report (Figure 20-6) (Message Code 00110). The terminal shall generate this RCCOW message in response to the Information Request CCOW from the channel controller. A terminal that, for operational reasons, is prohibited from responding to the Information Request CCOWs shall be able to report this limitation to the channel controller. The Configuration Code field of the Status Report B message (5.2.2.2.4.1) can be used to report this limitation to the controller in advance of the operation. The terminal Information Report response message shall be generated in accordance with

5.2.2.2.4.6.1, 5.2.2.2.4.6.2, Figure 20-6, and the data fields defined below:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on (AC mode only).

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted (AC mode only).

c. Responding Party (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the user number of the terminal port.

d. Response Code (Bits 0-5, byte 6 and bits 0-7, byte 7). This field shall contain the response code to the information request. Valid data shall range from 1 to 16383 (AC) or 1 to 255 (DC), and are operationally assigned. Response code 200 is reserved for the Constant Key Alarm Information Report.

5.2.2.2.4.6.1 Operational Code Information Report. When the terminal receives an Information Request command from the channel controller, it shall respond with an Information Report message before sending any other RCCOW message. The terminal (operator) shall respond to the information request by sending an operationally assigned code in the Response Code field of the Information Report message.

5.2.2.2.4.6.2 Constant Key Alarm Information Report. The Constant Key Alarm Information Report is used in conjunction with the Constant Key Alarm Information Request (see paragraph 5.2.2.1.7.14.2) to quickly regain use of a time slot by removing an illegal constantly keyed terminal from the slot. When a terminal port has been constantly keyed for 17 minutes, and has not been configured for legal constant-key operation, it shall automatically generate and send this information report to the channel controller. This message shall be sent before sending any other RCCOW message. When the port's constant transmit capability is enabled, the terminal shall not output receive data for this port, regardless of whether the terminal port is keyed or not keyed. An information report response code of 200 shall be sent by the terminal in this message. The Constant Key Alarm Information Report capability shall function when the terminal is operating in either the AC or DC mode. At the discretion of the channel controller operator, the terminal port can be commanded to automatically disconnect from the time slot, using the Constant Key Alarm Information Request.

5.2.2.2.4.7 Two-Party Request (or Cancel Call) (Figure 20-7) (Message Code 00111). The definition of the data in this RCCOW shall be as follows:

a. Precedence (Bits 5-7, byte 3). This field shall contain the precedence of the RCCOW. See table in 5.2.2.1.7.11.c.

b. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

c. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

d. Requesting Party (Bits 0-5, byte 4; bits 0-7, byte 5; and bits 6-7, byte 9). This field shall contain the user number of the terminal port.

e. Cancel Call Flag (Bit 6, byte 6). This flag, when set, shall indicate that the requesting party wants its two-party request canceled.

f. Requested Party (Bits 0-5, byte 6; bits 0-7, byte 7; and bits 4-5, byte 9). This field shall contain the user number of the terminal port that has been requested for communications.

g. Configuration Code (Bits 0-7, byte 8). This field shall contain the configuration code of the terminal port that initiated the RCCOW. The data shall have a BCD format. Valid codes shall range from 1 to 99 and are operationally assigned.

h. Contention Report (Bits 0-1, byte 11). This field shall contain a binary count of how many times the terminal port has transmitted two-party or conference request RCCOWs without receiving a CALL ACK. The counter shall be reset each time a CALL ACK is received for either of these two RCCOWs or when a Status Report A RCCOW is sent and a CALL ACK is received for the status report.

5.2.2.2.4.8 Conference Calls. Conference calls can be established two ways:

a. A conference call can be established by placing a call to a network of terminals. Networks can be

preestablished, and the address assigned to them may be assigned to a terminal's port. All terminals participating in the network include the network address in their guard list. A network call can be established by using the Two-Party Request RCCOW and placing the network address in the Requested Party field.

b. Conference calls of up to six (requesting party and up to five requested parties) terminals can be established by using the RCCOW messages defined in 5.2.2.2.4.8.1 and 5.2.2.2.4.8.2 for 16-bit terminals, and 5.2.2.2.4.8.3 for 14-bit terminals (optional).

5.2.2.2.4.8.1 Conference Request (or Cancel Call) (Type A). (Figure 20-8A) (Message Code 10000). This RCCOW message requests the establishment of conference calls. If the number of requested users is more than one, two RCCOWs shall be created. The second of these shall be the Conference Party List. The definition of the data in these RCCOWs shall be as follows:

a. Precedence (Bits 5-7, byte 3). This field shall contain the precedence of the RCCOW. See table in 5.2.2.1.7.11.c.

b. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

c. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

d. Requesting Party (Bits 0-5, byte 4; bits 0-7, byte 5; and bits 4-5, byte 8). This field shall contain the user number of the terminal port.

e. Cancel Call Flag (Bit 6, byte 6). This flag, when set, shall indicate that the requesting party wants its conference request canceled.

f. List Flag (Bit 7, byte 6). This flag, when set, shall indicate that the conference request is for more than two users; therefore, the controller shall request the conference party list RCCOW with an RCCOW assignment.

g. Requested Party #1 (Bits 0-5, byte 6; bits 0-7, byte 7, and bits 0-1, byte 8). This field shall contain the user number of the terminal port that has been

requested for communication.

h. Contention Report (Bits 6-7, byte 8). This field shall contain a binary count of how many times the terminal port has transmitted two-party or conference request RCCOWs without receiving a CALL ACK. The counter shall only be reset each time a CALL ACK is received for either of these two RCCOWs or when a Status Report A RCCOW is sent and a CALL ACK is received for the status report.

i. Time (Bits 0-7, byte 10). This field shall contain the estimated time for which the communications circuit is needed. The data shall consist of a 2-bit chronological exponent and a 6-bit binary time field. The chronological exponent represents the unit of time as described by the table in 5.2.2.1.7.2.f.

j. Configuration Code (Bits 0-7, byte 11). This field shall contain the configuration code of the port. The data shall have a BCD format. Valid codes shall range from 1 to 99 and are operationally assigned.

5.2.2.2.4.8.2 Conference Party List. (Figure 20-9A) (Message Code 01001). When a conference call is established and the number of requested users is greater than one, the channel controller will direct the terminal to generate a Conference Party List RCCOW. The terminal shall respond to the controller's direction by creating an RCCOW whose fields are as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Requested Party #2 (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall define the user number of the second requested party with which the conference is to be established.

d. Requested Party #3 (Bits 0-7, byte 6 and bits 0-7, byte 7). This field shall define the user number of the third requested party with which the conference is to be established. If the field is not used, all bits shall be set to zero (0).

e. Requested Party #4 (Bits 0-7, byte 8 and bits 0-7, byte 9). This field shall define the user number of the fourth requested party with which the conference is to be established. If the field is not used, all bits shall be set to zero (0).

f. Requested Party #5 (Bits 0-7, byte 10 and bits 0-7, byte 11). This field shall define the user number of the Requested Party #5 with which the conference is to be established. If the field is not used, all bits shall be set to zero (0).

5.2.2.2.4.8.3 Conference Request (Type B) (Cancel Call) (optional) and Conference Party List (Figures 20-8B and 20-9B) (Message Codes 01000 and 01001). If the number of requested users is three or greater, two RCCOWs shall be created. The second of these shall be the conference party list. The definition of the data in these RCCOWs shall be as follows:

a. Conference Request (Figure 20-8B)

1. Precedence (Bits 5-7, byte 3). This field shall contain the RCCOW's precedence. See table in 5.2.2.1.7.11.c.

2. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

3. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

4. Requesting Party (Bits 0-5, byte 4 and bits 0-7, byte 5). This field shall contain the user number of the terminal port.

5. Cancel Call Flag (Bit 6, byte 6). This flag, when set, shall indicate that the requesting party wants its conference request canceled.

6. List Flag (Bit 7, byte 6). This flag, when set, shall indicate that the conference request is for more than three users; therefore, the controller requests the conference party list RCCOW with an RCCOW assignment.

7. Requested Party #1 (Bits 0-5, byte 6 and bits 0-7, byte 7). This field shall contain the user number

of the terminal port that has been requested for communication.

8. Contention Report (Bits 6-7, byte 8). This field shall contain a binary count of how many times the terminal port has transmitted two-party or conference request RCCOWs without receiving a CALL ACK. The counter shall only be reset each time a CALL ACK is received for either of these two RCCOWs or when a Status Report A RCCOW is sent and a CALL ACK is received for the status report.

9. Requested Party #2 (Bits 0-5, byte 8 and bits 0-7, byte 9). This field shall contain the user number of the terminal port that has been requested for communication. If the field is unused, set all bits to zero (0).

10. Time (Bits 0-7, byte 10). This field shall contain the estimated time for which the communications circuit is needed. The data shall consist of a 2-bit chronological exponent and a 6-bit binary time field. The chronological exponent represents the unit of time as described by the table in 5.2.2.1.7.2.f.

11. Configuration Code (Bits 0-7, byte 11). This field shall contain the port's configuration code. The data shall have a BCD format. Valid codes shall range from 1 to 99 and are operationally assigned.

b. Conference Party List (Figure 20-9B)

1. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

2. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

3. Requested Party #1 to #4 (Bits 0-5, byte 4; bits 0-7, byte 5; bits 0-5, byte 6; bits 0-7, byte 7; bits 0-5, byte 8; bits 0-7, byte 9; bits 0-5, byte 10; and bits 0-7, byte 11). These fields shall contain user numbers for up to four additional terminal ports, for which the conference is requested. All bits in unused fields shall be set

to zero (0).

5.2.2.2.4.9 Link Test Results (Figure 20-10) (Message Code 01010). This RCCOW shall be generated by a terminal in response to a Report Link Test Results assignment in a CCOW's RCCOW Assignment field. The definition of the fields in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Reporting Party (Bits 0-5, byte 4; bits 0-7, byte 5; bit 7, byte 6; and bit 1, byte 10). This field shall contain the terminal's base user number.

d. Symbol Errors (Bits 0-6, byte 6 and bits 0-7, byte 7). This field shall contain the count of symbol errors received during the link test.

e. Symbol Erasures (Bits 0-7, byte 8 and bits 0-7, byte 9). This field shall contain the count of data symbols erased due to pulsed radio frequency interference (RFI) during the link test.

f. Missed Acquisitions (Bits 2-7, byte 10). This field shall contain the count of missed acquisitions during the link test.

g. Bits Tested (Bits 0-7, byte 11). This field shall contain the length of the link test in bits tested.

h. 9.6-kbps Flag (Bit 5, byte 3). This flag, when set, shall indicate that the link test was performed at 9.6 kbps.

i. 19.2-kbps Flag (Bit 6, byte 3). This flag, when set, shall indicate that the link test was performed at 19.2 kbps.

j. 32-kbps Flag (Bit 7, byte 3). This flag, when set, shall indicate that the link test was performed at 32 kbps.

k. Contention Flag (Bit 0, byte 10). This flag, when set, shall indicate that slot contention was detected during the link test.

5.2.2.2.4.10 Status Report A (Figure 20-11A for ports 1 through 4, and Figure 20-11B for ports 5 through 8) (Message Code 01011). This RCCOW shall contain status information that is not contained in Status Report B. Depending on whether the terminal is responding to a Status Report A: Group 1 or Status Report A: Group 2 RCCOW assignment code, the data in this RCCOW is applicable to either the first through fourth ports or fifth through eighth ports of the terminal. Ports 5 through 8 are represented parenthetically in subparagraphs d and e (below). The definition of the data in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Reporting Party (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the base user number of the terminal assigned to create the RCCOW.

d. Port #1 to #4 (or Port #5 to #8) Bit Rate (Bits 5-7, byte 6; bits 5-7, byte 7; bits 5-7, byte 8; and bits 5-7, byte 9). These fields shall contain a code that indicates the bit rate for each port. The bit rate code assignment shall be as follows:

BIT RATE (bps)	CODE
75	000
300	001
600	010
1,200	011
2,400	100
4,800	101
16,000	110
Not Allowed	111

e. Port #1 to #4 (or Port #5 to #8) Slot Assignment Number (Bits 0-4, byte 6; bits 0-4, byte 7; bits 0-4, byte 8; and bits 0-4, byte 9). These fields shall contain the slot number (binary) to which each port is assigned.

f. Number of Users in Guard List (Bits 0-4, byte 10). This field shall contain the total count of guarded numbers in all terminal port guard lists.

g. Contention Report (Bits 4-7, byte 11). This field shall contain a binary count of the sum of all times that all ports within a terminal have transmitted Call Request RCCOWs (two-party or conference) without

receiving CALL ACKs. All individual port contention counters within the terminal shall be cleared when a CALL ACK is received for this RCCOW.

h. Special Frame Format Flag (Bit 2, byte 11). This flag, when set, shall indicate that this terminal is operating with a frame format other than the one transmitted in a master frame CCOW.

i. Frequency Change Flag (Bit 1, byte 11). This flag, when set, shall indicate that this terminal is capable of frequency switching.

j. Full-Duplex Flag (Bit 0, byte 11). This flag, when set, shall indicate that this terminal is operating with a full-duplex receiver/transmitter.

5.2.2.2.4.11 Acknowledge Channel Control Request (Figure 20-12) (Message Code 01100). A terminal that has channel control capability shall transmit the Acknowledge Channel Control Request to acknowledge the controller's channel control handover request CCOW. The definition of the data in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Data Transfer Flag (Bit 2, byte 6). This flag, when set, shall indicate that acknowledging terminal requires additional system configuration information.

d. Ready Flag (Bit 1, byte 6). This flag, when set, shall indicate that acknowledging terminal is ready to perform the handover.

e. Request Control Flag (Bit 0, byte 6). This flag, when set, shall indicate that acknowledging terminal is requesting a channel control handover.

f. Channel Frequency (Bits 0-7, byte 7). This field shall contain the rf channel frequency number, as shown in Appendix C, for which control is to be handed over.

g. Current Time (Bits 0-7, byte 8 and bits 0-7, byte 9).

This 2-byte field shall contain the current time in hours and minutes, as shown in Figure 20-12. The format of each byte is described in 5.2.2.1.7.2.f.

h. Handover Time (Bits 0-7, byte 10 and bits 0-7, byte 11). This 2-byte field shall contain the current time in hours and minutes, as shown in Figure 20-12. The format of each byte is described in 5.2.2.1.7.2.f.

5.2.2.2.4.12 Guard List Report. The terminal shall generate this RCCOW message in response to a Guard List Report assignment directed to it by the channel controller. The terminal receives the Guard List Report assignment in the RCCOW Assignment field of a CCOW (in accordance with 5.2.2.1.2). The Guard List Report message reports to the channel controller a number of addresses guarded by the reporting terminal I/O ports. The waveform provides for a terminal to have up to 16 I/O ports. Terminal I/O port numbers range from 1 to 16 (Binary 0000 to 1111, respectively). Two types of Guard List Reports are defined: (1) Type A, which is mandatory and shall be used by 16-bit address terminals; and (2) Type B, which is optional and is used by 14-bit address terminals.

5.2.2.2.4.12.1 Guard List Report (Type A). (Figure 20-13) (Message Code 10001). This type of Guard List Report is mandatory and shall be used by 16-bit address terminals. The message shall identify a group of three addresses from the terminal's guard list. The group of addresses to be reported shall be as defined by the controller in the CCOW's RCCOW Assignment field. Guard List Report (Type A) messages shall be developed in accordance with Figure 20-13 and the data field definitions described below:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Port Guarding #1 (Bits 0-3, byte 4). This field shall define the terminal port number (1 through 16) that guards the address defined by the Guarded #1 field of this message.

d. Port Guarding #2 (Bits 0-3, byte 5). This field shall define the terminal port number (1 through 16) that guards the address defined by the Guarded #2 field of this message.

e. Port Guarding #3 (Bits 4-7, byte 5). This field shall define the terminal port number (1 through 16) that guards the address defined by the Guarded #3 field of

this message.

f. Guarded #1 (Bits 0-7, byte 6 and bits 0-7, byte 7). This field shall contain the number 1 address, as reported by this message, and which is guarded by the terminal port defined in Port Guarding #1.

g. Guarded #2 (Bits 0-7, byte 8 and bits 0-7, byte 9). This field shall contain the number 2 address, as reported by this message, and which is guarded by the terminal port defined in Port Guarding #2.

h. Guarded #3 (Bits 0-7, byte 10 and bits 0-7, byte 11). This field shall contain the number 3 address, as reported by this message, and which is guarded by the terminal port defined in Port Guarding #3.

The channel controller can direct a terminal to report any one of the five Guard List Report groups defined by the RCCOW Assignment field codes of 5.2.2.1.2. For this series of reports, up to 15 different guard list numbers will be placed as shown in the following table, beginning with "Terminal Guard List Address Reported" number one and continuing until the list is exhausted. There shall be no gaps (empty fields) within the list. The list shall then be reported in groups as specified by the table and requested in a RCCOW assignment.

RCCOW Assignment Field Code	Guard List Report Group Number	Message Field Guarded #	Terminal Guard List Address Reported
01100	1	1	1
		2	2
		3	3
01101	2	1	4
		2	5
		3	6
01110	3	1	7
		2	8
		3	9
01111	4	1	10
		2	11
		3	12
10011	5	1	13

		2	14
		3	15

5.2.2.2.4.12.2 Guard List Report (Type B) (optional). (Figures 20-13A and 20-13B) (Message Code 01101). This RCCOW shall be generated by a terminal to report four numbers in its guard lists in response to a Guard List Report assignment in the RCCOW Assignment field of a CCOW. The definition of the data in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Guarded #1 to #4 (or Guarded #5 to #8) (Bits 0-5, byte 4 and bits 0-7, byte 5; bits 0-5, byte 6 and bits 0-7, byte 7; bits 0-5, byte 8 and bits 0-7, byte 9; and bits 0-5, byte 10 and bits 0-7, byte 11). These fields shall contain up to four guard numbers.

d. Port Group (Bit 5, byte 3). This field informs the channel controller whether the data in this message is applicable to terminal ports one through four or five through eight. A zero in this field indicates the data applies to ports one through four, as shown in Figure 20-13A, and a one in this field indicates the data applies to ports five through eight, as shown in Figure 20-13B.

e. Port Guarding #1 to #4 (or Port Guarding #5 to #8) (Bits 6-7, byte 3; bits 6-7, byte 6; bits 6-7, byte 8; and bits 6-7, byte 10). These fields shall contain a code that identifies the terminal port number corresponding to each of the reported guard numbers. Depending on the state of the Port Group bit, port numbers one through four or five through eight are identified. The coding shall be as follows:

Port Group (PG) Field Code	Message Port Guarding Field Code	Terminal Port Guarding the Address
0	00	1
0	01	2

Port Group (PG) Field Code	Message Port Guarding Field Code	Terminal Port Guarding the Address
0	10	3
0	11	4
1	00	5
1	01	6
1	10	7
1	11	8

5.2.2.2.4.12.3 Guard List Report (Type B) Groups 1 to 5. (Figures 20-13A and 20-13B) (Message Code 01101). The channel controller can direct a terminal to report any one of the five Guard List Report groups defined by the RCCOW Assignment field codes of 5.2.2.1.2. The terminal shall respond to this direction with the RCCOW messages developed in accordance with 5.2.2.2.4.12.2 a through e. The Guard List Report: Group 5 RCCOW is intended for those terminals with 5 to 8 ports, to report all possible guard number assignments. Up to 15 different guard list numbers shall be stored in the 20 possible locations (one guard list number per location) and reported, as shown in the following table:

RCCOW Assignment Field Code	Guard List Report Group Number	Message Field Guarded #	Terminal Guard List Address Reported
01100	1	1	1
		2	2
		3	3
		4	4
01101	2	1	5
		2	6
		3	7
		4	8
01110	3	1	9
		2	10
		3	11
		4	12
01111	4	1	13

		2	14
		3	15
		4	16
10011	5	1	17
		2	18
		3	19
		4	20

5.2.2.2.4.13 Paging. (Figure 20-14) (Message Code 01110). The definition of the data in this RCCOW shall be as follows:

a. Initial Entry Flag (Bit 7, byte 4). This flag, when set, shall indicate that this is the first RCCOW created by the terminal after its power has been turned on.

b. Stored Call Flag (Bit 6, byte 4). This flag, when set, shall indicate that the terminal has another RCCOW stored in queue to be transmitted.

c. Requesting User (Bits 6-7, byte 3; bits 0-5, byte 4; and bits 0-7, byte 5). This field shall contain the user number of the terminal port.

d. Requested User #1 (Bits 0-7, byte 6 and bits 0-7, byte 7). This field shall define the ID number of the first user who is paged.

e. Requested User #2 (Bits 0-7, byte 8 and bits 0-7, byte 9). This field shall define the ID number of the second user who is paged.

f. Requested User #3 (Bits 0-7, byte 10 and bits 0-7, byte 11). This field shall define the ID number of the third user who is paged.

5.2.2.3 RCCOW transmit decision in the AC mode. The following factors shall affect the choice of transmit time for RCCOW messages: transmit enable, dedicated RCCOW access, and random RCCOW access.

5.2.2.3.1 Transmit enable. The terminal shall perform various checks to determine if RCCOW transmit is enabled. If so, the terminal shall move into either the dedicated or random RCCOW access selection process. The checks, and the possible results, are listed below in the order in which they shall occur:

a. Missing CCOW. When a terminal fails to receive a CCOW, RCCOW transmission shall be inhibited in the next frame. After a succession of six lost CCOWs, the terminal shall re-enter the CCOW acquisition process.

b. Loss of Range Lock. If the terminal does not have range lock, RCCOW transmissions shall be inhibited.

c. Transmit Inhibit. RCCOW transmissions shall be inhibited in any frame in which a terminal transmit inhibit condition occurs. The transmit inhibit

condition may be from the transmit control CCOW or imposed by the terminal.

d. RCCOW Assignment. The terminal shall reach this point when it has been determined that an RCCOW inhibit condition does not exist. The RCCOW assignment code shall then be tested, and the terminal shall either enter dedicated RCCOW access or random RCCOW access.

5.2.2.3.2 Dedicated RCCOW access. Dedicated RCCOW access shall be entered when the RCCOW assignment requests a specified terminal to transmit an RCCOW. The terminal shall halt all other RCCOW processing to reply immediately with the specified RCCOW in the next frame. The first step shall be to save data that states which RCCOW was being processed or transmitted in the last frame. The terminal shall then determine the specific RCCOW assignment to execute. The assignments, and possible actions, shall be as follows:

a. Conference List Report. When a terminal receives the Conference List Report RCCOW assignment, the terminal shall transmit its conference list. This RCCOW shall be created by a conference request entry at the terminal. The terminal shall then perform a check to determine if any other RCCOWs are stored in queue. If there are, the Stored Call Flag shall be set. The message shall then be formatted and transmitted over the rf channel. The terminal shall not delete this RCCOW from the transmitting queue until a positive CALL ACK is received. If it is not acknowledged, it shall remain in the queue and wait for another Conference List Report RCCOW assignment.

b. Dedicated RCCOW Slot. When a terminal receives the Dedicated RCCOW Slot RCCOW assignment, the terminal shall transmit any RCCOW it has in queue. If the terminal does not have an RCCOW in queue, it shall create and transmit a Status Report A. Since the CCOW does not request any particular RCCOW, the terminal shall use random RCCOW access processing to find an RCCOW to transmit. Transmit processing shall also be handled by the random RCCOW access process (as described in 5.2.2.3.3).

c. Status Report A. When a terminal receives the Status Report A: Group 1 or Status Report A: Group 2 RCCOW assignment, the terminal shall transmit the corresponding Status Report A. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

d. Status Report B. When a terminal receives the Status Report B: Group 1 or Status Report B: Group 2 RCCOW assignment, the terminal shall transmit the corresponding Status Report B. This RCCOW shall be

transmitted only once per assignment and shall be deleted from the queue after its first transmission.

e. Report Link Test Results. When a terminal receives the Report Link Test Results RCCOW assignment, the terminal shall transmit a Link Test Results RCCOW. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

f. Guard List Report: Group 1. When a terminal receives the Guard List Report: Group 1 RCCOW assignment, the terminal shall transmit the Guard List Report: Group 1 message. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

g. Guard List Report: Group 2. When a terminal receives the Guard List Report: Group 2 RCCOW assignment, the terminal shall transmit the Guard List Report: Group 2 message. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

h. Guard List Report: Group 3. When a terminal receives the Guard List Report: Group 3 RCCOW assignment, the terminal shall transmit the Guard List Report: Group 3 message. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

i. Guard List Report: Group 4. When a terminal receives the Guard List Report: Group 4 RCCOW assignment, the terminal shall transmit the Guard List Report: Group 4 message. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

j. Guard List Report: Group 5. When a terminal receives the Guard List Report: Group 5 RCCOW assignment, the terminal shall transmit the Guard List Report: Group 5 message. This RCCOW shall be transmitted only once per assignment and shall be deleted from the queue after its first transmission.

k. RCCOW Inhibit. When a terminal receives the RCCOW Inhibit RCCOW assignment, the terminal shall inhibit its RCCOW transmission in this frame.

5.2.2.3.3 Random RCCOW access. The terminal shall search its RCCOW queues to select an RCCOW for transmission.

a. Selection of RCCOW to Transmit. The terminal shall perform specific checks to determine an RCCOW to transmit. The checks shall be performed in the following sequence:

1. The RCCOW assignment shall be checked to determine if this frame is dedicated to another terminal. If it is, the terminal shall inhibit RCCOW transmission. If the frame is not dedicated, the next check shall be performed.

2. The terminal shall check to determine if it transmitted a dedicated RCCOW in the last frame. If a dedicated RCCOW was transmitted, it shall be cleared from the queue (except for a conference list report), and any RCCOW that was interrupted by the dedicated RCCOW shall be recovered for transmission. The next check shall then be performed.

3. The terminal shall check to determine if there is an Acknowledge Channel Control Request RCCOW to transmit. If there is, the terminal shall determine when to transmit the RCCOW. If there is not an Acknowledge Channel Control Request RCCOW, the terminal shall check for an RCCOW with a precedence. When the RCCOW with the highest precedence has been found, the terminal shall determine when to transmit the RCCOW. If there is not an RCCOW with a precedence, the terminal shall check for an RCCOW without a precedence. If an RCCOW without a precedence is found, the terminal shall determine when to transmit the RCCOW. If more than one RCCOW is found at any level, the first one transmitted shall be selected on a first-in/first-out basis.

b. When and How Often to Transmit a Selected RCCOW. To determine when and how often to transmit a selected RCCOW, the terminal shall use decision processes based on the type of RCCOW to be transmitted. A first-in/first-out decision process shall be used when more than one RCCOW of the same priority or precedence level exists in the queue. The types of RCCOWs in their order of importance shall be as follows:

1. Dedicated RCCOW. This type of RCCOW is requested

by the RCCOW assignment and shall have the highest priority to be transmitted. It shall preempt the transmission of any other RCCOW. This RCCOW shall be transmitted only once and shall be deleted from the queue (except for conference party list) after its first transmission. Any RCCOW that was preempted from transmission shall be recovered to renew the transmit processing.

2. Acknowledge Channel Control Request RCCOW (Figure 20-12). This type of RCCOW shall have the second highest priority to be transmitted. It shall preempt the transmission of any RCCOW except for a dedicated RCCOW. The RCCOW shall be transmitted immediately upon appearing in queue. The RCCOW shall remain in queue for a random (less than 20) number of frames. If the terminal does not receive a CALL ACK, the RCCOW shall be transmitted again, still remaining in queue for a random (less than 20) number of frames. If the second transmission does not receive a CALL ACK, the RCCOW shall be cleared from the queue, requiring a reentry for further transmission. If a CALL ACK is received any time during transmit processing, the RCCOW shall be cleared from the queue.

3. RCCOW with a Precedence. This type of RCCOW shall have a precedence contained within it, indicating the message's priority. This type of RCCOW shall be as illustrated in Figures 20-2, 20-5, 20-7, and 20-8. This type of RCCOW shall have the third highest priority to be transmitted. It shall preempt the transmission of any RCCOW with a lower precedence (highest precedence RCCOW shall always be transmitted first), as well as any RCCOW with no precedence.

   (a) The decision to transmit this type of RCCOW shall be based on a minimum frame precedence value contained in the RCCOW assignment. The RCCOW shall be transmitted for the first time in any frame in which its precedence is equal to or greater than the minimum frame precedence. The RCCOW shall remain in queue for a random (less than 20) number of frames. If the terminal does not receive a CALL ACK, it shall undergo more checking to determine when the second transmission shall take place.

(b) The second transmission shall depend on the frame precedence in which the first transmission took place. If the first transmission took place when the RCCOW precedence and the frame precedence were equal, the second transmission shall occur in the first frame in which the RCCOW precedence is equal to or greater than the frame precedence. If the first transmission took place when the RCCOW precedence was greater than the frame precedence, the next eight frames shall be checked to find a frame in which the RCCOW precedence and frame precedence are equal. If an equal precedence frame is found within the eight-frame check period, the second transmission of the RCCOW shall occur in that frame. If an equal precedence frame does not occur, the second transmission of the RCCOW shall occur in the next frame, after the eight-frame check period, where the RCCOW precedence is equal to or greater than the frame precedence.

(c) After the second transmission, the RCCOW shall remain in queue for a random (less than 20) number of frames. If the second transmission does not receive a CALL ACK, the RCCOW shall be cleared from the queue, requiring a reentry for further transmission. If a CALL ACK is received any time during transmit processing, the RCCOW shall be cleared from the queue.

4. RCCOW without a Precedence. This type of RCCOW has no priority to be transmitted and shall be processed at any time in which there are no priority messages to be transmitted. This type of RCCOW shall be as illustrated in Figures 20-1, 20-3, 20-4, 20-6, and 20-14. This type of RCCOW shall have the lowest priority to be transmitted. It shall be preempted by all RCCOWs, except for another RCCOW without a precedence. The RCCOW shall be transmitted in the first frame that has not been accessed by a higher priority RCCOW. The RCCOW shall remain in queue for a random (less than 20) number of frames. If the terminal does not receive a CALL ACK, it shall transmit the RCCOW again, and shall retain the RCCOW in queue for a random (less than 20) number of frames. If the second transmission does not receive a CALL

ACK, the RCCOW shall be cleared from the queue, requiring a reentry for further transmission. If a CALL ACK is received any time during transmit processing, the RCCOW shall be cleared from the queue.

5.2.2.4 CCOW in the DC mode. CCOW message data falls into six common fields: the CALL ACK field, the RCCOW Assignment field, the User Number field, the Flag field, the Parity field, and the Command field. (Master frame is an exception; it does not include a Command field.) The format of CCOW messages in the DC mode is shown in Figures 10-1, 10-14, 10-15, 10-16, 10-19, 10-20, and 10-21. In addition to receiving DC-mode CCOWs, if the terminal is required by its performance specification to have DC-mode channel controller capability, the terminal shall also be capable of accepting inputs to compose and transmit the CCOW messages described in 5.2.2.4.1 through 5.2.2.4.7.7.

5.2.2.4.1 CALL ACK field (Bits 0-2, byte 1). The CCOW's CALL ACK field is used to acknowledge RCCOW messages that have been transmitted by terminals. The CALL ACK code appears exactly three frames after the RCCOW is transmitted. All terminals shall record in what frame they transmitted an RCCOW; exactly three frames later, they shall decode the CALL ACK field to find out what type of CALL ACK they have received. If the terminal does not receive a CALL ACK, it shall proceed in accordance with paragraph 5.2.2.3.3. The CALL ACK field is defined below:

FIELD DEFINITION	CODE
No Acknowledgment	000
Positive RCCOW CALL ACK	001
Positive RCCOW CALL ACK	010
Positive RCCOW CALL ACK	011
Positive RCCOW CALL ACK	100
Positive RCCOW CALL ACK	101
Positive RCCOW CALL ACK	110
Positive RCCOW CALL ACK	111

Terminal retransmission of RCCOWs shall occur if proper acknowledgment is not received. Terminal interpretation of these calls shall be as follows:

a. No Acknowledgment (Code 000). No call was received. The terminal shall retransmit the RCCOW.

b. Positive RCCOW CALL ACK (Codes 001 to 111). The RCCOW has been received. The user number in the CCOW represents the user whose RCCOW was received.

5.2.2.4.2 RCCOW Assignment field (Bits 3-7, byte 1). The CCOW's RCCOW Assignment field controls access to subsequent RCCOW transmission slots. The codes are defined below:

FIELD DEFINITION	CODE
Not Allowed	00000-00100
RCCOW Precedence Routine	00101
Not Allowed	00110-11111

The RCCOW assignment will always be RCCOW precedence level ROUTINE in the DC mode.

5.2.2.4.3 User Number field. (Bits 0-5 and 7, byte 2; bits 0-7, byte 3; and bit 5, byte 7). This field defines the user ID number to which the frame's CALL ACK is applicable. Bit 7, byte 2 is the MSB (bit 16) for all CCOW messages, except for the CCOW Master Frame. [The Master Frame has only a 15-bit User Number field. All terminals with 16-bit addresses shall assume the MSB (bit 16) is a zero when receiving the Master Frame CCOW. Terminals with ID numbers containing a one as the MSB (bit 16) cannot get an RCCOW assignment in Master Frame CCOWs. Other assignment restrictions may apply to prevent address errors between terminals.] Bit 5, byte 7 is the second MSB (bit 15) in all CCOWs with two exceptions: (a) the CCOW Master Frame, with bit 15 being bit 6, byte 8; and (b) the CCOW for Computer Data Transfer, with bit 15 being bit 7, byte 4.

5.2.2.4.4 Flag field (Bit 6, byte 2). This flag, when set, (logic 1) indicates that this is a master frame. The flag is reset (logic 0) in all other frames.

5.2.2.4.5 Parity field (Bits 0-7, byte 5 and bits 0-7, byte 6). This field defines the 2-byte CRC derived in accordance with 5.2.1.3.

5.2.2.4.6 Command field (Bits 0-4, byte 7). The CCOW's Command field identifies which of the 7 different CCOW commands possible in the DC mode is used in this frame. The Master Frame is an exception. It does not include a Command field and is identified by the Flag field. The commands and associated codes are listed below.

CCOW MESSAGE	COMMAND CODE
Master Frame	none

CCOW MESSAGE	COMMAND CODE
Not Allowed	00000-01100
Information Request	01101
Zeroize	01110
Time-Slot Preparation	01111
Not Allowed	10000-10001
DC CCOW #1	10010
DC CCOW #2	10011
DC CCOW #3	10100
Not Allowed	10101-11111

5.2.2.4.7 Unique CCOW message fields. Paragraphs 5.2.2.4.7.1 through 5.2.2.4.7.7 identify all other bits unique to each CCOW message format that are not defined in 5.2.2.4.1 through 5.2.2.4.6.

5.2.2.4.7.1 Master Frame (Figure 10-1) (Command Field Code NONE). This CCOW is transmitted every eighth frame. The Master Frame CCOW contains data that updates orderwire status and KG status. The status indicators are as follows:

a. Master Frame Flag (Bit 6, byte 2). This flag, when set, indicates that this is a master frame. In all other frames, this flag is reset.

b. Precedence Cutoff (Bit 7, byte 2 and bits 0-1, byte 7). The precedence is always Routine (Binary 110) in the DC mode.

c. Frame Format (Bits 0-7, byte 4 and bits 2-5, byte 7). This noncontiguous 12-bit field identifies a 3-digit HEX number, indicating which frame format is to be used on this channel for the next seven frames. If the frame format has not changed from the previous Master Frame, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and disconnect any that existed in the changed segment(s) of the frame format.

d. KG Memory (Bits 6-7, byte 7 and bit 7, byte 8). This field contains the KG memory location in use.

e. KG Net Number (Bits 0-4, byte 8). This field contains the KG net number in use.

f. KG Day (Bits 5-7, byte 9). This field contains the KG day of the week.

g. Frame Count (Bits 0-4, byte 9; bits 0-7, byte 10; and bits 0-7, byte 11). This field contains the frame count of the current frame.

h. DC Flag (Bit 5, byte 8). This flag indicates whether the system is operating in the AC or DC mode. If the flag is reset, the system shall operate in the AC mode. If the flag is set, the system terminal shall operate in the DC mode.

i. KG ID (Bits 0-7, byte 12 and bits 0-7, byte 13). See the COMSEC appendix.

5.2.2.4.7.2 Information Request (Figure 10-14) (Command Field Code 01101). This CCOW command has two purposes, as defined in 5.2.2.4.7.2.1 and 5.2.2.4.7.2.2. Data fields in the message are as follows:

a. Called Party (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains one specific user ID number. The terminal shall compare this number with the user ID number assigned to each of its port numbers for a match.

b. Code (Bits 0-7, byte 10). This data field contains the information request code. It is in binary-coded decimal (BCD) format. Valid codes are 1 to 99 and are operationally defined. Code 4 is reserved for the Constant Key Alarm Information Request.

5.2.2.4.7.2.1 Operational Code Information Request. This CCOW command conveys a controller operator information-request code to the terminal. The terminal (operator) may respond to the information request by commanding the terminal to send an information report. After an information request has been received by a terminal, it shall send an information report before sending any other RCCOW. No other RCCOW messages shall be sent before the information report.

5.2.2.4.7.2.2 Constant Key Alarm Information Request. This information request message shall be used by the terminal to automatically disconnect a port that has been illegally transmitting on a slot for greater than 17 minutes. This message is commanded by the channel controller operator in response to

the Constant Key Alarm Information Report message described in paragraph 5.2.2.2.4.6.2. The called party in this message is the user ID number of the terminal port that generated the Constant Key Alarm Information Report, and the valid code for this message is 4. If there is a match between the terminal's port number and the user ID number in the Called Party field of the information request, and the code is 4, the terminal shall automatically disconnect its port from the slot.

5.2.2.4.7.3 Zeroize (Figure 10-15) (Command Field Code 01110). When a terminal receives this CCOW command, it shall zeroize the key storage memories of the KG and disconnect all slot connects. This CCOW command zeroizes the key storage memories of the attached KG and causes all slot connects to be disconnected. Data fields in the message are as follows:

a. Called Party #1 (Bits 0-7, byte 8 and bits 0-7, byte 9). This data field contains the terminal base address of the target terminal. The terminal shall compare this number with Called Party #2 and with its terminal base address. If all three match, the command shall be executed by control signals that cause the KG to erase stored keys.

b. Called Party #2 (Bits 0-7, byte 10 and bits 0-7, byte 11). This data field also contains the terminal base address of the target terminal. If it is not an exact copy of the Called Party #1 data field, the command shall not be executed.

5.2.2.4.7.4 Time-Slot Preparation (Figure 10-16) (Command Field Code 01111). This command causes all terminals on an rf channel to change the manner in which they prepare their orderwire KGs for CCOW and RCCOW. Data fields in the message are as follows:

a. Frame Count (Bits 0-4, byte 10; bits 0-7, byte 11; and bits 0-7, byte 12). This data field contains the frame count when the action is to be initiated. The terminal action shall be either (1) a TS0 preparation or (2) selection of new keys to prepare the KG.

b. TS0 Flag (Bit 7, byte 7). If this flag is set, all terminals shall perform a TS0 at the frame count given in this CCOW. The result shall be that new variables are used to prepare the KG, and the frame count is reset to 24.

c. Change KG Day Flag (Bit 4, byte 13). If this flag is set, all terminals shall change the KG day variable used to prepare the KG. The change shall occur at the

frame count given in this CCOW, and the new KG day shall be the one given in this CCOW.

d. Change Memory Flag (Bit 0, byte 13). If this flag is set, all terminals shall change the KG memory in use. The change shall occur at the frame count given in this CCOW, and the new KG memory shall be that which is given in this CCOW.

e. KG Day (Bits 5-7, byte 13). This data field contains the new KG day variable to be used to prepare the KG.

f. KG Memory Address (Bits 1-3, byte 13). This data field contains the binary address of the KG memory.

5.2.2.4.7.5 DC CCOW #1 (Figure 10-19) (Command Field Code 10010). This CCOW contains frame format (see 5.1.1.a and 5.2.2.1.7.1.c) and frequency code data for channels 1, 2, and 3. Data fields in the message are as follows:

a. Channel #1 Frame Format (Bits 0-3, byte 9, and bits 0-7, byte 11). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #1. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

b. Channel #2 Frame Format (Bits 4-7, byte 10 and bits 0-7, byte 12). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #2. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

c. Channel #3 Frame Format (Bits 0-3, byte 10 and bits 0-7, byte 13). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #3. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

d. Channel #1 Frequency Code/KG Net Number (Bits 0-4, byte 4). This data field contains a 5-bit frequency code. It indicates the frequency code for channel #1.

e. Channel #2 Frequency Code/KG Net Number (Bits 0-4, byte 8). This data field contains a 5-bit frequency code. It indicates the frequency code for channel #2.

f. Channel #3 Frequency Code/KG Net Number (Bit 7, byte 8 and bits 4-7, byte 9). This data field contains a 5-bit frequency code. It indicates the frequency code for channel #3.

The frequency code/KG net number for each of the nine channels addressed by DC CCOWs #1, #2, and #3 has permitted values of 0 to 31. The data field has two purposes: the information is used to prepare the orderwire KG, and it addresses a receiver/ transmitter that has preset or controllable frequencies.

5.2.2.4.7.6 DC CCOW #2 (Figure 10-20) (Command Field Code 10011). This CCOW contains frame format (see 5.1.1.a and 5.2.2.1.7.1.c) and frequency code data for channels 4, 5, and 6. Data fields in the message shall be as follows:

a. Channel #4 Frame Format (Bits 0-3, byte 9 and bits 0-7, byte 11). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #4. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

b. Channel #5 Frame Format (Bits 4-7, byte 10 and bits 0-7, byte 12). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #5. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

c. Channel #6 Frame Format (Bits 0-3, byte 10 and bits 0-7, byte 13). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #6. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

d. Channel #4 Frequency Code/KG Net Number (Bits 0-4, byte 4). This data field shall contain a 5-bit frequency code. It shall indicate the frequency code for

channel #4.

e. Channel #5 Frequency Code/KG Net Number (Bits 0-4, byte 8). This data field shall contain a 5-bit frequency code. It shall indicate the frequency code for channel #5.

f. Channel #6 Frequency Code/KG Net Number (Bit 7, byte 8 and bits 4-7, byte 9). This data field shall contain a 5-bit frequency code. It shall indicate the frequency code for channel #6.

5.2.2.4.7.7 DC CCOW #3 (Figure 10-21) (Command Field Code 10100). This CCOW contains frame format (see 5.1.1.a and 5.2.2.1.7.1.c) and frequency code data for channels 7, 8, and 9. Data fields in the message are as follows:

a. Channel #7 Frame Format (Bits 0-3, byte 9 and bits 0-7, byte 11). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #7. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

b. Channel #8 Frame Format (Bits 4-7, byte 10 and bits 0-7, byte 12). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #8. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

c. Channel #9 Frame Format (Bits 0-3, byte 10 and bits 0-7, byte 13). This data field contains a 3-digit HEX number, indicating which frame format is to be used on channel #9. If the frame format has not changed in value, no terminal action shall be taken. If the frame format has changed, the terminal shall check its slot connects and shall disconnect any that existed in the changed segment(s) of the frame format.

d. Channel #7 Frequency Code/KG Net Number (Bits 0-4, byte 4). This data field shall contain a 5-bit frequency code. It shall indicate the frequency code for channel #7.

e. Channel #8 Frequency Code/KG Net Number (Bits 0-4, byte 8). This data field shall contain a 5-bit frequency code. It shall indicate the frequency code for channel #8.

f. Channel #9 Frequency Code/KG Net Number (Bit 7, byte 8 and bits 4-7, byte 9). This data field shall contain a 5-bit frequency code. It shall indicate the frequency code for channel #9.

5.2.2.5 RCCOW in the DC mode. Two different RCCOW messages can be sent over the RCCOW to the channel controller in the DC mode: Data Transfer (Figure 20-2) and Information Report (Figure 20-6).

If the terminal is required by its equipment performance specification to use RCCOW Data Transfer messages, it shall also receive RCCOW messages. Data field definitions shall be the same as those given for the AC mode, with the exception of those fields labeled "AC mode only." These AC mode fields shall be set to zeros for the DC mode.

5.2.2.6 RCCOW transmit decision in the DC mode. The following factors shall affect the choice of transmit time for RCCOW messages: transmit enable, and random RCCOW access.

5.2.2.6.1 Transmit enable. The terminal shall perform various checks to determine if RCCOW transmission is enabled. If RCCOW transmission is enabled, the terminal shall progress into the random RCCOW access selection process. The checks and the possible results are listed below in the order in which they shall occur:

a. Missing CCOW. When the terminal fails to receive a CCOW, RCCOW transmission shall be inhibited in the next frame. RCCOW transmission shall also be inhibited if the terminal has not acquired range lock or if the terminal fails to properly decode a CCOW.

    1. When the terminal has acquired range and frame lock and has properly decoded CCOW, it shall be considered to be acquired. The acquired mode of operation shall not preclude the missing of individual CCOWs. If this occurs, RCCOW transmission shall be inhibited until another CCOW is properly received. At this time, the RCCOW transmission shall again be enabled.

    2. If every CCOW is missed for five minutes, the terminal shall re-enter the acquisition process.

b. Transmit Inhibit. RCCOW transmission shall be inhibited in any frame in which a terminal transmit inhibit condition occurs. The transmit inhibit condition shall be imposed by the terminal.

5.2.2.6.2 Random RCCOW access. The terminal shall search its RCCOW queues to select an RCCOW for transmission. Since neither the Data Transfer (Figure 20-2) RCCOW nor the Information Report (Figure 20-6) RCCOW has a higher priority of transmission than the other (except when the terminal is responding to an information request from the channel controller), whichever one appears in queue first shall be transmitted immediately. The RCCOW shall remain in queue for a random (less than 20) number of frames after the first transmission. If the terminal does not

receive a CALL ACK, the RCCOW shall be transmitted again, still remaining in queue for a random (less than 20) number of frames. If the second transmission does not receive a CALL ACK, the RCCOW shall be cleared from the queue, requiring a reentry for further transmission. If a CALL ACK is received any time during transmit processing, the RCCOW shall be cleared from the queue.

5.3 Orderwire processing

5.3.1 Plain-text orderwire processing. To fully operate within the waveform, the terminal shall be capable of processing plain text (PT) orderwire messages in both the AC and DC modes. In PT or unencrypted orderwire operation, the terminal shall process CCOWs and RCCOWs as described in 5.3.1.1 to 5.3.1.5.

5.3.1.1 CCOWs received, AC mode. There are two types of CCOWs that are received. In plain text operation within the AC mode, the reception process shall be the same for both master frame CCOWs and all other CCOWs and shall be as follows:

a. After demodulation, deinterleaving, and decoding, store the received 13-byte CCOW message.

b. Read and store separately the CCOW message parity bytes (bytes 5 and 6).

c. In the message stored in step a, above, set all of the bits in the parity bytes to zeros.

d. Generate a CRC on the modified 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC shall begin with byte 1 and end with byte 13. The generated 2-byte CRC shall be compared with byte 5 (high-order CRC byte) and byte 6 (low-order CRC byte) stored in step b, above.

e. Compare the calculated CRC with the stored CRC message parity bytes. If they match, reception of the CCOW shall be considered successful, and the CCOW message data bytes shall be considered valid for further processing by the terminal. The terminal shall consider CCOW reception to be failed, and the CCOW message data bytes shall be discarded, if the calculated CRC does not match the stored CRC message parity bytes.

5.3.1.2 CCOWs received, DC mode. In PT operation in the DC mode, reception of all CCOWs except the Master Frame CCOW is the same as 5.3.1.1, a through e. For reception of the Master Frame

CCOW, the processes described in paragraph 5.3.1.1 shall be adhered to. This process shall be supplemented by reading the KG ID field in bytes 12 and 13 and separately storing this number in terminal memory as the channel controller ID number.

5.3.1.3 RCCOWs transmitted. In AC or DC modes, in plain text operation, the terminal shall prepare RCCOW messages before encoding, interleaving, and modulating, as follows:

a. Once the PT RCCOW message has been formatted, place zeros in message bytes 1, 2, 12, and 13.

b. Generate a CRC on the modified 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC shall begin with byte 1 and end with byte 13. The generated 2-byte CRC shall be placed into RCCOW message bytes 12 (high-order CRC byte) and 13 (low-order CRC byte).

c. Continue transmit processing of the RCCOW message.

5.3.1.4 CCOWs transmitted. If the terminal is required by its performance specification to be DC-mode channel controller, it shall prepare PT CCOW messages to be transmitted for Master Frame CCOWs and all other DC-mode CCOWs. The process shall be as follows:

a. Format the CCOW message (bytes 1 through 13) to be transmitted.

b. If it is a Master Frame CCOW message, place the terminal's lowest (if the terminal has multiple ports) user ID number in the KG ID field (bytes 12 and 13).

c. Place zeros in all bits of parity bytes 5 and 6.

d. Generate a CRC on the 13-byte message. The CRC generation method is the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be placed into CCOW message bytes 5 (high-order CRC byte) and 6 (low-order CRC byte).

e. Continue transmit processing of the CCOW message.

5.3.1.5 RCCOWs received. If the terminal is required by its performance specification to be a DC-mode channel controller, or required to receive Data Transfer RCCOW messages, it shall process PT RCCOW messages as follows:

a. After demodulation, deinterleaving, and decoding, store the received 13-byte RCCOW message.

b. Read and store separately the RCCOW message parity bytes (bytes 12 and 13).

c. In the message stored in step a, above, set all of the bits in the parity bytes to zeros.

d. Generate a CRC on the modified 13-byte message. The CRC generation method is the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be compared with byte 12 (high-order CRC byte) and byte 13 (low-order CRC byte), stored in step b, above.

e. Compare the calculated CRC with the stored CRC message parity bytes. If they match, reception of the RCCOW shall be considered successful, and the RCCOW message data bytes shall be considered valid for further processing by the terminal. The terminal shall consider RCCOW reception to be failed, and the RCCOW message data bytes shall be discarded, if the calculated CRC does not match the stored CRC message parity bytes.

5.3.2 Encrypted orderwire processing. To fully operate within the waveform, the terminal shall be capable of processing encrypted orderwire messages in both the AC and DC modes. Orderwire encryption/decryption shall be performed using the COMSEC/TRANSEC Integrated Circuit (CTIC) or an alternate NSA-approved device that is cryptographically and functionally compatible with the CTIC implementing KGV-11 as specified in NSA specifications 88-4A *and 87-1*. Hardware implementation of the terminal shall include provisions for future implementation of Over the Air Rekeying (OTAR) for the orderwire. In encrypted or cipher text (CT) orderwire operation, the terminal shall process CCOWs and RCCOWs as described in 5.3.2.1 to 5.3.2.4.

5.3.2.1 CCOWs received, AC and DC modes. Two types of received CCOWs exist. In encrypted operation, in either the AC or DC modes, the reception process for Master Frame CCOWs is different from all other CCOWs.

5.3.2.1.1 Master Frame CCOW reception. The reception process for encrypted Master Frame CCOWs shall be as follows:

a. After demodulation, deinterleaving, and decoding, store the received encrypted 13-byte CCOW message.

b. Obtain from the terminal's memory the KG ID number that was received in this Master Frame CCOW. Transfer this number to the KG.

c. Decrypt the received 13-byte CCOW message.

d. Reformat the decrypted CCOW message by replacing bits 6 and 7 of byte 7, bits 0-5 and 7 of byte 8, and all bits of bytes 9, 10, and 11, with their corresponding bits from the received, encrypted message stored in a, above. Store the reformatted message.

e. Read the KG ID number (bytes 12 and 13) from the received, encrypted message and store it separately in the terminal's memory.

f. In the message stored in d, above, set all of the bits in the stored message KG ID field (bytes 12 and 13) to zeros.

g. Read and store separately the decrypted CCOW message parity bytes (bytes 5 and 6).

h. In the message stored in d, above, set all of the bits in the decrypted CCOW message parity bytes to zeros.

i. Generate a CRC on the modified 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be compared with byte 5 (high-order CRC byte) and byte 6 (low-order CRC byte), which are stored from g, above, in the decrypted CCOW message.

j. Compare the calculated CRC with the stored CRC message parity bytes. If they match, reception of the CCOW shall be considered successful and the CCOW message data bytes shall be considered valid for further processing by the terminal. The terminal shall consider CCOW reception to be failed, and the CCOW message data bytes shall be discarded, if the calculated CRC does not match the stored CRC message parity bytes.

5.3.2.1.2 Nonmaster frame CCOW reception. The reception process for all encrypted CCOWs other than Master Frame CCOWs shall be as follows:

a. After demodulation, deinterleaving, and decoding, store the received, encrypted 13-byte CCOW message.

b. Obtain from the terminal's memory the KG ID number that was received in the last valid Master Frame CCOW. Transfer this number to the KG.

c. Decrypt and store the received 13-byte CCOW message.

d. Read and store separately the decrypted parity bytes (bytes 5 and 6).

e. In the message stored in c, above, set all of the bits in the decrypted CCOW message parity bytes to zeros.

f. Generate a CRC on the modified 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be compared with byte 5 (high-order CRC byte) and byte 6 (low-order CRC byte), which are stored in d, above, from the decrypted CCOW message.

g. Compare the calculated CRC with the stored CRC message parity bytes. If they match, reception of the CCOW shall be considered successful and the CCOW message data bytes shall be considered valid for further processing by the terminal. The terminal shall consider CCOW reception to be failed, and the CCOW message data bytes shall be discarded, if the calculated CRC does not match the stored CRC message parity bytes.

5.3.2.2 RCCOWs transmitted. In AC or DC mode, in encrypted operation, the terminal shall prepare RCCOW messages before encoding, interleaving, and modulating, as follows:

a. Once the PT RCCOW message has been formatted, place zeros in message bytes 1, 2, 12, 13.

b. Generate a CRC on the modified 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be placed into RCCOW message bytes 12 (high-order CRC byte) and 13 (low-order CRC byte).

c. Initialize the KG in accordance with the classified COMSEC appendix.

d. Encrypt bytes 3 through 13 of the RCCOW message. The serial data stream of these bytes presented to the KG for encryption shall begin with byte 3, MSB, and end with byte 13, LSB.

e. Obtain the station ID from the KG at the end of the encryption cycle and place it in bytes 1 and 2 of the RCCOW message.

f. Continue transmit processing the encrypted RCCOW message.

5.3.2.3 CCOWs transmitted. If the terminal is required by its performance specification to be a DC-mode channel controller, it shall prepare encrypted CCOW messages to be transmitted for both

Master Frame CCOWs and all other Nonmaster Frame DC-mode CCOWs.

5.3.2.3.1 Encrypted Master Frame CCOW transmission. The sequence of events to encrypt CCOW Master Frame data shall be as follows:

a. Once the unencrypted CCOW Master Frame message has been formatted and stored, place zeros in all bits of bytes 5, 6, 12, and 13.

b. Generate a CRC on the 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be placed into CCOW message bytes 5 (high-order CRC byte), and 6 (low-order CRC byte).

c. Initialize the KG in accordance with the classified COMSEC appendix. The KG is initialized to operate in mode C2B for Master Frame encryption.

d. Encrypt the 13-byte Master Frame CCOW message after modification by a and b, above.

e. Reformat the encrypted CCOW message by replacing bits 6 and 7 of byte 7, bits 0-5 and 7 of byte 8, and all bits of bytes 9, 10, and 11. Replace these bits with their corresponding bits from the PT message stored in a, above.

f. Obtain the KG serial number from the KG and insert it into the KG ID field [message bytes 12 (MSBs) and 13 LSBs)]. Obtain the KG serial number from the KG at the end of the encryption cycle.

g. Continue transmit processing of the Master Frame CCOW message.

5.3.2.3.2 Encrypted Nonmaster Frame CCOW transmission. The sequence of events used to encrypt CCOW Nonmaster Frame data shall be as follows:

a. Once the unencrypted CCOW Nonmaster Frame message has been formatted, place zeros in all bits of bytes 5 and 6.

b. Generate a CRC on the 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be placed into CCOW message bytes 5 (high-order CRC byte) and 6 (low-order CRC byte).

c. Initialize the KG in accordance with the classified COMSEC appendix. The KG is initialized to operate in mode C2A for Nonmaster Frame encryption.

d. Encrypt the 13-byte Master Frame CCOW message after modification by a, above.

e. Continue transmit processing the Nonmaster Frame CCOW message.

5.3.2.4 RCCOWs received. If the terminal is required by its performance specification to be a DC-mode channel controller, or required to receive Data Transfer RCCOW messages it shall process encrypted RCCOW messages received as follows:

a. After demodulation, deinterleaving, and decoding, store the received, encrypted, 13-byte RCCOW message.

b. Read the Station ID from bytes 1 and 2, and transfer it to the KG.

c. Decrypt and store bytes 3 through 13 of the received, encrypted RCCOW message.

d. In the message stored in a, above, set all of the bits in Station ID field bytes (bytes 1 and 2) to zeros. Format and store the complete, decrypted, 13-byte RCCOW message using the 2 bytes with all zeros as bytes 1 and 2, and with bytes 3 through 13 from step c, above.

e. Read and store separately the decrypted RCCOW message parity bytes (bytes 12 and 13).

f. Set to zero all of the bits in the parity bytes stored (bytes 12 and 13) in d, above.

g. Generate a CRC on the modified 13-byte message. The CRC generation method shall be the IBM BSC CRC-16 Protocol (see 5.2.1.3). Calculation of the CRC begins with byte 1 and ends with byte 13. The generated 2-byte CRC shall be compared with byte 12 (high-order CRC byte) and byte 13 (low-order CRC byte), which are stored from e, above.

h. Compare the calculated CRC with the stored CRC message parity bytes. If they match, reception of the RCCOW shall be considered successful and the RCCOW message data bytes shall be considered valid for further processing by the terminal. The terminal shall consider RCCOW reception to be failed, and the RCCOW

message data bytes shall be discarded, if the calculated CRC does not match the stored CRC message parity bytes.

5.4 Error control

5.4.1 FEC coding. The FEC coding used shall be convolutional, with interleaving, to ensure errors are random. The code rates used shall be rate one-half (R = 1/2) and rate three-fourths (R = 3/4). The constraint lengths for these codes shall be k = 7 and k = 9 for the rate 1/2 and rate 3/4 codes, respectively. CCOW and RCCOW transmissions shall use rate 1/2, k = 7 FEC coding. Range and link test transmissions shall not use FEC coding. The code employed for user communications shall be determined by the transmission time slot, as defined in Figures 3 through 5.

5.4.2 FEC characteristics. The code tap positions shall be as follows:

Rate = 1/2	k = 7
	P1 1111001
	P2 1011011
Rate = 3/4	k = 9
	P1 100111010
	P2 010001101
	P3 001001011
	P4 111110100

NOTE: The MSB is farthest left, and the LSB is farthest right. The encoder tap connections shall be as shown in Figure 9.

5.4.3 Interleaver random structure generation. The interleaver shall use a random interleaving method with a block depth of 224 symbols. The block substructure shall consist of 2 independently constructed blocks of 112 symbols each, which are used in sequence. A hybrid random scatter shall be incorporated in each block of 112 symbols. The combination of two independent blocks and random scattering in each block provides decoding performance that is superior to totally uniform scattering for expected interference on the UHF satellite channel. The interleaver sequence shall be as shown in Table XI.

5.5 Detailed modulation requirements

5.5.1 Modulation interoperability. The modulation shall be interoperable with binary phase-shift keying (BPSK) and

differentially encoded quadrature phase-shift keying (DEQPSK), and shall have spectral containment equal to or better than BPSK and DEQPSK, respectively.

5.5.2 Modulation rates. The terminal shall burst at 9,600 or 19,200 symbols per second (sps) using BPSK modulation, and 32,000 sps using DEQPSK modulation.

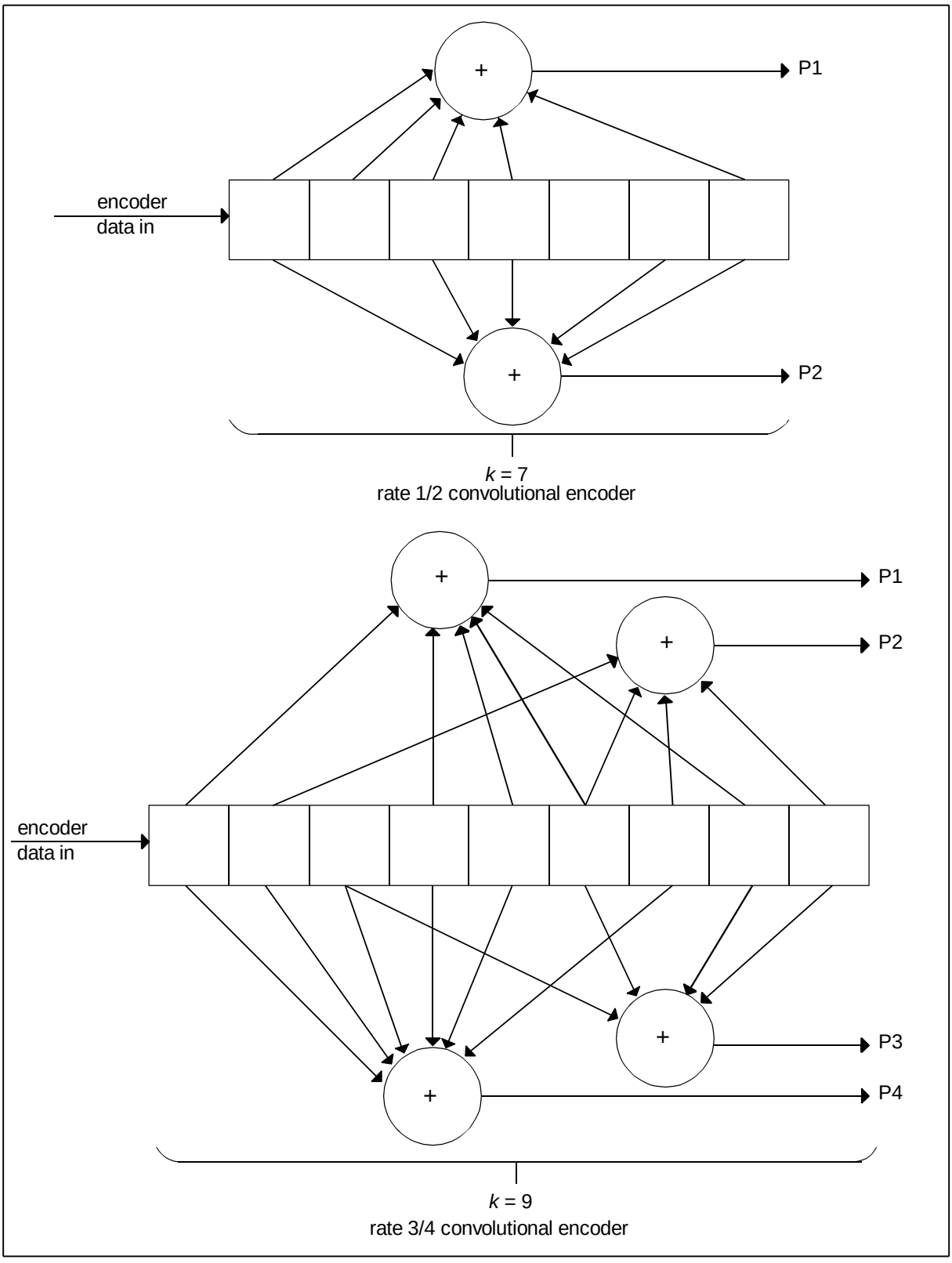

FIGURE 9. Convolutional encoder tap connections.

TABLE XI. Interleaver sequence.

address	data	address	data	address	data	address	data

00	19	28	22	56	04	84	69
01	61	29	85	57	60	85	84
02	86	30	32	58	108	86	13
03	49	31	106	59	68	87	43
04	94	32	73	60	44	88	93
05	25	33	23	61	52	89	103
06	87	34	03	62	02	90	77
07	34	35	88	63	110	91	64
08	09	36	96	64	72	92	15
09	50	37	28	65	10	93	24
10	107	38	79	66	35	94	89
11	99	39	41	67	53	95	75
12	08	40	59	68	97	96	33
13	40	41	11	69	62	97	47
14	111	42	70	70	00	98	05
15	74	43	42	71	81	99	95
16	65	44	21	72	12	100	57
17	45	45	29	73	109	101	46
18	14	46	01	74	91	102	07
19	83	47	101	75	20	103	82
20	30	48	90	76	51	104	56
21	48	49	16	77	06	105	38
22	58	50	80	78	37	106	102
23	100	51	54	79	63	107	76
24	26	52	67	80	78	108	66
25	39	53	27	81	55	109	17
26	71	54	105	82	18	110	36
27	104	55	92	83	31	111	98
112	116	140	203	168	131	196	195
113	140	141	137	169	166	197	215
114	193	142	129	170	177	198	125
115	156	143	180	171	123	199	164
116	214	144	219	172	223	200	112
117	171	145	209	173	208	201	172
118	205	146	190	174	144	202	220
119	113	147	160	175	114	203	206
120	181	148	198	176	122	204	158
121	128	149	118	177	134	205	192
122	221	150	212	178	162	206	174
123	211	151	141	179	154	207	145
124	120	152	173	180	202	208	153
125	196	153	161	181	191	209	216
126	147	154	204	182	218	210	207
127	182	155	126	183	124	211	127
128	139	156	143	184	136	212	184
129	115	157	217	185	178	213	175
130	152	158	167	186	151	214	142
131	165	159	157	187	119	215	121
132	187	160	133	188	138	216	200
133	176	161	148	189	130	217	168
134	201	162	213	190	170	218	183
135	210	163	197	191	155	219	149
136	150	164	169	192	194	220	199
137	132	165	222	193	135	221	163
138	189	166	188	194	185	222	186
139	179	167	146	195	159	223	117

5.5.3 Types of modulation. The burst modulation is described as follows:

a. BPSK modulation is represented by

$$S(t) = A \cos \theta(t) \sin \omega_o t + A \sin \theta(t) \cos \omega_o t = A \sin [\omega_o t + \theta(t)]$$

where

$\theta(t)$ = $\pm \pi/2$ radians, and the phase-shift changes with each new data bit of duration T

b. DEQPSK is represented by the Gray code mapping convention in 5.5.4.

5.5.4 Modulation bit-mapping characteristics. The data bit-mapping in the modulation process of the DEQPSK waveform shall be the following Gray code-mapping convention:

INPUT DATA PAIR TO MODULATOR		PHASE ADVANCE	
I	**O**	**radians**	**radians**
0	0	0	0
0	1	$\pi/2$	90
1	1	π	180
1	0	$3\pi/2$	270

The phase state is referenced to the carrier phase.

5.5.5 Modulation characteristics and timing. Paragraphs 5.5.5.1 through 5.5.5.3 describe data characteristics and timing requirements.

5.5.5.1 Modulation timing jitter. The modulating signal timing jitter requirement shall be less than 2 percent of a data bit period, or 10 µs, whichever is less.

5.5.5.2 Modulation rate accuracy. The maximum allowable error in the data rate shall be 1 part in 10^6 [1 part per million (ppm)].

5.6 Frequency accuracy. The assumptions used to derive the values in 5.6.1 and 5.6.2 may be found in Appendix E.

5.6.1 Uplink frequency accuracy. The uplink frequency of any transmission, as received at the satellite, shall be within 240 Hz of the allocated uplink frequency, provided a and b (below) are both true:

a. the CCOW transmission from the satellite is within 30 Hz of the allocated downlink frequency, and

b. the satellite inclination angle is equal to or less than 10 degrees.

5.6.2 Downlink frequency accuracy. The terminal shall be capable of receiving downlink signals within 310 Hz of the allocated center frequency. The accuracy of the CCOW downlink frequency at the satellite is 30 Hz. The frequency accuracy requirement shall include inaccuracies caused by doppler and inaccuracies caused by frequency-standard, frequency-measurement, and frequency-setting errors. Doppler is due to the relative velocity between the satellite and the receiver. The velocity of the satellite relative to a fixed receiver is 79 meters per second. The worst-case position of the satellite is a 10-degree inclination angle. Downlink frequency offset shall not exceed uplink frequency offset from the transponder center frequency plus the satellite transponder translation error.

5.6.3 Probability of missed acquisition. The probability of a missed acquisition of any burst shall not degrade the terminal's specified BER performance by more than a factor of two.

5.7 User Communications Security (COMSEC)

5.7.1 Voice security. Voice digitization and security shall be as follows:

(1) Mandatory. For joint operations, secure voice at 2400 bps shall be interoperable with the digitization and encryption techniques used in the Advanced Narrowband Digital Voice Terminal (ANDVT), application 3 (see MIL-C-28883A).

(2) Optional. Secure voice at 4800 bps shall be interoperable with the digitization techniques used in the Code Excited Linear Prediction (CELP) (FED-STD-1016) and encryption techniques used by the KG-84A (NSA NO. 82-2B).

(3) Optional. Secure voice at 16000 bps shall be interoperable with the digitization techniques using Continuous Variable Slope Delta (CVSD) modulation and encryption techniques used by the VINSON (CSESD-14).

5.7.2 Data security. For joint operations, data encryption shall be interoperable with KYV-5 and KG-84A encryption devices.

Terminals that embed COMSEC devices shall support all data rates specified in this MIL-STD for communication over the DAMA channel.