Scientific Atlanta

QUOTATION AND OFFER TO SELL

3845 Pleasantdale Road, Atlanta, Georgia 30340, Telephone: 404-449-2000 Cable: SCIATLADORA TWX: 810-766-4912 Telex: 054-2898

QUOTATION NO: 60 82 575
(Please refer to this number in orders or in correspondence.)

TO: U.S. Government
Langley, VA

STAT

Please Reply To: Gerry Rosenblatt
5100-J Philadelphia Way
Lanham, MD 20706
301 577 4830

DATE: 6-8-82 OFFER FIRM UNTIL: 6-30-82

YOUR REFERENCE: verbal

F. O. B.: Atlanta PAYMENT TERMS: see below

Scientific-Atlanta, Inc., (Seller) offers, subject to the terms and conditions hereinafter and on the reverse side hereof set out (which are expressly incorporated in and made part of this offer), the following described items at the prices specified:
NOTE: THIS IS NOT AN EXPRESSION OF ACCEPTANCE OR CONFIRMATION DOCUMENT.

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	EXTENSION
1.	1	Scientific-Atlanta Series 8000 7m receive only earth station including the following equipment and services:		
A.	1	Model 8010A 7m antenna including main reflector, elevation-over-azimuth mount with super high speed motor drives (120°/min), continuous 110° azimuth coverage automatic antenna position control unit, multiconductor control cable, anchor bolts and foundation template.		
B.	1	Subreflector and dual port receive only feed for the Model 8010A 7m antenna.		
C.	2	90°K Low Noise Converter (LNC) for use with Model 6650 Video Receiver.		
D.	2	Model 6650 frequency-agile, synthesized, 24 channel video receiver designed for use with Series 360 low noise amplifier converter (LNC). One 6.8 MHz audio subcarrier demodulator is standard with optional subcarrier frequencies available. Requires a Rack Adaptor which may hold up to two receivers if rack mounting is desired.		
	2	Rack Adaptors with mounting hardware, bias tees and equalizers for up to two Model 6650 Video Receivers.		

DELIVERY: 30 days ARO

(Present best estimate of time required for the delivery to the F.O.B. point, subject to change in circumstances prior to receipt of order.)

SPECIAL TERMS, CONDITIONS and WARRANTY:
15% of contract with order; 65% of contract upon shipment; 20% of contract upon proof of performance.

Scientific-Atlanta, Inc.

Gerald S. Rosenblatt

BY: Gerald S. Rosenblatt
TITLE: Regional Sales Manager

ACCEPTANCE LIMITED TO TERMS OF OFFER: Acceptance of this offer is expressly limited to the terms and conditions set out herein and on the reverse side hereof, and Seller expressly objects to any different or additional terms or conditions which may be included in Buyer's purchase order or other acceptance of this offer, which additional or different terms and conditions if any, shall be construed as proposals for additions to or modifications of the contract and are hereby rejected, unless independently expressly approved by Seller in writing.

SA416(1)-571

HQ's DISK ANTENNA

 6, 1982

Construction Cost Estimate

p 1 of 2

Concrete work:	length	cost	Total incl O+P
Ground slab reinforced	360 SF	X $8.00 =	2880
Cantilever retaining wall 8' high	5.73 cy	X $225 =	1290
footing strip reinforced	3.7 cy	X $135 =	500

Excavating Bulk:			
Backhoe	8 hr X $45/hr +	40 cy X 2.00 cy =	440
Transportation		100 mi X 4.00 $/mi =	400

Trench and Backfill by hand incl. compaction:

6" w X 24" deep		700 LF X $0.40 LF =	280

Boring under road and through wall in building

U.R.	4" dia	40' X $10.00 LF =	400
TW	4" dia	10 hole X $50 ea =	500

Electric work

Transformers for two 1hp motor 10 Am 208V:

1)	10A X 208V X 1.73 = 3KVA	2 X $340 ea	=	680
2)	30A X 208V X 1.73 = 10KVA	2 X $715 ea	=	1430

Construction Cost Estimate

Electric work cost. length cost Total incl O&P

wire size of power with transformer

1) #14 copper length 10 CLF x $22 = $220

2) #4/0 copper length 10 CLF x $275 = $2750

Conduit!

Galvanized steel in trench

1) 1.5" dia 2 X 700 LF X 5.80 = $4060

2) 2" " 2 X 700 LF X 7.35 =

3" dia 700 LF x 14.05 =

Uncouple EMT steel

1) 1.5" dia 300 LF x 3.56 = $1068

2) 2" dia 300 LF x 6.00 =

3" dia 300 LF x 7.25 =

---

1) Total O+P with transformer $18,000

2) Total O+P without "

BYERS COMMUNICATIONS CORPORATION

7300 MARKS LANE • AUSTELL, GEORGIA 30001
(404) 948-8228

June 4, 1982

Mr. Robert Ball
Field Operations Manager
Satellite Communications Division
Scientific Atlanta
3845 Pleasantdale Road
Atlanta, Georgia 30340

Re: Turnkey Price Proposal for
C.I.A. in McLean, Virginia

Dear Bob:

As we discussed on the telephone, I am pleased to submit the following proposal for the subject effort.

The total price is . . . . . [ ] STAT

The following is the breakdown of the price by major elements.

Site Preparation, Foundation and Retaining Wall . . . . . [ ] STAT

This effort covers the excavation and removal of the dirt and rock down to sufficient depth, assumed to be 7 feet, to permit the pouring of a 17' x 17' x 2' concrete reinforced pad. Concrete to be 5500 PSI strength and tested by a qualified test company.

Also included is the rear retaining wall of 1' x 7' x 25' with two sloping side retaining walls of 3000 PSI concrete. The area will be provided with sufficient drains to preclude erosion of the hill face. Also included is the design and time required to get approval by the C.I.A. engineers.

Trenching and Conduit . . . . . [ ] STAT

This effort is for the trenching from the pad to the building; a 6" x 18" trench and laying of 4" PVC conduit for the signal and control cables and 2" galvanized conduit for the power cable. The cables will be pulled, the trenches refilled, tamped, seeded and strawed; 22 foot bore under a street is included.

Also included is the transformer to reduce the 480 volt supply to 208, the connection of the power from an all-weather switch box to the drive system, and a 15 volt power supply connected to the LNC power ports.

Inside conduit will be the same for power and signal as the outside and the cable pulled. Connection to the power will be the government's responsibility and made based on our schedule.

Pull boxes will be provided where required.

Antenna Erection, Pointing and Drive System Installation and Check-out . . . . . [ ] STAT

After ATP, we will complete within 6 weeks or two weeks after plan approvals.

Should you have any questions, please call me.

Sincerely,
SATELLITE COMMUNICATIONS DIVISION

J. Simmons
President

JS/frl

Scientific Atlanta

QUOTATION AND OFFER TO SELL
Continuation Sheet

QUOTATION NO: 60 82 575 DATE: 6-8-82 PAGE NO: 2

ITEM	QUANTITY	DESCRIPTION	UNIT PRICE	EXTENSION
E.	1 lot	Integration hardware, including coax cable with connectors, 4 way divider, jumper cables, pressurization/dehydrator and all miscellaneous hardware for a complete operational system.		
F.	1 lot	Installation by non-union labor integration and proof of performance of the 7m nonredundant receive only earth station at specified customer location. Assumes antenna foundation, conduit runs, and all AC power will be furnished by others. Also assumes any site preparation, surveys and permits will be furnished by others, where necessary.		
G.	2 lgts.	1000 ft. 1/2" coaxial cable with type F connectors		
H.	1 lgt.	1000 ft. Motor Control Cable with 2 spare conductors		
		TOTAL PRICE OF ITEM 1		
2A.		To include Item 1 plus: Site Preparation Retaining Wall Fill Removal Antenna Foundation situated at side of hill.		
		TOTAL SYSTEM PRICE (ITEMS 1 and 2A)		
2B.		OPTION: To include Item 1 plus: Site Preparation Fill Removal Antenna Foundation situated on top of hill		
		TOTAL SYSTEM PRICE (ITEMS 1 and 2B)		
3A.		Total turnkey to include Item 1 and Item 2A plus: Conduit runs for power, motor control and RF from antenna to equipment room. Power cable - No. 4 wire with stepdown transformer Installation Supervision from building entry to equipment room		
		TOTAL SYSTEM PRICE (ITEMS 1, 2A and 3) Side of Hill		
3B.		OPTION: Same as ITEMS 1, 2B and 3A		
		TOTAL SYSTEM PRICE Top of Hill		

STAT

END OF QUOTATION

7-METER RECEIVE-ONLY
TELEVISION EARTH STATION

Scientific-Atlanta, Inc.

United States: 3845 Pleasantdale Road, Atlanta, Georgia 30340; Telephone 404-449-2000; TWX 810-766-4912; Telex 05428
Canada: 1640 Bonhill Road, Unit 6, Mississauga, Ontario L5T 1C8, Canada; Telephone 416-677-6555; Telex 06983600
Europe: Horton Manor, Stanwell Road, Horton, Slough SL3 9PA, England
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Approved For Release 2005/08/02 : CIA-RDP86-01019R000200160001-6

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SECTION 1
INTRODUCTION

1.1 SYSTEM SUMMARY

The proposed Series 8000 Video Earth Station is designed to receive high quality video and audio signals from any chosen satellite. The facility is equipped with a 7m dia. antenna with motorized drives and can receive one backup or two simultaneous signals via any satellite in the North American satellite orbital arc.

The antenna is equipped to provide full domestic satellite orbital arc coverage without requiring any mechanical changes. The three axis motor drive system is remotely controlled by a programmable automatic position control unit. This unit is preset to automatically acquire up to 20 satellite positions with the touch of a button and can be easily adjusted for any further additions or changes. A high speed antenna drive system, 110° per minute, is offered with this antenna. This system allows the antenna to sweep the full satellite arc in less than sixty seconds to allow the broadcaster to switch between any two satellites during a one minute commercial break.

The ground communications equipment is proposed in a redundant (non-automatic switching) configuration with key equipment and performance characteristics summarized as follows:

Frequency Band	3.7 - 4.2 GHz
Channels	Two downlink channels with audio are proposed. Additional receivers may be added to receive additional channels.
Video and Audio In/Out Levels	1 volt peak-to-peak into 75 ohms, unbalanced. Program channel bandwidth of 30 Hz to 15 kHz carried on either a 6.2 or 6.8 MHz subcarrier. Input/output levels are -10 to +10 dBm. 600 ohms, balanced

Video Signal-to-Noise Ratio	Better than 54 dB clear sky and better than 52 dB under 2.0 dB fade condition. These are nominal values and the actual S/N will be dependent of the station location and satellite in use.
Audio Signal-to-Noise Ratio	Better than 61 dB.
Documentation and Training	Complete written instruction manuals will be supplied by Scientific-Atlanta to completely define all components of the Series 8000 Video Earth Terminal. Scientific-Atlanta will also furnish assistance and training to station personnel during installation and system checkouts.
Warranty	The terminal is designed and built to normal microwave, electronics and electro-mechanical commercial standards. Each system is warranted to be free from defects in material or workmanship for a period of 90 days after delivery on all special equipment; otherwise, the manufacturer's warranty will be applicable (one year for all Scientific-Atlanta catalog equipment). The warranty is restricted to repair or replacement of parts or defective workmanship. Warranty repair will be performed at Scientific-Atlanta's option at the system site. Scientific-Atlanta maintains six service centers throughout the United States. Spare parts will be available from either Scientific-Atlanta or its vendors.
Field Engineering	Scientific-Atlanta will provide initial training and proof of performance at the time of installation. Thereafter, field engineering, other than that included in the warranty, will be provided at normal Scientific-Atlanta commercial rates.

Detailed Technical Description	Technical details of the design, fabrication and system performance of the proposed terminals are presented in the following sections of this proposal.

1.2 EQUIPMENT AND SERVICES

The equipment and services supplied are described in detail in this proposal. This section summarizes these items to present an overview of the total Video Earth Station.

1.2.1 SERVICES

All services are provided to design, produce, integrate and install the Video Earth Station on customer-designated premises. Services include the following:

- Program management
- System design and engineering
- Integration design and engineering
- Equipment design and procurement
- Equipment integration
- Installation on site using non-union labor (except AC power connections)
- On site checkout and video proof of performance tests
- Documentation and equipment manuals
- Training of station personnel
- Product assurance functions
- Spares and test equipment recommendations

EQUIPMENT TO BE PROVIDED

The following quantities and items of equipment comprise the basic Series 8000 transmit and receive earth station.

Item	Quantity	Description
1	1	Series 8000 Receive only Earth Station
		Antenna
1a	1	Model 8010A 7m antenna, including:
		Model 8128 Reflector Model 8228 Subreflector Model 8028 El/Az Mount Motorized Azimuth Actuator

		Motorized Elevation Actuator Model 8039 Polarization Drive Model 8841C Motor Control, 3 axis, high speed Model 8840C Remote Position Controller, 3 axis Anchor bolts and foundation template
1b	1	Model 8828DP two port, dual polarization, receive only feed
		Ground Communications Equipment
1c	2	Low Noise Converter Subsystem, including: Model 360-3 90°K LNCs with bias tee for simultaneous vertical and horizontal polarization reception
1d	2	Receiver Subsystem, including: Model 6650 video receivers with 6.8 MHz audio subcarrier demodulator with rack adaptor and equalizers per each polarization
		Integration Hardware, including:
1e	1 lot	2 sets 1000 ft. coax cable with connectors, automatic pressurization/dehydrator and all miscellaneous hardware for a complete operational system. All cable lengths are 1000 ft.
2	1 lot	Site preparation, foundation/retaining wall and necessary fill removal
3	1 lot	Providing and installation of power, control and RF transmission lines to include conduits, step down transformer, installation supervision for building cable runs
4	1 lot	Antenna Installation, pointing and checkout

Scientific Atlanta

SECTION 2

TECHNICAL DESCRIPTION

2.1 GENERAL

This section defines the technical approach and equipment proposed by Scientific-Atlanta for the redundant receive only station. The system design utilizes proven techniques and equipment to assure satisfactory and timely achievement of all objectives. A summary of overall system specifications follows in Table 2.1-1.

Table 2.1-1. Specifications for Video Satellite Earth Stations

Characteristic	Specification
Antenna Size	7m (23 feet)
Antenna Mount	Adjustable elevation, azimuth and polarization axes
Survival Wind Loads	125 mi/h (202 km/h) without special tiedowns
Operating Frequency Range	
Receive	3.7 to 4.2 GHz
Antenna Gain	47.5 dBi at 4.0 GHz
Antenna Polarization	Linear, adjustable
Video Bandwidth	15 Hz to 4.25 MHz ($\pm$ 1.0 dB)
Video Deviation Range	6 to 12 MHz peak at pre/de-emphasis crossover frequency
Pre/De-emphasis	525 line per CCIR Recommendation 405-1
Differential Gain	($\leq \pm$ 3%) 10% to 90% APL
Differential Phase	($\leq \pm$ 1.5) Max, 10% to 90% APL
G/T (at 4 GHz)	26.4 dB/K Nominal
Video Input/Output Levels	1.0 volt peak-to-peak, 75 ohms
Audio Subcarrier Frequency	6.8 MHz
Audio Bandwidth	30 Hz to 15 KhZ $\pm$ 1.0 dB
Audio Input Level	-10 dBm to +10 dBm, 600 ohms, balanced
Audio Output Level	-10 dBm to +10 dBm, 600 ohms, balanced
Low Noise Converter (LNC)	90°K
LNA Instantaneous Bandwidth	500 MHz
LNA Net Gain	50 dB, Min

2.2 EARTH STATION BLOCK DIAGRAMS

The dual-polarization LNC configuration is shown in Figure 2.2-1. This allows simultaneous reception on both horizontal polarizations.

2.3 PERFORMANCE ANALYSIS

The following parameters (Table 2.3-1) have been used in analyzing the earth station performance.

Table 2.3-1. Earth Station Performance Specifications

Characteristic	Specification
	Satellite
Type	Typical domestic satellite
Location	70° to 140° west longitude
EIRP	+34 dBW (Nominal)
G/T	-6.0 dB/$^{\circ}$K
Saturation Flux Density	-82.0 dBW/m^2
	Earth Station
Location	Continental United States
Antenna	
Size	7m
Gain:	
Receive	47.5 dBi (at 4 GHz)
Noise Temperature (at feed output)	22°K at 30° El
LNC Noise Temperature	90°K

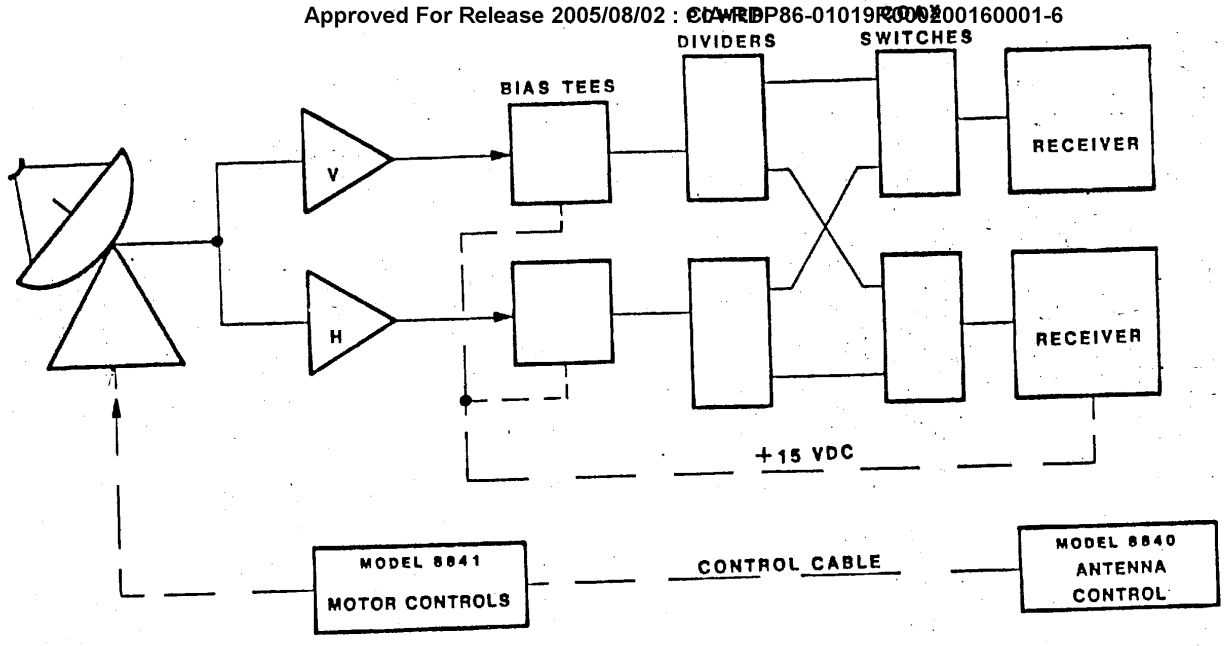


Figure 2.2-1 Dual-Polarization LNA Option

08-Jun-82
09:03

SCIENTIFIC ATLANTA
EARTH STATION PERFORMANCE ANALYSIS
SATELLITE COMMUNICATIONS DIVISION

CUSTOMER NAME: US GOVERNMENT

SITE NAME: LANGLEY

LATITUDE : 38 DEG. 54 MIN. 3 SEC. NORTH

LONGITUDE : 77 DEG. 8 MIN. 38 SEC. WEST

ANTENNA SIZE : 7 METERS

ANTENNA GAIN : 47.5 DB

LNA TEMPERATURE : 90 DEG. K

RECEIVER TYPE : 6650

SATELLITE EIRP : 34 DBW

SAT POS (DEG)	SATELLITE ASSIGNMENT	ANT AZ DEG	ANT EL DEG	PATH LOSS (DB)	G/T (DB/ DEG. K)	RCVR C/N (DB)	VIDEO S/N (DB
70	SOUTH PAC I	168.7	44.3	196.0	26.6	17.8	55.6
74	HUGHES I	175.0	44.8	196.0	26.6	17.9	55.7
79	ADV WESTAR II	183.0	44.9	196.0	26.6	17.9	55.7
83	SATCOM IV	189.3	44.5	196.0	26.6	17.9	55.7
87	TELSTAR II/COMSTAR D3	195.5	43.8	196.0	26.6	17.8	55.6
91	ADV WESTAR I/WESTAR III	201.4	42.7	196.0	26.6	17.8	55.6
95	TELSTAR I/COMSTAR D2	207.2	41.3	196.0	26.6	17.8	55.6
99	WESTAR IV/WESTAR I	212.6	39.5	196.0	26.6	17.7	55.5
104	ANIK D1/ANIK A1	218.9	37.0	196.1	26.6	17.7	55.5
109	ANIK B	224.7	34.2	196.1	26.5	17.6	55.4
114	ANIK D2/ANIK A2	230.0	31.1	196.2	26.5	17.5	55.3
119	SOUTH PAC II/SATCOM II	235.0	27.7	196.3	26.5	17.4	55.2
123	WESTAR V	238.6	24.9	196.3	26.4	17.3	55.1
123.5	WESTAR II	239.1	24.6	196.3	26.4	17.3	55.1
127	COMSTAR D4	242.1	22.1	196.4	26.4	17.2	55.0
128	COMSTAR D1	242.9	21.3	196.4	26.4	17.2	55.0
131	SATCOM III	245.4	19.1	196.5	26.3	17.1	54.9
135	HUGHES II/SATCOM I	248.5	16.1	196.5	26.3	16.9	54.7
139	SATCOM I-R	251.4	13.1	196.6	26.2	16.8	54.6
143	SATCOM II-R	254.3	10.0	196.7	26.0	16.6	54.4

SECTION 3

EQUIPMENT DESCRIPTION

3.1 ANTENNA, MOUNT, AND FOUNDATION

3.1.1 ANTENNA DESCRIPTION AND SPECIFICATION

The proposed Model 8010A (Photo No. 13077) 7m antenna incorporates the reflector and basic feed components of Scientific-Atlanta's standard Model 8010 Antenna and a new elevation-over-azimuth mount to meet the requirements of this application. Superior performance and reliability, and minimum installed cost are realized by combining high technology features with high volume manufacturing techniques.

The features of the Model 8010A include:

A dual reflector, diagonal horn feed system which provides:

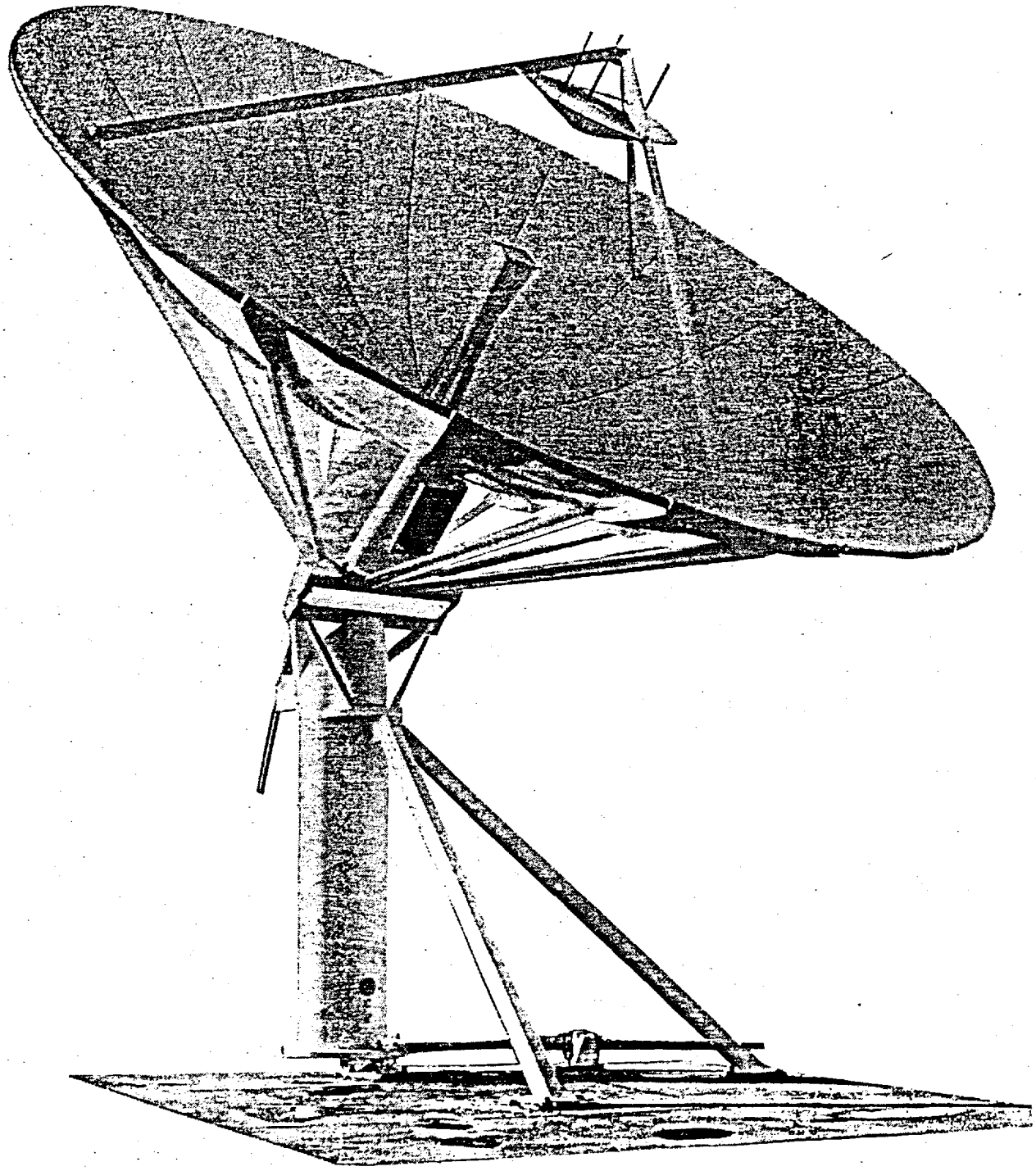
a. High aperature efficiency
b. Excellent radiation pattern performance in the 4 and 6 GHz frequency bands
c. LNA interface behind the reflector for maximum protection and accessibility
d. Convenient and unrestricted polarization adjustment

Precision die-stamped aluminum reflector panels which provide:

a. Long term durability in harsh environments
b. Dimensional repeatability, consistently high performance
c. Minimized weight and volume for ease of shipping and installation
d. Specified surface tolerance without panel adjustment
e. Simplified logistic support, since all panels are interchangeable in case replacement is necessary

A rugged space frame reflector support and elevation-over-azimuth mount providing:

a. Stiffness required for operation under severe environmental conditions
b. Structural safety per guidelines established by the AISC and EIA
c. Convenience in shipping and handling
d. Ease and minimum cost of installation
e. Simple pointing adjustment mechanism allowing 180^{o} azimuth and 0 to 90^{o} elevation adjustment.



Model 8010A 7-Meter Earth Station Antenna

The Model 8010A Earth Station Antenna is comprised of three major components:

1. Model 8128 7m dia. refelctor
2. Series 8228 DP Cassegrain feed system; for dual polarized receive only operation
3. Model 8028 elevation-over-azimuth mount

The technical characteristics of the antenna system are given in Table 3.1-1, and radiation distribution envelope is presented in Figure 3.1-1. Photo No. 13077 illustrates the Model 8010A 7m antenna.

Table 3.1-1. Model 8010A 7m Earth Station Antenna Technical Characteristics

Characteristic	Specification
	General
Antenna Type	Cassegrain, dual reflector
Antenna Diameter	7 m (23 ft)
Reflector Construction	18 precision die-stamped. aluminum panels (0.315 cm thick); space frame backing structure; central hub
Mount Type	Elevation-over-Azimuth
Pointing Range	
Azimuth	180° in 3 overlapping 110° sectors
Elevation	$0\text{-}90^{\circ}$
	Electrical
Operating Frequency	
Receive	3.7 to 4.2 GHz
Transmit	5.925 to 6.425 GHz
Gain (Midband, Ref. to OMT Port)	
Receive	47.5 dBi
Half Power Beamwidth (nominal)	
Receive	0.7°
VSWR	1.3:1 Max
Polarization	Linear
Axial Ratio (on axis)	35 dB min
Polarization Adjustment	360° continuous ($\pm 100^{\circ}$, motorized option)
First Sidelobe Level	-14 dB Max
Noise Temperature	see graph

Table 3.1-1. Model 8010A 7m Earth Station Antenna Technical Characteristics
Continued

	Electrical (continued)
Radiation Pattern Averaged Sidelobe Envelope*	$32-25 \log \theta$ $1^\circ < \theta < 48^\circ$ -10 dBi $48^\circ < \theta < 120^\circ$ -15 dBi $120^\circ < \theta < 180^\circ$
Feed Interface	
Receive	CPR-229G flange
	Environmental
Wind Loading at 0°C Air Temperature	
Operational	72 km/h (45 mi/h) gusting to 97 km/h (60 mi/h)
Survival**	200 km/h (125 mi/h) from any direction
Pointing Accuracy	0.08° rms in 72 km/h (45 mi/h) wind gusting to 97 km/h (60 mi/h)
Temperature Range	
Operational	-20°C to $+55^\circ$C
Survival**	-35°C to $+60^\circ$C
Solar Radiation	1.1 mW/mm^2
Atmospheric Conditions	Salt, pollutants, and corrosive contaminants as encountered in coastal and industrial areas
	Shipping
Weight (approximate)	
Shipping	2950 kg (6,500 lbs)
Net	1818 kg (4,000 lbs)
Net Volume (approximate)	23.3 m^3 (820 ft^3)

* Per FCC Reg. 25-209.

** Survival conditions considered separately. Adjustable components securely clamped. (Ballscrew drive options require positioning to one of a preferred range of positions for winds exceeding 80 mph.)

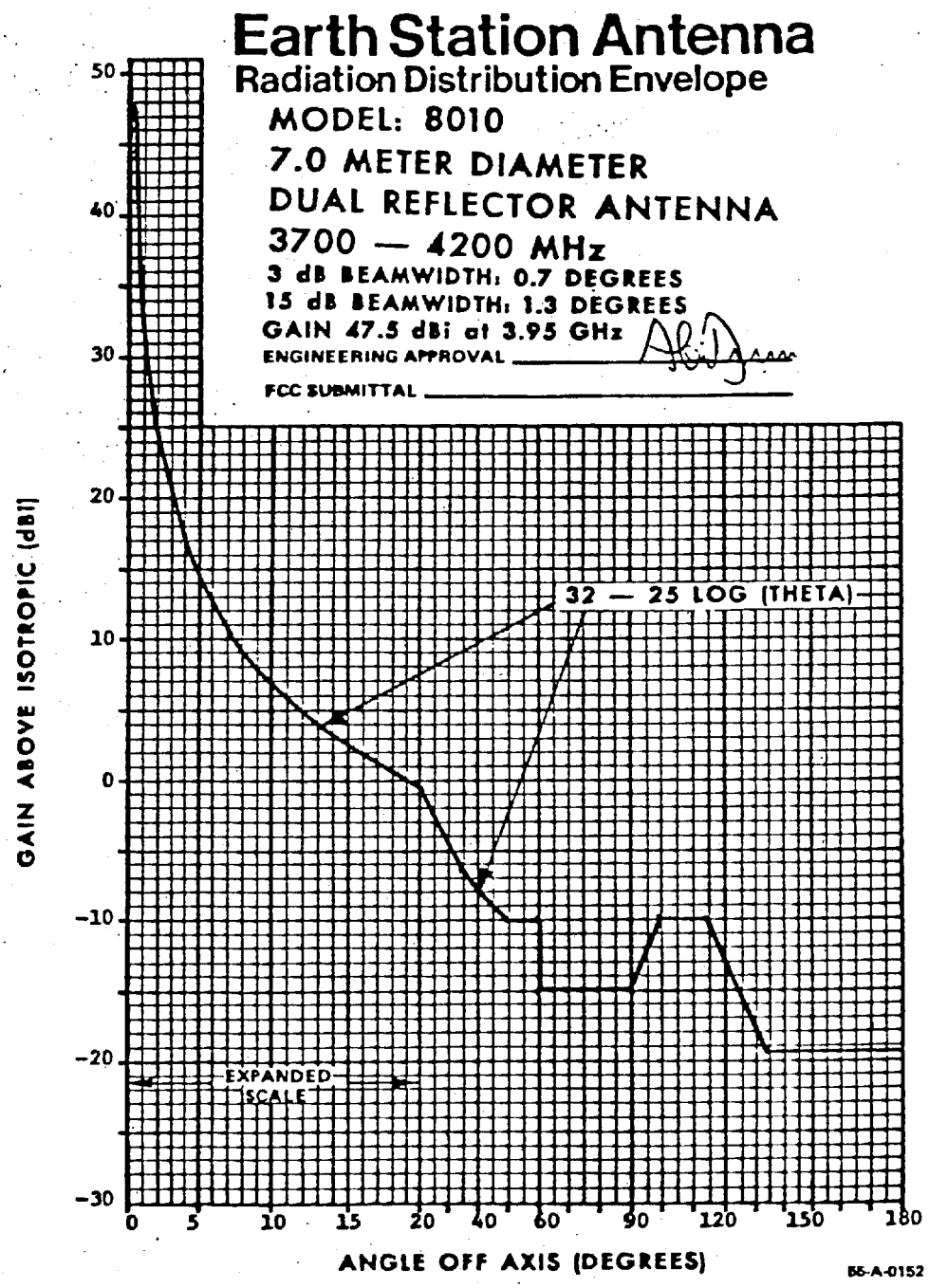
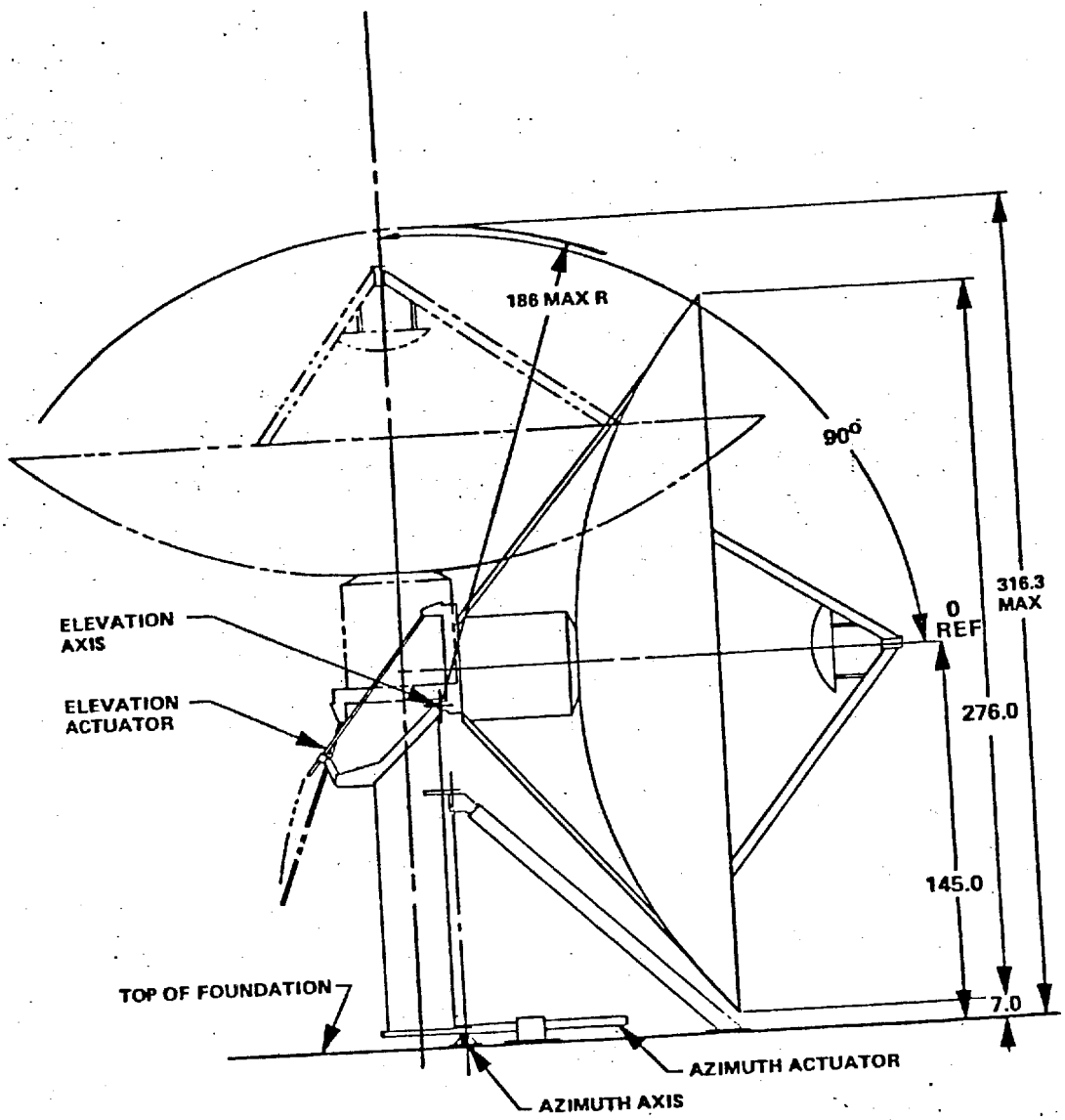


Figure 3.1-1. Earth Station Antenna Radiation Distribution Envelope (3700 to 4200 MHz)



NOTES:
1. ALL DIMENSIONS REFERENCE.
2. SEE FOUNDATION DRAWING FOR MOUNTING LOCATION.

55-B-2038
Sheet 1 of 3

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Figure 3.1-2. Model 8010 7-Meter Antenna Outline Drawing
Page 1 of 3

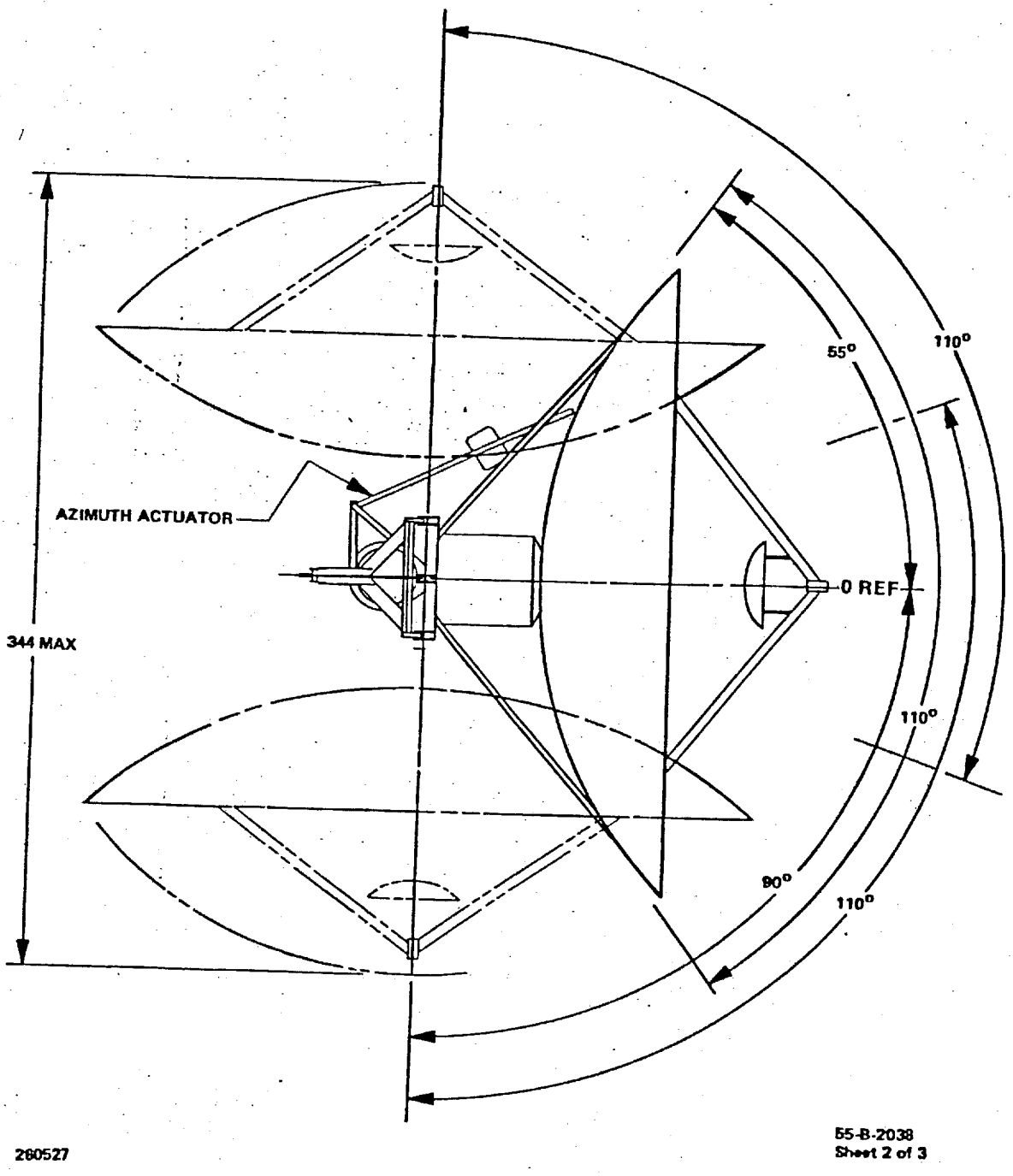


Figure 3.1-2. Model 8010 7-Meter Antenna Outline Drawing
Page 2 of 3

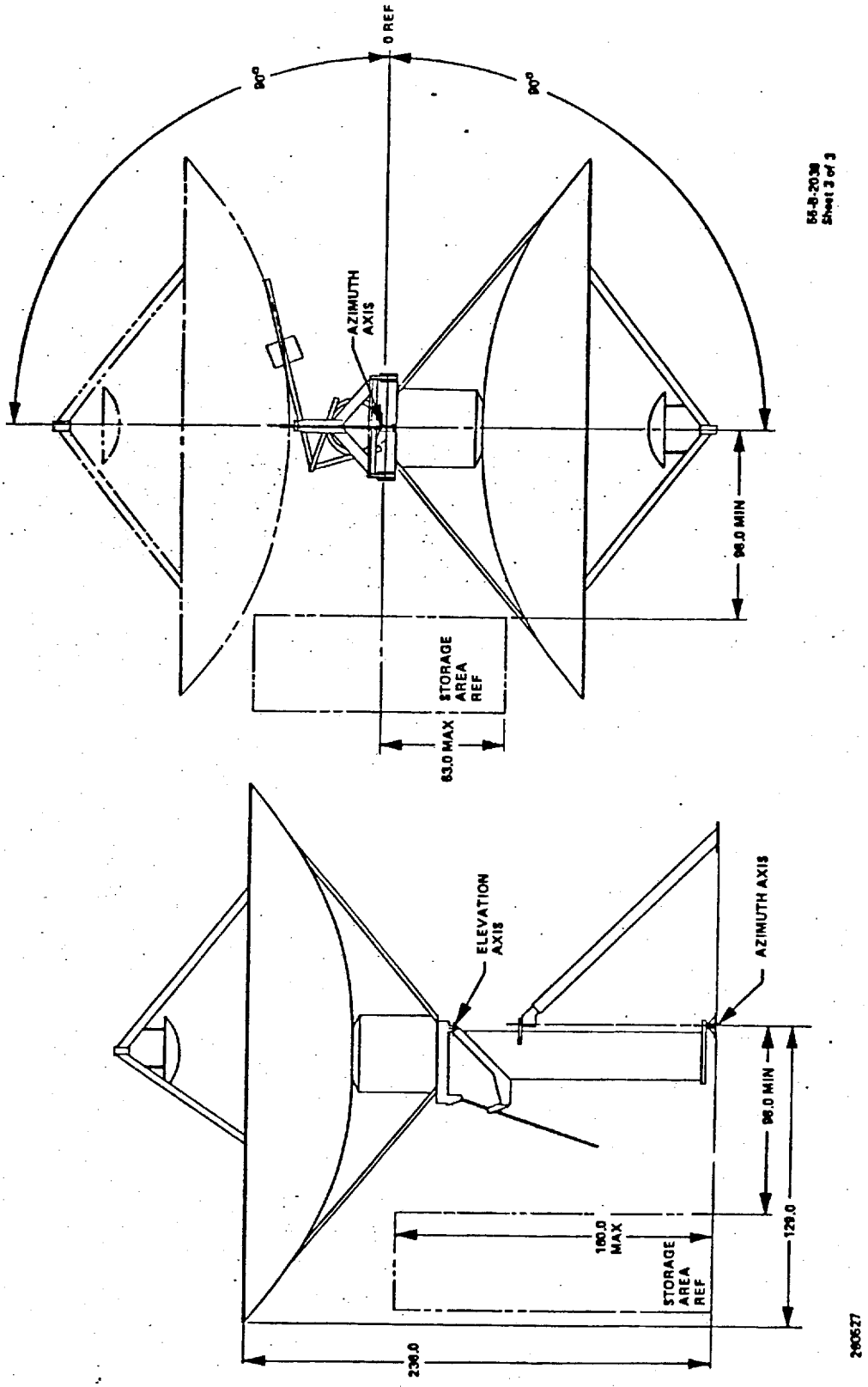


Figure 3.1-2. Model 8010 7-Meter Antenna Outline Drawing
Page 3 of 3

3.1.2 MODEL 8028 EL/AZ MOUNT

The Model 8028 elevation-over-azimuth mount employs a rigid, vertical torque tube as the principal structural member. The 7m reflector is attached to two elevation pivot points at the top of the torque tube and is positioned in elevation from 0 to 90^{o} with an adjustable elevation strut assembly. An outline drawing of the Model 8028 7m antenna is shown in Figure 3.1-2.

Azimuth rotation is accomplished by rotation of the entire torque tube/reflector assembly on two spherical bearings. One bearing is located at the base of the tube and anchored to the foundation. The second bearing is located at the point where two supporting members attach to the tube to resist overturning.

The azimuth pointing range is 180^{o} total in three overlapping 110^{o} sectors. The desired sector is selected by choosing the appropriate set of predrilled holes in the base of the torque tube for attachment of the azimuth adjusting strut. Adjustable angle indicators are provided at the azimuth and elevation pivots on the mount structure to serve as visual indication of antenna position.

3.1.3 FEED/SUBREFLECTOR

The feed system is a Cassegrain type and consists of a feed horn, receive-transmit orthomode coupler, and subreflector, all designed for high efficiency operation. The receive feed interface is a CPR-229G flange.

The feed horn is a diagonal horn which has a square input of the same size as the common output transition port. This horn has circularly symmetric patterns over a large bandwidth. On axis cross-polarization is better than 35 dB down raltive to the co-polarized peak intensity. The diagonal horn has a gentle flare to provide a good match to the input wave and to retain most of its energy within the solid angle subtended by the subreflector. The latter is of significant importance in earth station antennas where energy spillover losses must be small. The aperture is covered by a thin LUMAR window to provide a seal to the feed system for pressurization purposes.

The subreflector is 0.914 meters in diameter. This size corresponds to 12 wavelengths in the middle of the receive band and about 18.76 wavelengths in the middle of the transmit band. The subreflector to main reflector diameter ratio is about 0.13, which was chosen to provide minimum blockage while controlling energy spillover past the main reflector. Another factor which influences the forward and rearward spillover is the intensity of the field (with respect to the on axis peak) which illuminates the edge of the subreflector. This intensity is kept as low as possible (better than 19 dB below the peak) to minimize spillover energy.

The subreflector is shaped to that the incident feedhorn energy is scattered in a deisrable manner across the main reflector. From the geometric-optics viewpoint, the energy distribution across the main reflector aperture closely resembles a $(1-kr^2)$ type of field distribution, where r is the normalized aperture radius parameter and k is a constant. For the 7m antenna, k is chosen so as to provide an edge taper on the main reflector such that it is approximately 6 dB below the peak. Due to the finite size of the subreflector, the actual value of the edge taper is somewhat lower.

3.1.4 REFLECTOR

Most earth station antenna reflectors are parabolic surfaces of revolution. However, improved electrical performance can be achieved by shaping the reflector slightly from a true parabola. This shaping is accomplished by using advanced optics methods and computer program developed by Scientific-Atlanta. The 7m antenna utilizes this technology to minimize phase error and improve the performance of the antenna.

The 7m dia. reflector is made up of 18 identical panel sections. Each section is stamped using precision match metal dies in a 900 ton press. The basic panel material is aluminum, 3.15mm thick. The stamping process forms 3" wide flanges on each side of the panel and a peripheral flange. The side flanges are drilled in a fixture which accurately and repeatedly locates each adjacent panel flange such that they will be precisely aligned when assembled. Snug fitting bolts are used to join panels together during field assembly. The panel edge flanges form the stiffening ribs for the reflector. They transfer the wind and gravity loads from the panel faces to the backing structure.

The backing structure consists of 18 radial support members terminating at the rear of the antenna hub. These members transmit wind loads acting on the reflector surface to the hub and then to the mount, providing sufficient stiffness to stabilize the reflector in the operating winds and provide the strength required for survival winds.

An aluminum hub is used to provide the basic supporting geometry for the reflector. The hub also provides protection for the low noise amplifiers from the environment. Access for servicing hub-mounted electronics is provided through openings at the bottom and rear of the hub. No special provisions, such as ladders or platforms, are made to reach the hub since a stepladder is adequate.

3.1.5 STRUCTURAL DESIGN

The design of the earth terminal involves the use of several computer programs. The wind forces acting on the reflector are derived from a wind tunnel study performed by the Jet Propulsion Laboratory of the California Institute of Technology. The application of the data from this report resulted in pressure coefficients for wind directions from 0° to 180° to the axis of the antenna. The resulting pressure on the reflecting surface is broken into a symmetrical and a non-symmetrical component. The symmetrical component is applied to a shell analysis program to determine strength and deflections. The non-symmetrical portion is applied to a frame program to determine the strength and stiffness of the turned down edge flanges of each panel. A space frame analysis is used to determine the backing structure and the mount's loads and stiffness. This space frame analysis also gives the reaction loads at the base of the mount for foundation considerations.

Specifically the American National Standard A58.1 and Electronics Institute Association RS-411 are employed in establishing load conditions. The stress calculations and allowables are per the American Institute of Steel Construction Handbook and American Aluminum Manufacturers Associations.

3.1.6 POINTING ACCURACY

Deflections for the 7m elevation/azimuth antenna have been developed through load testing of an actual mount. The mount was positioned in a worst case orientation whichmaximized loads on all mount components. Loads were introduced by means of a cable and hydraulic ram. Targets were placed on the structure and movements were measured with a theodolite. The worst case movement measured for a 60 mph wind

force was 0.14°. Target movements were measured for several different wind loads, and the spring date of the antenna was caluclated. Using the spring date, deflections may be calculated for any desired operating case wind speed. The worst case deflection for 87 mph is 0.29°.

Based on the design calculations deflection measurements, and nominal beamwidth, the gain degradation in the receive band for the specified environmental conditions is given below:

Condition	Degradation
A	as specified
B	0.25 dB
C	2.6 dB

Where conditions A, B, and C are:

Condition A - steady state wind less than 15 mph, no ice or snow

Condition B - steady state wind to 45 mph. Static load of 1/4" radial ice or four inches snow on non-radiating surfaces.

Condition C - steady state wind to 87 mph. Static load of 1/2" radial ice or six inches snow on non-radiating surfaces.

3.1.7 ANTENNA ERECTION

Installation of the mount at the site is simply done since it is largely assembled prior to shipment. Erection involves lifting and positioning of the torque tube assembly on the lower azimuth bearing shaft (bolted to the foundation), and the connection of the two forward braces between the foundation and upper azimuth bearing fitting. The azimuth adjusting strut is then attached from its foundation anchor to the torque tube assembly, and the elevation adjusting strut is attached between the torque tube assembly and the hub-mounting frame.

The reflector panels and supporting members are assembled to the hub and the entire reflector assembly is lifted and attached to the hub-mounting frame. (This requires equipment with a lifting capacity of 4,000 lbs.)

The spar/subreflector assembly is then assembled, lifted, and attached to the reflector assembly. The feed assembly is now placed into the front of the hub and secured.

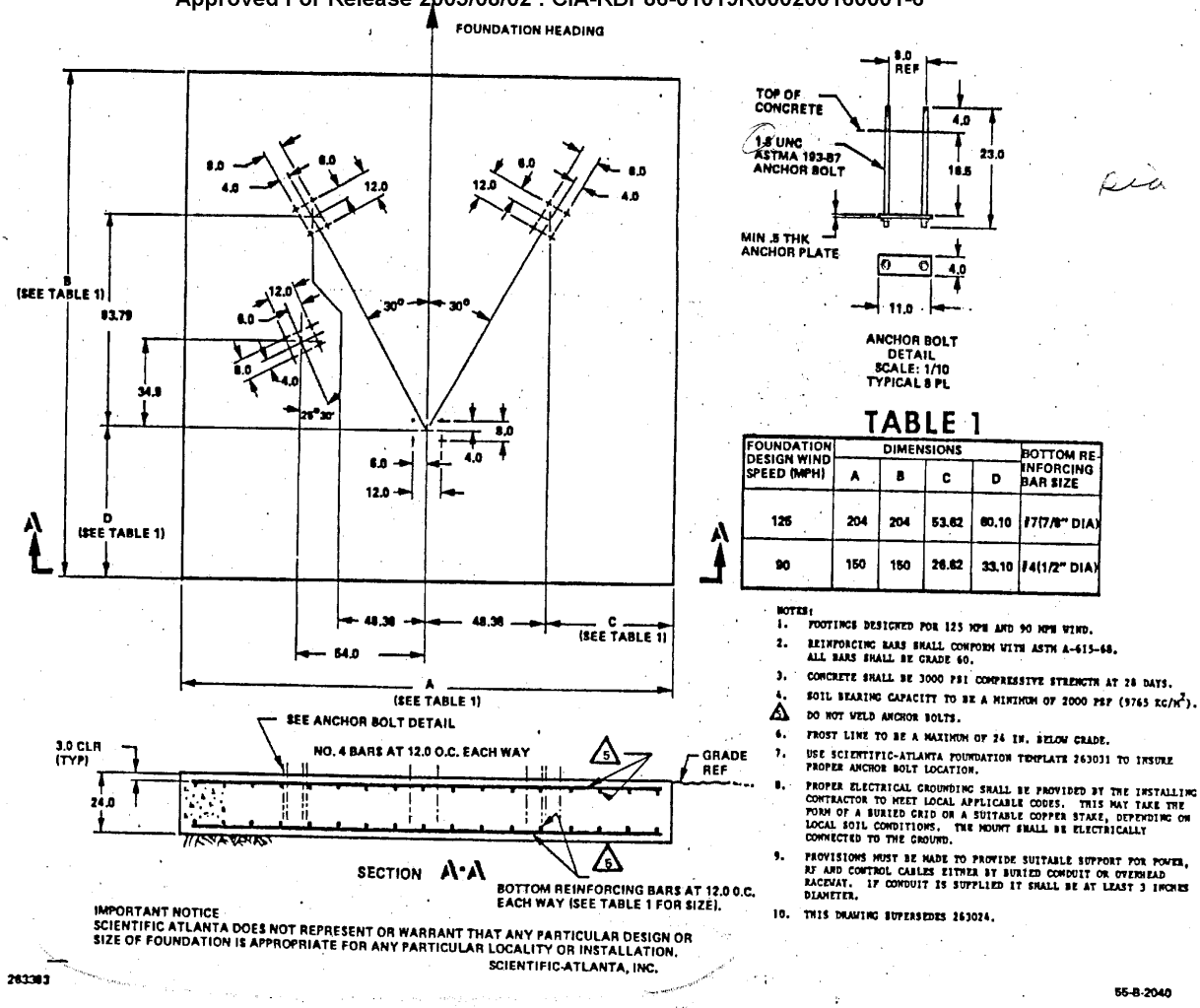


TABLE 1

FOUNDATION DESIGN WIND SPEED (MPH)	DIMENSIONS A	B	C	D	BOTTOM REINFORCING BAR SIZE
125	204	204	53.62	60.10	#7(7/8" DIA)
90	150	150	26.62	33.10	#4(1/2" DIA)

NOTES:
1. FOOTINGS DESIGNED FOR 125 MPH AND 90 MPH WIND.
2. REINFORCING BARS SHALL CONFORM WITH ASTM A-615-68. ALL BARS SHALL BE GRADE 60.
3. CONCRETE SHALL BE 3000 PSI COMPRESSIVE STRENGTH AT 28 DAYS.
4. SOIL BEARING CAPACITY TO BE A MINIMUM OF 2000 PSF (9765 KG/M^2).
5. DO NOT WELD ANCHOR BOLTS.
6. FROST LINE TO BE A MAXIMUM OF 24 IN. BELOW GRADE.
7. USE SCIENTIFIC-ATLANTA FOUNDATION TEMPLATE 263031 TO INSURE PROPER ANCHOR BOLT LOCATION.
8. PROPER ELECTRICAL GROUNDING SHALL BE PROVIDED BY THE INSTALLING CONTRACTOR TO MEET LOCAL APPLICABLE CODES. THIS MAY TAKE THE FORM OF A BURIED GRID OR A SUITABLE COPPER STAKE, DEPENDING ON LOCAL SOIL CONDITIONS. THE MOUNT SHALL BE ELECTRICALLY CONNECTED TO THE GROUND.
9. PROVISIONS MUST BE MADE TO PROVIDE SUITABLE SUPPORT FOR POWER, RF AND CONTROL CABLES EITHER BY BURIED CONDUIT OR OVERHEAD RACEWAY. IF CONDUIT IS SUPPLIED IT SHALL BE AT LEAST 3 INCHES DIAMETER.
10. THIS DRAWING SUPERSEDES 263024.

Figure 3.1-3. Model 8010-A 7-Meter Antenna Foundation Plan

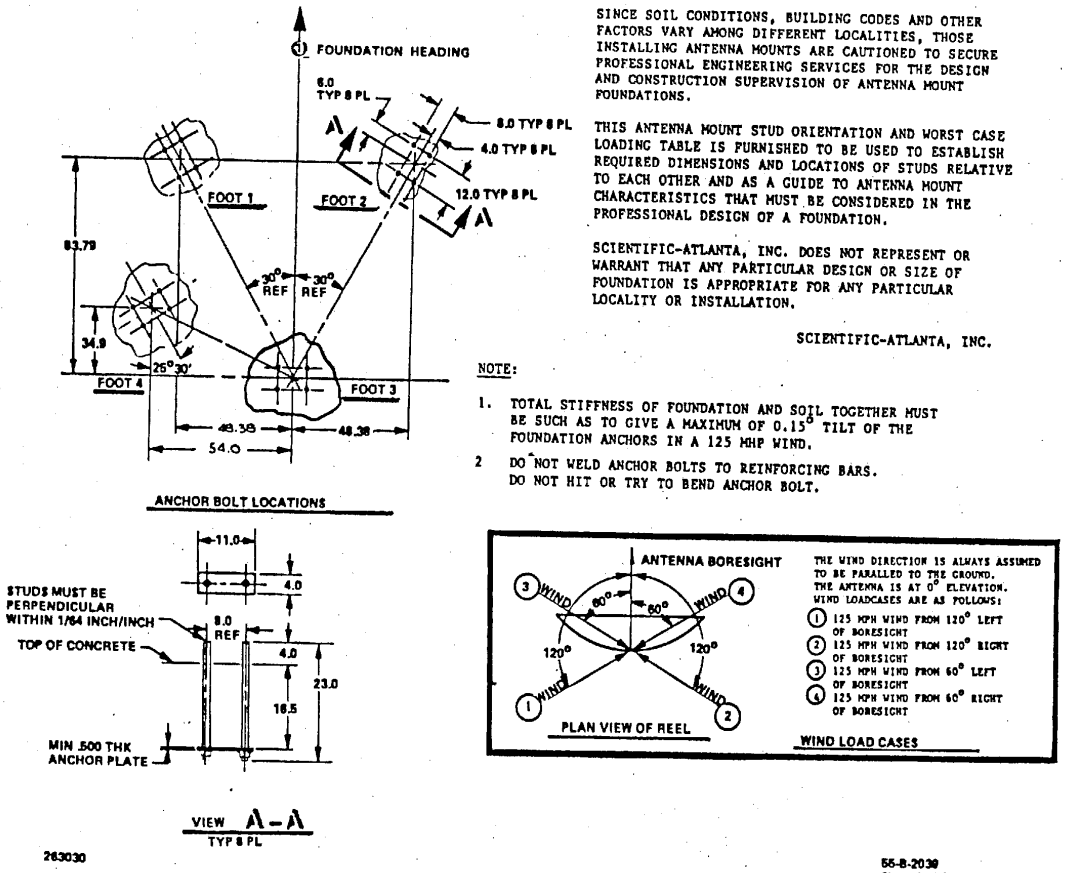
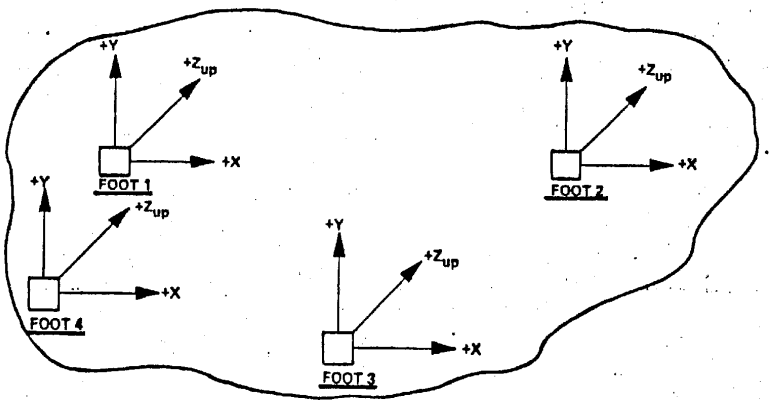


Figure 3.1-4. Model 8010-A 7-Meter Earth Station Antenna Foundation Loads



LOAD DIRECTIONAL SIGN CONVENTION

LOAD CASE	ANTENNA ORIENTATION	FOOT 1 FX	FOOT 1 FY	FOOT 1 FZ	FOOT 2 FX	FOOT 2 FY	FOOT 2 FZ	FOOT 3 FX	FOOT 3 FY	FOOT 3 FZ	FOOT 4 FX	FOOT 4 FY	FOOT 4 FZ
1	77.5° Right	3547	-6007	7045	330	582	-683	25963	-23575	-6362	-25934	25999	0
2	of Foundation	-1266	2143	-2514	2860	5042	-5914	-25255	23172	8428	25923	-25989	0
3	Heading	-11165	18907	-22173	-13418	-23660	27746	-17162	15527	-5572	15042	-15079	0
4		-8880	15039	-17636	-14612	-25765	30214	12368	-11592	-12577	-14895	14933	0
1	37.5° Right	2675	-4525	5326	1555	2724	-3208	25444	-25297	-2118	-24976	25613	0
2	of Foundation	-1519	2569	-3024	1997	3496	-4117	-24796	24400	-7142	24951	-25587	0
3	Heading	-5991	10131	-11927	-15514	-27169	31985	-16667	18781	-20057	14551	-14921	0
4		-4165	7044	-8292	-15704	-27503	32377	12213	-10014	-24084	-14270	14634	0
1	30° Right	1821	-3089	3651	2417	4187	-4949	8711	-18382	1297	-8097	18137	0
2	of Foundation	-2401	4074	-4815	943	1633	-1930	-8324	17034	6746	8099	-18121	0
3	Heading	1637	-2781	3287	-15078	-26116	30866	-6142	16861	-34153	4713	-10558	0
4		3461	-5872	6940	-14450	-25029	29580	3483	-3639	-36521	-4628	10368	0
1		520	-890	1053	2767	4735	-5605	9627	-19278	4552	-9141	18599	0
2	0° (Along Foundation	-2808	4806	-5689	-478	-819	970	-9629	17771	4719	9143	-18604	0
3	Heading)	9133	-15571	18905	-10749	-18395	21774	-5436	18097	-40680	5276	-10735	0
4		10775	-18439	21827	-9358	-16014	18956	5435	-3283	-40783	-5276	10735	0
1		-878	1521	-1799	2400	4074	-4815	14813	-21996	6614	-14649	21028	0
2	30° Left	-2482	4298	-5081	-1820	-3089	3651	-15215	20695	1429	14670	-21059	0
3	of Foundation	14411	-24961	29500	-3459	-5871	6939	-7200	18694	-36440	8383	-12035	0
4	Heading	15118	-26186	30948	-1639	-2781	3287	9925	-5883	-34236	-8537	12255	0
1		-1949	3414	-4020	1542	2606	-3069	25576	-27107	7089	-25811	25969	0
2	37.5° Left	-1603	2807	-3305	-2698	-4562	5371	-26237	26276	-2066	25851	-26009	0
3	of Foundation	15674	-27450	32316	4152	7021	-8266	-12664	19446	-24049	14766	-14856	0
4	Heading	15544	-27222	32047	6005	10155	-11955	17127	-11259	-20091	-15056	15148	0
1		-2772	4888	-5733	1143	1936	-2271	25372	-28483	-8004	-26015	26029	0
2	77.5° Left	-417	735	-863	-3424	-5801	6803	-26075	28115	-5939	26040	-26053	0
3	of Foundation	14559	-25671	30106	8748	15155	-17772	-12440	18092	-12333	14952	-14960	0
4	Heading	13471	-23752	27855	11096	18790	-22036	17236	-14449	-5819	-15100	15107	0

125 MPH WIND LOADS

THE DEADWEIGHT OF THE ANTENNA IS 4500 LBS AND ACTS IN THE -Z DIRECTION AT FOOT 3

7.0 METER FOUNDATION LOADS (125 MPH WIND AND DEADWEIGHT..) ALL LOADS IN LBS

263030

55-B-2039
Sheet 2 of 2

Figure 3.1-4. Model 8010-A 7-Meter Earth Station Antenna Foundation Loads (Sheet 2 of 2)

The erection is then complete and the azimuth and elevation adjusting struts are positioned to obtain the proper pointing angles.

3.1.8 FOUNDATION REQUIREMENTS

A typical foundation plan is shown in Figure 3.1-3. The foundation heading will be determined by simple calculation for each site based on the site latitude and longitude. However, significant installation errors in the foundation heading can be tolerated due to the large azimuth travel of the mount. Foundation loads are shown on Figure 3.1-4.

3.1.9 SHIPPING AND INSTALLATION

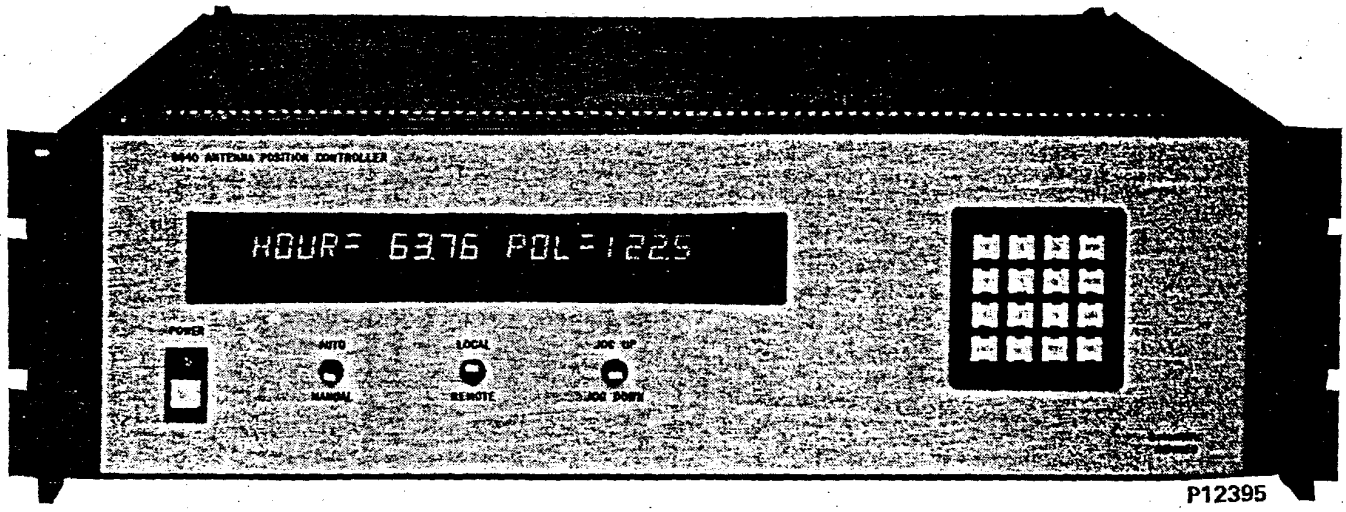
The design parameters of the Series 8010 antennas and the manufacturing processes employed were chosen to minimize costs of shipping and installation. The antenna, when crated, weighs approximately 6,500 lbs. and occupies a volume of approximately 820 cubic feet.

The installation procedures, as mentioned previously, require no field alignment of reflector components, which greatly simplifies the task. Alignment accuracy is built in to the component parts through precision tooling and manufacturing techniques.

3.1.10 SERIES 8840 ANTENNA CONTROL SYSTEM

Antenna motor control for the 10m antenna consists of a programmable antenna control unit and a solid state motor control package. The antenna control unit, Model 8840 Antenna Position Controller, is a rack-mounted panel (as shown in Photo No. 12395), which is located for convenient operator access. The solid state control unit, shown in Photo No. 12399, is located at the antenna and is connected by a control cable to the remote Model 8840. Together, this equipment provides complete manual and remote control of the antenna azimuth drive, elevation drive and feed polarization drive.

The Model 8841 Motor Control Unit is a packaged weatherproof enclosure which houses the solid state motor control relays and local control panel. Three phase 208V AC power is connected via a conduit fitting to a terminal block. The 8841 can be connected to the 8840 with up to 2 000 ft. of cable. A local control panel inside the 8841 allows operation of both drive motors from the antenna base. Each antenna axis is equipped with a motor, limit switch assembly, and a precision potentiometer



Model 8840 Antenna Control Unit

position transducer. Fail safe limit switch protection is provided to interrupt motor power if the antenna is driven beyond its safe operating range.

The proposed antenna control system operates at 110°/min. over the full satellite arc. This option permits the user to sweep the full arc in less than 60 seconds for switching between any two satellites in less than one minute.

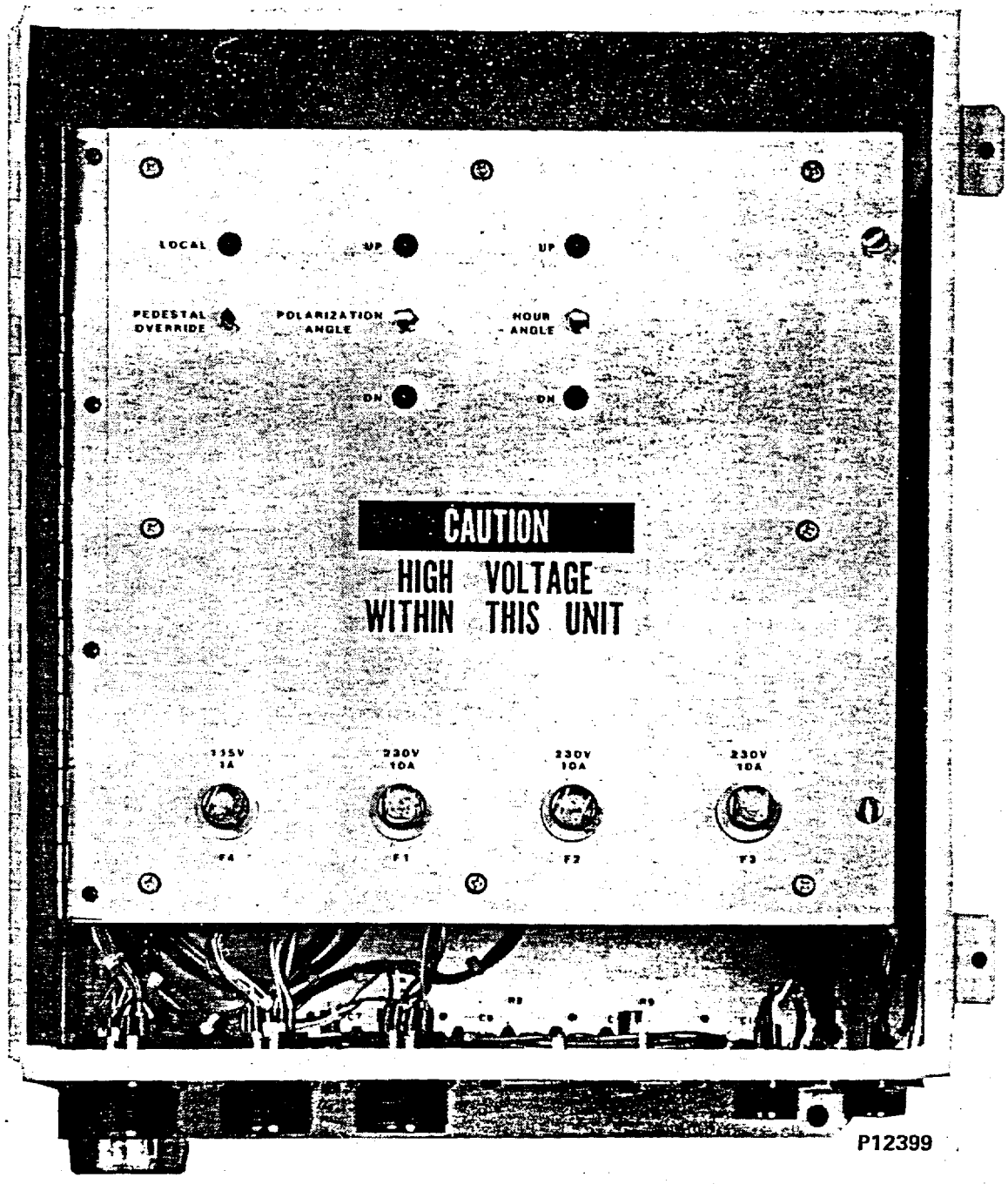
The Model 8840 Remote Controller is a rack-mounted unit 5-1/4: high. Antenna position in degrees is displayed continuously on the front panel. Antenna motion is controlled via a keypad on the front panel. Manual operation of any axis is controlled by use of a jog switch on the front panel. The Model 8840 features a 20 character alpha-numeric display for angle display and operator prompts, a 16 button keypad for operator inputs, and 20 unique satellite memories. The 20 memory locations are each capable of storing a satellite designator via the keyboard. Angular readout accuracies are 0.05° in azimuth, 0.02° in elevation, and 0.05° in polarization.

The Model 8840 and 8841 are designed with the latest microprocessor and solid state motor control circuits. Extensive self-test procedures and elaborate transient protection techniques ensure reliable operation and easy maintenance.

Table 3.1-2 lists the Model 8840 controls and indicators.

Table 3.1-2. Model 8840 Controls and Indicators

Control Indicator	Function
Power	Controls power to unit
Auto/Manual Switch	Selects manual positioning mode (jog switch) or automatic positioning mode.
Local/Remote Switch	Selects local or remote operation of 8840.
Jog Switch	Used to manually position azimuth, elevation or polarization axis
Keyboard	Used to enter control and command information
Display	20 character. alphanumeric display for antenna position and other information



Model 8841 Contactor Box for Antenna Control -- Interior View

3.2 LOW NOISE CONVERTER SUBSYSTEM SERIES 360

Most earth station receivers in use today get their inputs from the antenna electronics directly at the 3.7 to 4.2 GHz satellite downlink band. Professional quality receivers are usually of the double conversion type and must include a microwave local oscillator, mixer and filter in their first converters. Channel selection within the band is done in a receiver by choosing the first LO frequency to mix only the desired channel down to the first intermediate frequency (IF).

The proposed block converter approach takes the first frequency conversion of the double conversion system and moves it out to the antenna with the low noise amplifier (LNA). However, channel selection can no longer occur at the first converter for multiple receiver configurations. Instead, channel selection must be done by selecting the LO frequency in the remaining converter in each receiver. The function of the block converter is to convert the entire block of frequencies (channels) to the input frequencies of the receiver (270-770 MHz in the Series 360 LNC and Model 6650 Video Receiver). Figures 3-1b and 3-2 show the proposed input scheme to the Series 6650 Receiver as compared with the typical earth station configuration shown in Figure 3-1a.

Since any given type of coaxial cable becomes increasingly lossy as the frequency through it is increased, adding length to a cable run also increases the loss. In addition, cable types with lower loss characteristics are more expensive than lossier coax. Considering these factors it is easy to see the advantages in cabling cost and flexibility of converting to a lower frequency band at the antenna. Longer lengths of low loss cable can be used or traded off for shorter runs of less expensive cable. Either way, the cost of the cable is substantially less than that of microwave cable.

Another important advantage to the block conversion scheme is that multiple receivers can now share more of the electronics. An LNC at the antenna is more expensive than just an LNA, but only one is needed for several receivers. The receivers contain no expensive microwave electronics and only need to perform one frequency conversion, instead of the usual two.

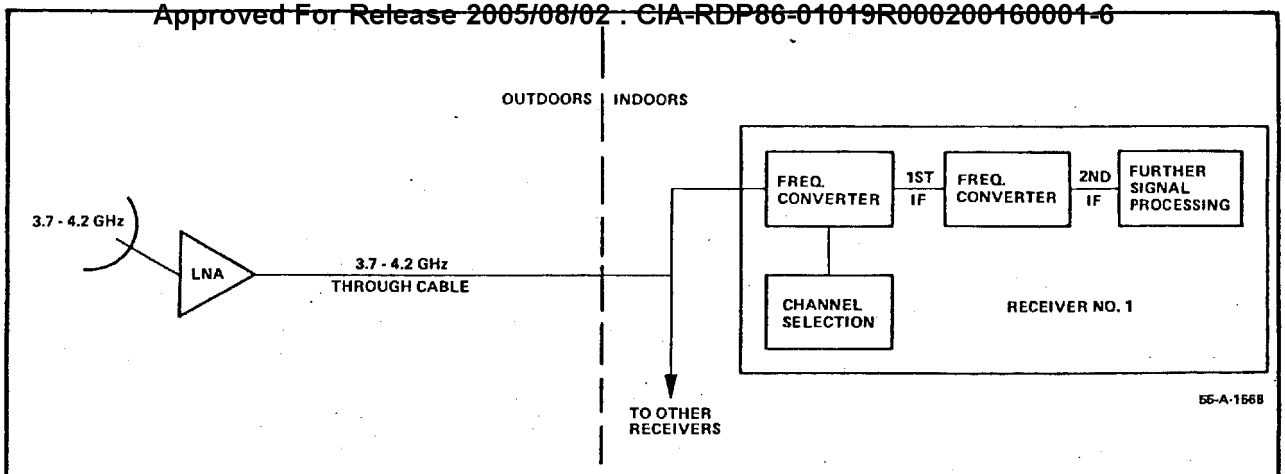


Figure 3.2-1a A Typical Earth Station

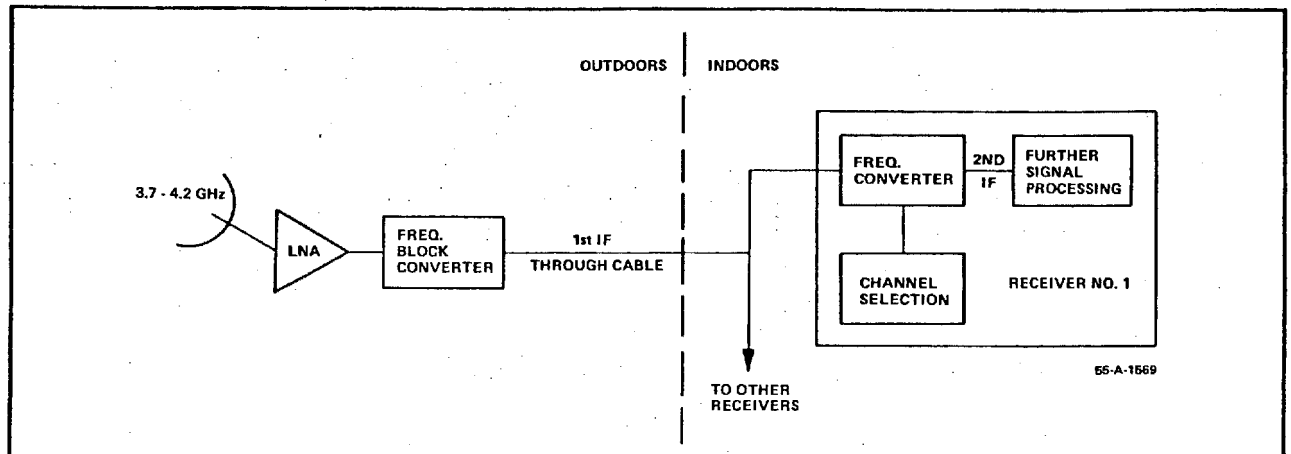


Figure 3.2-1b Block Conversions at the Antenna

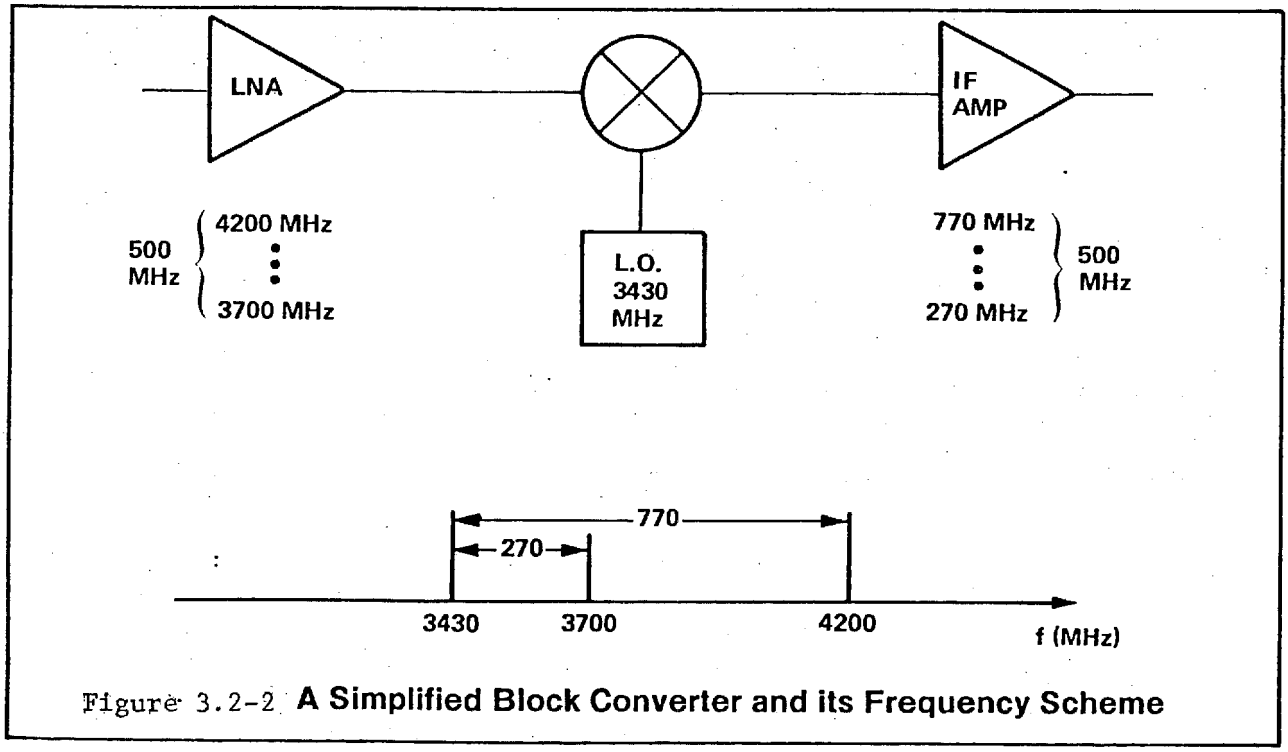


Figure 3.2-2 A Simplified Block Converter and its Frequency Scheme

3.2.1 LOW NOISE AMPLIFIER

The 3.7 - 4.2 GHz low noise amplifier used in the converter is essentially the first four stages of the Series 3000 LNA. The amplifier consists of two Gallium Arsenide Field Effect Transistor (GaAs FET) stages cascaded with two silicon bipolar transistor stages. Its purpose is to establish the noise temperature of the converter and to provide sufficient gain to overcome the losses and noise temperature contributions of the image filter, mixer and IF amplifier. These losses and noise contributions are not as great as those of a cable at microwave frequencies, and hence the greater gain of the Series 300 LNA is not required.

3.2.2 POWER SUPPLY

The LNC will receive DC power through the center conductor of the cable. The power supply board takes this voltage and converts it to the regulated supply voltages required by the circuits.

The power supply board also uses a voltage inverter to convert the positive DC voltage into a negative voltage to reverse-bias the FET gates in the LNA.

3.2.3 SPECIFICATIONS

The following details the specifications for the Series 360 LNC.

Conversion gain is specified for the LNC instead of the usual simple gain to indicate that the input and output frequencies are different.

Frequency Range	3.7 to 4.2 GHz
Input Level	-75 dBm to -95 dBm per channel
Input Impedance	50 ohm
Noise Temperature at 25°C	90°K
Return Loss	20 dB min
Conversion Gain	56 dB $\pm$ 3 dB
Image Rejection	50 dB min
IF Frequency Band	270 to 770 MHz
IF Output Impedance	75 ohm
IF Return Loss	17 dB min
Temperature	-40°C to +60°C full specification
Input Connector	CPR 229G flanged

Output Connector	Type F
Supply Voltage	+15V to +21V
Power Requirements	400 mA max at 15 to 21 volts

3.3 RECEIVE SUBSYSTEM

3.3.1 Model 6650 Video Receiver

The increased use of satellite earth stations by cable operators, broadcasters, hotel/motel operators, and many others, coupled with an increase in the number of subcarrier services per transponder has created a need for a lower cost, more compact and better performing receiver system. The Model 6650 Video Receiver was designed to meet this need.

First, the receiver takes advantage of block downconversion at the antenna. This eliminates costly pressurized heliax runs and microwave components from the unit. Second, two receivers fit into a standard 19" rack, thus reducing the amount of space needed for mounting the units. Third, the video demodulator performs well in the presence of multiple subcarrier signals. This decreases the problem of reduced threshold performance on multiple subcarrier transponders. Fourth, the receiver is of a high enough quality and reliability to meet all the demands placed upon it by Scientific-Atlanta's customers.

3.3.2 GENERAL DESCRIPTION

A block diagram of the Model 6650 Video Receiver connected to two Series 360 Low Noise Converters (LNCs) is shown in Figure 3.3-5. The 270 to 770 MHz signals from the LNCs enter the 6650's RF Converter, where first the proper polarization for the desired channel is selected. Next, the desired signal is converted to an IF frequency of 230 MHz. The signal then passes through the IF filter, where amplification, filtering and AGC is performed. The signal, now ready for demodulation, is converted into a baseband spectrum of 1 Hz to 10 MHz by the video demodulator. The baseband signal is passed to four points:

- The video clamp which filters and restores the DC level of the video contained within the baseband signal.
- The audio demodulator which selects the desired subcarrier and demodulates the audio present on it. This audio signal is available on the rear panel as AUDIO 1.
- Auxiliary slot A10, which may be used for an additional audio demodulator.
- The rear panel, for monitoring purposes or for connection to other equipment (i.e., stereo decoders, data modulators, etc.).

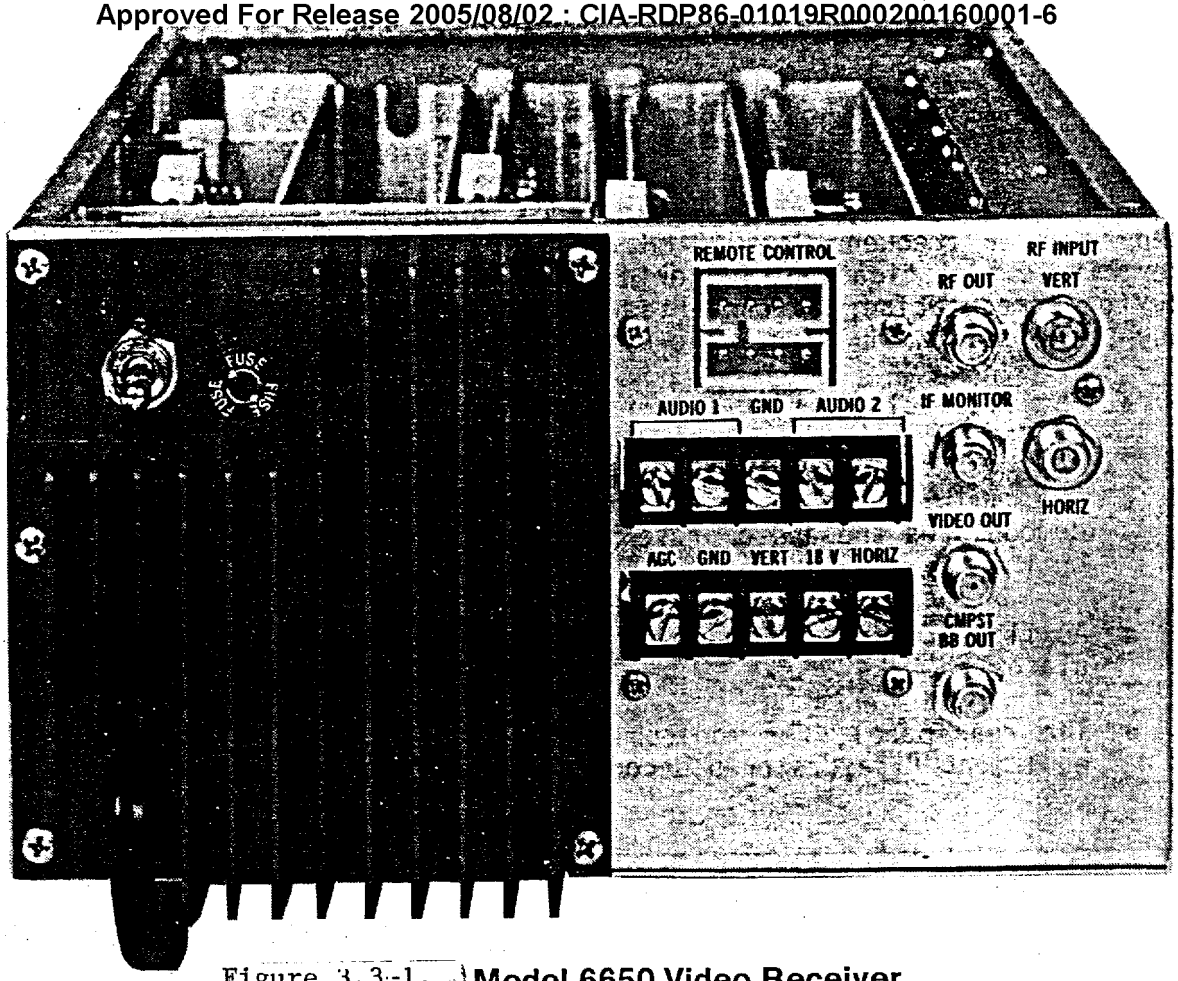


Figure 3.3-1. Model 6650 Video Receiver

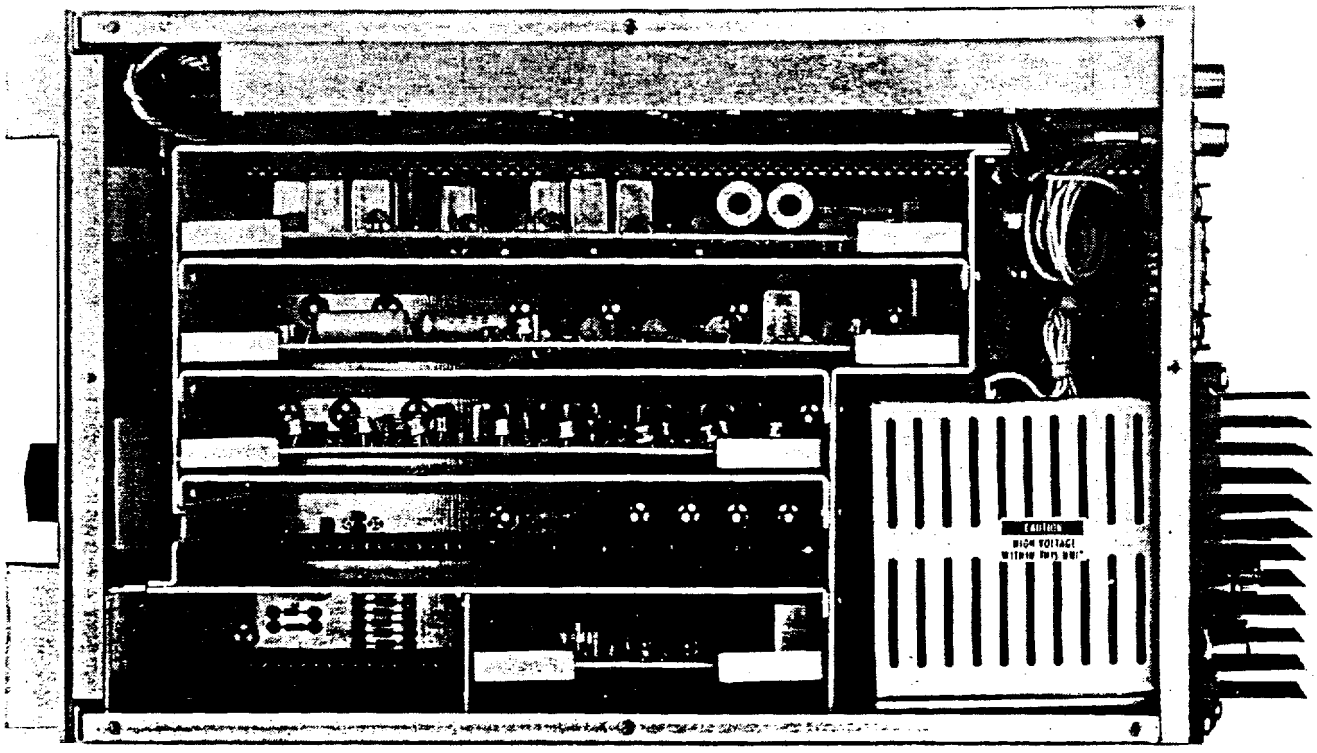


Figure 3.3-2. Model 6650 Video Receiver and its Card Cage

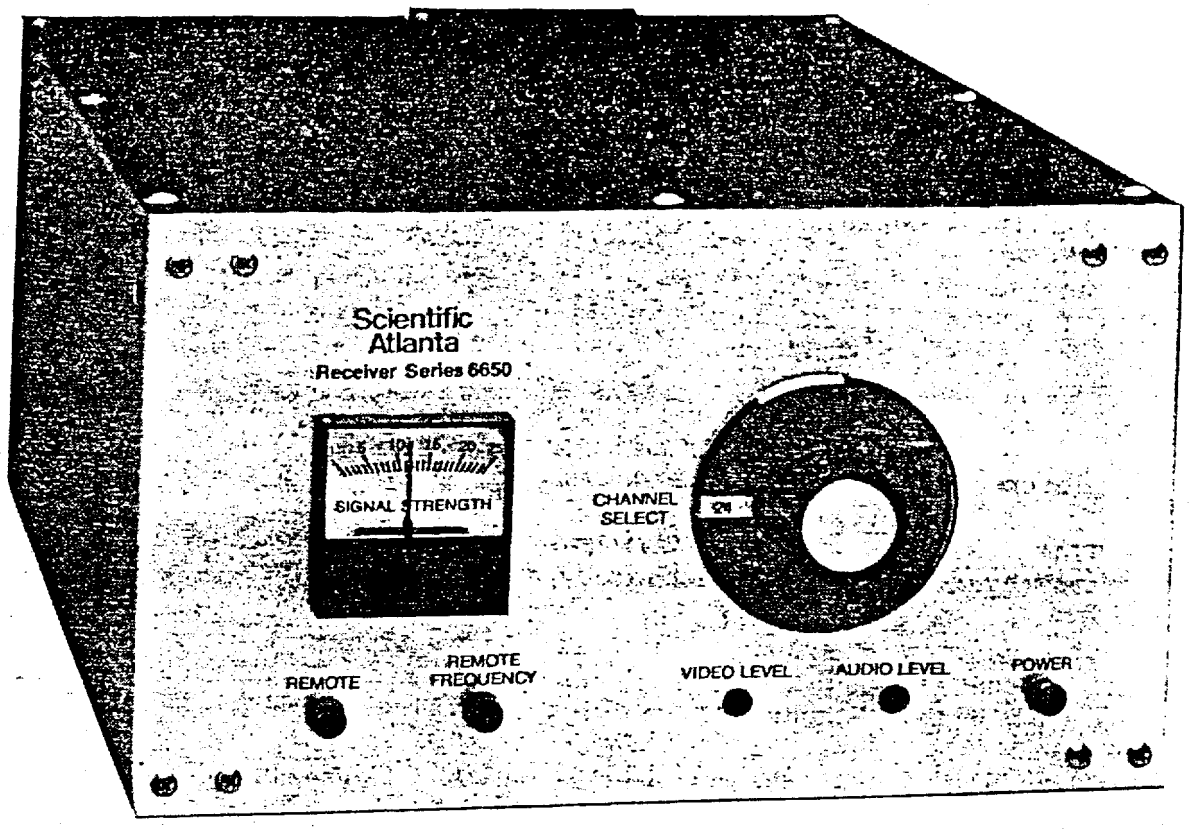


Figure 3.3-3 **Model 6650 Video Receiver**

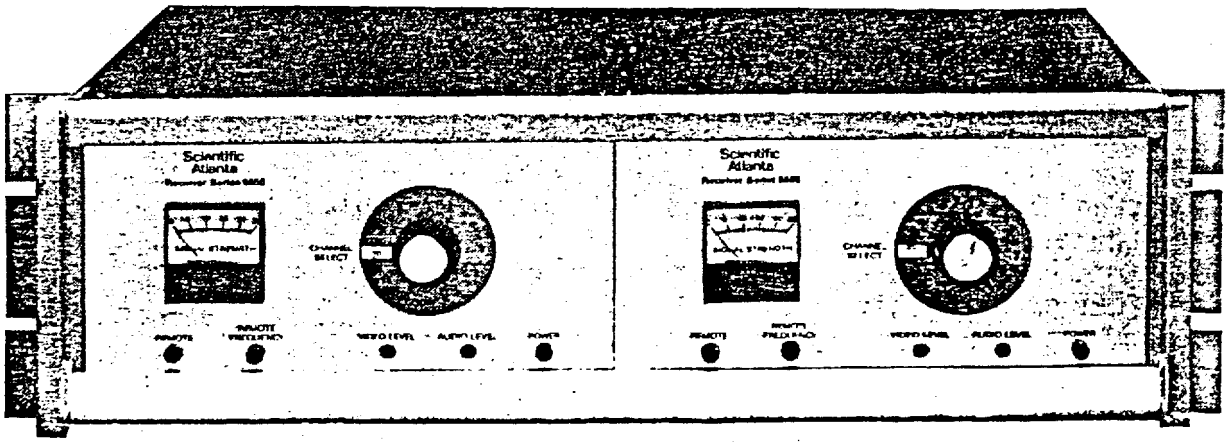


Figure 3.3-4 **Model 6650 Video Receiver Dual Rack Configuration with Rack Adapter**

3.3.3 BLOCK DOWNCONVERSION

The RF signals in the frequency band of 3.7 to 4.2 GHz are received by the antenna and routed to one of two Series 360 LNCs through an orthogonal mode transducer (OMT). The OMT separates the vertically and horizontally polarized signals into two 500 MHz bandwidth segments, both at 3.7 to 4.2 GHz. The LNCs take each of these segments, amplify and block downconvert each of them to two 500 MHz bandwidth signals, now in the 270 to 770 MHz band. From here each signal is sent via its own coaxial cable to the RF inputs of the Model 6650 Receiver.

The 270 to 770 MHz band was chosen for several reasons:

- Lower cost cable may be used to connect the 6650 Receiver to the LNC. RG-59 or RG-6 is recommended for most applications.
- Low cost UHF power splitters may be used to distribute the signals to multiple receivers. These are readily available and cost much less than conventional microwave power splitters.
- Convenient and easily obtainable F-type connectors are used. F-type connectors are lower cost than the conventional N-type needed for microwave signals.
- Microwave components are eliminated from the receiver. This allows the use of less complicated and more reliable circuitry in the RF converter part of the 6650 Receiver.

3.3.4 POWER SUPPLY

The power supply is a conventional 3 terminal regulator type which plugs into a 115V AC $\pm$15V AC outlet, and provides $\pm$15V DC and +18V DC to the receiver. The $\pm$15V DC is used to power all the modules inside the 6650 Receiver. The +18V DC is used to power a Series 360 LNC, either by a separate power cord or via the coaxial cable connecting it to the receiver. Both DC supplies have current foldback and overvoltage protection.

3.3.5 SPECIFICATIONS

The following table is a listing of the Model 6650 Video Receiver technical specifications. As compared to most link specifications, it can be seen that the 6650 Receiver is relatively transparent.

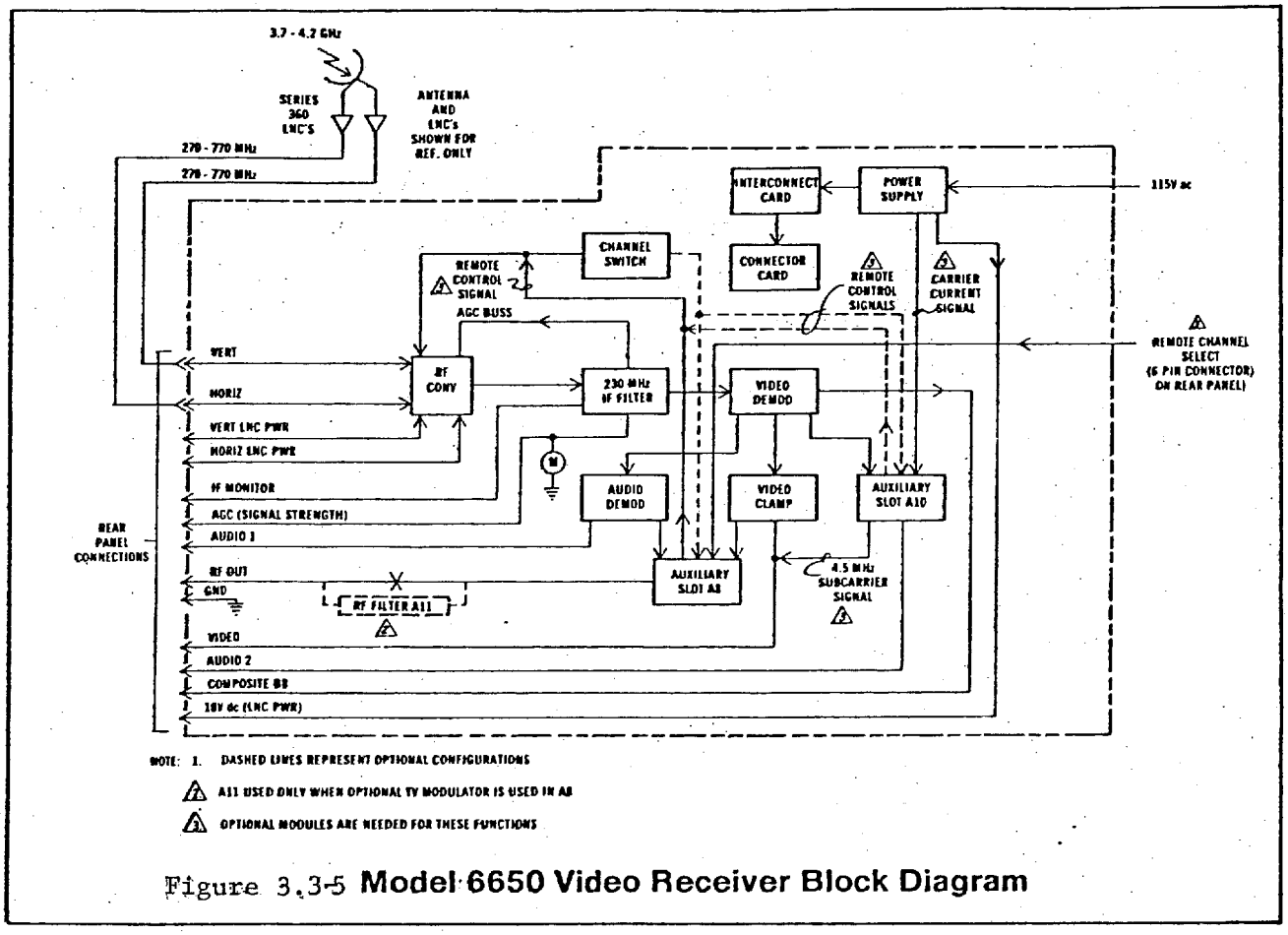


Figure 3.3-5 **Model 6650 Video Receiver Block Diagram**

MODEL 6650 VIDEO RECEIVER TECHNICAL SPECIFICATIONS

Characteristic	Specification
RF Input	
Level	-75 dBm to -35 dBm
Frequency	270 MHz to 770 MHz
Impedance	75 ohms
Return Loss	>14 dB
Noise Figure	12 dB Max
Image Rejection	>45 dB
IF	
Intermediate Frequency	230 MHz
Effective Noise Bandwidth	32.0 MHz
Impedance	75 ohms
Return Loss at IF Monitor Part	>15 dB
Dynamic Operating Range	40 dB
Video	
Baseband	Deemphasis 525-line CCIR Rec. 405-1
Dviiation Range	6 to 12 MHz peak at deemphasis crossover frequency
Video Level	1V peak-to-peak $\pm$3 dB, adjustable
Response (15 Hz to 4.2 MHz)	$\pm$1.0 dB
Impedance	75 ohms unbalanced
Return Loss	>26 dB
Polarity	Balck-to-white: positive going
Clamping	40 dB dispersal rejection
Line-Time Waveform Distortion	<1% tilt
Field-Time Waveform Distrotion	<1% tilt
Differential Phase	$\leq\pm1.5^{o}$ 10% to 90% APL
Differential Gain	$\leq\pm$3% 10% to 90% APL
Audio	
Subcarrier Frequency	6.8 MHz standard, other frequencies available
Frequency Response	30 Hz to 15 kHz $\pm$1.0 dB
Deemphasis	75 s
Output Level	Continuously variable, -10 to +10 dBm
Impedance	600 ohms, balanced
Harmonic Distortion	<1%
Controls	
Rear Panel Power	On/Off
Front Panel	
Video Level	Adjusts video output level to 1V peak-to-peak $\pm$3dB
Audio Level	Adjusts audio output level -10 to +10 dBm
Local Frequency Switch	In 20 MHz increments, 24 channels

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Top Panel	
AGC/MGC	Selects automatic or manual gain control of IF filter/amplifier
MGC	Adjusts gain of IF filter/amplifier
Zero-on-Noise	Allows calibration of meter for C/N measurements
General	
Operating Temperature	0°C to +50°C (32°F to 122°F)
Mechanical	
Height	126.5 mm (4.98 inches)
Width	209.8 mm (8.26 inches)
Depth	347.7 mm (13.69 inches), excluding fron panel knob
Power Requirements	75 watts max at 100 to 130V AC, 60 Hz

Options

5.8 MHz Subcarrier Demodulator
6.2 MHz Subcarrier Demodulator
6.8 MHz Subcarrier Demodulator
Interface Logic Board Remote Control
Class I TV Modulator

Satellite Transponder Frequencies

Single Polarization Satellite Transponder Number (Note 1)	Dual Polarization Satellite Transponder Number (Note 2)	Center Frequency (MHz)	Block Converted Frequency (MHz)
1	1 (V)	3720	290
	2 (H)	3740	310
2	3 (V)	3760	330
	4 (H)	3780	350
3	5 (V)	3800	370
	6 (H)	3820	390
4	7 (V)	3840	410
	8 (H)	3860	430
5	9 (V)	3880	450
	10 (H)	3900	470
6	11 (V)	3920	490
	12 (H)	3940	510
7	13 (V)	3960	530
	14 (H)	3980	550
8	15 (V)	4000	570
	16 (H)	4020	590
9	17 (V)	4040	610
	18 (H)	4060	630
10	19 (V)	4080	650
	20 (H)	4100	670
11	21 (V)	4120	690
	22 (H)	4140	710
12	23 (V)	4160	730
	24 (H)	4180	750

NOTES:

1. Transponder assignments for 12-channel satellites are all horizontally polarized.

2. Transponder assignments for 24-channel satellites are horizontally polarized for the even-numbered transponders and vertically polarized for the odd-numbered transponders.

SECTION 4

SYSTEM INSTALLATION

4.1 GENERAL

Scientific-Atlanta proposes to install the Series 8000 Video Earth Station on customer-provided property. Services provided by Scientific-Atlanta include the following:

- Complete installation of earth station antenna on a foundation
- Installation of all transmission lines between antenna and equipment building or shelter as applicable
- Installation of transmission lines conduits between antenna and equipment building
- Installation of customer-provided commercial power tapped off at customer's 480V source - (Scientific-Atlanta to run power lines from source and provide stepdown transformer) - to contactor box at base of antenna.
- Necessary site preparation and ground work for installation.
- Installation supervision from within building to antenna receiver/control room.
- Complete checkout of all antenna, GCE, and other subsystems for proper operation.
- Provide "hands on" training for station personnel to demonstrate proper operation of all earth station subsystems.

The antenna will be erected by a crew experienced in installing Scientific-Atlanta's earth station antennas, working under the full time supervision of a Scientific-Atlanta field installation supervisor. All transmission line hardware and GCE will be installed and checkout out by engineers and technicians from Scientific-Atlanta's Satellite Communications Division.

Installation of the antenna can be completed by a four man crew in approximately four working days. The time required to install the associated ground communications equipment varies with the specific site and station configuration. Over 5,000 Scientific-Atlanta's Series 8000 earth stations are now in commercial service. Numberous Scientific-Atlanta 10m earth stations are in service throughout the world, including 12 systems in Alaska, 25 systems in Indonesia, and over 200 in the United States.

SECTION 5
TEST PROGRAM

5.1 GENERAL TEST PROGRAM

The test program for the earth station is comprised of the following phases:

a. Standard production module and unit tests.
b. Subsystem tests performed at Scientific-Atlanta and/or vendor's plant.
c. Earth station integration and acceptance tests.

5.1.1 STANDARD PRODUCTION TESTS

Standard production tests include module, PC board, and unit tests that are specified by engineering and conducted as part of the production cycle. These tests are performed using production test procedures.

5.1.2 SUBSYSTEM TESTS

All subsystems will be thoroughly tested to ensure that individual modules and subsystems meet performance and interface requirements, and to minimize potential system integration problems.

Procured subsystems, when applicable, will be tested at the vendor's plant. Scientific-Atlanta will, at their discretion, either witness these tests or review the final test data.

Scientific-Atlanta manufactured subsystems will be tested to ensure that all equipment has been fabricated in accordance with contract requirements, applicable standards, and specifications. Such testing will further prove the capability of the equipment to meet subsystem performance requirements. Testing will include the following types of tests:

a. A general physical inspection including mechanical tests and visual examination as required to determine that the quality of materials and workmanship is acceptable and that the equipment meets all specified physical characteristics.
b. Electrical performance tests which demonstrate proof of performance of all significant electrical specifications.

c. Input and output signal levels to determine compliance with interface requirements.

5.1.3 EARTH STATION INTEGRATION AND ACCEPTANCE TESTS

Equipment will be installed, checked out, and preliminary tests will be run to assure the customer that the equipment is fully expected to be compliant to the performance specifications before formal acceptance tests are started. On site tests will include antenna tests, receive chain BB/IF/RF tests, RF loop video and audio tests, and functional tests. All tests will be conducted using Scientific-Atlanta on site test procedures. These tests, in conjunction with standard production and subsystem tests, will provide a thoroughly tested facility that demonstrates compliance with overall performance and system requirements.

5.2 TEST CONDITIONS AND TEST EQUIPMENT

All equipment will have previously passed standard production and subsystem test requirements. All equipment will undergo a warm up period of at least two hours before start of acceptance testing. Tests may not necessarily be conducted in the order indicated by the test procedure.

Scientific-Atlanta will provide the test equipment required for the test program. Environmental testing will not be performed. The equipment will be tested in normally encountered lab, production, and outside environments as applicable to each testing phase.

5.3 INDIVIDUAL TEST PROCEDURE OUTLINE

Formal acceptance tests will be performed in accordance with test procedures defined and developed during the program planning phase. Each individual test procedure contains a sequence of instructions for performing the individual acceptance tests. Following are the typical contents of each procedure:

a. Purpose of Test
b. Required Test Equipment
c. Test procedure
    1. Step by step test procedure
    2. Test setup

3. Test data sheet

   a. Performance parameter

   b. Performance requirement

   c. Test data

   d. Date of test

   e. Testing and witnessing personnel's signatures

SECTION 6
DOCUMENTATION

6.1 DELIVERABLE DOCUMENTATION

Scientific-Atlanta will deliver a comprehensive documentation package as part of the proposed earth station program. This documentation is prepared in accordance with Scientific-Atlanta's high quality commercial documentation standards. As a minimum, the documentation package will include:

a. Two copies of standard product operation and maintenance manuals for equipment used.

b. Two copies of vendor's standard operating and maintenance manuals covering the vendor equipment used.

c. Final drawings, including schematic diagrams, cabling diagrams, wire lists, assembly drawings, parts lists, etc., will be furnished as part of the operation and maintenance manuals.

d. Recommended spares list and test equipment list.

e. Other general documentation as required by the customer.

SECTION 7
TRAINING

Scientific-Atlanta will provide training of customer maintenance and operating personnel during the initial installation and checkout of the earth station. Valuable operating and troubleshooting techniques will be demonstrated as well as hands on experience with each equipment component.

Further training sessions providing in depth theory of operation of the earth station equipment are available at Scientific-Atlanta's facility upon request.