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AN/GGC-52 ASR TERMINAL (AIR FORCE ALL
ELECTRONIC TELETYPEWRITER)

Irving J. Etkind, et al

Electronic Systems Division
L. G. Hanscom Field, Massachusetts

March 1973

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DEPUTY FOR SURVEILLANCE AND CONTROL SYSTEMS
HQ ELECTRONIC SYSTEMS DIVISION (AFSC)
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FOREWORD

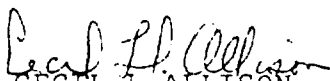
Tactical Weather System (433L)
Contract F19628-71-C-0119
SDM Corporation
10 Micro Drive
Woburn, Massachusetts 01801

Program Monitors

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March 1973

This technical report has been reviewed and is approved.


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13. ABSTRACT The AN/GGC-52 ASR terminal represents the first (and to our knowledge, the only) noiseless, non-impact, electronic ASR terminal meeting full military requirements of operation in a tactical environment. The unit consists of a console containing a keyboard send/receive unit, transmitter distributor, and reperforator. It has the capabilities of preparing and editing off-line teletype messages as well as performing normal send/receive teletype functions. Printing is accomplished by the contact of a 5 X 7 dot matrix printing head with termal paper. The unit was developed to meet the requirements of the 433L Tactical Weather System by SDM, Inc., under ESD Contract F19628-71-C-0119. The unit meets the high and low temperature, humidity, barometric pressure, and shock requirements of MIL-STD-810B; and vibration requirements of MIL-S-52059, and the EMI requirements of MIL-STD-461A.			

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
Teletypewriter						
Electronic						

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1.0 ASR.

1.1 The AN/GGC-52 Automatic Send Receive (ASR) teletype-writer terminal was developed under the Tactical Weather System (433L) program. It consists of a console containing a keyboard send/receive unit, transmitter distributor and reperforator providing the capability of sending, receiving and off-line preparation of teletype messages.

The terminal consists of the following components:

- a. KSR containing a keyboard, power supply and printer
- b. Transmitter-Distributor (T/D)
- c. Reperforator
- d. ASR Electronics
- e. Console containing wiring harness, control panel and rack assembly

The power required to operate the terminal is obtained from an external source of $28 \pm 10\%$ VDC. Maximum power requirement is 350 watts.

2.0 KSR.

2.1 The keyboard send/receive unit consists of a keyboard and printer. A secondary d.c. power supply provides all of the required operating voltages for this unit. The keyboard is a three row communication keyboard having characters as shown in Fig 5, Appendix C of MIL-STD-188C. Printing is performed by a non-impact print head having a 5 X 7 dot matrix. In order to form a character, the proper dots are energized (heated) and contact of this head with the thermal paper forms a .08 inch wide by .11 inch character. This results in a printing format of 10 characters per inch with a line spacing of 6 lines per inch (single space mode). Up to 80 characters can be printed on a

single line. Other features of the KSR include:

- a. A character counter with digital display.
- b. End of line indicator. A lamp illuminates and remains illuminated when the end of line is reached. This end of line can be adjusted from the 64th through 80th character or space.
- c. An audible signal adjustable from the 64th to 79th character indicates end of line.
- d. A page copy holder is provided.
- e. Carriage return - automatic, signal and manual.
- f. The following on-line functions are provided:
 - (1) Carriage return
 - (2) Line feed
 - (3) Space
 - (4) Blank
 - (5) Letters (Lower case shift)
 - (6) Figures (Upper case shift)
 - (7) Bell

The MSR receives and generates the Baudot "start/stop" five (5) unit code with a character interval of 7.0 units.

3.0 Transmitter - Distributor (T/D).

3.1 This unit accepts prepunched paper tape and transmits the message by Baudot five (5) unit code to a page printer or a send line for further dissemination. The unit accepts 11/16, 7/8 or 1 inch wide tapes that are punched in accordance with punching standard for paper tapes, Fig 3, Appendix B of MIL-STD-188C. Tape or tape loops can be inserted in the T/D and proper alignment is insured by means of a guide arrangement which is adjusted for each width of tape. Start/stop control, automatic tight-tape switch and end of tape switch are provided. The T/D receives its power from

the external 28 VDC source.

4.0 Reperforator.

4.1 The reperforator or "punch" receives the Baudot five (5) unit code and punches this code on paper tape in accordance with the standard format of Fig 3, Appendix B, of MIL-STD-188C. The reperforator accepts tapes that are 11/16, 7/8 or 1 inch wide. When punching a tape from the keyboard an edit function allows for a character by character correction on the tape. It can also be run so that only sprocket holes are punched out. The tape exits in a free manner from the reperforator compartment. The reperforator receives its power from the 28 VDC source.

5.0 ASR Electronics.

5.1 This includes all the digital and analog circuitry, switching functions and power supply required for operation of the ASR terminal. All printed circuit boards are conformal coated in accordance with MIL-STD-275C.

6.0 Console.

6.1 This unit contains the KSR, transmitter/distributor, reperforator and the electronics. The KSR is located on a horizontal desk surface protruding from the main rack and the T/D and reperforator are located to the side of the KSR. Convenient operator access is provided to all controls and functions essential for operation of the ASR terminal in accordance with the human factor design criteria of MIL-STD-1472. The overall physical dimensions of the ASR are as follows:

Height	48 1/2"
Width	27 1/2"
Depth (Including KSR desk)	40"

The total weight is 150 pounds.

7.0 Design Considerations.

7.1 Materials, parts and processes are predicated in MIL-STD-454B, General Requirements for Electronic Equipment and MIL-E-4158D, General Requirements for Ground Electronics Equipment.

7.2 The ASR terminal has the capability of converting to the USASCII code by substitution of a new 4 level keyboard, several printed circuit cards and modification of the T/D and reperforator so that all eight holes are active.

8.0 Reliability and Maintainability.

8.1 The teletypewriter ASR has a mean time between failures (MTBF) of 1600 hours. The mean time to repair (MTTR) is 30 minutes.

9.0 Operating Characteristics.

9.1 The transmitted signal levels are plus and minus 6 ± 1 volts. The transmitter source impedance is less than 100 ohms and the receive input circuit is greater than 6000 ohms in accordance with Appendix B, Figure 5 of MIL-STD-188C for low level keying. Transmitted pulse shape, transmitted distortion and ability to receive distorted signals are in accordance with MIL-STD-118C.

9.2 The mode switch located on the ASR Control Panel provides the following modes of operation:

Mode A. Keyboard or transmitter/distributor on send line with page printer monitor. Reperforator on receive line.

Mode B. Keyboard transmitter and transmitter/distributor to page printer and reperforator monitor off line.

Mode C. Page printer and reperforator simultaneously monitor receive line. Keyboard transmitter and transmitter/distributor connected to send line.

9.3 The speeds at which the ASR terminal operates are as follows:

<u>Works/Minute (Nominal)</u>	<u>Baud</u>
60	45.5
66	50.0
75	55.5
100	75.0

These speeds are crystal controlled and selectable by a switch in the printer. Maximum capability for this system is 30 characters per second or 300 baud.

10.0 Quality Assurance.

10.1 The AN/GGC-52 ASR terminal has undergone an extensive Development Test and Evaluation (DT&E) program to qualify it for tactical use. Operational suitability was verified by an Initial Operational Test & Evaluation (IOT&E) with USAF personnel.

10.2 The ASR was tested for environmental conditions in accordance with MIL-STD-810B, Environmental Test Methods.

10.2.1 The ASR was tested for storage between -62°C (-80°F) to $+71^{\circ}\text{C}$ (160°F).

10.2.2 Temperatures in which operation is possible are from 0°C ($+32^{\circ}\text{F}$) to $+52^{\circ}\text{C}$ ($+125^{\circ}\text{F}$).

10.2.3 A complete thirteen (13) day humidity test was performed.

10.2.4 The ASR was tested for operation at 12,000 ft and storage to 50,000 ft.

10.3 Mechanical testing was performed with the ASR installed in the AN/TCC-77 communications central which is a transportable shelter. The ASR sustained no damage during these tests.

10.3.1 The 18" flat and rotational drop test from MIL-S-52059 (EL) was performed on the AN/TCC-77 with the ASR installed.

10.3.2 The military truck transport test was performed over 4" X 8" timbers spaced 25 feet apart. Ten laps each at 5, 10, 15 and 20 mph were accomplished. Sixty (60) abrupt stops from 30 mph were also part of this test.

10.3.3 The rail transport test was performed by impacting the flat car mounted AN/TCC-77 into a 140,000 pound car twice each direction at 8, 9, and 10 mph.

10.4 The ASR was tested for Electromagnetic Interference (EMI) in accordance with MIL-STD-461A. A complete MIL-E-60510 test was performed with the ASR installed in the AN/TCC-77 with no system degradation.

10.5 Complete performance and electrical tests were also accomplished during the DT&E testing.

10.6 The ASR was tested for operational suitability during the IOT&E of the Tactical Weather System (433L). Actual

USAF personnel operated and maintained the ASR in a simulated tactical situation.

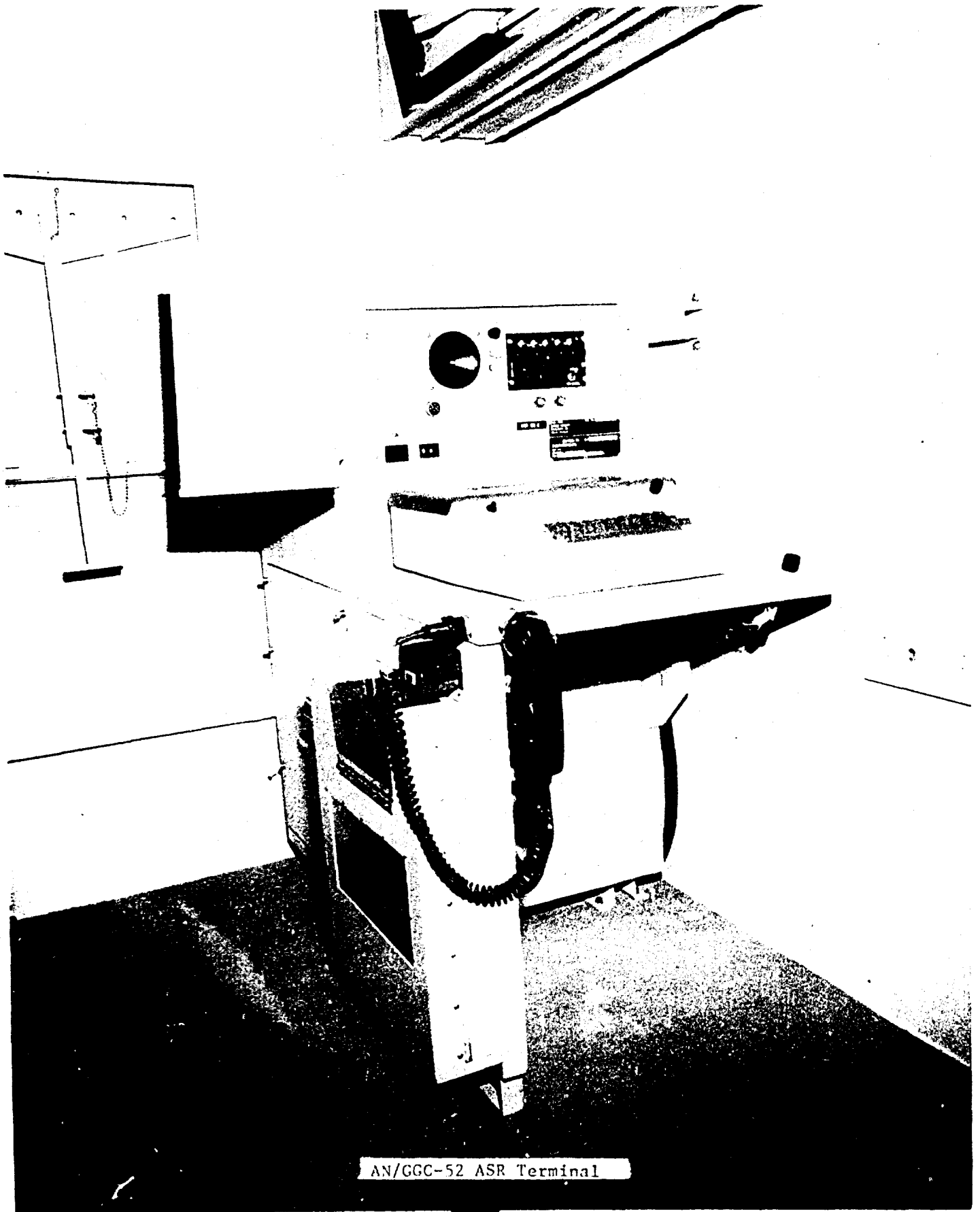
10.7 Test reports documenting all testing were produced and are maintained at Hq ESD/OCDW.

11.0 Logistics.

11.1 The ASR has been completely provisioned by Air Force Logistics Command. Spares and depot level repair facilities have been identified. All test equipment and special Aerospace Ground Equipment (AGE) are identified in the ASR Technical Order T.O. 31WI-2-GGC52-2.

12.0 Training.

12.1 Training Command has developed courses on the ASR for training teletype maintenance men to repair and maintain this new teletype.



AN/GGC-52 ASR Terminal

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