1.0   SCOPE

THIS SPECIFICATION ESTABLISHES THE PERFORMANCE, INTERFACE AND ACCEPTANCE CRITERIA FOR AN AUTOMATIC LINK ESTABLISHMENT (ALE) MODULE AS USED IN THE MAGNAVOX AN/GRC-206(V)5 RADIO SYSTEM.

2.0   APPLICABLE DOCUMENTS

THE DOCUMENTS LISTED BELOW APPLY TO THE EXTENT REFERRED TO IN THIS SPECIFICATION. IN THE EVENT OF CONFLICT BETWEEN THE DOCUMENTS REFERENCED HEREIN AND THE CONTENTS OF THIS SPECIFICATION, THIS SPECIFICATION SHALL GOVERN.

2.1   REFERENCED DOCUMENTS

MIL-STD-188-141A	APPENDIX A; AUTOMATIC LINK ESTABLISHMENT SYSTEM, DTD 15 SEPT. 1988 (INTEROPERABILITY AND PERFORMANCE STANDARDS FOR MEDIUM AND HIGH FREQUENCY RADIO EQUIPMENT)
MIL-STD-454K	STANDARD GENERAL REQUIREMENTS FOR ELECTRONIC EQUIPMENT, DATED 15 DECEMBER, 1989 WITH NOTICE 2 DATED 26 FEBRUARY 1989
MIL-STD-461	REQUIREMENTS FOR THE CONTROL OF ELECTROMAGNETIC INTERFERENCE EMISSIONS AND SUSCEPTIBILITY
MIL-STD-810E	ENVIRONMENTAL TEST METHODS AND ENGINEERING GUIDELINES. 14 JULY 1989, WITH NOTICE 1 DATED 9 FEB. 90
MS27508	MILITARY SPECIFICATION SHEET, CONNECTORS, ELECTRICAL, CIRCULAR, MINIATURE, HIGH DENSITY, QUICK DISCONNECT, ENVIRONMENT RESISTANT, REMOVABLE CRIMP AND HERMETIC SOLDER CONTACTS
186190	CONNECTOR, PLUG, ELECTRICAL, PW MOUNTING
186191	CONNECTOR, PLUS, ELECTRICAL

3.0   REQUIREMENTS

3.1   ALE MODULE FUNCTIONAL DEFINITION

THE ALE MODULE IS PART OF THE RT-1444A/URC RECEIVER-TRANSMITTER, (PART OF THE AN/URC-113A HIGH FREQUENCY (HF) RADIO) , WHICH FUNCTIONS AS A TACTICAL HF COMMUNICATIONS TERMINAL WITHIN THE AN/GRC-206 V(5) SYSTEM (SEE FIGURE 1).

3.1.1   SDU CONTROL OF THE URC-113 RADIOSET

THE ALE MODULE SHALL PROVIDE FOR EXTERNAL SERIAL DATA CONTROL OF THE URC-113A RADIO SET WHEN ELECTRICALLY CONNECTED TO THE GRC-206 SIGNAL DISTRIBUTION UNIT (SDU).

3.1.2   LOCAL CONTROL OF THE URC-113 RADIOSET

THE ALE MODULE SHALL PROVIDE FOR LOCAL (FRONT PANEL) CONTROL OF THE URC-113A RADIO SET WHEN THE SDU IS DISCONNECTED.

3.1.3   ALE FUNCTIONS

THE ALE MODULE SHALL PROVIDE ALE FUNCTIONS WHEN CONTROLLED VIA THE CONTROL SERIAL DATA (CSD) PORT FROM THE SDU. NO ALE CAPABILITY IS PROVIDED UNDER FRONT PANEL CONTROL.
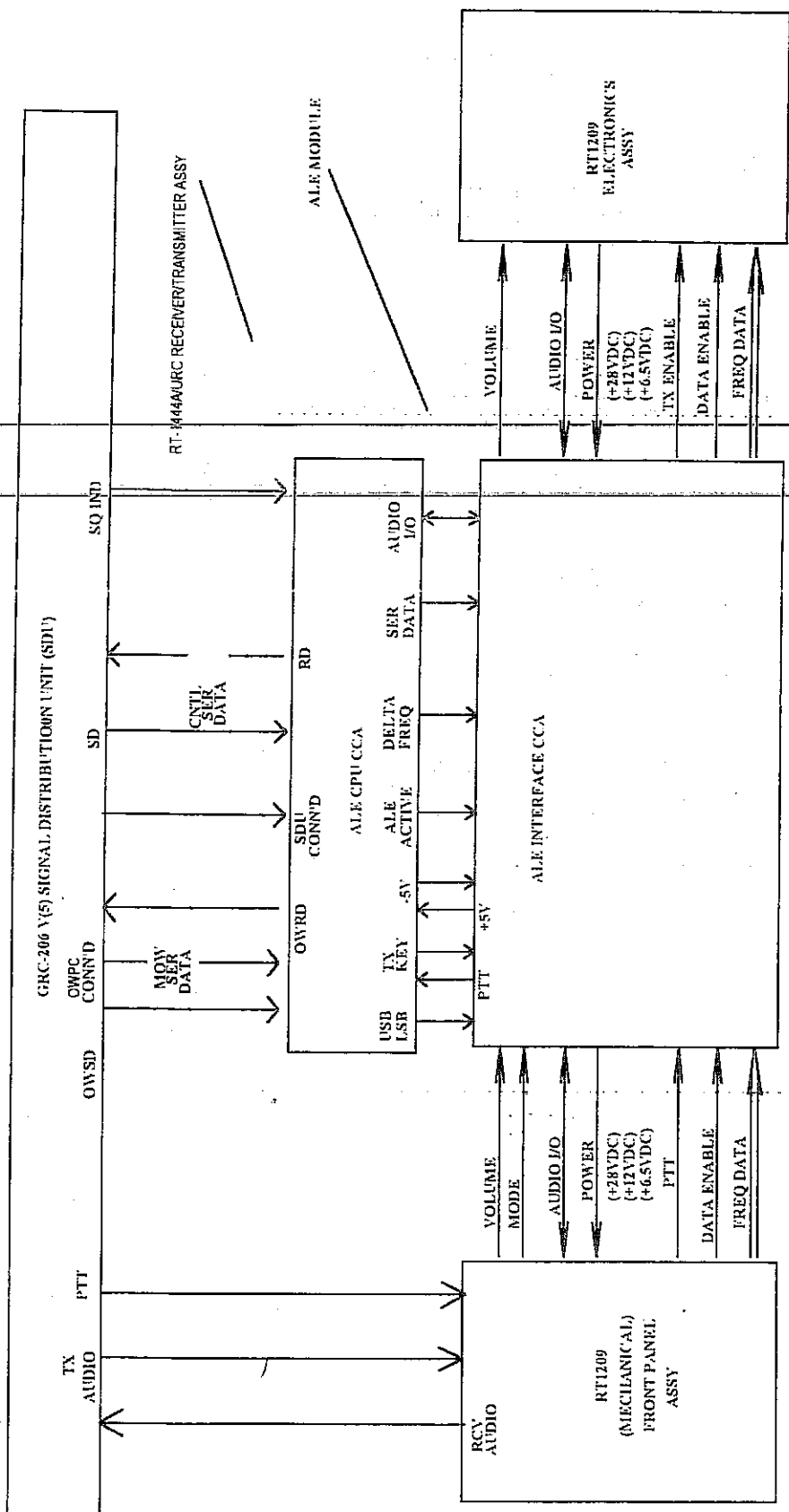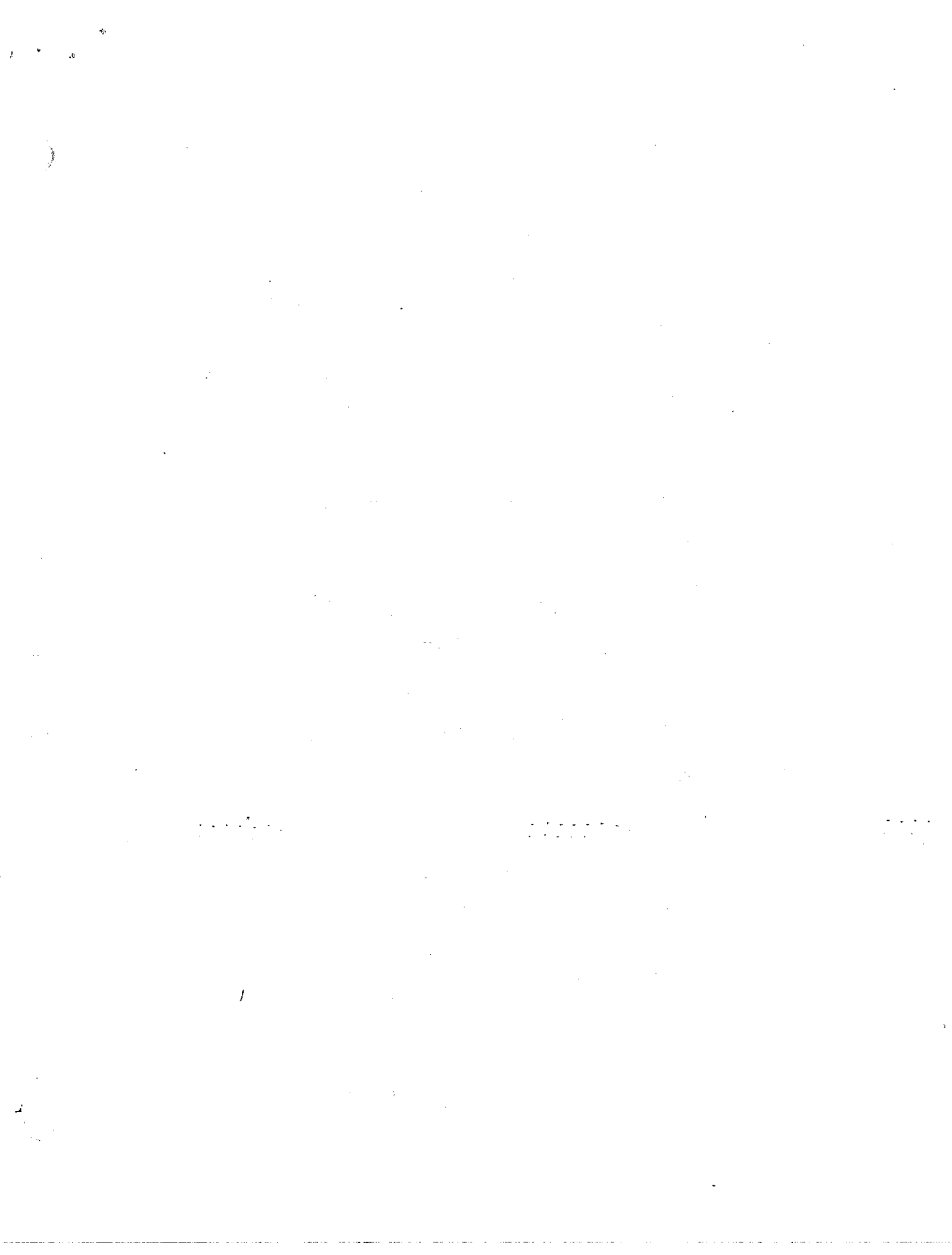
GRC-206 V(5) SIGNAL DISTRIBUTION UNIT (SDU)

RT-1444A/URC RECEIVER/TRANSMITTER ASSY

ALE MODULE

ALE CPU CCA

SDU CONN'D
OWPC CONN'D

RD
SD
SDU CONN'D
OWRD
TX KEY
USB LSB

CNTL SER DATA
MOW SER DATA

SQ IND
PTT
TX AUDIO
OWSD

ALE INTERFACE CCA

AUDIO I/O
SER DATA
DELTA FREQ
ALE ACTIVE
-5V
+5V
PTT

RT1209 ELECTRONICS ASSY

VOLUME
AUDIO I/O
POWER (+28VDC) (+12VDC) (+6.5VDC)
TX ENABLE
DATA ENABLE
FREQ DATA

RT1209 (MECHANICAL) FRONT PANEL ASSY

RCV AUDIO
VOLUME
MODE
AUDIO I/O
POWER (+28VDC) (+12VDC) (+6.5VDC)
PTT
DATA ENABLE
FREQ DATA

FIGURE 1
ALE SYSTEM BLOCK DIAGRAM

3.2 CHARACTERISTICS

3.2.1 AUTOMATIC LINK ESTABLISHMENT

ALE PERFORMANCE CHARACTERISTICS SHALL CONFORM TO THE PROVISIONS OF MIL-STD-188-141A, APPENDIX A, EXCEPT AS SPECIFICALLY MODIFIED IN THIS DOCUMENT. ITEMS DESIGNATED AS DESIGN OBJECTIVES (DO) PER MIL-STD-188-141A SHALL NOT BE A REQUIREMENT IN THIS DOCUMENT.

3.2.2 INTERFACE CHARACTERISTICS

3.2.2.1 ELECTRICAL INTERFACE

ELECTRICAL INTERFACES OF THE ALE MODULE SHALL BE AS DEFINED IN APPENDIX 1 OF THIS DOCUMENT

3.2.2.2 SOFTWARE INTERFACE

SOFTWARE INTERFACES OF THE ALE MODULE SHALL BE AS DEFINED IN APPENDIX 2 OF THIS DOCUMENT

3.2.3 MEMORY

THE DATA STORAGE MEMORY OF THE ALE MODULE SHALL BE AS FOLLOWS:

3.2.3.1 NON-VOLATILE STORAGE

ALL ALE DATA STORAGE MEMORIES SHALL BE CAPABLE OF RETAINING STORED DATA WITH NO POWER APPLIED FOR AT LEAST 1 YEAR.

3.2.3.2 CHANNEL MEMORY

THE ALE MODULE SHALL BE CAPABLE OF STORING, RETRIEVING, AND EMPLOYING AT A MINIMUM ONE HUNDRED DIFFERENT SETS OF RADIO CHANNEL DATA INFORMATION, TO INCLUDE: RADIO TRANSMIT AND RECEIVE FREQUENCY FROM 2.0000 TO 29.9999 MHz, SIDEBAND (UPPER OR LOWER) , A PROGRAMABLE 24 HOUR SOUNDING TIMER, AND A SOUNDING ADDRESS (UP TO 15 ALPHA-NUMERIC CHARACTERS). *100*

3.2.3.3 ACTIVE CHANNEL MEMORY

ALL ALE ACTIVITY SHALL BE LIMITED TO THE CHANNEL NUMBERS STORED WITHIN THE ACTIVE CHANNEL MEMORY (ACM). THE ACM SHALL PROVIDE FOR AT LEAST 10 GROUPS OF CHANNELS, EACH GROUP BEING CAPABLE OF STORING ANY OR ALL OF THE CHANNEL NUMBERS IN CHANNEL MEMORY.

3.2.3.4 SELF ID MEMORY

THE MODULE SHALL BE CAPABLE OF STORING, RETRIEVING, AND EMPLOYING AT A MINIMUM TWENTY DIFFERENT SETS OF SELF ADDRESSING INFORMATION , WHICH SHALL INCLUDE AN ADDRESS OF UP TO 15 ALPHA-NUMERIC CHARACTERS, AND VALID CHANNELS (UP TO 100) ASSOCIATED FOR USE WITH EACH ADDRESS. THE MODULE SHALL BE PERMITTED TO REPLY TO AN ALE CALL ONLY IF THE DESTINATION ADDRESS OF THE CALL MATCHES ONE OF THE TWENTY SELF ID ADDRESSES. *20 Self 15 char.*

3.2.3.5 OTHER ADDRESS MEMORY

THE MODULE SHALL BE CAPABLE OF STORING, RETRIEVING, AND EMPLOYING AT A MINIMUM ONE HUNDRED DIFFERENT SETS OF INFORMATION USED TO DEFINE OTHER STATIONS. EACH OF THE 100 MEMORY LOCATIONS OF THE OTHER ADDRESS MEMORY SHALL BE CAPABLE OF STORING UP TO 15 ALPHA NUMERIC CHARACTERS AS AN ADDRESS, VALID CHANNELS (UP TO 100) THAT EACH ADDRESS MAY BE USED ON, AND WAIT FOR REPLY TIME. *100 other*

3.2.3.6 NET ID MEMORY

THE MODULE SHALL BE CAPABLE OF STORING, RETRIEVING, AND EMPLOYING AT LEAST TWENTY DIFFERENT SETS OF INFORMATION USED TO DEFINE NETWORKS. EACH SET SHALL INCLUDE THE NET NAME (UP TO 15 ALPHA-NUMERIC CHARACTERS), ASSIGNMENT OF NET MEMBERS FROM OTHER ADDRESS MEMORY (ANY OR ALL) , AND NET SLOT WIDTH.

THE NET MEMBER SLOT NUMBER ASSIGNMENT SHALL BE ACCORDING TO THE ORDER IN WHICH EACH NET MEMBER APPEARS WITHIN THE "OTHER" ADDRESS MEMORY, SLOT NUMBER 1 BEING THE NET MEMBER IN THE NUMERICALLY LOWEST OTHER MEMORY LOCATION

3.2.3.7 GROUP ID MEMORY

THE MODULE SHALL BE CAPABLE OF STORING, RETRIEVING, AND EMPLOYING AT LEAST TWENTY DIFFERENT SETS OF INFORMATION USED TO DEFINE GROUPS. EACH SET SHALL INCLUDE THE GROUP NAME (UP TO 15 ALPHA-NUMERIC CHARACTERS), AND GROUP MEMBERS TAKEN FROM OTHER ADDRESS MEMORY (MAXIMUM GROUP MEMBERS AS PER MIL-STD-188-141A APPENDIX A) AS SELECTED BY THE OPERATOR.

3.2.3.8 LQA MEMORY

THE MODULE SHALL BE CAPABLE OF STORING, RETRIEVING, AND EMPLOYING 10000 DIFFERENT SETS OF BILATERAL BIT ERROR RATES (BER) VALUES (BER AS RECEIVED BY SELF FROM OTHER, AND BER AS RECEIVED BY OTHER FROM SELF). A CAPABILITY TO REDUCE THE WEIGHT (VALIDITY) OF THE STORED BER DATA WITH RESPECT TO TIME SHALL BE PROVIDED. A WEIGHT OF 0 (INVALID DATA) SHALL BE ACHIEVED IN A 1, 2, 4, OR 8 HOUR PERIOD, SELECTABLE BY THE OPERATOR. THE DECAY PROCESS SHALL BE CAPABLE OF BEING DISABLED.

3.2.4 EXCEPTIONS TO MIL-STD-188-141A APPENDIX A

3.2.4.1 LINK PROTECTION, PARA. 90 OF MIL-STD-188-141A APPENDIX A IS NOT APPLICABLE

3.2.4.2 A LIMITED SUBSET OF THE TIME RELATED FUNCTIONS CONSISTING OF THE "COMMAND TUNE AND WAIT" FUNCTION ONLY SHALL BE IMPLEMENTED AS DETAILED IN PARA 80.8 OF MIL-STD-188-141A APPENDIX A

3.2.5 BUILT IN TEST

THE ALE MODULE SHALL CONTAIN ON LINE AND OFF LINE SELF TEST CAPABILITY WHICH VERIFIES SDU-ALE COMMUNICATION, TESTS TRANSMISSION, RECEPTION AND DETECTION OF ALE TONES, AND ESTABLISHES BASIC MODULE FUNCTIONALITY.

3.2.5.1 SDU-ALE DATA LINK

THE ALE MODULE ON COMMAND SHALL CONDUCT A COMMUNICATION ECHO TEST TO VERIFY THAT COMMUNICATIONS BETWEEN THE SDU AND THE ALE MODULE ARE FUNCTIONAL. THIS TEST SHALL "ECHO" BACK TO THE SDU ANY ASCII CHARACTERS SENT BY THE SDU.

3.2.5.2 SYSTEM TONE TRANSMISSION TEST

THE ALE MODULE ON COMMAND SHALL CONDUCT AN ALE TONE TRANSMISSION TEST. THE ALE SYSTEM SHALL BE CAPABLE OF TRANSMITTING ANY ONE OF THE EIGHT ALE TONE FREQUENCIES (MIL-STD-188-141A APPENDIX A PARA. 50.2) ON COMMAND.

3.2.5.3 SYSTEM TONE DETECTION TEST

THE ALE MODULE ON COMMAND SHALL CONDUCT AN ALE TONE DETECTION
TEST. AN ON CHANNEL RF SIGNAL MODULATED WITH ONE OF THE EIGHT ALE
TONE FREQUENCIES (MIL-STD-188-141A APPENDIX A PARA. 50.2) WHEN
PRESENTED TO THE RADIO ANTENNA SHALL CAUSE THE ALE MODULE TO
IDENTIFY AND REPORT THE TONE TO THE SDU.

3.2.5.4 ALE POWER UP TEST

THE ALE MODULE SHALL PERFORM A SELF TEST WHEN POWER IS FIRST APPLIED TO THE MODULE. THE FOLLOWING TESTS/CHECKS SHALL BE PERFORMED AS A MINIMUM:

1. LQA MEMORY VALIDITY CHECK FOR A KNOWN 64 BIT SIGNATURE, FAILURE SHALL CAUSE LQA MEMORY TO BE CLEARED.
2. ACTIVE CHANNEL MEMORY CHECK FOR AN ID GREATER THAN 100, OR A GROUP ID GREATER THAN 10, FAILURE SHALL RESET TO THAT ID TO 00.
3. COMPARE ALL SYSTEM OPTION SETTINGS AGAINST MAXIMUM ALLOWED VALUES, FAILURE SHALL CAUSE SYSTEM OPTION SETTINGS TO BE RESET TO DEFAULT VALUES.
4. PLACE END OF MESSAGE (EOM) MARKERS AT END OF ALL AMD MESSAGES
5. CHECK ORDERWIRE PORT SETTINGS AGAINST MAXIMUM ALLOWED VALUES, FAILURE SHALL CAUSE ORDERWIRE PORT SETTINGS TO BE RESET TO 9600 BAUD, 8 BITS, NO PARITY, 2 STOP BITS.

THE ALE MODULE SHALL SEND THE CODE "*0" INDICATING THAT THE POWER UP TESTS HAVE BEEN SUCCESSFULLY COMPLETED.

3.2.5.5 ALE CONTINUAL TESTS

THE ALE MODULE SHALL PERFORM THE FOLLOWING CHECKS DURING NORMAL OPERATION:

1. COMMAND VARIABLES WHICH ARE CHANGED IN MEMORY, MUST BE CONFIRMED, FAILURE WILL CAUSE THE UNIT TO GO OFFLINE, WITH ERROR CODE *8
2. COMMANDS FROM THE CONTROL CPU TO THE DSP PROCESSOR MUST BE CONFIRMED, FAILURE WILL CAUSE THE UNIT TO GO OFFLINE, WITH ERROR CODE *F
3. IF DSP DOES NOT REQUEST ALE DATA WITHIN ONE SECOND OF START OF ALE TRANSMISSION, THE UNIT SHALL BE PLACED IN THE OFFLINE MODE, WITH ERROR CODE *F.
4. THE ALE MODULE SHALL CONTAIN A HARDWARE "WATCHDOG", WHICH SHALL CAUSE A SYSTEM RESTART IF IT DETECTS CPU INACTIVITY IN ANY 1 SECOND INTERVAL.
5. THE ALE MODULE SHALL INITIATE SYSTEM RESTART IF INPUT POWER DROPS BELOW 4.5 VDC ±10%.
6. IF THE CONTROL PROCESSOR IS ATTEMPTING TO WRITE TO THE DSP PROCESSOR AND CAN NOT GAIN ACCESS TO THE DUAL-PORT RAM WITHIN A PERIOD OF APPROXIMATELY 1 SECOND, AN ERROR CODE "E" WILL BE ISSUED AND THE UNIT WILL BE PLACED OFFLINE.

3.2.6 PHYSICAL CHARACTERISTICS

3.2.6.1 SDU INTERFACE CONNECTOR

THE MODULE SHALL USE MULTIPIN CONNECTOR MS27508E14B18P.

3.2.6.2 MECHANICAL INTERFACE

THE MODULE CIRCUITRY SHALL BE PACKAGED TO RESIDE WITHIN THE RT-1444 MODIFICATION KIT HOUSING , MAGNAVOX PART NUMBER 660156 (THE MODIFICATION KIT MAGNAVOX PART NUMBER IS 812130-801). REFER TO APPENDIX 3 FOR DETAILS.

3.2.6.2.1   WEIGHT
THE TOTAL WEIGHT OF THE ALE MODULE ASSEMBLY AS SHIPPED
(EXCLUDING PACKING MATERIAL) SHALL NOT EXCEED 2.5 POUND.

3.2.7   RELIABILITY CHARACTERISTICS
THE ALE MODULE WHEN INTEGRATED INTO THE AN/GRC-206(V)5 SYSTEM SHALL
DEMONSTRATE A LOWER TEST MODE MTBF (θ_1) OF NOT LESS THAN 5,000 HOURS.

3.2.8   ENVIRONMENTAL CHARACTERISTICS

3.2.8.1   NON-OPERATING
THE MODULE WHEN INSTALLED IN THE AN/GRC-206(V)5 SYSTEM SHALL MEET
THE PERFORMANCE REQUIREMENTS OF THIS SPECIFICATION AFTER THE
AN/GRC-206 HAS BEEN SUBJECTED TO:

3.2.8.1.1   SALT FOG
MIL-STD-810, PROCEDURE I METHOD 509.3 (48 HOURS MIN. NON-OPERATING)

3.2.8.1.2   FUNGUS RESISTANCE
MIL-STD-810, METHOD 508.3, PROCEDURE 1

3.2.8.1.3   IMMERSION
MIL-STD-810 METHOD 512.3, NON-OPERATING.

3.2.8.1.4   SHOCK
MIL-STD-810 PROCEDURE I METHOD 516.4, FIGURE 516.4-1, GROUND
EQUIPMENT, PEAK ACCELERATION 30 G'S

3.2.8.1.5   SAND AND DUST

MIL-STD-810 PROCEDURE I, METHOD 510.3.

3.2.8.1.6   VIBRATION
HZ TO 5.5 HZ @ 1 INCH (DOUBLE AMPLITUDE)

FROM 5.5 HZ, TAPER TO 0.033 INCH (DOUBLE AMPLITUDE) AT 30 HZ TO 50 HZ
0.033 INCH (DOUBLE AMPLITUDE) FROM 50 HZ, TAPER (0.03947 INCH/HZ,
SAME RATE AS ABOVE) TO 500 HZ.

3.2.8.1.7   TEMPERATURE SHOCK
MIL-STD-810 METHOD 503.3, -40° C TO +68° C.

3.2.8.2   OPERATING

THE MODULE WHEN INSTALLED IN THE AN/GRC-206(V)5 SYSTEM SHALL BE
CAPABLE OF CONTINUOUS OPERATION (24 HOURS PER DAY) AND MEET THE
PERFORMANCE REQUIREMENTS OF THIS SPECIFICATION WHILE THE
AN/GRC-206 IS BEING SUBJECTED TO:

3.2.8.2.1   TEMPERATURE
-40° C TO +68° C

3.2.8.2.2   HUMIDITY
MIL-STD-810, PROCEDURE I METHOD 507.3, CYCLE 1, 10 DAYS PER
TABLE 507.3-II.

3.2.8.2.3   COLD START
MEET THE REQUIREMENTS OF THIS SPECIFICATION WITHIN FIVE SECONDS
FOLLOWING A COLD START AT -40 ° C .

3.2.9   ELECTROMAGNETIC RADIATION
THE MODULE, WHEN INSTALLED IN THE AN/GRC-206(V)5, SHALL NOT CAUSE AN OUT
OF COMPLIANCE CONDITION WITH RESPECT TO THE REQUIREMENTS OF MIL-STD-461
CLASS A3 (TABLE 4-1) UNDER THE FOLLOWING TEST METHODS:
CE01,CE03,CS02,CS06,RE01,RE02,RS01,RS02,RS03.

3.2.10   WORKMANSHIP
WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF
MIL-STD-454K, NOTICE 2.

3.2.11   INTERCHANGEABILITY
ALL ALE MODULE ASSEMBLIES HAVING THE SAME PART NUMBER, SHALL BE
INTERCHANGEABLE IN ACCORDANCE WITH MIL-STD-454K, REQUIREMENT 7.

3.2.12   ELECTROSTATIC DISCHARGE

THE ALE MODULE ASSEMBLY IS CONSIDERED ESD SENSITIVE. ESD PROTECTIVE
HANDLING PROCEDURES SHALL BE IMPLEMENTED. ALE MODULE ASSEMBLIES SHALL
BE PACKAGED IN CONDUCTIVE, ANTI-STATIC OR STATIC DISSIPATIVE MATERIALS.

4.0   QUALITY ASSURANCE PROVISIONS

4.1   GENERAL

THE VENDOR SHALL MAINTAIN A QUALITY ASSURANCE PROGRAM MEETING THE
REQUIREMENTS OF THE STATEMENT OF WORK (SOW).

4.2   RESPONSIBILITY FOR TEST

THE MODULE VENDOR SHALL CONDUCT TESTS AT HIS OWN FACILITY TO ENSURE
THAT THE APPLICABLE REQUIREMENTS OF THIS DOCUMENT ARE MET.   MAGNAVOX
MUST BE NOTIFIED 15 DAYS IN ADVANCE OF SUCH TESTS AND RESERVES THE RIGHT
TO WITNESS TESTS AFTER NOTIFYING THE MODULE VENDOR.

4.3   ENVIRONMENTAL STRESS SCREENING

THE ALE MODULE SHALL MEET THE PERFORMANCE REQUIREMENTS (AS DETERMINED
BY MAGNAVOX APPROVED TEST PROCEDURES) OF THIS SPECIFICATION AFTER
EXPOSURE TO THE FOLLOWING ESS CONDITIONS. THESE ESS CONDITIONS SHALL BE
APPLIED AT THE CIRCUIT CARD ASSEMBLY LEVEL WITH NO POWER APPLIED.

4.3.1   THERMAL REQUIREMENTS

25 CYCLES FROM -54°C TO +85°C AT A MINIMUM RATE OF 30°C PER MINUTE. DWELL
TIME AT EACH EXTREME SHALL BE TO TEMPERATURE STABILIZATION.

4.3.2   RANDOM VIBRATION REQUIREMENTS

TWO AXES (MINIMUM) 6 G_{RMS} (100 HZ TO 1000 HZ) FOR 10 MINUTES EACH AXIS.

4.4 QUALITY CONFORMANCE INSPECTIONS

4.4.1 PRODUCTION TESTS

THE VENDOR SHALL TEST EACH MODULE PRIOR TO SHIPMENT USING A PROCEDURE APPROVED BY MAGNAVOX. THE FOLLOWING ELEMENTS SHALL BE INCLUDED AT A MINIMUM:

TABLE 1
PRODUCTION TEST MINIMUM REQUIREMENTS

PARA NO	TITLE	MIN TEST REQUIREMENTS	APPLICABILITY
3.2.1	AUTOMATIC LINK ESTABLISHMENT	SINGLE STATION LINK, AMD MESSAGE,	ALL PRODUCTION
3.2.2.2	SOFTWARE INTERFACE	ALL COMMANDS	LOT SAMPLE
3.2.5.1	SDU-ALE DATA LINK	ECHO KEY STROKES	ALL PRODUCTION
3.2.5.2	SYSTEM TONE TRANSMISSION TEST	TRANSMIT 8 TONES	ALL PRODUCTION
3.2.5.3	SYSTEM TONE DETECTION TEST	RECEIVE 8 TONES	ALL PRODUCTION
3.2.5.4	ALE POWER UP TEST	OBSERVE PROPER ACKNOWLEDGEMENT	ALL PRODUCTION
3.2.6.2	MECHANICAL INTERFACE	VERIFY MECHANICAL CHARACTERISTICS	LOT SAMPLE
3.2.10	WORKMANSHIP	VERIFY REQUIREMENTS ARE MET	ALL PRODUCTION
N/A	TEMPERATURE STRESS TEST	72 HOURS, +50 & -30°C, 10 MIN. DWELL AT EACH EXTREME, CONTINUOUSLY CYCLE BOTH TEMP. AND UUT POWER, PRE AND POST TEST DATA REQ'D.	ALL PRODUCTION

5.0   PREPARATION FOR DELIVERY

THE ALE MODULE SHALL BE PREPARED FOR SHIPMENT IN ACCORDANCE WITH BEST
COMMERCIAL PRACTICE, WITH APPROPRIATE PRESERVATION, PACKAGING, PACKING,
AND MARKING SUCH THAT ADEQUATE PROTECTION IS PROVIDED AGAINST
CORROSION, ELECTROSTATIC DISCHARGE, DETERIORATION, AND PHYSICAL DAMAGE
DURING SHIPMENT AND HANDLING.   THE VENDOR SHALL VERIFY THAT EACH ALE
MODULE PRESENTED FOR PACK SHALL HAVE PASSED THE APPROVED ACCEPTANCE
TEST PROCEDURE (ATP), THAT THE PROPER LABEL WITH CORRECT SERIAL NUMBER IS
ATTACHED, AND THAT ALL ITEMS ON THE PARTS LIST ARE INCLUDED.

6.0   NOTES

DEFINITIONS AS REQUIRED

APPENDIX 1
ALE HARDWARE INTERFACE

10.0 INTRODUCTION

THIS DOCUMENT DEFINES THE PHYSICAL AND ELECTRICAL CHARACTERISTICS OF THE INTERFACES OF THE ALE MODEM

10.1. INTERFACE DEFINITION

10.1.1 ALE - AN/URC-114 FRONT PANEL (SEE TABLE 1)

10.1.1.1 CONNECTOR

THE CONNECTOR IS A 51 PIN MICRO D WITH PINS (MALE), ULTI-MATE NO. PR51-N02 OR EQUIVALENT.

10.1.2 ALE - RT-1209 (SEE TABLE 2)

10.1.2.1 CONNECTOR

THE CONNECTOR IS A 51 PIN MICRO D WITH SOCKETS (FEMALE), ULTI-MATE NO. CB6R51-3507 OR EQUIVALENT.

10.1.3 ALE - SDU (SEE TABLE 3)

10.1.3.1 CONNECTOR

THE CONNECTOR IS A CIRCULAR 18 PIN MILITARY STYLE TYPE MS27508E14B18P.

TABLE 1
RT FRONT PANEL TO ALE MODULE
51 PIN INTERFACE DEFINITION

SIGNAL NAME	PIN # P1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
PTT	8	IN	10K OHM PULL UP TO +5V DC TO 74HC14 INPUT TRUE V IN ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3 VDC	ACTIVATES KEYLINE FOR TRANSMISSION WHEN TRUE.
CW	9	IN	10K OHM PULL UP TO +5V DC TO 74HC240 INPUT TRUE V IN ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3 VDC	TRANSMITS 1K HZ TONE WHEN TRUE (NOT USED)
RECEIVE AUDIO	10	OUT	HIGH Z INPUT TO ALE CIRCUITRY, LOW IMPEDANCE PASSING THROUGH	+3V DC TO -3V DC	DEMODULATED RECEIVE AUDIO SIGNALS
XMT (VOICE) AUDIO	11	IN	INPUT IMPEDANCE 150 OHM ± 15 OHMS (VOICE) SWITCHED OFF WHEN DATA ENABLES IS TRUE	-36 TO -56 DBM	SIGNAL TRANSMITTED WHEN PTT IS TRUE
XMT (DATA) AUDIO	11	IN	INPUT IMPEDANCE 600 ± 60 OHMS (DATA) SWITCHED ON WHEN DATA ENABLE IS TRUE	0 DBM TO + 7 DBM	INHIBITED IF ALE MODEM IS ACTIVE
AUDIO RETURN	12	IN			
DATA ENABLE	46	IN	10K OHM PULL UP TO +5 TO 74HC240 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES DATA MODE
LOWER SIDE BAND	45	IN	20K OHM TO GROUND. MINIMUM HIGH LEVEL 10V DC, MAX LOW LEVEL 1.5V DC	+32V DC 0V DC	HIGH LEVEL SELECTS LOWER SIDEBAND
100 Hz 1	30	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES

SIGNAL NAME	PIN # P1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
100 Hz 2	21	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100 Hz 4	19	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100 Hz 8	33	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 1	31	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 2	22	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 4	20	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 8	32	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 1	29	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 2	24	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 4	23	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 8	34	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES

TABLE 1 (CONT)
RT FRONT PANEL TO ALE MODULE
51 PIN INTERFACE DEFINITION

SIGNAL NAME	PIN # P1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
100K Hz 1	28	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100K Hz 2	26	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100K Hz 4	25	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100K Hz 8	35	IN	10K PULL UP TO +5V TO 74HC244 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1M Hz 1	13	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1M Hz 2	6	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1M Hz 4	1	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1M Hz 8	17	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10M Hz 1	4	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10M Hz 2	18	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 3.5V DC FALSE $\leq$ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
2 TO 2.9999M Hz	2	IN	10K PULL UP TO +5V TO 74HC240 TRUE $\geq$ 1.5V DC FALSE $\leq$ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL ACTIVATES

TABLE 1 (CONT)
RT FRONT PANEL TO ALE MODULE
51 PIN INTERFACE DEFINITION

SIGNAL NAME	PIN # P1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
100 Hz 2	21	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100 Hz 4	19	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
100 Hz 8	33	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 1	31	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 2	22	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 4	20	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
1K Hz 8	32	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 1	29	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 2	24	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 4	23	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES
10K Hz 8	34	IN	10K PULL UP TO +5V TO 74HC244 TRUE ≥ 3.5V DC FALSE ≤ 1.5V DC	+5.3 TO -.3V DC	HIGH LEVEL ACTIVATES

TABLE 1 (CONT)
RT FRONT PANEL TO ALE MODULE
51 PIN INTERFACE DEFINITION

SIGNAL NAME	PIN # P1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
3 to 4.9999M Hz	7	IN	10K PULL UP TO +5V TO 74HC240 TRUE ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL ACTIVATEs
5 to 7.9999M Hz	14	IN	10K PULL UP TO +5V TO 74HC240 TRUE ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL ACTIVATES
8 to 11.9999M Hz	16	IN	10K PULL UP TO +5V TO 74HC240 TRUE ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL ACTIVATES
12 to 19.9999M Hz	3	IN	10K PULL UP TO +5V TO 74HC240 TRUE ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL ACTIVATES
20 to 29.9999M Hz	5	IN	10K PULL UP TO +5V TO 74HC240 TRUE ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL ACTIVATES
TX ENABLE	51	IN	12.43K IMPEDANCE TO GND TRUE ≥ 18V DC FALSE ≤ 6V DC	32V DC TO -1.5V DC	HIGH LEVEL ACTIVATES TRANSMIT ENABLE
DELTA FREQUENCY	15	IN	10K PULL UP +5V THROUGH 74HC4053 TO 74C14 TRUE ≤ 1.5V DC FALSE ≥ 3.5V DC	+5.3 TO -.3V DC	LOW LEVEL PULSE RETURNS PA COUPLER
28 VOLT FUSED	39,40	OUT	PASS THROUGH	26 ±6V	TO FRT PNL POWER SW
WAS +12V DC	50	OUT	POWER TO LOGIC ON FRONT PANEL	5.1V DC	CHANGED TO +5V
+6.5V DC	44	OUT	PASS THROUGH	6.5V DC	REGULATED TO 5VDC
28V DC ON	41 & 42	IN	@ PWR SW ON (1 AMP MAX.), PASS THROUGH	26 ± 6V DC	FRT PNL ON/OFF SWITCH
TO VOLUME CONT.	38	OUT	PASS THROUGH	N/A	FROM RADIO
FRM VOLUME CONT.	37	IN	PASS THROUGH	N/A	TO RADIO
VOL CONT COMMON	36		PASS THROUGH	N/A	
GROUND	27, 47, 48		CONNECTED TO ALE MODULE CASTING & RT CHASSIS	N/A	

TABLE 2
ALE MODULE TO RT-1209 CHASSIS
51 Pin Interface Definition

SIGNAL NAME	Pin #J1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
SPARE	43 &49		PASS THROUGH	N/A	
PTT	8	OUT	OPEN COLLECTOR WITH DIODE CLAMP TO +28V. TRUE ≤ .7V DC FALSE ≤ 35 OHM A	32V DC .1 AMP	PULL UP IN RT1209 ACTIVATES KEYLINE
CW	9	OUT	OPEN COLLECTOR TRUE ≤ .7V DC FALSE ≤ .5 MA	13V DC 10 MA	PULL UP IN RT1209 TX 1K HZ WHEN TRUE (NOT USED)
RECEIVE AUDIO	10	IN	HIGH IMPEDANCE RECEIVER 500 ±100 OHM TO BE CONNECTED THROUGH FRONT PANEL		DEMODULATED RECEIVE AUDIO SIGNALS
XMIT (VOICE) AUDIO	11	OUT	LOW IMPEDANCE OUTPUT LESS THAN 10 OHMS	-36 to -56 dBm	SIGNAL TRANSMITTED WHEN PTT IS TRUE
XMIT (DATA) AUDIO	11	OUT	LOW IMPEDANCE OUTPUT LESS THAN 10 OHMS	+7 to 0 dBm	SIGNAL TRANSMITTED WHEN PTT IS TRUE
AUDIO RETURN	2	IN	ISOLATED AUDIO RETURN		CONNECTED TO GND IN DEMOD IN RT1209
DATA ENABLE	46	OUT	OPEN COLLECTOR OUTPUT	32V DC 10MA MAX	PULL UP IN RT1209 HIGH ACTIVATES DATA MODE
LOWER SIDE BAND	45	OUT	TRUE ≥ (28V ON - 1V) FALSE ≤ 10 MICRO AMP	32V DC .1 AMP	HIGH ACTIVATES LOWER SIDE BAND
100 Hz 1	30	OUT	TRUE ≥ 4V DC FALSE ≤ 1V DC	+5.1 6 MA	HIGH LEVEL ACTIVATES
100 Hz 2	21	OUT	TRUE ≥ 4V DC FALSE ≤ 1V DC	+5.1 6 MA	HIGH LEVEL ACTIVATES

TABLE 2 (CONT)
ALE MODULE TO RT-1209 CHASSIS
51 PIN INTERFACE DEFINITION

SIGNAL NAME	PIN # J1	ALE IN/OUT	SIGNAL CHARACTERISTICS		MAX. RATING	RESPONS
100 Hz 4	19	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
100 Hz 8	33	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
1K Hz 1	31	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
1K Hz 2	22	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
1K Hz 4	20	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
1K Hz 8	32	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
10K Hz 1	29	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
10K Hz 2	24	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
10K Hz 4	23	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
10K Hz 8	34	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
100K Hz 1	28	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
100K Hz 2	26	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
100K Hz 4	25	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES
100K Hz 8	35	OUT	TRUE ≥ 4V DC	FALSE ≤ 1V DC	+5.1, 6 MA	HIGH LEVEL ACTIVATES

TABLE 2 (CONT)
ALE MODULE TO RT-1209 CHASSIS
51 Pin Interface Definition

SIGNAL NAME	PIN # J1	ALE IN/OUT	SIGNAL CHARACTERISTICS	MAX. RATING	RESPONSE
1M Hz 1	13	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≥ 4V DC FALSE ≤ 1V DC	32V DC 100 MA	PULL UP IN RT1209, ACTIVE HIGH
1M Hz 2	6	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≥ 4V DC FALSE ≤ 1V DC	32V DC 100 MA	PULL UP IN RT1209, ACTIVE HIGH
1M Hz 4	1	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≥ 4V DC FALSE ≤ 1V DC	32V DC 100 MA	PULL UP IN RT1209, ACTIVE HIGH
1M Hz 8	17	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≥ 4V DC FALSE ≤ 1V DC	32V DC 100 MA	PULL UP IN RT1209, ACTIVE HIGH
10M Hz 1	4	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≥ 4V DC FALSE ≤ 1V DC	32V DC 100 MA	PULL UP IN RT1209, ACTIVE HIGH
10M Hz 2	18	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≥ 4V DC FALSE ≤ 1V DC	32V DC 100 MA	PULL UP IN RT1209, ACTIVE HIGH
2 to 2.9999M Hz Band	2	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≤ .9V DC FALSE ≤ 300 OHM MA	32V DC 100 MA	PULL UP IN RT1209, ACTIVE LOW
3 to 4.9999M Hz Band	7	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≤ .9V DC FALSE ≤ 300 OHM MA	32V DC 100 MA	PULL UP IN RT1209, ACTIVE LOW
5 to 7.9999M Hz Band	14	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≤ .9V DC FALSE ≤ 300 OHM MA	32V DC 100 MA	PULL UP IN RT1209, ACTIVE LOW
8 to 11.9999M Hz Band	16	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≤ .9V DC FALSE ≤ 300 OHM MA	32V DC 100 MA	PULL UP IN RT1209, ACTIVE LOW
12 to 19.9999M Hz Band	3	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≤ .9V DC FALSE ≤ 300 OHM MA	32V DC 100 MA	PULL UP IN RT1209, ACTIVE LOW

TABLE 2 (CONT)
ALE MODULE TO RT-1209 CHASSIS
51 PIN INTERFACE DEFINITION

| SIGNAL NAME	PIN #	ALE IN/OUT	SIGNAL CHARACTERISTICS FRONT PANEL INTERFACE	MAX. RATING	RESPONSE
20 to 29.9999M Hz BAND	5	OUT	OPEN COLLECTOR OUTPUT, CLAMP DIODE TO 28V DC TRUE ≤ .9V DC FALSE ≤ 300 OHM MA	32V DC 100 MA	PULL UP IN RT1209, ACTIVE LOW
TX ENABLE	51	OUT	TRUE ≥ 19.7V DC FALSE ≤ .89V DC	32V DC 100 MA	HIGH LEVEL ACTIVATES TRANSMIT ENABLE
DELTA FREQUENCY	15	OUT	≥ 100 MICRO SECOND, ACTIVE LOW PULSE ACTIVATED BY FREQUENCY CHANGES ≥ 1000 HZ, OPEN COLLECTOR	32V DC 10 MA MAX	PULL UP IN RT1209, ACTIVE LOW
28 VOLT FUSED	39+ 40	IN	BATTERY POWER PASS THROUGH	FUSED AT 2 AMPS	
PREVIOUS +12V DC	50	IN	12.5V DC NOT USED		
+6.5V DC	44	IN	REGULATED DOWN TO 5.1V DC ±5% USED FOR ALE MODULE.	MAXIMUM REQUIREMENT 270 MA	
+28V DC ON	41 & 42	OUT	SWITCHED BATTERY POWER 26±6V DC PASS THROUGH.	1 AMP	
TO VOLUME CONTROL	38	IN	LOW LEVEL AUDIO SIGNAL CONTROL FROM RT1209 ALE MODULE TO FRONT PANEL. (PASS THROUGH)	14.4 MVRMS	
FROM VOLUME CONTROL	37	OUT	LOW LEVEL AUDIO SIGNAL CONTROL TO RT1209 ALE MODULE FROM FRONT PANEL. (PASS THROUGH)		
VOLUME CONTROL COMMON	36		PASS THROUGH.		
GROUND	27, 47, & 48		CONNECTED TO ALE MODULE CASTING & RT1209 CHASSIS		
SPARE	43 & 49		PASS THROUGH.		

TABLE 3
ALE MODULE TO GRC-206 SDU INTERFACE

SIGNAL	PIN	IN/OUT AT ALE MODULE	SIGNAL CHARACTERISTICS	MAX RATING	RESPONSE	
SHIELD GROUND	T	-	CONNECTED TO CASTING		0V	P2-12
SERIAL CONTROL IN	K	IN	EIA-RS232 COMPATIBLE 9600 BAUD DATA* DATA WORD FORMAT FIXED: 8 DATA BITS, 1 STOP BIT, NO PARITY *EVEN*	±10V	RS-232 CONTROL TO ALE FROM SDU	P2-16
SERIAL STATUS OUT	R	OUT	EIA-RS232 COMPATIBLE 9600 BAUD DATA* DATA WORD FORMAT FIXED: 8 DATA BITS, 1 STOP BIT, NO PARITY	±10V	RS-232 STATUS FROM ALE TO SDU	P2-1
SQLIND	J	IN	MAXIMUM LOW LEVEL VOLTAGE .8V MINIMUM HIGH LEVEL VOLTAGE 2V	+5.25V	LOGIC (GND) = RX TRAFFIC LOGIC (+5V) = NO TRAFFIC	P2-21
GND	N	-	CONNECTED TO CASTING		0V	P2-4
SPARE	P					
ORDERWIRE/CONTROL SERIAL IN	A	IN	EIA-RS232 COMPATIBLE 9600 BAUD RATE* DATA WORD FORMAT PROGRAMMABLE	±10V	RS-232 ORDERWIRE DATA/CONTROL TO ALE FROM SDU	P2-17
ORDERWIRE/CONTROL SERIAL OUT	B	OUT	EIA-RS232 COMPATIBLE 9600 BAUD RATE* DATA WORD FORMAT PROGRAMMABLE	±10V	RS-232 ORDERWIRE DATA/CONTROL FROM ALE TO SDU	P2-2
PC TERMINAL INSTALLED	C	IN	MAXIMUM LOW LEVEL VOLTAGE .8V MINIMUM HIGH LEVEL VOLTAGE 2V	+5.25V	LOW = CONTROL OF HFSSB ALE AT TERMINAL	P2-18
ORDERWIRE CTS	D	OUT	≥ 3V = ACTIVE ≤ -3V = INACTIVE	±10V	RS-232 ORDERWIRE CTS FROM ALE TO SDU	NC
SDU CABLE INSTALLED	E	IN	MAXIMUM LOW LEVEL VOLTAGE .8V MINIMUM HIGH LEVEL VOLTAGE 2V	+5.25V	LOW (WITH HIGH ON PIN C) = CONTROL OF HFSSB-ALE AT RSC	P2-6
TX AUDIO	F	OUT	BUFFERED AUDIO	2 VAC	TEST ONLY	P2-13
RX AUDIO	L	OUT	RX AUDIO INPUT TO ALE	3 VAC	TEST ONLY	P2-10
CONTROL TO INTERFACE	G	OUT	DIGITAL DATA	5 VDC	TEST ONLY	P2-9
SHIFT CLK	H	OUT	DIGITAL PULSES	5.25 VDC	TEST ONLY	P2-24
LATCH CLK	M	OUT	DIGITAL STROBE PULSE	5.25 VDC	TEST ONLY	P2-

ALE pin 16

ALE pin 1

5 +5V buffered
5
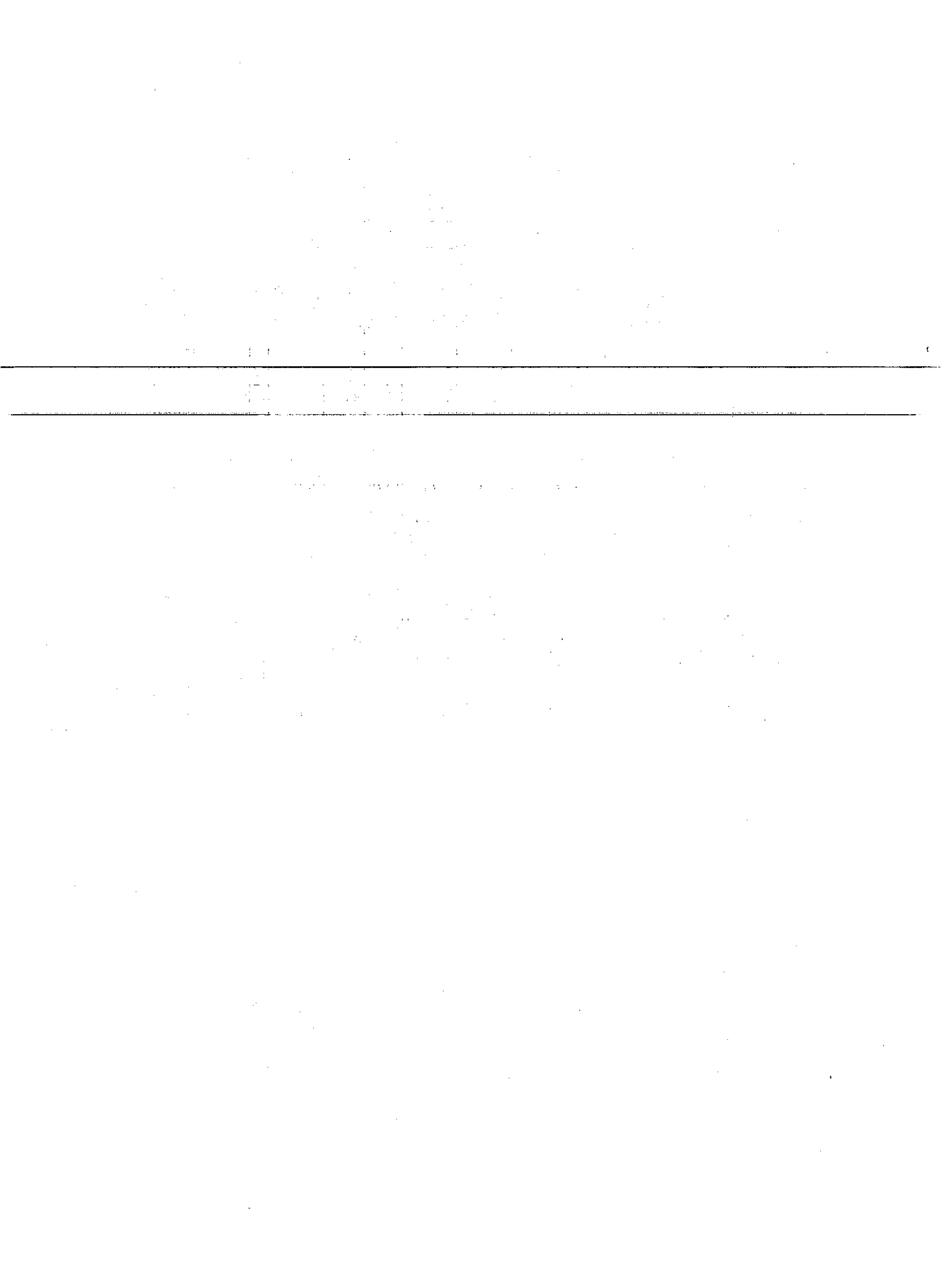
APPENDIX 2
ALE SOFTWARE INTERFACE

20.0 INTERNAL MEMORY STRUCTURE OF THE EMBEDDED ALE CONTROLLER

20.1 ACCESSING ALE MEMORIES

20.1.1 GENERAL

GAINING ACCESS TO THE DATA CONTAINED IN EACH OF THE ALE MEMORIES REQUIRES THE USE OF THE MEMORY ACTIVATION COMMAND 'ME'. THIS COMMAND REQUIRES TWO PIECES OF INFORMATION, MEMORY 'TYPE' AND MEMORY 'INDEX'.

20.1.1.1 MEMORY TYPE

THE MEMORY 'TYPE' IS A SINGLE CHARACTER USED TO REPRESENT THE DESIRED MEMORY. USE 'C' FOR CHANNEL MEMORY, 'S' FOR SELF ID MEMORY, 'O' FOR OTHER ID MEMORY, 'N' FOR NET ID MEMORY, 'G' FOR GROUP MEMORY, AND 'A' FOR ACTIVE CHANNEL MEMORY.

20.1.1.2 MEMORY INDEX

THE MEMORY 'INDEX' IS THE NUMBER OF THE DESIRED MEMORY ITSELF. FOR EXAMPLE, USE 'ME C 15' TO ACCESS THE MEMORY CONTAINING THE DATA FOR CHANNEL #15.

20.1.2 MEMORY RELATED COMMANDS

ONCE A PARTICULAR MEMORY HAS BEEN ACTIVATED, THE CONTENTS OF THAT MEMORY MAY BE READ-FROM OR WRITTEN-TO BY USING THE MEMORY-RELATED COMMANDS AS LISTED IN TABLE 1 BELOW. (ALSO REFER ALSO TO THE SECTION ON DETAILED COMMAND DESCRIPTIONS.)

TABLE 1
MEMORY RELATED COMMANDS

MEMORY TYPE	VALID COMMANDS
CHANNEL MEMORY	CF RM RX SA SI TM TX ZZ
SELF ID MEMORY	FI ID MA MB ZZ
OTHER ID MEMORY	FI ID MA MB WR ZZ
NET ID MEMORY	FI ID MA MB NM NW ZZ
GROUP ID MEMORY	FI ID MA MB ZZ
ACTIVE CHANNELS	FI ID MA MB ZZ

1.1.1.1

20.1.3 MEMORY DESCRIPTIONS

NOTE THAT NOT ALL COMMANDS WILL FUNCTION WITH ALL MEMORIES. EACH MEMORY 'TYPE' REPRESENTS A UNIQUE DATA STRUCTURE WHICH REQUIRES DIFFERENT COMMANDS TO ACCESS. ATTEMPTING TO UTILIZE A COMMAND WHICH IS NOT DESIGNED FOR A PARTICULAR MEMORY WILL RESULT IN AN ERROR CODE AND THE COMMAND WILL BE IGNORED. ONLY ONE MEMORY MAY BE ACTIVATED AT A TIME - OPENING A NEW MEMORY FOR ACCESS AUTOMATICALLY CLOSES ANY PREVIOUSLY OPENED ONE.

20.1.3.1 ID AND CHANNEL MEMORIES

20.1.3.1.1 CHANNEL MEMORY
ONE HUNDRED MEMORIES ARE AVAILABLE FOR THE STORAGE OF
PARAMETERS RELATING TO HF RADIO CHANNELS. THESE INCLUDE THE
TRANSMIT/RECEIVE FREQUENCIES, SIDEBAND MODES, A PROGRAMMABLE
24 HOUR TIMER FOR USE WITH AUTOMATIC SOUNDING AND A SELECTABLE
SOUNDING ADDRESS.

20.1.3.1.2 ACTIVE CHANNEL MEMORY
TEN PROGRAMMABLE 'ACTIVE-CHANNEL' MEMORIES ARE AVAILABLE. ALL
ALE ACTIVITY, SUCH AS SCANNING, CALLING, LINKING, AND SOUNDING WILL
BE LIMITED TO THOSE CHANNELS DEFINED WITHIN THE CURRENT ACTIVE
CHANNEL MEMORY. EACH MEMORY MAY BE PROGRAMMED TO INCLUDE
ANY OR ALL OF THE 100 AVAILABLE CHANNELS. EACH GROUP OF
CHANNELS MAY BE ASSIGNED AN OPTIONAL ALPHA-NUMERIC NAME.

20.1.3.1.3 SELF ID MEMORY
TWENTY MEMORIES ARE AVAILABLE FOR STORAGE OF PARAMETERS
RELATING TO 'THIS' STATION. THESE INCLUDE THE 'SELF ID' (OR ADDRESS),
AND THE CHANNEL ASSIGNMENT MATRIX. A 'SELF-ID' IS DEFINED AS A
UNIQUE 15 CHARACTER (MAX) ALPHA-NUMERIC CALL-SIGN WHICH IS USED
TO IDENTIFY THIS PARTICULAR STATION. DURING ACTUAL OPERATION, THE
DESTINATION ADDRESS OF EACH INCOMING ALE CALL IS COMPARED TO
THE ADDRESSES STORED IN EACH OF THE 20 AVAILABLE SELF-ID
MEMORIES. THE UNIT WILL REPLY TO THE CALL ONLY IF A MATCH IS FOUND
AND IF THE CHANNEL ASSIGNMENT MATRIX AND SYSTEM OPTIONS PERMIT.

20.1.3.1.4 OTHER ID MEMORY
ONE HUNDRED MEMORIES ARE AVAILABLE FOR STORAGE OF PARAMETERS
USED TO DEFINE 'OTHER' STATIONS. THESE INCLUDE THE 'OTHER ID' (CALL-
SIGN) CHARACTERS, THE CHANNEL ASSIGNMENT MATRIX, AND THE 'WAIT-
FOR-REPLY' TIME. THE WAIT-FOR-REPLY TIME IS USED TO INFORM THE ALE
OF THE MAXIMUM AMOUNT OF TIME TO ALLOW FOR A REPLY WHEN
CALLING A PARTICULAR STATION. THIS ALLOWS THE USER TO
COMPENSATE FOR THE DIFFERENT TUNE TIMES AND TURN-AROUND
DELAYS FOUND IN DIFFERENT STATION HARDWARE IMPLEMENTATIONS.

20.1.3.1.5 NET ID MEMORY
TWENTY MEMORIES ARE AVAILABLE FOR STORAGE OF PARAMETERS USED
TO DEFINE NETWORKS. . THE NET MEMORY PARAMETERS INCLUDE THE
'NET ID' (CALL-SIGN) CHARACTERS, THE NET-MEMBER ASSIGNMENT MATRIX
(100 MEMBERS), AND THE NUMBER OF 'THIS' UNITS TIME 'SLOT' . SLOT
WIDTH IS CALCULATED AUTOMATICALLY.

j

20.1.3.1.6   GROUP ID MEMORY
TWENTY MEMORIES ARE AVAILABLE FOR STORAGE OF PARAMETERS USED
TO DEFINE GROUPS. A GROUP IS A NONPREARRANGED COLLECTION OF
STATIONS WHICH ANSWER TO A SINGLE ALE CALL USING A TIME-SLOT
FORMAT. THE GROUP MEMORY PARAMETERS INCLUDE THE 'GROUP ID'
(CALL-SIGN) AND THE GROUP-MEMBER ASSIGNMENT MATRIX.

20.1.3.2 LINK QUALITY ASSESSMENT (LQA) MEMORY

LINK QUALITY DATA (LQA) IS HELD IN A 32K X 8 BIT STATIC RAM WHICH WILL
RETAIN DATA FOR AT LEAST 10 HOURS WITH NO POWER APPLIED.

20.1.3.2.1   LQA SIZE
THE ALE MAINTAINS AN ARRAY OF BYTES CONTAINING THE LINK QUALITY
MEASUREMENTS FOR EACH STATION ON EACH CHANNEL (UP TO 20,000
MEASUREMENTS MAY BE MAINTAINED).

20.1.3.2.2   LQA ACCESS
THE LQA MEMORY IS ACCESSED VIA THE LQ COMMAND.

20.1.3.2.3   LQA DECAY
THE LQA MEMORY ARRAY CAN BE PROGRAMMED TO DECAY IN VALUE. TO
COMPENSATE FOR CONTINUOUSLY VARYING HF PROPAGATION
CONDITIONS. THE OLDEST LQA MEASUREMENTS ARE GIVEN THE LEAST
VALUE.

20.2 COMMANDS

20.2.1 GENERAL:

ALL COMMAND AND STATUS FUNCTIONS CONSIST OF SERIAL ASCII CHARACTERS.
THE BASIC COMMAND FORMAT CONSISTS OF A UNIQUE TWO-LETTER COMMAND
IDENTIFIER FOLLOWED BY A VARIABLE NUMBER OF COMMAND PARAMETERS. ALL
COMMANDS SENT TO THE ALE CONTROLLER WILL BE ACKNOWLEDGED WITH A CODE
WHICH INFORMS THE SDU THAT THE COMMAND HAS BEEN PROCESSED AND IT IS
READY TO ACCEPT ANOTHER ONE.

20.2.2. COMMAND ACKNOWLEDGE CODES

AN ACKNOWLEDGE CODE (SEE TABLE 2) CONSISTS OF AN ASCII 'ASTERISK'
CHARACTER [HEX 2A] FOLLOWED BY A SINGLE NUMERIC DIGIT - TERMINATED WITH A
CARRIAGE RETURN. THIS CODE IS RETURNED BY THE ALE AFTER EVERY COMMAND (
EXCEPT BITE COMMAND BI8) ISSUED FROM THE SDU AND IS USED TO INDICATE THAT
ALL PROCESSING HAS BEEN COMPLETED AND THAT THE ALE IS NOW AVAILABLE TO
ACCEPT FURTHER COMMANDS.

EXAMPLE:
SDU SENDS A MEMORY COMMAND TO THE ALE:
ME S 00
ALE RETURNS THE ACKNOWLEDGE CODE: *1 <CR>

NOTE: CODE *0 IS ISSUED BY THE ALE AUTOMATICALLY ON POWER-UP.

TABLE 2
ACKNOWLEDGE CODES

CODE	DESCRIPTION
0	ALE POWER UP INITIALIZATION IS COMPLETE.
1	THE COMMAND WAS RECEIVED AND PROCESSED 'OK'.
2	A COMMAND SYNTAX ERROR WAS DETECTED.
3	A COMMAND VARIABLE WAS OUT OF RANGE.
4	THE SELECTED TO OR FR(OM) 'ID' IS EMPTY.
5	AN EMPTY SCAN-GROUP HAS BEEN ACTIVATED. (WARNING)
6	ILLEGAL COMMAND CONTEXT (WRONG 'MEMORY', ETC).
7	ID/MSG ERROR - CHARACTER NOT ALLOWED .
8	EEPROM 'WRITE' FAULT .
9	MEMORY LOCATION IS EMPTY
*A	RESERVED
*B	RESERVED
*C	RESERVED
*D	RESERVED
*E	INACTIVE DUAL PORT RAM INTL LINE
*F	NO DSP COMMAND-ECHO RECEIVED

1.1.1.2

20.2.3. STATUS

20.2.3.1. GENERAL

ALMOST EVERY COMMAND TO THE ALE HAS A CORRESPONDING STATUS
REQUEST FORMAT, TO ALLOW THE SDU TO QUERY THE ALE ON THE CURRENT
STATE OF ANY PARAMETER. A STATUS REQUEST IS ACCOMPLISHED BY
ISSUING THE COMMAND FOR THE PARAMETER DESIRED AND REPLACING THE
NORMAL COMMAND PARAMETERS WITH A QUESTION MARK. AN ASCII
'PERCENT SIGN' [HEX 25] WILL BE USED TO PREFIX ALL STATUS REPORTS
RETURNED TO THE SDU, TO PREVENT CONFUSION WITH COMMANDS WHICH
MAY BE ISSUED IN THE SAME FORMAT.

EXAMPLE:
SDU REQUESTS MODE STATUS FROM ALE: MO ?
CHANNEL STATUS RETURNED FROM ALE: %MO 2 *1 <CR>

20.2.3.2 AUTOMATIC CHANNEL CHANGE STATUS

THE ALE WILL KEEP THE SDU INFORMED OF THE CURRENT CHANNEL NUMBER, FREQUENCY, AND MODE DURING ANY CHANNEL CHANGE. AT POWER UP, THE CHANNEL IN USE AT POWER DOWN WILL BE PROVIDED. THIS WILL BE PROVIDED AS A STRING OF CHARACTERS IN THE FOLLOWING FORMAT:

#T#####MR#####M*#(ACK)

WHERE:

\# = CHANNEL NUMBER

(T OR R) ##### = TRANSMIT OR RECEIVE FREQUENCY

M = U = USB, OR L = LSB

AUTOMATIC LINK STATUS

LINK STATUS SHALL BE SENT TO THE SDU AUTOMATICALLY WHEN ANY OF THE EVENTS REFERENCED IN TABLE 3 (LINK STATUS CODES) OCCUR. THE FORMAT OF THE LINK STATUS MESSAGE IS CONTROLLED BY THE SETTING OF SYSTEM OPTION 22 PER TABLE 5. :

	CONDITION	LINK STATUS FORMAT
DELETE THIS TABLE		

20.2.4 COMMAND DESCRIPTIONS

20.2.4.1 GENERAL

A COMMAND CONSISTS OF A TWO-LETTER COMMAND IDENTIFIER FOLLOWED BY A VARIABLE NUMBER OF PARAMETERS AS RELATED TO THE INDIVIDUAL COMMAND FUNCTION. EACH COMMAND HAS A CORRESPONDING 'STATUS REQUEST' OPTION WHICH ALLOWS THE SDU TO INQUIRE ABOUT THE CURRENT STATE OF THE VARIABLES ASSOCIATED WITH THE COMMAND. THESE STATUS REQUESTS MAY BE ISSUED AT ANY TIME SINCE THEY DO NOT ALTER SYSTEM OPERATION IN ANY WAY.

20.2.4.2 COMMAND APPLICATION RESTRICTIONS

DO NOT CHANGE ANY CRITICAL MEMORY CONTENTS WHILE LINKED OR WHILE IN THE PROCESS OF ATTEMPTING A LINK. PLACE THE UNIT INTO SETUP MODE PRIOR TO A 'FILL'.

20.2.4.3 DETAILED COMMAND DESCRIPTIONS

20.2.4.3.1 GENERAL

THE SYMBOL '#' IS USED TO REPRESENT A SINGLE NUMERIC DIGIT. MULTIPLE USES OF THE '#' SYMBOL INDICATE THE NEED FOR AN EQUIVALENT NUMBER OF DIGITS. THESE DIGITS MAY BE DECIMAL OR HEXADECIMAL IN NATURE DEPENDING UPON THE INDIVIDUAL COMMANDS REQUIREMENT, EACH COMMAND WILL DESCRIBE PROPER USAGE. LEADING ZEROS MUST BE PROVIDED TO RESULT IN THE REQUIRED NUMBER OF DIGITS.

20.2.4.3.2   [BI] - BITE
USED TO INITIATE SELF TEST OPERATIONS.

FORMAT: BI #

PARAMETERS:
        # = 0-7: TRANSMITS ONE OF EIGHT TONES
        # = 8: WILL ECHO ANY CHARACTER, AND EXECUTE ANY
RECOGNIZED   COMMAND. WILL NOT RETURN AN
ACKNOWLEDGE CODE. ENTER BI9 TO EXIT AND TERMINATE BITE

        # = 9: EXIT BITE MODE

STATUS:
        IF OPERATING IN BITE MODE, BI? RETURNS THE DETECTED TONE
        NUMBER (0 THRU 7) TRANSMITTED BY A SECOND ALE SYSTEM
OPERATING IN BI 0 THRU 7 BITE MODE (TRANSMITTING THE TONE)
        %BI# QQQQ (SYSTEM OPTION 18=0)
        WHERE # IS THE TONE NUMBER, Q IS RECEIVED QUALITY NUMBER

        %BI QQQQ QQQQ QQQQ QQQQ QQQQ QQQQ QQQQ QQQQ (SYSTEM
        OPTION 18 = 1)
        WHERE QQQQ REPRESENTS THE TONE LEVEL DETECTED. TONE 0
        BEING THE LEFT GROUP OF 4 AND TONE 7 THE RIGHT GROUP OF 4.

20.2.4.3.3   [BR] - BREAK LINK DATA I/O
USED TO INTERRUPT DTM ORDERWIRE TRANSMISSIONS, WITHOUT
BREAKING THE LINK.

FORMAT: BR 1

PARAMETERS: IMPLIED

STATUS: NONE

THIS COMMAND WILL AUTOMATICALLY CLEAR THE BUFFER.
20.2.4.3.4   [CF] - CHANNEL FLAG SELECTION
USED TO SET OR CLEAR THE VARIOUS CHANNEL FLAG BITS WITHIN AN
INDIVIDUAL CHANNEL MEMORY. THESE BITS CAN CONTROL VARIOUS
FUNCTIONS ON A PER-CHANNEL BASIS. THIS COMMAND REQUIRES THAT A
'CHANNEL MEMORY' MUST BE ACTIVATED PRIOR TO USE (REFER TO ME
COMMAND).

FORMAT: CF ##(FLAG)

PARAMETERS: (FLAG)
        TWO DIGIT 'HEX' NUMBER (00 - FF)

STATUS: CF?

RESULT: %CF ##(FLAG) *#(ACK)

<u>CURRENT FLAG BIT ASSIGNMENTS:</u>
        BIT 0: 1 = ENABLE SOUNDING ,   0 = DISABLE SOUNDING
        BIT 1: 1 = BLOCK AUTOMATIC TRANSMISSIONS. (RX ONLY),
        0 = NORMAL RX/TX MODE
        BITS 2 THROUGH 7 ARE UNASSIGNED.

20.2.4.3.5   [CH] - CHANNEL SELECTION
USED TO INFORM THE ALE OF MANUAL CHANNEL SELECTIONS.

    FORMAT: CH ## (CHAN)

    PARAMETERS: (CHAN) = 2 DIGIT DECIMAL CHANNEL NUMBER (00-99)

    RESULT: %CH## T#####M R#####M*#(ACK)
        WHERE M= U OR L FOR UPPER OR LOWER SIDEBAND, C=CHANNEL #,
        T=TRANSMIT FREQ,   R=RECEIVE FREQ.

    STATUS: CH ?

    RESULT: %CH ##(CHAN) *#(ACK)

    THE UNIT WILL AUTOMATICALLY BE PLACED INTO 'SC ALE' MODE IF A
    CHANNEL COMMAND IS RECEIVED WHILE OPERATING IN EITHER OF THE
    'SCAN' (ALE 2 OR ALE 5) MODES, AND A WARNING (*A) WILL BE SENT IF
OPERATING IN A LINKED OR TRANSMITTING MODE. .

20.2.4.3.6   -[CL] ALE CALL
USED TO INITIATE AN ALE TRANSMISSION.

    FORMAT: CL ##(MSG) #(CONCL)

F3

    PARAMETERS:
        (MSG) = SELECTS TRANSMISSION OF AN AMD ORDERWIRE
        MESSAGE:
            '01' - '20 ' = SELECTS ONE OF THE TWENTY ONE AVAILABLE
                'CANNED' ORDERWIRE MESSAGES.
    '21' = "LIVE" AMD MESSAGE
            '00' = DO NOT SEND AN AMD ORDERWIRE MSG
        (CONCL) = SELECTS THE CALL 'CONCLUSION' TYPE AS FOLLOWS:
            '0' = THIS IS (USED TO REQUEST A LINK OR TO MAINTAIN
                AN EXISTING LINK).
            '1' = THIS WAS (USED TO TERMINATE A LINK OR TO
                REJECT REPLIES).
            '2' = ABORT (QUIETLY ABORTS A LINK OR A CALL IN
                PROCESS).
            '3' = RELINK (AUTOMATICALLY HANG UP AND CALLS THE
                STATION BACK ON   ANOTHER CHANNEL.)
            '4' = LQA POLL (INITIATE AN LQA POLL. AUTOMATICALLY
                CALLS THE SELECTED STATION AND
                EXCHANGES LQA ON EACH CHANNEL)
    STATUS: CL ?
    RESULT: %CL #(MSG) #(CONCL) *#(ACK)

    AN 'LK5' STATUS CODE WILL RESULT IF THE UNIT IS UNABLE TO PROCEED
    WITH THE TRANSMISSION REQUEST.
[CS] - CHECK SUM
USED TO VERIFY FUNCTION AND CONTENTS OF MEMORY
    STATUS: CS?
    RESULT: %CS####*#(ACK)
VERSION 1.00 = DFD0

How do you specify the call sign use with TO

20.2.4.3.7 [FI] - FIND INDEX
USED TO SEARCH MEMORY FOR A GIVEN STATION ADDRESS. GENERALLY
FOLLOWS THE MIL-STD-141A WILDCARD CONVENTIONS , TO FIND
ADDRESSES WITH MINIMAL CHARACTERS DEFINED

FORMAT: FI "ADDRESS" ?

PARAMETERS: "ADDRESS" = STATION ADDRESS CHARACTERS (15 MAX)
      (MUST BE ENCLOSED WITHIN DOUBLE-QUOTE
      CHARACTERS [HEX 22].)
RESULT:
    %FI "ADDRESS" #(MEMORY TYPE) ##(MEMORY INDEX)*#(ACK)
    %FI "ADDRESS" #(MEMORY TYPE) ##(MEMORY INDEX)*#(ACK)
    *#(ACK) (%FI LINE REPEATS AS REQUIRED)
    WHERE "ADDRESS" MAY BE UP TO 15 ALPHA-NUMERIC CHARACTERS
    MEMORY TYPE MAY BE:, S, O, N, G, OR A
    MEMORY INDEX MAY BE ANY VALUE BETWEEN 00 AND 99

    RETURNS %FI "ADDRESS"?*#(ACK) IF THE ADDRESS IS NOT
FOUND.

20.2.4.3.8 [FO] - FORMAT
ENABLES OR DISABLES THE ADDITION OF LINE FEEDS AND SPACE
CHARACTERS TO THE OUTPUT COMMANDS/STATUS FROM THE ALE.

FORMAT: FO # (MODE)

PARAMETERS: (MODE)
1 = ADD LINE FEEDS AND SPACE CHARACTERS
0 = NO ADDITIONAL LINE FEEDS AND SPACES

STATUS: FO ?

RESULT: %FO # (MODE) *#(ACK)

20.2.4.3.9 [FR] - CALL SOURCE SELECTION
SELECTS THE SOURCE ADDRESS (SELF ID) TO BE USED FOR 'OUTGOING'
ALE TRANSMISSIONS.

FORMAT: FR ##(INDEX)

PARAMETERS: (INDEX) = 2 DIGIT INDEX OF THE 'SELF ID' MEMORY IN
WHICH THE DESIRED 'FROM' ADDRESS RESIDES.   VALID RANGE = 00-19.

STATUS: FR ?

RESULT: %FR ##(INDEX) *#(ACK)

SELECTION OF AN 'EMPTY' SELF ID MEMORY WILL RESULT IN AN
'ACK CODE' OF *4

20.2.4.3.10   [GR] - ACTIVE CHANNEL GROUP SELECTION
SELECTS ONE OF TEN AVAILABLE 'GROUPS' OF CHANNELS TO BE
ACTIVATED FOR RECEIVE 'SCANNING' AND ALE CALLING.

FORMAT: GR #(GRP)

PARAMETERS: (GRP) = SINGLE DIGIT GROUP NUMBER (0-9).

STATUS: GR ?

RESULT: %GR #(GRP) *#(ACK)

AN 'ACK CODE' OF *5 WILL BE RETURNED AS A WARNING IF AN 'EMPTY'
GROUP IS SELECTED. ALL ALE ACTIVITY WILL BE CONFINED TO THOSE
CHANNELS WITHIN THE CURRENTLY ACTIVATED 'GROUP'.

20.2.4.3.11   [ID] STATION ADDRESS ENTRY
ENTERS THE STATION CALL-SIGN CHARACTERS (15 MAX) INTO THE
CURRENTLY ACTIVE 'SELF', 'OTHER', OR 'NET' MEMORY.

FORMAT: ID "ADDRESS"

PARAMETERS: "ADDRESS" = STATION ADDRESS CHARACTERS (15 MAX)
(MUST BE ENCLOSED WITHIN DOUBLE-QUOTE CHARACTERS [HEX 22].)

STATUS: ID ?

RESULT: %ID "ADDRESS" *#(ACK)

20.2.4.3.13   [LK] - LINK STATUS REQUEST
               REQUESTS STATUS OF THE ALE SYSTEM.

       FORMAT: LK ?

       PARAMETERS: NONE

       STATUS: IMPLIED

       RESULT:
   (SYSTEM OPTION 22 = 00)
   %LK ##(CODE) #(TYPE) ##(DESTINATION) ##(SOURCE)
       ##(NET) *#(ACK)
   (SYSTEM OPTION 22 = 01)
   %LK ##(CODE) #(TYPE) ##(DESTINATION) ##(SOURCE)
       ##(NET) ##(CH) ##(TLQA) ##(FMLQA) *#(ACK)

       CODE (LINK STATUS);
               SEE TABLE 3 FOR EXPLANATION
       TYPE:
               0=CALLS WHICH REQUIRE NO RESPONSE
               1=ALLCALLS
               2=INDIVIDUAL CALLS
               3=ANYCALL, WILDCARD, PSEUDO-RANDOM SLOTTED RESPONSE
               4=GROUP CALL
               5=NET CALL
       DESTINATION (MEMORY INDEX):
               INCOMING=INDEX MY ADDRESS
               OUTGOING=INDEX OTHER ADDRESS
       SOURCE (MEMORY INDEX):
               INCOMING=INDEX OTHER ADDRESS (THEIRS)
               OUTGOING=INDEX MY ADDRESS
       NET (MEMORY INDEX)= INDEX OF NET MEMORY ADDRESS
               NOTE: IF SYSTEM OPTION 22 IS SET TO 1, THEN CHANNEL #
               AND LQA DATA WILL BE APPENDED PRIOR TO THE ACKNOWLEDGE
               CODE AS FOLLOWS:
               ##(CHANNEL)##(TO LQA)##(FROM LQA): FIELDS HAVING NO DATA
               WILL BE SET TO "F"
   CH (CHANNEL) = CHANNEL FOR WHICH STATUS APPLIES
   TLQA (TO LQA) = LINK QUALITY NUMBER FOR THE TO LINK
   FMLQA (FROM LQA) = LINK QUALITY NUMBER FOR THE FROM LINK
       WHERE TLQA AND FMLQA MAY ASSUME 0 TO 30 DECIMAL, WITH 30 BEING
   THE LOWEST POSSIBLE ALE WORD BER

TABLE 3
LINK STATUS CODES

CODE	DESCRIPTION
00	START OF TRANSMIT OF AN ALE CALL
01	RETRYING THE CALL ON THE SAME OR DIFFERENT CHANNEL
02	LINKED VIA AN INCOMING ALE CALL
03	LINKED VIA AN OUTGOING ALE CALL
04	NOT LINKED - NORMAL LISTEN MODE
05	CANNOT CALL (EMPTY ID'S, NO COMMON CHANNELS, RX-ONLY, ETC)
06	AMD ORDERWIRE MESSAGE HAS BEEN RECEIVED
07	TRANSMITTING AN ALE SOUND
08	RECEIVED AN ALE SOUND
09	THE LINK HAS BEEN ABORTED VIA THE NO-ACTIVITY TIMEOUT
0A	RECEIVED AN INCOMING ALE CALL ADDRESSED TO 'ME'
0B	TRANSMITTING THE REPLY TO AN INCOMING ALE CALL
0C	RECEIVED THE REPLY TO AN OUTGOING ALE CALL
0D	CANNOT ESTABLISH AN ALE LINK (PROPAGATION, NO REPLY, ETC)
0E	LINK SHUTDOWN HAS BEEN RECEIVED
0F	LINK IS TERMINATED
10	CANNOT REPLY TO INCOMING CALL (CH BLOCKED OR RECEIVE ONLY)
11	AMD ORDERWIRE MESSAGE HAS BEEN SENT
12	NO POLLING ALLOWED FOR ALLCALLS OR IF IN MANUAL MODE
13	RECEPTION OF AN LQA EXCHANGE SEQUENCE (POLL)
14	START OF A TX LQA EXCHANGE SEQUENCE (POLL)
15	END OF A TX LQA EXCHANGE SEQUENCE (POLL)
16	LINK WAS NOT REQUESTED - INCOMING CALLS
17	LINK WAS NOT REQUESTED - OUTGOING CALLS
18	RECEIVED REPLIES FROM OTHER NET MEMBER(S) (FOR INCOMING CALLS)
19	NO ACKNOWLEDGE WAS RECEIVED
1A	LINK REJECTED BY CALLED STATION
1B	DTM DATA BLOCK WAS SUCCESSFULLY TRANSMITTED.
1C	TRANSMITTING THE CALL ACKNOWLEDGEMENT
1D	DTM INQUIRY WAS REJECTED
1E	DTM INQUIRY ARQ LIMIT WAS EXCEEDED-ORDERWIRE ABORTED
1F	DTM BLOCK ARQ LIMIT WAS EXCEEDED-ORDERWIRE ABORTED
20	DTM ORDERWIRE IS ON
21	DTM ORDERWIRE IS OFF
22	DTM BLOCK RECEIVED
23	TRANSMITTED THE LINK SHUTDOWN
24	RECEIVE AUDIO IS PLAIN TEXT
25	RECEIVE AUDIO IS CIPHER TEXT
26	CAN NOT CALL - SELF-ID TOO LARGE FOR SPECIAL CALLS
27	CAN NOT CALL - NO CHANNELS AVAILABLE
28	CAN NOT CALL - NO MANUAL SOUNDS WHILE SCANNING
29	CAN NOT CALL - GROUP IS TOO LARGE
2A	TUNE & WAIT COMMAND WAS RECEIVED
2B	TUNE & WAIT COMMAND WAS SENT
2C	ONLY THE CALLING STATION MAY RELINK
2D	RELINK NOT ALLOWED IN MANUAL MODE
2E	NO MORE CHANNELS WITH VALID LQA AVAILABLE
2F	WARNING: CANNOT POLL IF LINKED
2G-FC	RESERVED
FD	LOSS OF SYNC (ENABLED/DISABLED VIA SYSTEM OPTION #20)
FE	IN-SYNC (ENABLED/DISABLED VIA SYSTEM OPTION #20)
FF	ALE IS OFFLINE

20.2.4.3.14   [LQ] - LQA MEMORY I/O
               USED TO READ OR WRITE VALUES WITHIN THE LINK-QUALITY MEMORY.

               FORMAT: LQ ##(ID) ##(CH) ##(TO) ##(FR)

               PARAMETERS: (TO WRITE)
                    (ID) = INDEX OF DESIRED STATION ID (00-99, '-').
                         '-' = SELECT ALL ENTRIES FOR SELECTED CHANNEL.
                    (CH) = NUMBER OF DESIRED CHANNEL (00-99, '-').
                         '-' = SELECT ALL ENTRIES FOR SELECTED ID.
                    (TO) = THE QUALITY MEASUREMENT OF 'MY' SIGNAL AS HEARD
                    AND REPORTED BACK BY THE DISTANT STATION.
                    (FR) = THE QUALITY MEASUREMENT TAKEN ON THE RECEIVED
                    SIGNAL.

                    SETTING BOTH ID AND CH TO '-' CLEARS ALL AVAILABLE LQA
                    MEMORY. LQA VALUES (QUALITY MEASUREMENT) RANGE
                    FROM 30 (BEST) OR 00 (WORST) USE '31' TO ENTER 'NO
                    MEASUREMENT'.
                    A DISPLAYED VALUE OF 'FF ' INDICATES NO MEASUREMENT IS
                    AVAILABLE.

               STATUS: (TO READ)
                    LQ ##(ID) ##(CH) ? = LQA SCORE @ ID## & CH##
          LQ - ##(CH) ? = LQA SCORES ALL ID'S @ CH##
                    LQ ##(ID) - ? = LQA SCORES ALL CH'S @ ID##
                    LQ - - ? = ALL LQA SCORES ALL CHANNELS (CAUTION THIS CAN BE UP
          TO 20,000 SCORES)

               RESULT: %LQ ##(ID) ##(CH) ##(TO) ##(FR) *#(ACK)
                    WHERE TO FROM REPEAT AS REQUIRED.

20.2.4.3.15   [MA] - MATRIX DATA I/O
               USED TO ENTER DATA INTO A 10 X 10 BIT MATRIX. USED FOR CHANNEL
               ASSIGNMENT MAPS WITH 'ACTIVE CHANNEL', 'SELF', 'OTHER' AND 'GROUP'
               MEMORIES. ALSO USED TO ENTER THE INDICES OF THE MEMBERS OF A
               'NET' AND TO READ BACK THE STATUS OF THE MEMBERS WHICH
               RESPOND TO A NET CALL.

               FORMAT: MA #(ROW) ###(DATA)

               PARAMETERS:
                    (ROW) = MATRIX ROW SELECTION (0-9 OR 'X' TO SELECT ALL
                    ROWS).
                    (DATA) = 3 DIGIT HEXADECIMAL DATA. (000-3FF)

               FOR 'SELF', 'OTHER', AND 'GROUP' MEMORIES:

                    EACH BIT IN THE MATRIX CORRESPONDS TO THE EQUIVALENT
                    CHANNEL NUMBER.
                    MATRIX 'COLUMNS' EQUATE TO CHANNEL 'UNITS'
                    MATRIX 'ROWS' EQUATE TO CHANNEL 'TENS'.
                    A 'ONE' BIT RESULTS IN ENABLING THE CHANNEL, AND A 'ZERO'
                    DISABLES IT

               FOR 'NET' MEMORIES:

                    THE MATRIX CORRESPONDS TO THE 100 'OTHER ID' MEMORIES
                    THE MATRIX IS USED TO ENTER NET MEMBERS.
                    A 'ONE' BIT WILL ASSIGN THE EQUIVALENT 'OTHER ID' STATION
                    AS A MEMBER OF THIS NETWORK.

               STATUS: MA #(ROW) ?

               RESULT: %MA #(ROW) ###   (DATA) *#(ACK)
                    WHERE "DATA" IS HEX AS DETAILED IN TABLE 4

MAX 00

NET ID MEMORY DOES NOT CONTAIN A TRUE CHANNEL ASSIGNMENT MATRIX. DURING ACTUAL ALE OPERATION, THE 'BEST CHANNEL' SELECTION PROCESS WILL BE BASED UPON THE LINK QUALITY (LQA) VALUES FROM EACH INDIVIDUAL MEMBER OF THE NET. THE 'BEST' CHANNEL WILL BE THE ONE WHICH HAS THE HIGHEST PROBABILITY OF LINKING WITH ALL MEMBERS OF THE NET AND NOT NECESSARILY THE CHANNEL WITH THE HIGHEST INDIVIDUAL LQA READING. THE PROGRAM THEREFORE WILL AUTOMATICALLY CREATE A CHANNEL LIST BASED UPON THOSE CHANNELS WHICH ARE COMMON BETWEEN ALL NET MEMBERS. CONSEQUENTLY, THE STATUS IS RETURNED IN A DIFFERENT FORMAT. RATHER THAN RETURNING THE ROW AS A SINGLE 'HEX' NUMBER, EACH BIT WITHIN THE ROW IS GIVEN A DISCRETE VALUE (BY COMBINING TWO SEPARATE MATRICES). . THE READ-BACK VALUES COULD BE:

0= THIS STATION IS NOT ASSIGNED AS A NET MEMBER AND DID NOT RESPOND TO THE NET CALL.

1= THIS STATION IS ASSIGNED AS A NET MEMBER BUT DID NOT RESPOND TO THE NET CALL.

2= THIS STATION IS NOT ASSIGNED AS A NET MEMBER BUT DID RESPOND TO THE NET CALL.

3= THIS STATION IS ASSIGNED AS A NET MEMBER AND DID RESPOND TO THE NET CALL.

TABLE 4
EXAMPLE MATRIX

	DATA TO SDU (HEX)			WHAT THE DATA MEANS		
	MSD		LSD			
	01	2345	6789	CH	Row	Status
0	00	0000	0001	09	%MA 0	001
1	00	0000	0010	18	%MA 1	002
2	00	0000	0100	27	%MA 2	004
3	00	0000	1000	36	%MA 3	008
4	00	0001	0000	45	%MA 4	010
5	00	0010	0000	54	%MA 5	020
6	00	0100	0000	63	%MA 6	040
7	00	1000	0000	72	%MA 7	080
8	01	0000	0000	81	%MA 8	100
9	10	0000	0000	90	%MA 9	200

1.1.1.2.1.1

20.2.4.3.16   [MB] - MATRIX BIT I/0
AN ALTERNATE METHOD OF MATRIX DATA I/O USING CONTROL OF
INDIVIDUAL MATRIX BITS INSTEAD OF ENTIRE ROWS.

FORMAT: MB ##(BIT) #(DATA)

PARAMETERS:
(BIT) = 2 DIGIT NUMBER REPRESENTING THE DESIRED BIT WITHIN
THE MATRIX. (00 THROUGH 99)
(DATA) = SINGLE ASCII DIGIT ('1' OR '0') WHICH EQUATES TO THE
DESIRED STATE OF THE BIT.

STATUS: MB ##(BIT) ?

RESULT: %MB ##(BIT) #(DATA) *#(ACK)

REFER TO MATRIX EXAMPLE GIVEN WITH THE MA COMMAND.
USE WITH 'NETS' WILL RETURN THE SAME VALUES AS THE
'MA' COMMAND.

20.2.4.3.17   [ME] - MEMORY SELECTION
USED TO 'ACTIVATE' A SELECTED MEMORY FOR DATA ENTRY.

FORMAT: ME #(TYPE) ##(INDEX)

PARAMETERS:
(TYPE) = MEMORY TYPE SELECTION CODE
'C' = CHANNEL MEMORY
'A' = ACTIVE CHANNEL MEMORY
'S' = SELF ID MEMORY
'O' = OTHER ID MEMORY
'N' = NETWORK ID MEMORY
'G' = GROUP ID MEMORY
'-' = AUTOMATIC CHANNEL TRACK (ME COMMAND WILL
AUTOMATICALLY BE SET TO CURRENT ACTIVE CHANNEL)

(INDEX) = INDEX OF THE DESIRED 'CELL' WITHIN THE SELECTED
MEMORY 'TYPE'.

STATUS: ME ?

RESULT: %ME#(TYPE) ## (INDEX) *#(ACK)

SELECTION OF A SPECIFIC MEMORY MAY INVALIDATE CERTAIN
COMMANDS - RESULTING IN AN ACK CODE OF *6. FOR EXAMPLE,
ACTIVATING A 'CHANNEL" MEMORY WILL DISABLE MA, MB, ID, SP, AND
SW COMMANDS.

20.2.4.3.18   [MO] - SYSTEM MODE
USED TO SELECT THE CURRENT SYSTEM MODE.

#10= MO∅
F1=MO1
F2= MO2

FORMAT: MO #(MODE)

PARAMETERS: (MODE)
  '0' SC ALE   (USER CONTROLS CHANNEL, AND USED IN BITE MODE)
  '1' ALE 2   (SCAN 2 CHANNELS PER SECOND)
  '2' ALE 5   (SCAN 5 CHANNELS PER SECOND)
  '3' SETUP   (OFFLINE, USE FOR 'FILL')

STATUS: MO ?

RESULT: %MO #(MODE) *# (ACK)

20.2.4.3.19   [MS] - AMD ORDERWIRE
USED TO ENTER DATA INTO, OR READ BACK DATA FROM A SELECTED
AMD ORDERWIRE MESSAGE BUFFER.

FORMAT: MS ##(MSG) (+) "TEXT"

PARAMETERS:
  (MSG) SELECTS THE NUMBER OF THE DESIRED MESSAGE
  BUFFER AS FOLLOWS:
      (##)   SELECTS ONE OF TWENTY AVAILABLE 'CANNED' MESSAGE
      BUFFERS WHICH ARE STORED WITHIN E2PROM. (## = 01-21)
      (+)   (ASCII) SIGN WILL SELECT A 22ND MESSAGE BUFFER WHICH
      IS LOCATED WITHIN RAM. THIS BUFFER IS RECOMMENDED FOR
      USE DURING 'LIVE' AMD MESSAGE EXCHANGES.
      (00-)   WILL SELECT THE RECEIVE MESSAGE BUFFER. THIS
  BUFFER HOLDS INCOMING AMD MESSAGES AND SHOULD BE READ AS
  SOON AS POSSIBLE AFTER THE RECEPTION OF AN 'LK6' LINK STATUS.
  WRITING TO THIS BUFFER IS POSSIBLE BUT SERVES NO REAL
  PURPOSE.

  (+)   ASCII 'PLUS' CHARACTER [HEX 2B]. IF PRESENT, IT INDICATES THAT
  THE SPECIFIED TEXT WILL BE APPENDED ON TO THE END OF ANY
  EXISTING TEXT WITHIN THE SELECTED MESSAGE BUFFER. IF NOT
  PRESENT, THE TEXT WILL OVER-WRITE ANY EXISTING MESSAGE TEST.

  ('TEXT') ACTUAL MESSAGE DATA ENCLOSED WITHIN ASCII DOUBLE-
  QUOTE CHARACTERS [HEX 22]. (90 ASCII CHARACTERS MAX)

STATUS: VARIATION #1 - MS ##(MSG) ?
  (MSG) =MESSAGE BUFFER SELECTION CODE. (SEE ABOVE)

RESULT: %MS ##(MSG) "TEXT" *#(ACK)

STATUS: VARIATION #2 -   %MS ##(MSG) ##(START) ?
  (MSG) = MESSAGE BUFFER SELECTION CODE. (SEE ABOVE)
  (START) = TWO DIGIT NUMERIC VALUE INDICATING THE
  DESIRED STARTING CHARACTER POSITION WITHIN THE MESSAGE.
  (00 THROUGH 89) RETURNS THE NUMBER OF CHARACTERS WITHIN
  THE MESSAGE BUFFER STARTING FROM CHARACTER POSITION 'START'.

RESULT: %MS ##(MSG) ##(START) ##(SIZE) *#(ACK)

STATUS: VARIATION #3 -   MS #(MSG) ##(START) ##(SIZE) ?
(MSG) =MESSAGE BUFFER SELECTION CODE. (SEE ABOVE)
(START) = TWO DIGIT NUMERIC VALUE INDICATING THE DESIRED
STARTING CHARACTER POSITION WITHIN THE MESSAGE.
(00 THROUGH 90)
(SIZE) = TWO DIGIT NUMERIC VALUE WHICH INDICATES THE
NUMBER OF MESSAGE CHARACTERS TO BE RETURNED.(BEGINNING
FROM 'START') RETURNS THE REQUESTED NUMBER OF MESSAGE
CHARACTERS STARTING FROM CHARACTER POSITION 'START'.

RESULT: %MS #(MSG) ##(START) ##(SIZE) "TEXT" *#(ACK)

20.2.4.3.20   [OP] - SYSTEM OPTIONS

USED TO SELECT VARIOUS SYSTEM OPERATING PARAMETERS.

FORMAT: OP ##(NUM) ##(VAL)

PARAMETERS:
(NUM) = 2 DIGIT OPTION SELECTION CODE (00-99)
(VAL) = 2 DIGIT VALUE FOR THE SPECIFIED OPTION.

STATUS: OP ##(NUM) ?

RESULT: %OP ##(NUM) ##(VAL) *#(ACK)

SEE TABLE 5 FOR OPTION NUMBERS AND APPROPRIATE VALUES.

TABLE 5
SYSTEM OPTIONS

1.1.1.2.1.2

OPTION	NAME	OPTION VALUE	DEFAULT
00	SOUNDING	00:ALL AUTOMATIC SOUNDS DISABLED, 01:ALL AUTOMATIC SOUNDS ENABLED 02:SOUNDING CONTROLLED BY CHANNEL. (FLAG BIT #0, 1= ENABLED, 0 = DISABLED)	00
01	LQA EXCHANGE	01:ENABLE, 00:DISABLE	01
02	LQA DECAY RATE	00=1HR , 01=2HR , 02=4HR , 03=8HR , 04=DISABLED	02
03	RX LQA AVERAGING	00 = NO AVERAGING, 01 = (OLD +NEW)/2, 02 = ((3XOLD)+NEW)/4, 03 = ((7XOLD)+NEW)/8	02
04	RX AUTO FILL	01=ENABLE, 00=DISABLE	00
05	TX SOUND LENGTH (SEC)	00=MIN, 01=5, 02=10, 03=20, 04=30, 05=40, 06=50, 07=60, 8=80,09=100	00
06	RX BER THRESHOLD	THRU 48	48
07	RX GOLAY THRESHOLD		03
08	RX BAD WORD COUNT		03
09	LINK TIMEOUT VALUE	$N \times 15$ SECONDS, N = 00 THRU 40)	12
10	LINK TIMEOUT ACTION	00=DO NOT TRANSMIT SHUTDOWN, 01=TRANSMIT SHUTDOWN IF CALLER 02=TRANSMIT SHUTDOWN IF CALLEE, 03=TRANSMIT SHUTDOWN ALWAYS	00
11	RETRIES PER LIST	00 THRU 99 (99=INFINITE)	00
12	RETRIES PER CHANNEL	00 - 99 (99 = INFINITE)	00
13	TX-SILENT MODE	00=ALL TRANSMIT MODES ARE ENABLED, 01=ALL AUTOMATIC TX DISABLED 02=SELECTED TX CONTROL PER CHANNEL (USE CHANNEL FLAG BIT #1)	01
14	DTM TX BLOCK SIZE (ALE WORDS) (3CHRS/WORD)	00 = 25, 01 = 50, 02 = 75, 03 = 100, 04 = 150, 05 = 200, 06 = 250, 07 = 300, 08 = 351	00
15	DTM RETRY LIMIT	00 THRU 99 (99 = INFINITE)	04
16	AUTO POLL THRESHOLD	00 THRU 32 (32 = MANUAL POLL ONLY)	32
17	TX TUNE TIME (MILLISECONDS)	01=20, 02=50, 03=100, 04=200, 05=500, 06=1000, 07=2000, 08=5000, 09=10,000, 10=20,000, 11=50,000	08
18	BITE REPORT FORMAT	00 = TONE NUMBER, 01=TONE LEVELS	01
19	KEY TX IN BITE	00=NO, 01=YES	00
20	SHOW RX SYNC STATUS	00=DISABLED, 01=ENABLED	00
21	AMD HANDSHAKE	00=DISABLED, 01=ENABLED	00
22	STATUS FORMAT	00=SHORT, 01=LONG	00
23	RECEIVED BAND SELECTION-SCAN MODE	00: NORMAL RECEIVE BAND SELECTION 01: SELECT RECEIVE BAND FILTER AS INDICATED BY THE RB COMMAND OPTION VALUE 01 APPLIES ONLY WHILE SCANNING. WHEN TRANSMITTING OR LINKED, OPERATION WILL AUTOMATICALLY REVERT TO OPTION VALUE 00 UNTIL SCAN MODE IS RESUMED.	00
24	DISPLAY RAW RX ALE	00 = OFF, 01 = ON	00

TABLE 5 CONT
SYSTEM OPTIONS

OPTION	NAME	OPTION VALUE	DEFAULT
25	DTM ENTRY-AUTO EOM	00=OFF, 01=ON	01
26	RX SOUND LIMIT	00-99, (99=INFINITE)	99
27	MULTIPLE STATION MAX TUNE TIME (mSEC)	00=10, 01=20, 02=50, 03=100, 04=200, 05=500, 06=1000, 07=2000, 08=5000, 09=10,000, 10=20,000, 11=50,000	09
28-99	RESERVED		

Handwritten notes:

28 TUNE 4 WAIT   Ø = SquELCH... ... not label

29 SQUELCH   = 1   Ø

20.2.4.3.21   [OW] - ORDERWIRE PORT PARAMETERS
USED TO SELECT OPERATING PARAMETERS FOR THE ORDERWIRE
DATA PORT J11.

FORMAT: OW #(RATE) #(PARITY) #(STOP) #(FLOW)

PARAMETERS:
#(RATE) PER TABLE 6   *OW A*

TABLE 6
ORDERWIRE RATE CODES

CODE #	RATE	CODE #	RATE
0	50	8	2400
1	75	9	4800
2	100	A	9600
3	110	B	19,200
4	150	C	38,400
5	300	D	57,600
6	600	E	115,200
7	1200	F	115,200

#(PARITY) = 0:NONE, 1:EVEN, 2:ODD
#(STOP) = 0:1, 1:1.5, 2:2

STATUS: OW ?

RESULT: %OW #(RATE) #(PARITY) #(STOP) *#(ACK)
(DATA LENGTH IS ALWAYS SET TO 8 DATA BITS)

20.2.4.3.22   [RB] - RECEIVE BAND SELECTION

USED TO MANUALLY SET THE RECEIVE BAND WHILE SCANNING, IF
SYSTEM OPTION 23 IS SET TO 01. THIS COMAND IS USED TO LIMIT THE
BAND SWITCHING IN THE RT-1209 (THERE-BY INCREASING RELAY MTBF)
DURING RECEIVE SCAN MODE. DURING TRANSMIT OR WHILE LINKED,
THE CORRECT SINGLE BAND IS AUTOMATICALLY SELECTED TO OPTIMIZE
RECEIVE PERFORMANCE, AND FILTER THE TRANSMIT SIGNAL
HARMONICS. WHEN THE RADIO RETURNS TO SCAN MODE, THE BANDS
SELECTED BY THE RB COMMAND ARE USED. WHILE ANY OR ALL BANDS
MAY BE SELECTED, IT IS INTENDED THAT THE COMBINATION OF BANDS 2
AND 3, OR BANDS 3 AND 4 BE SELECTED BASED ON THE CHANNEL
FREQUENCIES CONTAINED IN THE CURRENT ACTIVE CHANNEL GROUP.
ANY OTHER COMBINATION OF BANDS MAY NOT PROVIDE ACCEPTABLE
PERFORMANCE.

FORMAT: RB ######
PARAMETERS:
        # VALUE IS 0 TO SELECT A BAND, OTHERWISE IT IS 1.
        POSITION OF # IS RELATED TO BAND NUMBER, LEFT IS BAND 1,
        RIGHT IS BAND 6, ALL 6 DIGITS MUST BE ENTERED. BANDS 2 AND
        3 FOR EXAMPLE ARE SELECTED AS: RB100111.

STATUS: RB?

RESULT: %RB ######*#(ACK)

20.2.4.3.23   [RD] - RECEIVE DOWNLOAD ORDERWIRE DATA
DOWNLOADS A SPECIFIC NUMBER OF ASCII CHARACTERS TO AN
ORDERWIRE TERMINAL AFTER A DTM BLOCK HAS BEEN RECEIVED BY
THE ALE MODULE (LINK STATUS CODE LK22)

FORMAT: RD####

PARAMETERS: ####

THE NUMBER OF ASCII CHARACTERS TO BE DOWNLOADED FROM
THE ALE MODULE TO THE ORDERWIRE TERMINAL., (1054
CHARACTERS MAX).

RESULT: %RD #### *#(ACK)
        # REPRESENTS THE NUMBER OF ASCII CHARACTERS TO BE
        DOWNLOADED

20.2.4.3.24   [RM] - RECEIVE MODE
USED TO SET THE RECEIVE SIDEBAND MODE (UPPER OR LOWER).

FORMAT: RM #(MODE)

PARAMETERS: #(MODE)
  0= LSB
  1= USB

STATUS: RM ?

RESULT: %RM #(MODE) *#(ACK)

ONLY VALID ON AN ACTIVE CHANNEL MEMORY. CHANGES MADE
TOTHE SAME CHANNEL MEMORY WHICH IS CURRENTLY 'ACTIVE'
WILL RESULT IN AN IMMEDIATE CHANGE TO THE RADIO ITSELF.

20.2.4.3.25   [RX] - RECEIVE FREQUENCY
USED TO SELECT THE DESIRED RECEIVE FREQUENCY.

FORMAT: RX #####(FREQ)

PARAMETERS: #####(FREQ) = 6 DIGIT FREQUENCY VALUE IN 100 HZ STEPS.

STATUS: RX?

RESULT: %RX #####(FREQ) *#(ACK)

FREQUENCY LIMITS ARE 020000 (2 MHZ) TO 299999 (29.9999 MHZ)
CHANNEL MEMORY MUST BE ACTIVATED.
CHANGES MADE TO THE SAME CHANNEL MEMORY WHICH IS
CURRENTLY 'ACTIVE' WILL RESULT IN AN IMMEDIATE CHANGE TO THE
RADIO ITSELF.

20.2.4.3.26   [SA] - SOUNDING ADDRESS

USED TO ENTER THE DESIRED 'SELF-ID' TO BE UTILIZED DURING AN
AUTOMATIC 'SOUND'.

FORMAT: SA ##(ID)

PARAMETERS: (ID) = INDEX OF DESIRED 'SELF-ID' MEMORY. (VALUE
MAY RANGE FROM 00 THRU 19)

STATUS: SA ?

RESULT: %SA ##(ID) *#(ACK)

NO CHECK IS MADE OF SELECTING AN 'EMPTY' SELF-ID
NO SOUND WILL OCCUR IF SELF-ID IS NOT VALID.
SOUNDING ADDRESS IS INDIVIDUALLY PROGRAMMABLE PER
CHANNEL.
DESIRED CHANNEL MEMORY MUST BE ACTIVATED, SEE ME
COMMAND.

20.2.4.3.27   [SC] - SCANNING CALL LENGTH
USED TO LENGTHEN THE LEADING CALL TO COMPENSATE FOR THE
'SCAN-CYCLE' TIME OF THE STATION BEING CALLED.

FORMAT: SC ###(LEN)

PARAMETERS: (LEN)
SPECIFIES THE NUMBER OF ADDITIONAL 'TO' WORDS (392 MSEC
EACH) WHICH WILL BE TRANSMITTED PRIOR TO THE 'LEADING' CALL.

STATUS: SC ?

RESULT: %SC ###(LEN) *#(ACK)
ENTERING 'SC - ' WILL CAUSE THE ALE TO AUTOMATICALLY CHOOSE
A VALUE BASED UPON THE NUMBER OF CHANNELS IN THE CURRENT
SCAN 'GROUP'. AS A GENERAL RULE, ENTER A VALUE WHICH IS
EQUAL TO TWICE THE NUMBER OF CHANNELS WHICH THE STATION
BEING CALLED IS SCANNING.
    EXAMPLE: ENTER 'SC 030 ' IF THE DISTANT STATION IS KNOWN TO
    BE SCANNING 15 CHANNELS.

20.2.4.3.28   [SI] - SOUNDING INTERVAL
USED TO ENTER THE TIME INTERVAL FOR AUTOMATIC SOUNDS.

    FORMAT: SI ##(HOURS) ##(MINS)

    PARAMETERS:
      (HOURS) = 2 DIGIT HOURS VALUE (00-23).
      (MINS) = 2 DIGIT MINUTES VALUE (00-59).

    STATUS: SI ?

    RESULT: %SI ##(HOURS) ##(MINS) ##(HOURS) ##(MINS) ##(SECS) *#(ACK)
    :___ INTERVAL___: :_____ TIME REMAINING_____:

    SOUNDING INTERVAL IS INDIVIDUALLY PROGRAMMABLE PER CHANNEL.
    THE DESIRED CHANNEL MEMORY MUST BE ACTIVATED PRIOR TO USE.
    REFER TO ME COMMAND
    PROGRAMMED SOUNDS WILL BE LIMITED TO:
         • THE CURRENT CHANNEL IF MANUAL
         •THE CURRENT 'GROUP; IF SCAN.
    ANY TRANSMISSION ON A SPECIFIC CHANNEL (CALLS, ETC.)
    WILL RESET THE SOUNDING TIMER FOR THAT CHANNEL.
    SOUNDS WILL NOT OCCUR IF :
         •THE UNIT IS 'BUSY' ON ANY PARTICULAR CHANNEL (I.E.
        CALLING, LINKED, ETC.)
         •SOUNDING IS DISABLED (SYS OPTION #00)
         •IF TX SILENT MODE IS ENABLED (SYS OPTION #11).
    ONCE A SOUND HAS BEEN TRANSMITTED, FURTHER SOUNDS WILL
    BE BLOCKED UNTIL A COMPLETE CYCLE OF THE CURRENT SCAN
    GROUP HAS OCCURRED. (EXCEPTION FOR MANUAL MODE).

20.2.4.3.29   [SP] - SELF ID/SLOT POSITION DATA ENTRY
USED TO ENTER A 'SELF-ID' AS A MEMBER OF THE CURRENTLY
SELECTED NET MEMORY AND TO ASSIGN ITS RESPONSE SLOT VALUE.

    FORMAT: SP ##(SELFID) ##(SLOT)

    PARAMETERS:
      (SELFID) = INDEX OF THE SELECTED SELF-ID NUMBER. (00 - 19).
      (SLOT) = 2 DIGIT DECIMAL NUMBER SPECIFYING THE DESIRED SLOT
      POSITION OF THE SELECTED SELF ID. VALID RANGE IS 01-99 .

    STATUS: SP ?

    RESULT: %SP ##(SELFID) ##(SLOT) *#(ACK)

    NET MEMORY MUST BE ACTIVATED.
    USE SP '-' TO CLEAR SELF-ID MEMBER DATA.
    SLOT 00 IS RESERVED

20.2.4.3.30   [SZ] - SLOT ZERO WIDTH
USED TO DEFINE THE WIDTH OF SLOT ZERO IN NETS, WHICH IS USED
FOR TUNING ALL RADIOS IN THE NET. WIDTH MUST BE SET TO EQUAL
THE LONGEST TUNE TIME IN THE NET.

    FORMAT: SZ ####(WIDTH)

    PARAMETERS: (WIDTH)
      FOUR DIGIT DECIMAL NUMBER SPECIFYING THE DESIRED SLOT
      WIDTH IN 10MS STEPS.

    STATUS: SZ ?

    RESULT: %SZ ##(WIDTH) *#(ACK)

20.2.4.3.31   [TD] - TRANSMIT ORDERWIRE DATA
TRANSMITS A DEFINED NUMBER OF ASCII CHARACTERS FROM
ORDERWIRE TERMINAL TO ALE MODULE.

FORMAT: TD ####

PARAMETERS: (#)
  NUMBER OF ASCII CHARACTERS (UP TO 2500) IN THE TRANSMISSION

STATUS: TD?

RESULT: %TD #### *#(ACK)
  # = NUMBER OF ASCII CHARACTERS THAT CAN BE TRANSMITTED
  NOW, (2500 MAX.).

20.2.4.3.32   [TM] - TRANSMIT MODE
USED TO SET THE TRANSMIT SIDEBAND MODE (UPPER OR LOWER).

FORMAT: TM #(MODE)

PARAMETERS: #(MODE)
  0 = LSB
  1 = USB

STATUS: TM?

RESULT: %TM #(MODE) *#(ACK)

ONLY VALID ON AN ACTIVE CHANNEL MEMORY. CHANGES MADE TO
THE SAME CHANNEL MEMORY WHICH IS CURRENTLY 'ACTIVE' WILL
RESULT IN AN IMMEDIATE CHANGE TO THE RADIO ITSELF.

20.2.4.3.33   [TO] - CALL DESTINATION SELECTION

USED TO SELECT THE DESTINATION FOR OUTGOING CALLS.
SELECTIONS ARE AVAILABLE FROM THOSE STATIONS WHICH HAVE
BEEN PREVIOUSLY DEFINED WITHIN THE 'OTHER ID' AND 'NET ID'
MEMORIES.

FORMAT: TO #(TYPE) ##(INDEX)

PARAMETERS:
  (TYPE)
    '0' = OTHER
    '1' = NET
    '2' = GROUP
  (INDEX) = 2 DIGIT INDEX OF DESIRED 'GROUP, 'NET' OR 'OTHER' ID
  MEMORY, WHERE INDEX MAY ASSUME ANY VALUE BETWEEN 00 AND
  99 FOR TYPE 0 OR 2 AND 00 THRU 20 FOR TYPE 1 (NET).

STATUS: TO ?

RESULT: %TO #(TYPE) ##(INDEX) *#(ACK)

SELECTION OF AN 'EMPTY' ID (GROUP,NET OR OTHER) MEMORY WILL
RESULT IN AN "ACK CODE' OF *4, AND THE ENTRY WILL BE REJECTED.
THIS PARAMETER WILL AUTOMATICALLY BE SET TO SELECT THE 'TO'
ID LAST USED DURING AN ALE LINK. THIS ALLOWS THE USER TO
CALL-BACK A STATION WITHOUT HAVING TO REMEMBER WHICH
DESTINATION ID NUMBER WAS LAST USED.

20.2.4.3.34   [TX] - TRANSMIT FREQUENCY

USED TO SELECT THE DESIRED TRANSMIT FREQUENCY.

FORMAT: TX #####(FREQ)

PARAMETERS: #####(FREQ)
DIGIT FREQUENCY VALUE IN 100 HZ STEPS

STATUS: TX?

RESULT: %TX#####(FREQ) *#(ACK)

FREQUENCY LIMITS ARE 020000 (2 MHZ) TO 299999 (29.9999 MHZ)
CHANNEL MEMORY MUST BE ACTIVATED. CHANGES MADE TO THE
SAME CHANNEL MEMORY WHICH IS CURRENTLY 'ACTIVE' WILL
RESULT IN AN IMMEDIATE CHANGE TO THE RADIO ITSELF.

20.2.4.3.35   [VE] - FIRMWARE VERSION
REPORTS THE FIRMWARE VERSION NUMBER.

FORMAT: SEE STATUS BELOW.

PARAMETERS: --

STATUS: VE ?

RESULT:
SYSTEM OPTION (TABLE 5) SET TO 00
%VEVVVVYYMMDD
VVVV = VERSION NUMBER (0100 = 1.00)
YY = YEAR (94 = 1994)
MM = MONTH (03 = MARCH)
DD = DAY
SYSTEM OPTION (TABLE 5) SET TO 01
%VE VERSION V, VV MMMMMMMMMM DD YYYY TT:TT*#(ACK)
V. VV = VERSION NUMBER
MMMMMMMMMM = MONTH
DD = DAY
YYYY = YEAR
TT:TT = TIME (HRS:MIN)

20.2.4.3.38   [WR] - WAIT FOR REPLY TIME

USED TO SPECIFY THE AMOUNT OF TIME TO ALLOW FOR AN
INDIVIDUAL STATION TO BEGIN THE RESPONSE TO A CALL.

FORMAT:WR ###(TIME)

PARAMETERS: (TIME)
DIGIT DECIMAL NUMBER WHICH SPECIFIES "WAIT-FOR-REPLY" TIME IN
100MS INCREMENTS.
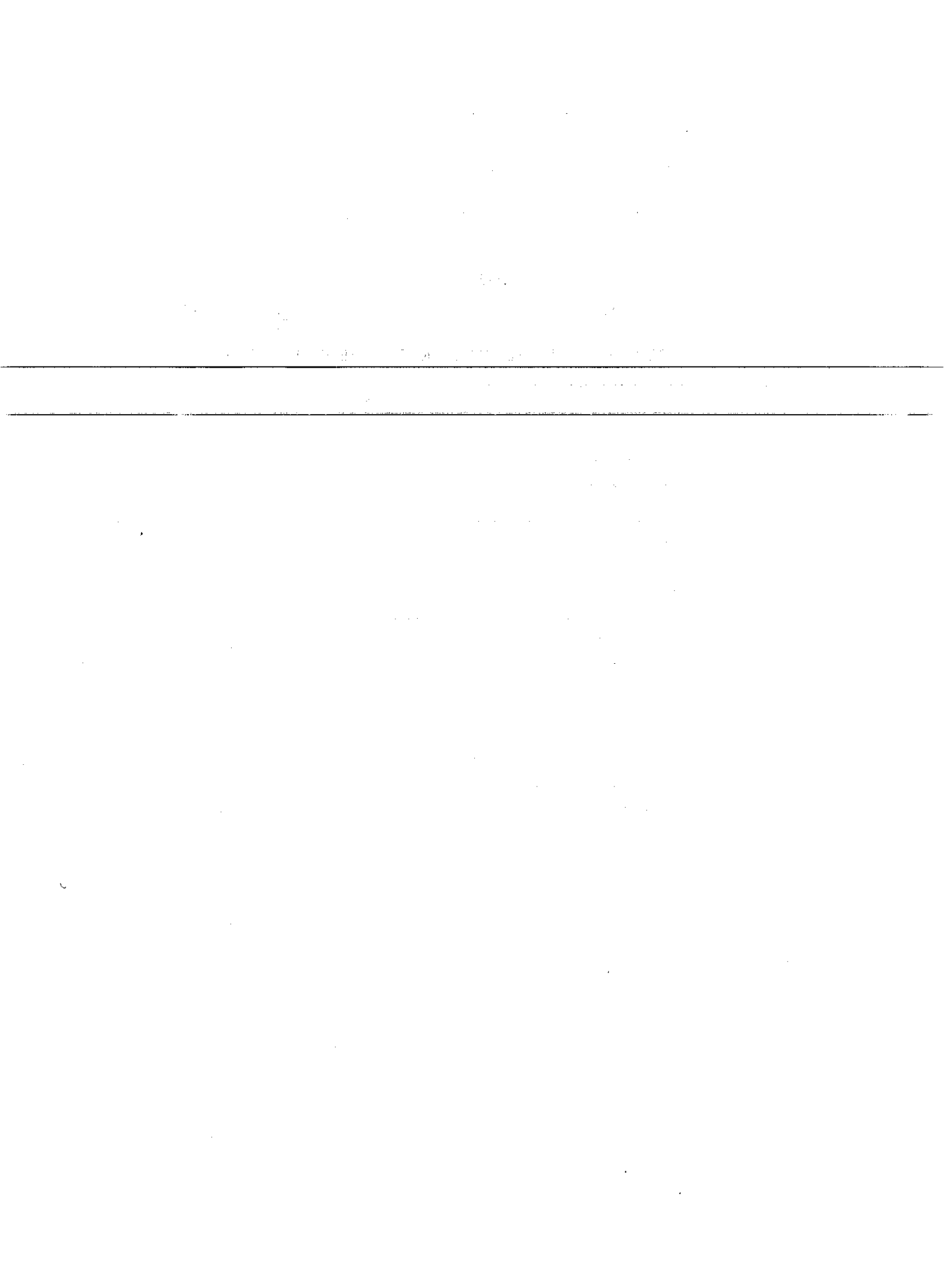
STATUS:WR ?

RESULT:%WR ###(TIME)

THIS VALUE IS ENTERED INTO THE 'OTHER ID' MEMORY 'OID'
MEMORY MUST BE ACTIVATED PRIOR TO USE. REFER TO ME
COMMAND. THE UNIT AUTOMATICALLY DEFAULTS THE (TIME) VALUE
TO 20 (2 SECONDS). WR IS NOT USED FOR NETWORK CALLS.

20.2.4.3.37   MEMORY PURGE

USED TO ERASE OR INITALIZE SYSTEM PARAMETERS.

FORMAT: ZZ #(TYPE)

PARAMETERS: (TYPE)
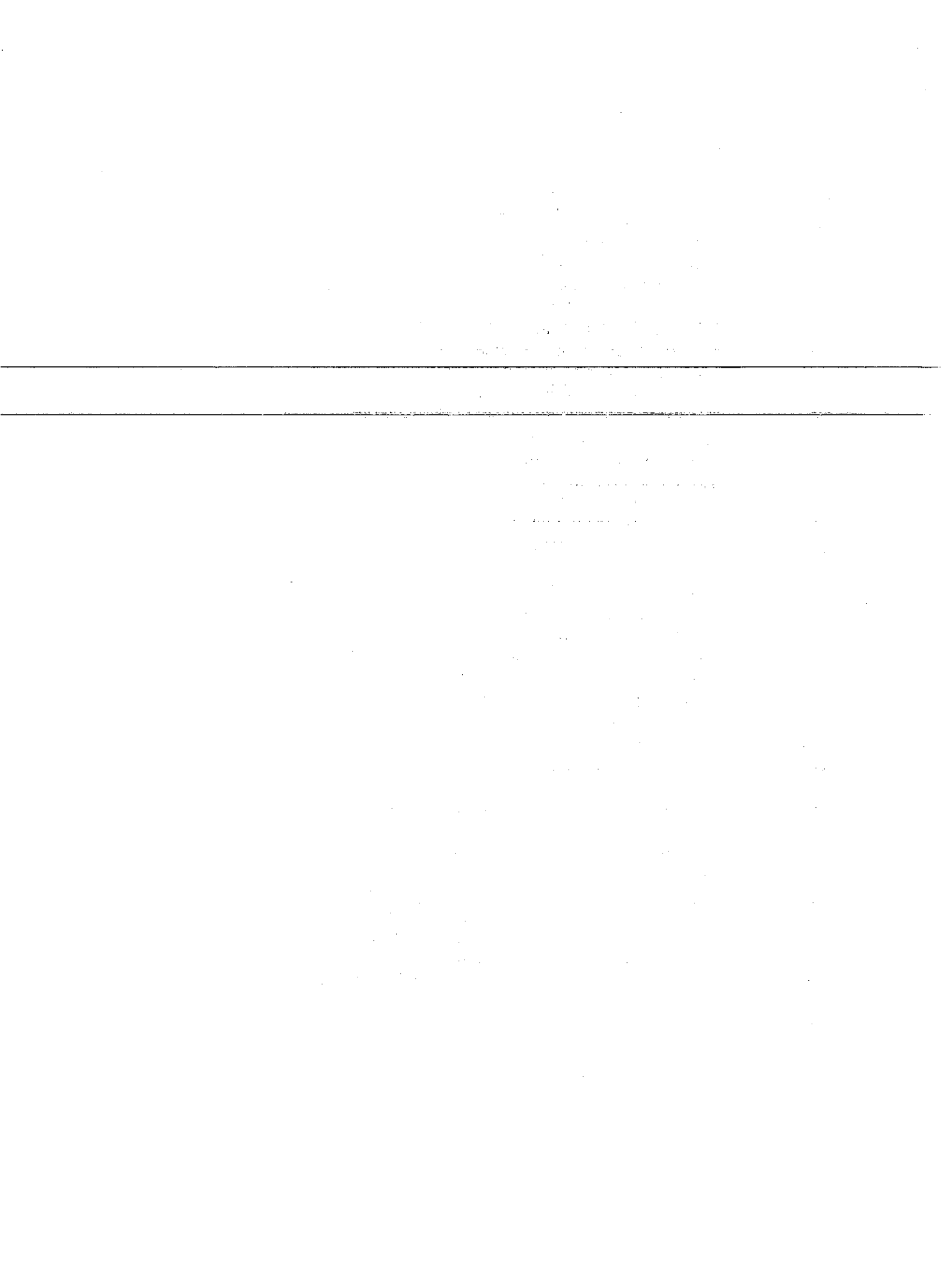
Embedded ALE Link Status Codes.
06 April 2004.

Note: Those LK messages marked with an * require an ACK.

Code	Description
00	*Start of transmission of an ALE call
01	*Retrying the call on the same or different channel
02	*Linked via an incoming ALE call
03	*Linked via an outgoing ALE call
04	*Not linked, normal listening mode
05	*Cannot call, NULL self ID
06	*AMD orderwire message has been received
07	*Transmitting an ALE sound
08	*Received an ALE sound
09	*Link has been aborted due to no-activity
0A	*Received an incoming call addressed to me
0B	*Transmitting the reply to an incoming ALE call
0C	*Received the reply to an outgoing call
0D	*Cannot establish an ALE link
0E	*Link Shut-down has been received
0F	*Link is terminated
10	*Cannot reply to incoming call, unknown caller, channel block or rx-only
11	*AMD orderwire message has been sent
12	*No polling allowed for multi-destination calls, nets, groups etc
13	*Reception of an LQA polling sequence
14	*Start of LQA polling sequence
15	*End of LQA polling sequence
16	*Link was not requested, incoming calls
17	*Link was not requested, outgoing calls
18	*Received replies from other net member(s)
19	*No acknowledgement was received
1A	*Link rejected by called station
1B	*DTM block was successfully transmitted
1C	*Transmitting the call acknowledgement
1D	*DTM inquiry was rejected
1E	*DTM inquiry ARQ limit exceeded, orderwire aborted
1F	*DTM block ARQ limit exceeded, orderwire aborted
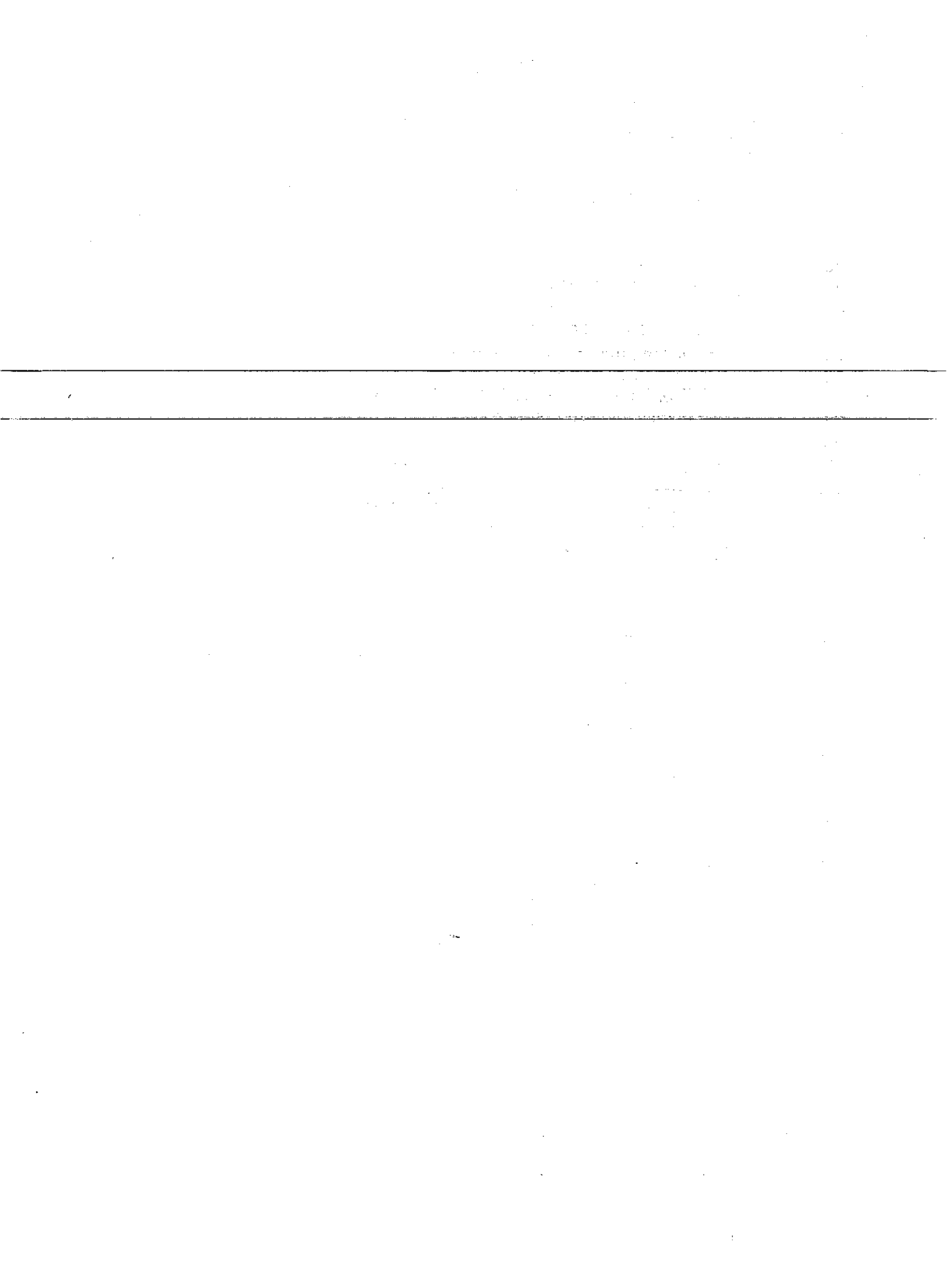
20	*DTM orderwire is on
21	*DTM orderwire is off
22	*DTM block received
23	*Transmitted the Link shutdown
24	*Receive audio in plain text
25	*Receive audio in cipher text
26	*Cannot call, self-ID too large for special calls
27	*Cannot call, no channels available
28	*Cannot call, no manual sounds while scanning
29	*Cannot call, group is too large
2A	*'Tune & Wait' command was received
2B	*'Tune & Wait' command was sent
2C	*Only the calling station may relink
2D	*Relink not allowed in manual mode
2E	*No more channels with valid LQA available
2F	*Warning, cannot poll if linked
30	Reserved for future use
31	Time broadcast transmitted
32	Time broadcast received
33	Time request transmitted
34	Time request received
35	Time response transmitted, no return requested
36	Time response transmitted, return requested
37	Time response received
38	Time return transmitted
39	Valid time return returned, other tq = my tq + 1
3A	Invalid time return returned, no match
3B	Time exchange receive fault
3C	Time update rejected, local date not initialized for year
3D	Time update rejected
3E	Time update accepted
3F	Time exchange refused, due to system option settings
40	Time quality deteriorated, not able to support AL-1 or AL-2
41	Cleartext incoming (AL-0)
42	Course cyphertext incoming (AI-1)
43	Enhanced cyphertext incoming (AL-2)
44	Decryption Timer expired (in debug mode only)
45	Authentication request return match, other tq > my tq
46	Authentication request return match, other tq = my tq
47	Authentication request return match, other tq < my tq
48	Inbound call starting (may or may not be directed to this station)
49 – FB	Reserved for future use
FC	Reserved (for debug purposes)
FD	Loss of sync. (Enabled/Disabled via SysOption[20])

FE   In sync. (Enabled/Disabled via SysOption[20])
FF   ALE is offline