Range Commanders Council
METEOROLOGY GROUP

DOCUMENT 355-84

METEOROLOGICAL SOUNDING SYSTEM (MSS) STANDARD OPERATING PROCEDURES

WHITE SANDS MISSILE RANGE
KWAJALEIN MISSILE RANGE
YUMA PROVING GROUND
DUGWAY PROVING GROUND
COMBAT SYSTEMS TEST ACTIVITY

ATLANTIC FLEET WEAPONS TRAINING FACILITY
NAVAL AIR WARFARE CENTER WEAPONS DIVISION
NAVAL AIR WARFARE CENTER AIRCRAFT DIVISION
NAVAL UNDERSEA WARFARE CENTER DIVISION, NEWPORT
PACIFIC MISSILE RANGE FACILITY

30TH SPACE WING
45TH SPACE WING
AIR FORCE FLIGHT TEST CENTER
AIR FORCE DEVELOPMENT TEST CENTER
AIR FORCE WEAPONS AND TACTICS CENTER
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SPACE TEST AND EXPERIMENTATION PROGRAM OFFICE
ARNOLD ENGINEERING DEVELOPMENT CENTER

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METEOROLOGICAL SOUNDING SYSTEM (MSS) STANDARD OPERATING PROCEDURES

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Range Commanders Council

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New Mexico 88002

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FOREWORD

This manual was prepared by an ad hoc committee of the Range Commanders Council (RCC) Meteorology Group (MG) Standing Committee for Meteorological Measurements. The ad hoc committee was composed of the following individuals:

E. E. Fisher, AFSC (Chairman)
O. H. Daniel, ESMC
B. R. Hixon, PMTC
J. M. Hobbie, KMR
R. W. Evert, NWC

The committee wishes to express special appreciation to Mr. Darwin Tolzin, PMTC, for the vast amount of effort he expended in developing the basic operating instructions of this manual. Also a special thanks goes to Ms. Shirley Fletcher, AFSC, for the many hours she donated in preparing this manual for publication.

If any user of this manual has any questions or suggestions for changes, address them to HQ AFSC/WEO (ATTN: G. K. Phelps), Andrews AFB, MD 20334, telephone 301-981-4772 or AUTOVON 858-4772 or CSR Meteorology Section, CSR 4600, P.O. Box 4127, Patrick AFB, FL 32925-0127, Telephone 407-853-5205, AUTOVON 467-5205, or FTS 253-5205.

CHAPTER I

INSTALLATION OF MSS

1.0 SELECTION OF OBSERVATION SITE

1.1 The site of the observing equipment is regarded as the point of observation. The point of observation will be selected with a view to reducing to a minimum the probability of loss of data due to fixed obstructions such as buildings, trees, and towers.

1.2 Obstructions around rawinsonde sites will affect the ability of the antenna to track on-target whenever the angular altitude of the obstruction is approached by that of the target; therefore, altitudes of obstructions should, insofar as possible, be less than that of the tracking antenna.

1.3 The launching area terrain should be flat, smooth, well-drained, and free of obstructions that constitute hazards to personnel while launching the balloon. Launching trains range from 35 to 75 feet; therefore, the observers need considerable maneuvering room for launching during strong surface winds.

2.0 INITIAL INSTALLATION OF EQUIPMENT

2.1 Installation and adjustments (except those adjustments that are considered part of the normal operating procedures) of electronic equipment used in taking rawinsonde observations will be made only by qualified electronic technicians.

2.2 The Meteorological Sounding System (MSS) pedestal and antenna assembly will be installed on a rigid platform or other base sufficiently strong to support safely the weights of the equipment and necessary workers. If an installation is planned for the roof of a building, ascertain that the roof is suitably supported, the building is stable, and vibrations originating within the building are not communicated to the platform.

3.0 ORIENTATION OF EQUIPMENT

Winds aloft are reported in terms of the direction, with respect to true north, from which they are blowing. A true north orientation point must be determined for each observation site.

4.0 OBSTRUCTIONS AND SIGNAL INTERFERENCE

When elevation angles are low (below 5 degrees) or within 5 degrees of obstructions (e.g., metal buildings or towers), MSS operators should expect rough and irregular tracking due to multipathing of the incoming signal. Because of the data rate and smoothing routines, these data are usable; however, they should be closely examined to ensure consistency with adjacent data.

CHAPTER II

GENERAL DESCRIPTION OF MSS

1.0 GENERAL

1.1 The MSS has been developed to track and acquire data from meteorological radiosondes, rocketsondes, windsondes, meteorological satellites, and remotely piloted vehicles. A single-channel monopulse tracking antenna is driven by a specially designed direct-drive torquer pedestal to provide high precision automatic tracking. A two-tone ranging system is used to provide accurate, reliable, and unambiguous slant range data. Automatic digital data processing and reduction are performed with a Nova 3/12 minicomputer system. The system is compatible with existing radiosondes and rocketsondes, and fully automated data reduction is provided with the newly developed MSS high precision radiosondes and windsondes.

1.2 The MSS has been developed to replace the older and less accurate AN/GMD-(X) systems used for the last 30 years to acquire upper air data. The MSS is a completely solid-state design that offers a significant improvement in accuracy, reliability, and maintainability over the gear-driven, vacuum-tube designs.

2.0 GENERAL SYSTEM DESCRIPTION

2.1 The MSS, as shown in figure II-1, consists of a direct-drive torquer antenna pedestal, a single-channel monopulse RF feed and reflector, a dual-tone range measurement system, a meteorological receiver, a telemetry signal and tracking converter, a strip chart recorder, a microprocessor system control unit, and a digital data processing system. The interrelationship of the system components is presented on the block diagram in figure II-2.

2.2 The tracking antenna consists of an 8-foot diameter parabolic reflector with a single-channel monopulse RF feed at 1660 to 1700 MHz. The meteorological receiver is a solid-state unit with acquisition bandwidth necessary for tracking standard radiosondes. Both AM and FM detection modes are included in the receiver. The tracking pedestal is an elevation-over-azimuth, direct-drive torquer type. The antenna and pedestal assemblies fit within the standard S-78G/UM radomes and are sufficiently small to be used in mobile configurations. The antenna control unit and pedestal servo drive circuits are solid-state.

2.3 The range measurement systems use a two-tone (fine and coarse) ranging modulation for use with transponder radiosondes, windsondes, and rocketsondes for high precision range data. The uplink ranging transmitting antenna system (401 to 405 MHz) consists of vertically oriented elements mounted within the receiving parabolic reflector to gain focusing power and to save space inside the radome.

2.4 The telemetry signal converter and system control unit convert the video output from the receiver into standard computer input digital signals (EIA RS-232) and signals to drive the real-time displays. Switchable options

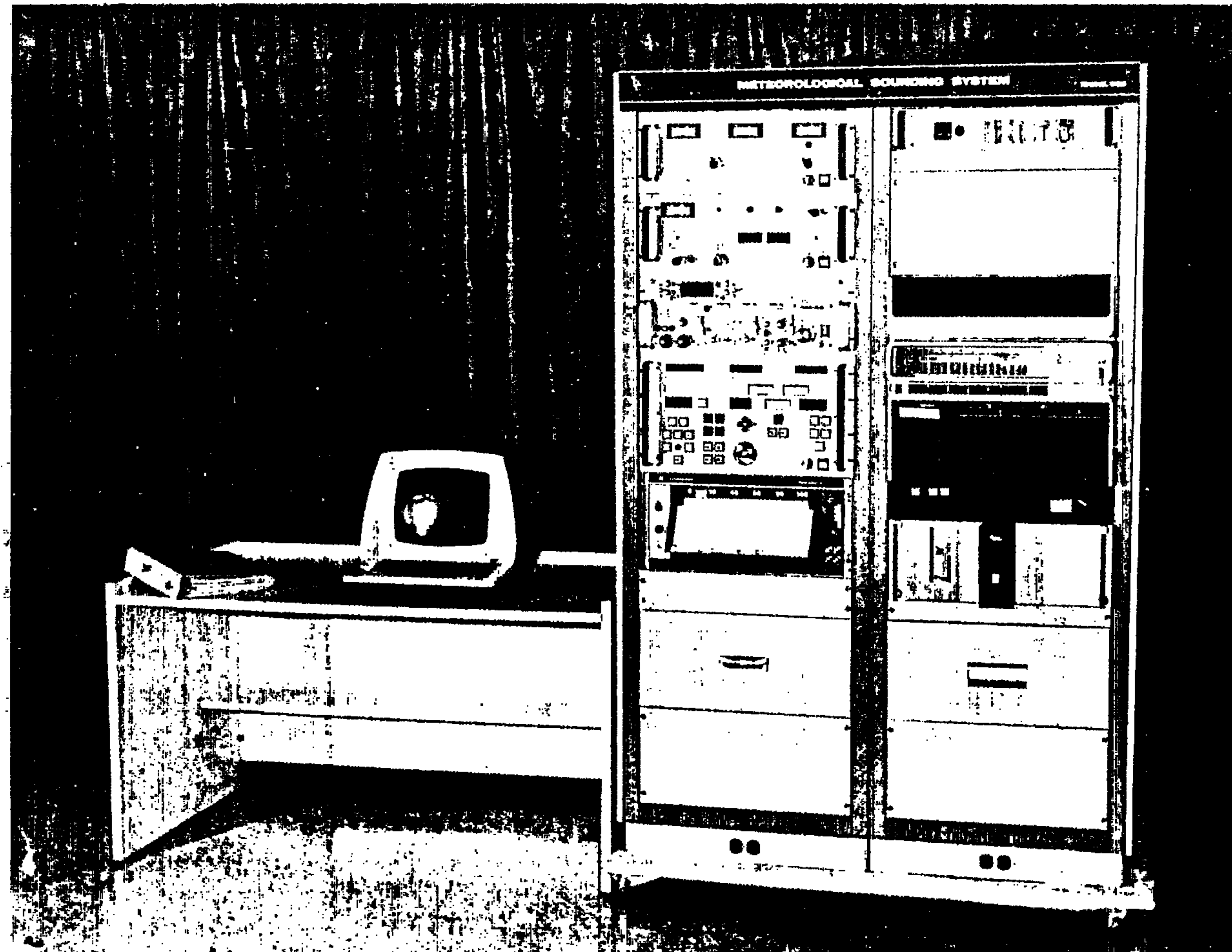

Figure II-1. MSS Tracking and Data Acquisition System.

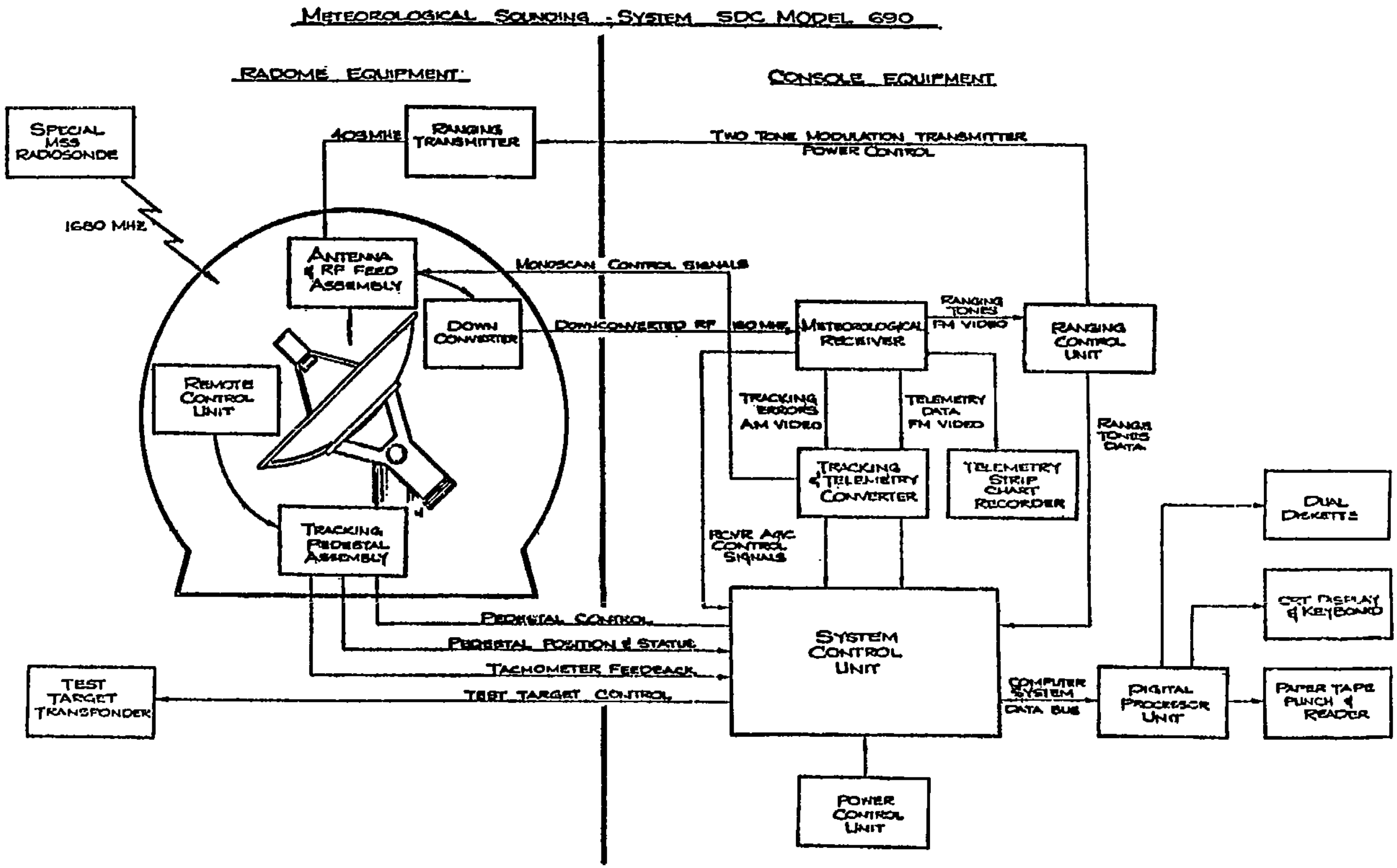

Figure II-2. Overall System Diagram.

available with the system include decoding formats for the various radiosondes and rocketsondes in addition to the MSS radiosondes and windsondes.

2.5 A microprocessor system is used as the system control unit. This unit accepts inputs from the tracking and telemetry system and converts these inputs to drive the real-time display and the computer system. The microprocessor system control unit also is used for the antenna pedestal servo control and manual command. Various servo bandwidth settings and servo loop selections are made possible with this microprocessor unit, in addition to tracking rate and position memory features.

2.6 The tracking system real-time display consists of LED readouts of range, altitude, azimuth angle, elevation angle, and telemetry channel monitors.

2.7 The minicomputer system consists of a digital processor unit with 3K words of MOS memory, dual diskette storage, an operator's console keyboard and CRT, a paper tape reader and punch, and optional peripherals such as printers, plotters, additional disk storage devices, and an RS-232 external source.

2.8 The operator's console and associated items consist of a double equipment rack assembly, a side table for the keyboard/CRT terminal, and the keyboard/CRT terminal. The left-most equipment rack contains the electronic units associated with the telemetry and tracking functions. The right-most equipment rack contains the minicomputer unit and its peripherals (with the exception of the keyboard/CRT terminal) and the power control functions.

2.9 The system can be operated by one operator from the console.

3.0 RECEIVING/TRACKING ANTENNA AND RF FEED DESCRIPTION

3.1 The receiving/tracking antenna is an 8-foot diameter parabolic reflector with a single-channel pseudo-monopulse feed. This feed consists of antenna elements, located in the focal plane of the reflector, that feed the lobing and sum channel outputs to the monopulse converter. Each element pair produces both horizontal and vertical polarization signals, which are summed in 90-degree hybrids. There are two elevation signals, two azimuth signals and one sum channel formed with these hybrids. The elevation signals are passed through one 180-degree hybrid and the azimuth signals through a second 180-degree hybrid to form elevation angle and azimuth angle error signals proportional to the differences between each pair of input signals. These error signals are serially commutated and then combined with the sum channel signal to produce an amplitude modulated sum signal output. The error signal commutation switching rates are commanded by the console-mounted tracking converter.

3.2 The three monopulse feed outputs (Σ, azimuth difference and elevation difference) of each polarization are combined into a single channel by the monopulse converter. The output of the converter is the sum signal amplitude modulated by the difference signal so that the amplitude modulation is proportional to the angle off-boresight.

4.0 PEDESTAL ASSEMBLY DESCRIPTION

4.1 The pedestal assembly, as shown in figure II-3, is an elevation-over-azimuth, direct-drive torquer type, which has been designed specifically for the meteorological radiosonde and rocketsonde tracking application. The servo system characteristics are also based upon these requirements.

4.2 The basic pedestal provides a weatherproof unit with high rigidity. All rotating components are sealed to keep out blowing sand, dust, and water; aluminum weldments serve as basic structural members and also as the weatherproof exterior. Internal components can be reached through removable access covers. The pedestal is self-draining to prevent accumulation of condensed moisture.

4.3 Stow locks and fail-safe electromechanical brakes are provided on both axes for protection and stability. The stow locks, located directly on the output axis, protect the drive train while stowed during extreme wind loads.

4.4 Since the pedestal would normally be stowed with power removed and with the brakes applied, a mechanical brake release is provided on MSS serial numbers 5 and higher.

4.5 Cable loop wrap-up or twist system is standard equipment. Two entirely separate limit-switch assemblies are for elevation and azimuth protection. Primary limit switches perform normal limit stopping by disabling the motor drive. Final limit switches for both elevation and azimuth apply 15 volts positive or 15 volts negative to the servo amplifier input, reversing the direction of antenna travel. This automatic backout of final limits eliminates manual intervention to reposition the antenna.

5.0 SYSTEM CONTROL UNIT DESCRIPTION

5.1 The System Control Unit (SCU) provides control and processing capabilities for several system subfunctions. It performs the entire function of pedestal servo compensation and control via its microprocessor and the associated SCU front panel operator controls. The SCU accepts raw phase angle measurements from the ranging system and meteorological telemetry frequency values for the reference channel and the data channels from the telemetry converter unit. The SCU formats these data and communicates them to the digital processor unit.

5.2 The major function of the SCU is antenna servo control. The microprocessor unit substitutes for the functions of a conventional analog antenna control unit. Variable servo bandwidth control, variable gain settings and tachometer feedback control are programmed into this unit. Tracking position and rate memories are provided for loss of track and acquisition conditions.

5.3 The SCU receives the tracking error voltages from the tracking converter, the digital position values and the tachometer outputs from the pedestal, and the incoming signal AGC level from the receiver. These quantities are sampled and digitized at a rate several times that of the

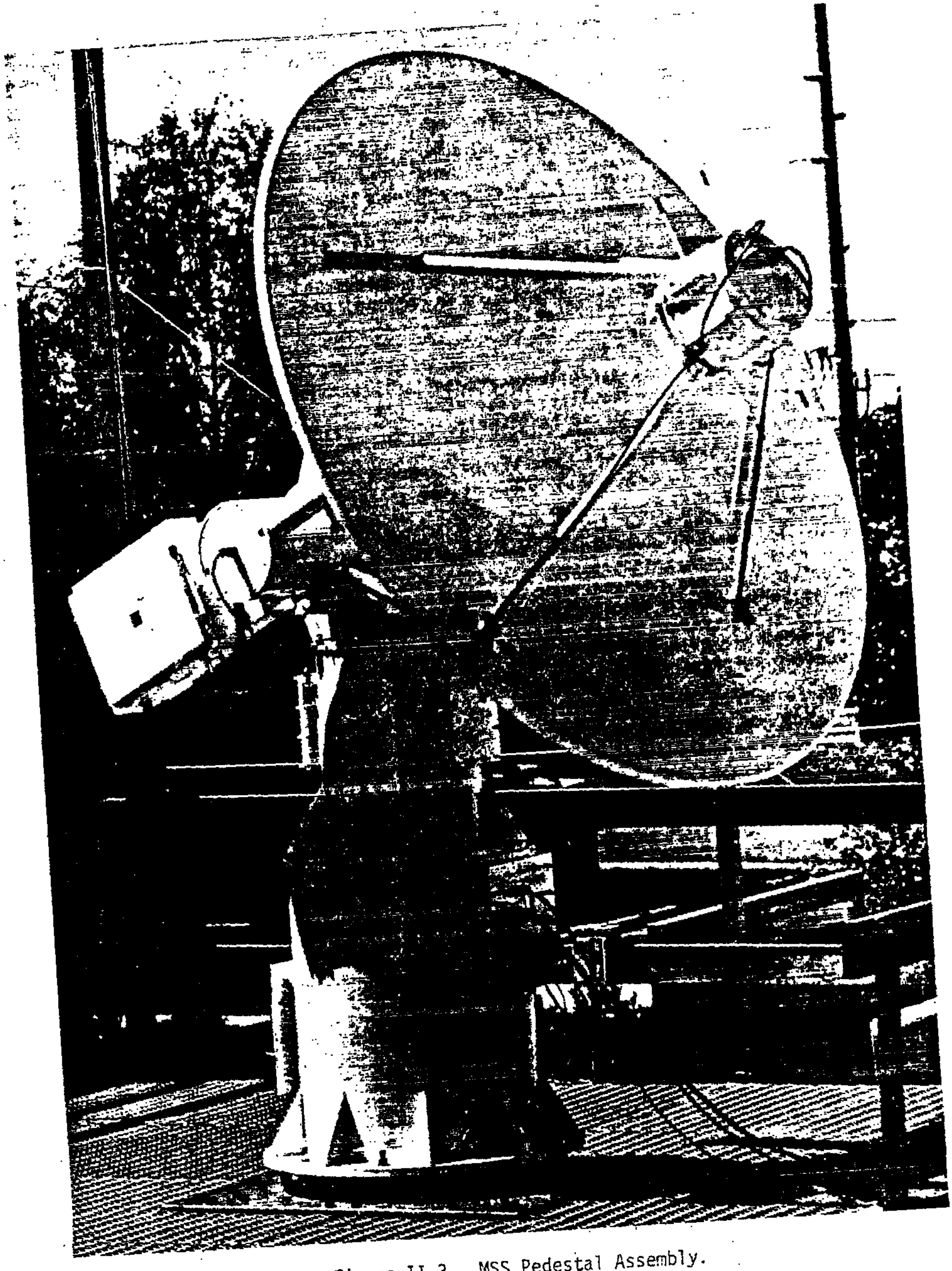

Figure II-3. MSS Pedestal Assembly.

upper servo control bandwidth and input by the microprocessor controller in the SCU. The software program resident in the microprocessor develops servo control output signals, via output D/A converters, to drive the motor power amplifiers at the pedestal. The software algorithms provide the required servo compensations and damping control to yield a servo control function that is critically damped for several front panel selectable operating bandwidths, typically 100 percent, 50 percent, and 10 percent. The parametric constants for the various selectable operating bandwidths are permanently stored in the microprocessor memory, and the appropriate set of constants is accessed for the selected bandwidth. The microprocessor samples the status of the front panel bandwidth control switch to determine which set of bandwidth and damping constants to apply. Change to a different set of constants requires reprogramming the microprocessor memory, which could be done by plugging in a different Read Only Memory (ROM) on a printed circuit card.

5.4 The microprocessor in the SCU also implements the tracking back-up modes, which are reverted to for pedestal control from autotrack whenever a signal loss or excessive tracking errors are detected. When tracking errors and signal levels return within bounds, the autotrack mode is automatically restored. This protects against tracking loss due to momentary dropouts and signal reflection phenomena.

5.5 The miniprocessor develops continually updated back-up memories of the last valid tracker positions (azimuth and elevation) and of the last valid tracking rates. Another continually updated memory stores the receiver AGC level of the past several seconds of valid operation. Whenever the AGC level instantaneously drops below a predetermined AGC value in memory, a threshold is tripped in the software that places the pedestal in control of either the position or rate memory. The specific memory used for back-up control is front-panel selectable. Upon return of the instantaneous AGC level to the memory level, autotrack operation is resumed.

5.6 The microprocessor also monitors the instantaneous values of the tracking error signals and trips a software threshold whenever some preset angular tracking error is exceeded. The crossing of this threshold automatically places the pedestal in control of the selected back-up memory. When the tracking error value drops below threshold, the system returns to autotrack.

5.7 As described above, position loop servo compensation is algorithmically applied, and the resulting signal, an effective rate command, is fed to the rate loop. The signal is compared to tachometer feedback from the pedestal for servo damping and further compensated for desired rate loop servo response. The resulting rate error signal then drives the axis motor to reduce the tracking error signal. Although performed digitally by a microprocessor, the overall control and operation of the pedestal system is not different than if performed using the traditional analog techniques.

5.8 For manual rate operation, a joystick-controlled DC voltage is applied to the rate loop in place of the command signal from the position loop amplifier. The pedestal will then run at the commanded rate and in the commanded direction until the control setting is changed or a travel limit is reached.

5.9 In the standby mode all drive signals are removed from the pedestal motors, but power is applied to the various pedestal subsystems.

5.10 The elevation axis and azimuth axis contain limit switches. Limit indicators are provided on the control panel. The position of each axis is displayed on the position display unit using LED-type readouts. The position data are received from the electro-optical encoders mounted on each pedestal axis.

5.11 An interlock prevents attempted system operation with the stow pins engaged. An indicator shows the operator stow status.

5.12 A remote control unit allows basic pedestal operation via joystick control from the pedestal. A switch on the remote control unit selects either standby or manual rate. When under remote control, the front panel controls of the SCU are disabled.

6.0 RANGE MEASUREMENT SYSTEM DESCRIPTION

6.1 The range measurement system is a two-tone system, compatible with all ranging radiosondes presently in use throughout the United States.

6.2 The range measurement system (figure II-4) operates on the principle that a repetitive signal modulated on a carrier and propagated through free space undergoes a phase shift directly proportional to the distance traveled. This phase shift is independent of carrier frequency and can be measured with an electronic phase meter and coverted into a measurement of distance. For unambiguous measurements, the modulation signal wavelength must be long enough that the largest measurable phase delay corresponds to the maximum range to be measured. For good resolution, however, a short wavelength is needed so that the smallest measurable phase delay corresponds to a sufficiently small increment of range.

6.3 In the range measurement system, two harmonically related, phase-coherent ranging frequencies are employed and are amplitude-modulated onto the uplink RF carrier. The higher ranging frequency is 82 kHz (or 75 kHz) and establishes the fine range resolution. The range measurement system has two operator-selectable fine tone frequencies, "75 kHz" or "82 kHz," depending upon the type of sonde being flown. The "75 kHz" mode produces range measurements in meters, while the "82 kHz" mode gives range values in yards. The coarse ranging frequency is 1/64th of the higher ranging frequency (about 11 Hz for the meters frequency) and establishes the maximum range. The lower frequency is employed for resolving the range ambiguities of the higher, or fine, frequency. The higher, or fine, tone is a CW sine wave modulated onto the uplink carrier. The lower, or coarse, ranging frequency is not transmitted directly as such, but rather is "folded" onto the frequency of the fine range tone. The folding process amounts to an arithmetic subtraction of the coarse frequency from the fine frequency. This results in a tone only

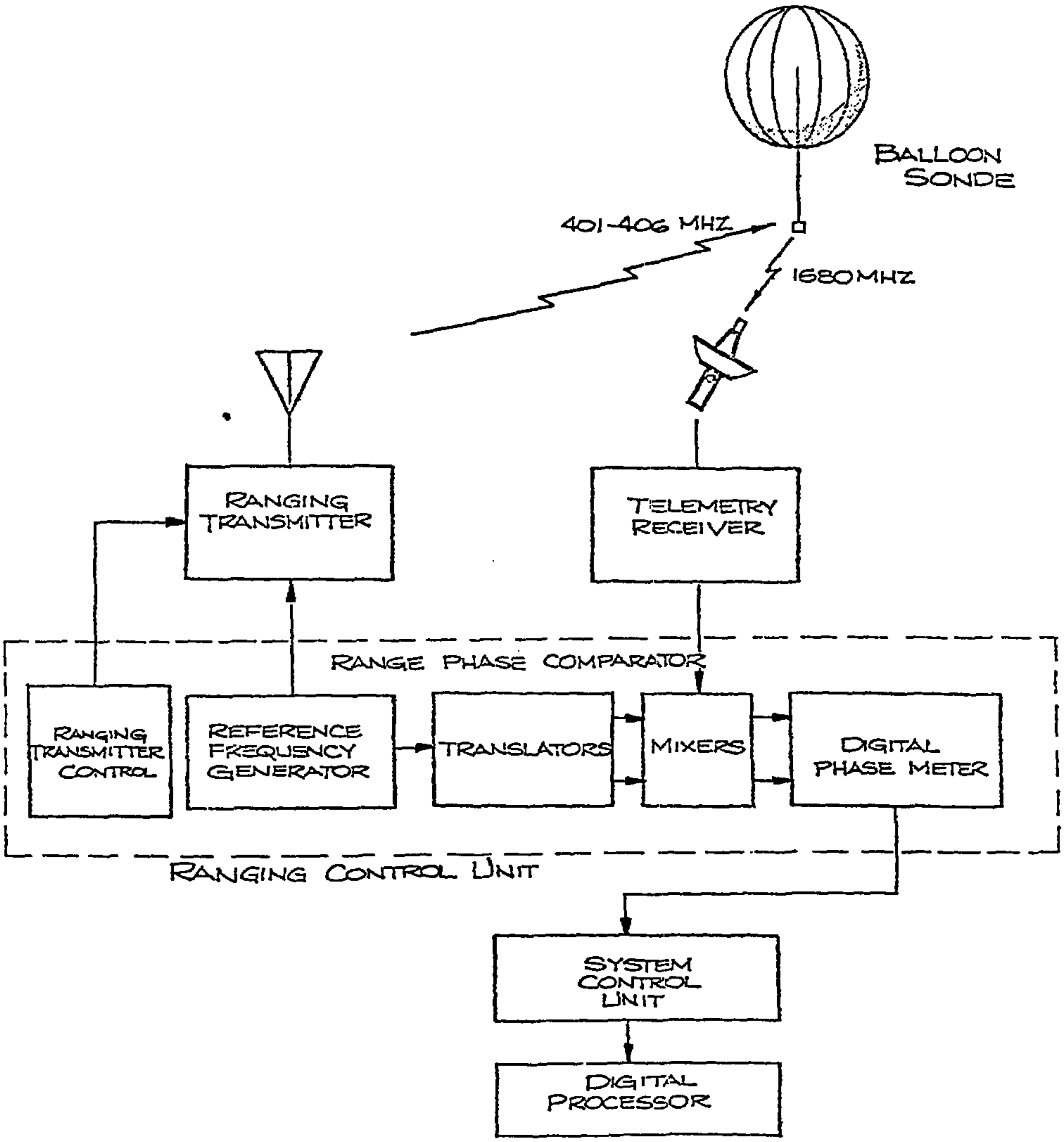

Figure II-4. Ranging System Block Diagram.

about 1170 Hz below the fine tone (FN). This folded coarse tone (CSF), also a sine wave, is amplitude-modulated onto the uplink carrier along with the FN.

6.4 Since the FN and CSF are so closely spaced in frequency, the analog ranging circuits in the radiosonde are easily broad enough in frequency response to transpond both tones at practically equal levels. The two range tones are frequency-modulated onto the 1680 MHz downlink carrier, along with the meteorological data signals.

6.5 The transponded ranging signals are recovered by the MSS telemetry receiving system and input to the range phase comparator. There the two recovered tones are separated and digitally compared in phase with the uplink modulation frequencies. The resultant coarse and fine range partials (digital words) are input to the data processor, where they are algorithmically "unfolded" and combined to form one digital word representing unambiguous range.

6.6 Ten separate range values are developed per second. Each of these range values is the result of the averaging of 64 separate and discrete ranging phase measurements performed on each of the two ranging frequencies. This 64-point averaging results in a signal-to-noise improvement of more than 18 dB in terms of phase noise.

6.7 The ranging system consists of the ranging control unit, the uplink 403 MHz transmitter, the uplink antenna, and a functional subsection of the SCU.

7.0 TELEMETRY SYSTEM DESCRIPTION

7.1 The telemetry system consists of the preamplifier, downconverter, meteorological receiver and the tracking telemetry converter. This system down-converts and demodulates the RF signal from the antenna. Demodulated data contain meteorological data and antenna error control signals.

7.2 The preamplifier/downconverter amplify the RF antenna signals and down-convert the frequency from 1660-1700 MHz to 140-180 MHz. The meteorological receiver receives the 140-180 MHz signals and demodulates the telemetry data and the antenna control signals. The antenna control signals go to the tracking and telemetry converter for antenna servo control, and the telemetry data go also to the tracking and telemetry converter for reduction of meteorological data and to the ranging control unit for demodulation of ranging data.

7.3 The tracking and telemetry converter converts the telemetry data to a digital count that is sent to the data processor. The tracking and telemetry converter also demodulates the azimuth and elevation AM signals to form the error control signals for the antenna servo motors. Also, the tracking converter develops the phase and frequency signals for the monopulse converter in the tracking antenna and feed assembly.

7.4 The meteorological receiver receives signals from the downconverter and provides frequency-modulated ranging data, amplitude- or frequency-modulated meteorological data and antenna positioning signals to the tracking converter.

The front panel of the receiver contains all controls and indicators necessary for adjusting and monitoring the various receiver functions. Also, a separate rack mount contains a spectrum display device for monitoring the tuned frequency spectrum of the receiver.

8.0 TRACKING AND TELEMETRY CONVERTER DESCRIPTION

8.1 The tracking and telemetry converter provides the control signals to the antenna and the telemetry meteorological data signals to the SCU. The tracking converter receives video signals from the meteorological receiver and develops both azimuth and elevation error control signals for the antenna servo motors. Also, the tracking converter develops the phase and frequency signals for the monopulse converter.

8.2 The telemetry converter reduces the meteorological data to an integral pulse count that is sent to the data processor for formation of the normalized data ratio used in the meteorological computation. Each data channel is also identified in the telemetry converter and sent to the SCU.

9.0 TELEMETRY STRIP CHART RECORDER DESCRIPTION

9.1 The telemetry strip chart recorder records radiosonde and rocketsonde data when the system is tracking standard sondes with slow commutation rates. An additional circuit board is added to the strip chart recorder to provide a frequency-to-voltage conversion for the analog recorder input.

9.2 The recorder is a servo-type, designed for continuous use. Chart drive is adjustable for either 1 inch or 4 inches per minute. Full-scale deflection is 1 VDC, which corresponds to an input of 200 Hz.

9.3 An additional module added to the recorder provides for pen lift circuit, calibration signals and frequency-to-voltage conversion. Frequency-to-voltage conversion is accomplished through the use of a monostable multivibrator that shapes the data signal and a frequency-to-voltage converter.

10.0 DATA PROCESSING SYSTEM DESCRIPTION

10.1 The system provides real-time capability, transmission of acquired data and diagnostic routines.

10.2 The tracking and telemetry data paths into and out of the computer consist of EIA RS-232C lines operating at 4800 baud. The lines provide the capability to operate the telemetry front-end and acquire data. Three communications lines are also available to send acquired data out in blocks. Data can also be sent to the paper tape punch.

10.3 Acquired data are stored in raw or smoothed format on either or both of the flexible diskettes. Data from a diskette can be transmitted over a communications line subsequent to the real-time acquisition as well as during the acquisition.

10.4 Control over the system is obtained through use of a CRT terminal, which provides an operator's console as well as a real-time display of tracking and telemetry parameters.

10.5 A paper-tape reader/punch is provided to allow input of calibration data as well as certain necessary system and diagnostic software. The punch provides an additional output medium for program storage and data.

10.6 All hardware and software necessary for the data reduction programs are provided in the standard configuration.

11.0 TRANSPONDER TEST TARGET DESCRIPTION

The transponder test target is used for alignment, maintenance and testing of the MSS operational status. The test target is mounted on a pole at a nominal distance of 120 meters from the MSS tracking pedestal. It is designed to simulate a radiosonde at a range of 50 km. The test target should be at an elevation angle of at least +3 degrees to prevent multipathing problems, since the half-beam-width of the antenna is 3 degrees.

CHAPTER III

PREPARING FOR THE RAWINSONDE OBSERVATION

1.0 GENERAL DESCRIPTION

1.1 Before starting a rawinsonde observation, the observer will become familiar with weather conditions prevailing at the time and expected during the observation. The type of observation, the length of time necessary for the preparation and warmup (if required) of each piece of equipment, and the needs of the station must all be considered in arranging the sequence of operations preparatory to the release. Several preliminary operations can usually be carried on at once, but all must be started sufficiently early so that the release can be made on schedule.

1.2 The MSS will be prepared for the observation in accordance with instructions in chapters I and IV of this manual. Particular attention is directed to the requirement that the tracking set be properly warmed up, leveled, and oriented with respect to established reference points before starting the observation.

1.3 The rawinsonde instrument, balloon and train will be prepared and assembled in accordance with the instructions in this chapter.

2.0 RAWINSONDE BALLOONS--GENERAL DESCRIPTION

Rawinsonde balloons are spherically shaped films of natural or synthetic rubber (neoprene) that, when inflated with a lighter-than-air gas (hydrogen, natural gas, or helium), are used to transport radiosonde flight equipment into the upper atmosphere. The film thickness of these balloons is extremely thin, being from .002 - .004 of an inch when inflated for release and decreasing to a thickness of .0001 of an inch at bursting altitude. To state it more graphically, the film of the balloon at release is thinner than an ordinary piece of writing paper, and at bursting altitude it would take 100 thicknesses of the film to equal the thickness of a punch card. Additionally, the balloon expands in size from an approximate release diameter of 6 feet (see figure III-1) to an expanded diameter of 24-32 feet at bursting. It is easy to see that the smallest cut, bruise, or scratch sustained during preflight preparation is almost sure to result in the balloon bursting at a lower altitude than it normally would attain. The requirement for careful preflight handling of these balloons cannot be overemphasized.

3.0 INFLATION AND ASSEMBLY OF TRAIN

3.1 Balloons will be stored in their original sealed containers in a room isolated from large electric motors or generators. Motors and generators emit ozone, which is detrimental to neoprene. Ideal temperatures for storage should be in the range of 10° to 30°C. Temperatures below 0°C and above 43°C should be avoided during storage. Balloons deteriorate with age; therefore, they should be used in the order of their production dates to avoid excessive aging. If by necessity balloons are stored at temperatures below 10°C, they should be removed to a room having a temperature of 20°C or higher for at

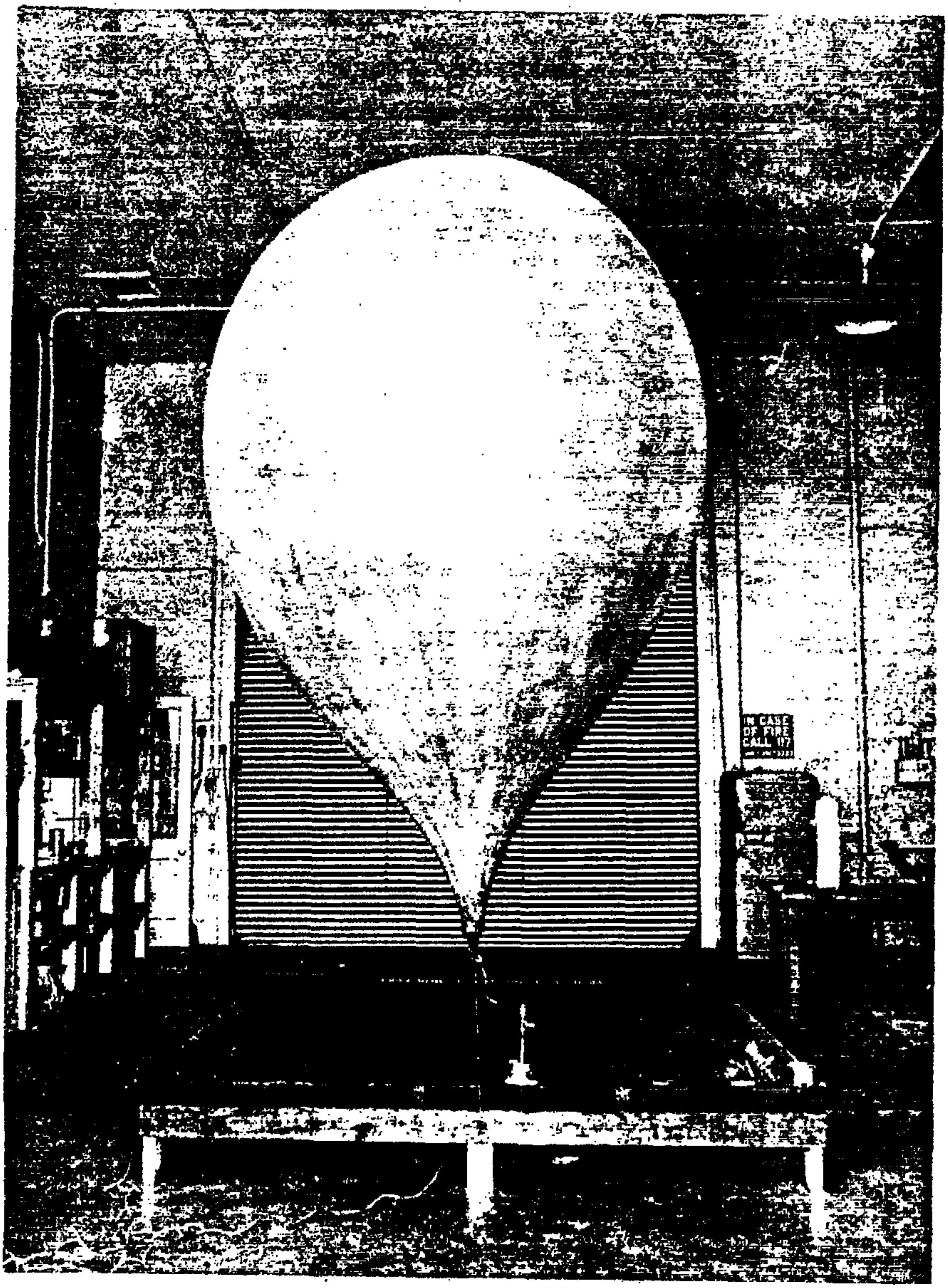

Figure III-1. Inflated Rawinsonde Balloon.

least 48 hours before use to avoid any damage that would result if balloons were removed from the containers and unfolded when cold. The balloons are extremely delicate, especially when softened by conditioning. No part of the balloon except the neck should be touched with bare hands. Use soft rubber gloves, soft cotton gloves, or use as a glove the plastic bag in which the balloon was received to handle any portion other than the neck of the baloon.

3.2 As a result of exposure to relatively low temperatures and of extended periods of storage, neoprene balloons suffer a partial loss of elasticity through crystallization. Neoprene balloons used in this stage will burst prematurely. To ensure the maximum elasticity, all neoprene balloons should be conditioned in accordance with the following paragraphs.

3.3 All balloons that are 1 year old or more or have been stored in sub-freezing temperatures should be conditioned using the electric conditioner before they are inflated. If the electric conditioner is inoperative or not available, the hot water method should be used.

3.4 When the electric balloon conditioner is used, balloons will be conditioned for a minimum of 12 hours at temperatures ranging between 60° and 65°C (or 140° to 160°F) and at a relative humidity near 100 percent. Four balloons may be kept in the conditioner at one time.

3.5 Balloons should be conditioned no more than 72 hours. The balloon should be removed from the plastic bag, unfolded, and placed in its cardboard box to permit uniform conditioning.

3.6 Hot water balloon conditioning consists of immersing the balloon for at least 5 minutes as follows:

a. Prepare the balloon for hot water conditioning as follows:

(1) Open the box and bag containing the balloon and lift out the balloon neck.

(2) Insert a small wooden plug in the neck of the balloon or tie the neck of the balloon tightly with a soft twine or a heavy rubber band. Closing the neck of the balloon, which will be submerged in water, will prevent the water from entering the balloon.

b. The container in which the balloon is to be conditioned should be made of smooth porcelain or noncorrosive metal. The walls of the container should be kept smooth, and the top rim should be rolled, ground, or filed smooth so that the balloon will not be scratched. The container should be of sufficient size so that the balloon may be completely immersed.

c. A metal pan or tray will be placed in the bottom of the container over the heat source to cover hot spots. When the water is brought to a boil, turn off the heat source.

d. Remove the balloon and bag from the box. Hold the neck of the balloon and ease the balloon out of the bag and into the containing tank, using a rod to keep the balloon submerged. The rod should be of either bakelite or hard rubber, not less than 1/2 inch in diameter, with a smooth, rounded edge. If it is necessary to use a wooden rod, the end used to submerge the balloon should be padded with cloth, rubber, or other soft material. Keep the balloon moving in the water to ensure that it is heated uniformly.

e. After 5 minutes, remove the balloon from the conditioning tank by raising the neck and folding the remainder onto a gloved hand or rod. Allow the balloon to drain as it is removed from the water or, if possible, place the balloon on a smooth tray and permit the water to drain off. Use the tray to carry the balloon to the inflation area. Do not open the neck until the inflation nozzle is to be inserted.

f. If the outside temperature is 4°C, or above, the balloon is ready for inflation. If, however, the outside temperature is below 4°C, the balloon should be allowed to dry before inflating. Hang the balloon by the neck to facilitate drying.

3.7 In an emergency, if neither the electric nor hot water conditioning method can be used, neoprene balloons may be conditioned by removing them from their plastic bags and placing them over a heater, radiator, or electric lamp. Take care to ensure uniform heating and to shield the balloon from direct contact with the heat source. A conditioning period of 12 hours should be used with temperatures near 65°C and relative humidity near 100 percent. The length of the conditioning period should be decreased as the temperature is increased. The balloons should not be exposed to temperatures in excess of 100°C.

3.8 The amount of helium, hydrogen, or natural gas most favorable for producing optimal performance should be ascertained before actual inflation of the balloon. Optimal performance is usually defined as the highest possible bursting altitude, with an average ascent rate favorable for obtaining winds-aloft data. Lift is defined as follows:

a. Free Lift. Free lift is the number of grams of lift that are available over and above that required by a balloon to support the weight of a complete radiosonde train.

b. Nozzle Lift. Nozzle lift is free lift plus the grams of lift required by a balloon to support the weight of a complete radiosonde train.

c. Gross Lift. Gross lift is nozzle lift plus the grams of lift required to support the weight of the balloon.

3.9 The performance of a balloon (bursting altitude and ascent rate) is affected by the free lift, thickness of the neoprene film, current air mass and weather conditions, and the size and shape of the balloon envelope. Since most of these factors cannot be controlled, the free lift to produce optimal performance for any given sounding can best be determined by experience. The following paragraphs are included as a guide.

a. For fair weather conditions, free lift ranging from 800 to 1400 grams for 600- to 1200-gram balloons (including severe weather balloons) and 800 to 1000 grams for 300-gram balloons will normally produce optimal performance.

b. The performance obtained in the preceding flights may be considered in selecting a free-lift value to be used.

c. When precipitation, icing, or terrain turbulence is occurring or expected, an effort will be made to provide sufficient free lift to ensure that the balloon will not descend or float. An increased free lift of 100 grams is normally sufficient to compensate for an increase in the weight of the train resulting from light precipitation. Under light or moderate icing conditions, moderate to heavy precipitation, or terrain turbulence, an increase in the free lift of from 200 to 300 grams will usually be sufficient. Under severe icing conditions, an increase of 500 grams or more may be required.

d. Attach the weights required to give the desired nozzle lift to the inflation nozzle, making allowance for part of the hose that will be supported by the balloon as well as the nozzle itself, hose clamp, cutoff values, etc. (usually 200 to 400 grams).

3.10 After the weights have been placed on the inflation nozzle, inflation should be started as soon as the balloon is removed from the conditioner, except when drying is required. When the electric balloon conditioner is used, any air should be forced out of the balloon before attaching the neck to the inflation nozzle. If the balloon is not conditioned, the inflation nozzle should be inserted into the neck before removing it from the plastic bag. In either case, the balloon should be handled as little as possible.

3.11 Place the balloon where it will not come in contact with sharp objects or rough surfaces. If the dimensions of the inflation shelter permit, the balloon should be placed on a table for inflation. The table top should be very smooth, free from projections of any sort, with all edges rounded. The table top should be cleaned frequently. To reduce abrasion during inflation, the table should be large enough so the balloon can be fully extended before inflation is started. If it is not practicable to use a table, then the balloon should be placed on a clean sheet of paper large enough to keep it off the floor. Remove any objects with sharp points from the immediate vicinity of the balloon and smooth all edges on the inflation weights and nozzle. Place the inflation nozzle in the neck of the balloon and secure it with a clamp, soft cord, or any other device the station finds suitable for this purpose.

3.12 Inflate the balloon at a sufficiently slow rate to ensure a uniform expansion of the film. If the gas regulator or outlet valve is equipped with a low pressure gage, open the valve to a pressure not exceeding 20 pounds per square inch when using helium. When a low pressure outlet gage is not available, adjust the flow of gas so 12 to 15 minutes are required to inflate the balloon completely. When hydrogen is used, open the valve to a pressure not exceeding 10 pounds per square inch. If the balloon is rapidly inflated with hydrogen gas, the likelihood of generation of static electricity is greatly increased, and with it, the hazard of fire or explosion.

3.13 When the balloon is about one-half inflated, close the gas valve. Listen for gas leaks and examine the balloon for defects. Serious defects may result from foreign material in the rubber, a break in the balloon skin, or a deformity in a small area of rubber film. Discoloration should not be regarded as a defect unless experience indicates that certain types of discolorations result in premature bursting. If the balloon is defective, reject it and begin preparing a second balloon; otherwise, proceed with inflation. Close the outlet valve as soon as the inflation weights are raised from their support. Again, listen for gas escaping from the balloon. If a leak is detected, reject the balloon.

3.14 When a balloon cannot be completely inflated with the inflation nozzle resting on a table because the balloon is likely to touch the ceiling, move the nozzle to the floor and continue the inflation. If the balloon is still likely to touch the ceiling before the desired lift has been reached, protect the balloon from damage by stretching a net below the ceiling or by padding the ceiling with some soft material. Then proceed as follows:

a. Inflate the balloon to a nozzle lift of 1500 grams.

b. Increase the inflation weight by 300 grams.

c. Using a watch with a second hand, determine the time, in minutes and seconds, required to inflate the balloon the extra 300 grams referred to in b.

d. Mark the position of the exhaust valve of the helium regulator or manifold system when it is in position c.

e. Using the rate of flow determined in c, compute the time required to inflate the balloon to the required nozzle lift. Once the rate of flow has been determined, the valve may be used until the regulator, tubing, or nozzle is replaced, at which time a new determination should be made. The rate of flow method should be checked with inflation weights, using a balloon that does not touch the ceiling. The required inflation weights should be installed even though the flow rate is used.

f. When the constant rate inflation method is used, the cylinder should be replaced when the gas pressure drops to 100 pounds per square inch, since the rate of flow then no longer remains constant. The partial cylinder of gas should be used at the beginning of the next inflation. If the ceiling of the inflation shelter is too low to determine the flow rate in accordance with the above instructions, the flow rate should be determined in a hangar or outdoors during a period of calm winds. The constant rate inflation method must not be used unless the balloon is likely to touch the ceiling before the desired nozzle lift is reached.

3.15 Tie the neck of the balloon with a 6-foot length of double cord as soon as inflation has been completed. Make one turn of the double cord around the neck of the balloon near the center (close to the top of the inflation nozzle). Adjust the double cord to obtain one free end of about 5 feet and another of about 1 foot in length. Pull the cord as tightly as possible and tie with a square knot. Make another turn around the neck and tie again. Remove from the nozzle, fold the neck upward and again tie the neck just above the first knot. Be sure that all cord is below the area where the neck starts to flare out to join the envelope of the balloon.

3.16 The balloon should be left in the inflation shelter until preparations for the release have been completed. If the release is not expected to occur within 15 minutes after the inflation is completed, the balloon should not be held down by weights attached to the neck, since the strain on the film will cause premature bursting. Rather, the balloon should be allowed to rest against the ceiling of the inflation room, provided the ceiling is smooth and free from projections or rough spots. If the ceiling is not smooth, then the balloon should be allowed to rest against the balloon cover. If no cover is available, then a sheet or some other suitable material may be used to protect the balloon. Balloons filled with hydrogen or natural gas must be rested against an antistatic balloon cover (shroud) when they are removed from the inflation nozzle.

3.17 If a launching device and flowmeter are used, be careful when placing the balloon in the launching device to ensure that the balloon is not twisted and that it is not tangled in the launching shroud.

3.18 Use a train of about 70 feet under normal conditions. Trains in excess of 100 feet should not be used, as they can cause excessive signal dropout. To avoid erroneous temperature readings, trains of less than 70 feet in length should never be used. Tie the parachute to the balloon with a double strand of 20-ply string, 65-feet long. Tie the instrument to the parachute with a minimum 5-foot length of single strand, 20-ply maximum, cotton string. When the release must be made in high winds, the train will be assembled as follows: Tie the end of a double 5-foot length of cord to the neck of the balloon and to the upper eye or spacer bar of the train regulator and tie the free end of the cord from the train regulator to the parachute top. Tie a 5-foot length of cord to bottom of the parachute and top of the sonde.

3.19 Parachutes will be used at all stations unless specific instructions to the contrary are issued.

3.20 The radiosonde train regulator consists of a frame, reel, and braking mechanism. The regulator is furnished with approximately 100 feet of twine or nylon tape wound on the reel (approximately 40 feet of this twine should be removed prior to use). The braking mechanism permits the weight of the radiosonde to unwind the twine at the nominal rate of 12 feet per minute. The regulator is designed to withstand the stresses placed on it in normal use. Care must be exercised to avoid unnecessary strains that might ruin the gear train and braking mechanism. Before using, test the regulator by firmly pulling about 5 feet of cord from the reel. Should the reel feed out too rapidly, it may be adjusted by squeezing the metal braking pawls together with pliers. If the braking pawls are too tight, the regulator will not feed out. To use, place the free end of the twine through the eye or over the spacer at the bottom of the regulator. Tie the twine to the supporting ring at the top of the radiosonde. Determine that the regulator operates normally when supporting the weight of the radiosonde. Then rewind the twine by rotating the reel assembly.

3.21 A shock unit may be used in the radiosonde train between the regulator and the radiosonde if the vibration caused by the regulator produces unstable signals. The shock unit may be formed by tying together in parallel four 1/8-inch wide rubber bands. Tie the bands to the cord of the train so that the cord is slack between the ends of the bands, permitting them to act as a shock absorber.

3.22 The radiosonde balloon cover or shroud is designed to protect the radiosonde balloon while it is being moved to the point of release and to aid in releasing it under conditions of high winds. The cover or shroud consists of a hood and four flaps, each of which terminates in a handhold.

3.23 A 35-foot train length is used with the MSS windsonde instrument.

> DANGER: DO NOT USE THE UNTREATED SHROUD WITH THE HYDROGEN-FILLED BALLOONS.

3.24 To place the balloon in the cover, the bottom portion of the segments should be untied and the balloon lowered as near the floor as possible. Two of the segments should be pulled to one side and the balloon then allowed to rise under the cover. The cover supporting cord is then unsnapped and pulled free of the loops on the top of the cover.

3.25 If the cover or shroud becomes wet, it should be suspended loosely until it is thoroughly dry.

3.26 Two types of balloon covers are available. The antistatic, treated balloon covers will be used at radiosonde stations using hydrogen. The untreated shroud will be used at stations using helium.

3.27 For night flights, use lighting units. Care must be taken to ensure that lighting units will not interfere with the braking mechanism of the train regulator. If a solid-state instrument is used, place the light unit as far as possible from the instrument. Otherwise, it may interfere with the signal received from the instrument.

4.0 MSS RADIOSONDE INSTRUMENT - GENERAL

4.1 The MSS radiosonde is an expendable instrument used for meteorological measurements from sea level to approximately 30 kilometers in altitude. The sonde is carried aloft by a balloon.

4.2 Atmospheric temperatures and humidities are measured with sensors that are telemetered to the ground station. During a sonde ascent, the balloon follows the wind and functions as a wind sensor. The MSS ground station tracks the airborne sonde and continuously determines its position with the aid of a transponder incorporated in the sonde. Position changes of the rising sonde are used to calculate windspeed and wind direction.

4.3 The MSS radiosonde, when ready for flight, consists of the following two components:

a. Sensors (see table III-1) and sensor duct.

b. Sonde electronics, battery, and housing assembly.

TABLE III-1

SPECIFICATIONS, MSS RADIOSONDE

TRANSMITTER	
Frequency Adjustment Range	1660 to 1700 MHz
Frequency Set When Delivered	1680 MHz
Power Output	200 mW Min
RANGING RECEIVER	
Frequency Tuning Range	401 to 405 MHz
Frequency Set When Delivered	403 MHz
Sensitivity, Minimum Signal for Valid Ranging Return	12 μV
Selectivity at ±12 MHz from Center	50 dB Down
Range Tone Frequencies (AM)	Fine - 74,948.13 Hz Coarse - 73,777.11 Hz
Range Tone Phase Instability 100-320 μV Input	2° Max
Variation Due to Battery Voltage during 2-Hr Balloon Flight	0.5° Max
PULSE CODING CIRCUIT	
Data Rate (approximate)	2 ms to 0.2 ms
Reference Rate	1.05 Times Highest Data Rate
Maximum Electrical Power Feedback to Sensors	10 μW
DATA CONVERSION ACCURACY	
Over 60% Center Band	0.1% FS
Over 20% on Each Band Edge	0.25% FS
COMMUTATOR	
Channel 1 Reference	400 ms
RTz	100 ms
Channel 2 Temperature	400 ms
RTz	100 ms
Channel 3 Humidity	400 ms
RTz	100 ms
Channel 4 Temperature	400 ms
RTz	100 ms
Total Frame Time	2 s

SENSORS

Temperature	10-mil diameter aluminized bead, 1-mil diameter support wire, minimum 0.25-inch wire length between bead and support
Humidity	VIZ Part Number 1386-163 (Gold Line Accu-Lok prem.)

SONDE PHYSICAL CHARACTERISTICS

Sonde Weight (Ready for Release)	Approx. 760 g
Overall Size	42.5x25x13 cm

4.4 The sonde electronics package is inserted into the sonde housing sleeve alongside the sensor duct. Electrical connections are made with connectors, allowing testing of the separate components. Engaging the connectors turns the radiosonde on.

4.5 The assembled radiosonde is shown in figure III-2 and the schematic is shown in figure III-3. The sensor duct is shipped disassembled and is readily folded into the final configuration. The humidity sensor, or hygristor, is shipped separately in a sealed container with the radiosonde. When the duct is assembled, the humidity sensor, along with a mount assembly, is inserted into a set of double access doors provided on the side of the sensor duct. The temperature sensor, also shipped in a separate container, is fastened to a boom that extends horizontally from the body of the sonde.

CAUTION: GROUND YOURSELF TO ANTENNA WHILE INSTALLING SENSORS.

4.6 The sonde electronics consist of the following components:

a. Ranging receiver.

b. Commutator.

c. Pulse code circuitry.

d. Transmitter.

e. Battery (water activated).

4.7 The block diagram of the MSS radiosonde is given in figure III-4. The four-channel commutator alternately converts the sensor and reference inputs in the following sequence to the pulse coding circuitry.

Channel	Output of Commutator
1	Reference
2	Temperature
3	Humidity
4	Temperature

4.8 The pulse coding circuit converts the sensor and reference resistances into a series of pulses. The repetition rate of these pulses varies from approximately 500 to 5250 Hz depending upon the individual resistances provided by each channel. Outputs from the pulse coding circuitry are fed into a modulator circuit where isolation and gain are provided. At this point, pulse signals are summed with the range tones and frequency-modulate the 1680 MHz downlink transmitter.

4.9 The 403 MHz receiver consists of a one-half wavelength dipole antenna, a preamplifier, a superregenerative detector, and a tuned IF amplifier.

4.10 The antenna is folded for shipment. The antenna must be unfolded with one leg horizontal and one leg vertical to the sonde housing. This will ensure compatibility with the uplink transmitter.

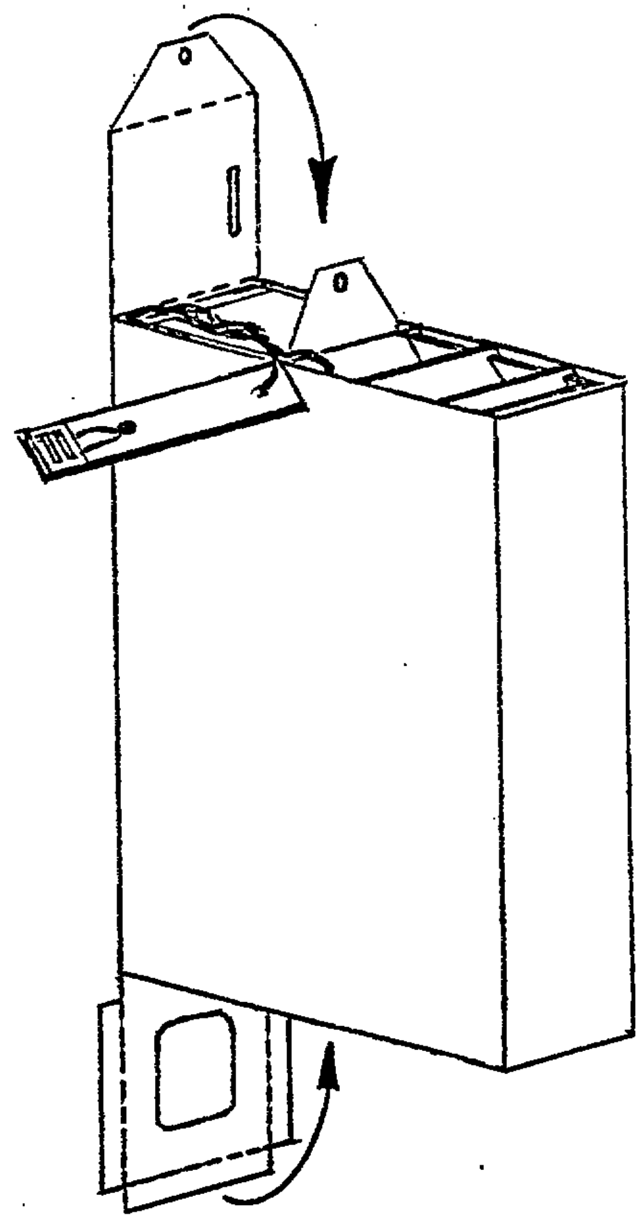

Figure III-2. Assembled Radiosonde.

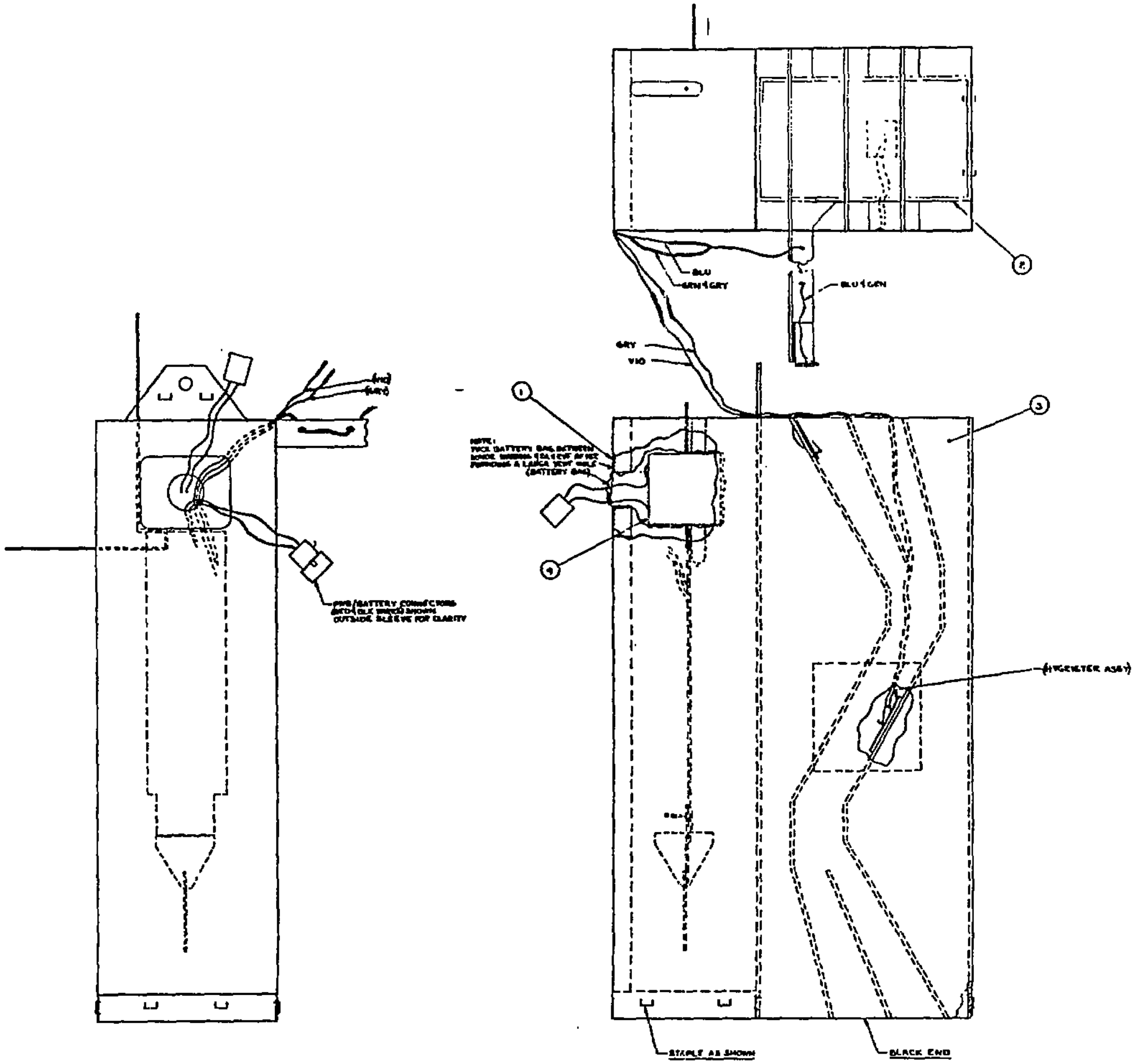

Figure III-3. MSS Radiosonde Schematic.

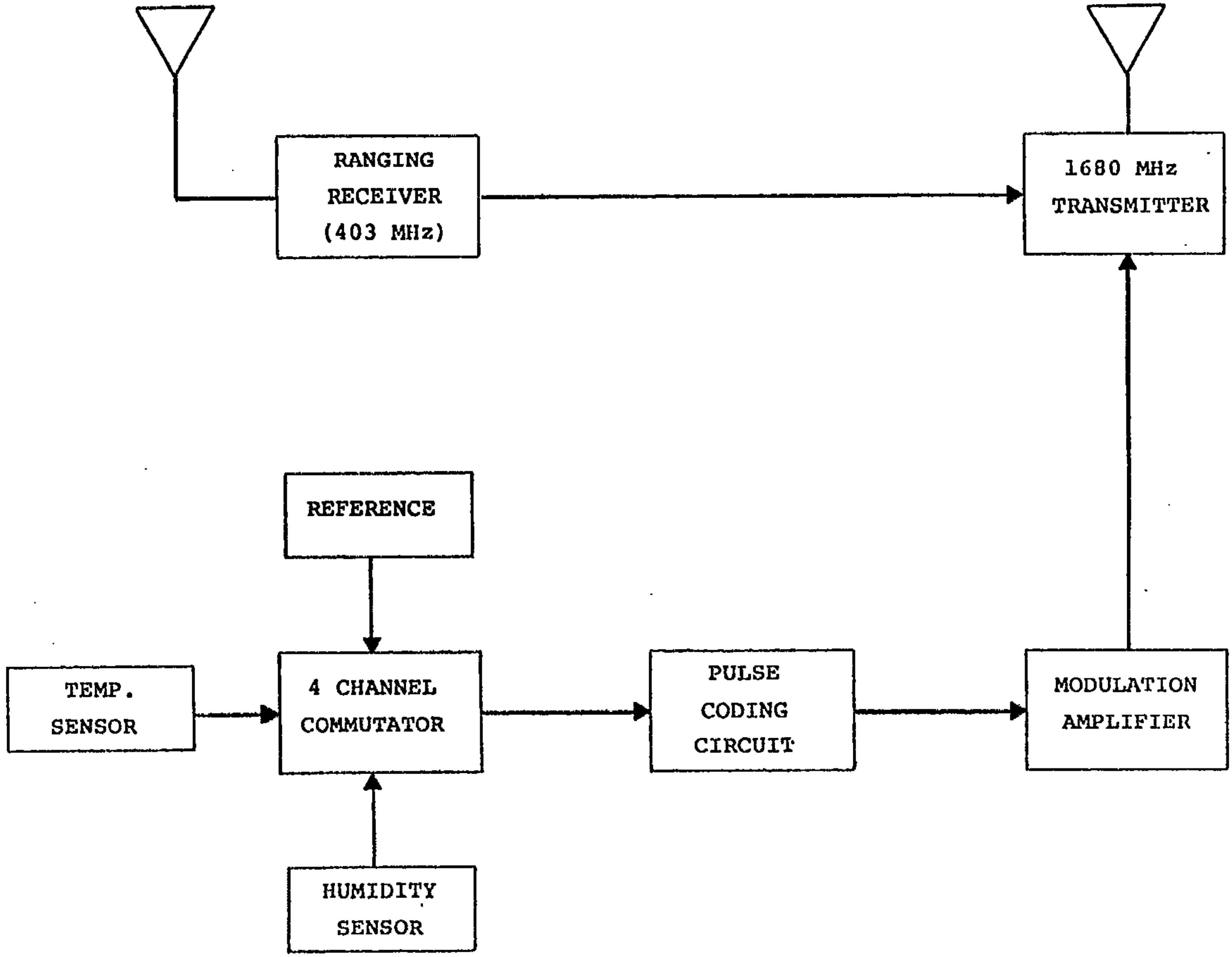

Figure III-4. MSS Radiosonde Block Diagram.

4.11 The preamplifier amplifies the incoming signal and decouples the antenna from undesired signals generated within the superregenerative detector.

4.12 The superregenerative detector provides gain along with the demodulation of the dual range tones. Selectivity is provided by the matching network incorporated between the preamplifier and the detector. The receiver, when tuned at 403 MHz, will accept uplink transmitted frequencies from 401 MHz to 405 MHz without retuning.

4.13 Within the tuned IF amplifier the dual range tones are filtered out and separated by the detector. Gain is provided to a level that is satisfactory for modulation of the 1680 MHz transmitter.

4.14 The 1680 MHz transmitter uses a solid-state device and is designed on glass teflon board material to provide minimum losses and frequency stability. A base-fed, one-quarter wavelength antenna radiates the 1680-MHz signal. A conical ground plane is used to elevate the input impedance of the antenna.

4.15 A cuprous chloride, water activated battery provides the sonde with electrical power for a minimum of 3 hours. Approximately 10 minutes after activation, the battery provides a voltage greater than the 16.5 volts necessary to sufficiently turn on the 15-volt regulator incorporated on the radiosonde printed circuit board. (Eighteen volts is nominal.) The total radiosonde current is approximately 130 milliamps. The battery is connected to the sonde by connecting the battery and sonde terminals.

4.16 Specifications for the MSS radiosonde are given in table III-1.

5.0 MSS WINDSONDE INSTRUMENT - GENERAL

5.1 The MSS windsonde instrument is a transponder that is basically the electronics portion of the MSS radiosonde excluding the sensor duct, sensor and reference circuits, pulse coding circuit, four-channel commutator and modulation amplifier.

5.2 Specifications for the MSS windsonde are given in table III-2, and a view of the sonde is provided in figure III-5. A block diagram is provided in figure III-6.

6.0 SYNOPTIC RADIOSONDE INSTRUMENTS - GENERAL

6.1 The synoptic radiosonde (see figure III-7) is a balloon-borne, battery-powered instrument used together with the ground receiving equipment to delineate the vertical profile of the atmosphere. Pressure is measured by means of a baroswitch that employs an expanding aneroid pressure cell to move a contact arm across a commutator bar as the pressure decreases. Temperature is measured by a thermistor, the electrical resistance of the thermistor being a function of temperature. Relative humidity is measured by a hygristor, the electrical resistance of the hygristor being a function of relative humidity, and, to some extent, temperature. As the radiosonde ascends, the thermistor and hygristor are switched sequentially into the modulator circuit by the baroswitch. The amplitude of the received signal, therefore, is alternately a function of temperature or humidity and may be

TABLE III-2

SPECIFICATIONS, MSS WINDSONDE

TRANSMITTER	
Frequency Adjustment Range	1600 to 1700 MHz
Frequency Set When Delivered	1680 MHz
Power Output	150 mW Min
Frequency Stability	+2 MHz
RANGING RECEIVER	
Frequency Tuning Range	400 to 406 MHz
Frequency Set When Delivered	403 MHz
Sensitivity, Minimum Signal for Valid Ranging Return	12 μV
Selectivity at +12 MHz from Center Tuned Frequency	500 dB Down
Range Tone Frequencies (AM)	Fine - 74,948.13 Hz Coarse - 73,777.11 Hz
Range Tone Instability	
100 to 320 μV Input	2° Max
Variation Due to Battery Voltage During 1-Hr Balloon Flight	0.5° Max
WINDSONDE PHYSICAL CHARACTERISTICS	
Sonde Weight (Ready for Release)	470 g
Size (Overall)	42.5x13x10 cm

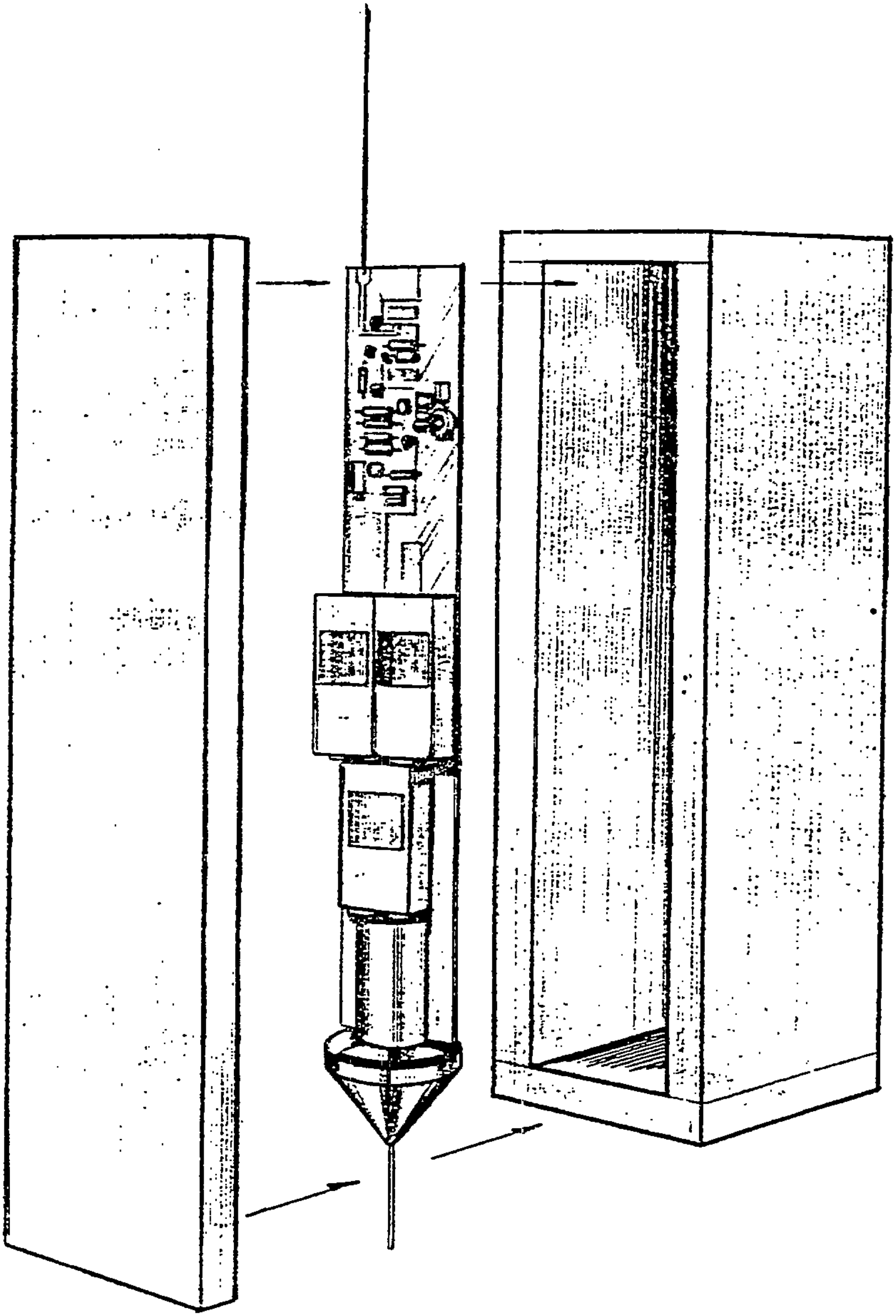

Figure III-5. MSS Windsonde.

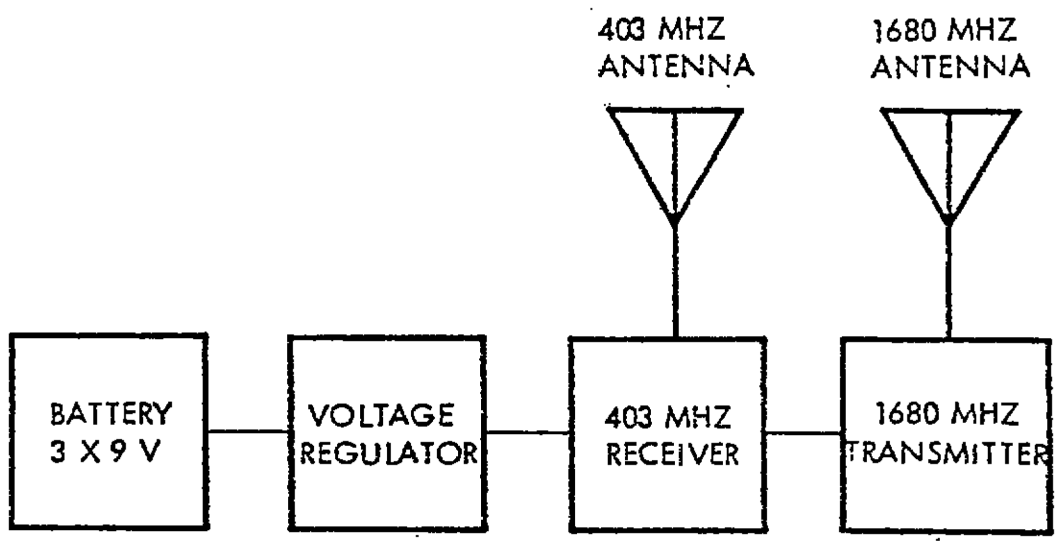

Figure III-6. MSS Windsonde Block Diagram.

Figure III-7. Synoptic Radiosonde.

any value from 0 to 200 MHz (0 to 100 recorder divisions). Periodically, the thermistor and hygristor are bypassed in the modulator circuit. Reference circuits using fixed resistors are then used to modulate the carrier frequency to known values: 95, 190, or 195 Hz. Any changes that may be occurring in the modulator circuit can then be evaluated.

6.2 Serial numbers are used to identify radiosondes differing from the basic radiosonde. The following is a list of the suffixes used to identify these radiosondes.

a. Radiosondes equipped with hypsometers to provide more accurate measurements of pressure than that provided by the aneroid cell at very high altitudes will usually be identified by the letter "H" suffixed to the serial number.

b. Radiosondes for use with the transponder system are equipped with a receiver to intercept the ranging signal radiated from the transponder ground adjuncts. These radiosondes will usually be identified by the letter "R" suffixed to the serial number.

c. Radiosondes equipped with both the hypsometer and the transponder capability will usually be identified by the letters "HR" suffixed to the serial number.

d. Radiosondes equipped with solid-state electronics will be identified by the letter "S" suffixed to the serial number.

e. Radiosondes equipped with solid-state electronics and prebaselined will be identified by the letters "SA" suffixed to the serial number.

f. Reconditioned radiosondes are identified as above, except an additional letter precedes the serial number.

CHAPTER IV

CONDUCTING UPPER AIR OBSERVATIONS WITH MSS

1.0 GENERAL

The MSS operating procedures consist of system startup; system checkout with the test target; preflight test of the sonde to be flown; acquisition of the launched sonde in tracking, ranging and telemetry modes; maintenance of track and data acquisition throughout the flight; system termination after flight completion; and postflight data reduction. The specific operating procedures for the various sondes are detailed in this chapter.

2.0 SYSTEM OPERATING CONFIGURATION

Prior to system start and warmup, the system should be in an unstowed configuration that is safe and minimizes operator preflight setup operations. The configuration should be as follows:

a. Pedestal

(1) Stow Pins - Removed.

(2) Pedestal Disable Switch - Operate.

(3) Pedestal Power Circuit Breaker - On.

(4) Pedestal Brakes - On.

b. Console Power

(1) Main Power - Off.

(2) Console TCK/TM System - Off.

(3) Computer System - Off.

(4) Pedestal System - Off.

(5) Utility Outlets - Off.

c. Ranging Control Unit

(1) Transmitter Control - Off.

(2) RF Level - Low Power.

(3) Modulation - Composite.

(4) Frequency - 403.0 MHz.

(5) Phase Test - Operate.

(6) Mode - 75 kHz.

(7) Power - Off.

d. Telemetry and Tracking Converter

(1) Sonde - MSS.

(2) Monopulse Scan Mode - Fixed.

(3) MSS TM Channel - Ref Ch.

(4) Power - Off.

e. Paper Tape Punch

Power - Off.

f. Strip Chart Recorder

(1) Power - Off.

(2) Chart Drive - Off.

(3) Span Module - 1.0.

(4) Mode - Cal 0 SC.

g. Receiver

(1) Operate Mode Switch - REC (normal receiver operation).

(2) Audio Gain - Down (used to adjust speaker level).

(3) Video Source - FM (employed to select either the AM detector (AM) or plug-in modulator (FM/PM) as the video source).

(4) Video Coupling Switch - AC (selects either AC or DC video coupling to the video amplifier).

(5) Video Bandwidth kHz - 250 kHz. (This selects the video filter cutoff frequency. The OUT position bypasses all filtering.)

(6) Gain Control - 0 (sets the video output level on video output meter).

(7) Fine Tune Control - Any position (not functional with MSS).

(8) Search Range Control - Maximum clockwise setting (permits adjustment of auto search range to ±5 MHz).

(9) 1st LO Mode Switch - Maximum clockwise (selects the VFO, XTAL, or OFF mode of operation for the first local oscillator located in the RF tuner).

(10) 2d LO Mode Switch - VFO (selects the PM, XTAL, OFF, VFO, and AFC operating modes for the second local oscillator).

(11) AGC Time Constant MSEC Switch - 10 (selects the time constant for the automatic gain control circuit to 0.1, 1, 10, 100, or 1000 milliseconds).

(12) Man Gain Control - N/A (used to manually set the gain control of the receiver).

(13) Tuning Meter - Zero. (This indicates the relative position of the applied signal in the IF passband. It also indicates the loop stress when the receiver is in the AFC or PM mode of operation.)

(14) Zero Control - See Receiver TM (used to zero the tuning meter).

(15) 60 dB CAL Control - See Receiver TM (used to calibrate the 60 dB level on the signal level dB meter).

(16) Zero Control - See Receiver TM (used to set the signal level dB meter zero point).

(17) Tuning - 1680 MHz.

(18) Remote/Internal - Internal.

(19) IF Bandwidth - 1.0 MHz.

(20) Module: Intermediate Band FM Demodulator; Deviation Range 150, Switch Position - FM kHz.

(21) Spectrum Display Unit - Power On.

h. System Control Unit

(1) Power - Off.

(2) Baseline Range - Test Target Distance.

(3) EL Manual Position - Test Target EL.

(4) AZ Manual Position - Test Target AZ.

i. CRT Display

Power - Off.

j. Dual Diskette Unit

(1) Power - Off.

(2) Doors - Closed.

(3) Left Door - 0.

(4) Right Door - 1 or 2.

k. Computer

(1) Power Key Switch - Off.

(2) Data Switches - 1 000 000 000 011 011.

3.0 SYSTEM START AND WARMUP

3.1 Prior to a tracking mission, the MSS system should be turned on for a minimum 20-minute warmup period.

3.2 Pedestal Preparation. Pedestal Preparation has already been completed.

3.3 Console and Subsystem Power

a. Turn on main circuit breaker power switch.

b. On the Power Control Unit turn on the Console Tracking/Telemetry System, Computer Main Power, and Utilities.

c. Turn on power switches on all subsystems: Telemetry and Tracking Converter, System Control Unit, Range Control Unit (if MSS sondes), CRT, Tape Punch, Dual Diskette Unit, Printer, and Strip Chart Recorder (if used).

d. Go to Power Control Unit and turn on pedestal power (this is turned on last because if the SCU is turned on after the main pedestal power, it will sometimes drive the antenna and could cause damage).

e. Verify that all subsystems are ON. If any subsystem does not come on (except computer), check the power switches located on the individual chassis.

f. Verify System Control Unit (SCU) status indicators are as follows:

(1) Meters.

(2) Servo Type (II or I with long baseline).

(3) Track Bandwidth - 50 percent).

(4) Backup Memory - Pos.

(5) EL Control - Standby.

(6) AZ Control - Standby.

(7) Pedestal Status - Local.

(8) Baseline Range - Test Target Distance.

(9) EL Man POS - Test Target EL.

(10) AZ Man POS - Test Target AZ.

3.4 Computer Systems

a. Place computer key switch in the ON position.

b. Verify diskette drive is ON.

c. Insert "G" diskette (data diskette) into unit 1.

d. Place MSS "I" diskette (real-time program diskette) in unit Ø.

e. Verify paper tape is loaded into punch.

f. Verify computer switches are set to 1 000 000 000 011 011 (switches 0, 11, 12, 14, 15 are in the UP position and all others are DOWN).

g. Switch Stop/Reset switch to Stop, then to Reset position.

h. Lift Program Load Switch. The program will load and indicate on CRT "FILENAME."

i. Respond to filename by typing "MSS" and depress Return Key.

j. To synchronize system timing:

(1) Type date where indicated and press Return Key.

(2) Type an advanced time and, when that time occurs, press Return Key to synchronize the computer to local time. (A short paper tape leader will be punched out indicating "TOP.")

3.5 Test Target Operations

Pretest Setup:

a. Complete system warmup previously described.

b. Verify that the ranging transmitter is turned on and in LOW POWER mode, 75 kHz selection, TM converter MSS type.

c. Switch receiver video source to FM and IF bandwidth to 2.0 MHz.

d. Select Pre-Amp Off for minimum gain on SCU.

3.6 Autotrack Checkout

a. Switch on test target.

b. Set test target EL and AZ on manual position thumbwheel switches.

c. Activate EL and AZ manual position switches.

d. Tune the receiver frequency to obtain maximum signal strength and switch to AFC reception mode.

e. Activate EL and AZ manual rate switches.

f. Drive antenna no more than 2 degrees off target in each axis.

g. Activate EL and AZ autotrack switches and verify:

(1) Steady autotrack.

(2) Maximum signal strength.

(3) Minimum EL and AZ error signals.

3.7 <u>Ranging and Telemetry Data Checkout</u>

a. Enter slant range to test target with range thumbwheel switches.

b. With computer real-time MSS program activated, depress baseline control on SCU front panel. Page 4 on computer terminal will be displayed automatically. Verify that one sigma variation is less than 5; if not, repeat baseline. Check differences between fine and coarse particles; they should be 100 - 200. If not, check with technician. (A complete description of page 4 data is located in chapter VI.)

c. Verify that the range displayed on SCU front panel is the baseline range ±2 meters.

d. Type CTRL-6 and check calculated sensor data for validity. (A complete description of page 6 data is located in chapter VI.)

3.8 <u>Test Termination</u>

a. Activate EL and AZ STANDBY mode.

b. Switch receiver to VFO mode.

c. Switch off test target.

4.0 MSS RADIOSONDE TRACKING

4.1 <u>Preflight Setup</u>

a. Complete system warmup outlined in paragraphs 1 through 3 of this chapter.

b. Verify ranging transmitter is turned on and in LOW POWER mode, 75 kHz selection, telemetry converter MSS type.

c. Select Pre-Amp Off for minimum gain on SCU.

d. Switch receiver video source to FM and IF bandwidth to 2.0 MHz.

e. Set receiver selection to VFO mode.

f. Activate EL and AZ manual rate switches.

g. Slew antenna to predetermined baseline position.

h. Enter slant range to baseline position in thumbwheel selection on SCU front panel.

i. Select Page 1 computer display by typing CTRL-1 simultaneously. (A complete description of page 1 data is located in chapter VI.)

j. Type operation number and, in last three spaces, the ascent number. Field holds ten digits.

k. Type of sonde - MSS.

l. Select smoothing interval - 0 to 120 (normally 120).

m. Select smoothed data output rate - 1 to 99 (normally 6--remember, this number is times 2, that is, type 3 for 6-second intervals because 2 x 3 = 6).

n. Select hard-copy option - raw, smoothed, both or none (usually both). (This is data going to the printer.)

o. Hard-copy output rate - 1 to 99 (normally the same interval as m above). (2 x 3 = 6).

p. Select scrolled output rate - 1 to 99. (This is for data on the CRT and is an interval for operator's use--usually twice m and o above, as this is not times 2, type 6 for 6-second interval).

q. Enter station temperature at release point in tenths of degrees Celsius.

r. Enter station pressure at release site in tenths of millibars.

s. Enter altitude of tracker in feet above MSL.

t. Select page 2 computer display by typing CTRL-2 simultaneously. (A complete description of page 2 is located in chapter VI.)

u. Load temperature calibration tape in reader at a point past the serial number.

v. Type CNTRL-Z and the tape will load. (Check the sonde serial number to see that it agrees with the tape and also check A, B, and C values, which should be near -5, 2100, and 60.) NOTE: Check RH (humidity) value; it should agree with the value printed on the label of the hygristor element can.

4.2 MSS Radiosonde Instrument Preflight Check

a. Perform a transmitter check with the MSS receiver. If the frequency observed is other than 1680 MHz±2 MHz or if a frequency change is required, use the spectrum display unit in conjunction with the receiver tuning dial to aid in readjustment of the sonde transmitter. NOTE: Tuning instrument clockwise will lower the frequency; counterclockwise will raise the frequency.

b. The term "range preset" is used to describe the process in which the range phase relationship between the tracker and sonde is established.

c. The processing of the meteorological data is checked through the MSS system and is displayed on the CRT of the data processing unit. The temperature and humidity displayed must be in agreement with conditions at the preset point. In addition, the functioning of each telemetry channel can be observed on the tracking and telemetry converter. The three data channels and reference channel are switch-selectable and are displayed on a 0 to 100 percent meter scale.

d. Performance of the sonde tone ranging is observed on the LED range partial display on the ranging control unit. The display must be stable and relatively free from jitter. The direct line-of-sight from the MSS tracker to the preset position should be unobstructed during tone ranging checks and sonde presetting. Movement in proximity of the sonde may cause errors in ranging.

e. Take the instrument to a surveyed pole (at least 50 meters distance from tracker with clear line-of-sight).

f. Tune the MSS to the sonde frequency.

g. Ensure that the antenna is locked on the sonde at the preset location by activating EL and AZ autotrack switches.

h. Set the baseline range on the SCU and activate the range preset switch. Page 4, ranging baseline, will be displayed. Compare the measured range with the preset range--they should be nearly the same.

i. Check "one sigma" values. They should be 5 or less. If not, check the tuning and video gain setting (gain setting should be set to show ±0 on video output meter). Hit the "Preset" switch. If one sigma value is greater than 5, try combinations of "High Power on Transmitter" and preamplifier on and off. Once a one sigma value of less than 5 is achieved, record "Calibration Factors" and try baseline again. If the one sigma value is less than 5 and the CAL factors are close (±50) to those recorded in the preset attempt, the preset is OK. Also, the differences between the CAL values of the fine and coarse particles must be between 100 and 200.

j. After a successful preset and while the sonde is still at the surveyed location, select page 8 by typing CNTRL-8 and observe temperature and relative humidity values being displayed on the CRT. Verify their reasonableness by comparing them with a psychrometric reading at or near the sonde location.

k. Because of the extreme sensitivity of the bead to temperature changes, do not be concerned about an exact agreement between the psychrometric values and those depicted on the CRT. Daytime thermals will cause some differences. Check to ensure that the bead and its lead wires extend above the mounting boom.

1. Type CNTRL-E. This CRT page will alert the operator to any anomalies, i.e., "sonde not baselined," "partial bad," etc. If everything appears OK, the sonde is ready for release.

4.3 Release and Flight

Acquisition:

a. Verify signal reception. Tune the receiver to peak signal in VFO mode to ensure it is on the primary signal. When the receiver is on the primary signal, shift to AFC mode.

b. Just prior to release or as soon as possible after liftoff (when using long baseline), switch from EL and AZ standby to autotrack mode.

c. The antenna must be pointing within ±3 degrees of the target in both EL and AZ to capture it in autotrack. The acquisition point may have to be at a predetermined EL to eliminate the effects of ground reflections. Also, note that sidelobe tracking can occur at ±9 degrees and ±15 degrees off target axis.

d. At liftoff, push the flight/run button.

e. Check for error messages on CRT screen by typing CNTRL-E.

f. After the target has cleared ground clutter, switch track mode to Type II 50 percent.

g. Push preamplifier button to ON.

4.4. Flight Monitoring

Frequently monitor the following:

a. RF Signal Level.

b. CRT Error Display.

c. Tape Punch.

d. Frequency.

e. Validity of Data.

f. Video Output Meter.

g. Stability of Track.

4.5 Flight Termination

a. After balloon burst or termination, turn ranging transmitter OFF, switch transmitter to LOW POWER, key in CNTRL-E on computer terminal and check the block number. When the current number is updated by one, release flight/run mode on SCU and key in CNTRL-B on computer terminal.

b. Slew the antenna as follows to check what sector it is in (CW or CCW). Move the antenna the direction opposite to which light is lit until light switches, then return in shortest direction to test target azimuth. Switch the pedestal into standby status and the receiver to VFO. Antenna will be in the CW sector at this time.

c. Remove and label the "G" diskette using a felt tip pen. Stamp the diskette label with radiosonde station stamp and fill in all appropriate blocks; remove the write protection tab.

d. Remove and label punched paper tape.

e. Turn pedestal power on console power panel to OFF.

f. After the last observation of the day, turn off ranging control unit, telemetry and tracking converter, and system control unit (SCU).

g. Proceed with post-op reduction.

h. When the last observation is completed with post-op, TURN OFF COMPUTER POWER, printer power, CRT power, dual diskette power, utility outlets, computer system, console TCK/TM system, and the main power.

i. Check and clean (if necessary) the air filter in back of the computer terminal (check daily, but clean at least 3 times weekly). Dust the complete unit with a DAMP, not wet, cloth or sponge.

5.0 SYNOPTIC RADIOSONDE (J030, J031) TRACKING

5.1 General

All procedures prior to preflight setup for the synoptic radiosonde remain the same as for an MSS sonde, including system operation configuration (paragraph 2.0), system start and warmup (paragraph 3.0), and test target operation (paragraph 3.5).

5.2 Preflight Setup

a. Complete the system warmup described in paragraphs 1 through 3 of this chapter.

b. Prepare the radiosonde instruments as outlined in FMH-3.

c. Verify that the ranging transmitter is turned OFF. Switch the Telemetry and Tracking Converter Sonde Switch to the FM Non-MSS position.

d. Select Pre-Amp Off for minimum gain on SCU.

e. Switch receiver video source to AM and IF bandwidth to 2.0 MHz.

f. Slew antenna to predetermined baseline position.

g. Calibrate recorder as follows:

(1) Set span module to 1.0.

(2) Set switch to CAL 0 SC.

(3) Set penlift so pen is down and adjust penlift for minimum drag prior to lifting.

(4) Adjust zero offset so pen goes to zero on the chart.

(5) Switch to CAL full SC.

(6) Adjust span so pen goes to 100 on the chart. If an adjustment is made either to zero or full scale, each adjustment must be rechecked to ensure it was not changed.

(7) Prepare sonde for baseline in accordance with FMH-3.

(8) No sensitivity test is required, but a recording in the following order must be done prior to baselining the sonde:

(a) 1/2 inch of zero recording.

(b) 1/2 inch of full scale (100) recording.

(c) 1/2 inch of zero recording.

(d) The recording above must be done without having to adjust zero offset or span.

h. Switch to OPR during preflight calibration of sonde and adjust span during reference to 95 ordinates.

i. Computer Page 1 setup:

(1) Select Page 1 of computer display by typing CTRL-1 simultaneously.

(2) Type in the operation number and, in the last three spaces, the ascent number.

(3) Type of sonde - 005.

(4) Select smoothing interval - 0-120 (normally 120).

(5) Select smoothed data output rate - 1 to 99 (normally 30--remember, this number is times 2).

(6) Select hard-copy option - Raw, smoothed, both or none (usually smoothed; remember, these data are going to the printer).

(7) Hard-copy output rate - 1 to 99 (normally the same interval as (5) above).

(8) Select scrolled output rate -1 to 99 (normally half of (5) and (7) above, as this is not times 2; these data are on the CRT and are at intervals for operator's use).

(9) Enter station temperature at release point in tenths of degrees Celsius.

(10) Enter station pressure at release site in tenths of millibars.

(11) Enter altitude of tracker in feet above MSL.

j. Select Page 2 of computer display by typing CTRL-2 simultaneously. In space provided for sonde serial number, type in J030 or J031.

5.3 Synoptic Radiosonde Instrument Preflight Check

a. Prepare the radiosonde for baseline checkout and turn it ON.

b. Tune the receiver to the radiosonde frequency.

c. Depress the recorder penlift and operate the chart recorder for the baseline period.

d. Prepare radiosonde and balloon for launch.

e. Manually slew antenna EL and AZ to launch position.

5.4 Release and Flight

Acquisition:

a. Switch the Video Source on the receiver to AM and the Telemetry/Tracking Converter Sonde Switch to AM Non-MSS (if on long baseline, this function should be performed after item (6)).

b. Verify signal reception. Tune the receiver to peak signal. Switch the receiver to AFC mode.

c. Activate EL and AZ position memory backup.

d. Ensure that the antenna is locked on the sonde at the preset location by activating EL and AZ autotrack switches.

e. At liftoff (in order to maintain proper flight timing condition), push flight/run button; this simultaneously starts the met data recorder. The antenna must be pointing ±3 degrees of the target in both EL and AZ to capture it in autotrack. The acquisition point may have to be at a predetermined EL to eliminate the effects of ground reflections. Also, note that sidelobe tracking can occur at ±9 degrees and ±15 degrees off target axis.

f. After the target has cleared ground clutter, switch track mode to Type II 50 percent.

g. Turn pre-amp on a few minutes after acquiring the track. (Pre-amp may be required prior to release with long baseline.)

h. Verify that the strip chart record is reasonable.

i. Check for error messages on the CRT screen by typing CTRL-E.

j. Verify that punched paper tape is being produced.

5.5 Flight Monitoring

Periodically monitor the following:

a. RF Signal Level.

b. Recorder Trace.

c. Video Output Meter.

d. CRT Error Display.

e. Stability of Track.

5.6 Flight Termination

a. After balloon burst or termination, type CTRL-E and check the block number. When it updates by one, release flight/run mode on SCU and type CTRL-B on computer terminal; raise penlift.

b. Slew the antenna to check sector as outlined in paragraph 4.5b of this chapter.

c. Remove and label diskettes using felt tip pen (remove write protection tabs).

d. Remove and label punched paper tape.

e. Refer to paragraph 4.5 of this chapter for further termination instructions.

6.0 ROCKETSONDE TRACKING

6.1 Preflight Setup

a. Complete system warmup described in paragraphs 1 through 3 of this chapter.

b. Verify that the ranging transmitter is turned on in AUTO mode, 82 kHz selection, FM Non-MSS sonde type for PWN-10. Verify ranging transmitter is turned off for PWN-11.

c. Switch receiver video source to FM and IF bandwidth to 2.0 MHz.

d. Verify that the strip chart recorder power is turned on and chart paper is adequate.

e. Switch receiver video source to FM and IF Bandwidth to 1.0 MHz.

f. Calibrate recorder as follows:

(1) Set switch to CAL 0 SC.

(2) Adjust zero offset so pen goes to 0 on the chart.

(3) Switch to CAL full SC.

(4) Adjust span so pen goes to 100 on the chart.

(5) Switch to OPR during preflight calibration of sonde and adjust span during high reference to 95 ordinates.

g. Activate EL and AZ manual rate switches.

h. Set receiver selection to VFO mode.

i. Slew the antenna to the predetermined baseline position (PWN-10 only).

j. Enter slant range to baseline position in thumbwheel selection on SCU front panel (PWN-10 only).

k. Select Page 1 computer display by typing CTRL-1 simultaneously.

l. Type mission number or identifier on system setup page and depress the Return Key.

m. Type sonde type.

n. Select smoothing interval and smoothed data output rate if different from default values.

o. Select hard-copy options if applicable.

p. Select scrolled output rate desired.

q. Enter station temperature, pressure, and altitude.

r. Type CTRL-2 for calibration data.

s. Enter sonde calibration data:

(1) Type sonde values from supplied CAL sheet.

(2) Load paper tape with calibration data in paper tape reader, skipping past the sonde serial number on the CAL tape. When loaded, type CTRL-Z.

6.2 Instrument Preflight Check

a. Prepare the sonde for baseline checkout and turn it on.

b. Tune the receiver to the sonde frequency (switch to AFC mode).

c. Depress the baseline control on SCU front panel. (PWN-10 only). For PWN-11, go to paragraph 6.3.

d. Page 4 on computer terminal will be displayed automatically. Verify that one sigma variation is less than 5; if not, repeat baseline. Once a good baseline is made, do not press baseline unless baseline setup is followed.

e. Verify that the range displayed on SCU front panel is the baseline range.

f. Type CTRL-6 and check calculated sensor data for validity.

6.3 Launch and Flight

Acquisition:

a. Verify signal reception. Tune the receiver to peak signal. Switch the receiver to AFC mode.

b. Activate EL and AZ rate memory backup.

c. Before lift off, when using predetermined EL and AZ points (gate), set FREQ and search switch full ON (counterclockwise).

d. At liftoff, push flight/run button; this simultaneously starts the met data recorder.

e. As soon as possible after liftoff, switch from EL and AZ manual rate to autotrack. The antenna must be pointing within ±3 degrees of the target in both EL and AZ to capture it in autotrack. The acquisition point may have to be at a predetermined EL to eliminate the effects of ground reflections. Also, note that sidelobe tracking can occur at ±9 degrees and ±15 degrees off target axis.

f. Push preamp button ON, search OFF after acquisition.

g. Verify that the strip chart record is reasonable.

h. Check for error messages on the CRT screen.

6.4 Flight Monitoring

Periodically monitor the following:

a. RF Signal Level.

b. Recorder Trace.

c. CRT Error Display.

6.5 Flight Termination

a. After termination, release flight/run mode on SCU, key in CTRL-B on computer terminal, switch the strip chart to OFF position and raise the pen-lift.

b. Switch the pedestal into standby status and the receiver to VFO.

c. Remove and label diskette using felt tip pen (remove write protection tabs).

d. Remove and label punched paper tape.

e. Refer to paragraph 4.5 of this chapter for further termination instructions.

7.0 MSS WINDSONDE TRACKING

7.1 Preflight Setup

Complete system setup, warmup, and checkout as outlined in paragraphs 1.0 through 4.0 of this chapter.

7.2 MSS Windsonde Instrument Preflight Check

Complete the preflight check as outlined in paragraph 4.2 of this chapter.

7.3 Release and Flight

Acquisition: Perform acquisition as outlined in paragraph 4.3 of this chapter.

7.4 Flight Monitoring

Conduct flight monitoring as outlined in paragraph 4.4 of this chapter.

7.5 Flight Termination

Conduct flight termination as outlined in paragraph 4.5 of this chapter.

CHAPTER V

UPPER AIR OBSERVATION POSTFLIGHT DATA REDUCTION

1.0 TRANSPONDER (MSS SONDE)

1.1 Load Program

a. Insert MSS/AMQ9/NTRS reduction "I" disk in left disk drive. Set the drive's thumbwheel to "Ø."

b. Insert MSS data "G" disk in right disk drive. Set the drive's thumbwheel to "1."

c. Load the program by pressing down (STOP) the STOP/RESET lever on the computer. Lift up the same lever (RESET). Lift the Program Load switch.

d. The display on the screen will respond:

FILENAME?

Press the RETURN key.

e. The display will respond:

NOVA DOS REV 3.00 followed by DATE (M/D/Y)?

Type the date using spaces instead of slashes between the numbers (e.g., 12 31 82) and press the RETURN key.

f. The display will respond:

TIME (HH:MM:SS)?

Type the time using spaces between the numbers instead of colons (e.g., 14 02 00) and press the RETURN key.

1.2 General Information

a. It is advisable to always start with CLEANUP. When the "R" appears, type DISK and return. What will appear is a description of how many file spaces are in use on the "I" diskette you are operating with, e.g., "46 Left 562 Used." This means that the instructions written permanently on the disk have used 562 of the available file spaces.

b. When you enter a reduction disk using the CLEANUP routine, all expendable files on that disk that were created during a preceding use of the "I" disk are deleted. (That is the meaning of the "FILES DELETED" listing that appears upon entering a reduction diskette through the CLEANUP mode.)

c. It is highly likely in the example just given that the 46 file spaces remaining would be enough to complete any reduction routine involving even very long radiosonde observations. Nevertheless, it is a good idea to "clean house" before starting a reduction routine.

1.3 Data Processing

The reduction process consists of the following programs in this order:

MSSEDIT
ANALYZE
MSSEDIT
FIELDCHANGE
SIGINSERT
RSRNP1
RSRNP2

In order to run a program, wait until the computer displays an "R." Then type the program name and press the RETURN key. If you wish to skip a program in the sequence, you simply do not type the program name. If you wish to run a previous program from the sequence, you simply type the program name again. This method of running the reduction allows you to save time if certain programs are not needed and to go back to fix any mistakes without having to recycle through the reduction sequence.

1.4 MSSEDIT Program

a. The display will clear and MSS PAPER TAPE LOADER & EDITOR will appear across the top of the screen, followed by PAUSE, MOUNT DATA DISK IN DRIVE 1. This tells the operator that the MSSEDIT program is about to begin. Check to see if the "G-diskette" (data disk) is in Drive 1 and press the RETURN key.

b. The words LOAD PAPER TAPE, DELETE BLOCKS, EDIT FILE, PUNCH TAPE OR STOP? (LOAD/DEL/EDIT/STOP/RUN): will appear on the display. Type EDIT and press the RETURN key.

c. (This step will occur only if there is an error in the header of the G-disk.) If the header block of the G-disk has an error, the following will appear. WHAT IS THE TIME INTERVAL OF THE RUN? XXXX. If the time interval between data points on the G-disk is known, enter it in the appropriate space. If the setup was 4-second outputs on the G-disk but 2-second outputs on the printed output, enter 4 and press RETURN. If the display does not ask for the time interval, your G-disk header is probably OK, and the only display to appear will be that in the next paragraph. (If G-disk data are not usable, see chapter VI, paragraph 4.15 for recovery from paper tape instruction.)

d. The computer displays WHAT TIME TAG DO YOU WISH TO CHANGE? XXXX. Type Ø and press the RETURN key. This response will allow you to correct the surface level. This must be done. A menu will be displayed with titles and numbers 1 through 18. At the bottom of the display, the compuner will show DO YOU WISH TO CHANGE ANY SPECIFIC FIELD (1-18 or NO)? Type 12 and press the RETURN key. The surface level data will be displayed, and the cursor will be at the elevation angle. Type ØØØØ and press the RETURN key. The display will change to reflect the change that was made. Note any other lines that need changing, then type DN and press the RETURN key. The program will recycle back to the WHAT TIME TAG ... statement noted above. If any other changes in the surface level data were noted, then type Ø and press the RETURN key again.

If not, type -1 and press the RETURN key, then go to step e below. If changes were to be made, type the smallest appropriate field number from the menu that appears and press the RETURN key. Type the corrected number that is required and continue. If no change is required in that field, but is required in a later field, don't type anything, but merely press the RETURN key until the cursor is in the field that needs the correction. If no further fields require correction, type DN and press the RETURN key. The display will again read: WHAT TIME TAG DO YOU WISH TO CHANGE? Type -1 and press the RETURN key.

e. The words LOAD PAPER TAPE, DELETE BLOCKS, EDIT FILE, PUNCH TAPE OR STOP (LOAD/DEL/EDIT/STOP/RUN): will appear. Type STOP and press the RETURN key. This will cause you to exit the MSSEDIT program.

1.5 ANALYZE Program

This is a quality control program to flag bad points. It primarily provides the difference between the current value and the previous value of, for example, the elevation angle. The object of the program is to signal data that may need correcting. At present, MSSEDIT does not allow the deletion of a bad line of data, so any corrections to the data have to be made by smoothing through the adjoining points and estimating a correct value.

a. The words PREREDUCTION FLIGHT ANALYZER will appear at the top of the screen followed by PAUSE, MOUNT DATA DISK IN DRIVE 1. Press the RETURN key.

b. The words OUTPUT TO CONSOLE OR PRINTER (CNS/PRT): will appear. Type PRT and press the RETURN key.

c. The words IS THE RANGE IN METERS OR YARDS (METERS/YARDS): will appear. Type METERS and press the RETURN key.

d. The words HEIGHT OF TRACKER OVER RELEASE POINT (IN FEET): XXXX will appear. Type the correct value and press the RETURN key.

e. The words AT WHAT TIME WAS THE EQUIPMENT ON TRACK? (IN SEC): XXXX will appear. Type the correct time in seconds or Ø and press the RETURN key.

f. The printer will now print the data.

g. Inspect the data for suspicious values; for example, an ascension rate that is negative followed by a large positive value. This would suggest an elevation error, so check for a ripple in the elevation differences or in the range differences. Circle the lines that contain the bad data.

1.6 MSSEDIT (Repeat)

This is the point when final changes to the data can be made. At this time, the only way to edit bad lines is to hand smooth the values to be corrected and then enter the corrected values. If the balloon was not acquired until some time after release, the intermediate levels between the surface and the acquisition height will have to be hand calculated and then entered through this routine.

a. The display will clear and MSS PAPER TAPE LOADER & EDITOR will appear across the top of the screen, followed by PAUSE, MOUNT DATA DISK IN DRIVE 1. This tells the operator that the MSSEDIT program is about to begin. Check to see if the "G-DISK" (data disk) is in drive 1 and press the RETURN key.

b. The words LOAD PAPER TAPE, DELETE BLOCKS, EDIT FILE, PUNCH TAPE OR STOP? (LOAD/DEL/EDIT/STOP/RUN): will appear on the display. Type EDIT and press the RETURN key.

c. The words WHAT TIME TAG DO YOU WISH TO CHANGE? XXXX will appear. Type in the time of the level you want to change (refer to the time listed in the output from the ANALYZE program). Press the RETURN key.

d. A menu will appear. Select the field that needs correcting and type the number corresponding to that field; press the RETURN key.

e. The cursor will now be positioned in the proper field to be changed. Before making any changes, be sure the time shown in the display is the time you want to correct. Type the corrected value and press the RETURN key. Ensure that the data were accepted correctly. If not, type DN and press the RETURN key. The display will ask for the time tag again. Type the time and press the RETURN key. When the menu appears, type the field number and press the RETURN key. Retype the correct value. (Note that in some data fields, where the XXXXs are, the number must be lined up so that the rightmost digit of the number is over the rightmost X.) If there are no more entries for that time, type DN and press the RETURN key.

f. Correct any more lines by repeating the steps above until all desired changes are completed.

g. When no more corrections are needed, type -1 and press the RETURN key when the display asks for which time tag to change.

h. The display will now read LOAD PAPER TAPE, DELETE BLOCKS, EDIT FILE, PUNCH TAPE OR STOP? (LOAD/DEL/EDIT/STOP/RUN): as before.

1.7 FIELDCHANGE Program

This program allows you to change the data in the header of the "G" diskette. There is also a routine in this program that allows the operator to add or subtract a constant value from the elevation, azimuth or slant ranges of a large block of data.

a. The words FIELD/HEADER CHANGE will appear along with PAUSE, MOUNT DATA DISK ON DRIVE 1. Press the RETURN key. The words MODIFY HEADER/MODIFY DATA OR STOP (HEADER/DATA/STOP): will appear.

b. To check that the G-diskette header and surface data are correct, type HEADER and press the RETURN key. The computer responds with the words HEADER MODIFICATION ROUTINE followed by a menu and listing of the data in the header. At the bottom of this menu will appear the words: SELECT FIELD # TO MODIFY (1-8).

c. Check to see if the data are correct. If the data are correct, skip to paragraph d below. If not, type the number of the field that needs correction. The computer will respond with a request for the correct data. In some cases, a series of Xs will appear. If so, align the numbers with the Xs so that the decimal point lines up or so that the least significant digit is over the rightmost X. Type the correct entry and press the RETURN key. The computer will return to the display reading HEADER MODIFICATION ROUTINE.

d. Make any additional changes required as outlined above. When all the changes have been made or if no more changes are needed, type in the number 9 and press the RETURN key. The computer responds with HEADER RELOADED-DONE.

e. The computer next recycles and displays MODIFY HEADER, MODIFY DATA OR STOP (HEADER/DATA/STOP):. If the data do not need correcting, type in STOP, press the RETURN key, and skip to section 1.8 of this chapter. Otherwise, continue as directed below.

f. If a whole block of data needs correcting by a constant amount, instead of typing STOP, type DATA and press the RETURN key.

g. The computer responds with YOU ARE ABOUT TO MODIFY THE RUN and then displays the date and time of the run. This display is followed by the words TIME TAG OF FIRST LEVEL TO MODIFY: XXXX. Type the first, or lowest, level of the block of data that needs to be modified and press the RETURN key. It is important that you line up the numbers with the Xs. For example, to enter the tenth second, type in space space 1Ø, not 1Ø; the latter will be read by the computer as 1000.

h. The computer next responds with TIME TAG OF LAST LEVEL TO MODIFY: XXXX. Type the time of the last or top level that needs to be modified and press the RETURN key.

i. The computer comes back with the response ENTER CHANGES followed by AZIMUTH ELEVATION SLANT RANGE above a row of Xs.

j. Type the amount that needs to be added to all the azimuth values in the time block specified (if all the values need to be reduced by some amount, make the value a negative number). Be sure to align the number with the Xs and press the RETURN key. (If no changes are needed to the azimuth, type in Ø.ØØ and press the RETURN key.)

k. The cursor should move under the elevation column. If changes are required, enter the amount to be added; otherwise, enter Ø.ØØ and press the RETURN key.

l. The cursor then moves under the slant range column. Type the amount to be added or enter ØØ and press the RETURN key.

m. The computer then lists the corrections made and flashes MODIFYING RECORD AT __________ SECONDS. The computer recycles and displays MODIFY HEADER, MODIFY DATA OR STOP (HEADER/DATA/STOP):. Type STOP and press the RETURN key.

1.8 SIGINSERT

The program SIGINSERT allows the operator to insert a significant level. The program was designed for use with the AMQ-9 sonde, but will work with the MSS sonde.

a. The words SIGNIFICANT LEVEL INSERTION, followed by PAUSE, MOUNT DATA DISK IN DRIVE 1 will appear. Press the RETURN key. These words are followed by DO YOU HAVE ANY SIGNIFICANT LEVELS TO INSERT (YES/NO):. If no significant levels need to be inserted or forced, type NO, press the RETURN key, and skip to section 1.9 of this chapter.

b. If significant levels are to be entered or forced, type in YES and press the RETURN key. The computer will then ask IS THIS A TRANSPONDER RUN (YES/NO):. Type YES and press the RETURN key. The computer will respond with SIGNIFICANT LEVEL INSERTION AND TIME RH TEMP across one row and a series of Xs below that.

c. Type the time to be made a significant level and press the RETURN key. Then type the relative humidity to be used at that significant level and press the RETURN key. Finally, type the temperature at the significant level and press the RETURN key. Repeat this as many times as necessary.

d. To stop the significant level insertion process, type the position where time is being requested and press the RETURN key.

e. The computer then displays PROCESSING an SIG LEVEL FIXED LEVEL and SEC followed by the inserted data.

1.9 RSRNP1 and RSRNP2 RCC Format Reduction

This is a two-pass program, but to the operator it will appear as one operation. This is the program that produces the Range Commanders Council upper air data reduction format.

a. The computer will display the words MSS/AMQ9/NTRS RAWINSONDE REDUCTION followed by PAUSE, MOUNT DATA DISK ON DRIVE 1. Press the RETURN key.

b. The computer then will request the answers to a series of questions. The first asked is OUTPUT IN FEET OR METERS (FEET/METERS):. This request is for the constant interval output. The normal response is to type FEET and press the RETURN key.

c. The computer then asks WIND SPEED IN FEET PER SECOND (YES/NO):. The normal data output is for winds to be in knots. If knots are desired, type NO and press the RETURN key.

d. The computer then asks UNINTERPOLATED OUTPUT - (RAW LEVELS - YES/NO):. This option will override question e, if answered YES, and output a level for every time on the G-disk. The normal response is to type NO and press the RETURN key.

e. The computer then asks ALTITUDE INCREMENT IN FEET: XXXX.XX. This request is for the spacing of the constant level data. (If the answer to the question in b had been METERS, the computer would have asked for the increment in meters.) The normal response is to type 1000 and press the RETURN key.

f. The computer then asks INDEX OF REFRACTION OPTICAL OR MICROWAVE (OPT/MWV):. The response to this will determine if a radar or an optical index of refraction is output under the index of refraction column. If optical wavelengths are specified, the wavelength used is 0.56 microns. The normal response response is to type MWV and press the RETURN key.

g. The computer then asks SHEAR IN KNOTS OR /SEC:. The response governs the units used in the wind shear column. The normal response is to type /SEC and press the RETURN key.

h. The computer then requests SURFACE WIND DIRECTION (IN DEGREES):. Type the surface wind direction at balloon launch time and press the RETURN key. Be sure to include the decimal point.

i. The computer then requests SURFACE WIND SPEED (IN KNOTS):. Type the surface wind speed in knots that occurred at balloon launch and press the RETURN key. Be sure to include the decimal point.

j. The computer then requests SURFACE RELATIVE HUMIDITY (IN %):. Type the relative humidity, in percent, that occurred at balloon launch and press the RETURN key. (Be sure to include two decimal places in the entry.)

k. The computer then asks OUTPUT TO CONSOLE OR PRINTER (CNS/PRT):. The response to this determines where the output will be displayed. The normal response is to type PRT and press the RETURN key.

l. The computer then asks HEIGHT OF TRACKER OVER THE RELEASE POINT (IN FEET):. This is to compensate for the fact that the MSS tracking antenna may be on a roof or a tower and that negative elevation angles may not imply that the sonde is below the ground. Type the height and press the RETURN key.

m. The computer then asks ENTER STATION NUMBER FROM MDG: XX. A computer file is being developed that will list a station identification code between 9 and 98 for each station using the MSS.

n. The computer then asks WHAT IS THE LATITUDE OF THIS STATION (IN DEGREES):. Type the latitude of the station in degrees and decimal parts of degrees and press the RETURN key, e.g., if the station latitude is 35° 45', type in 35.45. This question is asked if you answered 99 to question m.

o. The next request from the computer, ENTER STATION ID (MAXIMUM 30 CHARACTERS):, is displayed because 99 was typed for the response to question m. If a valid code number had been entered, the question in this paragraph would be skipped. Type the station identification and press the RETURN key (e.g., type ROI NAMUR, KWAJALEIN MI).

p. The computer then displays PROCESSING DURATION SHOULD BE ABOUT XXXX SECONDS.

q. The computer, while processing, may display several lines reading possible error in WIND SHEAR AT _____ MBS, indicating levels of excessive wind shear. This is a flag that the wind shear exceeded some limit. The limit is equal to 0.027 times the altitude interval selected. That is, if the data are being output every 1000 feet, the shear flag is 27 degrees per 1000 feet; if the output is every 500 feet, the shear limit is set for wind shears in excess of 13.5 degrees per 500 feet.

r. In addition to the wind shear flag being displayed as indicated in paragraph (q) above, the computer will also display TEMPERATURE AT _____ MBS for all levels where the temperature lapse rate was greater than -3.3°C per 1000 feet or less than +5°C per 1000 feet.

s. These comments are followed by the word STOP. The printer, if it was selected, then will produce the constant altitude part of the RCC format, which is shortly followed by the words MSS PASS 2 SIGNIFICANT/MANDATORY DATA and then STOP.

2.0 NONTRANSPONDER (NTRS) RAWINSONDE REDUCTION (NOVA 3/12)

2.1 Load Programs

a. Insert the EDITOR "I" diskette into unit drive zero. This editing process consists of the following programs:

(1) MSSEDIT

(2) NTRSEDIT

(3) ANALYZE

(4) MSSEDIT

(5) FIELDCHANG

(6) SIGINSERT

b. All of these programs are basically data preparation programs getting your raw data finalized for the data users format.

(1) Insert data "G" diskette into unit "1."

(2) Boot the program (stop, reset, program load).

(3) The CRT will display "filename." Respond with return. DCS Rev. will appear, then a request for data (M/D/Y). Enter and press return. When the request for time (H:M:S) appears, enter the data using colons, spaces, or the data slants, and press RETURN.

2.2 MSS Paper Tape Loader and Editor (MSSEDIT)

Refer to the instructions in section 1.4 of this chapter.

2.3 Temperature, Humidity, and Pressure Merge (NTRSEDIT)

a. The program will give you the option to save values for a later merge or to merge. If you wish to merge data, answer 1. If you wish to save data for later use, answer 2. This will create a file which you can use for input later.

b. Load the aneroid cell and calibration tape into the reader. LOAD SPTR means load the aneroid tape, supplied with the sonde, into the reader at the first rubout past a long series of rubouts (a rubout is a segment of tape where all holes are punched (letters)). Then strike any key and the tape will be loaded.

c. If the type loads successfully, the computer response is "tape successfully loaded." If the complete tape fails to run, try again by starting at the beginning of the NTRSEDIT program. If it fails again, you may have a bad "G" diskette, and a new one will have to be created from paper tape.

d. The CRT will display "Pause Mount Data Disk on Drive 1." This is a reminder for the operator to be sure the "G" diskette is in Drive "1."

e. In response to "Is this run for a J005 or J031 (J005/J031):" enter J031 (if sonde is a J030 or J031).

f. Enter thermistor calibration resistance - R30: XXXXX.XX.

g. Enter hygristor calibration resistance - R33: XXXXX.XX.

(1) For J031 or J030 radiosondes using non-premium sensors (i.e., not prebaselined), use the temperature ordinate found at 30°C on evaluator 230B and relative humidity at 33 percent on evaluator 8002 to compute R30 and R33:

$$R30 = \left(\frac{95.0}{\text{T-ORD @30°C}} - 1\right) \text{X } 47775$$

$$R33 = \left(\frac{95.0}{\text{RH-ORD @33\%}} - 1\right) \text{X } 47775$$

(2) NOTE: 47775 represents the sonde internal resistance. This should be checked to produce an ordinate of 47.5 on the recorder during baseline. Otherwise, adjust the sonde internal resistance to this value. (See paragraphs 3.4 and 8.1, FMH-3, describing this adjustment.)

(3) For sondes employing premium sensors (i.e., prebaselined), use the values printed on side of radiosonde and hygristor can to obtain R30 and R33, respectively.

h. Enter surface relative humidity: XXX.XX. (This is the RH at release site at time of release.)

i. Enter station latitude: XX.XXXX. (This is the latitude of the release point in ten thousandths of degrees.)

j. Enter height of tracker over release point (in feet): XXXX.

k. Enter estimated slant range to release point (in yards): XXXX.

l. Enter surface pressure: XXXX.XX. (Entered in tenths of millibars, this is the pressure at release point.)

m. Enter surface temperature (°C): XXX.XX. (This is the temperature at time of release.)

n. Input device (tape/CRT/file): Tape. (This is asking you how you want to input the temperature, RH, and contact points. If you typed a tape, respond with tape. If you want to enter data manually, type CRT. If you have previously saved the data on file, type FILE.) (Do not put significant levels on tape, only selected interval data.)

o. If you are loading from tape, load the data tape in the paper tape reader. (Be sure to have a long leader on the tape and put it in the tape reader at a point that is before data.)

p. If the paper tape or file successfully loads on the disk, the CRT will display the data being merged. When it is done, an "end of file" will appear, followed by a "stop."

2.4 Analyze

a. Refer to the instructions in section 1.5 of this chapter. (Note the following exceptions.)

b. Analyze must output only to the printer, as not enough space is available on the CRT.

c. Range is always in yards.

2.5 MSS Paper Tape Loader and Editor (MSSEDIT)

Refer to the instructions in section 1.6 of this chapter.

2.6 Field/Header Change (FIELDCHANG)

Refer to the instructions in section 1.7 of this chapter.

2.7 Significant Level Insertion (SIGINSERT)

a. The significant level insertion program is about to execute. If you have already inserted the significant levels into this "G" diskette, <u>do not</u> do it again. Please note that once you have inserted significant levels, you cannot rerun the NTRS merge without reloading the "G" diskette from paper tape.

b. Strike any key to continue.

c. "Pause Mount Data Disk on Drive '1'" appears so the operator will make sure the data disk is in Drive "1." Respond with Return.

d. The display will ask "Do you have any significant levels to insert (yes/no):?" Enter the appropriate answer and press Return.

e. Enter any significant levels. Entries are in seconds, degrees Celsius, and percent of relative humidity. When all significants are entered, type "END" in a time slot.

f. That completes the use of the NTRS editor diskette. Typing RELEASE DPO will release the computer, and you will see the message MASTER DEVICE RELEASED.

g. Now remove the NTRS editor diskette and place the MSS/AMQ9/NTRS reduction disk in unit 0. Proceed as described in section 1.1 of this chapter. Run the following programs:

(1) RSRNP1

(2) RSRNP2

(3) ASBDT

3.0 WINDSONDE DATA REDUCTION

The procedures for reducing windsonde data using the NOVA 3/12 are identical to the reduction procedures for transponder rawinsonde reduction (described in section 1.0 of this chapter), <u>except</u> the windsonde reduction "I" diskette is used.

CHAPTER VI

MSS COMPUTER OPERATIONS

1.0 DISKETTES

1.1 Accompanying the MSS system are 10 types of diskettes. They have been assigned the following names:

a. Disk-A

b. Disk-B

c. Disk-C

d. Disk-D

e. Disk-E

f. Disk-F

g. Disk-G

h. Disk-H

i. Disk-I

j. PDOS

1.2 Only two types of diskettes are necessary for normal MSS operations: Disk-I (which contains the MSS real-time program) and Disk-G (which is used to record data taken during a flight). A detailed description of the uses of all the diskette types is found in SDC TM-1568.

1.3 The following facts regarding the use and handling of diskettes will be useful to the operator.

a. Avoid touching exposed sections of diskette (recording medium) with fingers. Always handle diskettes by the protective outside envelope.

b. Diskettes are inserted into the diskette drive unit with the label side up.

c. Above both of the diskette drive openings, there are thumbwheel switches with the numbers 0, 1, 2, 3. These are used to "address the unit," i.e., to set each diskette drive to be a given unit number. At times in the operating instructions, the operator is required to set the diskette drives to particular unit numbers.

d. If two drive units are required, such as 0 and 1, it does not matter which (left or right diskette drive) is unit 0 and which is unit 1.

e. At no time should the system be operated with both diskette drives selected to the same unit number.

f. Never write on the diskette with anything other than a soft, porous-tipped pen.

g. A label put on a diskette must cover only the protective envelope. Do not place a label where it covers part of the inner recording medium.

h. Disk type "G" (used to store data from an MSS flight) may be reused when its data are no longer needed.

i. Diskettes come with small tabs (write enable tabs). One of these tabs is placed over a small notch in the side of a diskette when the disk is to be used to record data from an MSS flight. The tab allows new data to be written on the diskette. After a flight, the tab may be removed. This prevents accidental writing of new data on the diskette. Reading of data is still allowed when the tab has been removed. Remember to put on a new tab if a diskette is to be recycled and used for another flight.

j. Each diskette holds 512 blocks of eight data-intervals each. Up to two diskettes may be used in a flight.

2.0 COMPUTER STARTUP AND SHUTDOWN PROCEDURES

2.1 Startup Procedures

Power on the following units:

a. DPU (Nova 3 computer) - turn the key to the ON position.

b. Paper Tape Punch - POWER switch at left.

c. Diskette Unit - ON/OFF switch at right.

d. ADM3A Terminal (Console) - POWER ON/OFF switch at lower lefthand corner of back of console.

2.2 Boot the MSS System

a. Set disk unit numbers to 0 and 2 with thumbwheel switches on diskette unit.

b. Insert diskette "I" into diskette slot 0.

c. Depress STOP switch on DPU front panel.

d. Raise RESET switch on DPU front panel.

e. Set data switches on DPU front panel to the following settings: 1 000 000 000 011 011.

f. Raise PROG LOAD switch on DPU front panel.

g. Turn key-switch on DPU front panel to LOCKED position.

h. In response to "FILENAME?" typed out at the display console, key in "MSS" and press the "RETURN" key. If "FILENAME?" does not appear, power the system down and back up, then try again. If failure occurs again, call for assistance. When the MSS system is successfully read from the system diskette, it will display the MSS logo and ask for the date. Do not, repeat, do not enter the data yet!

i. Remove diskette "I" from unit 0.

j. Set diskette unit number 0 to unit number 1. The other unit should still be set at 2.

k. Insert two new diskettes "G" (to receive flight data) into diskette units 1 and 2. Both should have write-enable tabs put on them prior to use.

l. Enter the date and time (at the console). Each consists of three numbers, separated by commas:

(1) ENTER DATE (MM,DD,YY): 7,13,78.

(2) ENTER TIME (HH,MM,SS): 15,2,17.

(3) The above specifies that the date is July 13 1978 GMT and the range time is 17 seconds after 3:02 PM.

m. The MSS system is now running. The operator may call up any pages desired, as explained in the section following. It is recommended that the operator call up "Page E" to check for any adverse error conditions within the system.

2.3 Shutdown Procedures

After a flight, the following operations must be accomplished.

a. Turn off the FLIGHT/RUN indicator by depressing the FLIGHT/RUN button on the front of the SCU if this has not already been done. (If the button is still lighted, it must be done.) It is important to do this because it signals the computer that the flight is over and header data must be written to diskette. Failure to do this may result in loss of flight data!

b. Key in CTRL-B on the CRT.

c. Remove the two diskettes "G" from the diskette drives. Peel off the write-enable tabs from the diskettes. Using a soft, porous-tipped pen only (!), carefully label each diskette with the flight number and date.

d. Remove and label the paper tape output from the punch.

e. Turn the DPU key-switch to the OFF position.

f. Power off the diskette unit.

g. Power off the paper tape reader/punch.

h. Power off the ADM3A terminal.

3.0 OPERATOR CONTROL THROUGH MSS CONSOLE

3.1 General

Once the system has been powered on and booted (see paragraph 2.1 of this chapter), all subsequent control of the DPU (Nova 3 computer) is done through the ADM3A console. This console consists of a typewriter keyboard and a television display tube. Eleven different formats (pages) are available to the operator for display. In some of these pages (1, 2, and 3), data may be entered which direct the operations of the DPU during the flight. Other pages (4, 5, 6, 7, and E) provide real-time displays of flight data and system status. The remaining pages are static and merely display information which the operator may occasionally want to read. Page 8 is reserved for installations that desire to format a customized display to their application. The individual pages are detailed in section 4.0 of this chapter.

3.2 Page Selection

The basic level of control available to the operator is page selection. The 11 pages available to the operator (referred to as Page 0, Page 1, Page 2, ... Page 9, Page E) may be "called up" (i.e., displayed on the television display) at any time by the operator. This is done by depressing the CONTROL key (marked CTRL) and keying in the appropriate page digit (0-9 or letter E). A page called up remains on the display until either the operator or the MSS itself calls up a new one. A mission may be flown with any page or combination of pages being displayed.

3.3 Reboot

The operator may do a "reboot" by depressing the control key and keying the letter B. This causes a system bootstrap to occur. The reboot may be done for either of two reasons:

a. To bring into the DPU a fresh version of the MSS program with all fields set back to their default values.

b. To return control to the RDOS operating system when postflight applications programs are to be run.

3.4 Static Pages

a. Static pages are displays that contain unchanging information that the operator may occasionally desire to read. Page 0 is the MSS Table of Contents. It describes the function of all other pages. Page 9 contains a "system operations checklist" that may be used as a handy preflight reference.

b. When displaying a static page, the only legal actions are a page call-up or a reboot.

3.5 Updated Pages

a. Updated pages display changing real-time data. Most pages are updated about once per second. Page 4 contains data regarding the current (or most recent) baseline operation. Pages 5 and 6 contain raw and smoothed flight data, respectively.

b. Page 7 generates a scrolled television display that adds one new line of data periodically. The last 24 lines generated on this page are simultaneously displayed, providing a historical view of the flight. (The rate of new line generation is set by the operator through an entry in Page 1.) Page E is the "system error display" page. On it are displayed certain status indicators and a list of any prevailing error conditions.

c. When on an updated page, the only legal actions are a page call-up or a reboot.

3.6 Data Entry Pages

a. Pages 1, 2, and 3 of the MSS system allow the operator to enter data that control the operation of the MSS system. Each page contains a series of fields, each of which is used to specify a particular number of commands to the system. The function of each of the individual fields is detailed in section 4.0 of this chapter. The current section describes how the operator may change data within the various fields.

b. When the MSS system is first started, all fields contain default values. These values are generally useful for test-target applications only. In a flight situation, appropriate data must be inserted to ensure proper MSS operation.

c. In order to put data into a field, the operator must first move the cursor (the small, box-shaped character on the display) to the beginning of the field to be changed. Once there, the data itself may be typed directly.

d. Several characters are available for manual positioning of the cursor:

(1) Down-Arrow (CTRL-J)	To move cursor down one field
(2) Up-Arrow (CTRL-K)	To move the cursor up one field
(3) Right-Arrow (CTRL-L)	To move the cursor to the right one position
(4) Left-Arrow (CTRL-H)	To move the cursor to the left one position
(5) Home (CTRL-HOME)	To move the cursor to the beginning of first field of the current page

e. Note that moving the cursor around with the above commands does not change any data passed over by the cursor.

f. When keying in actual data for a field, it is necessary to move the cursor (via keying) beyond the last character of the field being changed. This is required to signal the DPU that the operator is finished with the field (at least temporarily), so the DPU can begin to evaluate and incorporate the change into the system. At this time the data are checked for errors.

g. If the data are not found to be both appropriate and error-free, the following actions are taken:

(1) All characters in the erroneous field are replaced with question marks ("??").

(2) The cursor is positioned back at the beginning of the erroneous field.

(3) An audible beep is sounded at the console to alert the operator.

(4) Other operator actions (e.g., new page call-ups) are inhibited until the error condition is cleared by new data keyed in by the operator.

h. The cursor may be positioned beyond the end of a field (necessary for proper evaluation and incorporation of the new data) by either of two methods. Blanks may be used to fill unused positions of the field. Alternatively, a RETURN key may be keyed in after the new characters, resulting in blanks automatically being inserted into remaining positions of a field. If a RETURN is used, unwanted characters in the field beyond the cursor are removed (replaced by blanks). However, if the cursor is in the first position of a field, the entire field is not filled with blanks (which would never be legal data!). Rather, the cursor is jumped to the beginning of the next field, as if a down-arrow had been keyed instead of the RETURN.

i. When on a data entry page, outstanding errors inhibit new page call-ups and cursor movements outside of the current field. Page call-ups keyed when a new field is partially entered are rejected. (In other words, page call-ups are legal only when at the beginning of a field.)

3.7 Prepunched Tapes

a. As an alternative to manual entry of data in Pages 1, 2, and 3, prepunched paper tapes may be read into the MSS system. These tapes contain exactly the same data as one would enter manually. (Optionally, extra commentary data may also be included.) Data tapes for Page 2 (MSS sonde/sensor calibration) are provided by Space Data Corporation along with each MSS sonde. Tapes for other sondes or other pages may be prepared by the operator, if desired, in the following manner.

b. Use the Data General text editor SPEED to create a file (e.g., MY DATA) which will later be punched. The file must consist of one line of text data per field (as required by the MSS page into which the tape will be read). Each line should contain the characters keyed exactly as one would enter them directly. In addition, extra characters may be included on each line, describing the contents of the line. (These extra characters will be ignored when the tape is read.) After building the file with the text editor, the RDOS command PUNCH MYDATA will punch the tape.

c. If, while reading a prepunched paper tape, an error is detected, the previously described actions are taken in response to the error. Tape reading is temporarily suspended until the operator manually keys in corrected data for the fields.

d. Prepunched tape reading is initiated by keying a CTRL-Z while displaying one of the data entry pages (1, 2, or 3). If none of these pages is displayed when a CTRL-Z is encountered, the key-in is rejected.

4.0 MSS DATA INDEX

4.1 Page 0 - Table of Contents (Static Page)

Page 0 contains the MSS Table of Contents. No data items are present.

4.2 Page 1 - System Setup (Data Entry Page)

a. FLIGHT IDENTIFIER. A 10-character identification for the flight. May contain letters and/or digits.

b. SONDE TYPE. The operator must select one of the sondes compatible with the MSS system. Options are

(1) MSS

(2) 8A

(3) 10A

(4) 10C

(5) 10D

(6) 11A

(7) Q9

(8) WS

(9) 005

c. SMOOTHING INTERVAL. The number of points for a moving average smoothing to be performed. Select 1 for no smoothing. Maximum is 120.

d. SMOOTHED DATA OUTPUT RATE. — The time interval between data bursts on those devices that receive smoothed data. Enter a number between 1 and 99, which is multiplied by 2 seconds. Devices receiving smoothed data are

(1) Punch

(2) Five-Level Communications Lines

(3) MIL-188B Communications Lines

(4) Hard copy

(5) Diskettes

e. HARD-COPY OPTION. — Select RAW, SMOO(thed), BOTH, or NONE to control what data are written to the hard-copy device. Default is none.

f. HARD-COPY OUTPUT RATE. — Applies only if hard-copy option (above) has other than NONE selected. Enter the number (to be multiplied by 2) that specifies the time interval between lines of hard-copy output. Maximum is 99.

g. SCROLLED OUTPUT RATE. — Enter the number of seconds between scrolled output lines displayed on Page 7. Remember that the last 24 lines are always visible. Maximum is 99. Default is 1.

h. STATION TEMPERATURE. — Enter the temperature at the launch site.

i. STATION PRESSURE. — Enter the atmospheric pressure at the launch site.

j. TRACKER ALTITUDE. — Enter the altitude of the station (or launch site, if different) in feet above mean sea level.

4.3 Page 2 - MSS Sonde/Sensor Calibration (Data Entry Page)

a. SONDE IDENT. — Enter a six-character (letters or numbers) identifier for the MSS sonde being flown.

b. CHANNEL 1 SENSOR. — Enter a six-character identifier for the sensor connected to Channel 1.

c. A. — Enter the "A" calibration coefficient for the Channel 1 sensor.

d. B. — Enter the "B" calibration coefficient for the Channel 1 sensor.

e. C. — Enter the "C" calibration coefficient for the Channel 1 sensor.

f. CHANNEL 3 SENSOR. — Enter a six-character identifier for the sensor connected to Channel 3.

g. A. — Enter the "A" calibration coefficient for the Channel 3 sensor.

h. B. — Enter the "B" calibration coefficient for the Channel 3 sensor.

i. C. — Enter the "C" calibration coefficient for the Channel 3 sensor.

j. R33. — Enter the 33-ohm resistance lock-in value for the Channel 2 hygristor.

k. HYG TEMP. — Enter the code to control temperature channel use in computing relative humidity as follows:

   (1) 01 = use Channel 1 sensor.

   (2) 03 = use Channel 3 sensor.

   (3) 13 = use average of Channels 1 and 3.

l. LOG-R. — Enter the 24 "log-of-resistances" that make up the sonde calibration table. If less than 24 entries are used, put zeros in the remaining positions.

m. RATIO. — Enter the 24 "ratios" that make up the sonde calibration table. If less than 24 entries are used, put zeros in the remaining positions.

4.4 Page 3 - AN/AMQ-9 Sonde/Sensor Calibration (Data Entry Page)

a. SONDE IDENT. — Enter the six-character (letters or numbers) identifier of the AN/AMQ-9 sonde to be flown.

b. TO. — Enter the baseline temperature ordinate to calibrate the Q9 sonde.

c. TC. — Enter the baseline temperature in degrees corresponding to the TO value entered above.

d. FC. — Enter the baseline relative humidity to calibrate the Q9 sonde.

e. HYG TEMP. — Select the temperature sensor(s) to be used when computing relative humidity from the codes below:

(1) 01 = use Channel 1 temperature.

(2) 03 = use Channel 3 temperature.

(3) 13 = use both Channels 1 and 3 (averaged).

4.5 Page 4 - Baseline Display (Updated Page)

a. BASELINE RANGE. — This is the range from the tracker to the test target. The baseline range must be entered into the thumbwheel switches of the SCU before the baseline operation is done.

b. MEASURED RANGE. — This is the current range computed by the system. Immediately after a baseline operation, it should agree exactly with the baseline range.

c. ONE-SIGMA VARIATION. — This is the value of one standard deviation in the ranges that were taken during the baseline operation. It is a measure of the noise in the system.

d. % BAD. — This is the percent of range partials found to be bad during the baseline operation. If this number exceeds 5, repeat the baseline.

e. FINE:AVE. — This is the average fine-tone range partial during the baseline operation.

f. FINE:1-SIGMA. — This is the value of one standard deviation of the fine-tone range partials during the baseline operation.

g. COARSE:AVE. — This is the average coarse-tone range partial during the baseline operation.

h. COARSE:1-SIGMA. — This is the value of one standard deviation of the coarse-tone range partials during the baseline operation.

i. CALIBRATION:FINE. — This is the fine-tone calibration factor to be added to all fine-tone ranging partials.

j. CALIBRATION:COARSE. — This is the coarse-tone calibration factor to be added to all coarse-tone ranging partials.

k. OFFSET. This is the software-generated coarse calibration offset that compensates for long-term drift in the Ranging Control Unit.

l. RANGE UNITS. This indicator will show either "meters" or "yards," based on the type of sonde.

m. BASELINE STATUS. This indicates that baselining is complete.

4.6 Page 5 - Raw Data Display (Updated Page)

a. STATUS. A series of five characters indicate miscellaneous system status as follows:

(1) CHARACTER 1: FLIGHT IN PROCESS: This character will be Y if the flight is in progress (the operator has hit the FLIGHT button on the SCU front panel). Otherwise, it will be N, indicating that the flight has not started.

(2) CHARACTER 2: BASELINE STATUS: This character will be N if no baseline has been done, C if a baseline has been completed, or I if a baseline is in progress.

(3) CHARACTER 3: TM STATUS: This character will be G if TM data received are good, or B if TM data received are bad.

(4) CHARACTER 4: UNITS: This character will be Y if units are yards, or M if units are meters.

(5) CHARACTER 5: RANGING STATUS: This character will be G if ranging is good, or B if ranging is bad.

b. ELAPSED TIME. This is the time in seconds since the operator pushed the FLIGHT button on the SCU front panel.

c. AZIMUTH. This is the current azimuth to the target.

d. ELEVATION. This is the current elevation to the target.

e. AZ ERROR. This is the current azimuth error signal.

f. EL ERROR. — This is the current elevation error signal.

g. RANGE. — This is the current range to the target.

h. FINE. — This is the current fine-tone ranging partial.

i. COARSE. — This is the current coarse-tone ranging partial.

j. CHANNEL 0. — This is the current pulse count on Channel 0 (reference).

k. CHANNEL 1. — This is the current pulse count on Channel 1 (first temperature sensor).

l. CHANNEL 2. — This is the current pulse count on Channel 2 (hygristor).

m. CHANNEL 3. — This is the current pulse count on Channel 3 (second temperature sensor).

4.7 Page 6 - Smoothed Data Display (Updated Page)

a. STATUS. — Eight characters and one number are displayed as system status on this page. The first five characters, identical to those in the status on Page 5, are not repeated here. The other indicators are as follows:

(1) CHARACTER 6: X FILTER STATUS: If the smoothing filter (in the X dimension) is initialized, an I will be displayed. If the filter is rejecting data as bad, a B will be displayed. If the filter is accepting data as good, a G will be displayed. If the data coming to the filter are zero, a Z will be displayed.

(2) CHARACTER 7: Y FILTER STATUS: Same as for X Filter Status, referring to data in the Y dimension.

(3) CHARACTER 8: Z FILTER STATUS: Same as for X Filter Status, referring to data in the Z dimension.

(4) CHARACTERS 9 THROUGH 11: NUMBER OF SMOOTHING POINTS: This number is the number of smoothing points currently being used by the filtering mechanism. It is set by the operator on Page 1 (number of points smoothing).

b. ELAPSED TIME. — This is the time in seconds since the operator pushed the FLIGHT button on the SCU front panel.

c. X DISTANCE. — This is the X distance to the target, positive east.

d. Y DISTANCE. — This is the Y distance to the target, positive north.

e. Z DISTANCE. — This is the Z distance to the target, positive up.

f. ALTITUDE. — This is the altitude of the target above mean sea level.

g. GROUND RANGE. — This is the ground range to the target.

h. AZIMUTH. — This is the azimuth angle to the target.

i. ELEVATION. — This is the elevation angle to the target.

j. CHANNEL 1. — This is the reduced data from Channel 1.

k. CHANNEL 2. — This is the reduced data from Channel 2.

l. CHANNEL 3. — This is the reduced data from Channel 3.

4.8 Page 7 - Scrolled Data Display (Updated Page)

a. Every "n" seconds, a new line of data is written to the display, where "n" is selected by the operator on Page 1 (scrolled output rate). As new lines are added to the bottom, old lines disappear off the top. In this manner, the last 24 lines of data are always visible. This is useful for watching trends of a flight.

b. The format of the line of data is as follows:

(1) Elapsed time (seconds).

(2) Azimuth (degrees).

(3) Elevation (degrees).

(4) Range (meters or yards, depending upon sonde).

(5) Height (above MSL).

(6) Channel 1 reduced data.

(7) Channel 2 reduced data.

(8) Channel 3 reduced data.

4.9 Page 8 - Reserved Page

Page 8 is reserved for custom displays users might desire to implement. It may be used as a static, data entry, or updated page. It requires an experienced assembly language programmer to install a new page.

4.10 Page 9 - System Operations Checklist (Static Page)

Page 9 contains a checklist that is a handy reference before a mission. The operator may call up this page at any time before, during, or after a mission.

4.11 Page E - System Error Display (Updated Page)

a. Page E is used to determine system status on demand. The important numbers (described below) are displayed, as well as a list of error conditions (if any) which prevail. When an error condition goes away, the particular error message will be erased from the display.

b. Along with each error message, a single digit code is listed. For error messages with more than one possible cause, this digit will indicate a specific reason for the appearance of the error.

4.12 Spare Time Count

A number is displayed that is an indication of the amount of spare time the computer had during the tenth of a second before the number was displayed. (The number is updated every 0.3 second.) This number will vary but should never remain at zero for long, as this would indicate that the system is stalled. Users of the MSS customization features USER1 and USER2 should take care that their additions to the system processing do not use all remaining time and result in a spare time count of zero.

4.13 Disk Blocks Written

This is a count of the number of blocks written to the disk or diskette unit. It starts at zero and will count up once the flight has started. If the final count is greater than 615, data have been written on both diskettes. Otherwise, only the unit 1 diskette need be saved from the mission.

4.14 Error Messages

a. TM Data Missing:

1 = TM channel bad

b. Reduction Incomplete:

9 = Acquisition completed

8 = USER1 routine completed

7 = Preprocessing completed

6 = TM, angles, range converted

5 = X, Y, Z completed, edited, and smoothed

4 = Q9 TM completed

3 = MSS temperature completed

2 = MSS RH completed

1 = Data stored in output buffers

0 = USER2 and all processing completed

c. Tracking Bad:

1 = Loss of track during autotrack

d. Punch Late:

1 = Punch did not finish output in allotted time

e. ML188B Late:

1 = ML188B did not finish output in allotted time

f. Range Partials Bad:

1 = Ranging phase-lock-loops not locked

g. Sonde Not Baselined:

1 = Successful baselining has not been completed

h. 5-Level Baudot Late:

1 = 5-level Baudot did not finish output in allotted time

i. DPU/SCU Communications Failure:

1 = Low character count from SCU

2 = Synchronization failure

j. Diskette Error:

1 = Diskette unit not working

2 = Diskette space exhausted

3 = System error

k. Paper Tape Reader Error:

1 = Unable to read from paper tape

l. DPU Hardware Error:

1 = Floating point unit bad

4.15 G-Disk Recovery Instructions

Follow these procedures to load a 5-level paper tape onto a "G" diskette.

a. Select any reduction program diskette containing the MSSEDIT as a subroutine and insert in unit 0.

b. See Reduction Program Directory for list of programs and subroutines.

c. Insert "G" diskette in unit 1.

d. BOOT program.

e. The CRT will display FILENAME. Respond with a Return.

f. The CRT will display:

(1) Date (M/D/Y): Respond and Return.

(2) Time (H/M/S): Respond and Return.

g. The letter "R" will appear.

h. To remove expendable files from a diskette, run CLEANUP.

i. The letter "R" will appear. Run MSSEDIT.

j. When the menu appears, respond LOAD. When it asks you where to load from, respond TAPE. Load the paper tape in the reader and strike any key to continue. The paper tape will then be loaded on "G" diskette.

k. Header Data will appear on the CRT. Answer all questions on the CRT, and data will then be transferred to the "G" diskette and appear on the CRT.

l. The menu will then appear. Deletions and or corrections may then be made to the "G" diskette. If none are required, reply STOP.

CHAPTER VII

RCC MG MSS SOFTWARE AND INVENTORY OF APPLICATION PROGRAMS

1.0 INTRODUCTION

The purpose of this chapter is to provide a central reference for the following information. It is not anticipated that an ordinary operator will ever need this chapter. The information contained herein is as follows:

a. Inventory of Data General software manuals supplied with the MSS. This section lists the Data General manuals a programmer might need.

b. Disk types. This section describes the function and organization of the 10 diskette types used in the MSS system.

c. Implementation notes. This section is a collection of notes that are useful to the systems programmer when making changes to the MSS system.

d. Inventory of existing MSS data reduction programs available. This section provides a current listing of data reduction programs.

2.0 INVENTORY OF DATA GENERAL SOFTWARE MANUALS SUPPLIED WITH THE MSS

a.	093-000105	RDOS USER'S HANDBOOK.
b.	093-000044-04	SYMBOLIC DEBUGGER (USER'S MANUAL).
c.	003-000085-03	FORTRAN V (USER'S MANUAL).
d.	093-000185-00	FORTRAN V SUPPLEMENT.
e.	093-000096-02	FORTRAN V RUNTIME LIBRARY.
f.	093-000075-07	NOVA-LINE REAL-TIME DISK OPERATING SYSTEM (REFERENCE MANUAL).
g.	093-000109-00	RDOS COMMAND LINE INTERPRETER (REFERENCE MANUAL).
h.	093-000188-00	HOW TO LOAD AND GENERATE YOUR NOVA-LINE RDOS SYSTEM.
i.	093-000056-06	REAL-TIME OPERATING SYSTEM (REFERENCE MANUAL).
j.	093-000111-00	SUPEREDIT (USER'S MANUAL).
k.	093-000080-04	NOVA-LINE EXTENDED RELOCATABLE LOADERS (USER'S MANUAL).
l.	093-000093-02	INTRODUCTION TO THE REAL-TIME OPERATING SYSTEM.

m. 015-000021-10 PERIPHERALS (PROGRAMMER'S REFERENCE).

n. 015-000023-06 NOVA-LINE COMPUTERS (PROGRAMMER'S REFERENCE).

o. 069-000022-00 LEARNING TO USE YOUR RDOS/DOS SYSTEM.

p. 093-000081-05 RDOS/DOS MACROASSEMBLER USER MANUAL.

q. 093-000201-03 DOS REFERENCE MANUAL.

3.0 THE FOLLOWING DISK TYPES ARE USED IN THE MSS SYSTEM

a. DISK-A DOS and utilities. Used for assemblies and general use.

b. DISK-B Assembly language sources and links to speed and links to MAC. Used for macroassemblies.

c. DISK-C Loader and relocatable binaries and MSS SV. Used to store compiler and assembler output. Also stores MSS SV created by loader.

d. DISK-D FORTRAN V compiler. Used to compile FORTRAN source programs.

e. DISK-E DOS and libraries. Used to load MSS system.

f. DISK-F DOS and speed and FORTRAN sources and links to compiler. Used to modify FORTRAN sources and compile FORTRAN programs.

g. DISK-G MSS data. Used to collect data during MSS mission.

h. DISK-H Skeleton initialized diskette. Used to create initialized diskettes (by copying operation) onto which other programs may be loaded. (Not for distribution to customers.)

i. DISK-I MSS real-time disk. Used to boot real time in normal operations.

j. PDOS Diskette formatter. Used to format new non-Data General diskettes.

k. STARTER NOVA 3 starter system. Used to install BOOTSTRAP. (Not distributed to customers.)

4.0 HOW TO MAKE A DISKETTE FOR DISTRIBUTION TO CUSTOMERS

a. Format the diskette (see section 6.0) if it is not a Data General diskette.

b. Initialize the diskette:

(1) If diskette "H" is available, make a copy of it (see section 7.0). (Diskette "H" is a skeleton preinitialized diskette.)

(2) If diskette "H" is not available, make one using the following steps.

(a) Insert Disk-A in unit 0 and a newly formatted diskette in unit 1.

(b) Boot DOSINIT.

(c) Key in the following responses:

1. 6030 (disk drive model number)

2. Full (command)

3. Yes (OK to go?) (When completed, the message "diskette contains no bad blocks" should appear on the console. If it does not, the diskette should be returned as bad.)

4. Stop (command)

(d) Install BOOTSTRAP: Boot from starter system (unit 0) key:

1. 5 (which file?)

2. DP1 (BOOTSTRAP device specifier)

3. Y (install BOOTSTRAP (Y or N))

c. Make the particular disk type under RDOS (hard disk) by entering @MAKEDISKX@, where "X" is A, B, C, D, E, F, G, or I.

5.0 "BOOT"ING THE COMPUTER

5.1 Knowledge of the following section is necessary for the successful performance of the procedures described in the rest of this section.

5.2 "Boot"ing the computer (or "BOOTSTRAP"ING) is the procedure whereby a previously nonrunning computer is started. It consists of manually starting the computer from the front panel (described below) and then telling the computer the name of the operating systems on the diskettes, each for a specific task. When the computer first starts, it asks for the operating system desired by displaying (on the console screen):

FILENAME?

5.3 The operator may enter any one of the following names:

a. MSS

b. DOS

c. DOSINIT

5.4 "MSS" is entered when the MSS system is to be run (when a flight is about to take place). "DOS" is entered only when onsite data reduction or program corrections are to be made. "DOSINIT" is entered when diskettes are to be copied.

5.5 Throughout this documentation, the expression "BOOT MSS" means that the operator should respond with "MSS" when the computer types "FILENAME?." The same applies to the expressions "BOOT DOSINIT" and "BOOT DOS."

5.6 The actual BOOTSTRAP procedure is as follows (the instructions assume that Disk-A, -E, -F, or -I is in unit 0):

a. If the system is already running, type "RELEASE DPO."

b. Depress "STOP" on the front panel.

c. Raise "RESET" on the front panel.

d. Set the following pattern in the 16 data switches on the front panel: 1 000 000 000 011 011.

e. Raise "PROG LOAD" on the front panel.

f. The computer will type "FILENAME?" on the console. (If "FILENAME?" does not appear, begin the sequence again.) Type "MSS" or "DOS" or "DOSINIT," as needed.

6.0 HOW TO FORMAT A NEW DISKETTE FOR USE WITH THE COMPUTER

"Formatting" is the process of writing disk block addresses on the surface of a diskette. Once formatted, the addresses remain there permanently. Therefore, only diskettes received new from the factory must have the formatting process performed. Formatting must be done before any other function (copying, etc.) may be done using a new diskette.

a. Insert PDOS diskette into unit 0.

b. Insert "new" diskette (with tab) into unit 1.

c. Boot the system (see above).

d. Type:

```
DKTFMTR        (>)
1              (# SURFACES)
```

1 (UNIT NUMBERS)
115 (# TRACKS)

e. Remove PDOS diskette (from unit 0) when program says it is done.

f. Insert Disk-A into unit 0.

g. BOOT DOSINIT.

h. Key:

(1) 6030 (Disk Drive Model Number)

(2) DP1 (Disk Unit)

(3) FULL (Command)

(4) YES (Answer)

(5) VERIFY (Command)

(6) STOP

7.0 HOW TO COPY A DISKETTE

7.1 Insert Disk-A into unit 0.

7.2 BOOT DOSINIT.

7.3 Remove Disk-A. Insert source diskette into unit 0. Insert newly formatted diskette (with tab) in unit 1. Note that the diskette must have been formatted previously or an error message will result and the copy will fail. Formatting is explained in section 6.0 above.

7.4 Key:

a. 6030 (Disk Drive Model Number)

b. DP1 (Disk Unit)

c. FULL (Command)

d. YES (Answer) (Entries c. and d. may be omitted if the destination diskette has been previously used.)

e. COPY (Command)

f. 6030 (Disk Drive Model Number)

g. DPO (Disk Unit)

h. YES (OK?)

i. STOP (Command)

8.0 HOW TO MODIFY AN MSS ASSEMBLY LANGUAGE SOURCE PROGRAM

a. Insert Disk-A into unit 0.

b. Insert Disk-B into unit 1.

c. BOOT DOS.

d. DIR DP1.

e. Speed PROGNAME.

f. Release DPO.

9.0 HOW TO ASSEMBLE AN MSS ASSEMBLY LANGUAGE PROGRAM

a. Insert Disk-A into unit 0.

b. Insert Disk-B into unit 1.

c. BOOT DOS.

d. DIR DP1.

e. MAC PROGNAME.

f. Move/D/V/R/DPO PROGNAME RB.

g. Release DP1.

h. Remove Disk-B. Insert Disk-C into unit 1.

i. Remove D/V/R DP1 PROGNAME RB.

j. Release DPO.

10.0 HOW TO MODIFY AN MSS FORTRAN SOURCE PROGRAM

a. Insert Disk-F into unit 0.

b. BOOT DOS.

c. Speed PROGNAME.

d. Release DPO.

11.0 HOW TO COMPILE AN MSS FORTRAN PROGRAM

a. Insert Disk-F into unit 0.

b. Insert Disk-D into unit 1.

c. BOOT DOS.

d. Init DP1.

e. FORTRAN PROGNAME.

f. Release DP1.

g. Remove Disk-D. Insert Disk-C into unit 1.

h. Move/D/V/R DP1 PROGNAME RB.

i. Release DPO.

12.0 HOW TO RELOAD MSS

a. Insert Disk-E into unit 0.

b. Insert Disk-C into unit 1.

c. BOOT DOS.

d. @MAKEMSS@.

e. Release DPO.

f. Remove Disk-E from unit 0; leave Disk-C in unit 1.

g. Insert Disk-I into unit 0.

h. BOOT DOS.

i. Delete MSS SV.

j. DIR DP1.

k. Move DPO MSS SV.

l. Release DPO.

13.0 IMPLEMENTATION NOTES

13.1 The following implementation notes are designed to assist the knowledgeable systems operator in successfully making changes to the MSS real-time software. Inherent in the discussion that follows is the assumption that the reader is a systems programmer who is very familiar with the following:

a. Functioning and purpose of the MSS system.

b. DOS operating system.

c. Data General assembly language.

d. MAC, RLDR, and speed system utilities.

e. NOVA 3/12 hardware architecture.

13.2 Summary of Real-Time Timing

a. Every 0.1 second, the acquisition control task ("ACTMR"), which is a user-defined clock routine, initiates a new processing cycle. It accomplishes this by triggering two tasks, "AQUIR" (data acquisition task) and 'SCGEN" (SCU data generation task). "AQUIR" has the highest priority in the system (other than "ACTMR," which operates at interrupt level), so it is given CPU control. "AQUIR" initiates a read request on the data line to the SCU and is put into I/O wait pending the completion of the read request. This allows the next highest priority task, "SCGEN," to gain control of the CPU. "SCGEN" generates and transmits data to the SCU, and then puts itself to sleep until the next trigger from "ACTMR." When the SCU receives data from the DPU (from "SCGEN"), it responds by transmitting data back to the DPU. These data fulfill the pending read request made by "AQUIR," who is then free to continue processing data. "AQUIR" decodes all data from the SCU and then triggers the reduction task ("REDUC"). The reduction task is almost entirely FORTRAN. Its priority is just below that of "AQUIR," so it will run to completion before any of the lower level tasks are run. Note that the FORTRAN reduction task is the only task in the system with access to the floating point unit. All other tasks use software implementation or floating point functions.

b. The lower level tasks form a group of tasks that operate in the excess time between clock cycles. Their principal function is I/O or display operations. A summary of the tasks may be seen in the individual program descriptions. The lowest priority task in the system is "SPARE" (task 99). It runs during the system's spare time, i.e., when the system is truly idle. It continuously increments a location (which is subsequently displayed as the "Spare Time Count" on Page E of the CRT display).

14.0 USER1 AND USER2 SUBROUTINES

Provisions have been made for additions to the FORTRAN-Writer reduction tasks in the following manner. Subroutines USER1 and USER2, supplied by SDC as "dummy" routines, are called in the reduction software. The systems programmer may supply his/her own version of either routine (or both) and reload the system. USER1 is called at the very beginning of the MSS reduction task, before any processing has been done. The user may "preprocess" the system data at this point. USER2 is called as the last operation of the reduction task. Here the user may postprocess data or compute new data of his/her own.

15.0 XTRA1, XTRA2, XTRA3

Three floating point variables, XTRA1, XTRA2, and XTRA3 are provided, in which the user may store the results of his computations. A total of 6 x 16 or 96 bits are contained therein. These three variables are automatically stored on diskette along with the normal system data. They may be found in /EXTRA/.

16.0 COMMON BLOCKS

16.1 All system common blocks exist in individual files whose names are "XXX.CO," where XXX is the name of the common block. For example, the block /BLINE/ in the FORTRAN routines exists on the file called "BLINE.CO." All common blocks are initially allocated and defined in the assembly language routine "COMON" (along with other system locations). This low-memory allocation allows all assembly language routines to easily access any location in common with a "GADD" pseudo-instruction. It also inhibits differing common-block length problems. It must be noted that the common blocks (and offsets to their entries) are defined (along with other MSS-specific symbols) in the assembly language routine "MSSDEFS." Hence, any extensions to existing common blocks or additions of common blocks to be used by both FORTRAN and assembly language programs require the following procedures:

a. Updating of "MSSDEFS."

b. Recreation of "MAC.PS" (which incorporates "MSSDEFS" symbols into assemblies).

c. Reassembly of all assembly language routines which reference common, in particular, the routine "COMON."

16.2 "MAC.PS" may be recreated (when "MSSDEFS" is changed) by the following command:

a. MAC/S NBID.SR NSID.SR OSID.SR.

b. MACROBASE.MC MACRONOVA.MC.

c. MSSDEFS.

17.0 ADDING A DISPLAY TO THE CRT

17.1 Should the user desire to add a display page to the CRT, three simple options are available. One, the user may desire a static (unchanging) page that is informative only (similar to the already existing Page 9). Two, the user may desire a page on which data items are periodically updated. Three, the user may desire a page on which the operator may enter data.

17.2 The two (assembly language) tasks involved are "DISPLAY" (TSK02) and "UPDATER" (TSK04). "DISPLAY" is the table-driven controller of the CRT page system. "UPDATER" is charged with updating individual fields on pages that require that service.

17.3 If a user desires to add a page to the CRT display, he/she should make use of the reserved page, Page 8, that is there for that purpose.

17.4 A page (and its contents) are defined by the following, which are found in the module "DISPLAY."

a.	TEXT	Table of basic text for each page.
b.	BCNT	Table of BYTE counts for text for each page.

c. PTYPE — Table of page types, which determine type of display to be generated.

d. FFIELD — Table of first field for each page (if any). Subsequent fields are linked.

e. FIELD MACROS — MACROS that generate a data structure describing the location and contents of each field on a given page. These structures also contain processing routine ("FIELD SUBROUTINE") addresses and links to subsequent fields.

f. FIELD SUBROUTINES — Subroutines that process a given field for an updating type page (data displayed periodically). This subroutine encodes into the display buffer its particular data. If used with an operator-selectable field (i.e., the operator enters data), this routine evaluates the entered data and stores valid entries in common.

17.5 Pages in the MSS are one of three types (specified in "PTYPE" table):

a. TYPE-1 — Static Display - Once the page has been put on the CRT, no further action is taken until the operator requests a display.

b. TYPE 0 — Operator Selectable - This type of page contains fields into which the operator may enter data.

c. TYPE 1 — Updated Display - This type of page periodically displays updated data until another page is selected by the operator.

17.6 For organizational purposes, the data structures have been named by the following convention:

a. PnFm — The label for field number m of page number n.

b. PnSm — The associated field subroutine for field m of page n.

c. TXTPn — The name of the text string for page n.

d. LENPn — The length of the text located at TXTPn.

18.0 RELOADING THE SYSTEM

The file "MAKEMSS" (see user procedures 12.0) is provided and can be executed (@MAKEMSS@) to reload the MSS system. Note that it involves both the relocatable loader "RLDR" and the system patch routine "PATCH."

19.0 INVENTORY OF APPLICATION PROGRAMS

a. Rawinsonde MSS/AMQ9/NTRS Instrument Reduction - RSRNP1/RSRNP2.

b. Nontransponder RH/Temp Insertion Editor - NTRSEDIT.

c. PWN-10A Rocket Reduction - ROCKETP1 ROCKETP2.

d. Windsonde Reduction - WINDSONDE.

e. Real-Time Flight Disk Editor - MSSEDIT.

f. Postflight Analyzer - ANALYZE.

g. AZ/EL/Range Fast Editor - FIELDCHANG.

h. ASCII to Baudot Converter - ASBDT.

i. Significant Level Insertion Program - SIGINSERT.

j. Reduction Output Formatter - PRINTCONV.

k. Early Code Transmission - UXUS.

l. Radiosonde Coder - CODE.

20.0 DESCRIPTION OF APPLICATION PROGRAMS

20.1 Rawinsonde MSS/AMQ9/NTRS Instrument Reduction

a. Filename: RSRNP1, RSRNP2.

b. Purpose: The purpose of this program is to reduce raw data recorded on a "G" diskette by the MSS real-time program tracking an MSS/AMQ9/NTRS sonde. RSRNP1 produces tabulated output, usually in the form of 1000-foot levels. RSRNP2 produces a listing of significant mandatory levels that is appended to the end of the tabulated output.

c. CRT Input:

(1) Output in feet or meters (feet/meters): This question is requesting the basic units of the run. If you wish the tab and sig/man levels to be printed with altitudes in feet, answer "FEET." If you wish the output to be in meters, enter "METERS."

(2) Windspeed in feet per second (Yes/No): The answer to this question will determine if the windspeeds will be output in feet per second. If you do not want windspeeds in feet per second, respond "No." Otherwise, respond "Yes." If you respond "No," the units used for windspeeds will be determined by the units that were selected in question c(1). If you answered "METERS," the windspeeds will be in meters per second. If you answered "FEET," the windspeed will default to knots.

(3) Uninterpolated output-(raw levels-yes/no): This question is asking if you want to output the raw data levels instead of the fixed altitude levels that you request in question c(4). If you respond "Yes," the output altitudes will be determined by the altitude of the raw data levels. If you respond "No," the output altitudes will be at the interval you request in question c(4).

(4) Altitude increment in NNNNNN: XXXX.XX: This question is requesting the altitudes at which levels will be printed. The "NNNNNN" in the question will be replaced by "FEET" or "METERS," depending on which was the answer to question c(1). If, for instance, you answered "FEET" to question c(1) and you wanted 1000-foot intervals, your response would be "1000.00'."

(5) Index of refraction optical or microwave (OPT/MWV): If you are asked to produce a tab with optical refractive index, respond "OPT" to this question. Otherwise, the normal answer is "MWV."

(6) Shear in knots or /sec (kts or /sec): If you are asked to produce a tab with shears in knots, respond "KTS" to this question. Otherwise, the normal response is "/SEC."

(7) Surface wind direction (in degrees): XXX: The response to this question is the surface wind direction in degrees at the time of release. For calm winds, enter "000."

(8) Surface windspeed (in knots): XXX: The response to this question is the surface windspeed in knots at the time of release. No matter what you responded to question c(1), this entry is always in knots. For calm winds, enter "000."

(9) Surface relative humidity (in percent): XXX: For this question, enter the surface relative humidity in percent at the time of release.

(10) Output to console or printer (CNS/PRT): If you want the output of the program to be listed on the printer, respond "PRT" to this question. If you want to see the output on the CRT, enter "CNS."

(11) Height of tracker over the RLS PT (in feet): XXXX: This question is asking for the difference between the height of the release point and the height of the tracker. For example: at CCAFS WX, the "A" set is at 29 feet MSL, and the station is at 16 feet MSL. Therefore, the difference in height between the release point and the tracker is 13 feet. The response to this question is always in feet, regardless of the answer to question c(1).

(12) Was this a daylight flight (yes/no): Respond "Yes" if the flight was mainly in daylight. Otherwise, respond "No."

(13) Enter station number from meteorology desk guide: XX: Enter your station number as specified in the M.D.G.. If you do not have a number assigned, respond with "99" and you will be asked question c(14).

(14) Enter station ID: This question will be asked only if you responded with a number of 98 or 99 to question c(13). Enter a 30-character station name that you wish to appear on the heading of the tab output.

(15) Enter the latitude of this station (in degrees): XX.XXXX: Respond to this question with the latitude of the station in degrees. (CCAFS WX is 22.4833.) If you are at latitudes below the equator, do not enter a minus sign.

(16) Was this sonde a J005 or a J031 (J005/J031): XXXX: This question will be asked only if you forgot to enter the sonde identification during the real time. Enter the type of nontransponder instrument you used.

(17) Was a second data disk created this run (Yes/No): There are only two possible situations where this question will be asked: (a) you forgot to hit CONTROL-B at the end of the run or (b) you really did create a second diskette. If you forgot to hit CTRL-B, respond "NO" and hit CTRL-A. Then reload the "G" diskette from paper tape using the "MSSEDIT" program and start over. If you do not have the paper tape, respond "NO," and the program will ask you questions c(18) through c(20) and attempt to process the available data. If you did create two diskettes, respond "YES."

(18) What is the time interval of the run: XXX: This question will be asked if you respond NO to question c(17) and you wish to continue. Enter the time interval (in seconds) of the run you are trying to process. (Most runs are 1-minute intervals. In that case, enter "060.")

(19) What is the time tag of the last record output: XXXX: This question follows question c(18) and will only be asked under the same set of circumstances. Enter the time of the last level printed on the tab out of the real-time program in seconds.

(20) Did the time roll over (Yes/No): This question follows question c(19) and will only be asked under the same set of circumstances. If the time hit a number around 6550 and then started over, enter "YES." Otherwise, enter "NO."

d. Disk Input:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA.
STATIONIDS.PMI/I	STATION NAMES.

e. Other Input:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1)
```
*****************************************************
**** If you have not run the NTRS MERGE to insert ****
**** temperatures and humidities - abort the run  ****
**** by typing CTRL-A now. Then run NTRS MERGE    ****
*****************************************************
```

PAUSE "Abort Now If Editor Was Not Run"

This message appears at the beginning of each NTRS reduction. It is a reminder that "NTRSEDIT" must be run before a "G" diskette containing an NTRS observation can be reduced. If you have not run the NTRS MERGE, respond with CTRL-A. Otherwise, respond with return.

(2) Pause "Insert Data Disk in Drive 1." This message allows the operator a last chance to put the "G" diskette in Drive 1. If you have not already done so, now is the time to do it. Respond with return.

(3) ***** Restarting Run *****. This message will appear if you have had problems with your "G" disk and always means that you did not hit CTRL-B at the end of the run. You will only see this message if you have already answered questions c(17) through c(20). The program will restart at the beginning of the "G" diskette and reprocess it until the time you specified in question c(19).

(4) Pause "Mount Second Diskette." This message will appear only if you respond positively to question c(17). If you happened to have created a second data diskette, this is the time to remove the first "G" diskette from Drive 1 and replace it with the second diskette. Do not change the drive address! Respond with return.

(5) RDBLK ERROR-RDDATA--IER=000000. If you get this message, you have a bad "G" diskette. You either forgot to put it in the drive (!) or it has been destroyed. If you have remembered to mount the diskette, reload from paper tape to another "G" diskette using the "MSSEDIT" program.

(6) Encode Error-Time-Header. If this message appears, stop processing and call the programmer. Somehow, a bad time was entered on the "G" diskette.

(7) Illegal Sonde Type--ABORT. If this message appears, you do not have AMQ9, MSS, J005 or J031 instrument data in your data disk. If your data are from one of these type instruments, run FIELDCHANG to correct the header's sonde type.

(8) Processing Duration Should be 000000 Seconds. This is an information message only. This is to advice how much time is available during processing.

(9) Temperature at XXXX.XX MBS. This message appears whenever the temperature at an output level causes the temperature lapse rate to exceed certain bounds.

(10) Wind Shear at XXXX.XX MBS. This message appears whenever the shear value at an output level exceeds certain bounds.

g. Disk Output:

FILENAME/DISK	CONTENTS
ERRORFILE/I	TMP/WIND ERRORS.
CONTROLFIL/I	BINARY FILE OF IDENTIFICATION DATA.
RAWDATA/I	BINARY FILE OF RAW DATA LEVELS.
TABDATA/I	BINARY FILE OF TABULATED LEVELS.
MANDATORY/I	BINARY FILE OF MANDATORY LEVELS.
SIGNIFICAN/I	BINARY FILE OF SIGNIFICANT LEVELS.

h. Other Output:

FILENAME	CONTENTS
QTY:2(PRINTER)	TAB AND SIGMAN LISTING (IF REQUESTED IN QUESTION c(10)).

i. I/O Flowchart. See the figures immediately following the text of this chapter.

j. Notes. Questions c(11) and c(15) were abbreviated to fit on this documentation and appear slightly differently when output by the program. Also note that the NTRS MERGE ("NTRSEDIT") must be rerun if you have to reload the "G" diskette from paper tape (reference question c(17) and message f(6)).

20.2 Nontransponder RH/Temp Merge Editor

a. Filename: NTRSEDIT.SV.

b. Purpose: This program is used to merge the RH, temperature and contact point with the angular data recorded on a "G" diskette from a National Weather Service nontransponder instrument. It must be run before the NTRS reduction.

c. CRT Input:

(1) Options:

(a) Merge data disk with strip-chart data from TAPE/CRT/FILE.

(b) Save strip-chart data for later merge selection: X. If you are going to save the temperature, RH and contact point values for a later merge, respond "2." If you are ready to merge the RH, temperature and pressure data with the "G" diskette data, respond "1."

(2) Is this a restart (Yes/No): This question will be asked only if the calibration tape file is left on the diskette. That usually means that the editor was not run to completion. If you are restarting a run, respond "YES." Otherwise, respond "NO."

(3) Is this run for a J005 or J031 (J005/J031): This question will appear only if you forgot to enter "J031XX" on Page 2 of the real time or "J005XX" on Page 3 of the real time. Respond with the type of sonde.

(4) Enter temperature baseline ordinate: XX.XX. If you forgot to set the 09 identification in the real-time program to "J005XX," you will be asked this question. Enter the temperature ordinate from the baseline procedure.

(5) Enter baseline temperature (in degrees Celsius): XXX.XX. This question will be asked only under the same set of circumstances as question c(4). Enter the temperature from the baseline procedure.

(6) Enter baseline 50 percent RH lockin value: XXX.XX. This question will be asked only under the same set of circumstances as question c(4). Enter the ordinate value from the National Weather Service humidity evaluator #500 where the 50 line intersects the ordinate division.

(7) Enter thermistor calibration resistance: XXXXX.X. This question will appear only if you forgot to enter "J031XX" on Page 2 of the real time and responded "J031" to question c(3). Enter the calibration resistance from the side panel of the radiosonde.

(8) Enter hygristor calibration resistance: XXXXX.X. This question will be asked only under the same set of circumstances as question c(7). Respond with the calibration resistance printed on the hygristor can.

(9) Enter surface relative humidity: XXX.XX. Enter the surface RH at the time of release in percent.

(10) Enter station latitude: XX.XXXX. Enter the latitude of the station in degrees for the nontransponder run.

(11) Enter height of tracker over the release point (in feet); XXXX. This question is asking for the difference between the height of the release point and the height of the tracker.

(12) Enter estimated slant range at release (in yards): XXX. Enter the estimated slant range at release. This range will be used to set the slant ranges for the entire flight.

(13) Enter surface pressure: XXXX.XX. This question will appear only if you forgot to enter the surface pressure on Page 1 of the real time. Respond with the surface pressure (in millibars).

(14) Enter surface temperature: XXX.XX. This question will appear only if you forgot to enter the surface temperature on Page 1 of the real time. Respond with the surface temperature (degrees Celsius).

(15) Input Device (Tape/CRT/File). If you have prepared an off-line, five-level paper tape of the desired input, respond "TAPE." If you are going to input the run through the CRT, respond "CRT." If you have already entered the data levels using NTRSEDIT number 2 option for c(1), respond "FILE."

(16) Enter time interval of the run: XXXX. This question will be asked only if you respond "YES" to question c(2). Enter the difference (in seconds) between successive data levels. (This is equivalent to 2 times the smoothed output rate in the real-time program.)

(17) Enter time to restart at: XXXX. This question will be asked only if you respond "YES" to question c(2). Enter the time (in seconds) at which you want to restart.

(18) The screen below appears when you are inputting levels. The Ts will be replaced by time in seconds, the Es will be replaced by the elevation angle in degrees, and the As will be replaced by the azimuth angle in degrees. The Xs will not appear on the screen. If you are inputting through the CRT, you must enter the RH, temperature and contact point in the format indicated. If the input is from tape, the program will automatically display the input converted to percent, degrees, and millibars. As you input each field from the CRT, you must terminate it with a carriage return. When you have input the last field on a line (contact point), the program will redisplay the input converted to percent, degrees, and millibars. This screen will repeat itself until all levels have been input. Once you have input all levels, enter "9999.00" as a temperature ordinate value and skip over the RH ordinate and contact point. The program will recognize this as the flag to end input of levels for a later merge.

TIME SECONDS	ELEVATION DEGREES	AZIMUTH DEGREES	TEMPERATURE ORDINATE	REL. HUM ORDINATE	CONTACT POINT
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX
TTTTTT	EEE.E	AAA.A	XXX.XX	XXX.XX	XXX.XX

d. Disk Input:

FILENAME/DISK	CONTENTS
ORDATA/I	INTERMEDIATE DATA FILE. READ WHEN USING PAPER TAPE OR A FILE AS INPUT.
J5CALTAPE/I	ANEROID CELL CALIBRATION TAPE ON DISK. READ ONLY IF RESTARTING.
MSSDATA/G	RAW DATA FILE.

e. Other Input:

FILENAME	CONTENTS
$PTR (TAPE READER)	ANEROID CELL CALIBRATION TAPE/OFF-LINE LEVEL INPUT TAPE.

f. Messages:

(1) Contact Point File Reloaded: This message will appear if the program has found a contact file on the diskette. It is to inform you that you do not have to reload the contact tape if you are performing a restart. If you are not restarting this merge, you need to reload the tape anyway, so ignore this message.

(2) Load Aneroid Cell Calibration Tape in Reader. Load $PTR, strike any key. This message is to let you know that the time has come to change the paper tape reader to eight-level and load the aneroid calibration tape. The tape must be loaded at the last rubout preceding the data. (A rubout is a frame with all eight holes punched.)

(3) Tape Successfully Loaded: This message tells you that the calibration tape has been loaded and written out to diskette.

(4) Error 000000 on reading header - ABORT******. If this message appears, you either forgot to put the "G" diskette in Drive 1, or you have a bad "G" diskette. Check that the diskette is in Drive 1 and rerun the program. If the diskette is bad, reload the file from paper tape using the "MSSEDIT" program and rerun the editor.

(5) RH of XXXX.XX is not acceptable - reenter value. This message is issued if the surface RH entered is not between 1.0 and 100.0. Reenter the surface RH.

(6) Restarting at time XXXXXX seconds. This message is issued only during a restart. It is to tell you the time at which the program was able to start over. It may or may not be the time at which you wanted to restart, due to block boundaries. (Eight records/block.)

(7) Load data tape in paper tape reader. Load $PTR, strike any key. This message is issued only if you told the program that you were going to input from tape. Change the reader to five-level and load the paper tape you prepared off-line anywhere before the first level.

(8) Error 000000 on intermediate output file. This message indicates that you probably had a bad "I" diskette. Try rerunning the editor.

(9) Error 000000 on read of block 000000 ABORT******. This message indicates that you probably have a bad "G" diskette. Check to see that the "G" diskette is properly inserted in Drive 1 and try again. If the program cannot read the diskette, reload the file to another "G" diskette from paper tape using the "MSSEDIT" program.

(10) Error 000000 on write of block 000000 ABORT ******. This message indicates that you probably have a bad "G" diskette. Follow the same procedure outlined in message (9).

(11) End of file - STOP. This message indicates that the program has hit the end of the raw data file and that all the levels entered have been merged with the angles.

(12) Pause "Mount Data Disk in Drive 1." This message is asking the operator to verify that the "G" disk is in Drive 1. If you have not already done so, now is the time no put it in the drive. Respond Return.

(13) Ordinate-File Saved-STOP. This message appears only if your answer to question c(1) was "2." It signifies that the program is finished saving the data.

(14) Error - number of blocks in header is zero - Reload file. This message is normally issued when the diskette in Drive 1 has no header record. Usually this means that you forgot to hit CTRL-B at the end of the run. Reload the file from paper tape using "MSSEDIT."

(15) Error on open at ordinate file - ABORT******. This message indicates that the machine could not find the strip-chart data which had been saved previously. Either you have a bad "I" diskette or you have lost your strip-chart data file ("ORDATA"). Try rerunning the editor loading from the CRT.

g. Disk Output:

FILENAME/DISK	CONTENTS
ORDATA/I	INTERMEDIATE DATA FILE CREATED WHEN USING PAPER TAPE OR A FILE AS INPUT.
J5CALTAPE/I	ANEROID CELL CALIBRATION TAPE ON DISK.
MSSDATA/G	RAW DATA FILE.

h. Other Output:

FILENAME	CONTENTS
NONE	NONE

i. I/O Flowchart. See the figures immediately following the text of this chapter.

j. Notes.

(1) This program must be run before the NTRS reduction can be run. Please note that the altitudes generated by this program on the diskette are built up in layers. This means that if you make a mistake and don't notice it

until later, you must restart before the error to correct all the levels following the error. Note that all old type instruments are referred to as J005s. This nomenclature is to describe all nontransponder radiosondes using old type sensors (not Accu-lok). All new type instruments are referred to as J031s. This nomenclature is used to describe all instruments having new type sensors (Accu-lok Goldine hygristors and prebaselined thermistors).

(2) The format for the off-line, five-level paper tape is as follows:

TTTTT-RRRRR-CCCCC
TTTTT-RRRRR-CCCCC
TTTTT-RRRRR-CCCCC, etc.

Where: - = Space
TTTTT = Temperature Ordinate
RRRRR = Relative Humidity Ordinate
CCCCC = Contact Point
(two decimal places assumed on all three)

Examples: 57.9 Ord entered as 05790
9.2 Ord entered as 00920

(3) Please note that the calibration tape must be loaded at the last rubout before the data. These tapes start with the sonde I.D., followed by a long series of rubouts, followed by a few lines of data, followed by a single rubout and the rest of the data. The tape must be loaded at the single rubout!

20.3 Rocket Reduction

a. Filename: ROCKETP1.SV ROCKETP2.SV

b. Purpose: The purpose of this program is to reduce raw data recorded on a "G" diskette by the MSS real-time program tracking a transponder rocketsonde. ROCKETP1 produces various tabulated outputs at certain altitude intervals. ROCKETP2 produces ham-data and teletype (coder) data outputs.

c. CRT Input:

(1) Was this a night launch (Yes/No): If the launch occurred during the hours of darkness, respond Yes; otherwise, respond No.

(2) Output to console or printer (CNS/PRT). If you wish to see the output on the printer, respond PRT; otherwise, respond CNS.

(3) Enter station number from M.D.G.: XX. Enter the two-digit number assigned to your station in the Meteorology Desk Guide. If your station has not been assigned a number, respond 99.

(4) What is the first good time: XXX. Enter the time (in seconds) that good data are first obtained during the rocket flight.

(5) Enter station ID: .... This question will be asked only if the response to question c(3) was 98 or 99. Enter the name of your station, using a maximum of 30 characters.

d. Disk Input:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA RECORDED BY THE REAL-TIME PROGRAM.
STATIONIDS.PM/I	STATION NAME FILE.
ROCKETABLE.PM/I	TEMPERATURE CORRECTION FILE.
CONTROLFILE/I	BINARY FILE OF IDENTIFICATION DATA FROM CORAWINSONDE.
TABDATA/I	BINARY FILE OF 1000-FOOT LEVELS FROM CORAWINSONDE.
MANDATORY/I	BINARY FILE OF MANDATORY LEVELS FROM CORAWINSONDE.
SIGNIFICAN/I	BINARY FILE OF SIGNIFICANT LEVELS FROM CORAWINSONDE.
TAPE1/I	TEMPORARY WORK FILE.
TAPE2/I	TEMPORARY WORK FILE.

e. Other Input:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Pause "Mount Data Disk in Drive 1." This message allows the operator a last chance to put the "G" diskette in Drive 1. If you have not already done so, now is the time to do it. Respond with Return.

(2) Pause "Remove Data Disk from DP1 and Mount Corawinsonde on DP1." When this message appears, remove the "G" diskette from Drive 1 and insert the "I" diskette in its place. Note that the corawinsonde run must have been previously reduced on that "I" disk.

(3) Error 000000 on MSS Data File - Abort. An error has occurred on the "G" diskette. The diskette is probably bad. Reload the data to another "G" diskette from paper tape using "MSSEDIT."

(4) Error or end of file on Rocketables - Abort. An error has occurred on the temperature correction tables. The "I" diskette is probably bad. Recopy the master "I" diskette. The other possibility is that the tables do not match the revision level of the program. Contact the programmer for assistance if copying the master "I" diskette does not solve this problem.

(5) Error on open of corawinsonde files - Abort. This message indicates that something is wrong with the files produced on the corawinsonde "I" diskette. The corawinsonde "I" diskette may be bad. Rerun the reduction of the corawinsonde run and try to rerun the rocket reduction. If this does not help the problem, try copying the master RNRN reduction "I" diskette and rerunning the corawinsonde reduction. If none of these procedures helps this problem, contact the programmer.

(6) Error on open of MSS Data File - Abort. This error will occur if the "G" diskette in Drive 1 is bad. It can also occur if the diskette in Drive 1 is not a "G" diskette. Insure that the diskette in Drive 1 is in fact the correct "G" diskette. If it is, reload the data from paper tape to another "G" diskette using "MSSEDIT."

(7) Corawinsonde taken more than 6 hours before launch - Abort. If this message appears, the time entered in the real-time program for either the corawinsonde or the rocket was not the correct Zulu time. If this is the case, correct the time on the corresponding "G" diskette using "FIELDCHANG." If the time was in error on the corawinsonde "G" diskette, you must rerun the reduction of the corawinsonde and then rerun the rocket reduction. If it was the time on the rocket "G" diskette that was in error, rerun the rocket reduction only. Other possible causes of this message could be a bad rocket "G" diskette, a bad corawinsonde "I" diskette, or neglecting to run corawinsonde reduction. For a bad "G" diskette, reload the data from paper tape using "MSSEDIT." If the corawinsonde "I" diskette is bad, copy the master corawinsonde "I" diskette to another diskette and rerun the corawinsonde reduction. If you forgot to run the corawinsonde reduction, run it now and then rerun the rocket reduction.

(8) Units error on rawin reduction. Run reduction again using feet, knots, and 1000-foot increments. This message appears if you did not run the reduction in the correct units. Rerun the reduction using 1000-foot interpola- and winds in knots.

(9) Error on open of CONTROLFILE - Abort. This message indicates that the program could not find the "CONTROLFILE" file. There are two possible reasons: (a) You do not have the "I" disk with the reduction output in Drive 0 or (2) You do not have the links from your disk to the reduction "I" disk for the CONTROLFILE and TABDATA file. If so, check the post-reduction specification for the links.

(10) Pause "Mount Reduction Disk on Drive 1." This message means the same as message (2).

g. Disk Output:

FILENAME/DISK	CONTENTS
TAPE1/I	TEMPORARY WORK FILE.
TAPE2/I	TEMPORARY WORK FILE.
ROCKSAVE/I	CONTROL INFO FOR PASS 2.
ROCKETOUT/I	TABULATED OUTPUT FROM THE ROCKET REDUCTION. (CAN BE PRINTED.)
HAMDATA/I	HAM-DATA OUTPUT. (CAN BE PRINTED.)
CODEDATA/I	TELETYPE (CODER) OUTPUT. (CAN BE PRINTED.)

h. Other Output:

FILENAME	CONTENTS
QTY:2(PRINTER)	OUTPUT FROM THE REDUCTION (IF REQUESTED).

i. I/O Flowchart. See the figures immediately following the text of this chapter.

j. Notes. The corawinsonde reduction must be completed in uninterpolated meters for this reduction to work. The corawinsonde must have been taken within 6 hours of the launch (+ or -) and must be reduced prior to running this reduction.

20.4 Windsonde Reduction

a. Filename: WINDSONDE.SV.

b. Purpose: The purpose of this program is to reduce raw data recorded on a "G" diskette by the MSS real-time program tracking a windsonde. Any transponder sonde recorded on a "G" diskette can be used as a windsonde because the windsonde reduction only required the tracking data to be recorded (the met data are ignored).

c. CRT Input:

(1) Run Type: RAWIN -- YARD RANGING/MET DATA
WINDSONDE -- YARD RANGING/NO MET DATA
MSS -- METRIC RANGING

Select (RAWIN/WINDSONDE/MSS): ....

The response to this question depends on the sonde that was flown. For any sonde using metric ranging, respond "MSS." For any sonde using yard ranging that was flown as a windsonde (no met data), respond "WINDSONDE." For any sonde using yard ranging and collecting met data, respond "RAWIN."

(2) Output in feet or meters (feet/meters). This question is requesting the basic units of the run. If you wish the tab and sig/man levels to be printed with altitudes in feet, answer "FEET." If you wish the output to be in meters, enter "METERS."

(3) Altitude increment in NNNNNN: XXXX.XX. This question is requesting the altitudes at which levels will be printed. The "NNNNNN" in the question will be replaced by "FEET" or "METERS," depending on which was the answer to question c(2). If, for instance, you answered "FEET" to question c(2) and you wanted 1000-foot intervals, your response would be "1000.00'."

(4) Windspeed in feet per second (Yes/No). The answer to this question will determine if the windspeeds will be output in feet/sec. If you do not want windspeeds in feet/sec, respond "No." Otherwise, respond "Yes." If you respond "No," the units used for windspeeds will be determined by the units that were selected in question c(2). If you answered "METERS," the windspeed will be in meters/sec. If you answered "FEET," the windspeed will default to knots.

(5) Uninterpolated output-(raw levels-Yes/No). This question is asking if you want to output the raw data levels instead of the fixed altitude levels that you requested in question c(3). If you respond "Yes," the output altitudes will be determined by the altitude of the raw data levels. If you respond "No," the output altitudes will be at the interval you requested in question c(3).

(6) Shear in knots or /sec (kts or /sec). If you are asked to produce a tab with shears in knots, respond "KTS" to this question. Otherwise, the normal response is "/SEC."

(7) Surface wind direction (in degrees): XXX. The response to this question is the surface wind direction in degrees at the time of release. For calm winds, enter "000."

(8) Surface windspeed (in knots): XXX. The response to this question is the surface windspeed in knots at the time of release. No matter what you responded to question c(2), this entry is always in knots. For calm winds, enter "000."

(9) Output to console or printer (CNS/PRT). If you want the output of the program to be listed on the printer, respond "PRT" to this question. If you want to see the output on the CRT, enter "CNS."

(10) Enter the latitude of this station (in degrees): XX.XXXX. Respond to this question with the latitude of the station in degrees. (CCAFS WX is 28.4833.) If you are at latitudes below the equator, do not enter a minus sign.

(11) Height of tracker over the RLS PT (in feet): XXXX. This question is asking for the difference between the height of the release point and the height of the tracker. For example: at CCAFS WX, the "A" set is at 29 feet

MSL, and the station is at 16 feet MSL. Therefore, the difference in height between the release point and the tracker is 13 feet. The response to this question is always in feet, regardless of the answer to question c(2).

(12) Surface refractive index (in N units): XXX.X. The response to this question is the surface index of refraction at the time of release in N units.

(13) Enter station number from MDG: XX. Enter your station number as specified in the M.D.G. If you do not have a number assigned, respond with "99" and you will be asked question c(14).

(14) Enter station ID. This question will be asked only if you responded with a number of 98 or 99 to question c(13). Enter a 30-character station name that you wish to appear on the heading of the tab output.

(15) Type in heading: .... If this run has a particular heading assigned to it (i.e., "T-50 HR"), enter it here.

d. Disk Input:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA.
STATIONIDS.PM/I	STATION NAMES.

e. Other Input:

DEVICE NAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Pause "Mount Data Disk in Drive 1." This message allows the operator a last chance to put the "G" diskette in Drive 1. If you have not already done so, now is the time to do it. Respond with return.

(2) RDBLK Error-JREAD--IER = 000000. If you get this message, you have a bad "G" diskette. You either forgot to put it in the drive, or it has been destroyed. If you have remembered to mount the diskette, reload from paper tape to another "G" diskette using the "MSSEDIT" program.

(3) Encode Error-ITIM-JREAD. If this message appears, stop processing and call the programmer. Somehow, a bad time was entered on the "G" diskette.

g. Disk Output:

FILENAME/DISK	CONTENTS
WNDSNDOUT/I	TAB LISTING (CAN BE PRINTED).
WNDSNDTAB/I	BINARY FORMAT TAB LISTING (FOR PLOTTING AND ANALYSIS).
WNDSNDIDFL/I	BINARY FORMAT HEADING INFORMATION FILE (FOR PLOTTING AND ANALYSIS).

h. Other Output:

FILENAME	CONTENTS
QTY:2(PRINTER)	TAB LISTING (IF REQUESTED IN QUESTION c(9)).

i. I/O Flowchart. See the figures immediately following the text of this chapter.

j. Notes. Questions c(10), c(11) and c(14) were abbreviated to fit this documentation and appear slightly differently when output by the program. Remember that if you want to use a J005 sonde as a windsonde, you must run "NTRSEDIT" first, since it is a nontransponder sonde.

20.5 Real-Time Flight Disk Editor

a. Filename: MSSEDIT.SV

b. Purpose: This program enables the operator to edit the raw data diskette produced by the MSS real-time program. It also has functions to delete blocks from the end of the run, reload the diskette from a paper tape, and create a disk file containing a copy of the edited file in paper tape format.

c. CRT Input:

(1) Load tape, delete blocks, edit, punch tape or stop? (LOAD/DEL/EDIT/STOP/RUN.) This question is requesting the function that you wish to perform. A response of "LOAD" will let you reload the "G" diskette from paper tape. Responding "DEL" will allow you to delete blocks from the end of the raw data file. "EDIT" will let you change an individual level in the file. Finally, "RUN" will create a disk file containing the contents of the raw data file in paper tape format. You can punch this file on five-level paper tape by using the "ASBDT" program.

(2) What is the time interval of the run: XXX. This question is part of the edit routine. It will only be asked if the diskette does not have the time interval in the header. The response to this question will determine how the program will access the raw data file. Enter the difference between levels in seconds, which corresponds to the smoothed output rate in the real-time program multiplied by 2. (Reference--Page 1 of real-time CRT output.) If more than one interval were used during the run, input the largest interval that was used (don't worry, the program will still find all the levels).

(3) Has "NTRSEDIT" program been run on this disk (Yes/No): XX. This question is part of the edit routine and appears only if you are editing a "G" diskette from a nontransponder run. If you have not run "NTRSEDIT" on this disk, respond "No." You can only edit elevation and azimuth until "NTRSEDIT" is run. Otherwise, respond "Yes" and you can edit the disk normally.

(4) Enter time tag of the record you wish to change: XXXXXX. The response to this question is the time of the level you wish to change in seconds; i.e., if you want to change the level at 60 seconds, enter 60, If you wish to exit the edit mode and return to question c(1), enter a negative number (e.g., -1).

(5) The table and question below are part of the edit routine. Select the first field that you want to change and enter its number; i.e., if you want to change slant range and relative humidity, enter "8." The edit screen can be sequenced down to RH by repeatedly entering return after you have edited the slant range.

FIELD NAME	CONTENTS	FIELD NAME	CONTENTS
SOFTWARE STATUS	(= 1)	ELAPSED TIME	(= 2)
HARDWARE STATUS-1	(= 3)	HARDWARE STATUS-2	(= 4)
X DISTANCE	(= 5)	Y DISTANCE	(= 6)
Z DISTANCE	(= 7)	SLANT RANGE	(= 8)
GROUND RANGE	(= 9)	ALTITUDE	(= 10)
AZIMUTH	(= 11)	ELEVATION	(= 12)
TEMPERATURE-1	(= 13)	RELATIVE HUMIDITY	(= 14)
TEMPERATURE-2	(= 15)	SPARE-1	(= 16)
SPARE-2	(= 17)	SPARE-3	(= 18)

Do you wish to change any specific field (1-18 or NO): XX

The edit screen follows. To change a value, simply retype it and hit return. The program will automatically sequence to the next field. If you want to skip a field, hit return. All values displayed with a decimal point require a decimal point in their input (X, Y, Z, Slant Range, Ground Range, Altitude, Azimuth, Elevation, Temp-1 and -2, RH and Spare 1-3). When you are done, enter "DN." If you want to stop editing a record but do not wish it to be changed, enter "QT." When you are finished with the screen, question c(4) will be repeated. If you change Slant Range, Azimuth or Elevation, then X, Y, Z, Altitude and Ground Range will be updated. If you need to back up to a previous level, enter "<<" and the screen will back up one field.

CONTENTS OF BLOCK 000 RECORD 0

FIELD NAME	CONTENTS	FIELD NAME	CONTENTS
SOFTWARE STATUS	XXXXXX	ELAPSED TIME	XXXXXX
HARDWARE STATUS-1	XXXXXX	HARDWARE STATUS-2	XXXXXX
X DISTANCE	XXXXXXX.XXXX	Y DISTANCE	XXXXXXX.XXXX
Z DISTANCE	XXXXXXX.XXXX	SLANT RANGE	XXXXXXX.XXXX
GROUND RANGE	XXXXXXX.XXXX	ALTITUDE	XXXXXXX.XXXX
AZIMUTH	XXXXXXX.XXXX	ELEVATION	XXXXXXX.XXXX
TEMPERATURE-1	XXX.XX	RELATIVE HUMIDITY	XXX.XX
TEMPERATURE-2	XXX.XX	SPARE-1	X.XXXXXXX E+00
SPARE-2	X.XXXXXXX E+00	SPARE-3	X.XXXXXXX E+00

"QT" = QUIT, "DN" = DONE, RETURN = SKIP FIELD

(6) What type of sonde is this tape for? (WS/Q9/8B/10A/10C/10D/11A/MSS/J005): .... This question is part of the punch routine. If you want the tape to be in windsonde format, enter WS. If you want the tape to be in non-transponder format, enter 8B, 11A or J005. If you want the tape to be in transponder format, enter Q9 or MSS. The 10A, 10C, and 10D responses create a special tape that has temperature in the relative humidity field to accommodate the three temperature channels on those sondes. When you have answered this question, the screen will display the data it is writing to the disk file. This question will be asked only if the type of sonde is not present in the header record.

(7) How many blocks do you want to delete: XXX. This question is part of the block delete routine. Enter the number of blocks you want to delete. You cannot delete more blocks than the run contains, so if you want to find out how many blocks the run has, enter "999" (a diskette only holds 550). Remember that a block is a group of eight levels. If you change your mind and don't want to delete any blocks, enter "000."

(8) The block is zero. Enter the number of samples you have divided by 8: XXX. This question is part of the block delete routine. It indicates that you forgot to hit CTRL-B at the end of the observation. Unless you are running a windsonde, the best response to this question is "NO." That will return you to question c(1), where you can reload the file from paper tape. If you are running a windsonde, find the time of the last level on the tape, divide it by the time interval and add one. This is the number of samples you have. Divide that number by eight and enter it in response to the question.

Example: The last time is 5940 seconds, the time interval was 6 seconds, and 5960/6 is 990. Adding 1 for the surface gives 991. Since 991/8 is about 123.8, enter "123."

(9) Loading from disk file or paper tape (File/Tape): .... This question is part of the tape load routine. It is asking you for the type of input you will be using. Enter "TAPE" if you are loading from paper tape or "FILE" if you are loading from an ASCII file (the file has to be named "INTERMFILE").

(10) Flight Identification: .... This question is part of the tape load routine. Enter the flight ID for the run. Note that the first six characters are the test number and the last four are the ascent number.

(11) Sonde Type: (WS/Q9/8B/10A/10C/10D/11A/MSS/J005): .... This question is part of the tape load routine. Enter the type of sonde that was flown when the tape was created.

(12) Tracker Altitude (in feet above MSL): XXXXXX. This question is part of the tape load routine. Enter the tracker altitude.

(13) Station Pressure (in millibars): XXXX.XX. This question is part of the tape load routine. Enter the station pressure in millibars at the time of release.

(14) Station Temperature (in degrees Centigrade): XXX.XX. This question is part of the tape load routine. Enter the station temperature in degrees Centigrade at the time of release.

(15) Sonde Identification: ...... This question is part of the tape load routine. If the tape is from a 10A, 10C, or 10D or an MSS sonde, enter the serial number of the sonde. Otherwise, respond return.

(16) Q9 Sonde Identification: ...... This question is part of the tape load routine. You will be asked this question only if you responded "Q9" or "J005" to question c(11). For a Q9 sonde, enter the serial number of the sonde. For a J005 sonde, enter "J005XX."

(17) Time Interval of Run (seconds): XX. This question is part of the tape load routine. Enter time interval of the run.

(18) Date (month, date, year): MM/DD/YY. This question is part of the tape load routine. Enter the date of the observation.

(19) Start Time of Run (hours, minutes, seconds): HH/MM/SS. This question is part of the tape load routine. Enter the time of the observation (Zulu).

(20) Is this a J005 type or J031 type sonde (J005/J031): .... This question will be asked only if you responded "J005" to question c(11). If you are using a new type sonde with Accu-lok sensors, respond "J031." Otherwise, respond "J005."

(21) J005 Sonde Baseline Values. Temperature Baseline Ordinate: XX.X. This question is part of the tape load routine. It will be asked only if you responded with "J005" to question c(11). Enter the temperature ordinate from the baseline procedure.

(22) Baseline Temperature (in degrees Centigrade): XX.X. This question is part of the tape load routine. It immediately follows question c(21) and will be asked only if you responded "J005" to question c(11). Enter the baseline temperature from the baseline procedure.

(23) Baseline Relative Humidity (50 percent lockin value): XX.X. This question is part of the tape load routine. It will be asked only if you responded "J005" to question c(11). Enter the ordinate value where the end of the 50 percent line intersects the ordinate divisions, using the NWS No 500 humidity evaluator.

(24) J031 Sonde Baseline Values. Thermistor Lockin Resistance: XXXXX.X. This question is part of the tape load routine. It will be asked only if you responded "J031" to question c(20). Enter the thermistor lockin resistance (in ohms) printed on the side of the instrument.

(25) Hygristor Lockin Resistance: XXXXX.X. This question is part of the tape load routine. It will be asked only if you responded "J031" to question c(20). Enter the hygristor lockin resistance (in ohms) printed on the hygristor can label.

(26) AMQ-9 Sonde Baseline Values. Temperature Baseline Ordinate: XX.X. This question is part of the tape load routine. You will be asked this question only if you responded Q9 to question c(11). Enter the temperature baseline ordinate from the baseline procedure.

(27) Baseline Temperature (in degrees Centigrade): XX.X. This question is part of the tape load routine. It immediately follows question c(26) and will only be asked if you answered Q9 to question c(11). Enter the baseline temperature from the baseline procedure.

(28) Baseline RH % (46 Ord at -40 degrees Centigrade): XX.X. This question is part of the tape load routine. It immediately follows question c(27), and will be asked only if you responded Q9 to question c(11). Enter relative humidity value from the CP-223B/UM wheel where the -40 degree gridline intersects the humidity curve with the cursor set at 46 ordinates.

d. Disk Input:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA FILE.
INTERMFILE/I	INTERMEDIATE DATA FILE USED WHEN LOADING PAPER TAPE.

e. Other Input:

FILENAME	CONTENTS
$PTR (TAPE READER)	FLIGHT TAPE TO RELOAD DATA FILE.

f. Messages:

(1) Pause "Mount Data Disk on Drive 1." This message gives the operator a last chance to insert the data diskette in the drive. If you have not already done so, now is the time to do it. Respond RETURN.

(2) Time interval not consistent, searching for correct record. This message indicates that the "G" diskette did not have a constant time interval. If you do have a constant time interval, check your "G" diskette for bad data.

(3) Error on initialization of Data File - Abort. This message indicates that either the "G" diskette is not in Drive 1 or that the "G" diskette is bad. Check to see that the diskette is in the drive. If it is, reload the data file from paper tape to another "G" diskette.

(4) Error 000000 on Block 000000 - Abort. This error means that the "G" diskette is bad. Reload the file from paper tape to another "G" diskette.

(5) Error 00000 on Block 00000 Record 00000 while updating. No changes made. If this message appears, you probably have a soft error on the "G" diskette. Reload the file from paper tape to another "G" diskette.

(6) ***Error 000000 on Header - Abort***. This error means that you have a bad "G" diskette. Reload the file from paper tape to another "G" diskette.

(7) Error 000000 on Intermediate Output File. This error is issued only when attempting to reload the file from paper tape or file. It either means that the "I" diskette is bad or the "I" diskette if full. Check your files.

(8) Error on Read of Intermediate File. This error is issued only when attempting to reload the file from paper tape or file. It either means that the "I" diskette is bad or the tape was bad. Try rereading the tape and make sure that it has a figure shift at the beginning. (By the way, you should load the tape after the top message.)

(9) Error 000000 on Output Data File. This message indicates that the "G" diskette is bad. Reload the data file to another "G" diskette.

(10) File Successfully Loaded. This message is issued when the program has successfully read the intermediate file and reloaded the raw data file.

(11) End of File. This message is issued from the tape punch routine. It indicates that the "Smoothtape" file has been created.

(12) Illegal Sonde Type. This message will be issued if a bad sonde type is entered in response to question c(6) or c(11). Enter a correct sonde type.

(13) There are 000000 Samples in this Run. This message is an information message issued by the tape punch routine. It indicates the number of levels that are going to be output to the "Smoothtape" file.

(14) Illegal # of Blocks. This message is issued if a bad number of blocks is entered in response to question c(8). Enter a number that is less than the number of blocks in the file.

(15) There are only 000000 blocks in this run. This message is issued, possibly in conjunction with message (14), to indicate that the number of blocks you wanted to delete is more than the number of blocks in the run.

(16) Invalid # of Blocks in Header - Cannot Delete Any Blocks. This message will be issued in conjunction with question c(7). It indicates that the block count was zero or negative. Usually, this means that you forgot to hit CTRL-B at the end of the observation.

(17) Load Data Tape in Paper Tape Reader. Load $PTR, Strike Any Key. This message is issued from the tape read routine. Set the reader for five-level tape and load the flight tape (past the top message) into the reader. Respond RETURN.

(18) Data Being Loaded:

SAMPLE	RANGE	TIME	AZIMUTH	ELEVATION	TEMP	RELHUM
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X
XXXX	XXXXXXX	XXXX	XXX.X	XXX.X	XXX.X	XXX.X

This screen will be output from the tape load routine. It is a display of the data being loaded to the raw data file.

g. Disk Output:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA FILE WITH CHANGES.
SMOOTHTAPE/I	TAPE FORMAT COPY OF RAW DATA FILE (CAN BE PRINTED/PUNCHED).
INTERMFILE/I	INTERMEDIATE DATA FILE USED WHEN LOADING FROM PAPER TAPE OR FILE.

h. Other Output:

FILENAME	CONTENTS
NONE	NONE.

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes:

(1) Questions c(1), c(4), and c(7) were abbreviated to fit on this report and appear slightly differently when output by the program.

(2) This program is a general utility program that can be run just about any time to modify the raw data file. Try not to reload the data file from paper tape unless you really have to: it causes a loss of accuracy at long HDOs. In the case of a J005 run, the "NTRSEDIT" program must be run after the disk has been reloaded.

20.6 Postflight Analyzer

a. Filename: ANALYZE.SV.

b. Purpose: This program provides the operator with a preliminary QC check on the raw data. Elements considered to be out of tolerance are flagged, and a very rudimentary reduction is performed on the data.

c. CRT Input:

(1) Output to Console or Printer (CNS/PRT): ... If you want the output to be listed on the printer, respond "PRT." If you want to see the output on the console, respond "CNS."

(2) Is the range in meters or yards (METERS/YARDS): ...... If the sonde utilized had metric ranging (75 kHz), respond "METERS." If the sonde had English unit ranging (82 kHz), respond "YARDS." (A J005 has an "artificial" range in yards.)

(3) Height of tracker over the RLS PT (in feet): XXXX. This question is asking for the difference between the height of the release point and the height of the tracker. For example: at CCAFS WX, the "A" set is at 29 feet MSL, and the station is at 16 feet MSL. Therefore, the difference in height between the release point and the tracker is 13 feet.

(4) At what time was the equipment on track (in seconds): XXXX. Enter the time (in seconds) that track was acquired. If you have already edited the lower levels, enter "0000."

(5) What is the time interval of the run (in seconds): XX. This question appears only if the smoothed data output rate was zero in the header of the "G" diskette. Enter the time interval of the run.

d. Disk Input:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA.

e. Other Input:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Pause "Mount Data Disk in Drive 1." This message allows the operator a last chance to put the "G" diskette in Drive 1. If you have not already done so, now is the time to do it. Respond with RETURN.

(2) Error 000000 on input file - ABORT. If you get this message, you have a bad "G" diskette. You either forgot to put it in the drive or it has been destroyed. If you have remembered to mount the diskette, reload from paper tape to another "G" diskette using the "MSSEDIT" program.

(3) NTRS Output not allowed on the console. This message appears if you try to output to the console with a nontransponder run. The NTRS analysis has three additional columns of data and will not fit on the console. It must be run on a printer (see notes).

(4) Error on initialize of disk - Abort. This message means the same as message (2).

g. Disk Output:

FILENAME/DISK	CONTENTS
FLIGHTEDIT/I	ANALYZER OUTPUT (CAN BE PRINTED).

h. Other Output:

FILENAME	CONTENTS
QTY:2(PRINTER)	PRINTED ANALYZER OUTPUT (IF SELECTED IN QUESTION c(1)).

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes:

(1) This program is usually run before any others to determine the extent of bad levels in the flight diskette. Any level elements flagged could be in error; however, correction is left to operator discretion. Note that question c(3) was abbreviated and appears slightly differently when output by the program.

(2) If you must have an NTRS run displayed on the console, use "FIELDCHANG" to temporarily change the sonde type to "MSS" ro "AMQ9," and rerun "ANALYZE." You will lose the three additional data columns this way (Pressure, Virtual Temperature, and Index of Refraction). Be sure to restore the sonde type afterward.

20.7 AZ/EL/Range Fast Editor

a. Filename: FIELDCHANG.SV.

b. Purpose. This program allows the operator to perform a constant edit on AZ, EL, and Range simultaneously on large sections of the raw data on the "G" diskette. It also allows the operator to make changes to the header block of the "G" diskette.

c. CRT Input:

(1) Modify header, modify data or stop (HEADER/DATA/STOP): ...... Select the option required. A response of "HEADER" will allow the operator to change values in the header block. A response of "DATA" will allow changes to AZ, EL and Range. Responding "STOP" will stop the program.

(2) Time Tag of First Level to Modify: XXXX. This question is part of the data modification routine. Respond with the time (in seconds) of the first level to be modified.

(3) Time Tag of Last Level to Modify: XXXX. This question is part of the data modification routine. Respond with the time (in seconds) of the last level to be modified.

(4) Enter changes:

AZIMUTH	ELEVATION	SLANT RANGE
XXX.XX	XXX.XX	XXXXXX

Respond with the change needed. If you do not want to change a particular field, enter RETURN. Negative changes must be preceded by a minus sign (-). For example, to increase the azimuth by 2.5 degrees at every level selected enter "002.50" in the azimuth slot. To leave elevation alone, respond RETURN in the elevation slot. To decrease slant range by 2000 at every level selected, enter "-02000" in the slant range slot. The net effect of the above example would be to increase all azimuths in the range selected by 2.5, leave elevations unchanged and decrease all ranges by 2000.

(5) By what amount do you wish to change time: XXXX. This question appears only if you answered "time" to question c(1). It is part of the data modification routine. Respond with the time (in seconds) by which you want to change the time of all levels on the "G" diskette.

WARNING: IN ALL NORMAL USAGES OF THIS PROGRAM, THIS QUESTION DOES NOT APPEAR AND THE TIMES ON THE DISK WILL NOT BE CHANGED. THIS UTILITY WAS ADDED FOR A FEW VERY RARE CASES, AND IT SHOULD NOT BE USED BY ANYONE NOT THOROUGHLY FAMILIAR WITH THE PROGRAM ITSELF.

(6) Header Data:

0 - Flight Ident. XXXXXXXXXX	1 - Instrument Type XXXX
2 - Tracker Altitude XXXX.XX	3 - Station Pressure XXXX.XX
4 - Station Temp. XXXX.XX	5 - Release Date XX/XX/XX
6 - Release Time XX:XX:XX	7 - Number of Blocks XXXX
8 - Time Interval XX	9 - End Modification

Select Field Number to Modify (0-9): X

This is the header change screen. To modify a field, select the number adjacent to it. One of the following nine questions will appear, depending on the field selected. To end the modification and reload the header, respond "9."

<u>WARNING</u>: OPTIONS 7 AND 8 SHOULD BE USED WITH CAUTION, BECAUSE CHANGING THESE VALUES COULD CAUSE PROBLEMS IN OTHER PROGRAMS.

(7) Enter New Flight Identification: .... Enter a new 10-character flight identification.

(8) Enter New Inst. Type: .... Enter MSS, AMQ9, 10A, 10C, 10D, WS, 11A, 8B, or J005, depending on the type of instrument.

(9) Enter New Tracker Alt: XXXX.XX. Enter a new tracker altitude in feet.

(10) Enter New Station PRS: XXXX.XX. Enter a new station pressure in millibars.

(11) Enter New Station Temp: XXXX.XX. Enter a new station temperature in degrees Centigrade.

(12) Enter New Date: XX/XX/XX: Enter new release date in the form MM/DD/YY.

(13) Enter New Times: XX:XX:XX. Enter new release time in the form HH:MM:SS (Zulu).

(14) Enter New # of Blocks: XXXX. Enter new number of blocks for the run.

(15) Enter New Time Intvl: XX. Enter new time interval (in seconds) for the run.

d. Disk Input:

<u>FILENAME/DISK</u>	<u>CONTENTS</u>
MSSDATA/G	RAW DATA.

f. Messages:

(1) Pause "Mount Data Disk on Drive 1." This message allows the operator a last chance to put the "G" diskette in Drive 1. If you have not already done so, now is the time to do it. Respond with RETURN.

(2) You are about to modify the run XXXXXXXXXX, taken on MM/DD/YY at HH:MM:SS. This is an information message only. It lets you know what run you are about to modify when you enter the data modification routine.

(3) Start time must be less than end time. You have entered a start time that is greater than the end time in the data modification routine. Reenter the items of the first and last level to modify.

(4) Records from XXXX sec to XXXX sec will be modified as follows:

AZIMUTH	ELEVATION	SLANT RANGE	TIME
XXX.XX	XXX.XX	XXXXXX	XXXX

This message lets you verify that the changes requested will be executed. No response is necessary.

(5) Modifying record at XXXX seconds. This message tells you the record on which the modification is working.

(6) XXX records modified - DONE. This message lets you know that all the levels that were selected have been modified and reloaded to the disk.

(7) Modifying time - please wait. This message indicates that the computer is changing the time on all levels of the run. If you did not ask for this option on question c(1), hit CTRL-A and reload the "G" diskette from paper tape. All previously made corrections to the data will have to be redone.

(8) Header reloaded - DONE. This message appears after selecting option 9 in the header modification routine. It indicates that the changes have been made and the header block has been reloaded.

(9) Error on file open - Abort. If this message appears, you probably have a diskette other than a "G" diskette in Drive 1. Put in the correct diskette.

(10) Error 000000 on header - Abort. This message indicates that the "G" diskette is bad. Reload the data file from five-level paper tape using "MSSEDIT."

(11) Error 000000 on Block 000000 - Abort. This message is essentially the same as message (10). Reload the file.

(12) Number of blocks is illegal - reload file - Abort. This message will appear if the file has no header block. Normally this means that

you forgot to hit CTRL-B at the end of the flight. Reload the file from paper tape using "MSSEDIT."

(13) Error 000000 on initialize of disk - Abort. This message could mean that you have a bad "G" diskette or that the diskette you put in Drive 1 is not a "G" diskette. Check and try again.

(14) Error on get of record block - Abort. This message means that either your "I" diskette or your "G" diskette is bad. Hit CTRL-A, clean up the diskette and try to rerun the program again.

(15) Error on put of block - Abort. This message means the same as f(14).

(16) Error on block I/O - Abort. This message means the same as f(14).

g. Disk Output:

FILENAME/DISK	CONTENTS
MSSDATA/G	RAW DATA.

h. Other Output:

FILENAME	CONTENTS
NONE.	NONE.

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes: This program is really useful only for transponder sondes. It can be used with both transponder or nontransponder types; however, since the most common modification is Slant Range, the applications are obvious. This program can be run as many times as needed. After one modification is finished, the program will restart at question c(1).

20.8 ASCII to Baudot Converter

a. Filename: ASBDT.SV.

b. Purpose: This program will input an ASCII Disk File, convert it to Baudot, and output it to either the teletype or to the paper tape punch. It will also read a Baudot paper tape, convert it to ASCII, and load it on a disk file.

c. CRT Input:

(1) Convert from ASCII or Baudot, or STOP (ASCII/BAUDOT/STOP): ...... If you wish to punch or print an ASCII file, respond "ASCII." If you wish to load a file from a Baudot paper tape, respond "BAUDOT." If you wish to stop the program now, respond "STOP."

(2) NNNNNN Filename: .... The "NNNNNN" in this question will be replaced by "input" or "output," depending on the answer to question c(1). For input Filename, respond with the name of the file you wish printed or punched. For output Filename, respond with the name of the file you wish to load from paper tape.

(3) Enter drive number or local (1/0/L): X. If the file you want to work with is on (or is going to be on) Drive 0, respond "0." If the file you want to work with is on (or is going to be on) Drive 1, respond "1." If the file is in the current directory (on the disk/directory that is being used), respond "L" for local.

(4) Printer format or standard format file (PRT/STD): ... You will be asked this question only if your response to question c(1) was "ASCII." If the file you want to print/punch is in printer format (has line feeds), respond "PRT" (usual response). If the file you want to print/punch is a standard data file (no line feeds), respond "STD."

(5) Do you want a heading (Yes/No): ... You will be asked this question only if your response to question c(1) was "ASCII." If you want to have a heading line on your paper tape/teletype copy, respond "Yes." Otherwise, respond "No." (NOTE: When you ask for a heading, you automatically get the end-of-message code of "NNNN" appended to the end of your paper tape/teletype copy.)

(6) Type in the heading (70 characters maximum): You will be asked this question only if your response to question c(5) was "Yes." Enter your heading line, and hit return to terminate the line.

(7) Output printed or punched (PRT/PUN): ... If you wish the output to go to the paper tape punch, respond "PUN." If you want a printed copy, respond "PRT."

d. Disk Input:

FILENAME/DISK	CONTENTS
DETERMINED BY OPERATOR	FILE TO BE OUTPUT IN BAUDOT.

e. Other Input:

FILENAME	CONTENTS
$PTR/(TAPE READER)	DATA TO BE LOADED WHEN CONVERTING FROM BAUDOT TO ASCII.

f. Messages:

(1) File NNNNNNNNNNNNNN is being converted to XXXXXX. This message tells you the name of the file that will be converted and the type of conversion that is taking place. The Ns are replaced by the Filename and the Xs are replaced by "ASCII" or "BAUDOT," depending on the response to question c(1).

(2) Input file does not exist - ERROR. This message tells you that the file you wanted to output does not exist. Check your Filename and try again.

(3) 5-level communication line unavailable - ERROR. This message lets you know that the program could not open the teletype line for output. Check to make sure that the operating system you are running supports QTY:3. (If you answered "RETURN" or "SYS" to the "Filename?" question at bootstrap time, it does.) If the operating system does support QTY:3, find the programmer.

(4) Error on read of input file. You got an error while trying to convert an ASCII file to Baudot. You might have a bad disk. The best response to this message is to key CTRL-A, rerun the program and try again. If this doesn't work, you've got a disaster on your hands unless you have a back-up disk. At this point, call the programmer.

(5) Error on write of output file. This occurs when you are trying to load a Baudot paper tape to a bad disk or a disk that does not have enough room to hold the file. Follow the procedure in message (4).

(6) Load $PTR, strike any key. This message will show up on an attempt to load a Baudot paper tape. Respond with RETURN. Be aware that if the tape is not loaded properly, the program will respond as if the end of the tape had been reached and close out the file that it is loading.

(7) End of file encountered - conversion complete. This message lets you know that the entire file has been successfully converted to Baudot and output.

(8) End of input tape - file successfully loaded. This message lets you know that the program has considered that it has hit the end of the tape you wanted loaded and has output all that it has read to the specified file.

(9) Error on open of heading file. This error probably indicates a bad disk. Try the procedure outlined in message (4).

(10) Error on read of heading file. Again, this probably indicates a bad disk. Follow the procedure in message (4).

g. Disk Output:

FILENAME	CONTENTS
DETERMINED BY OPERATOR	FILE READ FROM PAPER TAPE.

h. Other Output:

FILENAME	CONTENTS
QTY:3 (TELETYPE)	ASCII FILE OUTPUT.
$PTP (TAPE PUNCH)	ASCII FILE OUTPUT.

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes: Question c(1) has been abbreviated for this report and appears differently when the program is run. When you ask for a heading on ASCII conversions, you automatically get various carriage returns, line feeds and shift characters (and "NNNN" appended to the end of the output), so that the paper tape/teletype output can be used without alteration on a teletype network.

20.9 Significant Level Insertion Program

a. Filename: SIGINSERT.SV.

b. Purpose: This program allows the operator to insert significant levels into the raw data "G" diskette. It will function correctly only with transponder sondes (AMQ-9 and MSS) and with nontransponder sondes that have already gone through the NTRS merge (NTRSEDIT).

c. CRT Input:

(1) Do you have any Sig. levels to insert (Yes/No): ... If you do not have any significant levels to insert, respond "NO" and the program will terminate. If you have significant levels to insert, respond "YES."

(2) Is this a transponder run (Yes/No): ... For transponder runs (MSS radiosonde, AMQ9, PWN-10A, etc.), respond "YES." For nontransponder runs (J005, J031, etc.), respond "NO."

(3) Significant Level Insertion:

	TIME	RH	TEMP		TIME	RH	TEMP
(1)	XXXX	XXX.X	XXX.X	(2)	XXXX	XXX.X	XXX.X
(3)	XXXX	XXX.X	XXX.X	(4)	XXXX	XXX.X	XXX.X
(5)	XXXX	XXX.X	XXX.X	(6)	XXXX	XXX.X	XXX.X
(7)	XXXX	XXX.X	XXX.X	(8)	XXXX	XXX.X	XXX.X
(9)	XXXX	XXX.X	XXX.X	(10)	XXXX	XXX.X	XXX.X
(11)	XXXX	XXX.X	XXX.X	(12)	XXXX	XXX.X	XXX.X
(13)	XXXX	XXX.X	XXX.X	(14)	XXXX	XXX.X	XXX.X
(15)	XXXX	XXX.X	XXX.X	(16)	XXXX	XXX.X	XXX.X
(17)	XXXX	XXX.X	XXX.X	(18)	XXXX	XXX.X	XXX.X
(19)	XXXX	XXX.X	XXX.X	(20)	XXXX	XXX.X	XXX.X

This screen will appear when you respond "YES" to question c(1). Enter the time, relative humidity and temperature of the levels you want to insert in chronological order (i.e., 10 seconds before 60 seconds, etc.). The time is in seconds, the relative humidity is in percent and the temperature is in degrees Celsius. When you have finished inputting all of the levels, enter "END" in the text time slot.

(NOTE: This program will not take temperature and humidity ordinate values.)

d. Disk Input:

FILENAME/DISK	CONTENTS
SIGLEVELS/I	SIGNIFICANT LEVELS INPUT TO QUESTION c(3).
INTERMFILE/I	SCRATCH COPY OF THE RAW DATA FILE.
MSSDATA/G	RAW DATA FILE.

e. Other Input:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Error 000000 on Read of Record 000000 Block 000000 - ABORT. This message will appear if there is an error on the intermediate file. It usually means that you have a bad "I" diskette. Try to rerun the program. If the error appears again, call for assistance.

(2) Error 000000 on Put of Block 000000 - ABORT. This message will appear if there is a write error on the raw data file. It usually means that you have a bad "G" diskette. Try to rerun the program. If the message appears again, call for assistance.

(3) Error 000000 on Open of Data File - ABORT. This message means that the program could not access the raw data file. Usually, it is the result of not putting the "G" diskette in Drive 1. Make sure that the "G" diskette is in Drive 1 and try again.

(4) Error 000000 on Header Record - ABORT. This message will be issued if the program could not read the header record on the raw data file. It usually means that the "G" diskette is bad. Try rerunning the program.

(5) Number of Blocks is Zero - Reload Data File - ABORT. If this message appears, it means that you forgot to hit CTRL-B at the end of the observation in the real-time program. Reload the data file from paper tape using the "MSSEDIT" program and try again.

(6) Error 000000 on Read of Block 000000 - ABORT. This message means that the program could not read one of the blocks on the raw data file. It usually indicates that the "G" diskette is bad. Reload the file from paper tape using the "MSSEDIT" program and try again.

(7) Error 000000 on Write of Block 000000 - ABORT. This message means that the program could not write one of the blocks on the raw data file. It usually indicates that the "G" diskette has software errors. Reload the file from paper tape using the "MSSEDIT" program and try again.

(8) No levels entered, insert request not processed. This means that the first time you gave the program in question c(3) was "END." If you really have no levels, respond "NO" to question c(1). It's easier.

(9) Time in line XX is invalid - please reenter. This message will be issued at the bottom of question c(3) if any of the times entered are invalid. Reenter the time correctly.

(10) Temp in line XX is invalid - please reenter. This message will be issued at the bottom of question c(3) if any of the temperatures entered are invalid. Reenter the temperature correctly.

(11) RH in line XX is invalid - please reenter. This message will be issued at the bottom of question c(3) if any of the relative humidities entered are invalid. Reenter the humidity correctly.

(12) Pause "Mount Data Diskette on Drive 1." This message is asking the operator to verify that the "G" diskette is in Drive 1. If you have not already done so, now is the time to put it in the drive. Respond RETURN.

(13) Processing:

(a) Sig. Level 0000 SECS   Fixed Level 0000 SECS

(b) This message appears when all of the levels have been input (after you enter END). The times indicate which levels are being processed.

(14) Zero pressure encountered
NTRSEDIT must be run before significant level insertion
Run NTRS RH/temp merge and rerun significant insertion

This message will appear only if you attempt to run the significant insertion before the NTRSEDIT on a nontransponder run. Run NTRSEDIT, then rerun SIGINSERT.

g. Disk Output:

FILENAME/DISK	CONTENTS
SIGLEVELS/I	SIGNIFICANT LEVELS INPUT TO QUESTION c(3).
INTERMFILE/I	SCRATCH COPY OF THE RAW DATA FILE.
MSSDATA/G	RAW DATA FILE WITH SIG LEVELS.

h. Other Output:

FILENAME	CONTENTS
NONE	NONE.

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes: Question c(1) was abbreviated to fit on this report and appears slightly differently when output by the program. Temperatures will be considered invalid if they are out of the range -100.0 to 60.0 degrees Celsius. Humidities will be considered invalid if they are out of the range 1.0 to 100.0 percent. Times will be considered invalid if they are not greater than the preceding time (first time must be greater than zero).

20.10 Reduction Output Formatter

a. Filename: PRINTCONV.SV.

b. Purpose: This program provides a chance to create multiple printer copies, a card image file (FILE01) or a teletype copy (RAWITAP).

c. CRT Input:

(1) Is this a J005 or a J031 run (J005/J031): .... Enter the type of nontransponder instrument you used.

(2) Do you want a printer copy, a teletype copy, a file01 version or a stop (PRINTER/TELETYPE/FILE01/STOP): .... If you want a printer copy, enter "PRINTER." If you want a teletype file, enter "TELETYPE." If you want a card file, enter "FILE01." If you do not want any copies or files, enter "STOP."

(3) Do you want headings on every page (Yes/No): ... This question will be asked only if you respond "PRINTER" to question c(2). If you want the station headings on every page, enter "YES"; otherwise, enter "NO."

(4) Enter four digit termination code: XXXX. This question will be asked only if you answered "FILE01" to question c(2). Enter the four digit termination code for this particular run from the following set:

DIGIT ONE:

0 - COMPLETE
1 - INCOMPLETE

DIGIT TWO:

1 - OBLIGATED OBSERVATION
2 - DELAYED OBLIGATED OBSERVATION
3 - SPECIAL OBSERVATION

DIGIT THREE:

1 - BALLOON BURST
2 - FAILURE OF ATTACHMENTS
3 - GROUND EQUIPMENT FAILURE
4 - PROJECT LIMITATIONS
5 - CALIBRATION CHART LIMITATIONS
6 - LEAKING BALLOON
7 - POWER FAILURE
8 - FORCED DOWN (PRECIP, ICING, ETC.)
9 - ALL OTHERS

DIGIT FOUR:

0 - RAWINSONDE/OMEGASONDE (MET & WIND DATA)
1 - RAWIN RUN (WIND ONLY)
2 - WINDSONDE (WIND ONLY)
3 - RAOB (MET ONLY)

d. Disk Input:

FILENAME/DISK	CONTENTS
CONTROLFILE/I	BINARY FILE OF IDENTIFICATION DATA FROM REDUCTION.
STATIONIDS.PM/I	STATION NAMES.
TABDATA/I	BINARY FILE OF 1000-FOOT LEVELS FROM REDUCTION.
MANDATORY/I	BINARY FILE OF MANDATORY LEVELS FROM REDUCTION.
SIGNIFICAN/I	BINARY FILE OF SIGNIFICANT LEVELS FROM REDUCTION.

e. Other Input:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Creating teletype file (RAWITAP)--PLEASE WAIT. This message means a teletype file is being created.

(2) Creating card image file (FILE01)--PLEASE WAIT. This message means a card image file is being created.

g. Disk Output:

FILENAME/DISK	CONTENTS
RAWITAP/S	TELETYPE COPY OF RUN (CAN BE PRINTED OR CONVERTED TO BAUDOT).
FILE01/S	COPY OF RUN IN CARD FORMAT (CAN BE PRINTED).

h. Other Output:

FILENAME	CONTENTS
QTY:2 (PRINTER)	PRINTED COPY OF THE RUN (IF REQUESTED IN QUESTION c(2)).

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes: None.

20.11 Early Code Transmission

a. Filename: UXUS.SV.

b. Purpose: This program outputs the early transmission, consisting of a couple of Sig levels and a Radat.

c. CRT Input: Output to console or printer (CNS/PRT): ... If you want the output listed on the printer, respond "PRT." If you want to see the output on the CRT, respond "CNS."

d. Disk Input:

FILENAME/DISK	CONTENTS
MANDATORY/I	BINARY FILE OF MANDATORY LEVELS FROM REDUCTION.
SIGNIFICAN/I	BINARY FILE OF SIGNIFICANT LEVELS FROM REDUCTION.
TABDATA/I	BINARY FILE OF 1000-FOOT LEVELS FROM REDUCTION.
CONTROLFILE/I	BINARY FILE OF IDENTIFICATION DATA FROM REDUCTION.
INDXHEDING/S	WMO INDEX NUMBERS AND CODE HEADINGS.

e. Other Inputs:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Invalid Temp Stabix. This message indicates that an invalid temperature was detected when attempting to compute the stability index. It probably means that the run is no good. Examine your raw data for possible errors.

(2) Invalid Pressure Stabix. This message indicates that an invalid pressure was detected when attempting to compute the stability index. The cause and action are the same as message (1).

(3) TT-500 out of range. The 500 MB temperature is out of the range in which a stability index can be calculated. Check the mandatory levels of the reduction output.

(4) TDP-500 out of range. The 500 MB dewpoint is out of the range in which a stability index can be calculated. Action required is the same as for message (3).

(5) Units error on rawin reduction. Run reduction again using feet, knots, and 1000-foot increments. This message appears if you did not run the reduction in the correct units. Rerun the reduction using 1000-foot interpolation and winds in knots.

(6) Error on open of CONTROLFILE--ABORT. This message indicates that the program could not find the "CONTROLFILE" file. There are two possible reasons: (a) You do not have the "I" diskette with the reduction output in Drive 0 or (b) You do not have the links from your diskette to the reduction "I" diskette for the CONTROLFILE and TABDATA file. If so, check the post-reduction specification for the links.

g. Disk Output:

FILENAME/DISK	CONTENTS
UXUSOUT	CODED MESSAGE (CAN BE PRINTED).

h. Other Output:

FILENAME	CONTENTS
QTY:2 (PRINTER)	CODED MESSAGE.

i. I/O Flowchart: See the figures immediately following the text of this chapter.

j. Notes: None.

20.12 Radiosonde Coder

a. Filename: CODE.SV.

b. Purpose: This program generates a coded message from an upper air observation.

c. CRT Input:

(1) Output to console or printer (CNS/PRT): ... If you want to get a listing of the output on the printer, enter "PRT." If you would like to see the output on the CRT, enter "CNS."

(2) Are there any missing data groups (Yes/No): ... If there are any missing data in the observation, respond YES. Otherwise, respond NO.

(3) How many stratums have missing data (1-5): X. You will be asked this question only if you responded YES to question c(2). Enter the number of stratums that contain missing data.

(4) Enter lower limit of stratum # N (in MBS): XXXX.X. You will be asked this question after question c(3). The question will be repeated, depending on the number of stratums that you input to question c(3). This question alternates with question c(5).

(5) Enter upper limit of stratum # N (in MBS): XXXX.X. You will be asked this question after question c(4). This question will be repeated, depending on the number of stratums that you input to question c(3). This question alternates with question c(4).

(6) Are there any doubtful data groups (Yes/No): ... If there are any layers that have doubtful data, respond YES. Otherwise, respond NO.

(7) How many stratums have doubtful data (1-2): X. You will be asked this question only if you responded YES to question c(6). Enter the number of stratums that have doubtful data. This question will be followed by questions c(4) and c(5) until the limits of all the layers have been input.

(8) Enter station index # from NWS Com Handbook #4: XXXXX. You will be asked this question only if you responded with a station number of 98 or 99 in the associated reduction run. Enter the index number of your station in the mentioned manual.

(9) Enter heading line # N: .... You will be asked this question after question c(8). The question will be repeated three times. An example of the response to this question would be:

Enter heading line #1: USUS 1 KXMR

Enter heading line #2: UJUS 1 KXMR

Enter heading line #3: UJUS 2 KXMR

d. Disk Input:

FILENAME/DISK	CONTENTS
MANDATORY/I	BINARY FILE OF MANDATORY LEVELS FROM REDUCTION.
SIGNIFICAN/I	BINARY FILE OF SIGNIFICANT LEVELS FROM REDUCTION.
TABDATA/I	BINARY FILE OF 1000-FOOT LEVELS FROM REDUCTION.
CONTROLFILE/I	BINARY FILE OF IDENTIFICATION DATA FROM REDUCTION.
INDXHEDING/S	WMO INDEX NUMBERS AND CODE HEADINGS.
STATIONIDS.PM/I	STATION NAMES.

e. Other Input:

FILENAME	CONTENTS
NONE	NONE.

f. Messages:

(1) Levels between XXXX.X & XXXX.X MBS will be considered missing: This message is issued after you have completed responding to the sequence of questions c(4) and c(5) for the missing levels. It is a check so that you can ensure that you have entered the correct limits.

(2) Levels between XXXX.X & XXXX.X MBS will be considered doubtful: This message is issued after you have completed responding to the sequence of questions c(4) and c(5) for the doubtful levels. It is a check so that you can ensure that you have entered correct limits.

(3) Units error on rawin reduction. Run reduction again using feet, knots, and 1000-foot increments. This message appears if you did not run the reduction in the correct units. Rerun the reduction using 1000-foot interpolation and winds in knots.

(4) Error on open of CONTROLFILE--ABORT. This message indicates that the program could not find the "CONTROLFILE" file. There are two possible reasons: (a) You do not have the "I" diskette with the reduction output in Drive 0 or (b) You do not have the links from your diskette to the reduction "I" diskette for the CONTROLFILE and TABDATA file. If so, check the post-reduction specification for the links.

g. Disk Output:

FILENAME/DISK	CONTENTS
CODEOUT	CODED MESSAGE.

h. Other Output:

FILENAME	CONTENTS
QTY:2 (PRINTER)	CODED MESSAGE.

i. I/O Flowchart: See the figures immediately following the test of this chapter.

j. Notes: Messages f(1) and f(2) were abbreviated to fit on this report and appear slightly differently when output by the program.

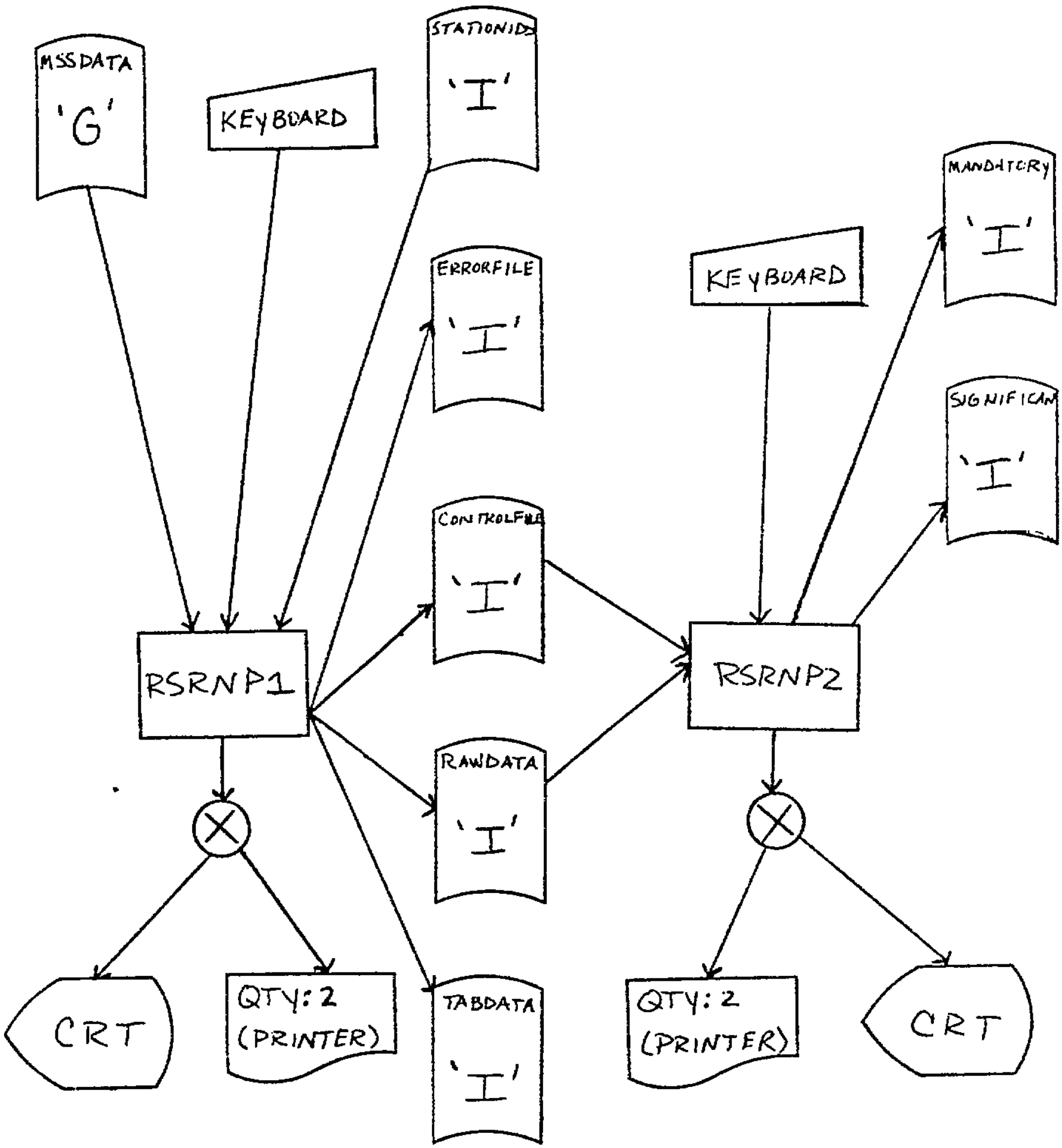

Figure VII-1. I/O Flowchart for Rawinsonde MSS/AMQ9/NTRS Instrument Reduction.

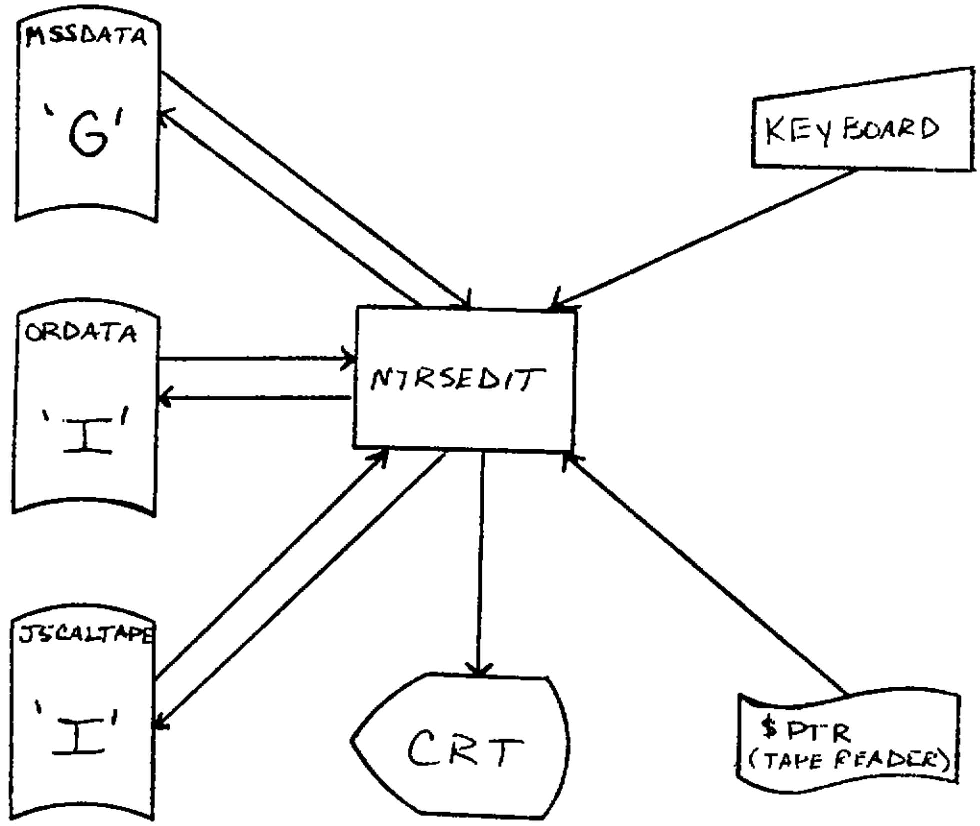

Figure VII-2. I/O Flowchart for Non-Transponder RH/Temp Merge Editor.

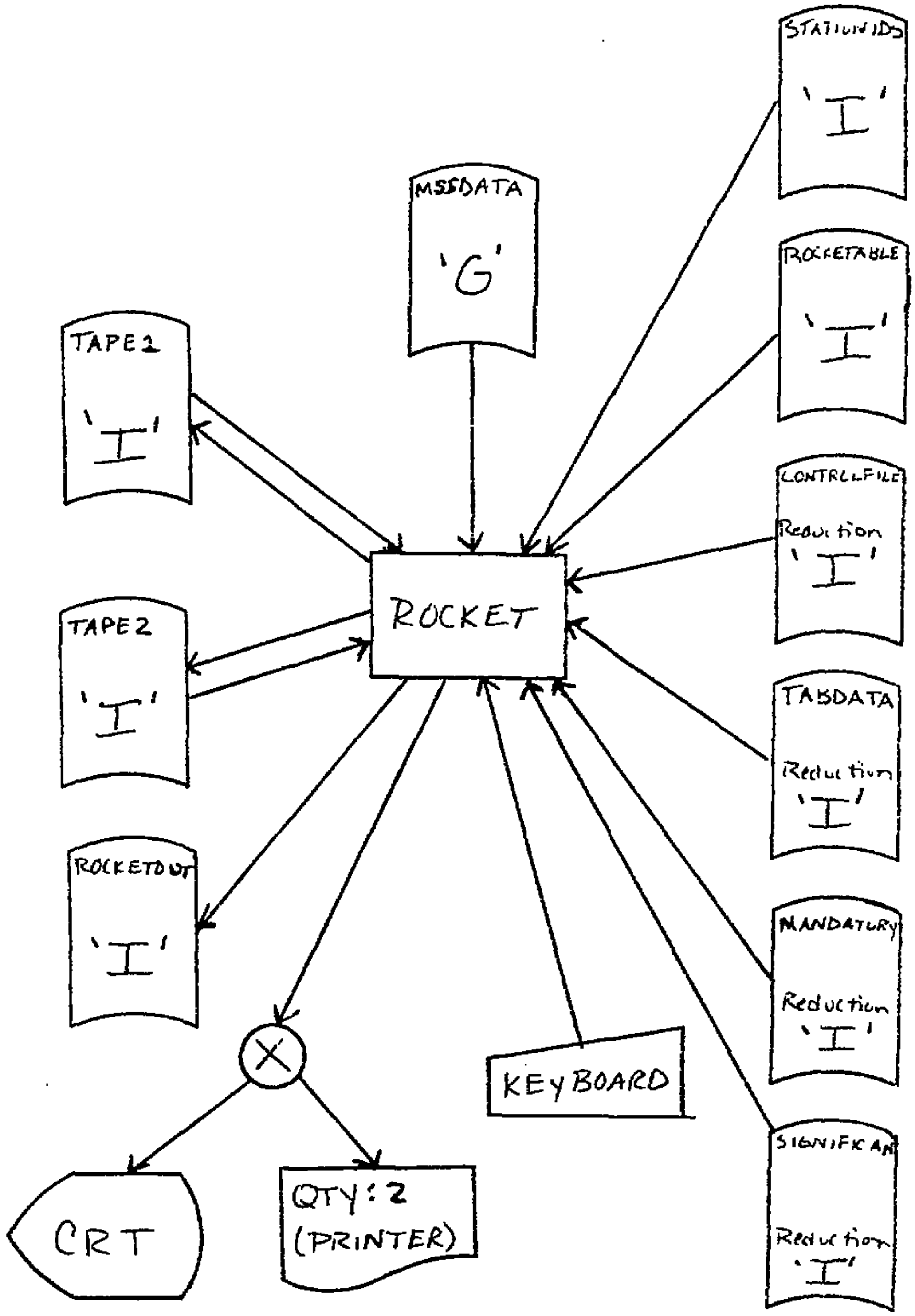

Figure VII-3. I/O Flowchart for Rocket Reduction.

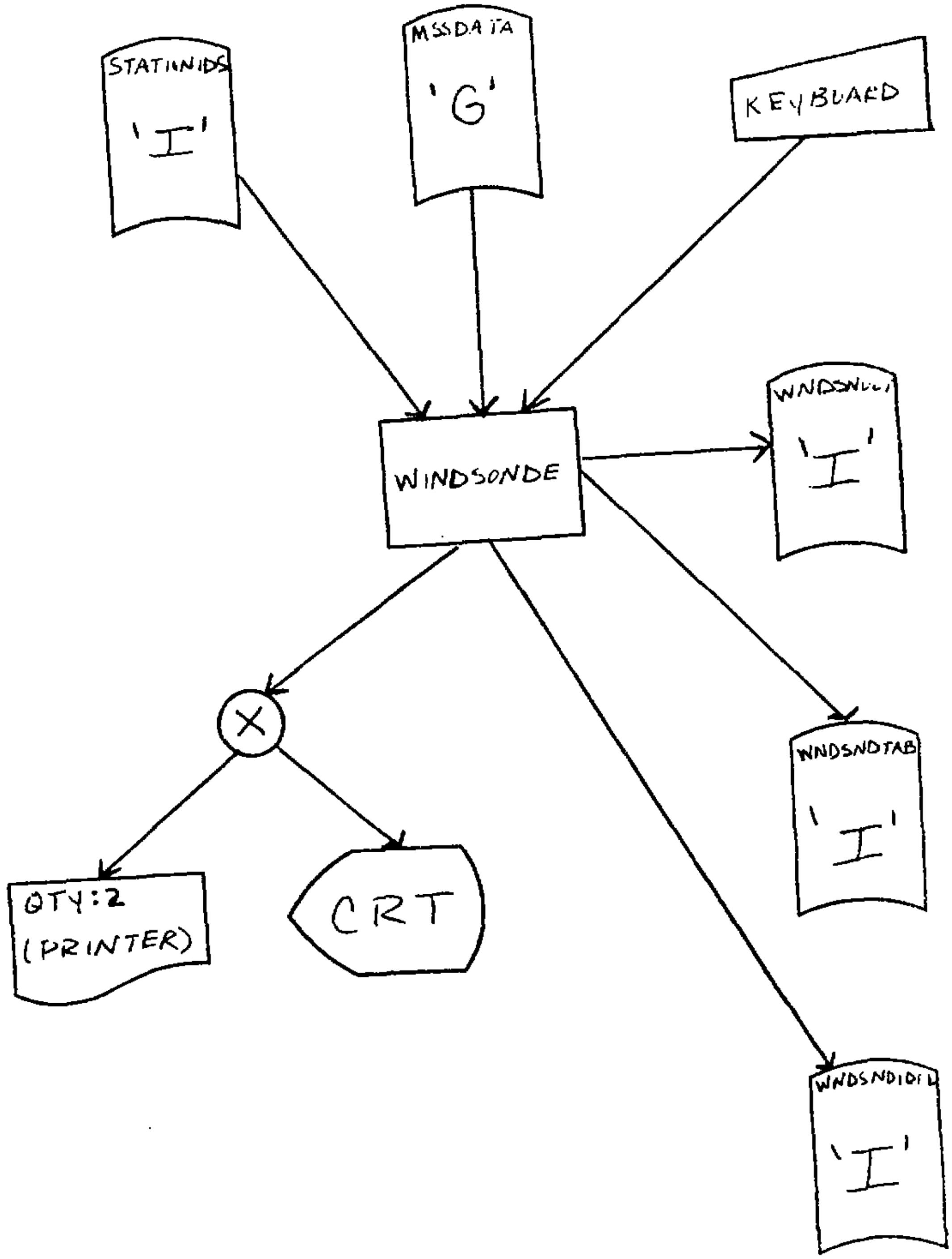

Figure VII-4. I/O Flowchart for Windsonde Reduction.

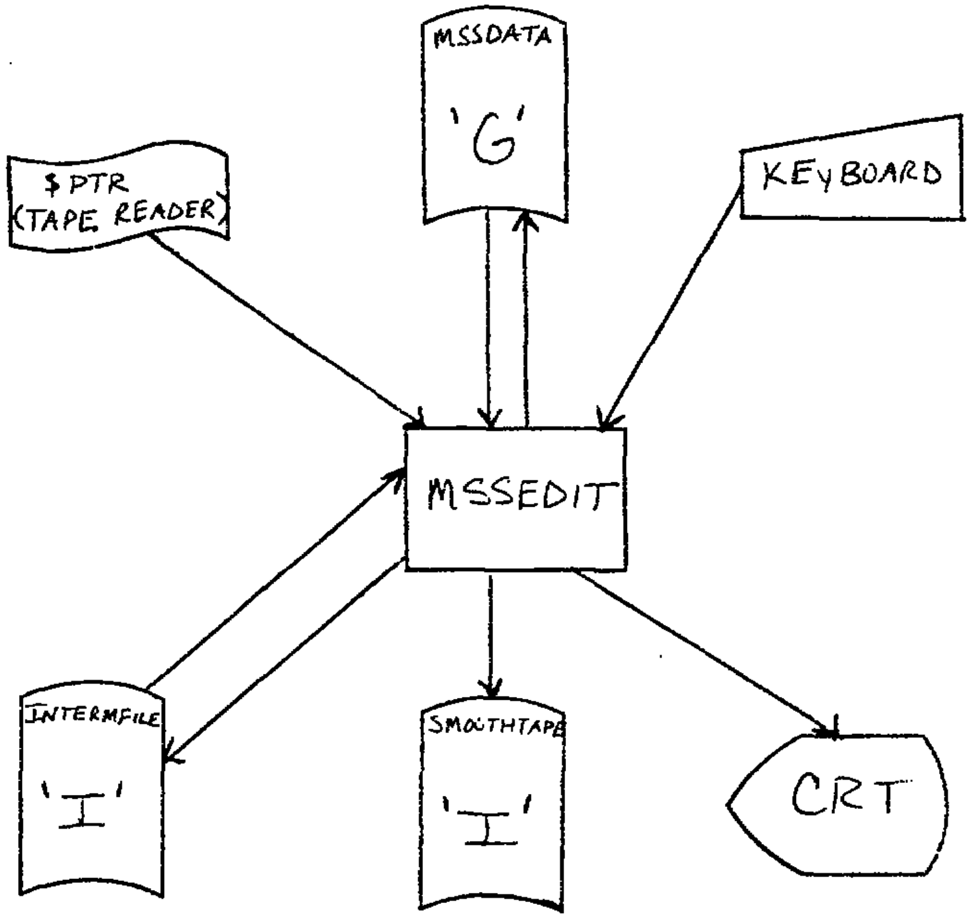

Figure VII-5. I/O Flowchart for Real Time Flight Disk Editor.

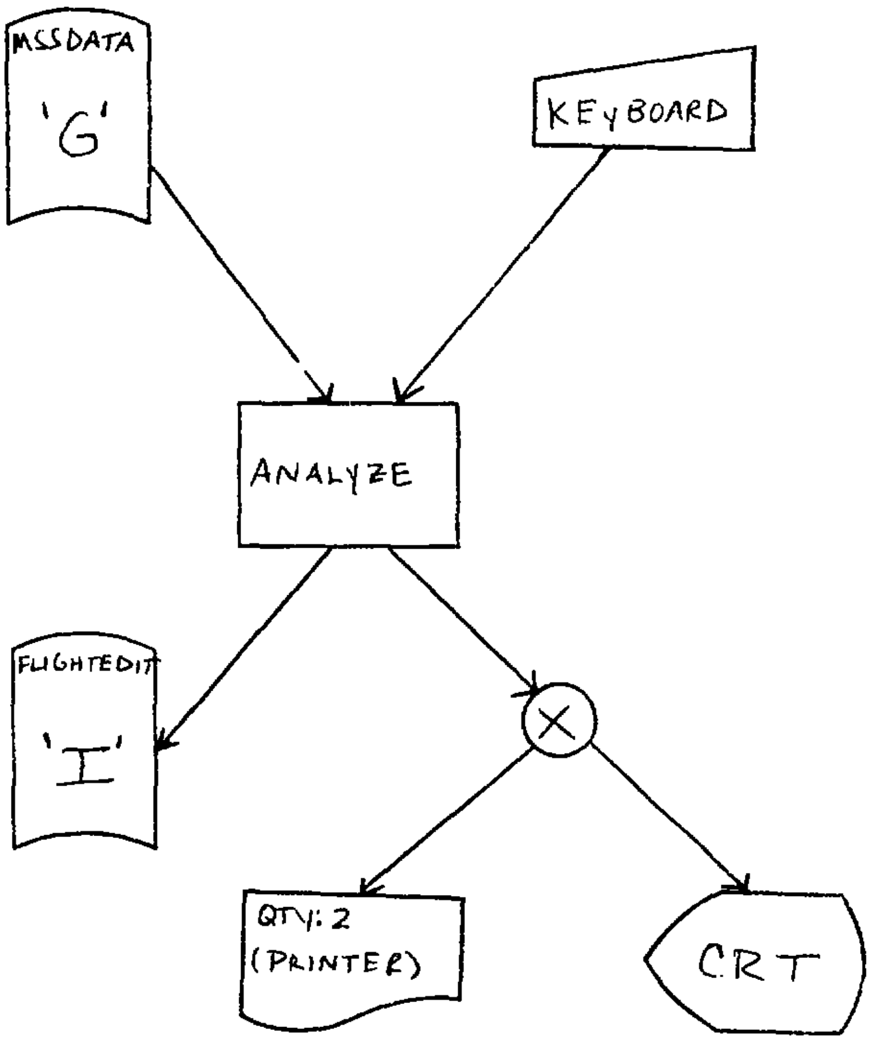

Figure VII-6. I/O Flowchart for Post Flight Analysis.

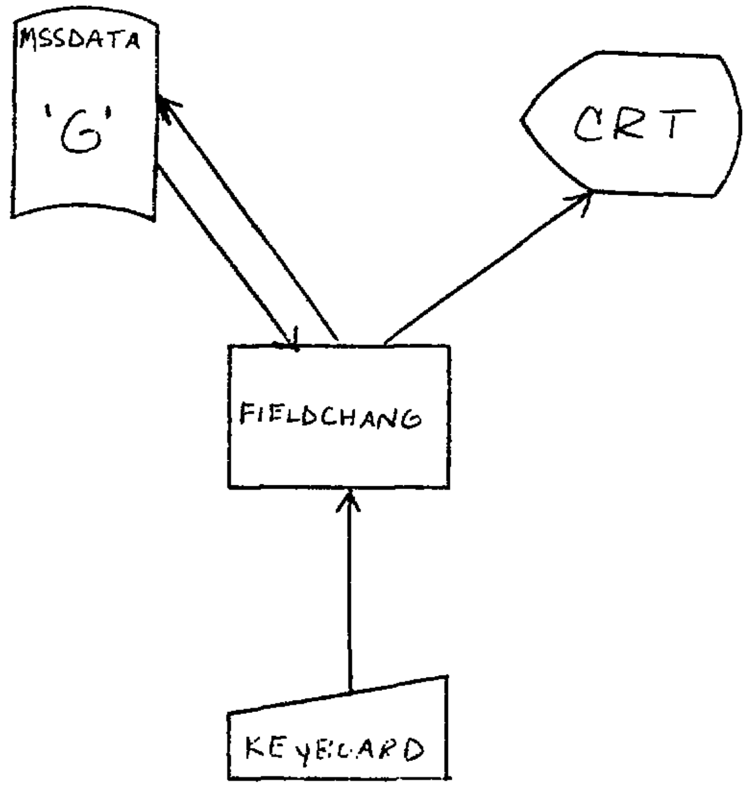

Figure VII-7. I/O Flowchart or AZ/EL/Range Fast Editor.

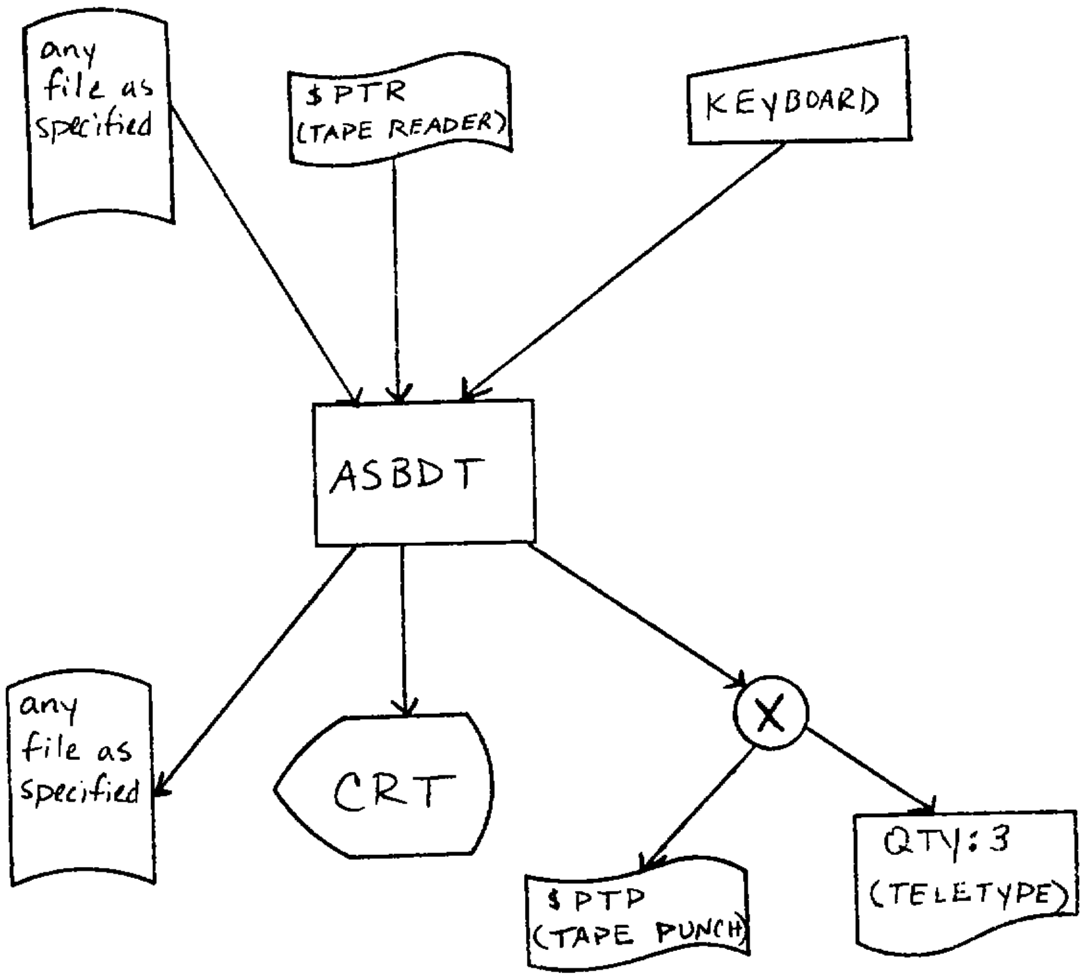

Figure VII-8. I/O Flowchart for ASCII to Baudot Converter.

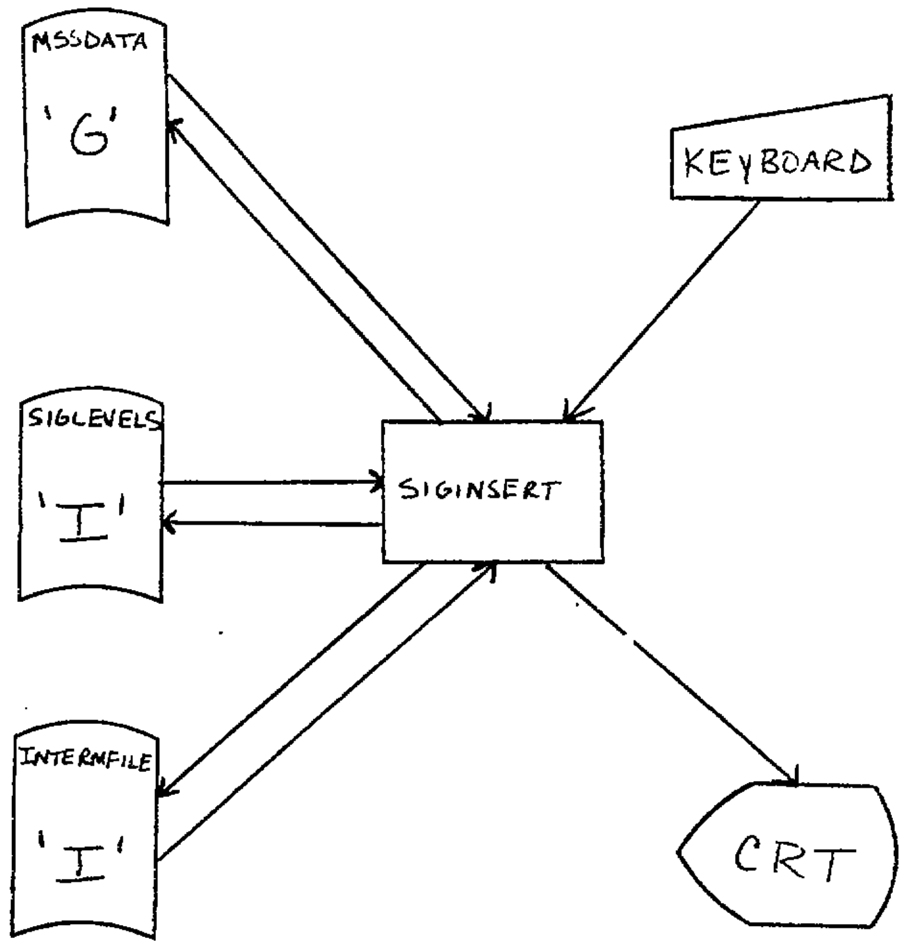

Figure VII-9. I/O Flowchart for Significant Level Insertion Program.

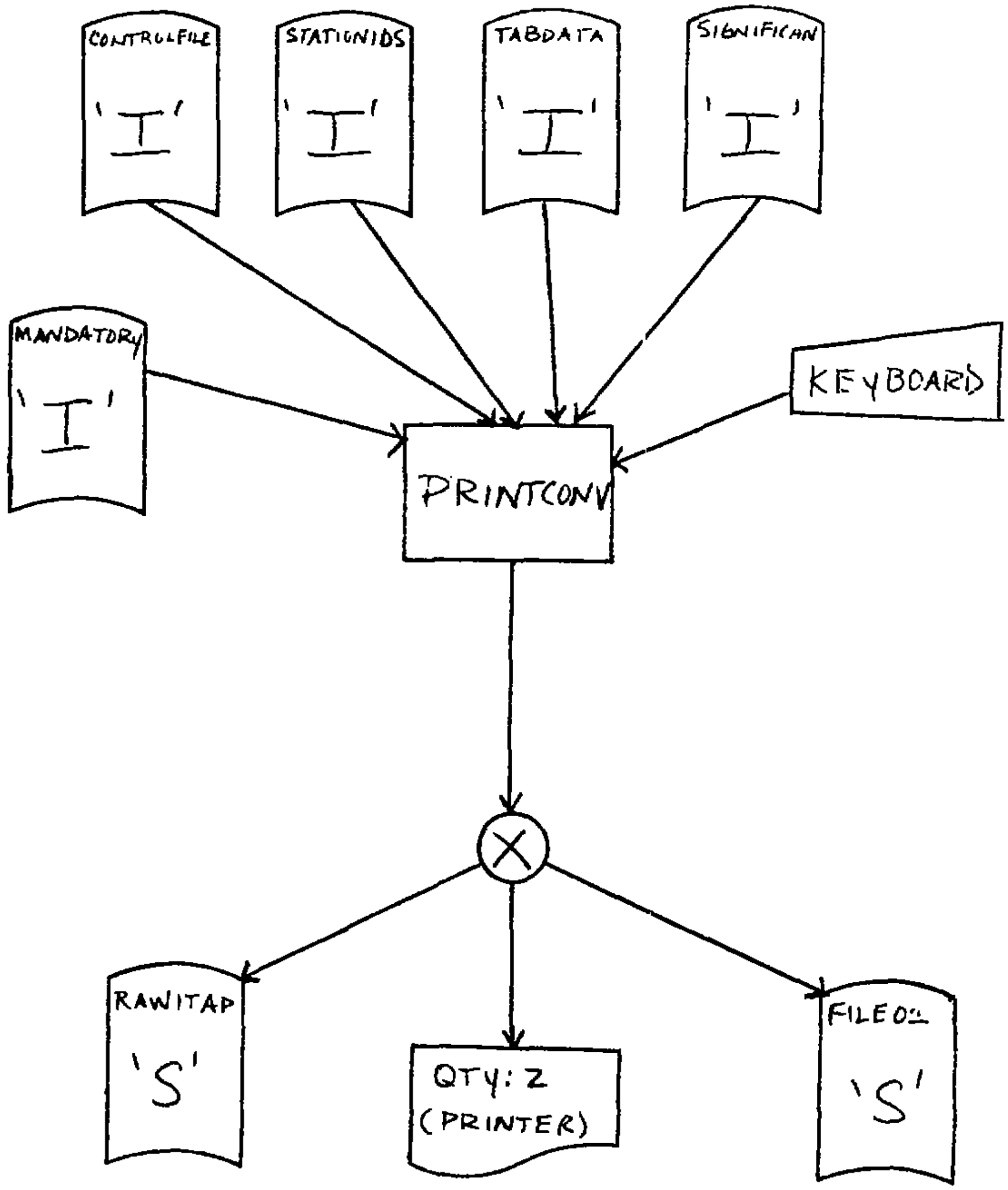

Figure VII-10. I/O Flowchart for Reduction Output Formatter.

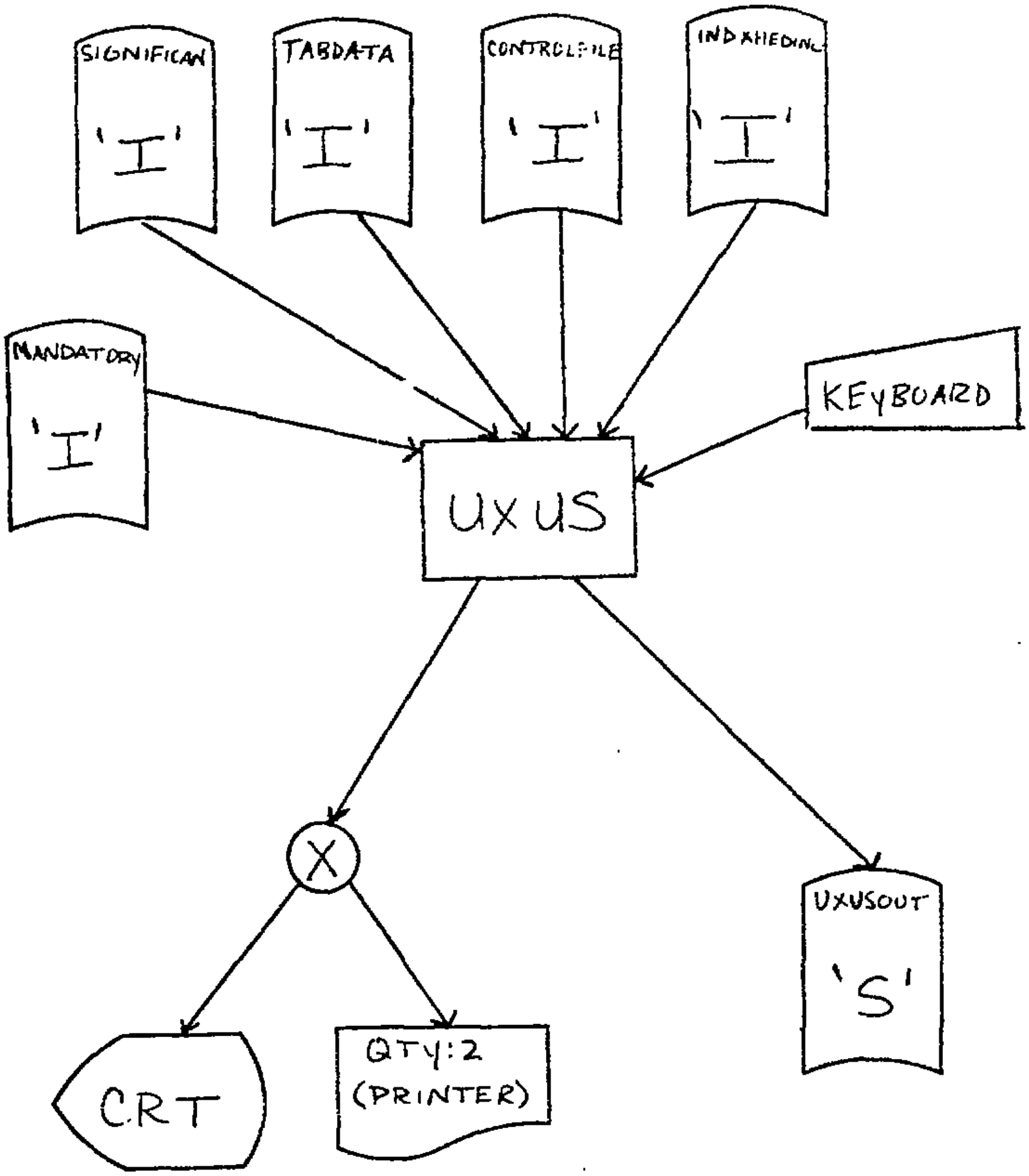

Figure VII-11. I/O Flowchart for Early Code Transmission.

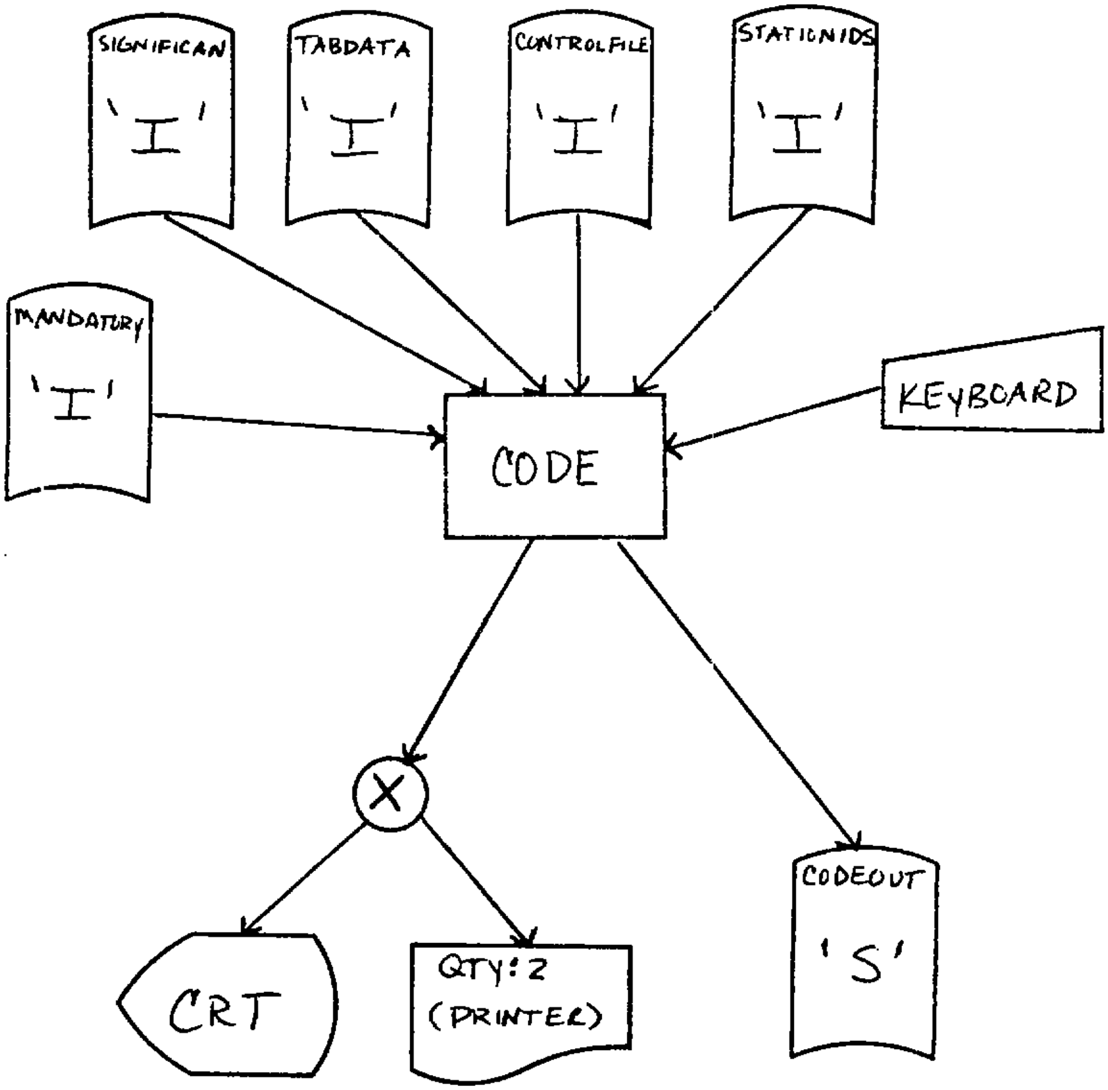

Figure VII-12. I/O Flowchart for Radiosonde Coder.