DSN Monitor and Control System, Mark III-80

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A description of the DSN Monitor and Control System, Mark III-80 is presented. The major implementations required to evolve from the Mark III-78 to the Mark III-80 configuration are identified.

I. Introduction

The DSN Monitor and Control System, Mark III-80, is a multimission system utilized by the DSN to support Pioneer 6-11, Helios, Viking, Pioneer Venus, and Voyager missions. Figure 1 provides a block diagram of the DSN Monitor and Control System, Mark III-80 configuration.

Since 1978, implementation of equipment and software changes within the DSN facilities has resulted in enhanced capability within the DSN Monitor and Control System. The affected facilities are the Deep Space Stations and the Network Operations Control Center.

At the Deep Space Stations (DSS) a Stand-Alone Host Processor is being implemented. Included are software ("host" software) changes which provide downline loading to the Stand-Alone Host Processor from a disc unit of any idle data system computer.

At Deep Space Stations with a 34-m antenna, the Microwave Subsystem has been provided with an interface which allows remote configuration selection at the central monitor and control operator's position.

In the NOCC, software changes have been implemented to provide precision power monitor and GCF monitor displays for use by the Network Operations Control Team.

II. Deep Space Station

As part of the DSN Monitor and Control System, the DSS Monitor and Control Subsystem (DMC) provides two primary functions: (1) The DMC provides the central control and monitor capability for the DSS, and (2) the DMC receives control data from and furnishes monitor data to the NOCC for Network Central Control and Monitor purposes.

There are four major assemblies of the DMC that accomplish the above functions. The four major assemblies are:

(1) Digital Instrumentation Assembly.

(2) Stand-Alone Host Processor.

(3) Station Monitor and Control Console.

(4) Data System Terminal.

A. Digital Instrumentation Assembly (DIS)

The DIS, (an XDS 920 computer) is utilized as a central collection point for station monitor data and for interfacing with the NOCC. For collecting station monitor data, the DIS has interfaces with all of the station subsystems. The station monitor data are accumulated by the DIS and displayed to the station operator located at the Station Monitor and Control Console. Additionally, a subset of this station monitor data is sent to the NOCC for central monitoring purposes.

B. Stand-Alone Host Processor Assembly (SHP)

An SHP, which consists mainly of the Modcomp 7810 classic computer, is being installed in the DIS Monitor Interface Assembly (DMI) cabinet at all Deep Space Stations for the Mark III-80 configuration. Previously, the host software operated concurrently with the communications program in the Communications Monitor and Formatter Assembly (CMF). The SHP is being implemented to remove constraints which arise from the use of the CMF to support data recalls and system performance tests. The SHP provides the interface for centralized operation of DSS data system computers.

The SHP operational program is downline loaded using a disc drive of an idle data system computer (either the Command Processor Assembly, Metric Data Assembly, Communications Monitor and Formatter Assembly or Telemetry Processor Assembly). The SHP is interfaced to the data system computers via a Star Switch Controller (SSC) and operates in an unattended manner in conjunction with the Data System Terminal.

Changes to the host software occurred to provide loading of the operational program in the SHP, but the operator interface has not been changed. The software is currently undergoing soak testing prior to DSN operations acceptance.

C. Station Monitor and Control Console (SMC IIA, SMC IIB)

The SMC IIA and SMC IIB were implemented as part of the Mark III-78 System configuration for the purpose of providing a central monitor and control operator's position for some of the noncomputerized subsystems. Two different configurations, designated SMC IIA for the 64-m DSS and SMC IIB for all others, were developed for the DSN.

D. Data System Terminal Assembly (DST)

The DST is used as a central DSS input-output device for computers in the Command, Telemetry, Tracking, and Radio Science Subsystems, and for the Communications Monitor Formatter at the DSS. It consists of four elements: two keyboard-CRTs, a hardcopy printer, and "host" software capability. The keyboard-CRTs and printers interface with the host software, and the host software then interfaces with all of the data system computers via the star switch controller. In this manner, the data system computers can be centrally controlled and monitored. The DST and the Station Monitor and Control console are collocated within the DSS control room and form a centralized operator position for monitor and control.

III. Network Operations Control Center (NOCC)

The NOCC Monitor and Control Subsystem provides the processing capability for central network monitor and control. Software changes have occurred to provide monitoring of the signal level and noise temperature parameters from the Precision Power Monitor Assembly (part of the Receiver/Exciter Subsystem at the DSS). Signal and noise measurement data are returned to the NOCC to enable system level monitoring of baseband combining of the signal received by two Deep Space Stations. Other software changes have been implemented to provide readouts of the GCF Monitor data (line performance and status) at the NOCC Displays.

NETWORK OPERATIONS — CONTROL CENTER | GROUND COMMUNICATIONS FACILITY | DEEP SPACE STATION

DSS SUBSYSTEMS

STAR SWITCH CONTROLLER (2)

- TELEMETRY (2)
- COMMAND (2)
- TRACKING
- RADIO SCIENCE

MONITOR AND CONTROL

STAND-ALONE HOST PROCESSOR — DATA SYSTEM TERMINAL

DIGITAL INSTRUMENTATION ASSEMBLY

STATION MONITOR AND CONTROL CONSOLE

NON-COMPUTERIZED SUBSYSTEMS

- RECEIVER-EXCITER
- MICROWAVE
- ANTENNA MECHANICAL
- FREQUENCY AND TIMING
- TRANSMITTER

NOCC SUBSYSTEMS

NOCC COMMUNICATIONS SUBSYSTEM

HIGH-SPEED DATA SUBSYSTEM

- DISPLAY
- MONITOR AND CONTROL
- TELEMETRY (3)
- TRACKING (2)
- TEST AND TRAINING (2)
- SUPPORT (2)
- COMMAND
- SPARE

STAR SWITCH CONTROLLER (3)

NCE

ERROR CORRECTION AND SWITCH ASSEMBLY

CMF

CENTRAL COMMUNICATIONS MONITOR

GCF SUBSYSTEMS
WIDEBAND
VOICE
TELETYPE

NCE - NOCC COMMUNICATION EQUIPMENT
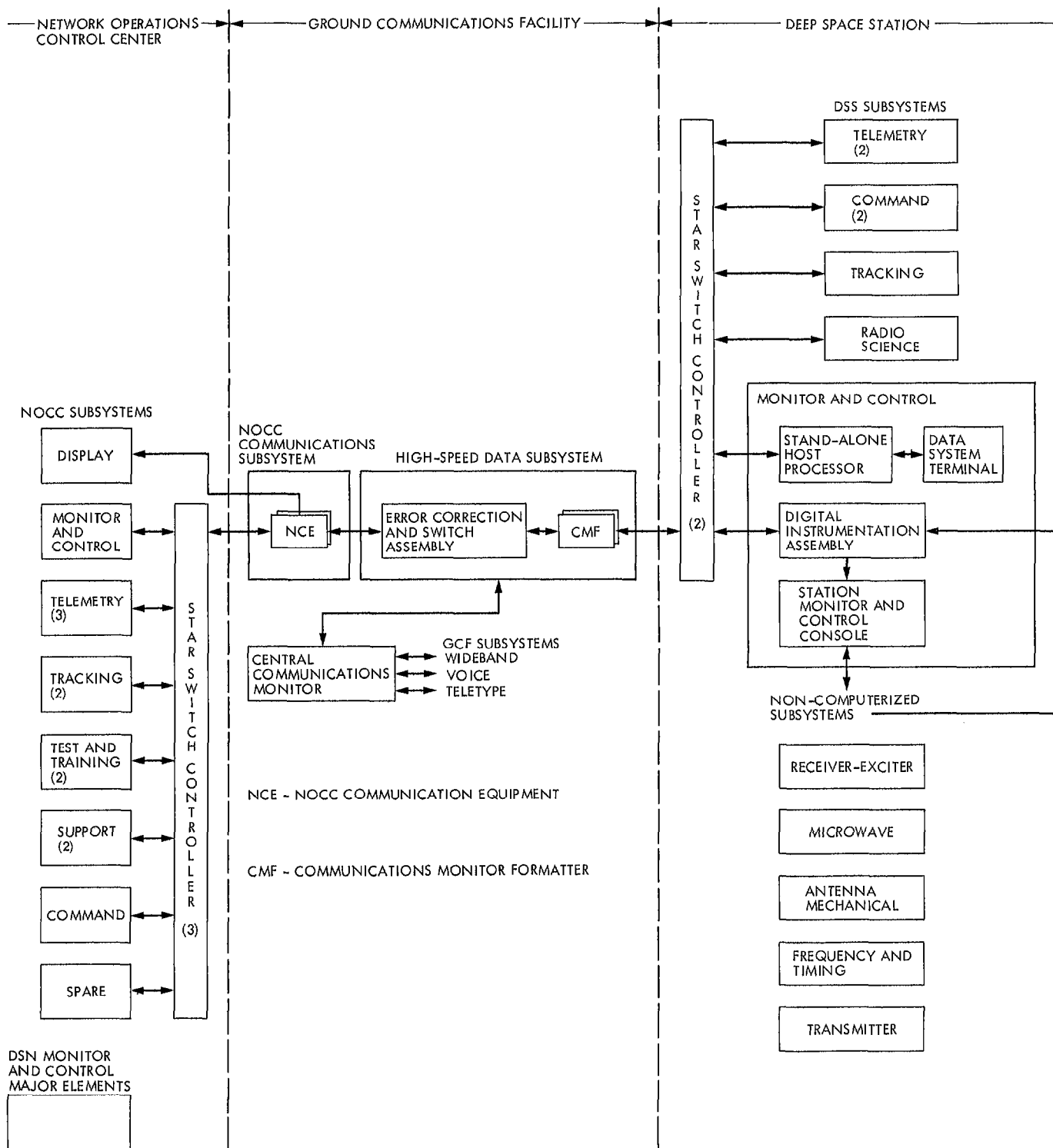
CMF - COMMUNICATIONS MONITOR FORMATTER

DSN MONITOR AND CONTROL MAJOR ELEMENTS

Fig. 1. DSN Monitor and control Subsystem Mark III-80

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