For Network Personnel Only

TECHNICAL INFORMATION BULLETIN

MANNED SPACE MSFN FLIGHT NETWORK

GODDARD SPACE FLIGHT CENTER, GREENBELT, MARYLAND

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ALL MISSION ASPECTS COVERED AT MA-9 DEBRIEFING

Flight Director Cris Kraft praised the network at the MA-9 debriefing held at Houston on May 28. He gave details about the gantry diesel malfunction, pointing out that the trouble originated with a worn cam in the fuel pump, and congratulated BDA for being objective in their estimate of 24 hours to repair their C-band radar, even though such an estimate was bound to result in a scrub. Accolades also went to the RTK for outstanding support and for demonstrating the feasibility of the use of C-band radar tracking ships in the manned space flight program.

Kraft was followed by Cape CapCom Wally Schirra, speaking for Astronaut Cooper, and Dr. Charles Berry, who described some of the preliminary medical findings. These included the fact that Cooper slept for a total of about 7-1/2 hours in naps of up to one hour and fifteen minutes duration. The slow-scan TV, as used in MA-9, was reported to have little value as an AeroMed aid—its original purpose.

Gene Kranz gave the rundown from the procedures standpoint, citing the success of the AN/UYK computer at BDA and noting the exemplary performance of the Goddard SCAMA operators. He acknowledged the difficulties experienced at some sites with the new headsets and stated that a solution was being sought.

Arnie Aldrich discussed the systems aspects and revealed that corrosion in the amplifier calibrator unit of the autopilot is the prime suspect in the failure of the inverters and the malfunction of the .05 G indicator circuit. This discovery has prompted an investigation into the effect of a magnetic field on water and humidity in a zero G environment.

Simulations were covered by Mel Brooks, who expressed satisfaction with increased network efficiency as the simulations progressed. Asst. Status Monitor Bob Sheridan reviewed radar coverage statistics which showed C-band track during 80 per cent of the time the C-band beacon was on and a corresponding 36 per cent coverage for S-band radar. Dick Holt's presentation revealed that the Atlantic radar aircraft detected orbital passes of the spacecraft, and the Pacific-based EC-121's were able to track during blackout and reentry and plot a reasonably accurate IP. No attempt was made to remote the aircraft radar data.

Aspects of communications and computer coverage and details of site manning and documentation efforts were presented by George Cassels, Jim Stokes, and Bob Miller from GSFC.

John Graham wound up the debriefing session with a first-hand account of the recovery operations, emphasizing improved techniques in this area. Examples were the availability of communication equipment on the carrier elevator for direct contact with the astronaut, and earlier take-off of the recovery helicopters.

About Documentation

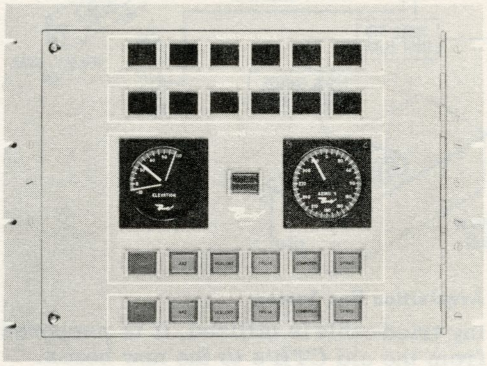
The following manuals were completed and mailed to the applicable sites since the last issue of TIB:

ME-315 Ampex Recorder / Reproducer Series FR100B. Revision dated May 15, 1963.

ME-143 Power Modulation Monitor, Model SG-41.1 and SG-41.2. Revision dated May 17, 1963.

Now in preparation is the Manned Space Flight Network Performance Analysis for MA-9, GSFC report No. X551-63-108, dated June 6, 1963. Copies of this report will be distributed to the sites early in June.

GEMINI ACQUISITION BUS SYSTEM NOW BEING PRODUCED



AA-1 Acquisition Control Panel

A new acquisition bus system that will allow ground tracking stations to acquire two space vehicles simultaneously is now in production at Bendix Radio Division, Baltimore, Maryland, and deliveries for the MSF Network should begin late this summer.

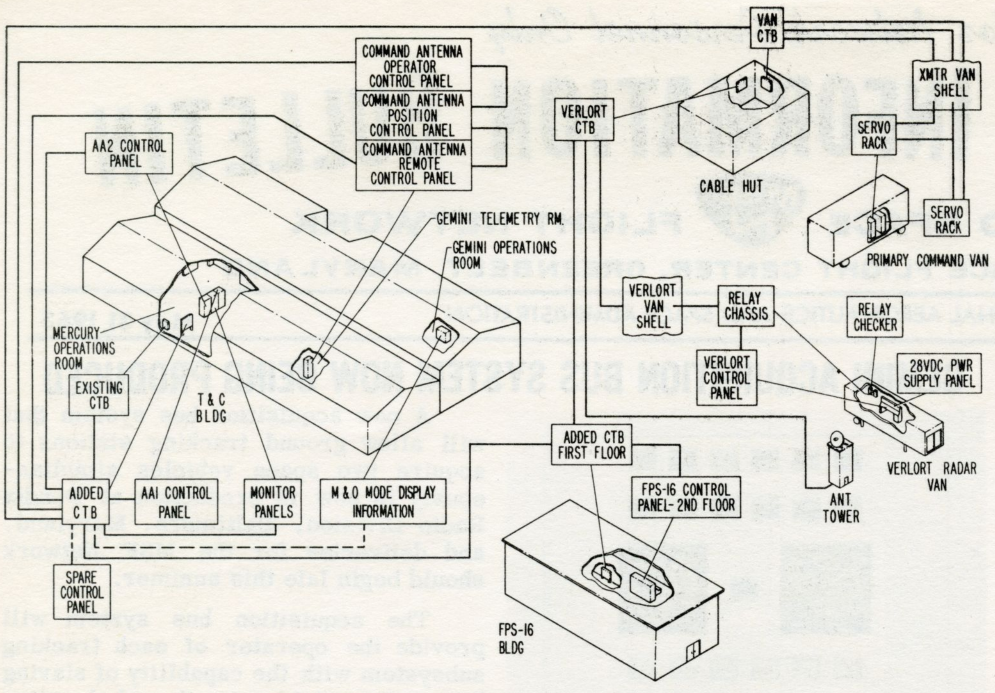
The acquisition bus system will provide the operator of each tracking subsystem with the capability of slaving his equipment in azimuth and elevation to any other data source; viz., acquisition aid, radar, and computer-generated data. (Provisions for a spare position have been included in the design for future expansion.) This capability results from a network of synchro data transmission buses interconnecting all the steerable antennas at a site. Each subsystem will provide to all other subsystem positions information concerning which spacecraft is being tracked, the validity of the data, and the cable wrap indications, where applicable. Remote control of the command antennas has been incorporated.

A typical equipment layout has been included in this article as an aid for describing the system. The acquisition control panels (see photo of one type) display positional information from any other subsystem, and permit each operator to slave his antenna to any one of the other positions by pressing a switch. These switches are electrically interlocked to prevent the application of more than one set of information onto the indicators or antennas at any one time. Each panel is physically interlocked to prevent slaving to its own information. The control panel is hinged to permit access to all components as an aid to troubleshooting and maintenance.

Associated with each acquisition control panel is an acquisition control relay chassis. Activated by the pushbuttons on the panels, the relays switch the selected information from the bus to the display panel and to the control transformer of the slaved antenna.

The following types of control panels are also used in the acquisition bus system:

(1) The command antenna operator panel allows selection of source synchro information for the command antenna.



Typical Site Layout for Acquisition Bus System

Those sources having valid track on each vehicle are indicated by lamps at the top of the panel. Angular position of each source can be selected for display on EL and AZ position indicators. The command antennas may be individually slaved to any source by depressing switches near the bottom of the panel. This panel also contains indicator lamps to indicate which command transmitter is in use and whether high or low power is feeding the antenna. An alternate-action switch provides control to direct the transmitter output to the desired antenna.

(2) The command antenna position panel allows the operator to monitor the position of either command antenna. Since the command antennas do not supply position data to other equipment, the loading of these indicators is not significant, and simple torque receiver devices are used.

(3) The command antenna remote panel permits remote manual control of the antennas by means of a pair of handwheels. Selection of handwheel control between antennas is made simultaneously with selection of command antenna position display.

(4) The acquisition bus monitor panel continuously displays the EL and AZ coordinate position of all buses. The entire site antenna complement can be monitored from this panel.

Capability to display tracking mode, vehicle being tracked, and validity of track is being provided to the M&O supervisor's desk for mission status monitoring.

All transmission cables and associated mode and control cables terminate at each antenna location in new cable termination boxes (CTB's). When existing triad cable is utilized, it is jumpered from the old CTB's to the new boxes.

The CTB's house a signal distribution assembly, a relay chassis associated with the acquisition control panels, and where applicable, a relay chassis associated with the three command antenna panels. Also included for troubleshooting convenience are trouble lights, maintenance tools, 117-VAC service outlets, and laminated illustrations of plug and terminal board pin configurations. Cables from the signal distribution assembly to the relay chassis are segregated to permit easy removal of any one cable and chassis.

For van-mounted equipment, external CTB's are provided for cable termination. The relay chassis and a relay checker are then mounted within the van. All panels and chassis are furnished with quick-disconnect connectors to facilitate installation and maintenance. Interior cabling will be prefabricated to the maximum possible extent to reduce installation time. Auxiliary test cables are also provided to allow direct test connection to an acquisition control panel in proximity to its associated relay chassis.

A pictorial site layout drawing, a site cabling drawing, and a wiring chart book are being provided to simplify installation and maintenance of the acquisition bus system at each Gemini site. The site layout drawing shows a view of each of the panels and cable termination boxes to be installed at the site, and the equipment into which each is to be installed.

The site cabling drawing and the book of wiring charts together facilitate rapid troubleshooting. The site cabling drawing contains the number of each cable and the functions carried. The wire charts list all connections of the wires within each cable, arranged numerically by cable number. By using the cabling drawing, a trouble in a synchro line or control circuit can be localized to a few cables with identifying numbers. By referring to the wire charts, maintenance personnel can quickly determine which wires of these cables are associated with the malfunction.

The design of the acquisition bus system provides for good synchro data transmission accuracy. Balanced capacity between stators and ground throughout the synchro cable system is maintained during manufacturing and by capacity trimming as necessary during installation. It has been found that well-balanced cables contribute less than 0.02-degree error per mile, whereas cables installed with one stator grounded contribute errors of the order of one degree per mile.

Loading of the synchro bus by the control transformers of antennas slaved to the bus is reduced by employing delta synchro capacitors to resonate the inductive component of the CT impedance. The input impedance of a properly resonated control transformer should exceed 7.5K ohms per stator. The series resistance of the triad synchro cable is less than 25 ohms per mile. This is small compared with the transmitter output impedance and does not contribute appreciably to the regulation. The bus voltage regulation is then about 3 per cent per pedestal. With as many as six pedestals slaved to a single source, the voltage drop should be less than 1.5 DB. Therefore, the ability of the slaved pedestals to accurately follow the position of the source antenna should not be significantly affected by voltage drop.

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Much of the information in this article was taken from the Gemini Acquisition Bus System, dated May 31, 1963, published by The Bendix Corporation, Bendix Radio Division. Copies of the publication will be available early in June.

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