MIL-STD-1399 (NAVY)
SECTION 505
26 November 1974

MILITARY STANDARD

INTERFACE STANDARD FOR SHIPBOARD SYSTEMS

SECTION 505

CENTRAL TIME AND FREQUENCY SUPPORT

FSC MISC

DEPARTMENT OF THE NAVY
WASHINGTON, D. C. 20360

Interface Standard for Shipboard Systems,
Central Time and Frequency Support

MIL-STD-1399(NAVY)
SECTION 505

1. This Military Standard is approved for use by Commands of the Navy in the technical development plans, design, and procurement specifications for new ship acquisitions, ship modernizations or conversions, and systems/equipment for installation therein and into active fleet ships.

2. Recommended corrections, additions, or deletions should be addressed to the Commander, Naval Electronics Systems Command, Department of the Navy, Washington, D.C. 20360.

FOREWORD

Purpose. This section defines the standard interface requirements for, and the constraints on, the design of shipboard systems/equipment which will utilize the central time and frequency system.

Nature of the interface. Navy ships are to be equipped with a centralized source of standard time and frequency control signals which are available to the various users who require such support. It is essential that the interface between the central system outputs and the various users be properly engineered so that the stability of the outputs is not upset and that the users may effectively accept and process the control signals.

Structure of this section. The technical content first delineates the characteristics in terms of time and frequency paramaters available, impedance, voltages, capacity, etc. The constraints on systems/equipment design and installation which are necessary to achieve shipboard compatibility with these characteristics are then established.

CONTENTS

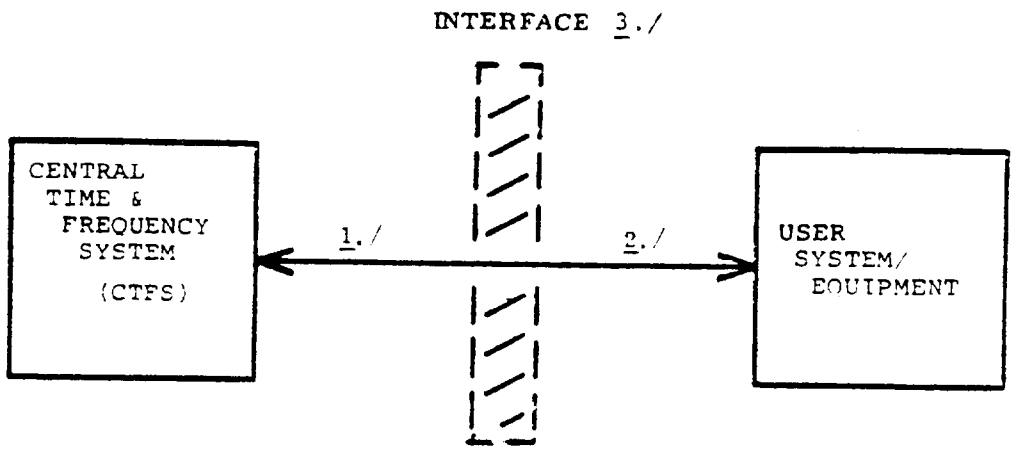
FIGURES

1 GENERAL, SCOPE, INTERFACE AND APPLICABILITY

1.1 General. The policies and procedures established by MIL-STD-1399 are mandatory. This section and the standard are to be viewed as an integral single document.

1.2 Scope. This section establishes interface requirements for shipboard systems/equipment utilizing central time and frequency system (CTFS) support to ensure compatibility between such user systems/equipment and the CTFS.

1.3 Interface. The basic characteristic and constraint categories concerned with this interface are shown symbolically on figure 1 (see paragraph "Definitions" of MIL-STD-1399):



BASIC CATEGORIES

1./ CHARACTERISTICS
- Time
- Time interval (frequency)
- Output impedance
- Voltage
- Capacity

2./ CONSTRAINTS
- Compatibility

3./ The interface is located at the input connector of the user system/equipment.

Figure 1 - Interface

The specific details of the interface characteristics and constraints are described in 5.2 and 5.3.

1.4 Applicability. The criteria of this section apply to the design of systems/equipment required to be interfaced with the CTFS. It also applies, to the indicated extent, to those systems/equipment which will be interfaced with a partial CTFS (i.e. frequency support only).

2 REFERENCED DOCUMENTS

2.1 This section does not apply to this standard.

3 DEFINITIONS

3.1 Central time and frequency system (CTFS). A central time and frequency system is a shipboard system which provides a highly accurate centralized source of time and frequency control signals for various user systems/equipments throughout the ship.

3.2 User system/equipment. A user system/equipment is any shipboard system or equipment which utilizes the support services of a central time and frequency system (CTFS).

4 REQUIREMENTS

4.1 The specific interface requirements and constraints established herein are mandatory and shall be adhered to by SYSCOMs, PMs, contractors and all others engaged in any aspect of shipboard central time and frequency support service to which these requirements and constraints apply including systems/equipment design, production, and installation (see paragraph "Requirements" of MIL-STD-1399).

5 INTERFACE CHARACTERISTICS AND CONSTRAINTS

5.1 General considerations. As weapons, command and control, surveillance, and other systems become increasingly sophisticated, the need for accurate and stable time and frequency support is more demanding, to the extent that only very precise frequency and controlled time interval devices, such as cesium beam standards, can do a satisfactory job. These devices are extremely expensive and many systems cannot affort the luxury of "owning" their own standards. Consequently, a centralized system, similar to the master gyro, stable vertical, and other centralized

support services, is being installed in many ships. This Central Time and Frequency System (CTFS), when installed in surface ships and submarines, provides highly accurate time and frequency control signals to a variety of users, thus eliminating the requirement for individual equipments to have their own built-in standard. Slaved crystal oscillators for frequency control are provided at various locations to drive one or more equipments, and relatively simple time generators are available at the various locations on the ship as required.

5.1.1 System description. The CTFS consists of a highly stable and accurate frequency generator and a time code generator which derives its timing base from the frequency generator. This equipment is stabilized by a cesium beam tube which provides extremely long-term precise time interval signals (the reciprocal of time interval is frequency). The basic zone time is correlated from time-to-time by satellite; between these periods the time code generator is accurately controlled by the cesium beam standard emission of one pulse per second. Frequency control signals are fed to RF distribution amplifiers and time signals to time signal distribution amplifiers. These amplifiers are located throughout the ship as required to provide such services. The amplifiers act as isolation buffers between the central source equipment and the users, and also provide for expansion of the system to service any number of users. If the control signals generated by the CTFS should become inaccurate or unusable, an audio/visual alarm is activated. Some installations may provide only frequency control signals. The basic elements of a typical CTFS are shown on Figure 2.

5.2 Interface characteristics. The interface characteristics of the CTFS are given below. Each shipboard CTFS will provide time and frequency control signals with the characteristics of 5.2.1 through 5.2.5 to the user equipment interface.

5.2.1 Frequency. The RF distribution amplifier outputs are provided at precisely accurate frequencies of 0.1, 1, and 5 MHz with a long term stability such that the frequencies will remain with 1 pp 10^{11} for the life of the cesium beam tube, whose life expectancy is at least five years.

5.2.2 Time. The time signal distribution amplifier outputs provide time pulses at required intervals as supplied by the time code generator. The time code generator can supply pulses at intervals of 1 minute, 10 seconds, 1 second, 100 milliseconds, 10 milliseconds, 1 millisecond, and 0.1 millisecond , and also selected time code signals as required. Since the time pulses are derived from the frequency generator, the accuracy of these pulses is the same as that of the frequency generator. Accurate time-of-day and time-of-event signals are also available from the digital clock.

5.2.3 Output impedance. The impedance at the output of the amplifiers is 50 ohms.

5.2.4 Voltage. The voltage at the output of the amplifiers is 4.5 volts ± 1/2 volt rms, and can be attenuated as required to a minimum of 1.5 volts rms.

5.2.5 System capacity. The CTFS support service capacity is expandable to meet various ship type requirements, depending on the number of amplifiers installed. Each RF amplifier can provide service for up to 12 users, and each time signal amplifier for up to 10 users.

5.3 Interface constraints.

5.3.1 Compatibility. The design of systems/equipment utilizing the support services of the CTFS shall be compatible with the interface characteristics given in 5.2.

6 DEVIATIONS

6.1 Conditions. In achieving the purpose of this section it is recognized that there must be some flexibility of application. During the early design stage of shipboard systems/equipment utilizing

the support services of the CTFS it may become apparent that significant advantages in the overall design/operation of such systems/equipment can be achieved by deviating from the standard characteristics specified herein. In such instance, the provisions of the "Deviations" paragraph of MIL-STD-1399 must be complied with.

6.1.1 Deviation procedure. Requests for deviations shall be submitted to NAVELEX with copies to:

(a) Program/Project Manager

(b) NAVSEA

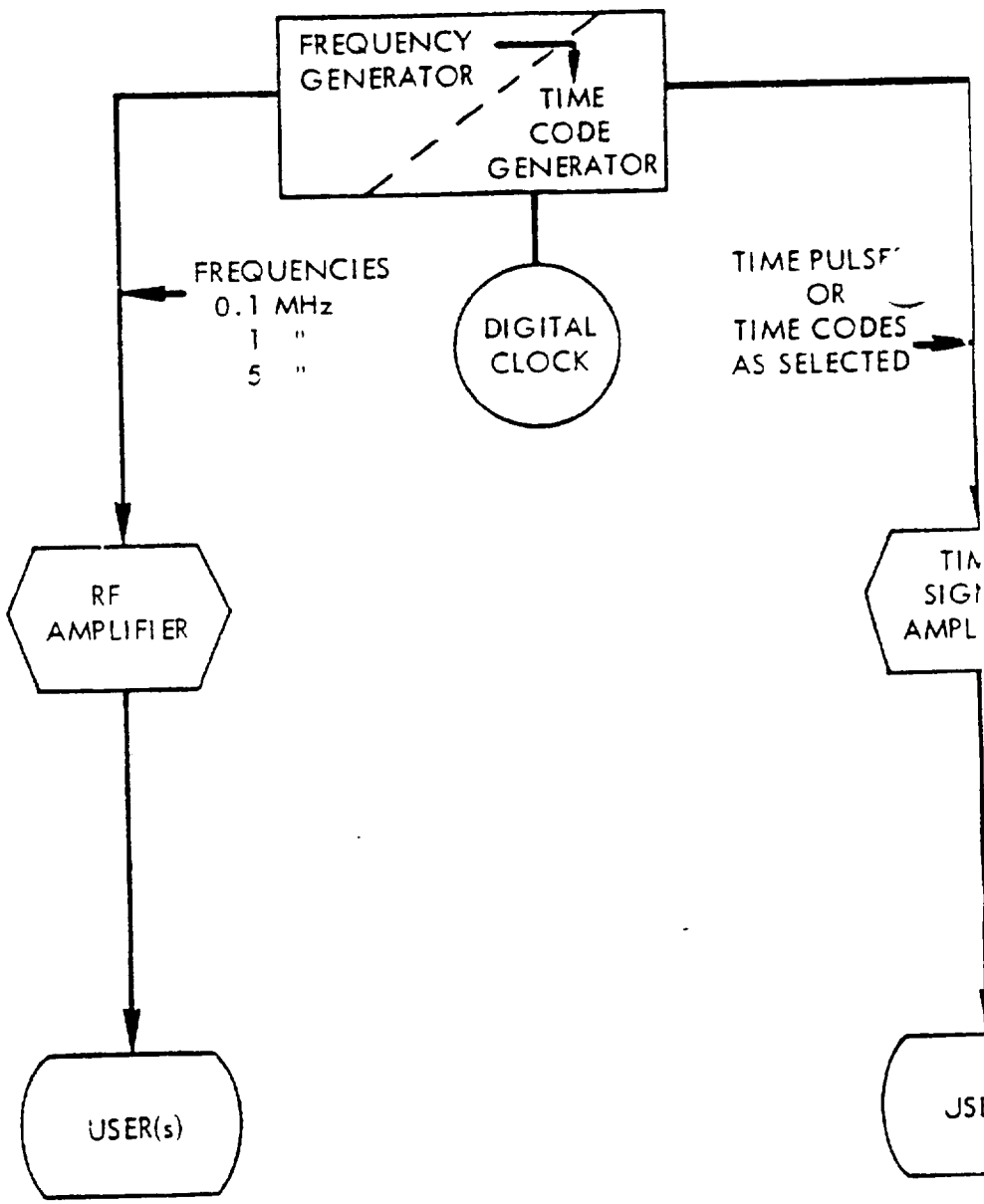
(c) NAVELEX 5101

Review activities:
NAVY - SH, AS, OS

User activity:
CG

Preparing activity:
Navy-EC
(Project MISC-NA41)

Figure 2 - Basic Elements, Central Time and Frequ
Support System



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