704685-0300

INSTRUCTION BOOK

WILCOX MARK 20A CATEGORY I/II/III INSTRUMENT LANDING SYSTEM GLIDE SLOPE GROUP

GLIDE SLOPE ELECTRONIC SUBSYSTEM 098686

GLIDE SLOPE ANTENNA ELEMENT 447791

GLIDE SLOPE DISTRIBUTION UNIT AND COMBINING UNIT 120519

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SECTION 1. GENERAL INFORMATION AND REQUIREMENTS

1.1 INTRODUCTION.- This instruction book provides data required to install, operate, and maintain the Mark 20A Instrument Landing System (ILS) Glide Slope Group manufactured by Airsys ATM, Inc. This instruction book covers the following Mark 20A ILS glide slope group equipment developed in accordance with FAA and ICAO requirements (see figure 1-0):

Nomenclature

Glide Slope Electronic Subsystem

Glide Slope Antenna Element

Glide Slope Distribution Unit and Combining Unit

1.2 EQUIPMENT DESCRIPTION.- The following paragraphs contain physical descriptions and functional descriptions of the Mark 20A ILS glide slope group. Although the glide slope is available as single equiment or single frequency, the following paragraphs describe the most complex configuration; dual equipment, dual frequency. Glide slope antenna arrays are also available as an null reference, sideband reference, endfire and capture effect. The capture effect (two frequency) system is described in the following paragraphs.

1.2.1 Physical Description.- See figure 1-1. Figure 1-1 illustrates the relationship of the major assemblies of the glide slope group. The major assemblies are glide slope electronic subsystem 10; glide slope antenna subsystem 12 which includes glide slope distribution unit and combining unit 11; 24-volt, 100-ampere-hour battery kits A10 and A11; and glide slope environmental sensor kit. These assemblies are described in the following paragraphs.

1.2.1.1 Glide Slope Electronic Subsystem 10.- See figure 1-2. Glide slope electronic subsystem 10 is housed in a 182.88-centimeter (72-inch) high glide slope wired cabinet assembly. Opening the cabinet front door provides access to all the assemblies of glide slope electronic subsystem 10. Subsystem front panel circuit-card assembly (cca) 10A1 is installed on the inside of the wired cabinet assembly behind the silkscreened front panel. The silkscreened front panel mounted on the cabinet above the cardcage and has cutouts that provide access to subsystem control panel cca 10A1 control switches, LED indicators and the RS-232 PMDT connector 10A1J4. The PMDT connector 10A1J4 is the connection point for a pmdt (portable maintenance data terminal). The pmdt is required for setup and maintenance of the Glide Slope group equipment. Mounted in glide slope card cage assembly 10A3 and plugged into the J2 backplane cca 10A3A14 are the following assemblies: synthesizer assemblies 10A3A1 and 10A3A12, audio generator cca 10A3A3 and 10A3A11, monitor cca 10A3A4 and 10A3A10, subsystem interface cca 10A3A5, local control and status unit (lcsu) cca 10A3A6, and remote maintenance monitor computer (RMM) cca 10A3A7. Glide slope ac-dc switch module assemblies 10A2 (equipment 1) and 10A4 (equipment 2) are mounted on either side of glide slope card cage assembly. Mounted on the cabinet inside right and left panels are the following assemblies: dc-dc converter cca 10A5 and 10A6, glide slope course modulator/power amplifier assemblies 10A7 and 10A8, and glide slope clearance modulator/power amplifier assemblies 10A10 and 10A11. Glide slope transfer switch assembly 10A9 is mounted at the back of the cabinet. Two ac-dc converter assemblies, 10PS1 and 10PS2, are mounted at the bottom of the cabinet. The cabinet is installed inside the glide slope shelter.

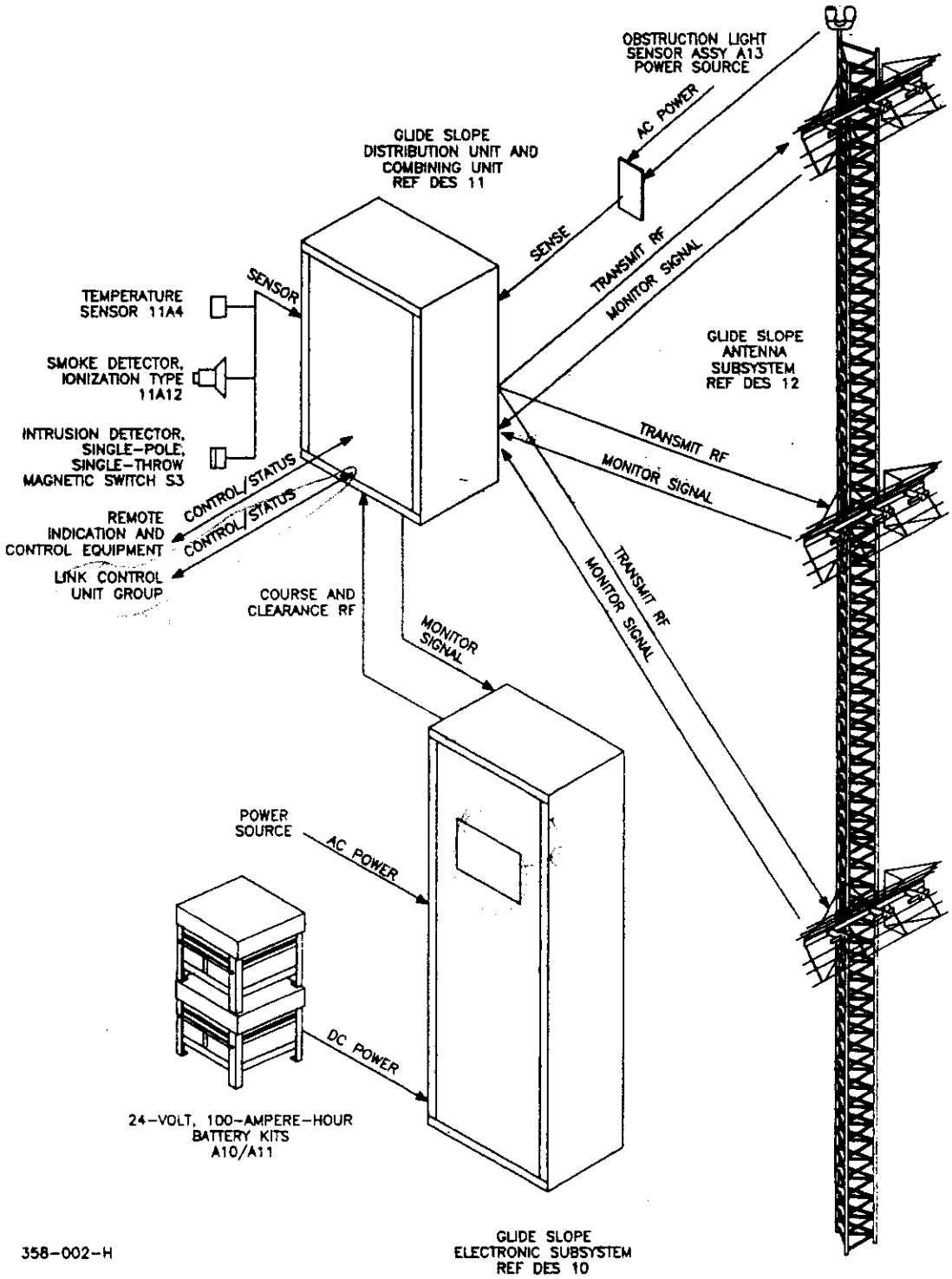

Figure 1-1. Glide Slope Group, Relationship of Units

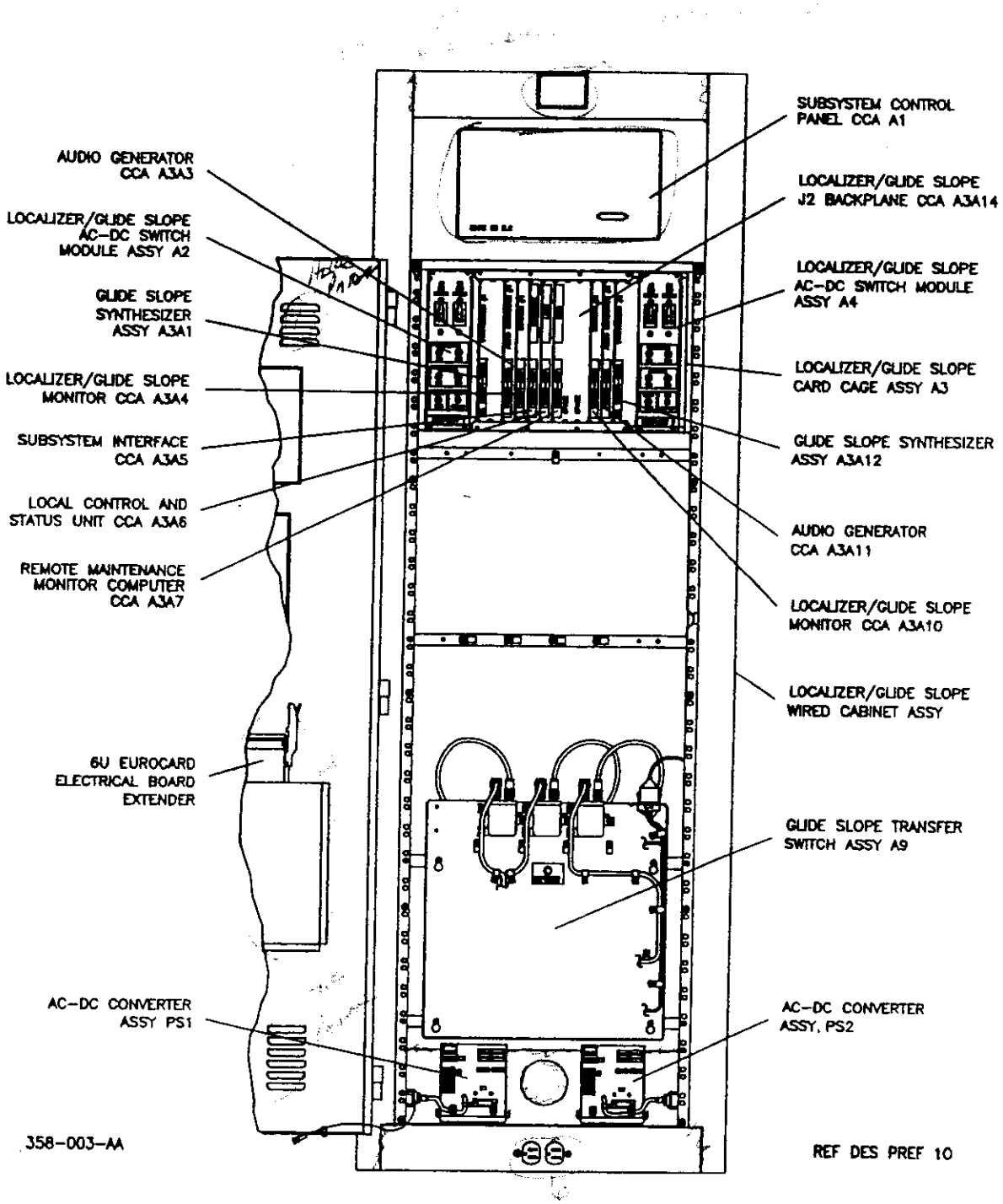

Figure 1-2. Glide Slope Electronic Subsystem 10 (Sheet 1 of 2)

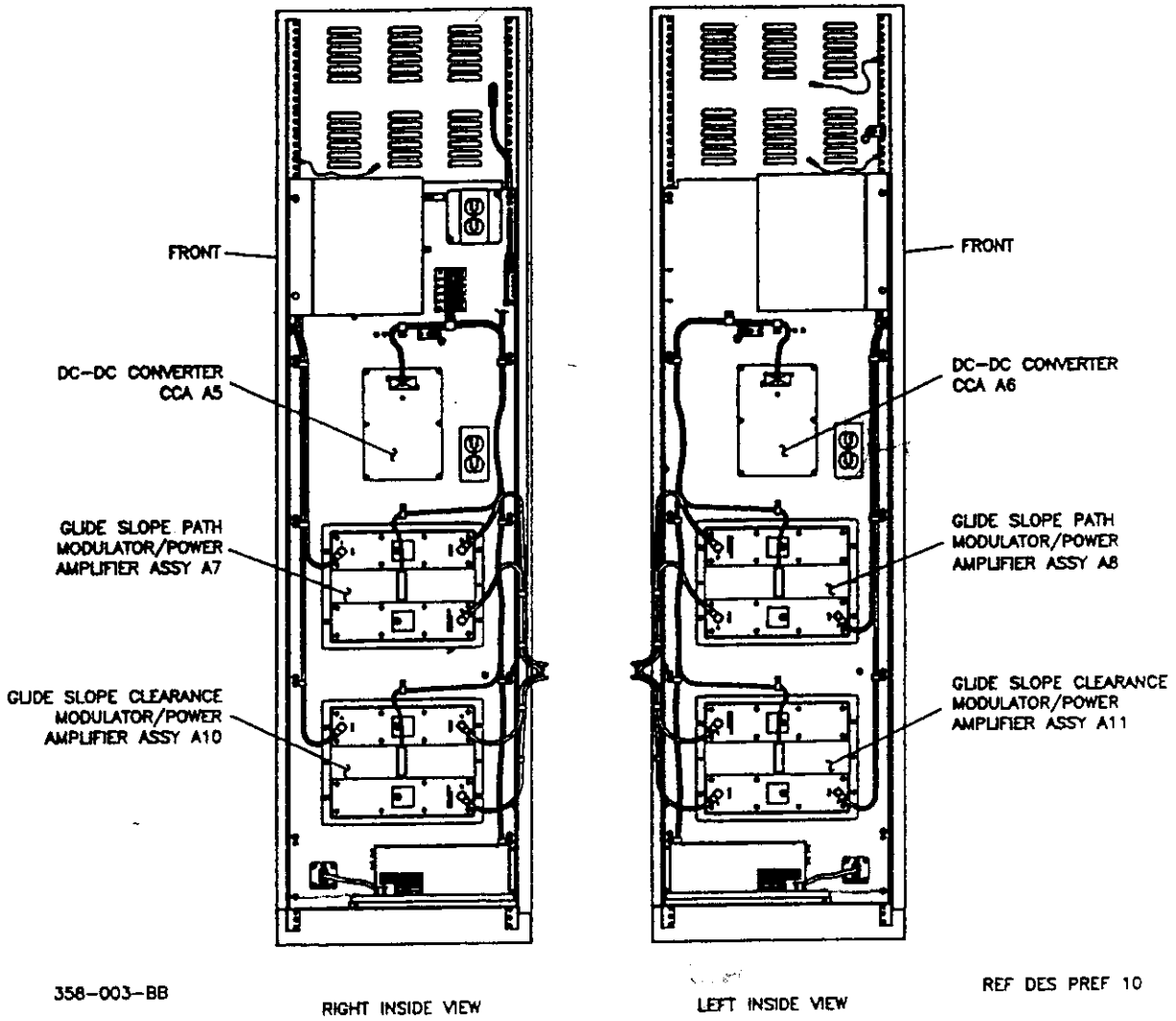

Figure 1-2. Glide Slope Electronic Subsystem 10 (Sheet 2 of 2)

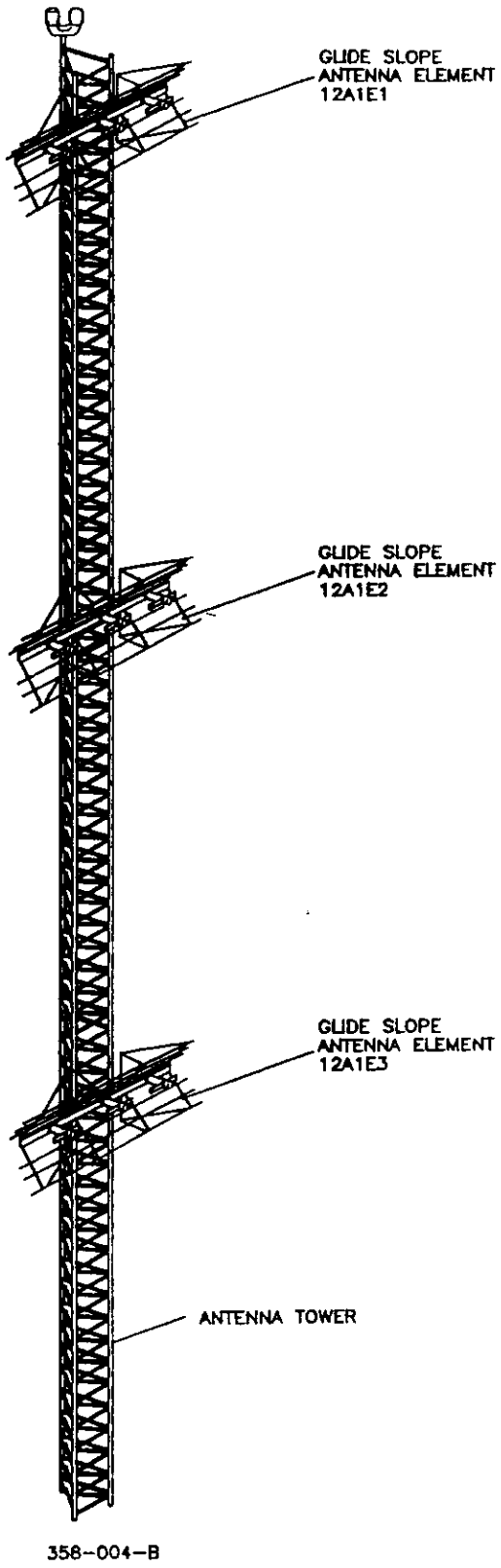

Figure 1-3. Glide Slope Antenna Subsystem 12

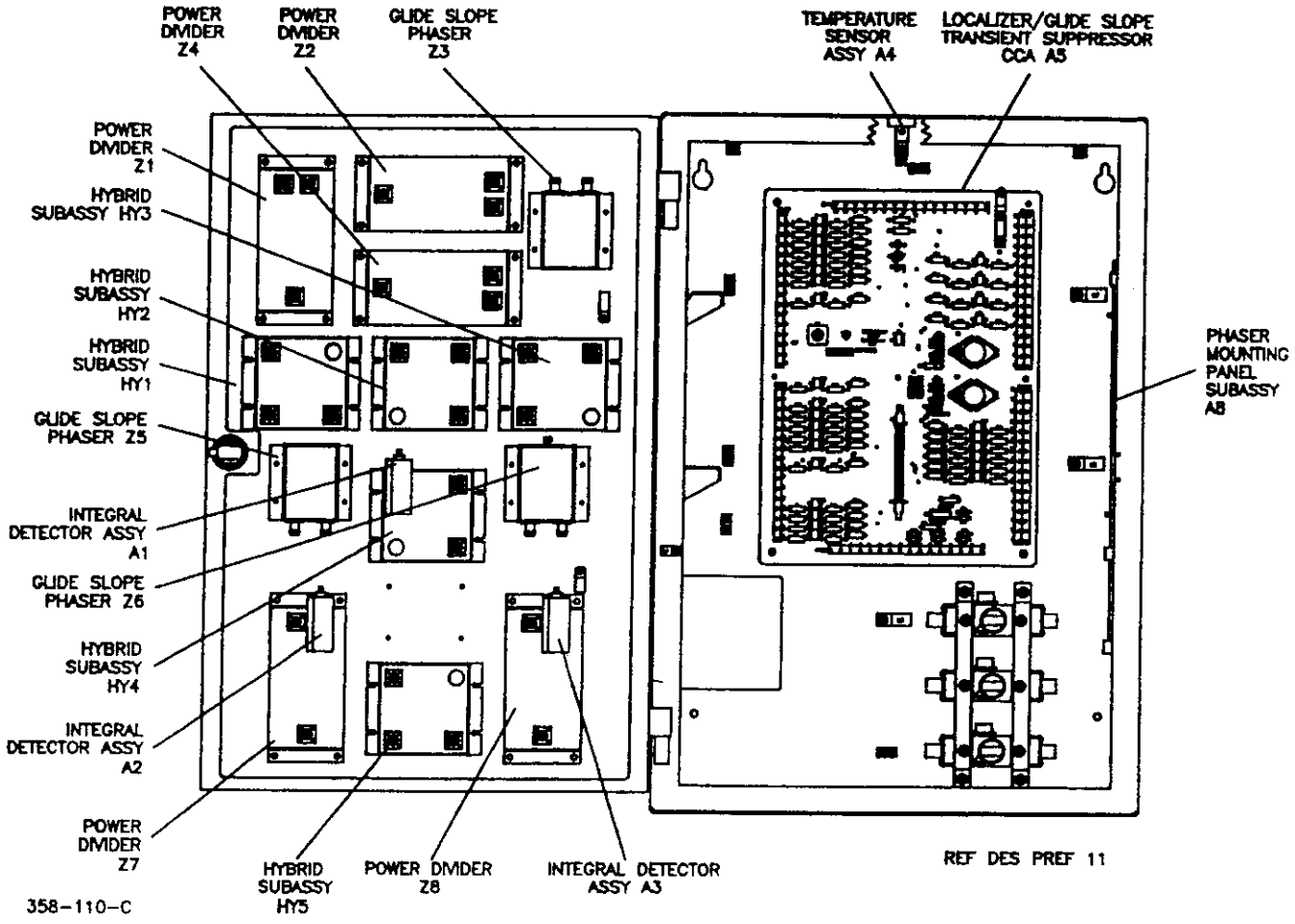

Figure 1-4. Glide Slope Distribution Unit and Combining Unit 11

1.2.1.2 Glide Slope Antenna Subsystem 12.- See figures 1-3 and 1-4. Capture effect glide slope antenna subsystem 12 consists of three glide slope antenna elements 12A1E1 through 12A1E3, glide slope distribution unit and combining unit (ducu) 11, three glide slope antenna mounting kits, a glide slope antenna tower kit, and a glide slope antenna cable kit. Each glide slope antenna element consists of three horizontally polarized, collinear dipoles mounted in front of a 90° corner reflector. The three dipoles are installed on a mounting frame that, in turn, is installed on the 15.24-meter (50-foot) high triangular glide slope antenna tower. Middle antenna element 12A1E2 is located at the approximate center of the glide slope antenna tower with upper antenna element 12A1E1 offset toward the runway and lower antenna element 12A1E3 offset away from the runway. The amount of offset is determined by antenna element heights and distance to the runway centerline. The glide slope antenna tower consists of four tower sections: two 6.10-meter (20-foot) sections and two 1.52-meter (5-foot) sections. The glide slope shelter and glide slope antenna tower are located on either side of the runway along a line that is parallel to and between 121.92 and 198.12 meters (400 and 650 feet) from the runway centerline. Distance from runway threshold is between 243.84 and 396.24 meters (800 and 1300 feet). Glide slope ducu 11 (figure 1-4) is mounted on an inside wall of the glide slope shelter. Accessible at the front door of glide slope ducu 11 enclosure are the following controls: CARRIER POWER DIVIDER 11Z1, SIDEBAND A POWER DIVIDER 11Z2, CARRIER TO SB PHASER 11Z3, SIDEBAND B POWER DIVIDER 11Z4, MIDDLE ANTENNA PHASER 11Z5, UPPER ANTENNA PHASER 11Z6, CLEARANCE POWER DIVIDER 11Z7, AND PATH/WIDTH POWER DIVIDER 11Z8. These assemblies are mounted on the inside of the front door. Also mounted on the inside of the front door are hybrid subassemblies 11HY1 through 11HY5 and integral detectors 11A1 through 11A3. Temperature sensor assembly 11A4 is installed on top of the enclosure with the sensing circuitry protruding into the interior of the enclosure through a cutout. Phaser mounting panel subassembly 11A8 is installed on the inside right side of the enclosure and glide slope transient suppressor cca 11A5 is installed on the inside rear wall of the enclosure.

1.2.1.3 24-Volt, 100-Ampere-Hour Battery Kit A10/A11.- See figure 1-5. Each battery kit contains two 12-volt batteries, a 20-ampere fuse, and a battery tray assembly. The battery kits are installed inside the glide slope shelter.

1.2.1.4 Glide Slope Environmental Sensor Kit.- See figure 1-6. The glide slope environmental sensor kit contains temperature sensor assembly 11A4 (inside temperature), ionization type smoke detector A12, single-pole single-throw magnetic switch (intrusion detector) S3, obstruction light sensor assembly A13, and a glide slope sensor installation kit. Temperature sensor assembly 11A4 is installed on glide slope ducu 11 inside the glide slope shelter. Obstruction light sensor assembly A13 and ionization type smoke detector A12 are installed inside the shelter. Magnetic switch (intrusion detector) S3 is installed on the shelter door and door frame.

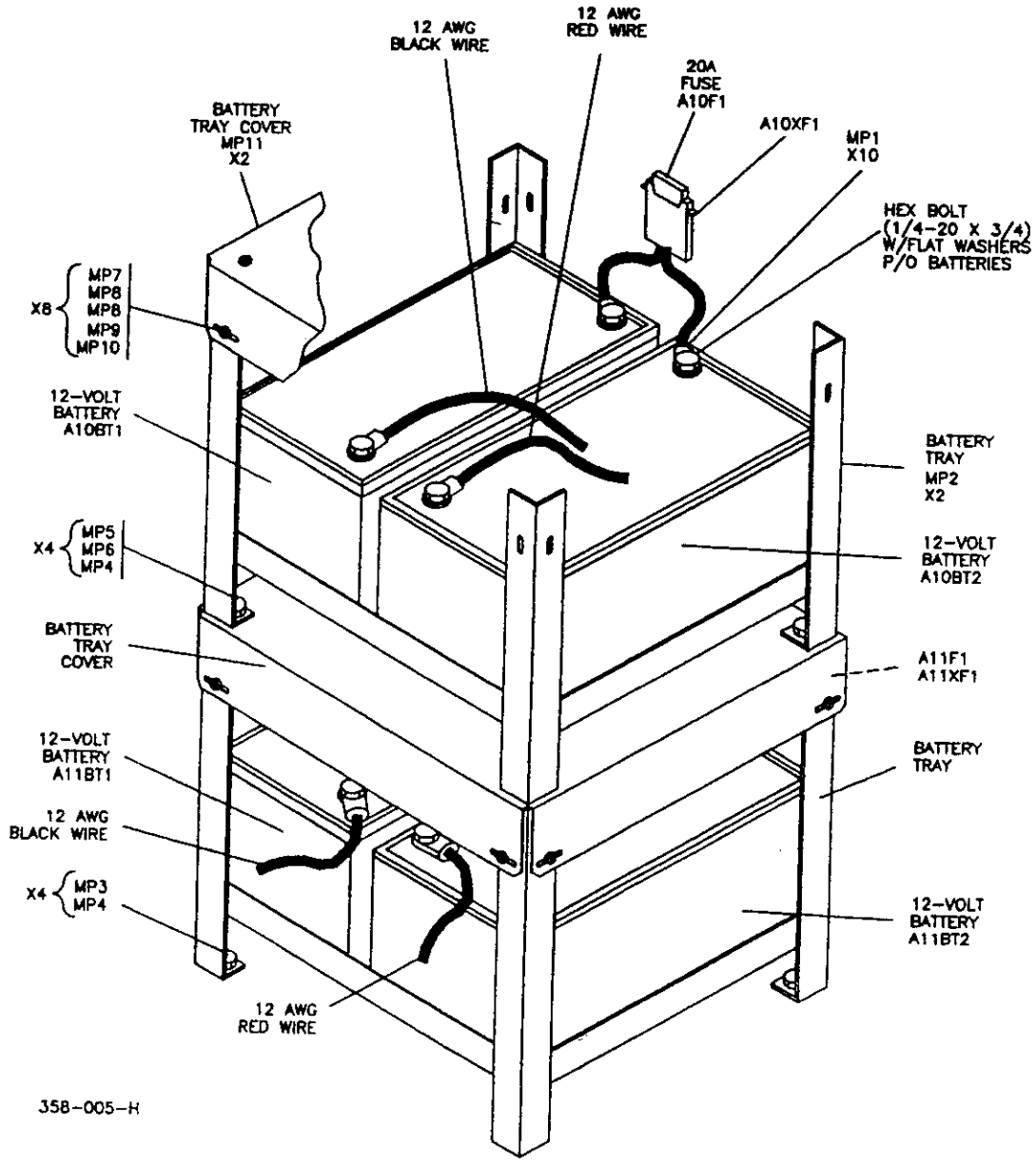

Figure 1-5. 24-Volt, 100-Ampere-Hour Battery Kit A10/A11

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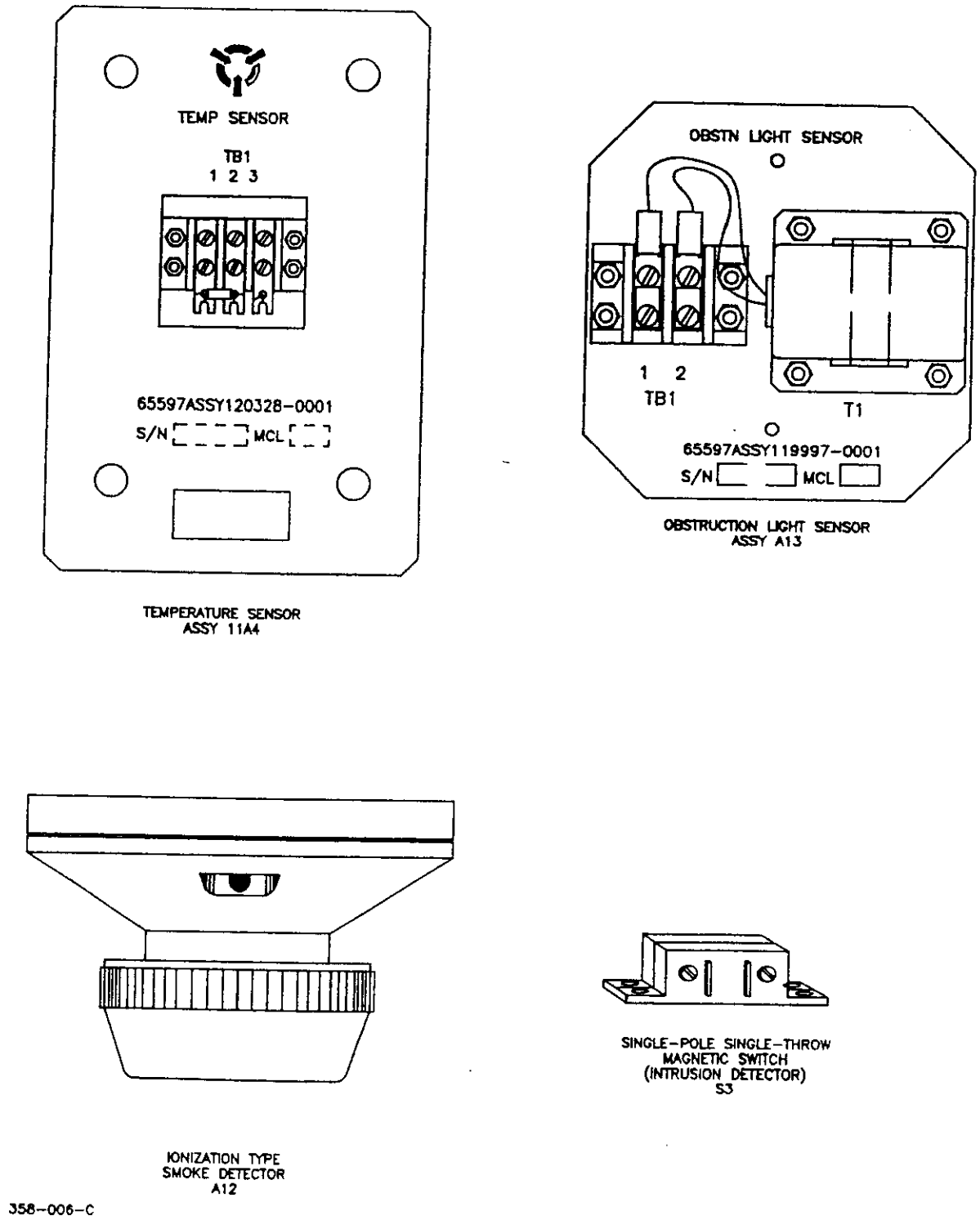


Figure 1-6. Glide Slope Environmental Sensor Kit

1.2.2 Functional Description.- See figure 1-1. Angle of descent information is generated by the glide slope equipment. The transmitted ultrahigh frequency (uhf) signal is a horizontally polarized, composite field pattern modulated by 90 and 150 Hz. The transmitted signal is received by the landing aircraft and displayed on a visual indicator, enabling the pilot to maintain proper vertical flight direction until the landing is completed. The radiation pattern establishes a straight-line descent path in a vertical plane containing the runway centerline extension. The 90-Hz modulation predominates above the glidepath and the 150-Hz modulation predominates below the glidepath. The glidepath angle can have values from 2° to 4°, depending upon topography of the runway approach area, but the glidepath angle is normally 3.0°. If the aircraft is on the glidepath, the airborne indicator shows no deflection. If the aircraft is above the glidepath, the 90-Hz depth of modulation predominates causing a downward deflection of the indicator pointer. If the aircraft is below the glidepath, a similar but opposite pointer deflection occurs (150-Hz depth of modulation predominant). The following paragraphs contain functional descriptions of the assemblies of the glide slope group.

1.2.2.1 Glide Slope Electronic Subsystem 10.- See figure 1-1. Glide slope electronic subsystem 10 generates the modulated radio frequency (rf) signal for the glide slope station. Glide slope electronic subsystem 10 monitors the parameters of the glide slope station and will switch operating equipment if a critical parameter limit is exceeded. If a critical parameter limit is still exceeded, glide slope electronic subsystem 10 will shut down the glide slope station. The glide slope electronic subsystem contains various sensors, microcomputers, built-in test equipment, and microprocessor-controlled equipment necessary to remotely monitor, control, record, and certify proper operation of the glide slope subsystem. The glide slope electronic subsystem contains a terminal interface (PMDT connector 10A1J4 on subsystem control panel cca 10A1) for a pmdt. When a pmdt is connected to glide slope PMDT connector 10A1J4 or remotely via a switched telephone line and properly logged on at level 2 or 3; an authorized operator can perform routine maintenance tasks, record site data, perform fault isolation and diagnostic tests, and control and adjust glide slope equipment parameters. Glide slope station status information is sent to the remote indication and control equipment remote control and status unit (rcsu) 60 and rcsu control information is sent to the glide slope station via a single voice-grade balanced telephone line pair.

1.2.2.2 Glide Slope Antenna Subsystem 12.- See figure 1-1. Capture-effect glide slope antenna subsystem 12 radiates in space the rf energy generated by the glide slope electronic subsystem to produce a uhf signal. The rf signals are routed from the glide slope electronic subsystem through the glide slope ducu where the signals are properly phased then routed to glide slope antenna elements. The signal received by aircraft instrumentation aids the pilot in aligning the aircraft on the glidepath during an approach and landing. The glide slope antenna subsystem also samples the radiated signals and provides the radiated signal samples to the glide slope electronic subsystem for monitoring.

1.2.2.3 24-Volt, 100-Ampere-Hour Battery Kit A10/A11.- See figure 1-1. Battery kits A10 and A11 provide operating voltage to the glide slope station in the event of primary power failure.

1.2.2.4 Glide Slope Environmental Sensor Kit.- See figure 1-1. The glide slope environmental sensor kit contains sensors and detectors that monitor conditions around the glide slope site. There are sensors that monitor glide slope ducu 11 inside temperature (temperature sensor assembly 11A4), detect presence of smoke in the shelter (ionization type smoke detector A12), detect whether the shelter door is open or not (single-pole single-throw magnetic switch [intrusion detector] S3), and monitor status of the antenna obstruction lights (degraded) (obstruction light sensor assembly A13).

1.3 EQUIPMENT SPECIFICATION DATA.- Equipment specification data for the Mark 20A ILS glide slope group is listed in table 1-1.

Table 1-1. Equipment Specification Data

Specification	Characteristics
Nomenclature	Glide Slope Electronic Subsystem, Glide Slope Antenna Element, Glide Slope Distribution Unit and Combining Unit
Frequency range	Operates across band of 329.3 to 335.0 MHz in 0.150-MHz increments
Frequency stability	±0.002% (±0.0005% TYP.)
Frequency control	Temperature-compensated crystal oscillator DDS frequency synthesizer
Course transmitter modulation percentage	Adjustable 0% to 49.75% of each tone
Clearance transmitter modulation percentage	Adjustable 0% to 99.5%
Course transmitted carrier-plus-sideband (csb) output	3 W nominal; adjustable from 0 to 4.0 W
Course transmitted sideband-only (sbo) output	Not less than 0.15 W at maximum csb power
Clearance transmitted csb output	0.5 W nominal; adjustable from 0 to 4.0 W
Antenna input impedance	50 ohms (nominal)
Antenna input voltage standing-wave ratio (vswr)	Not more than 1.2:1 under normal test conditions with antenna fed from 50-ohm line; not more than 1.3:1 over full range of service conditions
Type of radiation	Horizontally polarized, amplitude-modulated radiation in a directional pattern; minimum front-to-back ratio 16 dB; gain 10 dB above isotropic radiator
Glide angle	Adjustable 2° to 4°
Ambient temperature range	Sheltered, −10 °C to 50 °C (14 °F to 122 °F); outside, −50 °C to 70 °C (−58 °F to 158 °F)
Relative humidity	Sheltered, 0 to 90%; outside, 0 to 100%
Wind and ice loading:	...

Table 1-1. Equipment Specification Data

Specification	Characteristics
Antenna	Up to 161 km/h (100 mi/h) encased in 1.27-cm (0.5-in.) radial thickness clear ice
Antenna tower	Up to 177 km/h (110 mi/h) encased in 1.27-cm (0.5-in.) radial thickness clear ice
Altitude	To 3048 m (10,000 ft)
Duty cycle	Continuous unattended
Primary power requirements	Nominal 120 (85 to 132) V ac, 60 (47 to 440) Hz, three-wire, single phase; 1400 W
Battery requirements	4 hr continuous operation (min)
Battery recharge capability	Recharge 50% discharged battery within 8 hr
Mean time between failures	4000 hr (min)

1.4 EQUIPMENT AND ACCESSORIES SUPPLIED.- Equipment and accessories supplied with the Mark 20A ILS glide slope are listed in table 1-2.

Table 1-2. Equipment and Accessories Supplied

Qty	Nomenclature	FAA Type No.	Overall Dimensions cm (in.)	Weight and Volume kg/m^3 (lb/ft^3)
			Uncrated (H/W/D)	Uncrated
1	Glide Slope Electronic Subsystem 10		182.88/60.96/48.90 (72.00/24.00/19.25)	117/0.545 (258/19.250)
3	Glide Slope Antenna Element 12A1E1/ 12A1E2/12A1E3		30.48/55.88/187.96 (12.00/22.00/74.00)	44.18/0.32 (97.40/11.31)
1	Glide Slope Antenna Tower		...	...
1	Glide Slope Distribution Unit and Combining Unit 11		71.76/49.23/27.94 (28.25/19.38/11.00)	19.57.7/0.10 (43.0/3.49)
4	Battery		25.10/42.11/17.27 (9.88/16.58/6.80)	41.73/0.0183 (92.00/0.6446)

1.5 EQUIPMENT REQUIRED.- Equipment required is briefly described in the following paragraphs.

1.5.1 Portable Maintenance Data Terminal.- The pmdt is a portable computer that provides the human interface with the glide slope group. The pmdt is connected to glide slope electronic subsystem 10 at subsystem control panel cca PMDT connector 10A1J4 or remotely connected via a standard switched telephone line. The pmdt is used to set up station parameters, view station status and alarm history, and perform troubleshooting. The pmdt must be IBM compatible with 640 kilobytes (minimum) internal memory. One 3.5-inch disk drive with 720-kilobyte density is required. The pmdt should have a parallel port with a standard 25-pin female D-shell connector for printer connection and a serial port with a standard 25-pin female D-shell connector for equipment connection.

1.5.2 Printer.- A printer may be connected via the pmdt for printing glide slope data screens. The printer connector must be compatible with the pmdt printer connection.

1.5.3 RS-232 Cable.- See figure 1-6. Figure 1-6 provides fabrication details for the RS-232 cable. This cable is required for connecting the pmdt to the Mark 20A ILS glide slope.

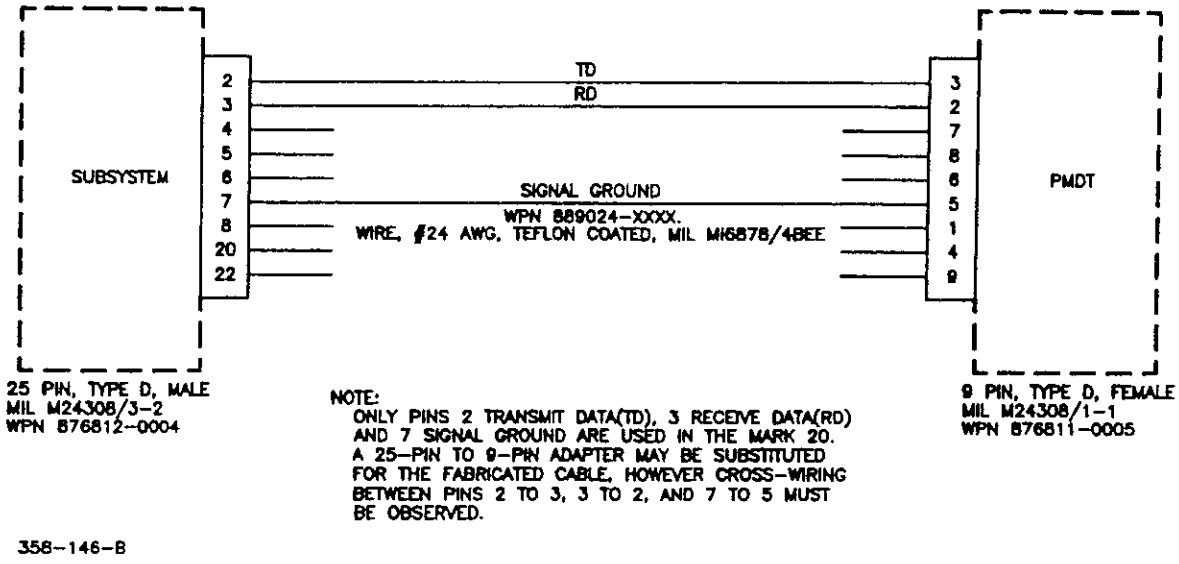


Figure 1-7. RS-232 Cable

1.6 RELATED INSTRUCTION BOOKS.- Instruction books required to operate and maintain the Mark 20A ILS are listed in table 1-3.

Table 1-3. Related Instruction Books

Title	Manual No.
Mark 20A Instrument Landing System	704683-0300
Mark 20A Instrument Landing System Localizer Group	704684-0300
Mark 20A Instrument Landing System Far-Field Monitor Kit	704687-0300
Mark 20A Instrument Landing System Marker Beacon Group	704686-0300
Mark 20A Instrument Landing System Portable ILS Receiver Group	704708-0300
Mark 20A Instrument Landing System Remote Indication and Control Equipment	305627-0474

SECTION 2. TECHNICAL DESCRIPTION

2.1 INTRODUCTION.- This section presents the theory of operation for the Mark 20A Category I/II/III Instrument Landing System (ILS) Glide Slope Group. Theory is presented as simplified theory of operation. The simplified theory of operation describes equipment operation at the line-replaceable unit (lru) level.

2.2 GLIDE SLOPE GROUP SIMPLIFIED THEORY OF OPERATION.- See figure 2-1. The glide slope group generates and radiates radio frequency (rf) signals to provide final approach glidepath information to landing aircraft. This information is received by the aircraft and is displayed as a visual indication of the aircraft's elevation position. The displayed information enables the pilot to maintain proper glidepath until visual contact is made with the runway and landing is completed. The glide slope group consists of electronic subsystem 10; glide slope antenna subsystem 12; 24-volt, 100-ampere-hour battery kits A10 and A11; and the glide slope environmental sensor kit. As shown in figure 2-1, glide slope electronic subsystem 10 generates rf (PATH and CLEARANCE RF) signals that are applied to glide slope antenna subsystem 12. Glide slope antenna subsystem 12 sends status signals (ANALOG EXECUTIVE MONITOR SIGNALS) to glide slope electronic subsystem 10. The glide slope environmental sensor kit provides raw sensor/detector data that is processed by glide slope electronic subsystem 10. This sensor data includes inside (and outside if an outside temperature sensor is installed) temperature status, smoke detection status, intrusion detection status, and status of the obstruction lights on the antenna. There is a glide slope to remote indication and control equipment (glide slope/RICE) interface. The glide slope/RICE interface provides an interface between the glide slope group and control tower personnel via the RICE The glide slope/RICE interface enables receiving commands (such as turning transmitters on or off and reset) from the control tower personnel and sending status data (such as which equipment is selected) to the control tower personnel. Glide slope electronic subsystem 10 has an RS-232 interface that allows use of a portable maintenance data terminal (pmdt) to set parameters and check glide slope status. During normal

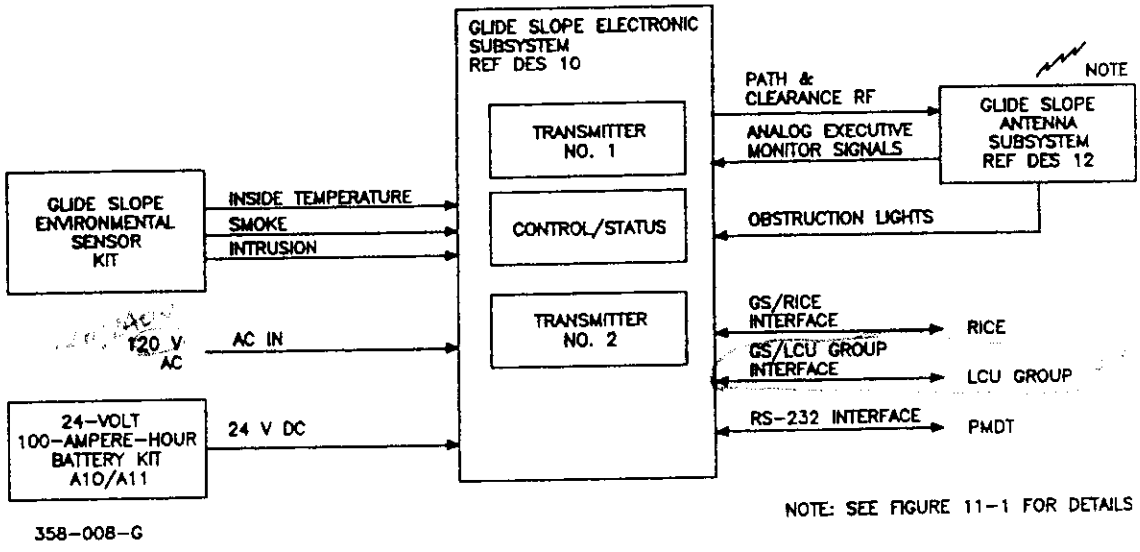


Figure 2-1. Glide Slope Group, Simplified Functional Block Diagram

operation, glide slope electronic subsystem 10 operates from 120/240 volts ac and maintains a 24-volt nominal dc charge on battery kits A10 and A11. The use of secondary power (24 volts, 100 ampere-hours from the battery kits) is automatically invoked during loss of primary power (ac). Each battery kit contains two 12-volt, 100-ampere-hour batteries connected in series. Battery kit A10 provides 24 volt dc power to modulator/power amplifier 1 and battery kit A11 provides 24 volt dc power to modulator/power amplifier 2.

2.2.1 Glide Slope Electronic Subsystem 10.- See figures 11-1 and 11-2. Glide slope electronic subsystem 10 generates the modulated path and clearance rf signals that are radiated by the antenna subsystem. The electronic subsystem also interfaces and processes the environmental sensor kit status signals, glide slope antenna subsystem status, and RICE signals. The electronic subsystem functions as two fully redundant transmitters and performs control/status and power distribution functions. The transmitters operate in a hot standby configuration. In this configuration; the rf output from the transmitter, designated as the main transmitter, is connected to the antenna. The second transmitter, designated standby, rf output is connected to an internal termination load. When the main transmitter fails, the rf output of the standby transmitter is switched to the antenna subsystem. Transmitter 1 is normally the main transmitter. Transmitter 2 is normally the standby transmitter. The following paragraphs describe the glide slope electronic subsystem functions.

2.2.1.1 Transmitters 1 and 2 Function.- See figure 11-1, sheet 1, and figure 11-2. The transmitters generate and modulate the rf signal. Each transmitter consists of an audio generator circuit-card assembly (cca), a synthesizer assembly, and two glide slope modulator/power amplifier assemblies. The audio generator cca generates the audio modulation frequencies for the transmitter. The synthesizer assembly functions as a local oscillator to generate the rf carrier signal. The glide slope modulator/power amplifier assembly modulates and amplifies the rf signal. Transmitter 1 consists of audio generator cca 10A3A3, glide slope synthesizer assembly 10A3A1, glide slope modulator/power amplifier assembly 10A7 (path), and glide slope modulator/power amplifier assembly 10A10 (clearance). Glide slope modulator/power amplifier assembly 10A7 supplies a path carrier-plus-sideband (PATH CSB) and a path sideband-only (PATH SBO) signal to glide slope transfer switch assembly 10A9. Glide slope modulator/power amplifier assembly 10A10 supplies a CLEARANCE CSB signal to glide slope transfer switch assembly 10A9. Transmitter 2 consists of audio generator cca 10A3A11, synthesizer assembly 10A3A12, glide slope modulator/power amplifier assembly 10A8 (path), and glide slope modulator/power amplifier assembly 10A11 (clearance). The following paragraphs describe the assemblies that make up the transmitters.

2.2.1.1.1 Synthesizer Assembly 10A3A1/10A3A12.- See figure 11-1, sheet 1, and figure 11-2, sheets 3 and 4. The synthesizer assembly generates a path carrier frequency and a clearance carrier frequency. The path carrier frequency is a nominal 4 kHz above the desired glide slope channel frequency and is the input signal to path modulator/power amplifier assembly 10A7/10A8. The clearance carrier frequency is a nominal 4 kHz below the desired glide slope channel frequency and is the input signal to clearance modulator/power amplifier assembly 10A10/10A11. The path carrier frequency may be set to any one of the forty channels and the clearance frequency is locked to the carrier frequency to provide a nominal 8-kHz frequency separation. An LED on the synthesizer assembly will be illuminated if an invalid channel is selected or if the synthesizer is shutdown by the lcsu. The synthesizer assembly provides a frequency difference (125-Hz) signal, lock detect signal, and a path frequency output (scaled frequency) signal to the monitor cca as monitor input data. When a transmitter turnoff is initiated, local control and status unit (lcsu) cca 10A3A6 supplies a SHUTDOWN 1A/SHUTDOWN 2A signal to the synthesizer assemblies. The shutdown signal terminates the generation of carriers in the synthesizer assembly.

2.2.1.1.2 Audio Generator Circuit-Card Assembly 10A3A3/10A3A11.- See figure 11-1, sheet 1. The audio generator cca generates the audio modulation frequencies for the path and clearance transmitters. The path audio modulation and ZERO CROSS signals are routed to the input of glide slope path modulator/power amplifier assemblies 10A7/10A8. The path audio modulation signals include a CSB 1 (90 + 150) Hz and SBO 1 (90 – 150) Hz signal. The clearance audio modulation is routed to the input of clearance modulator/power amplifier assembly 10A10/10A11. The clearance audio modulation signal is a CSB 2 (150) Hz. The audio generator are programmed by their associated monitor when a PROGRAM ENABLE signal is received from the lcsu. The audio generator provides all signals as monitor data to glide slope monitor for monitoring operation of audio generator cca. When a transmitter turnoff is initiated, the lcsu cca supplies a SHUTDOWN signal to the appropriate audio generator. The shutdown signal disables audio signals from audio generator.

2.2.1.1.3 Modulator/Power Amplifier Assembly 10A7/10A8/10A10/10A11.- See figure 11-1, sheet 1, and figure 11-2, sheets 3 and 4. The path modulator/power amplifier assemblies 10A7/10A8 supply the PATH CSB and PATH SBO signals to transfer switch assembly 10A9. Clearance modulator/power amplifier assemblies 10A10/10A11 supply the CLEARANCE CSB signal to transfer switch assembly 10A9. Each modulator/power amplifier assembly receives carrier signals from its associated synthesizer assembly and modulation signals from its associated audio generator. The carrier signals are the continuous wave rf in (CW RF IN) signals and the modulation signals are the csb 1 (90 + 150 Hz), csb 2 (150 Hz), and sbo 1 (90 – 150 Hz) signals. Modulator/power amplifier assemblies 10A7 and 10A8 perform modulation and power amplification on the path input signals (csb 1 and sbo 1) and provide monitor input data (such as forward and reverse power measurements) to its associated monitor. Modulator/power amplifier assemblies 10A10 and 10A11 perform modulation and power amplification on the clearance input signals (csb 2) and provide monitor input data (such as forward and reverse power measurements) to its associated monitors. ALL four modulator/power amplifier assemblies are identical, however the SBO output of the clearance transmitter is not used.

2.2.1.2 Control/Status Function.- See figures 11-1 and 11-2. The control and status function controls and monitors the performance of the transmitters, the power distribution subsystem, glide slope environmental sensor kit components, and the antenna subsystem. The control and status function consists of the monitors, remote maintenance monitor computer (RMM), subsystem front panel, lcsu, and the transfer switch assembly. The lcsu selects the main transmitter via the front panel switch or a pmdt command. The transfer switch assembly routes csb and sbo signals from the main transmitter to the antenna subsystem via the distribution unit and combining unit (ducu). The transfer switch assembly terminates the standby transmitter (hot backup) into an internal termination load. If a critical parameter limit is exceeded in the main transmitter, the lcsu signals the transfer switch assembly to select the standby transmitter. If the fault continues after the standby transmitter is selected, that transmitter is also shut down. The transfer switch assembly supplies analog standby monitor signals (detected) to the monitors via the subsystem interface cca. Executive monitor signals and antenna power (detected) and all external signals are supplied to the monitors via the subsystem interface cca and transient suppressor cca. External signals include communications with the RICE and signals from environmental sensors/detectors. The RMM cca receives environmental data via transient suppressor cca and subsystem interface cca and path/clearance transmitter data from both monitors.The RMM cca communicates remotely with the pmdt via the subsystem interface cca and the transient suppressor cca. Subsystem front panel cca 10A1 displays system status and provides for manual control. Subsystem front panel cca 10A1 has an RS-232 interface for connection of a pmdt that is used to set parameters and check system status. The following paragraphs describe the assemblies that perform control/status functions.

2.2.1.2.1 Monitor Circuit-Card Assembly 10A3A4/10A3A10.- See figure 11-1. Glide slope monitor one receives monitor input data from all assemblies in transmitter 1: audio generator one, synthesizer one assembly, and modulator/power amplifier assemblies 10A7 and 10A10. Glide slope monitor two receives monitor input data from all assemblies in transmitter 2: audio generator two, synthesizer two assembly, and modulator/power amplifier assemblies 10A8 and 10A11. Both monitors receive detected standby monitor signals from the transfer switch assembly and detected executive monitor signals from the antenna elements via the ducu and the transient suppressor. Each monitor compares the inputs to known standards and generates an alarm to the lcsu if any input deviates beyond preset limits. The monitors provide the monitored information to the RMM for local viewing (at the subsystem front panel) with a pmdt or remotely with a pmdt connected via the switched telephone network.

2.2.1.2.2 Subsystem Interface Circuit-Card Assembly 10A3A5.- See figure 11-1 and figure 11-2, sheet 2. The subsystem interface cca provides an interface for both monitors with the transfer switch assembly and transient suppressor. The subsystem interface cca receives detected standby monitor signals from the transfer switch assembly and supplies the signals to both monitors. The subsystem interface cca receives detected executive monitor signals from the antenna elements via the ducu and transient suppressor cca

and supplies the signals to both monitors. (The standby monitor signals and executive monitor signals comprise detected path, width, and clearance signals.) The subsystem interface cca receives raw and processed environmental data via transient suppressor and routes both raw and processed environmental data to the RMM. The subsystem interface cca also provides a communication path for the remote pmdt to RMM and RICE data to the lcsu.

2.2.1.2.3 Transient Suppressor Circuit-Card Assembly 11A5.- See figure 11-1 and figure 11-3, sheet 5. The transient suppressor cca protects the electronic subsystem from transient voltage surges, such as lightning strikes, that occur near the signal lines. Transient protection is provided for the signal lines used with the RICE interface, remote pmdt, and executive monitored signals. Environmental data from the sensors and detectors is routed to the subsystem interface cca via transient suppressor cca without transient protection. The transient protection network for each line consists of a resistor, a gas-filled tube, and a bipolar transient suppression diode. The gas-filled tube conducts when the transient voltage reaches the rated voltage for the tube, shorting the transient to earth ground. The diodes short when the transient voltage reaches the rated voltage for the diode, shorting the transient to chassis ground. Amplifiers U3B, U3C, and U3D (U3A is not used) amplify the element voltages from wattmeter bodies 11Z9, 11Z10, 11Z11, and 2Z1, respectively. The wattmeter element outputs are connected to J8-10 through J8-12 and routed to the amplifier inputs. The amplifier outputs exit at J6-C23, J6-C22, and J6-C21. The 15-volt operating voltage for the amplifiers is supplied by voltage regulator U2. The positive supply voltage output for the smoke detector is at J1-11. This voltage, identified as SMOKE DET PWR +24V3, is generated from the +24V1 and +24V2 supplies that are connected to J6-A20 through J6-A27. All three supply voltages are isolated from one another by diodes CR4 and CR5. Resistors R1 and R4 on the +24V3 supply line limit current output in case the output line should be accidently shorted. Smoke detector ground is routed through transistor Q1 and connected to J1-12. Once activated, the smoke detector alarm will remain on until reset. The smoke detector reset line input is at J6-C26 and is routed to the base of transistor Q1. When the reset line is grounded, current through Q1 is shut off, resetting the alarm. Voltage regulator U2 generates a 15-volt dc supply from the +24V3 input. Voltage regulator U2 provides power for wattmeter amplifiers U3A through U3D. A regulated 12.7 volts dc for an optional vhf/uhf radio is provided by voltage regulator U1 from the +24V3 input. The supply voltage output is at J7-5.

2.2.1.2.4 Remote Maintenance Monitor Computer Circuit-Card Assembly 10A3A7.- See figure 11-1, sheet 1. The RMM cca is a 16-bit single board computer. The RMM collects parameter data from both monitors. The RMM receives and processes environmental data from the sensors/detectors via the transient suppressor. The RMM communicates remotely with the pmdt via the subsystem interface cca and the transient suppressor. The RMM to remote pmdt communication allows the pmdt operator to monitor the subsystem parameters and environmental data and set up the glide slope configuration. The RMM contains an integral modem and communicates with the pmdt at 2400 bits per second. The RMM sends control data to the lcsu and receives status data from the lcsu. The RMM provides an RS-232 interface to the subsystem front panel via the lcsu. A pmdt is used at the RS-232 interface to check glide slope status and set system parameters.

2.2.1.2.5 Subsystem Front Panel Circuit-Card Assembly 10A1.- See figure 11-1, sheet 1 and figure 11-2, sheet 2. The subsystem front panel provides a means for local control and status monitoring of the subsystem. The subsystem front panel receives display data from the lcsu and uses these signals to light status lamps on the subsystem front panel. The subsystem front panel uses switches for supplying controls and sends control signals to the lcsu. The subsystem front panel has an RS-232 interface connector that connects the pmdt to RMM to set parameters and check the glide slope status.

2.2.1.2.6 Local Control and Status Unit Circuit-Card Assembly 10A3A6.- See figure 11-1, sheet 1, and figure 11-2, sheet 2. The lcsu receives control inputs from the RMM and alarm signals from both monitors. The lcsu receives local control inputs from the subsystem front panel and remote control inputs

from the RICE (Communications with the RICE are via the subsystem interface, transient suppressor, and the RICE/glide slope interface). The lcsu sends status data to thw subsystem front panel, RMM, and the RICE. The lcsu provides shutdown signals to audio generator one and synthesizer one for transmitter 1. The lcsu provides shutdown signals to audio generator two and synthesizer two for transmitter 2. These shutdown signals ensure prompt and total shutdown of the glide slope station when both glide slope monitors detect a critical parameter out of tolerance. The RS-232 data from the subsystem front panel is routed via the lcsu to the RMM.

2.2.1.2.7 Transfer Switch Assembly 10A9.- See figure 11-1, sheet 1, and figure 11-2, sheet 5. The transfer switch assembly connects the path and clearance signals from the modulator/power amplifier assemblies 10A7/10A10 in the main transmitter to the antenna elements via glide slope ducu in the antenna subsystem. The lcsu supplies an antenna select signal to the transfer switch assembly, selecting the main transmitter and terminating the standby transmitter into a 50-ohm load. The transfer switch assembly simulates path/clearance position and width signals and supplies detected standby monitor signals to both monitors via the subsystem interface cca.

2.2.1.3 Power Distribution Function.- See figure 11-1, sheet 2, and figure 11-2. The power distribution function generates and distributes 5, ±15, and 27.5 volts dc power for the electronic subsystem, antenna subsystem, and environmental sensor kit components. The power distribution function is performed by the ac-dc switch module assemblies, ac-dc converter assemblies, and dc-dc converter assemblies. The power distribution function provides 5, ±15, and 27.5 volts dc to the electronic subsystem; 27.5 volts dc to the antenna subsystem; and −15 and 27.5 volts dc to the environmental sensor kit components. The following paragraphs describe the assemblies that make up the power distribution function.

2.2.1.3.1 AC-DC Switch Module Assembly 10A2/10A4.- See figure 11-1, sheet 2, and figure 11-2, sheets 3 and 4. The ac-dc switch module assembly 10A2 routes the primary ac voltage to the ac-dc converter 10PS1. The ac-dc switch module assembly 10A2 also connects the nominal 24-volt dc battery voltage from battery kit A10 to dc-dc converter cca 10A5. The ac-dc switch module assembly 10A4 routes the primary ac voltage to ac-dc converter 10PS2. The ac-dc module assembly 10A4 also connects the nominal 24-volt dc battery voltage from battery kit A11 to dc-dc converter cca 10A6. Each ac-dc switch module assembly provides circuit breaker protection for both the ac and dc power sources.

2.2.1.3.2 AC-DC Converter Assembly 10PS1/10PS2.- See figure 11-1, sheet 2, and figure 11-2, sheets 3 and 4. The ac-dc converter assemblies 10PS1/10PS2 convert the primary ac voltage to 28 volts dc. The ac-dc converter assembly 10PS1 receives ac input voltage via switch module assembly 10A2 and supplies 28 volts dc to dc-dc converter cca 10A5. The ac-dc converter assembly 10PS2 receives ac input voltage via switch module assembly 10A4 and supplies 28 volts dc to dc-dc converter cca 10A6.

2.2.1.3.3 DC-DC Converter Circuit-Card Assembly 10A5/10A6.- See figure 11-1, sheet 2, and figure 11-2, sheets 3 and 4. The dc-dc converter cca 10A5 converts 28 volts dc, from ac-dc converter assembly 10PS1, to a regulated ±15 volts dc and a regulated 5 volts dc for susystem operation. The dc-dc converter cca 10A5 supplies a regulated 27.5 volts dc (or unregulated 24 volts from the batteries) to modulator/power amplifier assemblies 10A7 and 10A10 in transmitter 1 and charging current for battery kit A10. The dc-dc converter cca 10A6 converts 28 volts dc, from ac-dc converter assembly 10PS2, to a regulated ±15 volts dc and a regulated 5 volts dc for subsystem operation. The dc-dc converter cca 10A6 supplies a regulated 27.5 volts dc to modulator/power amplifier assemblies 10A8 and 10A11 in transmitter 2 and charging current for battery kit A11. Normally, each dc-dc converter cca 10A5/10A6 operates from 28 volts dc supplied by the associated ac-dc converter 10PS1/10PS2. In case of a primary power failure, each dc-dc converter operates from 24 volts dc supplied by the associated battery kit, A10 or A11. The ±15 volts and 5 volts dc from each dc-dc converter are paralleled so that either dc-dc converter can power any of the assemblies requiring ±15 and 5 volts dc. However, only ac-dc converter

10PS1 supplies power to modulator/power amplifiers 10A7 and 10A10. Only ac-dc converter 10PS2 supplies power to modulator/power amplifiers 10A8 and 10A11.

2.2.2 Antenna Subsystem 12.- See figure 11-1, sheets 2 and 3, and figure 11-4. The antenna subsystem distributes, monitors, and radiates into space the rf signals from the electronic subsystem. The antenna subsystem contains three antenna elements, 12A1E1 through 12A1E3, and the ducu. The antenna elements and each lru in ducu are discussed in the following paragraphs.

2.2.2.1 Antenna Element 12A1E1/12A1E2/12A1E3.- See figure 11-1, sheets 2 and 3, and figure 11-4. The antenna is a two-frequency three-antenna system. The course/path transmitter operates approximately 4 kHz above the assigned channel frequency and the clearance transmitter operates approximately 4 kHz below the assigned channel frequency. The carrier is modulated equally with 90 and 150 Hz and there is a 90 and 150 Hz sideband only. Antenna element 12A1E1 is the upper element, 12A1E2 is the middle element, and 12A1E3 is the lower element. The antenna receives the combined csb and sbo signals in the appropriate amplitude and phase relationship from the antenna distribution circuitry in the ducu and radiates the signals for angle of descent guidance of a landing aircraft. The rf probes located in each transmitting antenna dipole sample the radiated signals and route the samples to the combining circuitry in ducu.

2.2.2.2 Radiation Pattern.- Capture effect is the term used to describe the manner in which a linear receiver detector circuit responds to two rf signals of different frequencies an dpower levels, which are each within the passband of the receiver. If one signal is stronger than the other, the detector will discriminate against the weaker signal, resulting in a much greater ratio of the detected signals than the ratio of the input signals. See figure 2-2. Capture effect utilizes a scooped-out path-forming (primary) signal that minimizes the effects of reflections from obstructions in the approach area and an auxiliary clearance signal to ensure adequate clearance below path. The frequencies of the two signals are different, but both are within the passband of the aircraft receiver. The aircraft receiver captures the stronger primary signal in the flyable area of the glide path and the stronger clearance signal at small angles below path. The primary signal consists of modulated carrier signals fed to the lower and middle antennas and a sideband-only signal that is fed to all three antennas. Figure 2-3 shows the lobe structure for the carrier signals with a 4-to-1 power ratio. The middle antenna is fed a signal that is 180 degrees displaced from, and one-fourth the power of, the carrier signal fed to the lower antenna. Figure 2-4 shows the lobe structure of the sideband signals from each antenna and the composite lobe structure with a 4-to-1 power ratio. The sbo signal fed to the upper antenna and the sbo signal fed to the lower antenna are displaced approximately 180° from, and one-fourth the power of, the signal fed to the middle antenna. The clearance signal is formed by feeding modulated 150-Hz signals, having the same audio phase as the 150-Hz modulation of the primary carrier, to the upper and lower antennas. The composite clearance lobe has a broad null in the 2.5° to 3.5° area where the aircraft receiver captures the primary navigation signals. This is also a relatively strong signal in the area below the glide angle where the composite primary sideband energy is low. Figure 2-5 shows the clearance signal vertical lobe structure. Figure 2-6 shows the glide slope antenna horizontal radiation pattern. The clearance signal effectively fills the area between 0° and 2° where the receiver will capture the clearance signal. In the area from 2° to 6°, the primary signal is much stronger and the receiver will capture the primary signal to provide the necessary navigation signals.

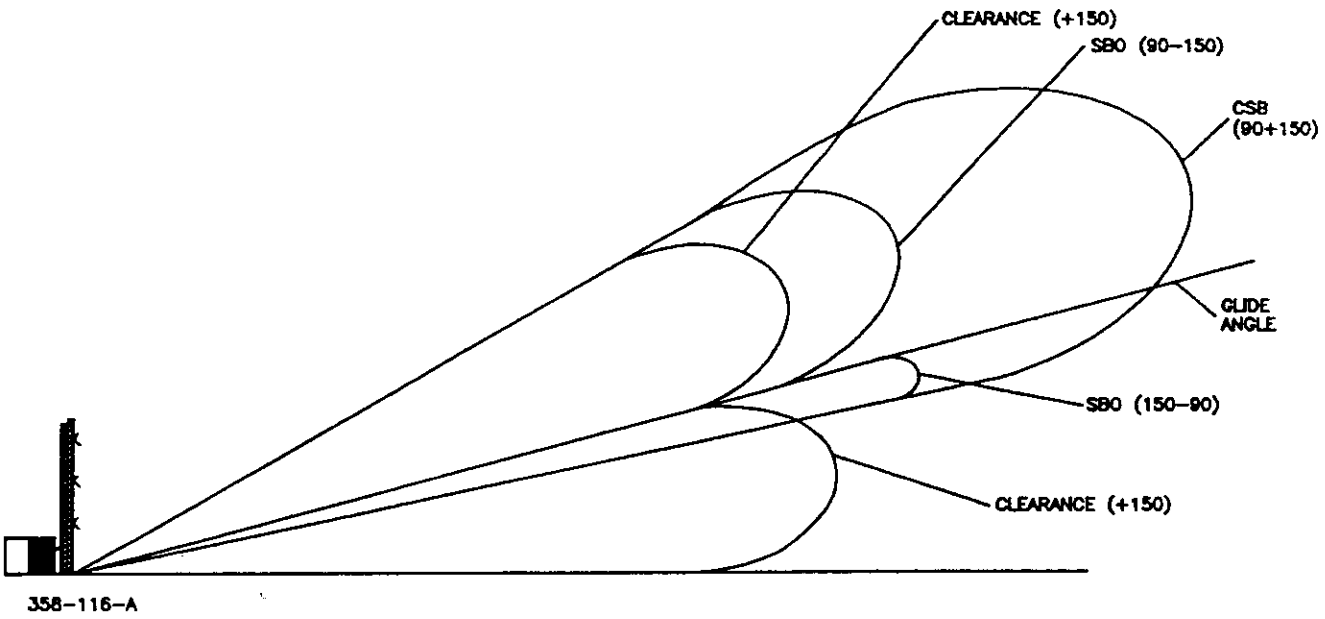


Figure 2-2. Glide Slope Antenna Radiation Pattern

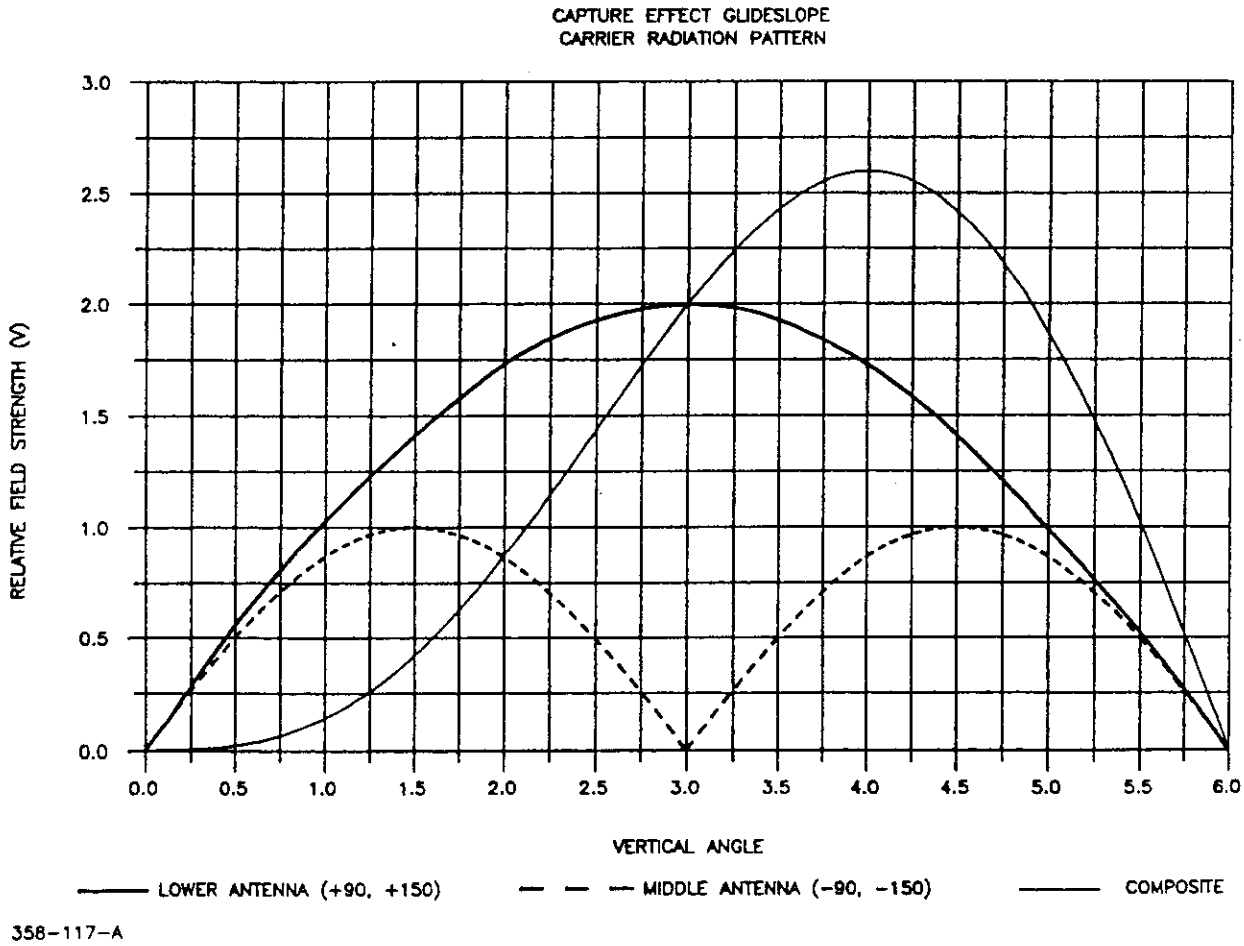


Figure 2-3. Carrier Radiation Pattern

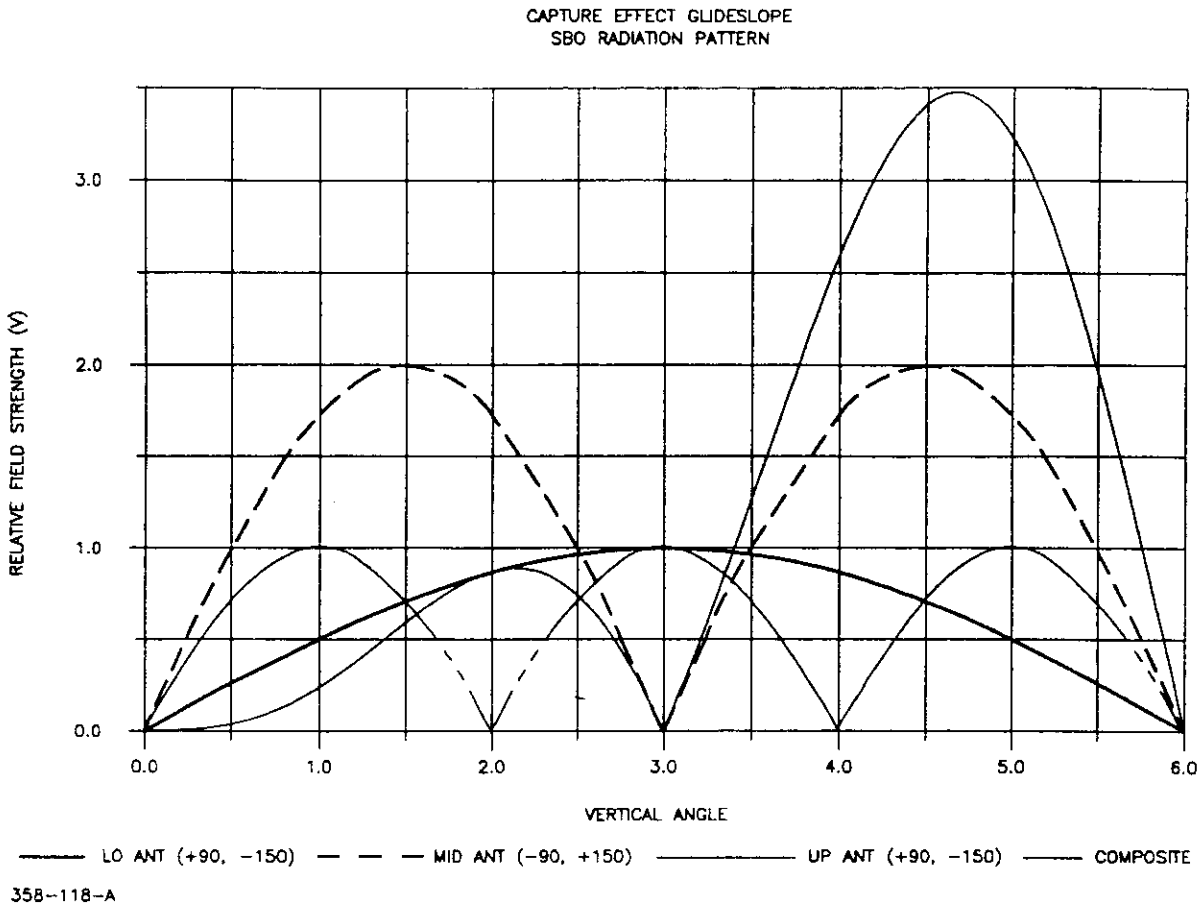


Figure 2-4. Sideband Radiation Pattern

2.2.2.3 Distribution Unit and Combining Unit 11.- See figure 11-1, sheets 2 and 3, and figure 11-3. The ducu performs the following major functions: a signal distribution function that includes dividing the glide slope signals into the proper phases and amplitudes for distributing to each antenna element, monitors rf power supplied to the antenna elements, linearly combines rf signals sampled from the antenna elements to simulate the composite radiated rf signal pattern, and detects the simulated composite radiated rf signals. The signal distribution function is performed by power dividers 11Z1, 11Z2, and 11Z4; phaser 11Z3; phaser mounting panel subassembly 11A8 antenna phasers 11A8Z1, 11A8Z2, and 11A8Z3; hybrid subassemblies 11HY1, 11HY2, and 11HY3; and associated rf termination loads. The rf power monitoring is performed with wattmeter bodies 11Z9, 11Z10, and 11Z11. The signal combining function is performed by glide slope phasers 11Z5 and 11Z6, power dividers 11Z7 and 11Z8, hybrid subassemblies 11HY4 and 11HY5, and associated fixed attenuators and termination loads. The composite signals are detected by integral detector assemblies 11A1, 11A2, and 11A3. The detected signals supplied by integral detector assemblies 11A1, 11A2, and 11A3 and wattmeter bodies 11Z9, 11Z10, and 11Z11 are routed to the electronic subsystem via transient suppressor cca 11A5.

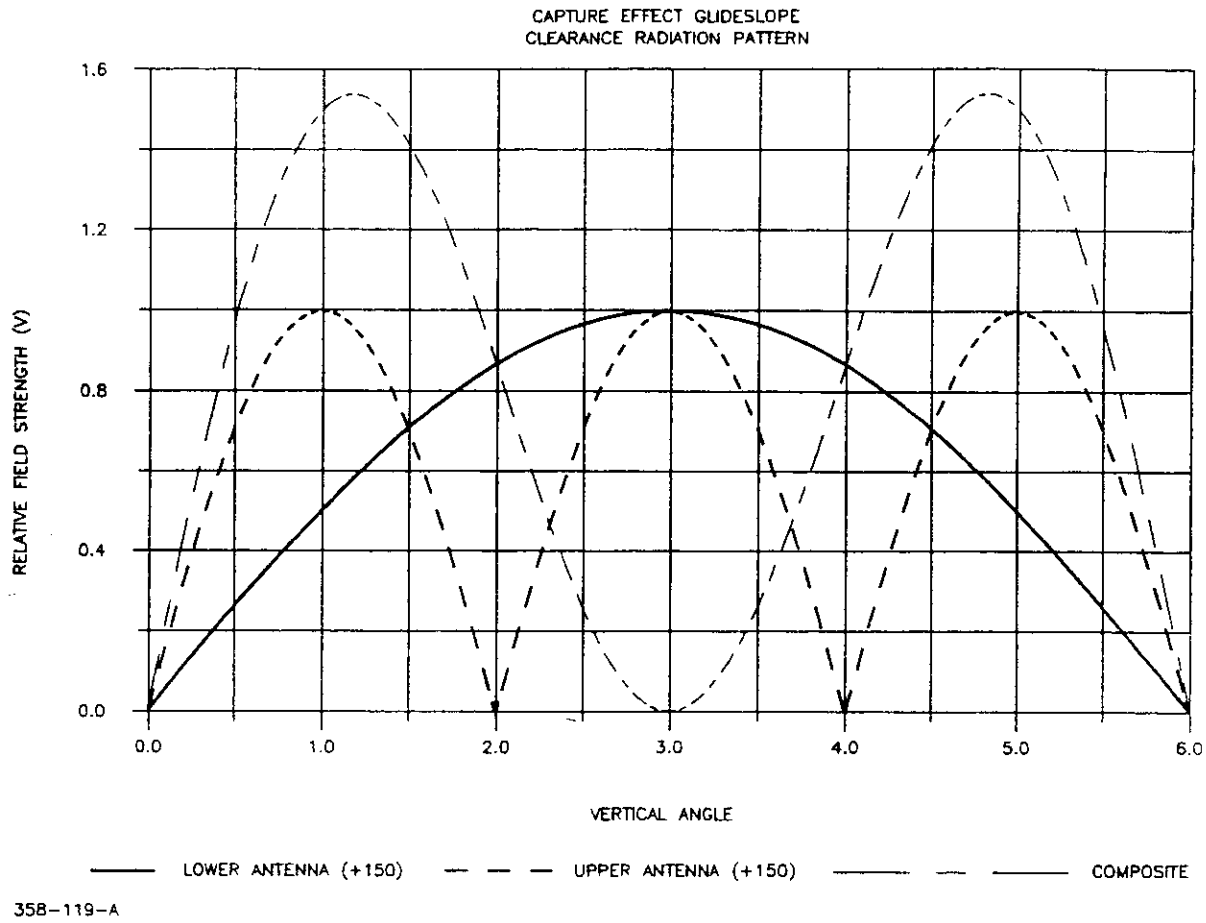


Figure 2-5. Clearance Radiation Pattern

2.2.2.3.1 Hybrid Subassembly 11HY1/11HY2/11HY3.- See figure 11-1, sheets 2 and 3, and figure 11-3, sheet 2. Hybrid subassemblies 11HY1, 11HY2, and 11HY3 are combining networks. Hybrid subassembly 11HY2 combines the CSB and SBO signals for the middle antenna element 12A1E2; the unused port is loaded with 11AT2. Hybrid subassembly 11HY3 combines the SBO and CLEARANCE CSB signals; the unused port is loaded with 11AT3. The CLEARANCE AND SBO signals are split by power divider 11Z4. Equal amplitudes of CLEARANCE AND SBO signal is routed to upper antenna and lower antenna elements. Hybrid subassembly 11HY1 combines the CSB signal with the PHASED CLEARANCE AND SBO signals; the unused port is loaded with 11AT1. The signals combined by hybrid subassembly 11HY1 are fed to the lower antenna element 12A1E3.

2.2.2.3.2 Power Divider 11Z1.- See figure 11-1, sheets 2 and 3, and figure 11-3, sheet 2. The PATH CSB signal from glide slope transfer switch assembly 10A9 is supplied to the input of power divider 11Z1. Power divider 11Z1 establishes the ratio of csb power levels between lower antenna element 12A1E3 and middle antenna element 12A1E2. Power divider 11Z1 OUTPUT 1 CSB signal is routed to hybrid subassembly 11HY1 for the lower antenna element 12A1E3. Power divider 11Z1 OUTPUT 2 CSB signal is routed to hybrid subassembly 11HY2 for the middle antenna element 12A1E2.

2.2.2.3.3 Power Divider 11Z2.- See figure 11-1, sheets 2 and 3, and figure 11-3, sheet 2. The PATH SBO signal from glide slope transfer switch assembly 10A9 is supplied to the input of power divider 11Z2. Power divider 11Z2 establishes the ratio of sideband power levels at the middle antenna 12A1E2 with

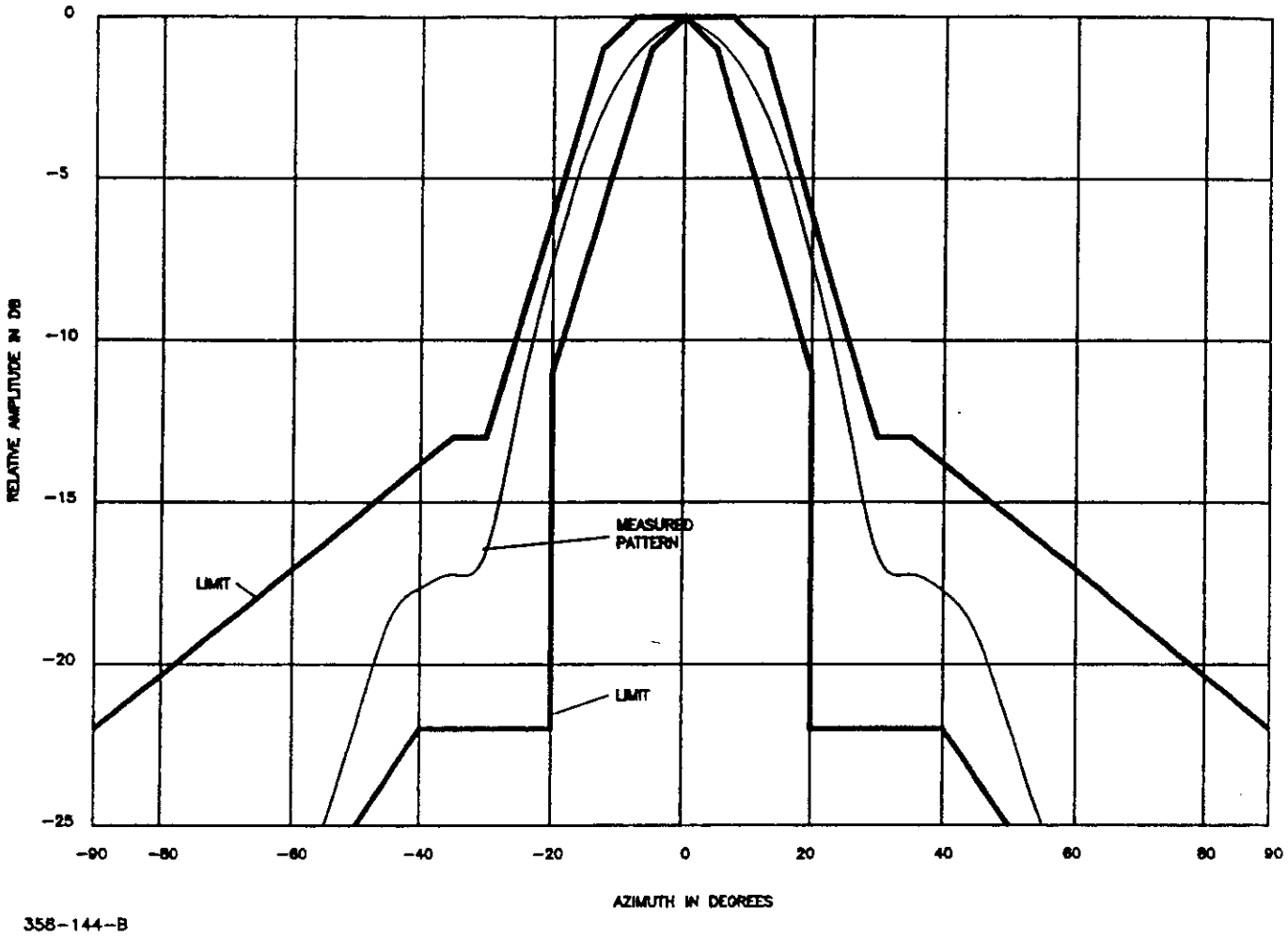


Figure 2-6. Glide Slope Antenna Horizontal Free Space Radiation Pattern

respect to upper antenna element 12A1E1 and lower antenna element 12A1E3. Power divider 11Z2 OUTPUT 1 SBO signal is routed to hybrid subassembly 11HY3 for upper antenna element 12A1E1. Power divider 11Z2 OUTPUT 2 SBO signal is routed to hybrid subassembly 11HY2 for middle antenna element 12A1E2.

2.2.2.3.4 Power Divider 11Z4.- See figure 11-1, sheets 2 and 3, and figure 11-3, sheet 2. The CLEARANCE AND SBO signals from hybrid subassembly 11HY3 are supplied to the input of power divider 11Z4. Power divider 11Z4 establishes the ratio of clearance and sbo power levels at upper antenna element 112A1E1 and lower antenna element 12A1E3. Power divider 11Z4 OUTPUT 1 CLEARANCE AND SBO signal is routed to phaser 11Z3 for lower antenna element 12A1E3. Power divider 11Z4 OUTPUT 2 CLEARANCE AND SBO signal is routed to phaser mounting panel subassembly 11A8 for upper antenna element 12A1E1.

2.2.2.3.5 Phaser 11Z3.- See figure 11-1, sheets 2 and 3 and figure 11-3, sheet 2. The OUTPUT 1 CLEARANCE AND SBO signals from power divider 11Z4 are supplied to the input of the glide slope phaser 11Z3. The primary purpose of phaser 11Z3 is to adjust the phase of the SBO signals for lower antenna element 12A1E3 relative to the phase of the CARRIER signal at lower antenna element 12A1E1.

The CLEARANCE AND SBO signals output by glide slope phaser 11Z3 are mixed with a CSB signal by hybrid subassembly 11HY1 and supplied to lower antenna element 12A1E3.

2.2.2.3.6 Phaser Mounting Panel Subassembly 11A8.- See figure 11-1, sheets 2 and 3, and figure 11-3, sheet 3. Phaser mounting subassembly 11A8 provides a mechanical adjustment of the phase of the signals applied to each antenna element via a wattmeter body. The mechanical adjustment is provided by phaser 11A8Z1 in the lower antenna path, middle antenna phaser 11A8Z2, and upper antenna phaser 11A8Z3. Lower antenna phaser 11A8Z1 routes the PHASED CSB and CLEARANCE AND SBO signals to lower antenna element 12A1E3 via wattmeter body 11Z11. Middle antenna phaser 11A8Z2 routes the PHASED CSB AND SBO signals to middle antenna element 12A1E2 via wattmeter body 11Z10. Upper antenna phaser 11A8Z3 routes the PHASED CLEARANCE AND SBO signals to upper antenna element 12A1E1 via wattmeter body 11Z9. Each wattmeter body detects the applicable signals and routes a detected signal to the electronic subsystem for power monitoring. The detected signals are routed to the electronic subsystem via the transient suppressor cca.

2.2.2.3.7 Phaser 11Z6.- See figure 11-1, sheet 3, and figure 11-3, sheet 4. Phaser 11Z6 routes upper antenna element 12A1E1 MONITOR INPUT signals to power divider 11Z7. Phaser 11Z6 supplies a phase-adjusted CLEARANCE AND SBO signal to hybrid subassembly 11HY5 and integral detector assembly 11A2 via power divider 11Z7. Phaser 11Z6 adjusts the phase of the signals received from upper antenna element 12A1E1 rf probe. Phaser 11Z6 is adjusted to so that upper antenna element 12A1E1 CLEARANCE AND SBO signals at hybrid subassembly 11HY5 are 180° out of phase with lower antenna element 12A1E3 CLEARANCE AND SBO signals at hybrid subassembly 11HY5.

2.2.2.3.8 Power Divider 11Z7.- See figure 11-1, sheet 3, and figure 11-3, sheet 4. Power divider 11Z7 divides the phase-adjusted upper antenna element CLEARANCE AND SBO signal. One output is to clearance integral detector assembly 11A2 and the other output is to hybrid subassembly 11HY5. The signal supplied to hybrid subassembly 11HY5 is equal in amplitude and 180° out of phase with the lower antenna element 12A1E3 signal that is also supplied to 11HY5. The signal amplitude is adjusted with power divider 11Z7.

2.2.2.3.9 Hybrid Subassembly 11HY5.- See figure 11-1, sheet 3, and figure 11-3, sheet 4. Hybrid subassembly 11HY5 receives phased CSB, CLEARANCE, AND SBO signals from lower antenna element 12A1E3 via fixed attenuator 11AT7 and inverted (180° out of phase) CLEARANCE AND SBO signals from upper antenna element 12A1E1. The signals from upper antenna element 12A1E1 are routed via glide slope phaser 11Z6 and power divider 11Z7. (The signals from upper antenna element 12A1E1 are inverted 180° due to the adjustments of glide slope phaser 11Z6 and equal in amplitude due to the adjustments of power divider 11Z7.) The SBO and CLEARANCE signals cancel within hybrid subassembly 11HY5 and the subassembly outputs lower antenna element 12A1E3 CSB signal. Hybrid subassembly 11HY5 has an unused port that is loaded by 11AT6.

2.2.2.3.10 Power Divider 11Z8.- See figure 11-1, sheet 3, and figure 11-3, sheet 4. Power divider 11Z8 divides lower antenna element 12A1E3 CSB signal from hybrid subassembly 11HY5 to produce a CSB PATH DETECTOR input signal for integral detector assembly 11A3 and a CSB WIDTH signal for hybrid subassembly 11HY4. The CSB signal is combined with the SBO signal by hybrid subassembly 11HY4 to produce the simulated WIDTH DETECTOR signal detected by width integral detector assembly 11A1. The WIDTH AUDIO signal from integral detector assembly 11A1 is adjusted for the required difference in depth modulation (ddm) by power divider 11Z8.

2.2.2.3.11 Phaser 11Z5.- See figure 11-1, sheet 3, and figure 11-3, sheet 4. Phaser 11Z5 routes middle antenna element 12A1E2 CSB AND SBO signals to hybrid subassembly 11HY4 via fixed attenuator 11AT4. Phaser 11Z5 phase adjusts the CSB AND SBO signals supplied to hybrid subassembly 11HY4. Phaser 11Z5 is adjusted so that middle antenna element 12A1E2 CSB signal at hybrid subassembly

11HY4 is 180° out of phase with lower antenna element 12A1E3 CSB signal at hybrid subassembly 11HY4.

2.2.2.3.12 Hybrid Subassembly 11HY4.- See figure 11-1, sheet 3, and figure 11-3, sheet 4. Hybrid subassembly 11HY4 receives a properly phased and attenuated CSB AND SBO signal from middle antenna element 12A1E2 via phaser 11Z5 and attenuator 11AT4. Hybrid subassembly 11HY4 also receives a CSB signal from power divider 11Z8. The two CSB signals are 180° out of phase. The CSB signal from lower antenna element 12A1E3 has a greater amplitude and cancels the CSB signal from middle antenna element 12A1E2. Hybrid subassembly HY4 output consists of the SBO signal from middle antenna element 12A1E2 and the CSB signal from lower antenna element 12A1E3. These signals combine in 11HY4 to produce the simulated width signal (WIDTH AUDIO) that is detected by width integral detector assembly 11A1. The WIDTH AUDIO from integral detector assembly 11A1 is adjusted for the required ddm by power divider 11Z8.

2.2.2.3.13 Integral Detector Assembly 11A1/11A2/11A3.- See figure 11-1, sheet 3, and figure 11-3, sheet 5. Integral detector assembly 11A3 detects the CSB PATH signal and integral detector assembly 11A1 detects the WIDTH signal. Integral detector assembly 11A2 detects the CLEARANCE signal. The detected signals are routed to the electronic subsystem for monitoring. The detected signals are routed to the electronic subsystem via transient suppressor cca 11A5.

2.2.2.3.14 Transient Suppressor Circuit-Card Assembly 11A5.- See figure 11-3, sheets 3 and 5; tables 2-1 and 2-2; and figure 11-2, sheet 2. Transient suppressor cca 11A5 protects the ducu and electronic subsystem from transient voltage surges, such as lightning strikes, that occur near the signal lines. Transient protection is provided for the signal lines used with the RICE interface, remote pmdt, executive monitor signals, and antenna element power signals. Environmental data from the sensors and detectors is routed to subsystem interface cca via the transient suppressor without transient protection.

Table 2-1. Glide Slope Transient Suppressor Circuit-Card Assembly 11A5 Input-Output Chart (Protected Lines)

Line Name	Source	11A5 Input Connector	11A5 Output Connector	Destination
DME KEY A	DME	J3-7	J6-53	10A3A5P1-C27
DME KEY A DIRECT	DME	J3-8	...	...
DME KEY B	DME	J3-5	J6-55	10A3A5P1-C28
DME KEY B DIRECT	DME	J3-6	...	...
DME LOCK A	DME	J3-11	J6-47	10A3A5P1-C24
DME LOCK A DIRECT	DME	J3-12	...	...
DME LOCK B	DME	J3-9	J6-49	10A3A5P1-C25
DME LOCK B DIRECT	DME	J3-10	...	...
CLR DET #1 A	11W4P3-1	J5-5	J6-21	10A3A5P1-C11

Table 2-1. Glide Slope Transient Suppressor Circuit-Card Assembly 11A5
Input-Output Chart (Protected Lines)

Line Name	Source	11A5 Input Connector	11A5 Output Connector	Destination
CLR DET #1 B	11W4P3-2	J5-6	J6-23	10A3A5P1-C12
PATH DET A	11W4P4-1	J2-2	J6-9	10A3A5P1-C5
PATH DET B	11W4P4-2	J2-3	J6-11	10A3A5P1-C6
RCSU RING	Rcsu	J7-9	J6-3	10A3A5P1-C2
RCSU TIP	Rcsu	J7-10	J6-1	10A3A5P1-C1
RMM RING	Rmm	J7-7	J6-7	10A3A5P1-C4
RMM TIP	Rmm	J7-8	J6-5	10A3A5P1-C3
SYNTH VOICE OUT	10A3A5P1-A2	J6-4	J7-11	Radio
WIDTH DET A	11W4P1-1	J2-4	J6-13	10A3A5P1-C7
WIDTH DET B	11W4P1-2	J2-5	J6-15	10A3A5P1-C8

Table 2-2. Glide Slope Transient Suppressor Circuit-Card Assembly 11A5
Input-Output Chart (Unprotected Lines)

Line Name	Source	11A5 Input Connector	11A5 Output Connector	Destination
GND	10A3A5P1-A28	J6-56	...	...
GND	10A3A5P1-A29	J6-58	...	...
GND	10A3A5P1-A30	J6-60	...	...
GND	10A3A5P1-A31	J6-62	...	...
GND	...	...	J8-2	11W4P4-13
GND	...	...	J8-4	11W4P3-13
GND	...	...	J8-6	11W4P1-13
INSIDE TEMP	11A4-1	J1-3	J6-14	10A3A5P1-A7
INTRUSION DET +	S3-1	J1-1	J6-6	10A3A5P1-A3
INTRUSION DET –	...	...	J1-2	S3-2

Table 2-2. Glide Slope Transient Suppressor Circuit-Card Assembly 11A5
Input-Output Chart (Unprotected Lines)

Line Name	Source	11A5 Input Connector	11A5 Output Connector	Destination
LCSU TO RADIO COM	Radio	J7-4	J6-59	10A3A5P1-C30
OB LIGHT IN	A13-1	J1-7	J6-30	10A3A5P1-A15
OB LIGHT GND	...	...	J1-8	A13-2
RADIO GND	...	...	J7-6	Radio
RADIO KEY	10A3A5P1-C32	J6-63	J7-1	Radio
RADIO PWR	...	...	J7-5	Radio
RADIO SQUELCH	Radio	J7-2	J6-64	10A3A5P1-A32
RADIO TO LCSU COM	Radio	J7-3	J6-61	10A3A5P1-C31
RMM DIN8 FROM DME	DME	J3-4	J6-38	10A3A5P1-A19
RMM DIN9 FROM DME	DME	J3-3	J6-36	10A3A5P1-A18
RMM DOUT8 TO DME	10A3A5P1-A17	J6-34	J3-2	DME
RMM DOUT9 TO DME	10A3A5P1-A16	J6-32	J3-1	DME
SMOKE DET GND	...	...	J1-12	A12-1
SMOKE DET RST	10A3A5P1-C26	J6-51	...	...
SMOKE DET +	A12-4	J1-9	J6-10	10A3A5P1-A5
SMOKE DET –	...	...	J1-10	A12-6
WATTMETER GND	...	...	J6-12	10A3A5P1-A6
+15 VDC	...	...	J8-1	11W4P4-14
+15 VDC	...	...	J8-3	11W4P3-14
+15 VDC	...	...	J8-5	11W4P1-14
UPR ANT PWR	11Z9P1	J8-10	J6-45	10A3A5P1-C23
MID ANT PWR	11Z10P1	J8-11	J6-43	10A3A5P1-C22
LWR ANT PWR	11Z11P1	J8-12	J6-41	10A3A5P1-C21
–15 VDC TEMP SENSOR SUPPLY	10A3A5P1-A9	J6-18	J1-4	11A4-2
+24 V1	10A3A5P1-A20	J6-40	...	...
+24 V1	10A3A5P1-A21	J6-42	...	...

Table 2-2. Glide Slope Transient Suppressor Circuit-Card Assembly 11A5
Input-Output Chart (Unprotected Lines)

Line Name	Source	11A5 Input Connector	11A5 Output Connector	Destination
+24 V1	10A3A5P1-A22	J6-44	...	...
+24 V1	10A3A5P1-A23	J6-46	...	...
+24 V2	10A3A5P1-A24	J6-48	...	...
+24 V2	10A3A5P1-A25	J6-50	...	...
+24 V2	10A3A5P1-A26	J6-52	...	...
+24 V2	10A3A5P1-A27	J6-54	...	...
+24V3 SMOKE DET PWR	...	...	J1-11	A12-2

2.2.3 Environmental Sensor Kit.- See figure 11-1, sheet 1. The environmental sensor kit contains sensors for monitoring conditions around the glide slope site. Temperature sensor assembly 11A4 monitors temperature inside the ducu. The presence of smoke is monitored by ionization type smoke detector A12 and whether the shelter door has been opened is sensed with single-pole single-throw magnetic switch (intrusion detector) S3. The status of the antenna element obstruction lights is sensed by obstruction light sensor assembly A13. If a sensor detects an out-of-tolerance condition, subsystem front panel cca 10A1 indicates a maintenance alert and a signal is sent to the RICE to indicate a maintenance alert.

2.2.4 24-Volt, 100-Ampere-Hour Battery Kit A10/A11.- See figure 11-1, sheet 2. Battery kits A10 and A11 are 24-volt, 100-ampere-hour kits. Battery kits A10/A11 provide 24 volts dc voltage to the glide slope station in the event of primary power failure. During battery operation, battery kit A10 supplies battery voltage for dc-dc converter cca 10A5 and battery kit A11 supplies battery voltage for dc-dc converter cca 10A6. During normal operation, the battery is charged by the associated ac-dc converter assembly 10PS1/10PS2 through dc-dc converter cca 10A5/10A6. The glide slope ac-dc switch module assembly 10A2 and glide slope ac-dc switch module assembly 10A4 supply circuit breaker protection for the associated battery kit.

SECTION 3. OPERATION

3.1 INTRODUCTION.- This section contains instructions for operating the Mark 20A Category I/II/III Instrument Landing System (ILS) Glide Slope Group. Operation of the equipment is essentially controlled by firmware programs embedded in hardware, so physical controls and indicators for operation of the equipment are minimal. The normal controls and indicators are accessed using a portable maintenance data terminal (PMDT). The PMDT software contains operator screens that allow the operator to view data, configure the subsystem, set subsystem parameters, etc. This section includes a description of all controls and indicators followed by procedures for equipment turn on and checkout, procedures for initializing remote monitoring and control, and equipment shutdown. Finally, illustrations and descriptions of glide slope operator screens are provided to familiarize the operator with the procedures for requesting glide slope subsystem parameters and operational status and the significance of the contents of the screens.

NOTE

The Software Versions supported by this instruction book are as follows:

PMDT -	Version x.00
Monitor -	Version 1.00
RMM -	Version 1.00

3.2 CONTROLS AND INDICATORS.- Operator controls and indicators are shown in figures 3-1 through 3-6 and listed in tables 3-1 through 3-6.

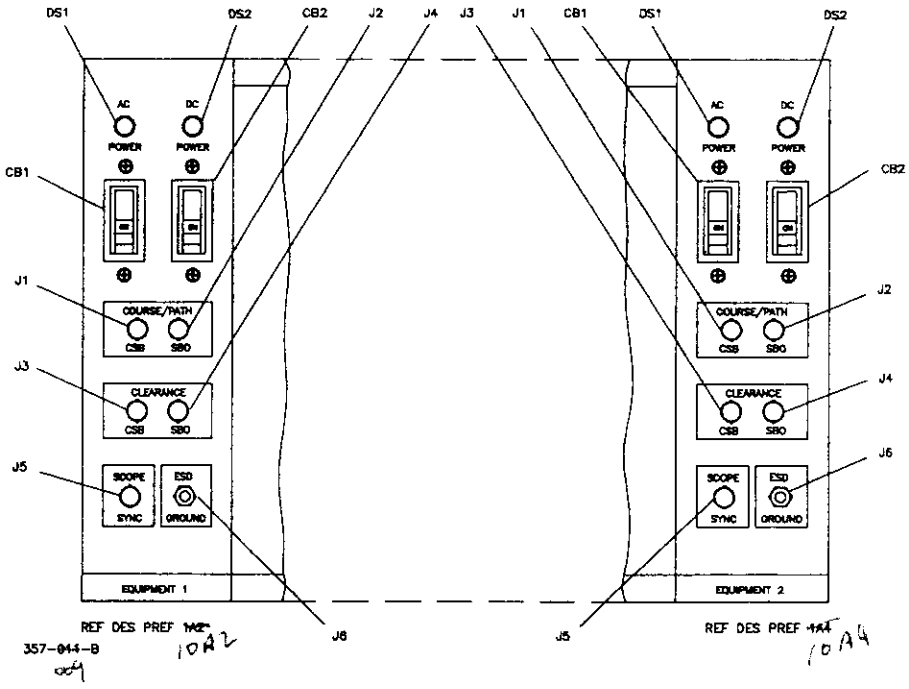


Figure 3-1. Glide Slope AC-DC Switch Module Assemblies 10A2/10A4, Controls and Indicators

Table 3-1. Glide Slope AC-DC Switch Module Assemblies 10A2/10A4, Controls and Indicators

Control or Indicator	Ref Des	Function
EQUIPMENT 1	...	...
AC POWER ON/OFF circuit breaker	10A2CB1	Turns ac power on or off.
DC POWER ON/OFF circuit breaker	10A2CB2	Turns battery power on or off.
AC POWER indicator	10A2DS1	Lights green to indicate ac power is on.
DC POWER indicator	10A2DS2	Lights green to indicate dc power is on.
COURSE/PATH CSB jack	10A2J1	Test jack for checking detected course/path carrier-plus-sideband (CSB) signal.
COURSE PATH SBO jack	10A2J2	Test jack for checking detected course/path sideband-only (SBO) signal.
CLEARANCE CSB jack	10A2J3	Test jack for checking detected clearance CSB signal.
CLEARANCE SBO jack	10A2J4	Not used.
SCOPE SYNC jack	10A2J5	Test jack for connection to oscilloscope external synchronization input.
ESD GROUND jack	10A2J6	Provides for connection of grounding strap.
EQUIPMENT 2	...	...
NOTE EQUIPMENT 2 controls and indicators are the same as EQUIPMENT 1 except reference designator prefix is 10A4.		

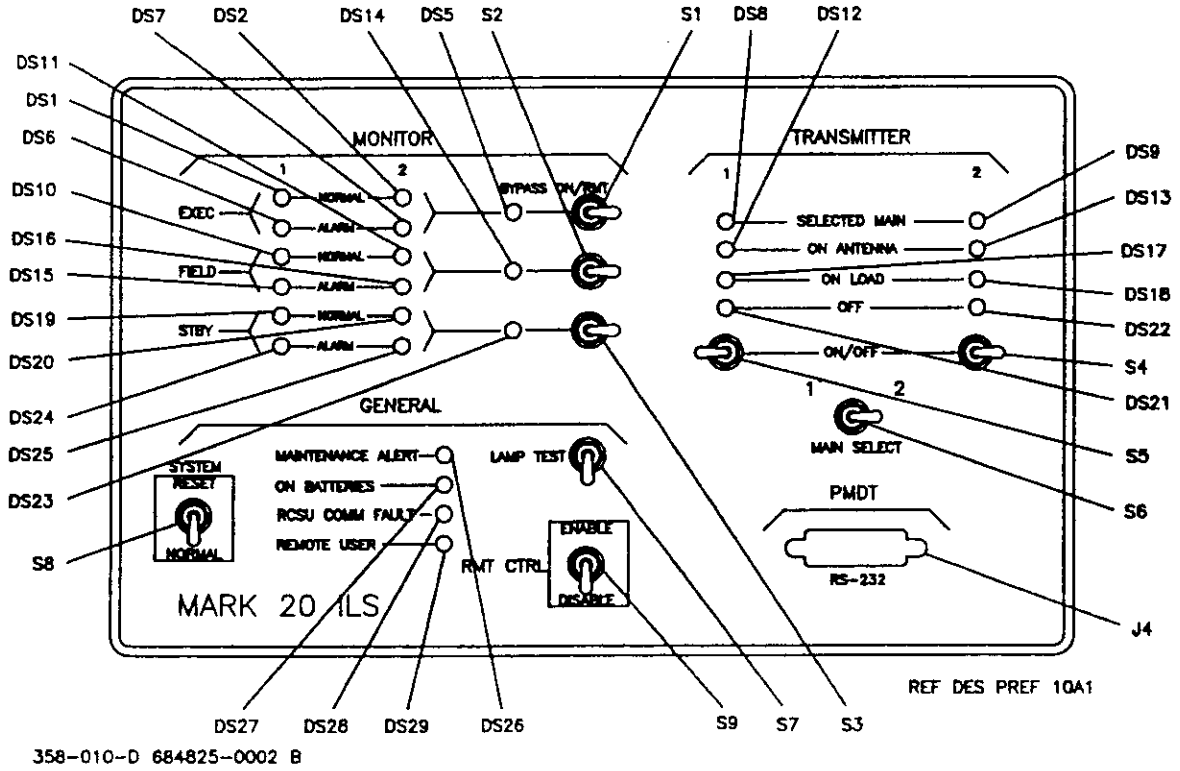


Figure 3-2. Subsystem Front Panel Circuit-Card Assembly 10A1, Controls and Indicators

Table 3-2. Subsystem Front Panel Circuit-Card Assembly 10A1, Controls and Indicators

Control or Indicator	Ref Des	Function
MONITOR FUNCTION	...	...
MONITOR 1 EXEC NORMAL indicator	10A1DS1	Lights green to indicate executive monitor 1 is functioning normally.
MONITOR 2 EXEC NORMAL indicator	10A1DS2	Lights green to indicate executive monitor 2 is functioning normally.
MONITOR EXEC BYPASS indicator	10A1DS5	Lights yellow to indicate MONITOR EXEC BYPASS ON/RMT switch 10A1S1 is set to ON and executive monitor is bypassed.
MONITOR 1 EXEC ALARM indicator	10A1DS6	Lights red to indicate executive monitor 1 is in alarm condition.
MONITOR 2 EXEC ALARM indicator	10A1DS7	Lights red to indicate executive monitor 2 is in alarm condition.
MONITOR 1 FIELD NORMAL indicator	10A1DS10	Not used.

Table 3-2. Subsystem Front Panel Circuit-Card Assembly 10A1, Controls and Indicators

Control or Indicator	Ref Des	Function
MONITOR 2 FIELD NORMAL indicator	10A1DS11	Not used.
MONITOR FIELD BYPASS indicator	10A1DS14	Not used.
MONITOR 1 FIELD ALARM indicator	10A1DS15	Not used.
MONITOR 2 FIELD ALARM indicator	10A1DS16	Not used.
MONITOR 1 STBY NORMAL indicator	10A1DS19	Lights green to indicate standby monitor 1 is functioning normally.
MONITOR 2 STBY NORMAL indicator	10A1DS20	Lights green to indicate standby monitor 2 is functioning normally.
MONITOR STBY BYPASS indicator	10A1DS23	Lights yellow to indicate MONITOR STBY BYPASS ON/RMT switch 10A1S3 is set to ON and standby monitor is bypassed.
MONITOR 1 STBY ALARM indicator	10A1DS24	Lights red to indicate standby monitor 1 is in alarm condition.
MONITOR 2 STBY ALARM indicator	10A1DS25	Lights red to indicate standby monitor 2 is in alarm condition.
MONITOR EXEC BYPASS ON/RMT toggle switch	10A1S1	Set to ON, inhibits circuits that control automatic transfer or shutdown when an alarm occurs. Set to RMT, enables circuits to allow automatic transfer or shutdown when an alarm occurs.
MONITOR FIELD BYPASS ON/RMT toggle switch	10A1S2	Not used.
MONITOR STBY BYPASS ON/RMT toggle switch	10A1S3	Set to ON, inhibits circuits that control automatic transfer or shutdown when an alarm occurs. Set to RMT, enables circuits to allow automatic transfer or shutdown when an alarm occurs.
TRANSMITTER FUNCTION	...	...
TRANSMITTER 1 SELECTED MAIN indicator	10A1DS8	Lights green to indicate transmitter 1 is selected as main transmitter.

Table 3-2. Subsystem Front Panel Circuit-Card Assembly 10A1, Controls and Indicators

Control or Indicator	Ref Des	Function
TRANSMITTER 2 SELECTED MAIN indicator	10A1DS9	Lights green to indicate transmitter 2 is selected as main transmitter.
TRANSMITTER 1 ON ANTENNA indicator	10A1DS12	Lights green to indicate transmitter 1 is connected to antenna.
TRANSMITTER 2 ON ANTENNA indicator	10A1DS13	Lights green to indicate transmitter 2 is connected to antenna.
TRANSMITTER 1 ON LOAD indicator	10A1DS17	Lights green to indicate transmitter 1 output is terminated in a termination load.
TRANSMITTER 2 ON LOAD indicator	10A1DS18	Lights green to indicate transmitter 2 output is terminated in a termination load.
TRANSMITTER 1 OFF indicator	10A1DS21	Lights red to indicate transmitter 1 is not radiating.
TRANSMITTER 2 OFF indicator	10A1DS22	Lights red to indicate transmitter 2 is not radiating.
TRANSMITTER 1 ON/OFF momentary toggle switch	10A1S5	Turns transmitter 1 on or off.
TRANSMITTER 2 ON/OFF momentary toggle switch	10A1S4	Turns transmitter 2 on or off.
MAIN SELECT 1/2 momentary toggle switch	10A1S6	Selects equipment 1 or 2 as main equipment.
GENERAL FUNCTION	...	...
MAINTENANCE ALERT indicator	10A1DS26	Lights yellow to indicate a degraded system parameter has been detected.
NOTE A maintenance alert is also caused by the following: remote control disabled, intrusion alarm, smoke detector alarm, obstruction light alarm, temperature alarm, power supply alarm, battery alarm, standby equipment on air, monitor integrity failure, reverse power failure, link failure, ac power failure, transmitter integrity data alert, integrity test aborted, or rf channel alert.		
ON BATTERIES indicator	10A1DS27	Lights yellow to indicate glide slope is operating on battery power.

Table 3-2. Subsystem Front Panel Circuit-Card Assembly 10A1, Controls and Indicators

Control or Indicator	Ref Des	Function
RCSU COMM FAULT indicator	10A1DS28	Lights yellow to indicate a communication fault exists between glide slope subsystem and remote indication and control equipment.
REMOTE USER indicator	10A1DS29	Lights yellow to indicate a remote user is logged on to the glide slope subsystem.
LAMP TEST momentary toggle switch	10A1S7	Toggle up to test (light) all indicators.
SYSTEM RESET/NORMAL momentary toggle switch	10A1S8	Toggle up (RESET) to initialize all program variables and all software/firmware-controlled hardware to a predefined condition from which normal operation can continue. Transmitter function is disabled while subsystem is resetting.
RMT CTRL ENABLE/DISABLE toggle switch	10A1S9	Set to ENABLE, allows control of glide slope subsystem from remote control and status unit (RCSU) and PMDT. Set to DISABLE, inhibits control from RCSU and remote PMDT.
PMDT connector	10A1J4	Provides for connection of a PMDT.

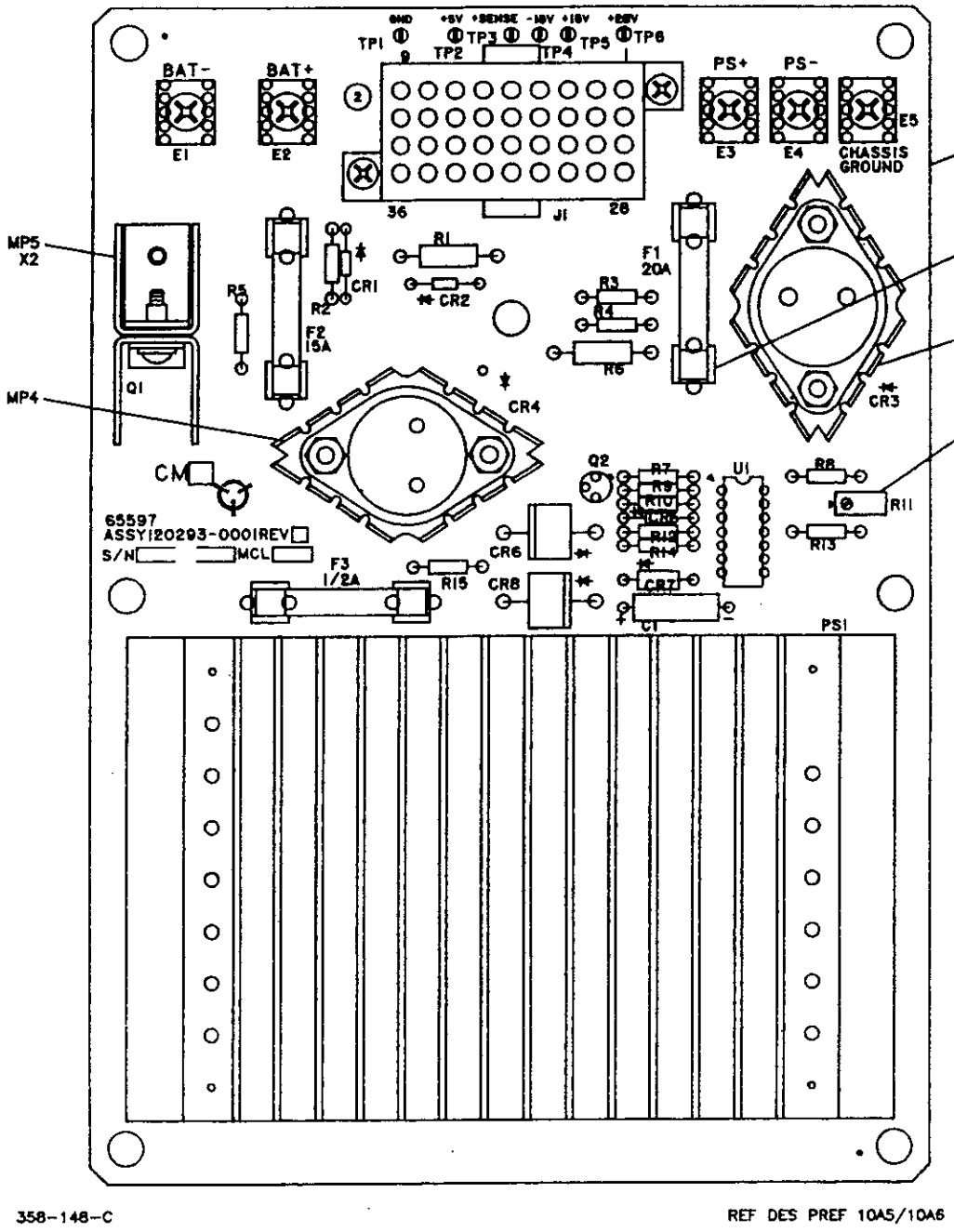


Figure 3-3. DC-DC Converter Circuit-Card Assembly 10A5/10A6, Controls

Table 3-3. DC-DC Converter Circuit-Card Assembly 10A5/10A6, Control

Control or Indicator	Ref Des	Function
Battery cutoff control	10A5R11 10A6R11	Adjusts battery cutoff threshold voltage.

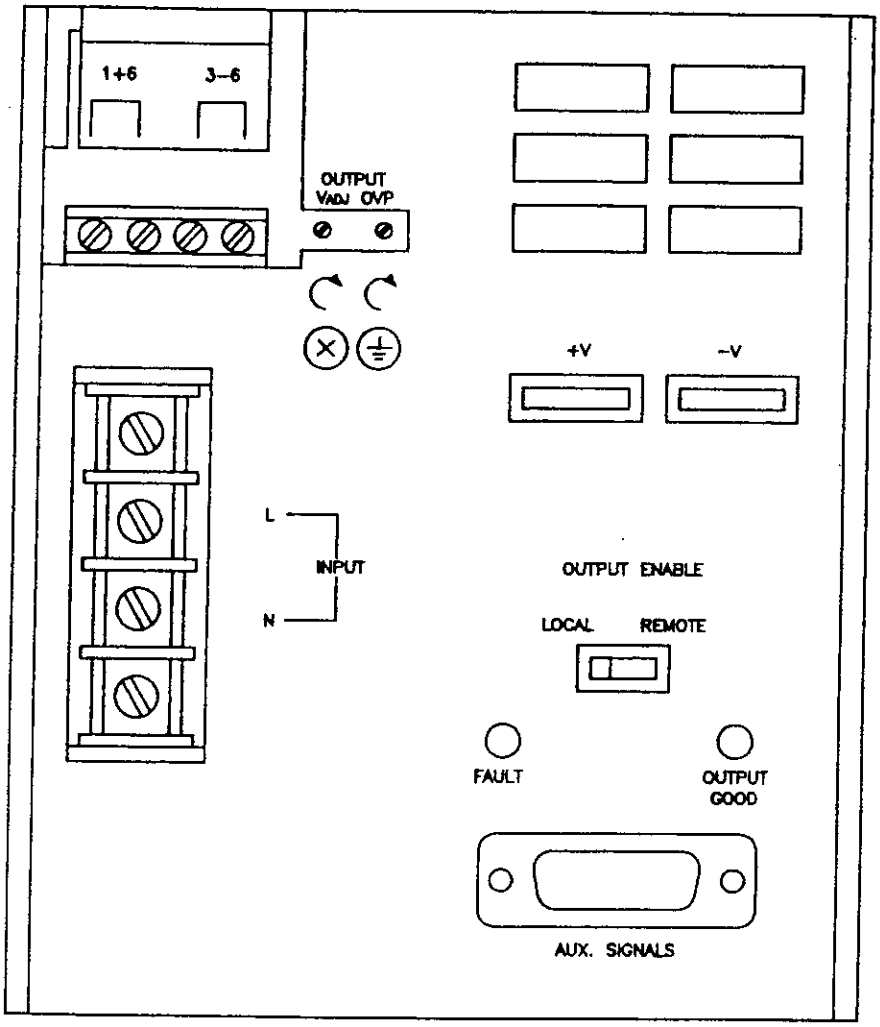


Figure 3-4. AC-DC Converter Assembly 10PS1/10PS2, Controls and Indicators

Table 3-4. AC-DC Converter Assembly 10PS1/10PS2, Controls and Indicators

Control or Indicator	Ref Des	Function
OUTPUT ENABLE LOCAL/REMOTE switch	...	Set to LOCAL, remote control actions are inhibited. Set to REMOTE, output voltage is enabled or disabled by logic inputs from a remote control source. Set to LOCAL for Mark 20A application.
OUTPUT OVP control	...	Adjusts overvoltage protection (ovp) voltage.
OUTPUT VADJ	...	Adjusts output voltage.
FAULT indicator	...	Lights red to indicate overvoltage or overtemperature functions are in alarm condition.
OUTPUT GOOD indicator	...	Lights green to indicate output voltage is within specified operating range.

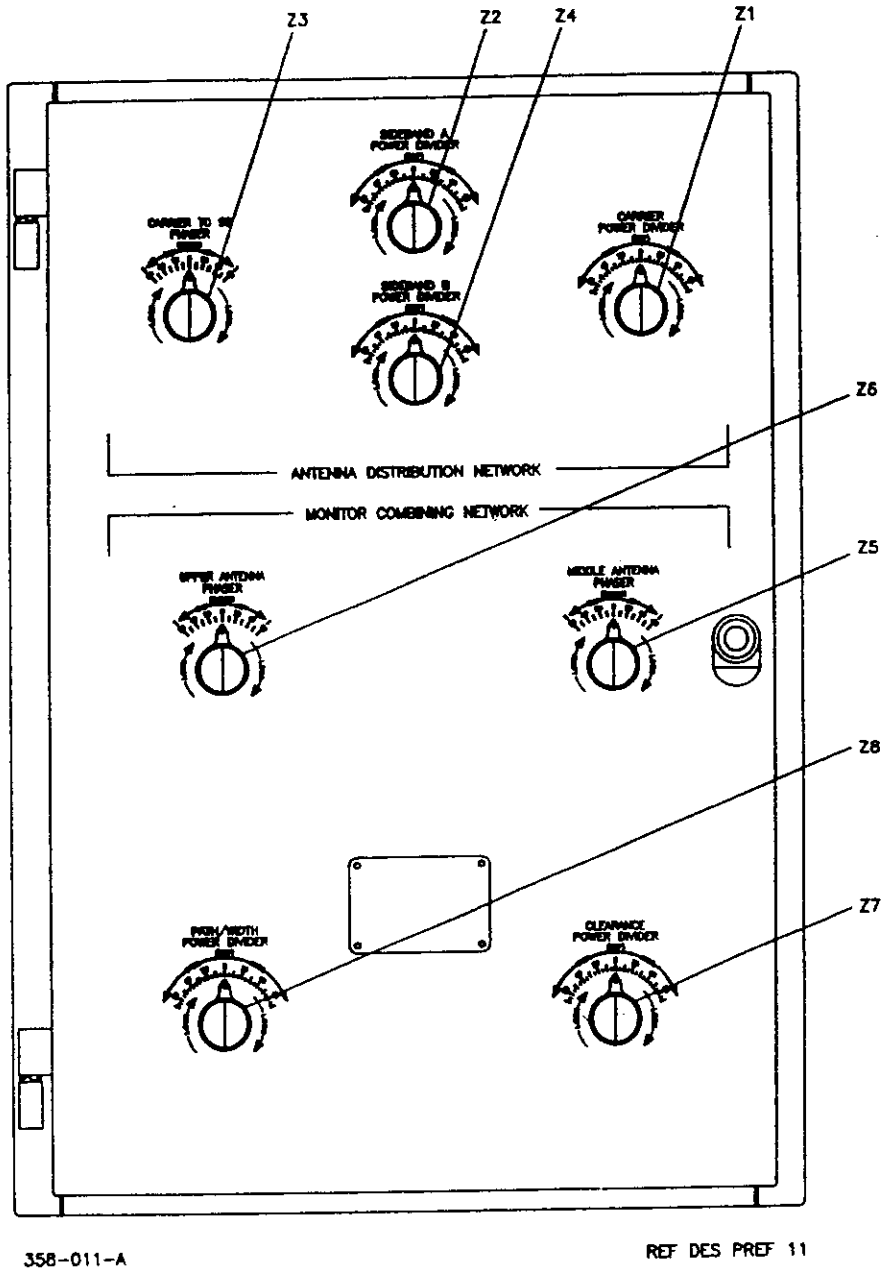


Figure 3-5. Glide Slope Distribution Unit and Combining Unit 11, Controls

Table 3-5. Glide Slope Distribution Unit and Combining Unit 11, Controls

Control	Ref Des	Function
ANTENNA DISTRIBUTION NETWORK	...	...
CARRIER POWER DIVIDER control	11Z1	Divides carrier into two components and sends them to hybrid subassemblies.
SIDEBAND A POWER DIVIDER control	11Z2	Divides sideband into two components, middle antenna and upper/lower antenna.
CARRIER TO SB PHASER control	11Z3	Adjusts relative phase of SBO input to hybrid subassembly 11HY1.
SIDEBAND B POWER DIVIDER control	11Z4	Divides sideband/clearance composite rf signal into two components, upper antenna and lower antenna, and sends them to phasers.
MONITOR COMBINING NETWORK	...	...
MIDDLE ANTENNA PHASER control	11Z5	Sets received middle antenna monitor input signal 180° out of phase with lower antenna monitor input signal.
UPPER ANTENNA PHASER control	11Z6	Sets received upper antenna monitor input signal 180° out of phase with lower antenna monitor input signal.
CLEARANCE POWER DIVIDER control	11Z7	Varies division of upper antenna monitor input signal between clearance output and hybrid subassembly 11HY5 input.
PATH/WIDTH POWER DIVIDER control	11Z8	Varies division of lower antenna monitor input signal between path output and hybrid subassembly 11HY4 input.

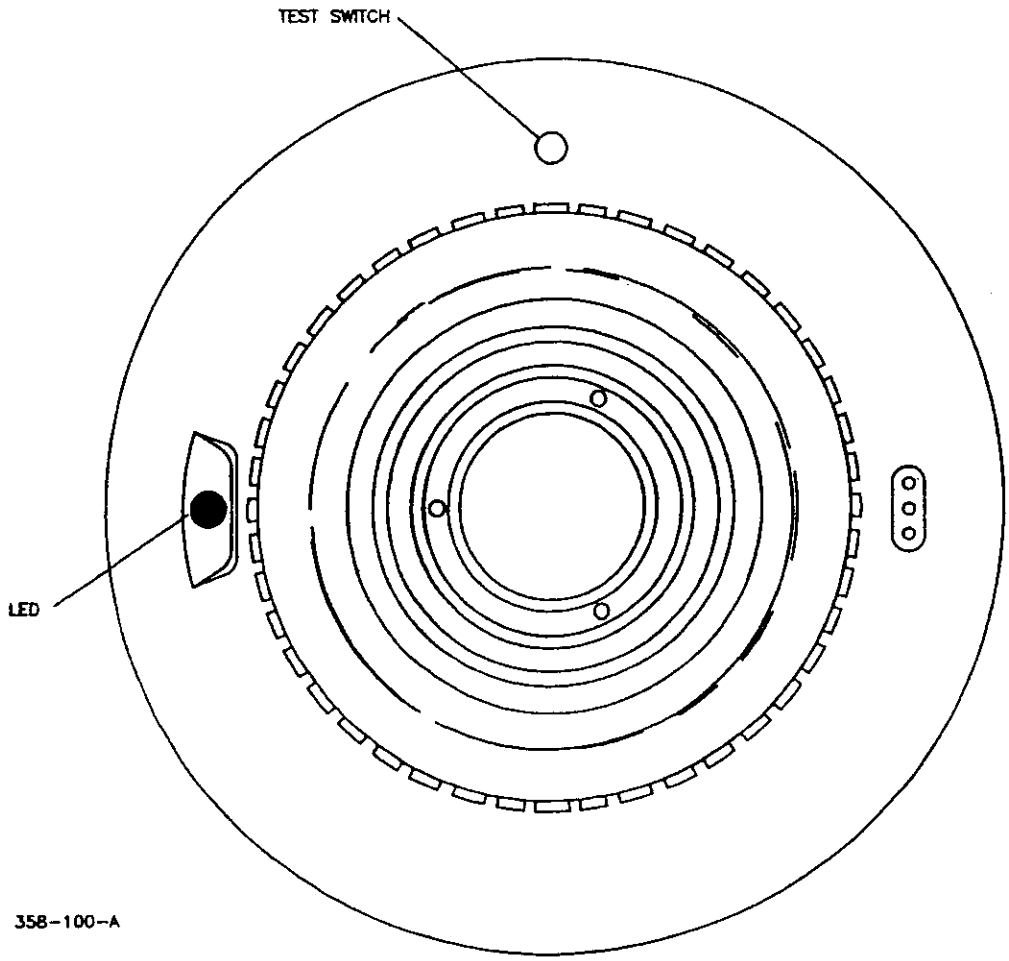


Table 3-6. Ionization Type Smoke Detector A12, Controls and Indicators

Control or Indicator	Ref Des	Function
Test switch	...	When pushed and held, causes audible alarm to sound and lights light-emitting diode (LED).
LED	...	Lights red to indicate an alarm condition. Flashes every 10 seconds in unalarmed condition to indicate power is applied.

3.3 TURN ON AND CHECKOUT.- The following paragraphs contain turn-on and checkout procedures for the glide slope subsystem and log-on/log-off procedures for the PMDT.

3.3.1 Glide Slope Subsystem Turn On and Checkout.- All monitoring and control logic within the glide slope electronic subsystem is powered from either power supply (equipment 1 or equipment 2). Transmitter power is received exclusively from its associated power supply. Because monitoring and control activity is initiated when either power supply is enabled, it is preferred to power up the equipment

designated main to prevent a transition to the standby equipment as a result of expiration (3 to 4 seconds) of the power-on monitor bypass function. Refer to table 3-7 for steps required to turn on and check out the glide slope subsystem.

Table 3-7. Glide Slope Subsystem Turn On and Checkout

Location	Item	Action	Indication - Remarks
NOTE The glide slope subsystem is shipped from the factory configured to default to equipment 1 as the main equipment. Power to equipment designated main should be turned on first.			
Glide slope ac-dc switch module assembly 10A2	EQUIPMENT 1 AC POWER ON/OFF circuit breaker	Set to ON.	EQUIPMENT 1 AC POWER indicator lights. Applies ac power to subsystem 1 electronics. Subsystem front panel circuit-card assembly (cca) TRANSMITTER 1 SELECTED MAIN and ON ANTENNA indicators light. Subsystem front panel cca TRANSMITTER 2 ON LOAD indicator lights.
NOTE If another ILS is installed at opposite end of runway and that ILS is radiating, ON ANTENNA indicator flashes and OFF indicator lights when EQUIPMENT 1 AC POWER ON/OFF circuit breaker is set to ON.			
Glide slope ac-dc switch module assembly 10A2	EQUIPMENT 1 DC POWER ON/OFF circuit breaker	Set to ON.	EQUIPMENT 1 DC POWER indicator lights. Applies charge voltage to battery. Applies battery voltage to subsystem 1 electronics if ac power is lost.

Table 3-7. Glide Slope Subsystem Turn On and Checkout

Location	Item	Action	Indication - Remarks
Glide slope ac-dc switch module assembly 10A4	EQUIPMENT 2 AC POWER ON/OFF circuit breaker	Set to ON.	EQUIPMENT 2 AC POWER indicator lights. Applies ac power to subsystem 2 electronics.
Glide slope ac-dc switch module assembly 10A4	EQUIPMENT 2 DC POWER ON/OFF circuit breaker	Set to ON.	EQUIPMENT 2 DC POWER indicator lights. Applies charge voltage to battery. Applies battery voltage to subsystem 2 electronics if ac power is lost.
Subsystem front panel cca	LAMP TEST switch	Momentarily toggle up.	All subsystem front panel cca indicators light momentarily.
Subsystem front panel cca	MONITOR EXEC BYPASS ON/RMT switch	Set to ON.	MONITOR EXEC BYPASS indicator lights. Inhibits circuits that control automatic transfer or shutdown when an alarm occurs.
Subsystem front panel cca	MONITOR STBY BYPASS ON/RMT switch	Set to ON.	MONITOR STBY BYPASS indicator lights. Inhibits circuits that control automatic transfer or shutdown when a standby alarm occurs.
Subsystem front panel cca	RMT CTRL ENABLE/DISABLE switch	Set to DISABLE.	Provides operator with exclusive control of glide slope subsystem. Inhibits control from remote site. Disabling remote control generates a maintenance alert (subsystem front panel cca MAINTENANCE ALERT indicator lights).

Table 3-7. Glide Slope Subsystem Turn On and Checkout

Location	Item	Action	Indication - Remarks
Subsystem front panel cca	PMDT connector	Connect PMDT.	After log on (para 3.3.2), Commands menu and System Status screen will be displayed.
PMDT	...	Verify PMDT system status functions displayed match subsystem front panel cca indications.	System Status screen allows operator to view system status and configuration.
NOTE When leaving the glide slope shelter, perform the following actions.			
PMDT	...	Log off (para 3.3.3).	...
Subsystem front panel cca	PMDT connector	Disconnect PMDT.	...
Subsystem front panel cca	MONITOR EXEC BYPASS ON/RMT switch	Set to RMT.	Enables circuits to allow automatic transfer or shutdown when an alarm occurs.
Subsystem front panel cca	MONITOR STBY BYPASS ON/RMT switch	Set to RMT.	Enables circuits to allow automatic transfer or shutdown when a standby monitor alarm occurs.
Subsystem front panel cca	RMT CTRL ENABLE/DISABLE switch	Set to ENABLE.	Allows remote control of glide slope subsystem.

3.3.2 Portable Maintenance Data Terminal Log-On Procedure.- The following procedure is used to log on to an operational glide slope station.

NOTE

After log on, the PMDT software program will terminate if there is no activity on the PMDT for 15 minutes. The automatic 15-minute timeout can be overridden by setting RMT CTRL ENABLE/ DISABLE switch on subsystem front panel cca 10A1 to DISABLE.

NOTE

The PMDT software may be loaded onto your computer hard drive if sufficient memory is available on your computer hard disk. Copy the PMDT software programs to your computer hard drive, usually drive C:. To access the software program when it is loaded onto a hard drive, follow the procedure below except type C: instead of A:.

a. Set PMDT power switch to on.

b. PMDT will display C> after computer booting is complete.

c. Connect PMDT serial communications connector to subsystem front panel cca 10A1 PMDT connector J4.

NOTE

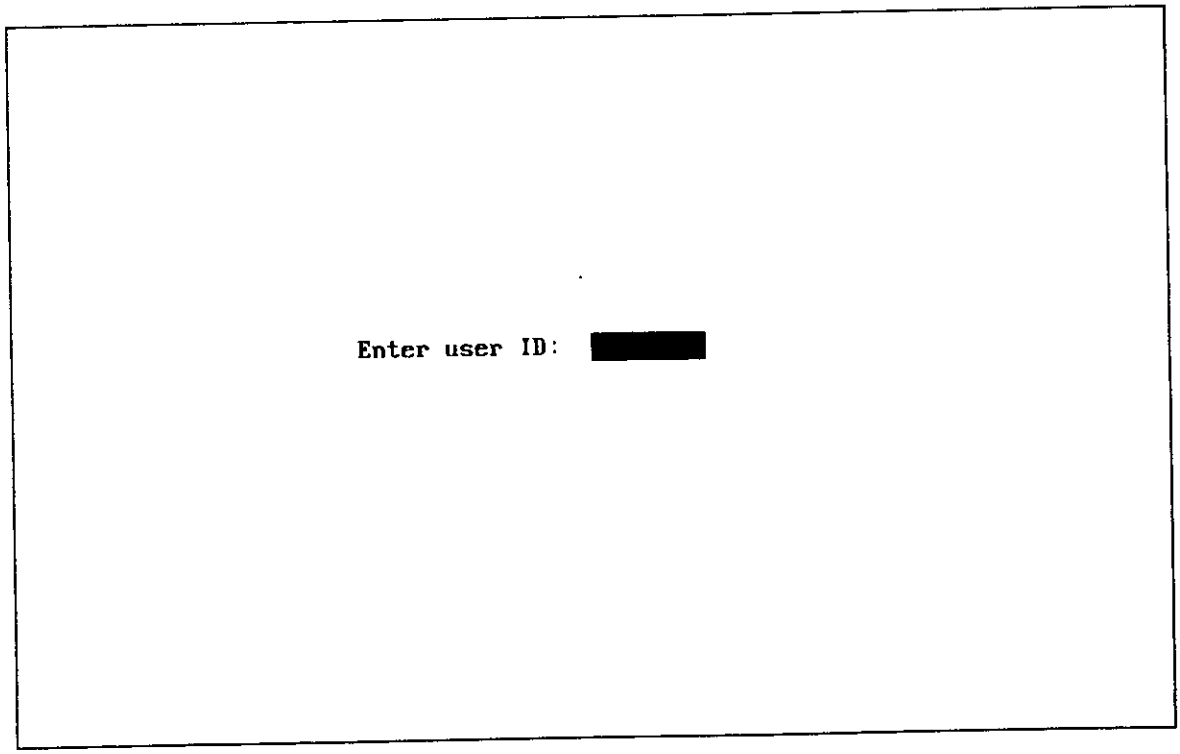
Steps d and e are applicable when the PMDT software programs are on floppy disks.

d. Insert Mark 20A computer disk into PMDT disk drive.

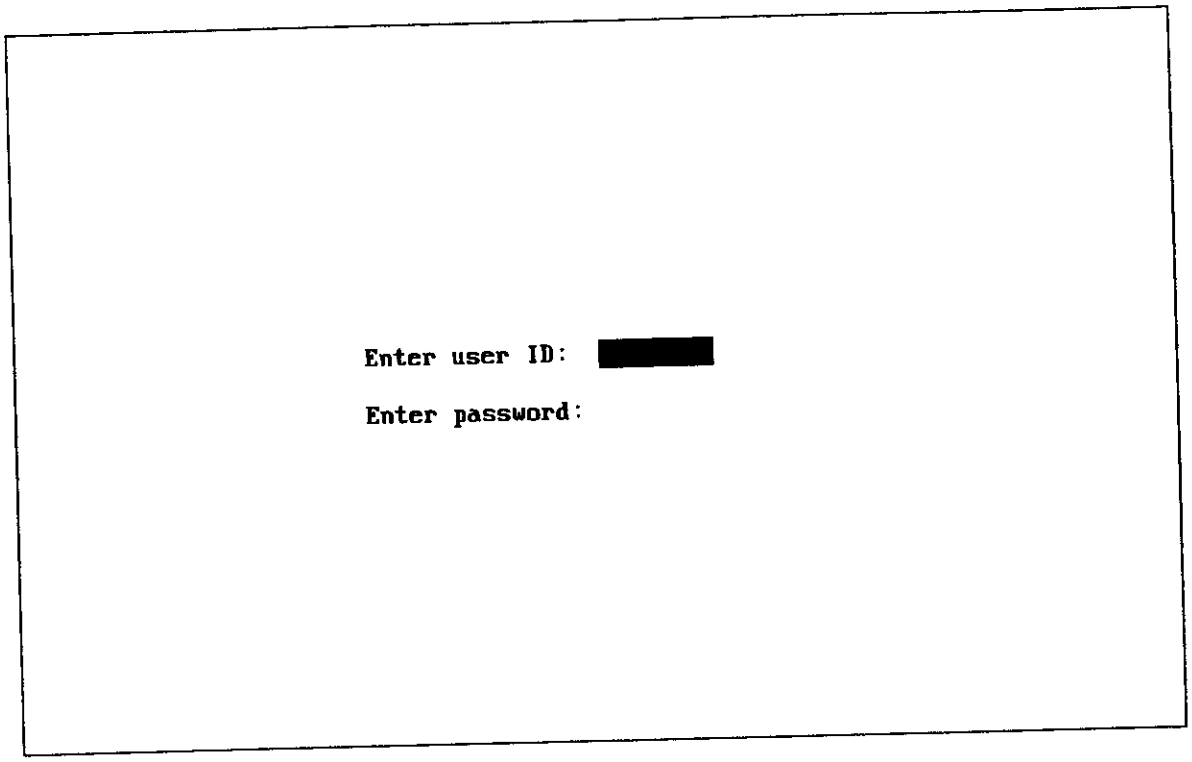
e. Type a: (or A:) and press Enter key on PMDT.

f. Type mk20a 1 (or MK20A 1) and press Enter key.

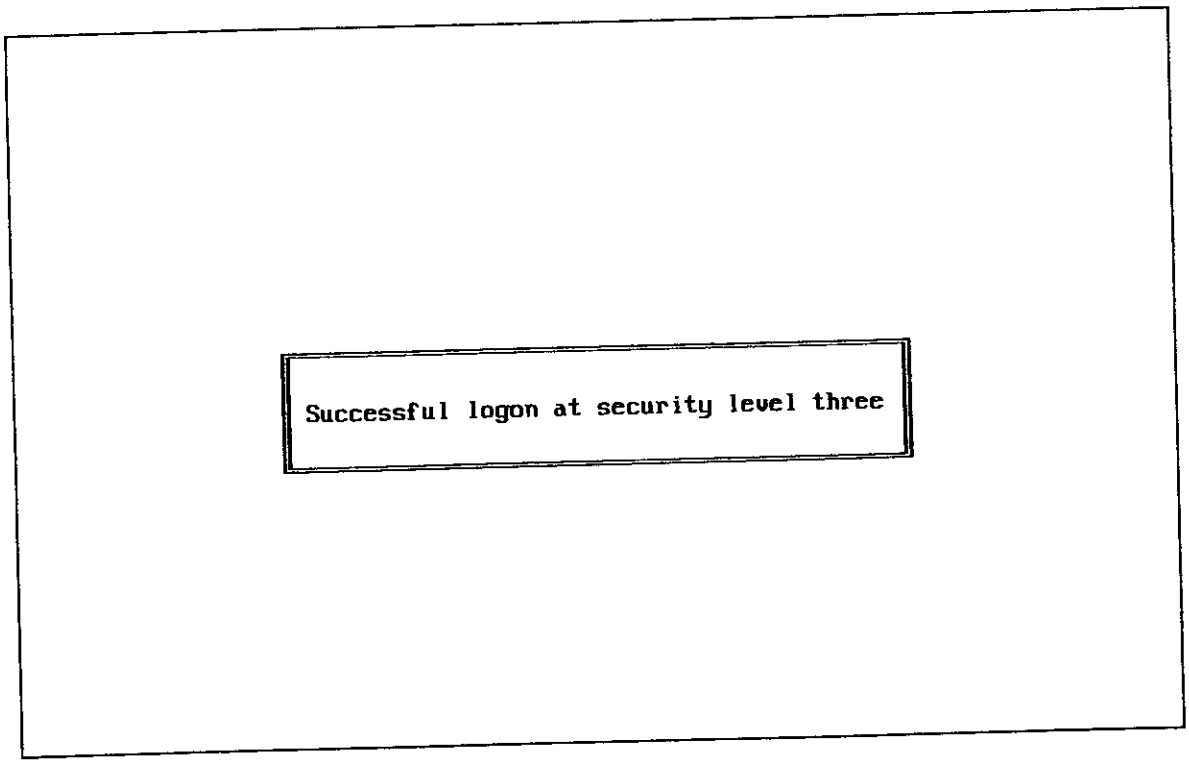
g. PMDT will display Enter user ID screen. Enter user identification and press Enter key. If user identification has not been assigned to the station software, press Enter key.

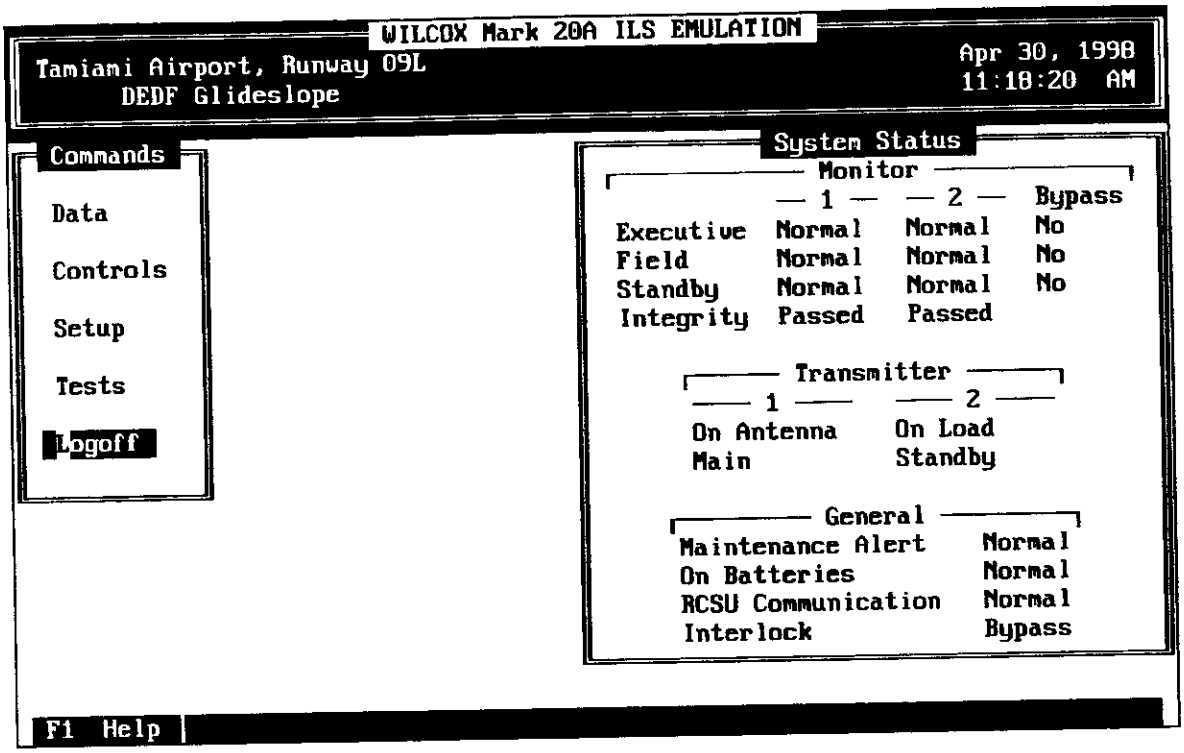


h. PMDT will display Enter password screen. Enter password and press Enter key. If password has not been assigned to station software, press Enter key.



i. PMDT will display "Successful logon at security level (one, two, or three)" and then display WILCOX Mark 20A ILS Commands menu and System Status screen.





NOTE

Powering down the glide slope with the glide slope ac-dc switch module assembly 10A2/10A4 causes the software to reset and logs off the PMDT and shuts down both transmitters. It is necessary to log onto the PMDT, therefore losing continuity of operation. Shutting down the transmitters individually and then powering down does not reset the software and therefore does not affect PMDT operation.

3.3.2.1 Power-Down/Power-Up Sequence 1.- The purpose of this procedure is to power down and power up transmitter 1 without affecting the PMDT or transmitter 2 operation.

a. **POWER DOWN TRANSMITTER 1**. On subsystem front panel cca 10A1, toggle TRANSMITTER 1 ON/OFF switch S5 to OFF.

b. On ac-dc switch module assembly 10A2, set EQUIPMENT 1 AC POWER ON/OFF and DC POWER ON/OFF circuit breakers CB1 and CB2 to OFF.

c. **POWER UP TRANSMITTER 1**. On ac-dc switch module assembly 10A2, set EQUIPMENT 1 AC POWER ON/OFF and DC POWER ON/OFF circuit breakers CB1 and CB2 to ON.

d. On subsystem front panel cca 10A1, toggle TRANSMITTER 1 ON/OFF switch S5 to ON.

3.3.2.2 Power-Down/Power-Up Sequence 2.- The purpose of this procedure is to power down and power up transmitter 2 without affecting the PMDT.

a. **POWER DOWN TRANSMITTER 2**. On subsystem front panel cca 10A1, toggle TRANSMITTER 2 ON/OFF switch S4 to OFF.

b. On ac-dc switch module assembly 10A4, set EQUIPMENT 2 AC POWER ON/OFF and DC POWER ON/OFF circuit breakers CB1 and CB2 to OFF.

c. **POWER UP TRANSMITTER 2**. On ac-dc switch module assembly 10A4, set EQUIPMENT 2 AC POWER ON/OFF and DC POWER ON/OFF circuit breakers CB1 and CB2 to ON.

d. On subsystem front panel cca 10A1, toggle TRANSMITTER 2 ON/OFF switch S4 to ON.

3.3.3 Portable Maintenance Data Terminal Log Off-Procedure.- The following procedure is used to log off of an operational glide slope station.

a. Select <L>ogoff from Commands menu. Prompt "Do you really want to log off?" will appear.

b. Select <Y>es. If monitor is bypassed, message "Alarm(s) are bypassed! Unbypass the ALARM(S)? <Y>es/<N>o?" will appear. Refer to step c. If monitor is not bypassed, PMDT screen will display active drive prompt. Refer to step d.

c. Select <Y>es to leave monitor bypassed and log off or select <N>o, unbypass the monitor, and then continue log off.

d. Turn PMDT off.

e. Disconnect PMDT from subsystem front panel cca 10A1 PMDT connector J4.

f. Set MONITOR EXEC BYPASS ON/RMT switch S1 on subsystem front panel cca 10A1 to RMT.

g. Set MONITOR STBY BYPASS ON/RMT switch S3 on subsystem front panel cca 10A1 to RMT.

3.4 REMOTE MONITORING AND CONTROL.- The glide slope group may be monitored remotely by the PMDT, and remote indication and control equipment (RICE). Performance may be monitored using the PMDT connected via the switched telephone network. The glide slope group control bypass status, alarm status, and difference in alarm status signals are sent to the RICE For details, refer to Remote Indication and Control Equipment Instruction Book 305627-0474.

3.5 EQUIPMENT SHUTDOWN.- Refer to table 3-8 for steps required to shut down the glide slope subsystem. In an emergency, the glide slope group can be shut down by turning off the equipment shelter main circuit breaker. This is not a recommended procedure and should only be used when personal injury or equipment damage is occurring.

Table 3-8. Glide Slope Subsystem Shutdown

Location	Item	Action	Indication - Remarks
PMDT	PMDT Commands menu and System Status screen	Type L or highlight the Logoff command and press Enter. The screen will display "Do you really want to logoff? Yes/No". Type Y.	...
Subsystem front panel cca	PMDT connector	Disconnect PMDT.	...
Glide slope ac-dc switch module assembly 10A4	EQUIPMENT 2 DC POWER ON/OFF circuit breaker	Set to OFF.	EQUIPMENT 2 DC POWER indicator should not be lit. Removes charge voltage from battery. Removes battery voltage from subsystem 2 electronics.
Glide slope ac-dc switch module assembly 10A2	EQUIPMENT 1 DC POWER ON/OFF circuit breaker	Set to OFF.	EQUIPMENT 1 DC POWER indicator should not be lit. Removes charge voltage from battery. Removes battery voltage from subsystem 1 electronics.
Glide slope ac-dc switch module assembly 10A4	EQUIPMENT 2 AC POWER ON/OFF circuit breaker	Set to OFF.	EQUIPMENT 2 AC POWER indicator should not be lit. Removes ac power from subsystem 2 electronics.
Glide slope ac-dc switch module assembly 10A2	EQUIPMENT 1 AC POWER ON/OFF circuit breaker	Set to OFF.	EQUIPMENT 1 AC POWER indicator should not be lit. Removes ac power from subsystem 1 electronics.

3.6 OPERATOR SCREEN SELECTION AND FORMAT.- The following paragraphs describe the purpose, function, interface between screens, and operator interface for the operator screens seen on the PMDT when the PMDT is connected to the glide slope group.

NOTE

The screens provided in this section contain typical parameters and alarm limits only and are not to be used instead of the equipment standards and tolerances (section 4). Data displayed on some screens is dependent upon site-specific data entered into the system in accordance with site requirements.

3.6.1 Operator Screen Format.- After log on, the Commands menu and System Status screen will be displayed on the PMDT. See figure 3-7. Figure 3-7 shows the operator screen format described in the following paragraphs.

3.6.1.1 Station.- This area of the screen identifies the configuration of the station, the airport, and the runway.

3.6.1.2 Date/Time.- This area of the screen displays the current date and the time. The time can be displayed in local time or Greenwich mean time (GMT).

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Figure 3-7. Operator Screen Format

3.6.1.3 System Status.- This area of the screen displays the status of the station equipment.

3.6.1.4 F1 Help.- Pressing function key F1 will select help from any screen. The help information is dependent on the screen/data being displayed at the time function key F1 is pressed.

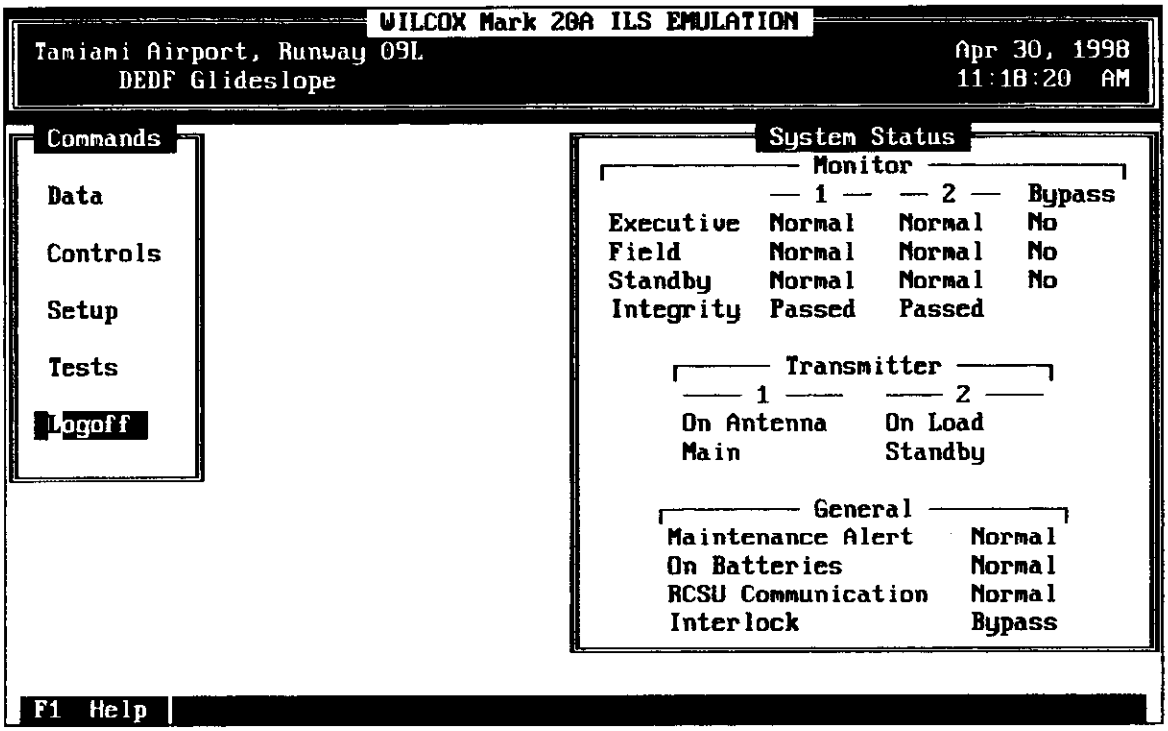
NOTE

It is advisable to print the help file (MK2AHELP.TXT) from the PMDT software program. The printed help file will provide the operator with a hard copy of all F1 HELP information available in the PMDT software. Studying the printed copy will enable the operator to better understand the PMDT software program.

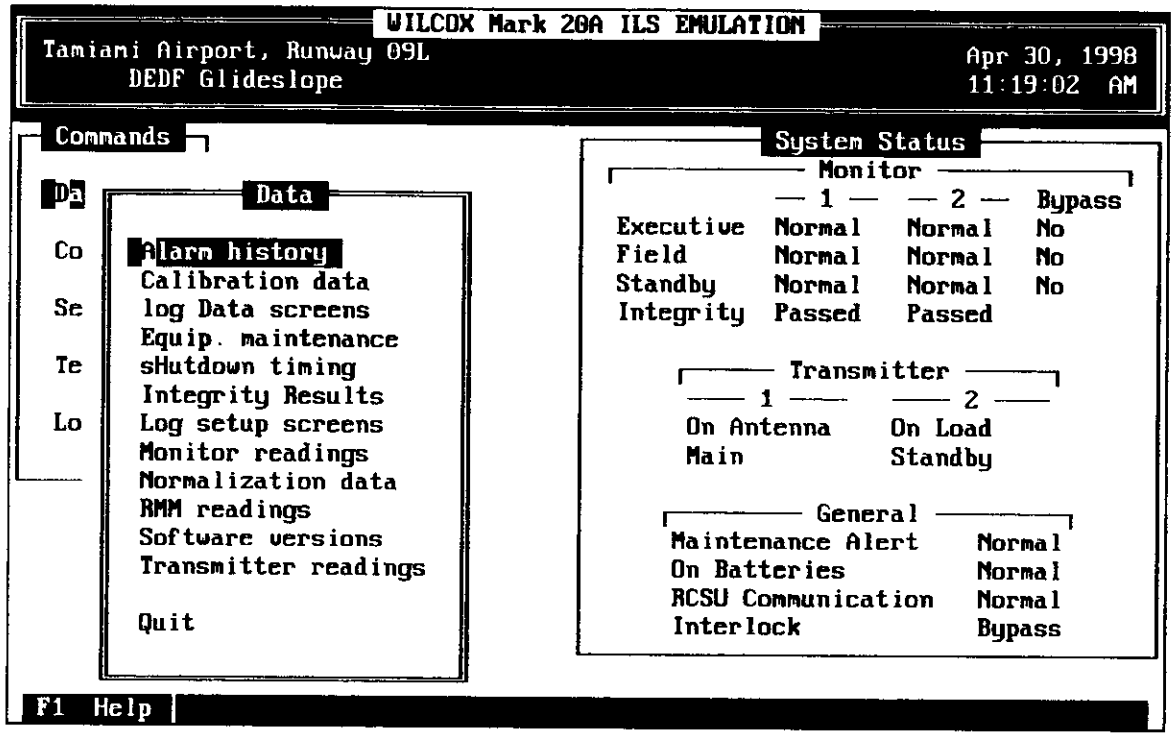
3.6.1.5 Portable Maintenance Data Terminal Function Keys.- The PMDT function key selections available to the operator from any screen are listed as follows:

F1 - Help
F2 - Executive Monitor One Data screen,
F3 - Executive Monitor Two Data screen,
F4 - Combined Executive Monitor Data screen,
F5 - On-Course/Path Transmitter One Data screen,
F6 - Clearance Transmitter One Data screen,
F7 - On-Course/Path Transmitter Two Data screen,
F9 - Maintenance Alert Data
F8 - Clearance Transmitter Two Data screen,
Shift-F2 - Field Monitor One Data screen,
Shift-F3 - Field Monitor Two Data screen,
Shift-F4 - Combined Field Monitor Data screen.
Alt-F2 - Standby Monitor One Data screen,
Alt-F3 - Standby Monitor Two Data screen,
Alt-F4 - Combined Standby Monitor Data screen.
Alt-F5 - Transmitter One Maintenance Data screen
Alt-F6 - Transmitter Two Maintenance Data screen

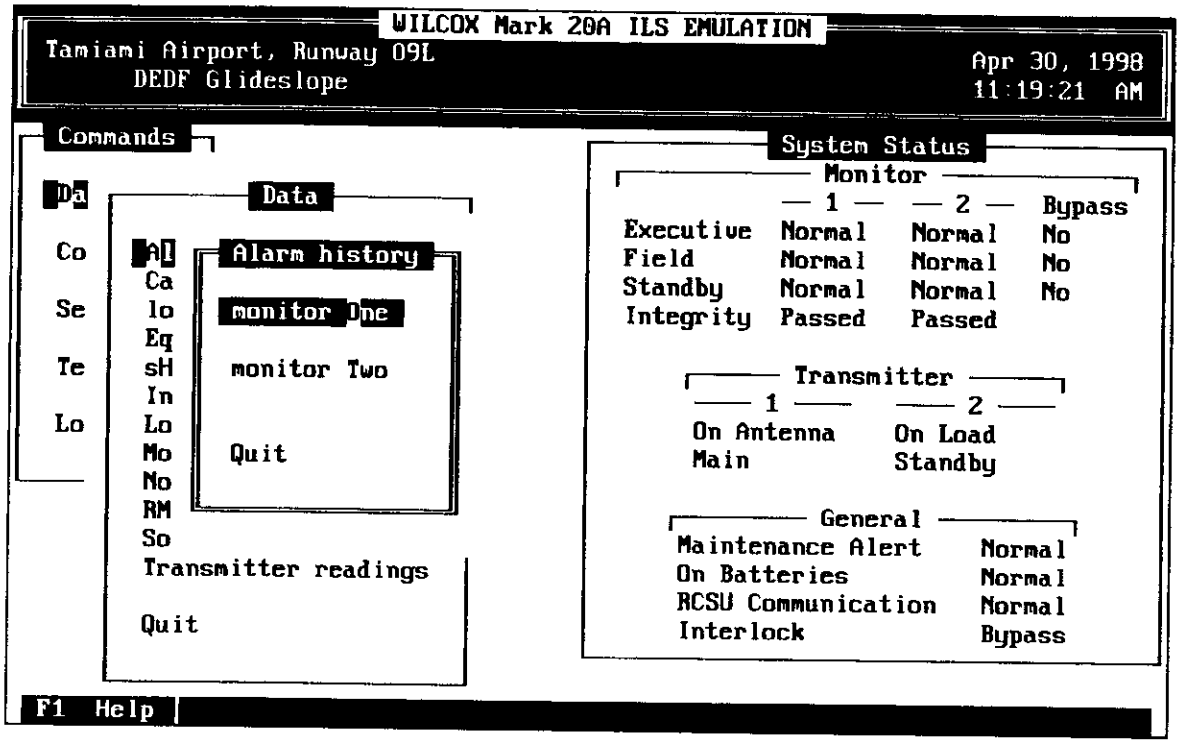
3.6.1.6 Commands Menu.- After logging onto the glide slope station, the PMDT software will display the Commands menu screen. This area of the screen provides access to basic equipment parameter screens by selecting the function containing the desired parameter. There are five subcommands found on the Commands menu. Each of these subcommands may be used to access all screens in that functional group. The commands listed are <D>ata, <C>ontrols, <S>etup, <T>ests, and <L>ogoff. Each of these subcommands is followed by descriptions of each screen accessible through the command. The screens are described in order of accessibility after making a selection from the Commands menu.



3.7 DATA SCREENS.- After logging onto the glide slope station, the operator may view the Data menu screen by selecting <D>. The Data menu allows the operator to select the <A>larm history menu screen, <C>alibration data menu screen, log <D>ata screens, <E>quip. maintenance menu screen, s<H>utdown timing data screen, <I>ntegrity results menu screen, <L>og setup screens, <M>onitor readings menu screen, <N>ormalization data menu screen, <R>MS readings menu screen, <S>oftware versions screen, and <T>ransmitter readings menu screen. The following paragraphs describe these data screens.



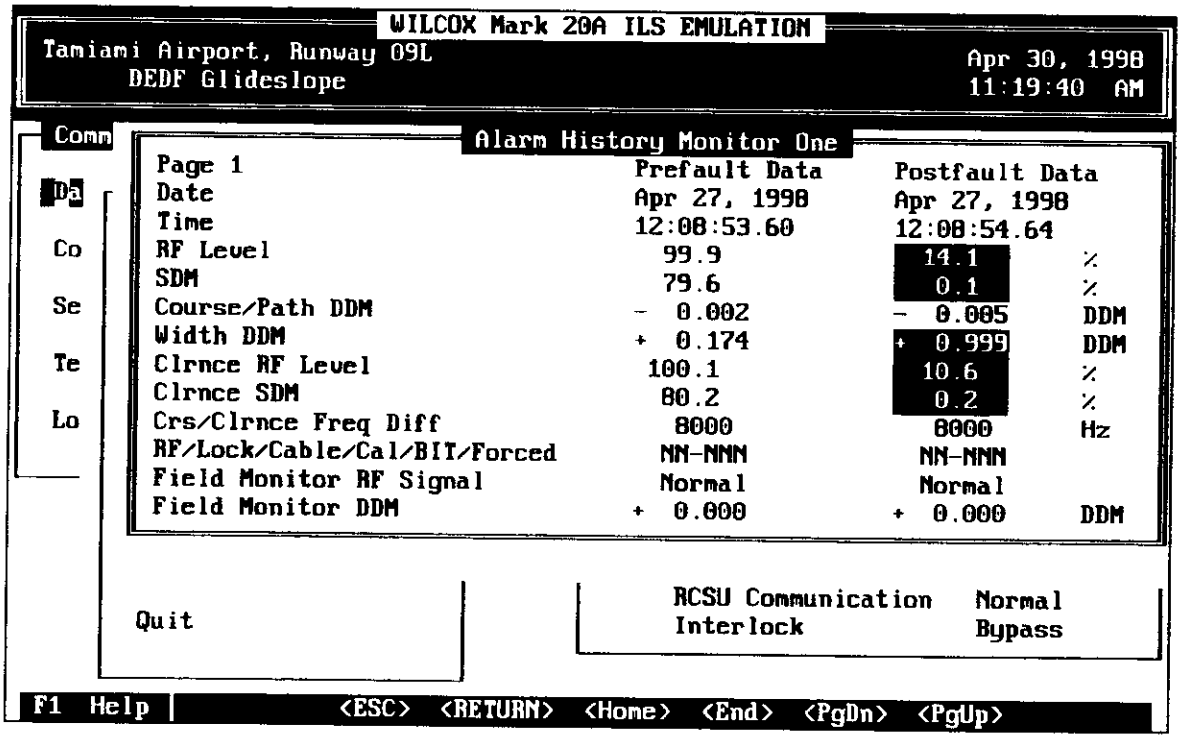
3.7.1 Alarm History Menu Screen.- After logging onto the glide slope station, the operator may view the Alarm history menu screen by selecting <D A>. The Alarm history menu screen allows the operator to select the alarm history of monitor 1 or the alarm history of monitor 2. Selecting <Q>uit returns the operator to the Data menu screen.

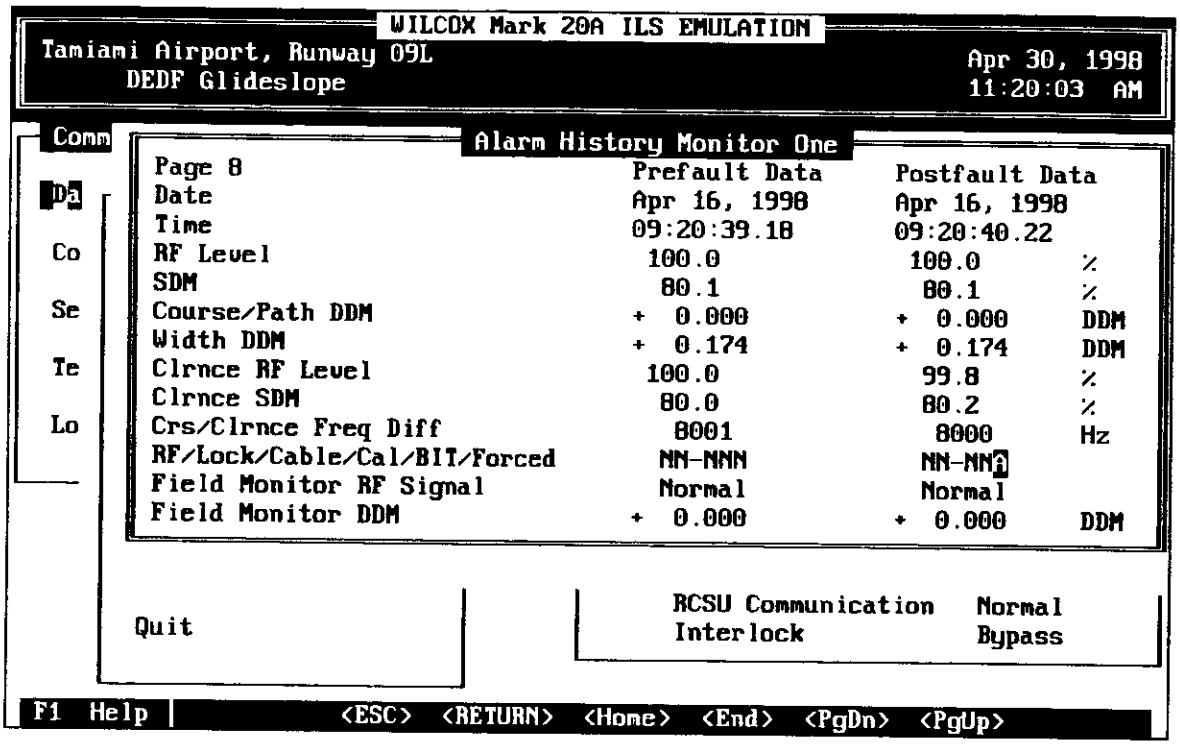


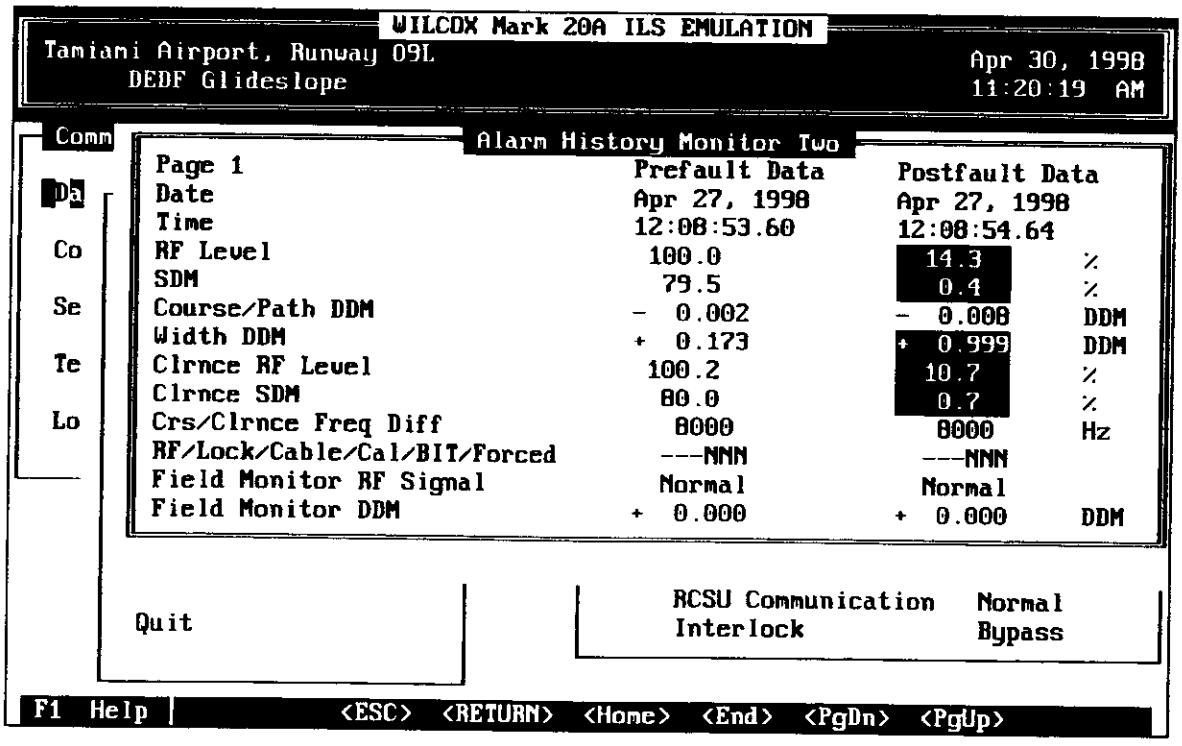
3.7.1.1 Alarm History Monitor One Screen.- After logging onto the glide slope station, the operator may view the Alarm History Monitor One screen by selecting <D A O>. This screen displays a record of the last eight faults of monitor one cca 10A3A4. When monitor <T>wo is selected, the Alarm History Monitor Two screen displays a record of the last eight faults of monitor two cca 10A3A10. Page 1 of the alarm history contains the newest fault and page 8 contains the oldest fault. Each page consists of a prefault set of data and a postfault set of data. The prefault data is a snapshot of the system at the moment before the fault condition occurred. The postfault data is a snapshot of the system at the moment when the fault condition was first detected. Only one page of data can be displayed at a time. The PgUp and PgDn keys are used to move between the different pages. The Home key moves to the newest fault entry. The End key moves to the oldest entry. The PgUp key moves to the next entry in the "newest" direction. The PgDn key moves to the next entry in the "oldest" direction.

NOTE

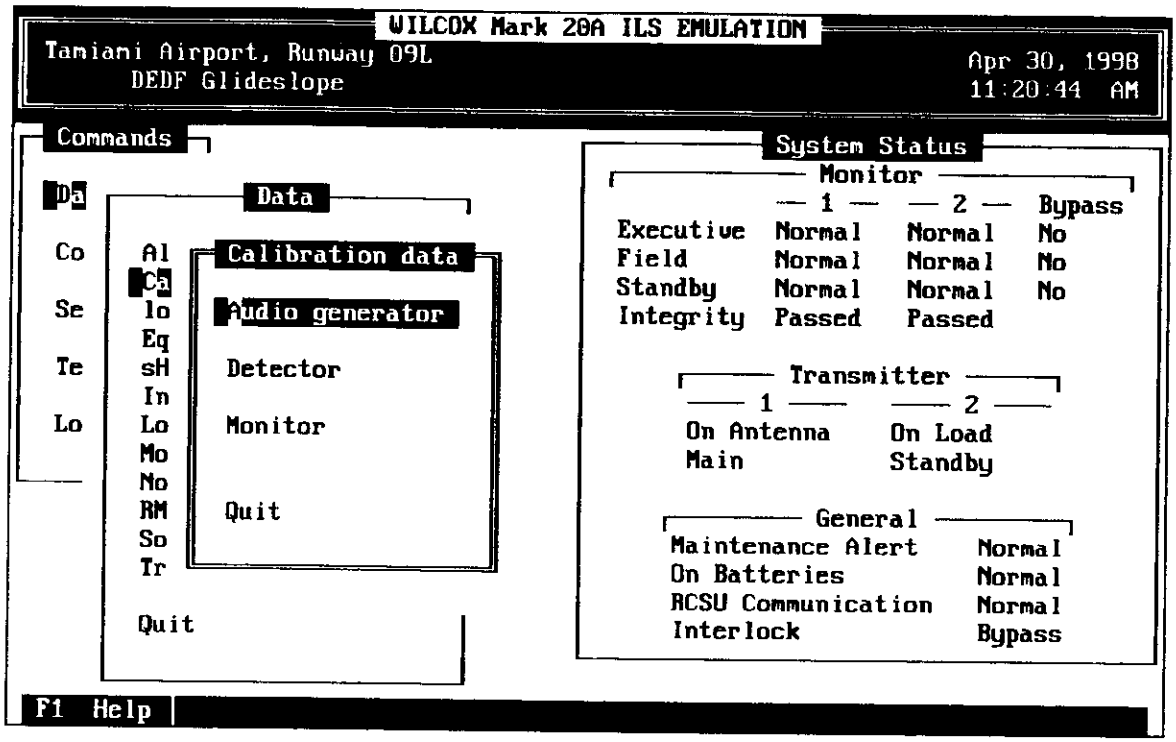
If an alarm is present at the moment the system is first powered up, no alarm history is generated because there is no prefault data to record.



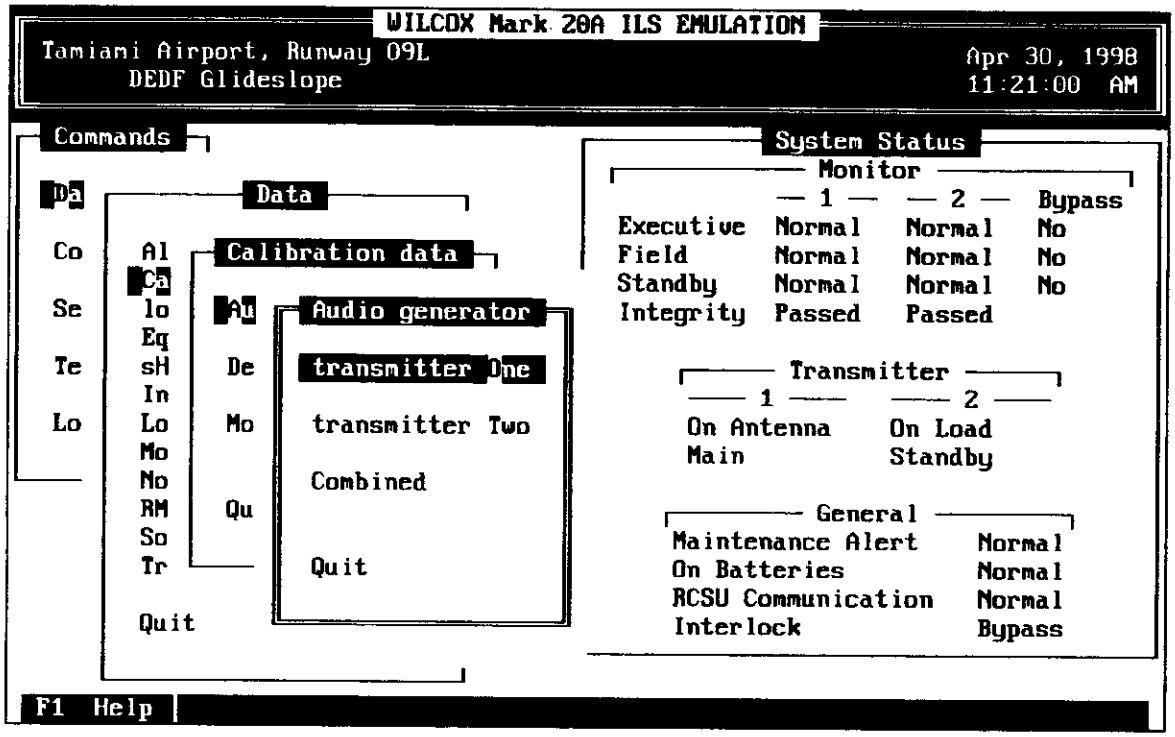

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
Apr 30, 1998
11:20:03 AM
Comm
Alarm History Monitor One
Page 8
Prefault Data
Postfault Data
Date
Apr 16, 1998
Apr 16, 1998
Time
09:20:39.18
09:20:40.22
RF Level
100.0
100.0 %
SDM
80.1
80.1 %
Course/Path DDM
+ 0.000
+ 0.000 DDM
Width DDM
+ 0.174
+ 0.174 DDM
Clrnce RF Level
100.0
99.8 %
Clrnce SDM
80.0
80.2 %
Crs/Clrnce Freq Diff
8001
8000 Hz
RF/Lock/Cable/Cal/BIT/Forced
NN-NNN
NN-NN
Field Monitor RF Signal
Normal
Normal
Field Monitor DDM
+ 0.000
+ 0.000 DDM
Quit
RCSU Communication Normal
Interlock Bypass
F1 Help
<ESC> <RETURN> <Home> <End> <PgDn> <PgUp>


WILCOX Mark 20A ILS EMULATION
Tamiani Airport, Runway 09L
DEDF Glideslope
Apr 30, 1998
11:20:19 AM
Comm
Alarm History Monitor Two
Page 1
Prefault Data
Postfault Data
Date
Apr 27, 1998
Apr 27, 1998
Time
12:08:53.60
12:08:54.64
RF Level
100.0
14.3 %
SDM
79.5
0.4 %
Course/Path DDM
- 0.002
- 0.008 DDM
Width DDM
+ 0.173
+ 0.999 DDM
Clrnce RF Level
100.2
10.7 %
Clrnce SDM
80.0
0.7 %
Crs/Clrnce Freq Diff
8000
8000 Hz
RF/Lock/Cable/Cal/BIT/Forced
---NNN
---NNN
Field Monitor RF Signal
Normal
Normal
Field Monitor DDM
+ 0.000
+ 0.000 DDM
Quit
RCSU Communication Normal
Interlock Bypass
F1 Help
<ESC> <RETURN> <Home> <End> <PgDn> <PgUp>

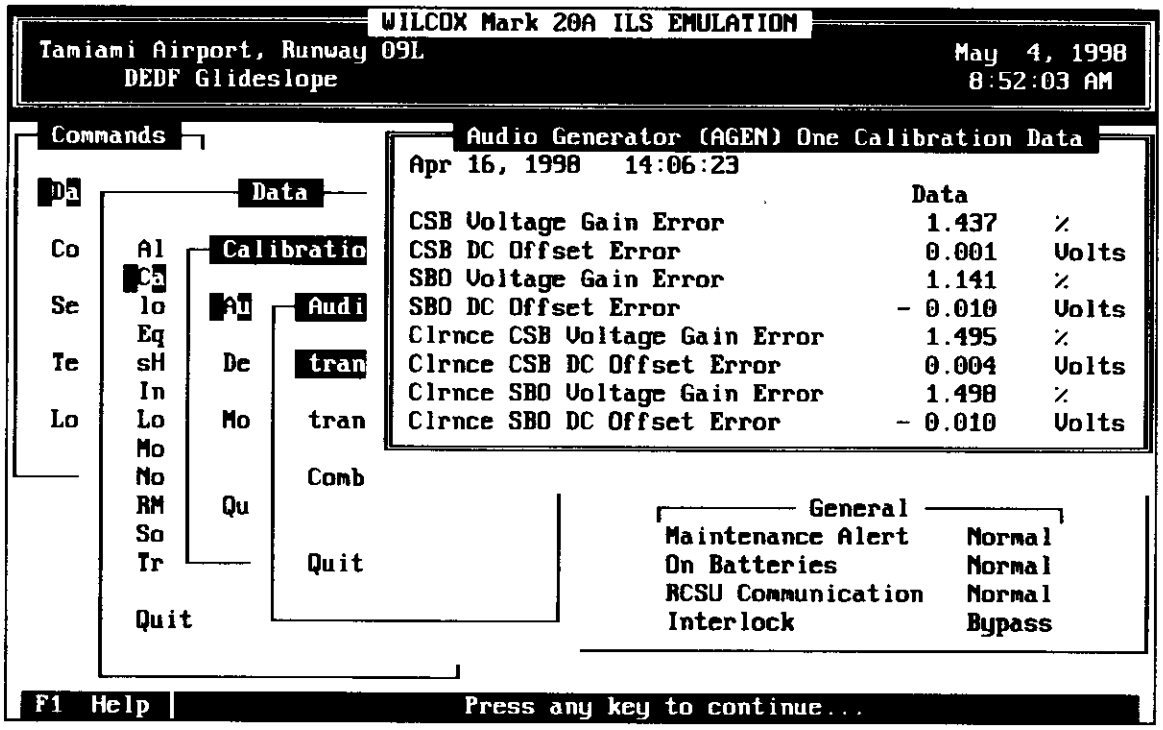
3.7.2 Calibration Data Menu Screen.- After logging onto the glide slope station, the operator may view the Calibration data menu screen by selecting <D C>. The Calibration data menu screen allows the operator to select the <A>udio generator menu screen, <D>etector menu screen, or <M>onitor menu screen. Selecting <Q>uit returns the operator to the Data menu screen. The following paragraphs describe these menu screens.

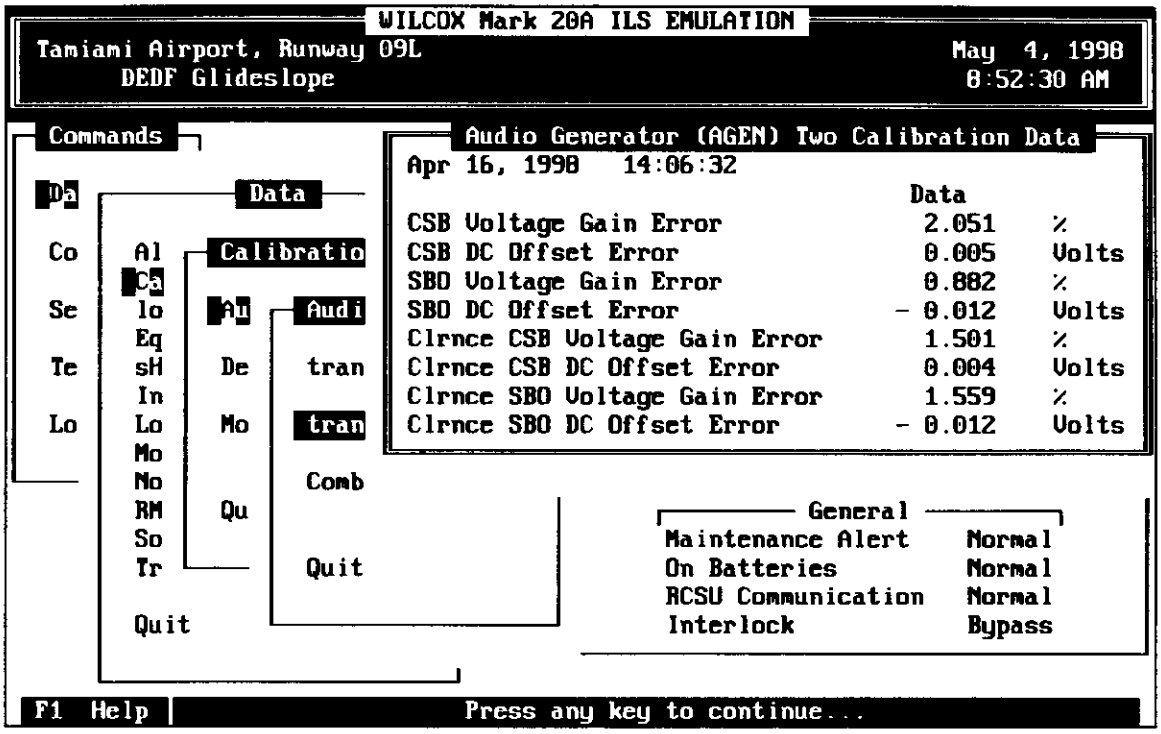


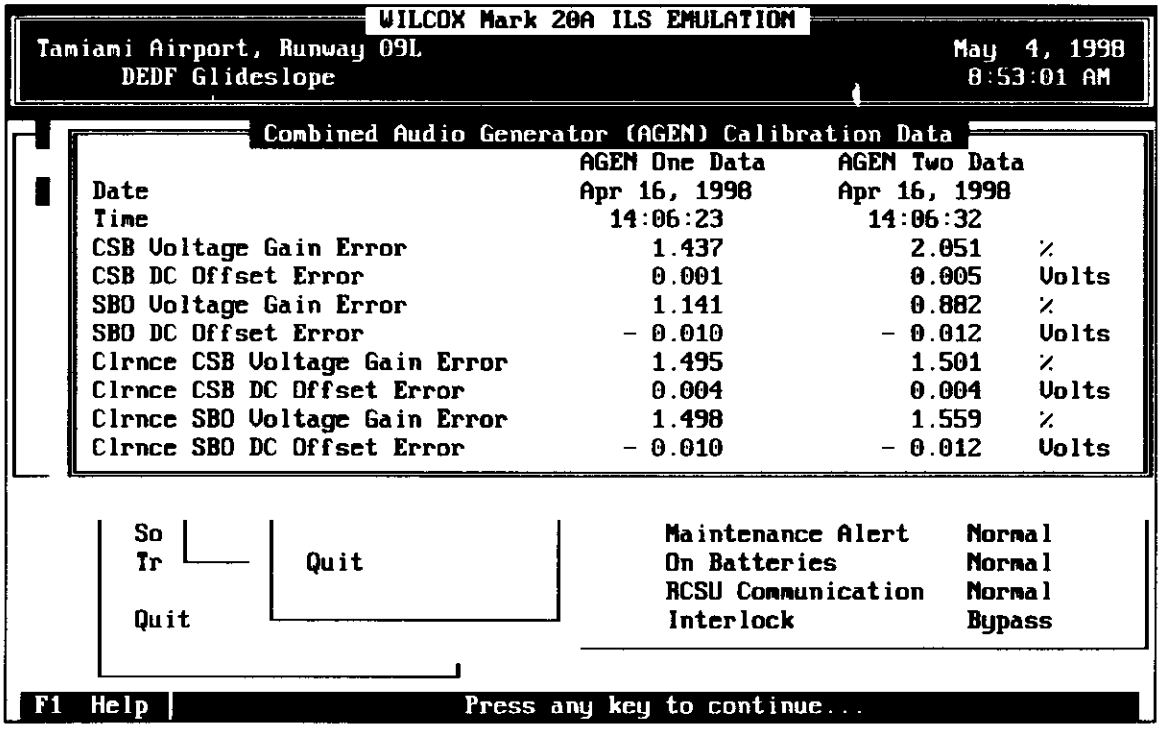
3.7.2.1 Audio Generator Menu Screen.- After logging onto the glide slope station, the operator may view the Audio generator menu screen by selecting <D C A>. The Audio generator menu screen allows the operator to select transmitter <O>ne, transmitter <T>wo, or <C>ombined calibration data. Selecting <Q>uit returns the operator to the Calibration data menu screen. The Calibration data Audio generator screens display historical readings from the last time audio generator cca 10A3A3/10A3A11 was calibrated. The following paragraphs describe the audio generator calibration data screens.



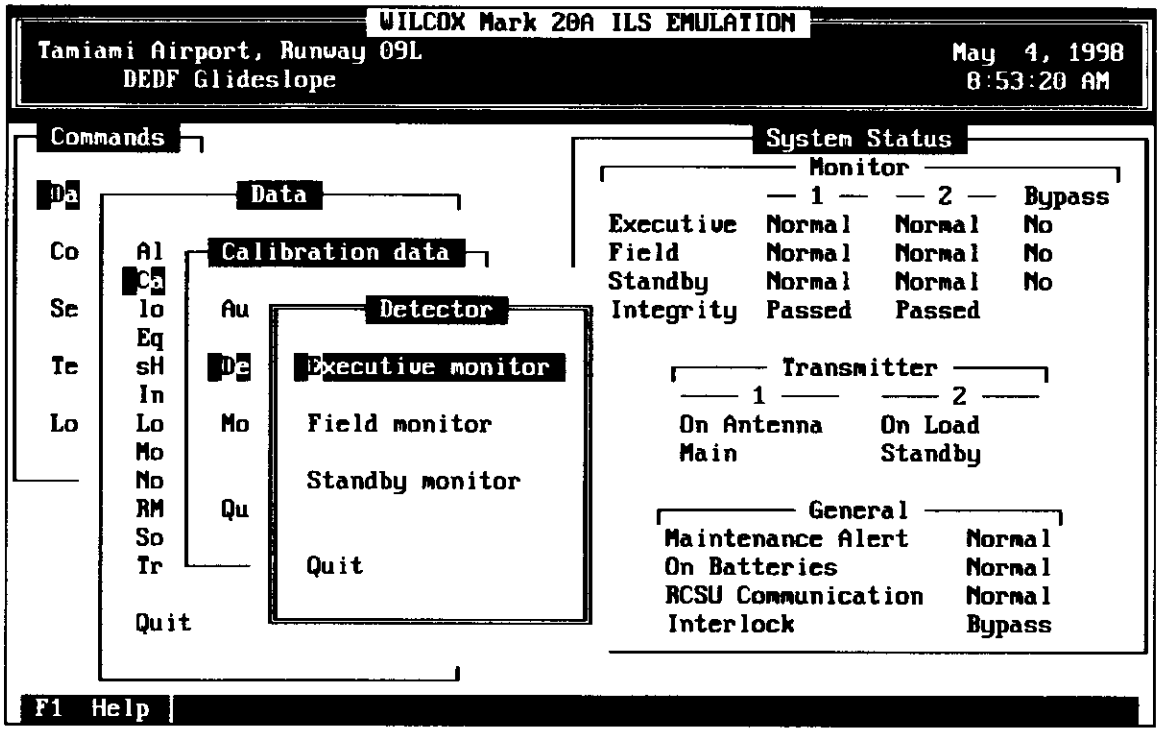
3.7.2.1.1 Audio Generator (AGEN) One Calibration Data Screen.- After logging onto the glide slope station, the operator may view the Audio Generator (AGEN) One Calibration Data screen by selecting <D C A O>. This screen allows the operator to view historical data parameters for audio generator ~~cca~~ 10A3A3 ~~in transmitter~~ 1. This screen data represents the error components removed by the monitor one before any calculated waveform data is programmed into audio generator ~~cca~~ 10A3A3. The allowable error limits are built into the monitor software. Any errors outside these limits prevent calibration of the audio generator cca. Tolerance limits are defined by the hardware design and are fixed in the firmware. The limits are based on the audio generator design and component lot-to-lot variations. Removal of these errors prior to monitor waveform calculations guarantees both the precision and purity of the ILS modulation plus the ability of the ILS to generate modulation within the specified operating limits. The resulting data is permanently stored within the monitor until a new set of test data replaces it. The readings of these screens are useful reference information and should be recorded at periodic maintenance intervals and when audio generator calibration is re-run. Whenever changing an audio generator ~~cca~~, a new test must be run since the data is associated only with a specific audio generator ~~cca~~. If any parameters are highlighted, the transmitter will not operate. The limits displayed on the Audio Generator Calibration Data screen are the results of the audio generator calibration test, paragraph 3.11.1.1. The Audio Generator (AGEN) Two Calibration Data screen may be viewed by selecting <D C A T> and the Combined Audio Generator (AGEN) Calibration Data screen may be viewed by selecting <D C A C>.




WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
8:52:30 AM
Commands
Data
Calibratio
Audi
tran
Comb
Quit
Audio Generator (AGEN) Two Calibration Data
Apr 16, 1998 14:06:32
Data
CSB Voltage Gain Error 2.051 %
CSB DC Offset Error 0.005 Volts
SBO Voltage Gain Error 0.882 %
SBO DC Offset Error - 0.012 Volts
Clrnce CSB Voltage Gain Error 1.501 %
Clrnce CSB DC Offset Error 0.004 Volts
Clrnce SBO Voltage Gain Error 1.559 %
Clrnce SBO DC Offset Error - 0.012 Volts
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help
Press any key to continue...


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
8:53:01 AM
Combined Audio Generator (AGEN) Calibration Data
AGEN One Data
AGEN Two Data
Date Apr 16, 1998 Apr 16, 1998
Time 14:06:23 14:06:32
CSB Voltage Gain Error 1.437 2.051 %
CSB DC Offset Error 0.001 0.005 Volts
SBO Voltage Gain Error 1.141 0.882 %
SBO DC Offset Error - 0.010 - 0.012 Volts
Clrnce CSB Voltage Gain Error 1.495 1.501 %
Clrnce CSB DC Offset Error 0.004 0.004 Volts
Clrnce SBO Voltage Gain Error 1.498 1.559 %
Clrnce SBO DC Offset Error - 0.010 - 0.012 Volts
Quit
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help
Press any key to continue...

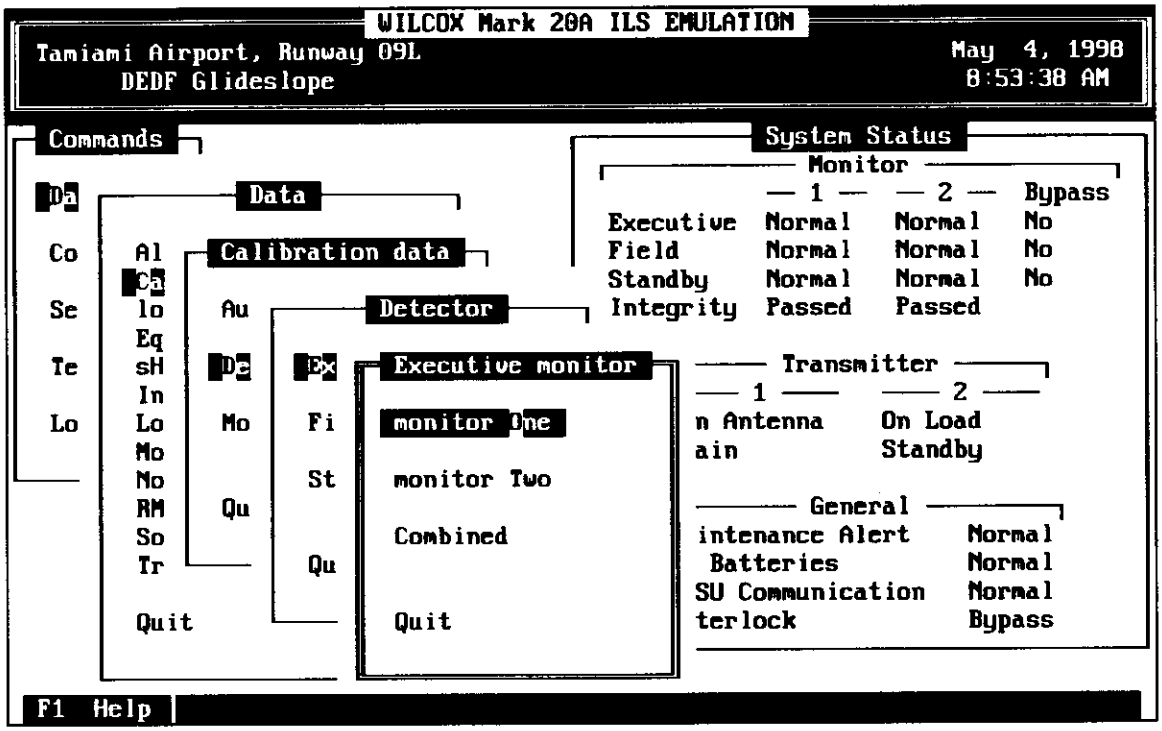
3.7.2.2 Detector Menu Screen.- After logging onto the glide slope station, the operator may view the Detector menu screen by selecting <D C D>. The Detector menu screen allows the operator to select <E>xecutive monitor or <S>tandby monitor menu screens. The detector screens display historical readings from the last time the monitors were calibrated to internal detector circuits. Selecting <Q>uit returns the operator to the Calibration data menu screen. The detector calibration data represents the results of the monitor's ILS signal calibration process.



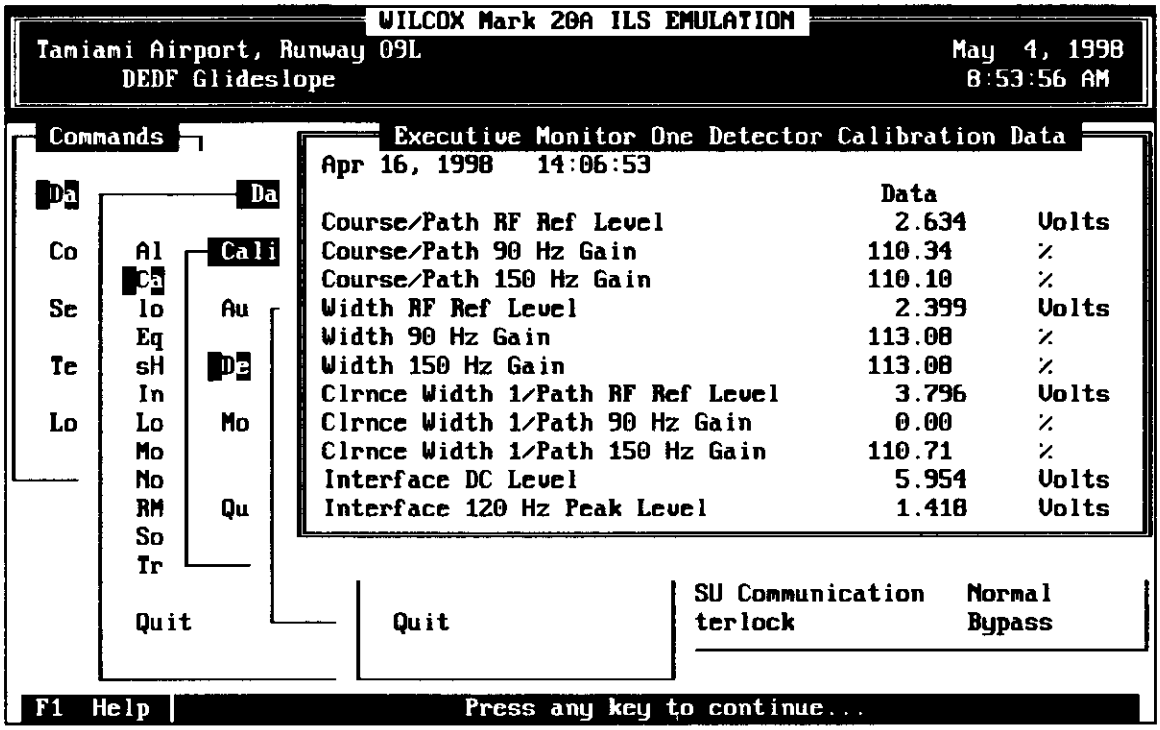
3.7.2.2.1 Executive Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Executive monitor menu screen by selecting <D C D E>. The Executive monitor menu screen allows the operator to select monitor <O>ne, monitor <T>wo, and <C>ombined. Selecting <Q>uit returns the operator to the Detector menu screen.

NOTE

The term executive is used to identify equipment associated with the On antenna transmitter (transmitter 1 or 2). Both monitors monitor the on antenna transmitter (executive monitor 1) and (executive monitor 2) continuously during normal operation.



3.7.2.2.1.1 Executive Monitor One Detector Calibration Data Screen.- After logging onto the glide slope station, the operator may view the Executive Monitor One Detector Calibration Data screen by selecting <D C D E O>. The Executive Monitor Two Detector Calibration Data screen may be viewed by selecting <D C D E T>. The Combined Executive Monitor Detector Calibration Data screen may be viewed by selecting <D C D E C>.



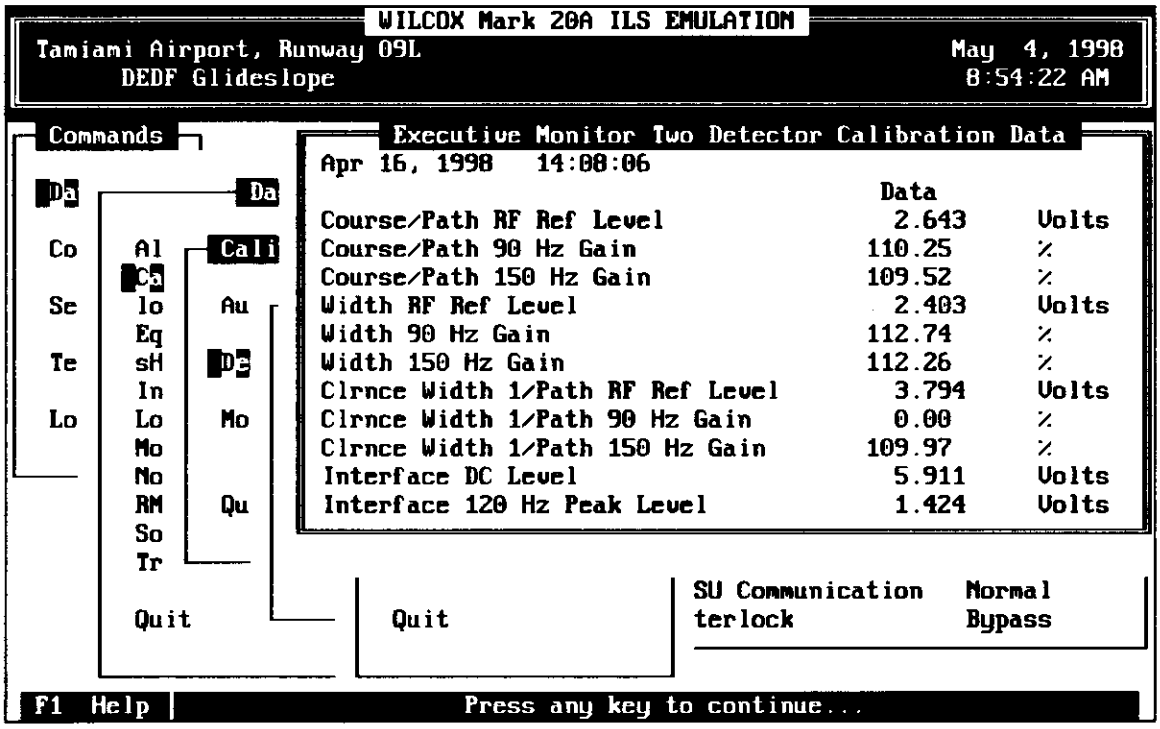
This data represents the results of the monitor ILS input signal calibration process. The data is in two groups:

(1) *Adjustments to center and size the ILS input signal* - The dc offset and gain parameters are similar to the adjustments on an oscilloscope when examining a signal with both ac and dc components. The dc offset provides a virtual ground reference by moving the ac signal vertically to the crt screen center. The offset range is -10 to 10 volts. The gain resembles a scope's attenuator control but is capable of both gain and attenuation in the range of 1/3 to 2.7. These parameters and their adjustment ranges are designed to minimize errors introduced into the ILS monitoring process. Removal of the dc component prior to application of gain (or attenuation) allows a larger dynamic range for processing the ac component by the monitor's 12-bit analog-to-digital converter (adc). This maximizes the signal-to-noise ratio for the monitor's subsequent digital signal processing, increasing the resolution of critical difference in depth of modulation (ddm) calculations.

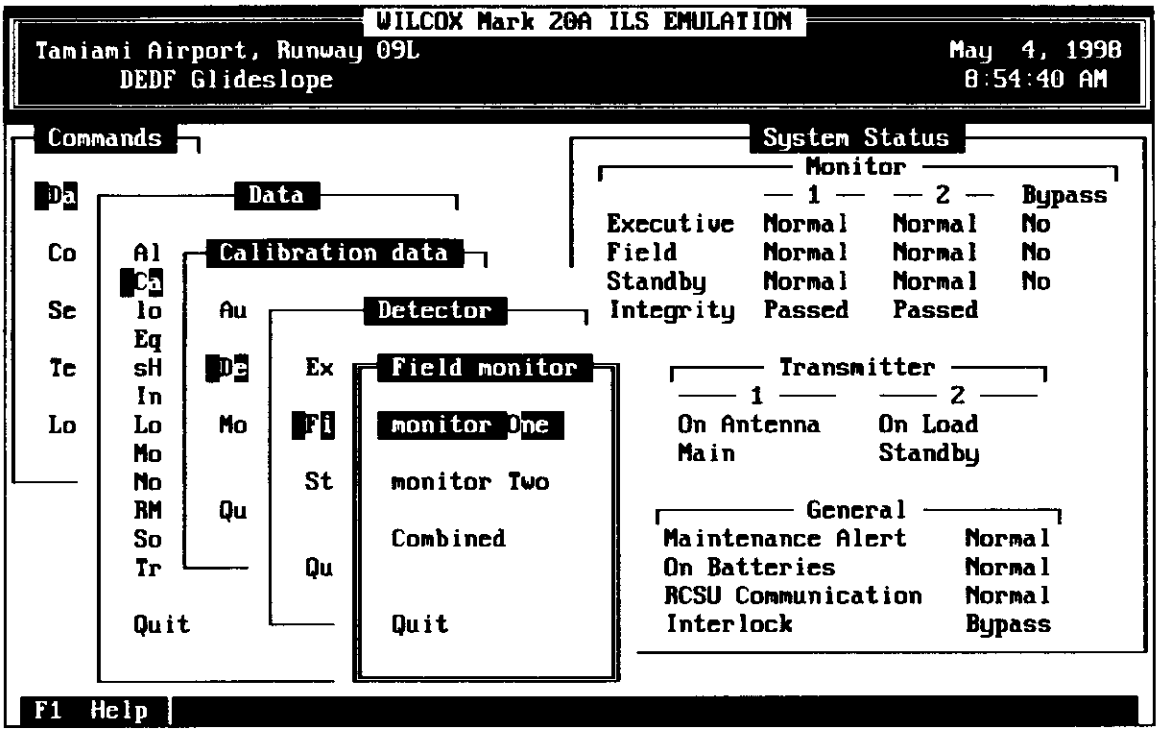
This portion of the detector calibration will fail if the input signal does not meet built-in programmed limits for both dc and ac peak-to-peak levels which guarantee the ability of the monitor to accurately monitor the ILS signals. These limits check input signal clipping to both the plus and minus input limits, a dc offset which is too large or an ac peak-to-peak which is too small. Upon failure, the monitor outputs a constant executive alarm status until a subsequent recalibration is successful.

(2) *Error adjustments to the measured ILS input signal* - After adjustments in (1) above are applied to an ILS input signal, the result is processed into rf level (dc) plus 90-Hz, 150-Hz, and 1020-Hz (localizer only) modulation components. The dc becomes the rf level's 100 percent reference relative to the programmed power level. Then the sum of the resultant 90-Hz and 150-Hz modulations are used to correct both the programmed sum of depth of modulation (sdm) and ddm levels. The ddm reference level is set by the operator entered values on the Executive Monitor Detector Offsets, Field Monitor Detector Offsets, and Standby Monitor Detector Offsets, whichever apply. For a localizer, the 1020-Hz ident modulation is also corrected to its programmed level.

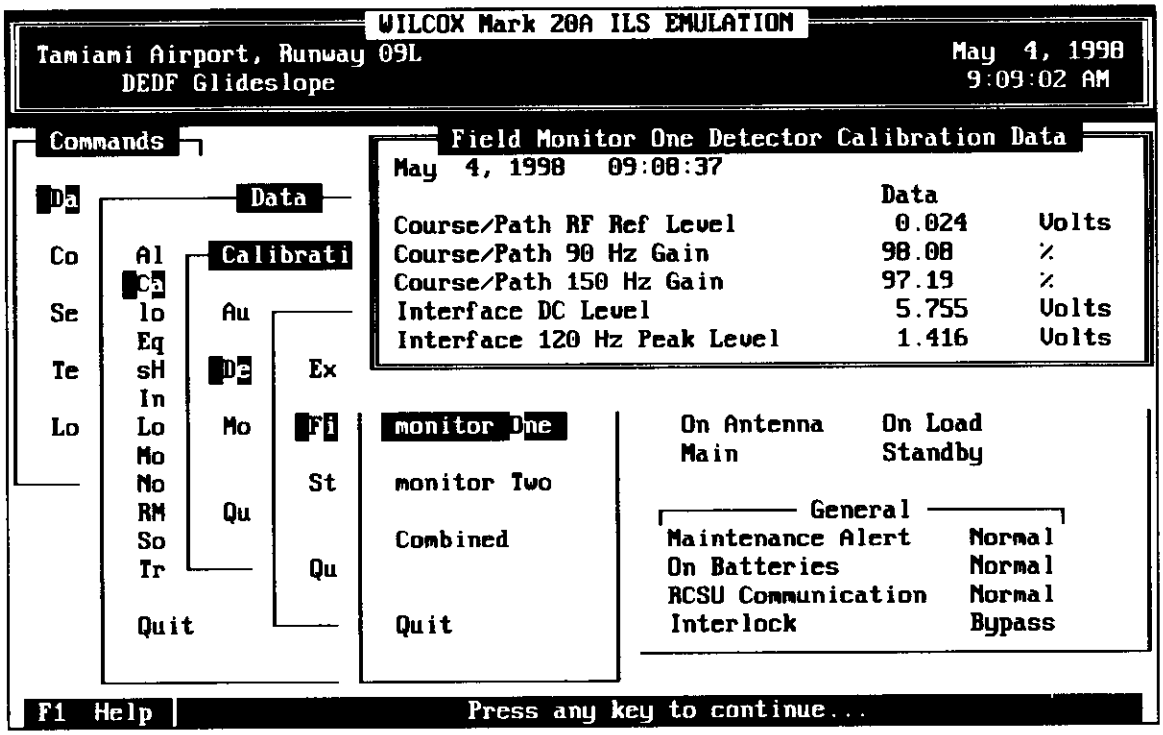
Eight consecutive samples are averaged in order to produce a better match to the signal's characteristics. Of these signal correction factors, only ddm is displayed since it is the most critical and provides a relative error indication of the others. These adjustments remove errors caused by the ILS signal paths (for example; any minor recombining unit errors) plus the detectors' dc and frequency response errors prior to alarm detection by the ILS signal monitoring process.



3.7.2.2.2 Field Monitor Menu Screen.- After logging onto the localizer station, the operator may view the Field monitor menu screen by selecting <D C D F>. This menu screen allows the operator to select monitor <O>ne, monitor <T>wo, and <C>ombined detector calibration data.



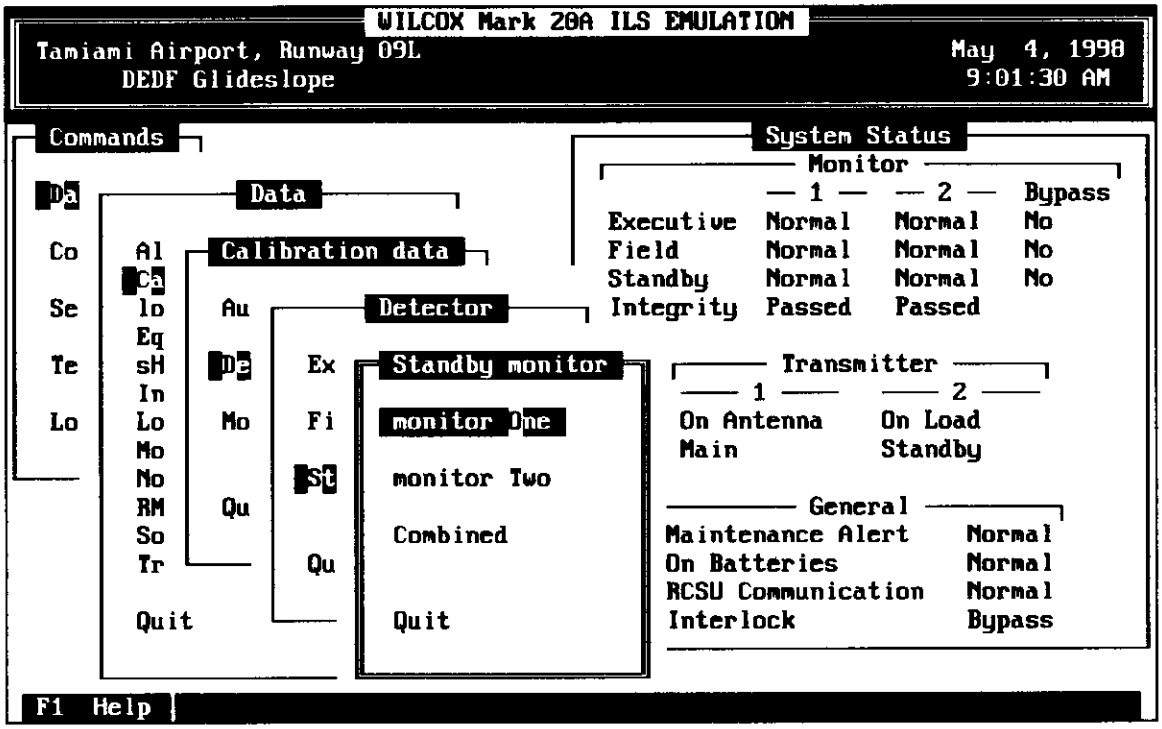
3.7.2.2.2.1 Field Monitor One Detector Calibration Data Screen.- After logging onto the localizer station, the operator may view the Field Monitor One Detector Calibration Data screen by selecting <D C D F O>. The Field Monitor Two Detector Data screen may be viewed by selecting <D C D F T>. The Combined Field Monitor Detector Calibration Data screen may be viewed by selecting <D C D F C>. This screen allows the operator to view real-time operating parameters. This data screen contains course/path and interface calibration data for monitor one (or two) from the field detector assembly.



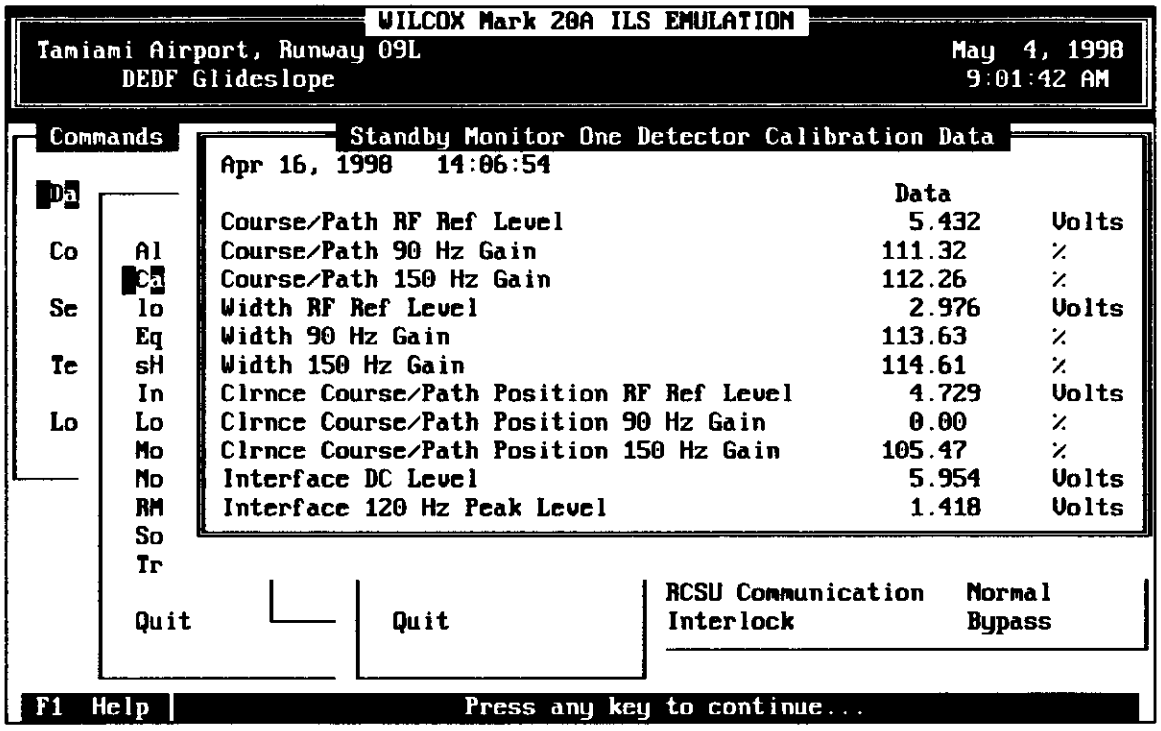
3.7.2.2.3 Standby Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Standby monitor menu screen by selecting <D C D S>. This menu screen allows the operator to select monitor <O>ne, monitor <T>wo, or <C>ombined.

NOTE

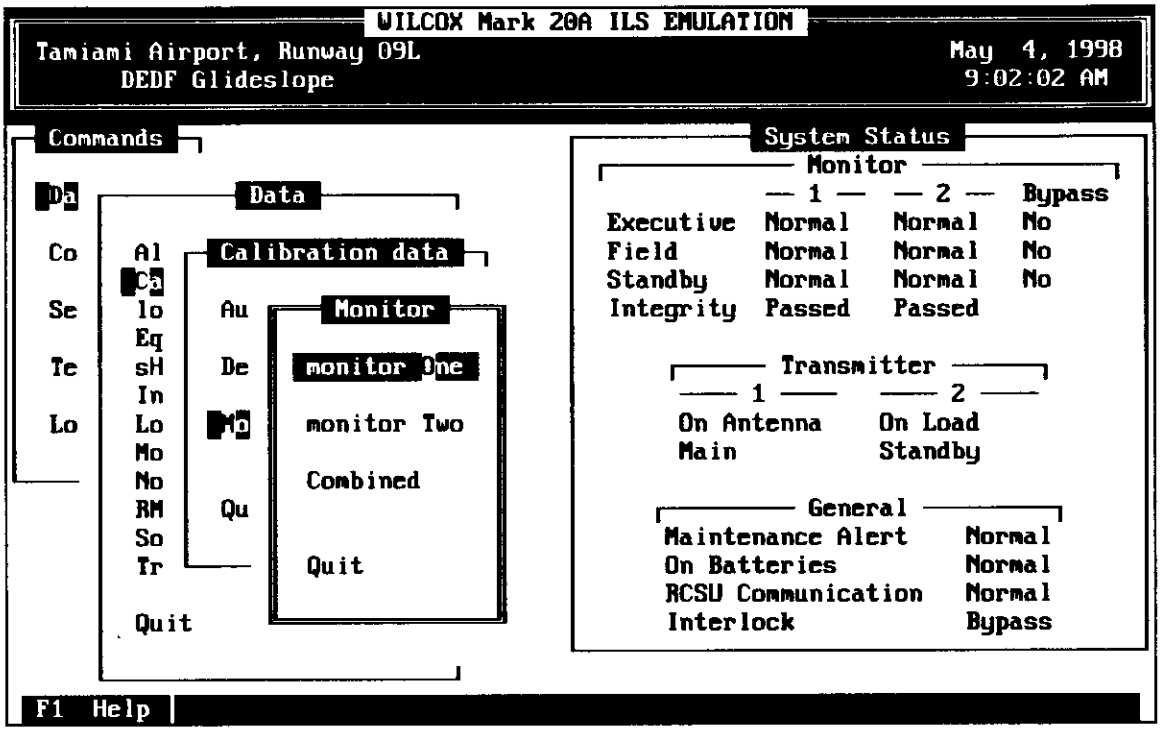
The term standby is used to identify equipment associated with the off-antenna transmitter. Both standby monitors monitor the standby transmitter continuously during normal operation.



3.7.2.2.3.1 Standby Monitor One Detector Calibration Data Screen.- After logging onto the glide slope station, the operator may view the Standby Monitor One Detector Calibration Data screen by selecting <D C D S O>. The Standby Monitor Two Detector Calibration Data screen may be viewed by selecting <D C D S T>. The Combined Standby Monitor Detector Calibration Data screen may be viewed by selecting <D C D S C>. This data screen contains course, path, width, clearance, and interface data for standby monitor one.



3.7.2.3 Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Monitor menu screen by selecting <D C M>. This screen allows the operator to select monitor <O>ne, monitor <T>wo, or <C>ombined on the Monitor menu screen. The monitor calibration data screens display real-time parameters from the automatic calibration of the analog-to-digital (a/d) circuits on the both monitors. This automatic calibration is performed once every 2 seconds.



3.7.2.3.1 Monitor One A/D Calibration Data Screen.- After logging onto the glide slope station, the operator may view the Monitor One A/D Calibration Data screen by selecting <D C M O>. The Monitor Two A/D Calibration Data screen may be viewed by selecting <D C M T>. The Combined Monitor A/D Calibration Data screen may be viewed by selecting <D C M C>. This data represents the monitor a/d converter subsystem calibration and built-in-test (bit.) results for its various component parts. The a/d subsystem consists of: a high-speed precision ±5-volt 12-bit a/d converter, a gain/attenuator using an 8-bit digital-to-analog (d/a) converter, a 32 input analog signal multiplexer, an 8-input analog ground reference multiplexer, a ±10-volt offset using an 8-bit d/a converter, and a temperature stable high-precision 5-volt reference.

Monitor calibration is done immediately at power-on and periodically thereafter, to ensure the integrity of monitor signal measurements. Whenever any of these parameters are outside of design limits, monitoring ceases and the monitor forces an executive alarm. The continuous nature of this calibration both detects in-operation failures plus provides long-term and temperature compensation of monitor measurements for enhanced accuracy.

The 5-volt reference is a precision component with initial accuracy of 0.05 percent at room temperature. The Mark 20A hardware and software were designed so that maximum accuracy of all ILS analog signal monitoring measurements are directly traceable to this 5-volt reference.

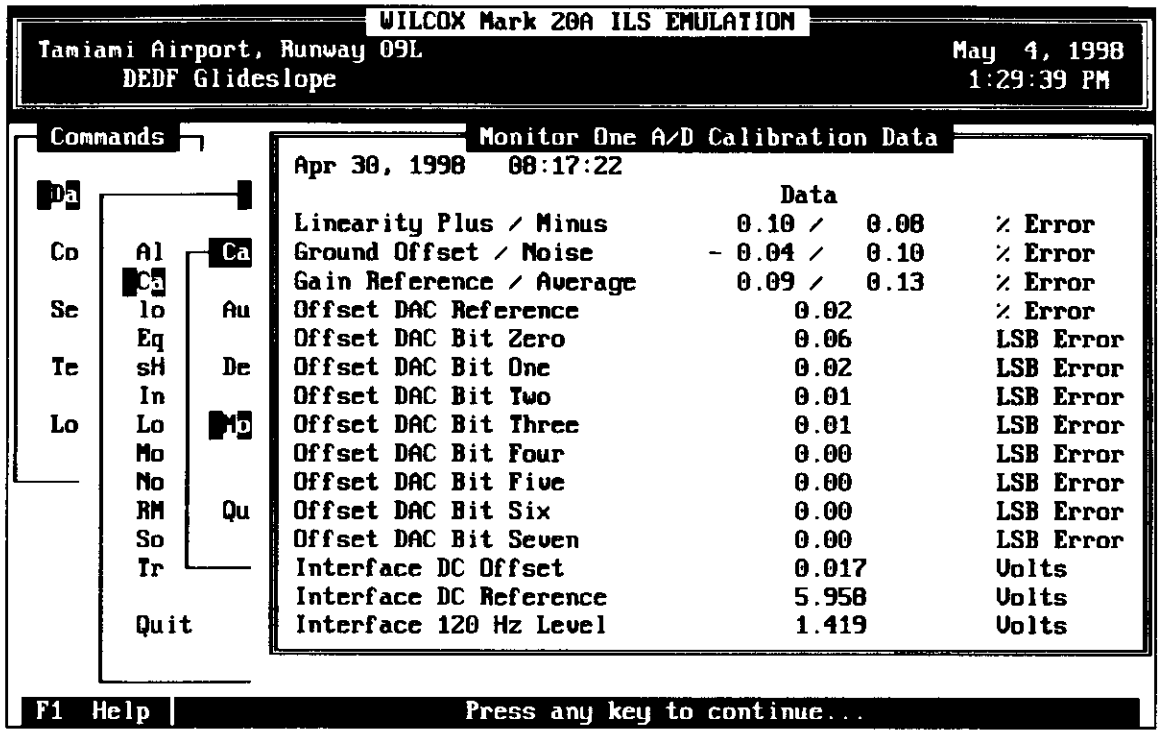
The 12-bit a/d converter has a resolution of 1 part in 4096 or 0.0244 percent of full scale. The accuracy of the a/d converter is enhanced for the high-accuracy dc measurements in the monitor's calibration by employing the technique of over-sampling. Simply stated, any a/d converter's accuracy can be improved by averaging the result of a group of measurements. Through heavy over-sampling, the dc calibration resolution is better than 12 bits.

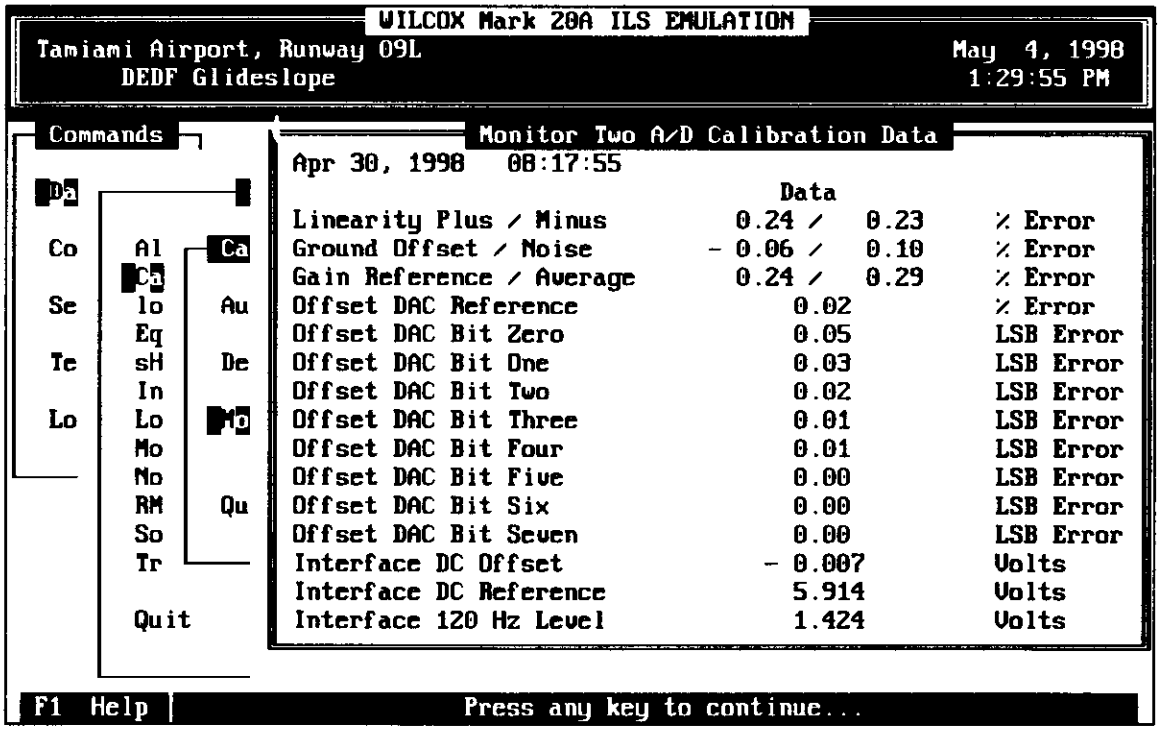
NOTE

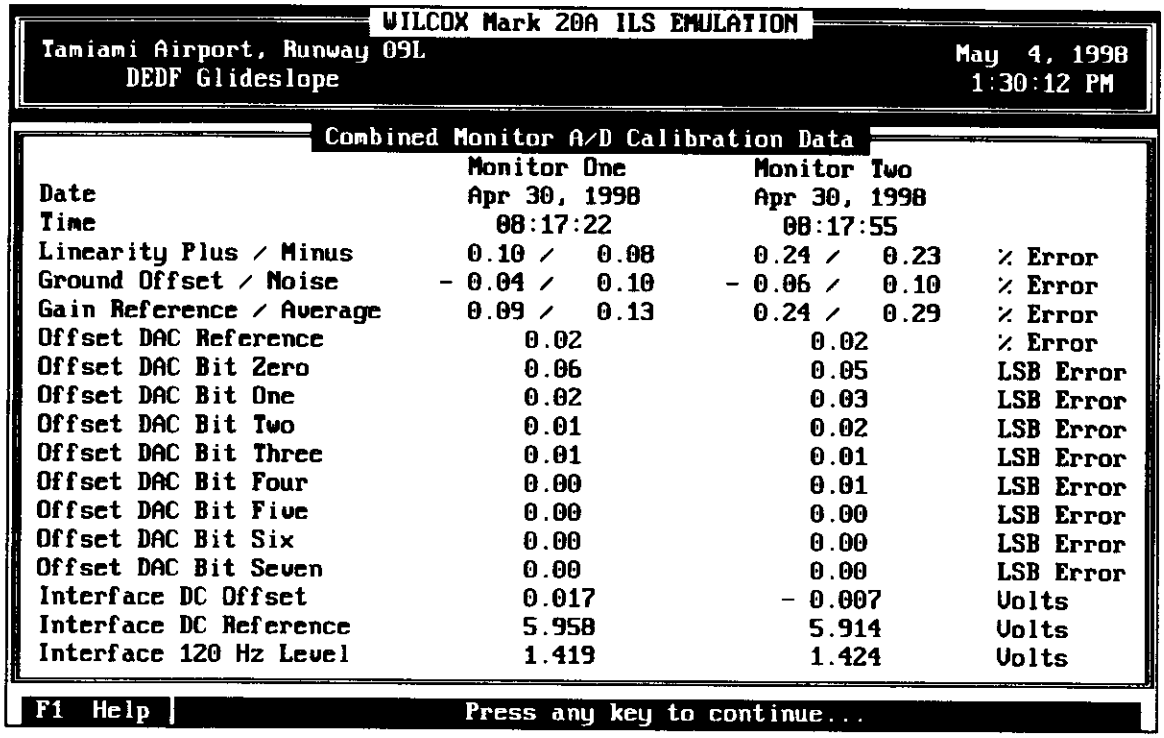
Accuracy and resolution are not the same. Accuracy reflects the amount of possible error in a measurement, while resolution indicates the smallest increment that can be measured. They are related, in that accuracy cannot be greater than resolution.

There are no trim pots on the Mark 20A monitor cca. Component errors are trimmed by software using the calibration data on the Monitor A/D Calibration Data screen, which is more stable, accurate, and reliable than (manual) hardware trimming. Any drifts during operation are automatically compensated.

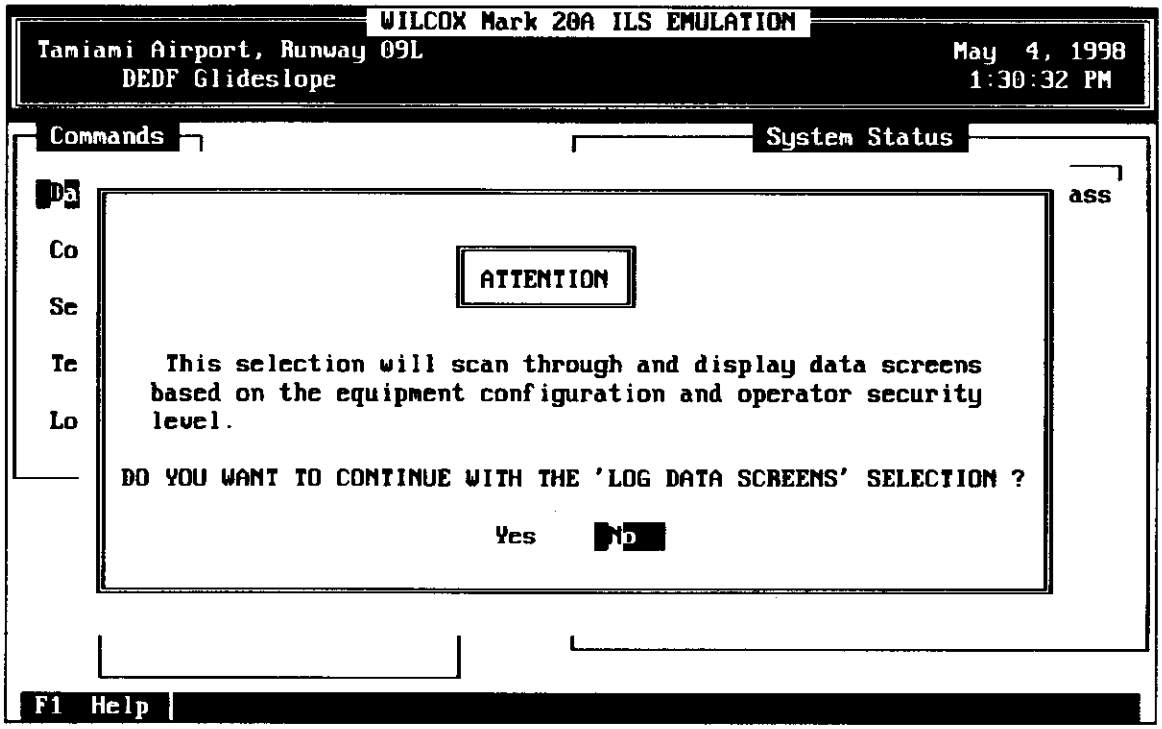
Linearity plus and minus are measurements of the 5-volt reference through the signal multiplexer and reference multiplexer respectively. Providing an indication of the a/d converter's linearity. The plus and minus values must be approximately equal. These values are also used to derive reference gain, which is the gain used for correcting secondary calibration operations, like the audio cca calibration. Ground offset is the a/d converter's zero voltage error, while ground noise indicates the peak-to-peak variation (ac) of the entire set of samples used to derive ground offset. Average gain is approximately equal to calibration gain and is a simple average of the total error in gain for the range of gain settings utilized. The offset d/a converter values indicate the integrity of that subsystem. The offset d/a converter reference reflects the deviation from the ideal 10-volt reference level. The offset d/a converter bits 0 through 7 indicate the linearity of the 8-bit offset d/a converter. These latter values are not over-sampled, as indicated by the larger jitter in their values relative to other measurements.


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
1:29:39 PM
Commands
Da
Co
Al
Ca
Ca
Se
lo
Au
Eq
Te
sH
De
In
Lo
Lo
Mo
Mo
No
RM
Qu
So
Tr
Quit
Monitor One A/D Calibration Data
Apr 30, 1998 08:17:22
Data
Linearity Plus / Minus 0.10 / 0.08 % Error
Ground Offset / Noise - 0.04 / 0.10 % Error
Gain Reference / Average 0.09 / 0.13 % Error
Offset DAC Reference 0.02 % Error
Offset DAC Bit Zero 0.06 LSB Error
Offset DAC Bit One 0.02 LSB Error
Offset DAC Bit Two 0.01 LSB Error
Offset DAC Bit Three 0.01 LSB Error
Offset DAC Bit Four 0.00 LSB Error
Offset DAC Bit Five 0.00 LSB Error
Offset DAC Bit Six 0.00 LSB Error
Offset DAC Bit Seven 0.00 LSB Error
Interface DC Offset 0.017 Volts
Interface DC Reference 5.958 Volts
Interface 120 Hz Level 1.419 Volts
F1 Help
Press any key to continue...

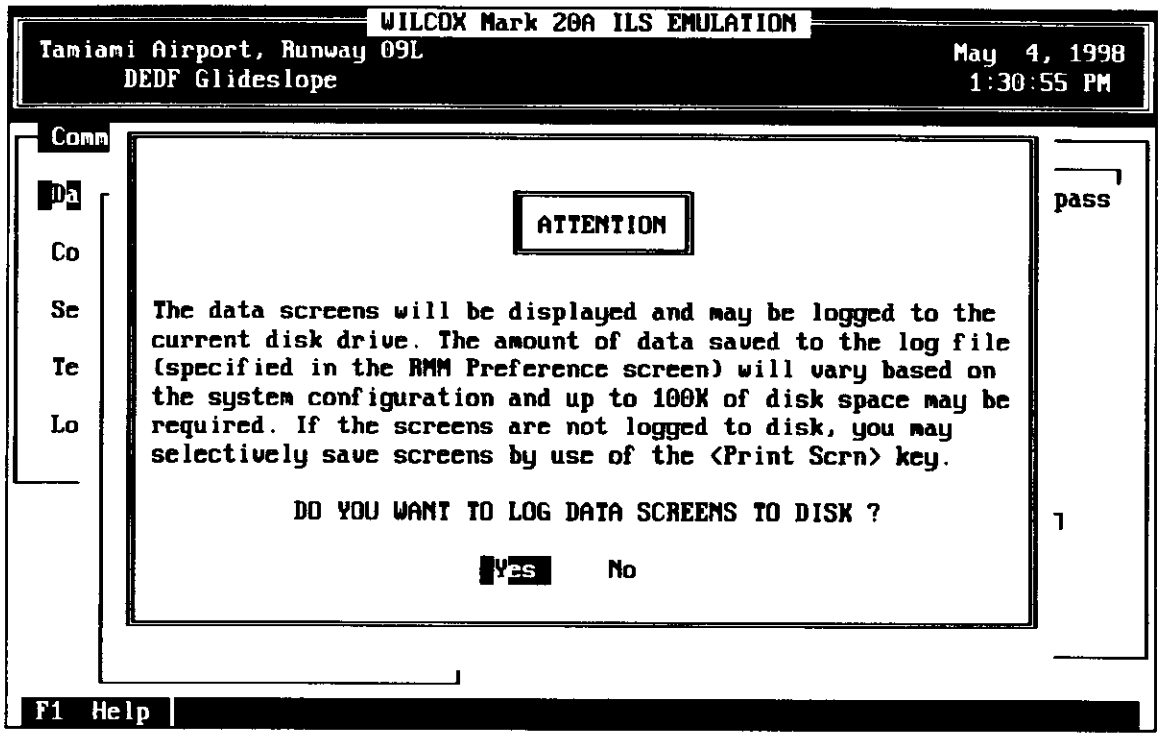

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
1:29:55 PM
Commands
Da
Co
Al
Ca
Ca
Se
lo
Au
Eq
Te
sH
De
In
Lo
Lo
Mo
Mo
No
RM
Qu
So
Tr
Quit
Monitor Two A/D Calibration Data
Apr 30, 1998 08:17:55
Data
Linearity Plus / Minus 0.24 / 0.23 % Error
Ground Offset / Noise - 0.06 / 0.10 % Error
Gain Reference / Average 0.24 / 0.29 % Error
Offset DAC Reference 0.02 % Error
Offset DAC Bit Zero 0.05 LSB Error
Offset DAC Bit One 0.03 LSB Error
Offset DAC Bit Two 0.02 LSB Error
Offset DAC Bit Three 0.01 LSB Error
Offset DAC Bit Four 0.01 LSB Error
Offset DAC Bit Five 0.00 LSB Error
Offset DAC Bit Six 0.00 LSB Error
Offset DAC Bit Seven 0.00 LSB Error
Interface DC Offset - 0.007 Volts
Interface DC Reference 5.914 Volts
Interface 120 Hz Level 1.424 Volts
F1 Help
Press any key to continue...

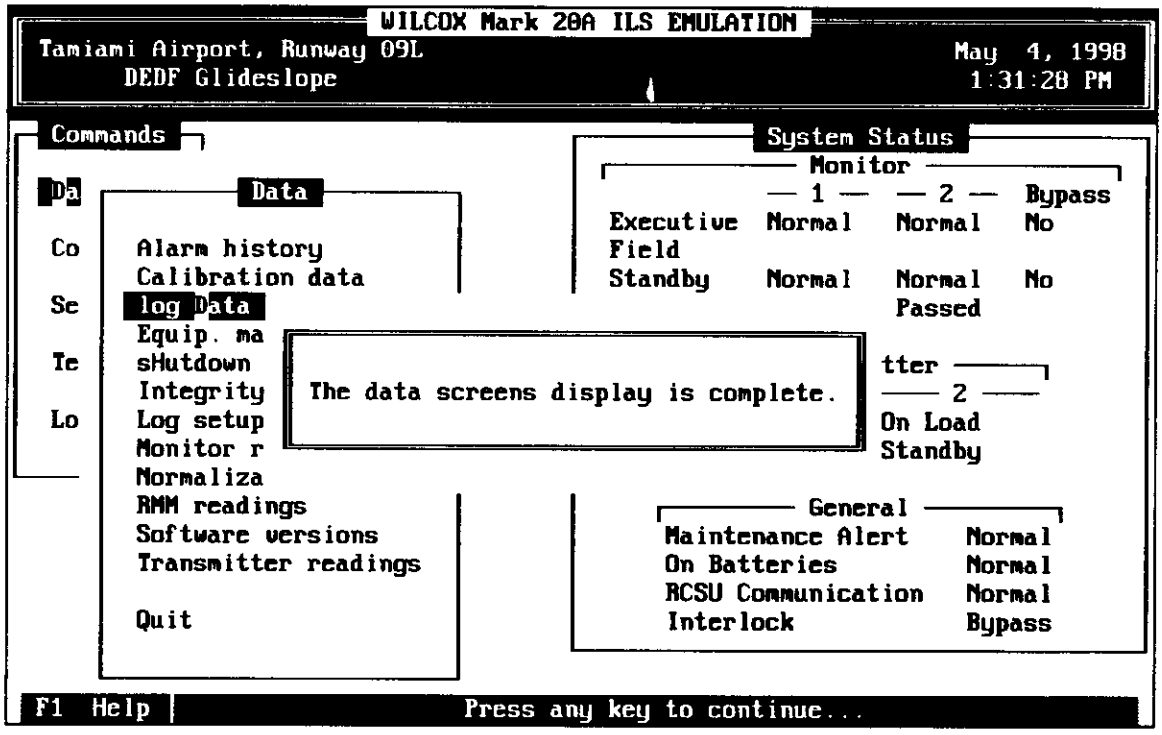

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
1:30:12 PM
Combined Monitor A/D Calibration Data
Monitor One
Monitor Two
Date
Apr 30, 1998
Apr 30, 1998
Time
08:17:22
08:17:55
Linearity Plus / Minus
0.10 / 0.08
0.24 / 0.23
% Error
Ground Offset / Noise
- 0.04 / 0.10
- 0.06 / 0.10
% Error
Gain Reference / Average
0.09 / 0.13
0.24 / 0.29
% Error
Offset DAC Reference
0.02
0.02
% Error
Offset DAC Bit Zero
0.06
0.05
LSB Error
Offset DAC Bit One
0.02
0.03
LSB Error
Offset DAC Bit Two
0.01
0.02
LSB Error
Offset DAC Bit Three
0.01
0.01
LSB Error
Offset DAC Bit Four
0.00
0.01
LSB Error
Offset DAC Bit Five
0.00
0.00
LSB Error
Offset DAC Bit Six
0.00
0.00
LSB Error
Offset DAC Bit Seven
0.00
0.00
LSB Error
Interface DC Offset
0.017
- 0.007
Volts
Interface DC Reference
5.958
5.914
Volts
Interface 120 Hz Level
1.419
1.424
Volts
F1 Help
Press any key to continue...

3.7.3 Log Data Screens.- After logging onto the glide slope station, the operator may copy the data screens to disk or selectively print a screen or screens by selecting <D D>. Selecting log Data screens brings up an ATTENTION screen that tells the operator the conditions under which data screens will be displayed. The operator must then answer the question, "DO YOU WANT TO CONTINUE WITH THE 'LOG DATA SCREENS' SELECTION?". If the answer is No, the operator is returned to the Commands menu screen. If the answer is Yes, another ATTENTION screen is displayed with additional information. The operator must then answer the question, "DO YOU WANT TO LOG DATA SCREENS TO DISK?". If the answer is Yes, the data screens will be copied to the current disk drive. If the answer is No, the data screens will be displayed one at a time by pressing any key and may be selectively printed by pressing Print Scrn key. The number of files available is dependent on the equipment configuration and the user security level. The current disk drive must have a minimum of 100 K free space when logging to a disk.

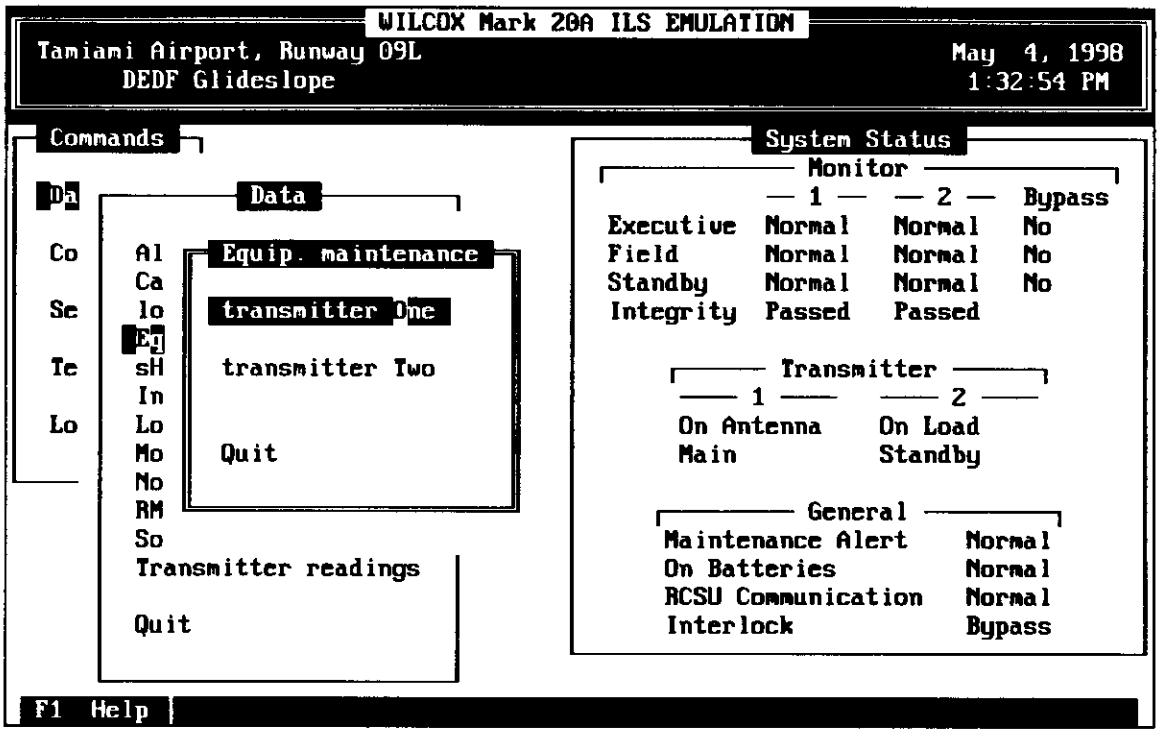


You may specify the path and filename to use when data logging. This may be done by selecting <P>references from the <S>etup commands menu. The drive and path are optional. This entry should conform to DOS conventions with respect to path and file nameing. For example the filename cannot exceed eight characters plus a three character extension. If blank, data will be logged to the default directory of the current default disk drive. If you do not choose a file name, a default file named "mm_dd_yy.LOG" is used, where "mm" is the current month, "dd" is the current day, and "yy" is the current year. All log copies made to disk on this day are written to this file.

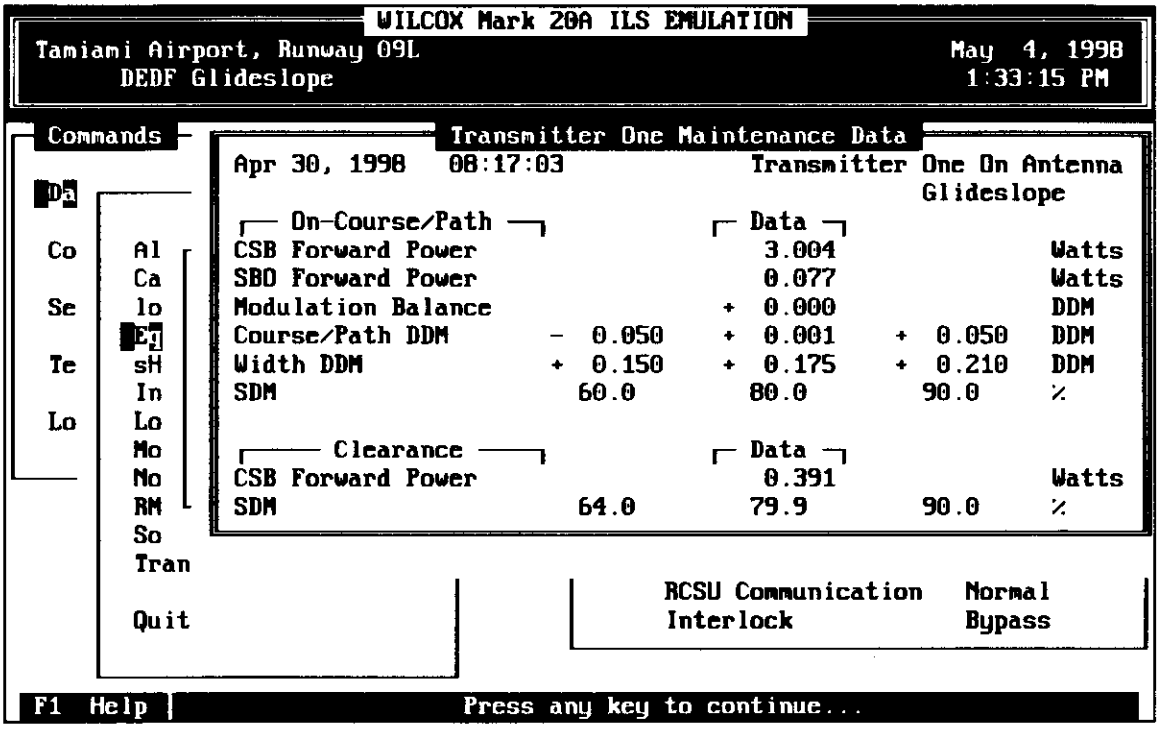

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
1:30:55 PM
Comm
Da
Co
Se
Te
Lo
pass
ATTENTION
The data screens will be displayed and may be logged to the current disk drive. The amount of data saved to the log file (specified in the RMM Preference screen) will vary based on the system configuration and up to 100K of disk space may be required. If the screens are not logged to disk, you may selectively save screens by use of the <Print Scrn> key.
DO YOU WANT TO LOG DATA SCREENS TO DISK ?
Yes
No
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
1:31:28 PM
Commands
Da
Co
Se
Te
Lo
Data
Alarm history
Calibration data
log Data
Equip. ma
sHutdown
Integrity
Log setup
Monitor r
Normaliza
RMM readings
Software versions
Transmitter readings
Quit
System Status
Monitor
— 1 —
— 2 —
Bypass
Executive
Normal
Normal
No
Field
Standby
Normal
Normal
No
Passed
The data screens display is complete.
tter
— 2 —
On Load
Standby
General
Maintenance Alert
Normal
On Batteries
Normal
RCSU Communication
Normal
Interlock
Bypass
F1 Help
Press any key to continue...

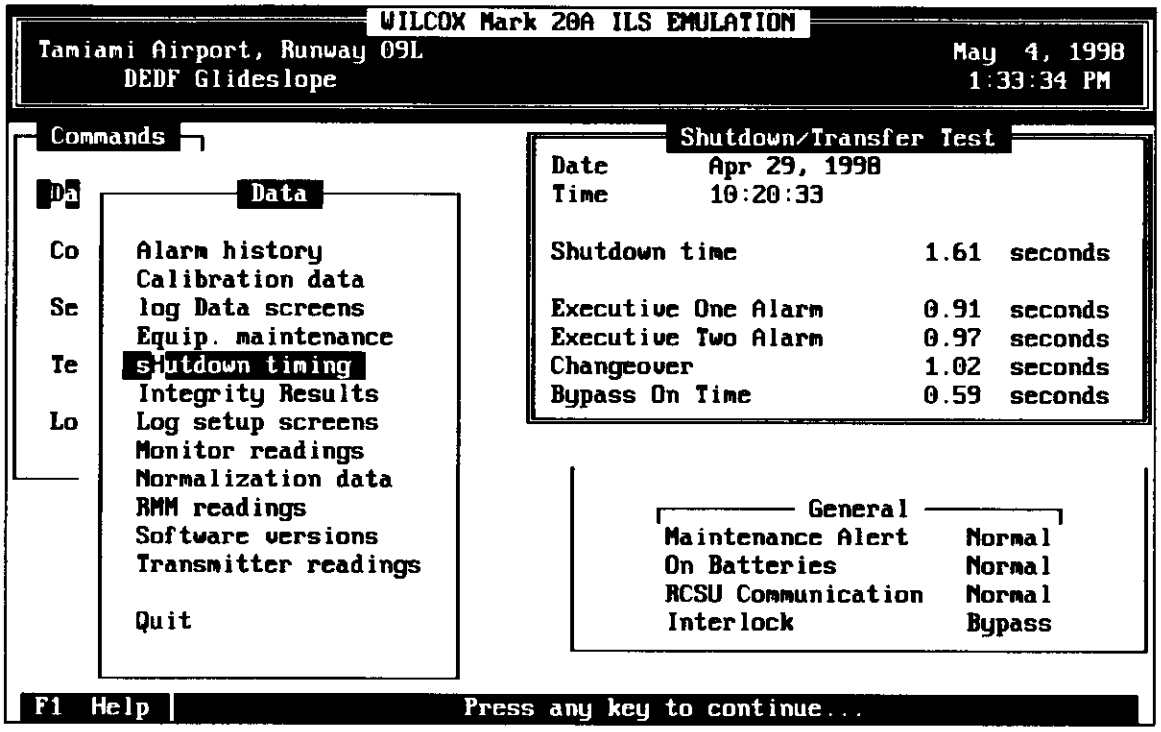
3.7.4 Equipment Maintenance.- After logging onto the glide slope station, the operator may view the Equipment Maintenance menu screen by selecting <D E>. This menu allows the operator to select transmitter <O>ne or transmitter <T>wo. Selecting <Q>uit returns the operator to the Data menu screen.



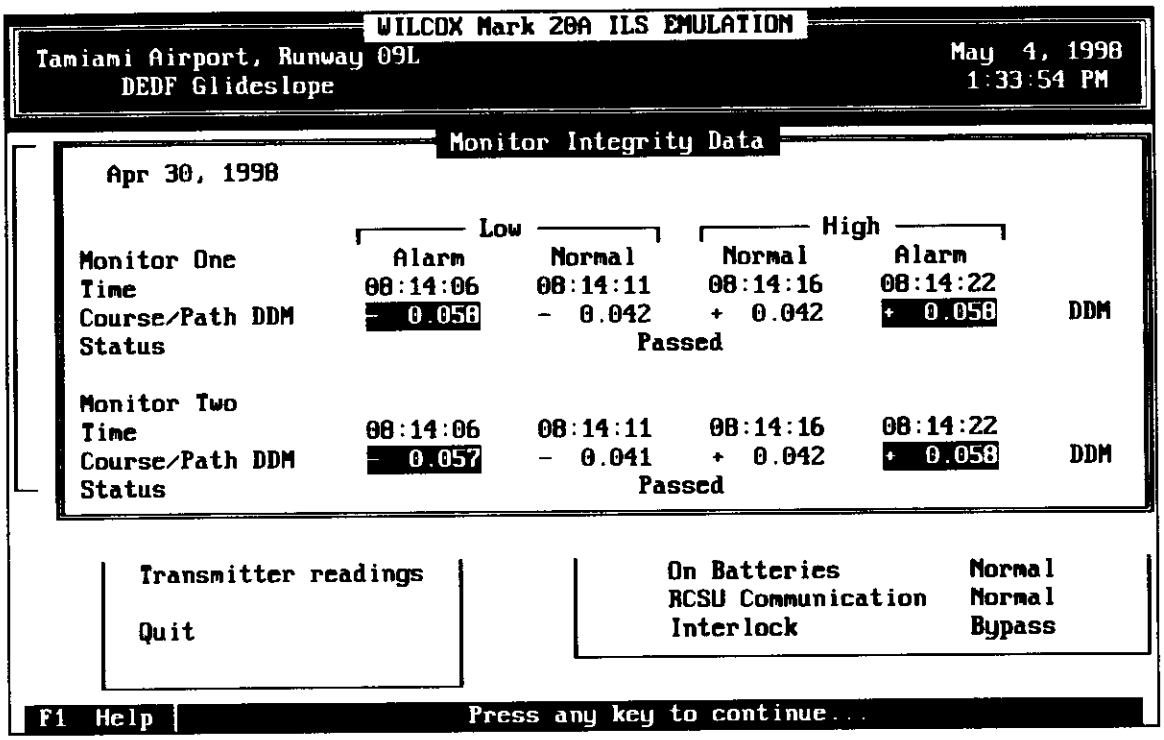
3.7.4.1 Equipment Maintenance Data Screen.- After logging onto the glide slope station, the operator may view the Transmitter One Equipment Maintenance menu screen by selecting <D E O>. The operator may view the Transmitter Two Equipment Maintenance menu screen by selecting <D E T>. Selecting <E>quip. maintenance displays a selection of monitor and transmitter data. It also indicates whether the transmitter is on antenna or on load and displays relevant EXECUTIVE or STANDBY data parameters. Collecting the data may require up to 15 seconds before the data is displayed. Transmitter One Equipment Maintenance Data screen may be accessed by pressing the Alt and F5 keys simultaneously. Transmitter Two Equipment Maintenance Data screen may be accessed by pressing the Alt and F6 keys simultaneously.



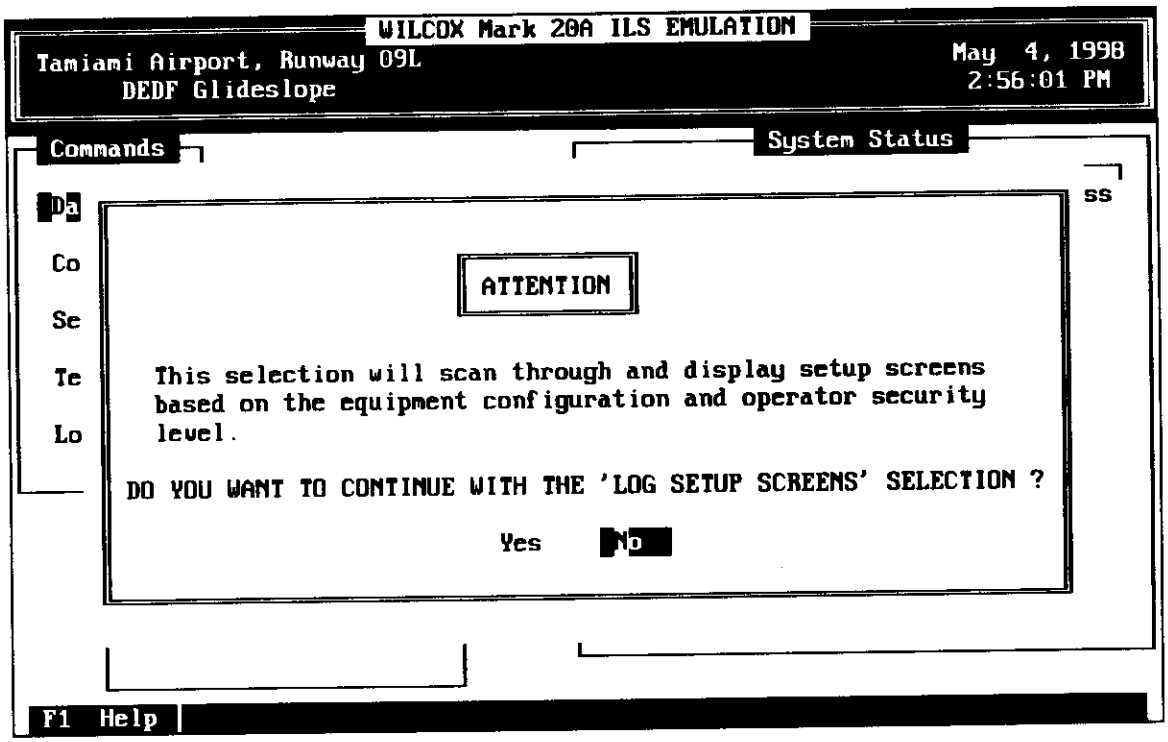
3.7.5 Shutdown Timing.- After logging onto the glide slope station, the operator may view the Shutdown/Transfer Timing Data screen by selecting <D H>. This screen displays the results of the latest Shutdown/Transfer Timing Test (STT). The STT verifies the Mark 20A ability to meet the specified requirements in responding to an invalid on-the-air condition. The data recorded is the total time to system shutdown, the time each executive monitor first goes into alarm, the time when the antenna select (change over) first changes state, and the bypass on time. If the test is not completed within it's allotted time, it will timeout. On timeout, the test status will be set to timeout (a failure). This test is conducted for information purposes only. No executive action results from a failed test.



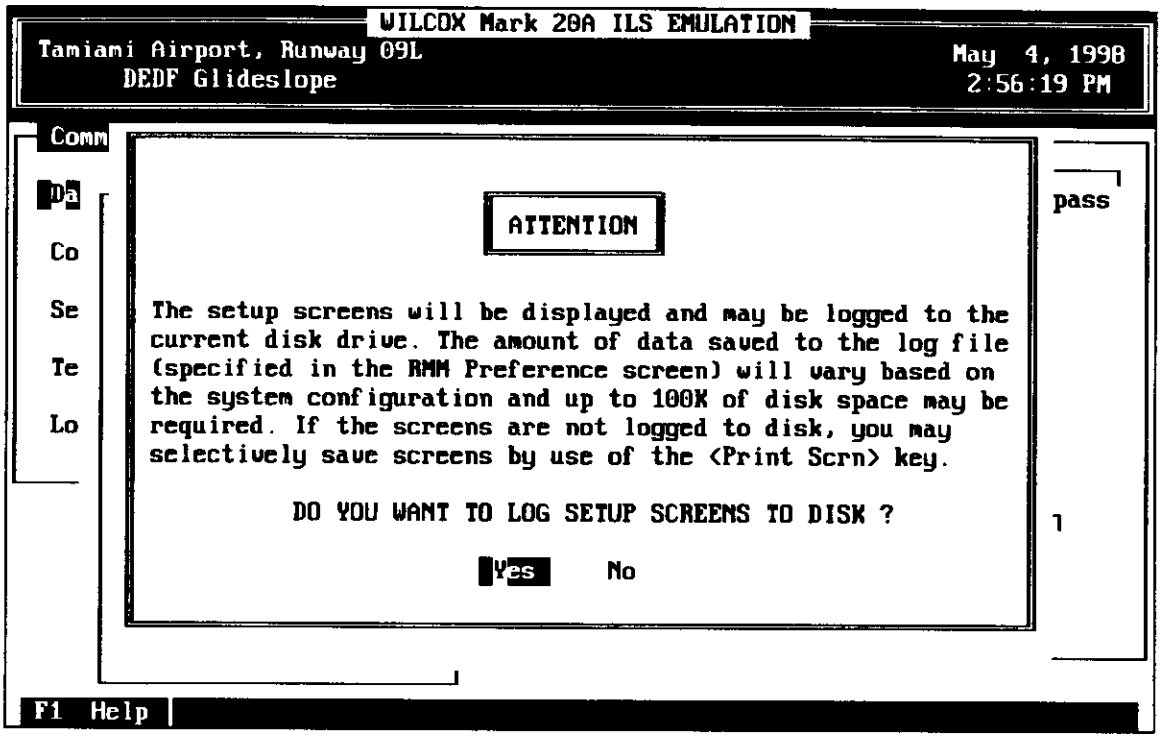
3.7.6 Integrity Results Screen.- After logging onto the glide slope station, the operator may view the Integrity readings menu screen by selecting <D I>. This menu screen allows the operator to select <H>istory or <R>esults. Selecting <Q>uit returns the operator to the Data menu screen.

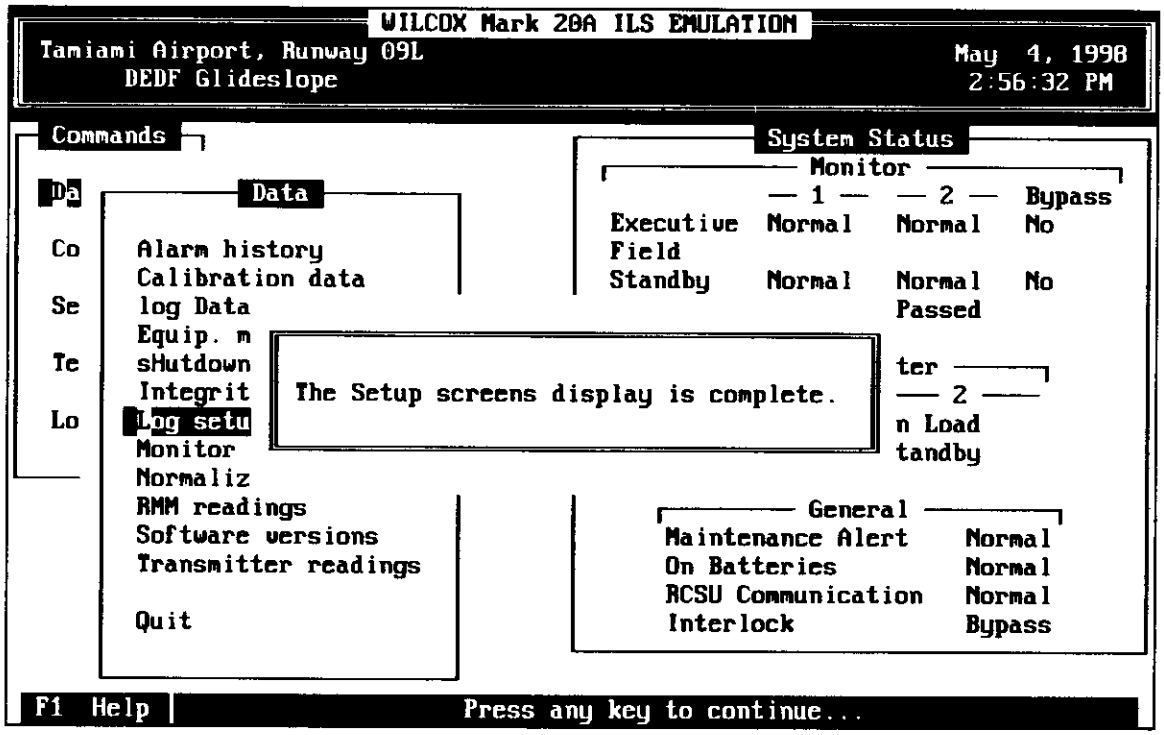


3.7.7 Log Setup Screens.- After logging onto the glide slope station, the operator may save all setup screens to disk or selectively save or print a screen or screens by selecting <D L>. Selecting Log Setup Screens brings up an ATTENTION screen that tells the operator the conditions under which setup screens will be displayed. The operator must then answer the question, "DO YOU WANT TO CONTINUE WITH THE 'LOG SETUP SCREENS' SELECTION?". If the answer is No, the operator is returned to the Commands menu screen. If the answer is Yes, another ATTENTION screen is displayed with additional information. The operator must then answer the question, "DO YOU WANT TO LOG SETUP SCREENS TO DISK?". If the answer is Yes, the setup screens will be copied to the current disk drive. If the answer is No, the setup screens will be displayed one at a time by pressing any key and may be selectively printed by pressing Print Scrn key. The number of files available is dependent on the equipment configuration and the user security level. The current disk drive must have a minimum of 100 K free space when logging to disk.

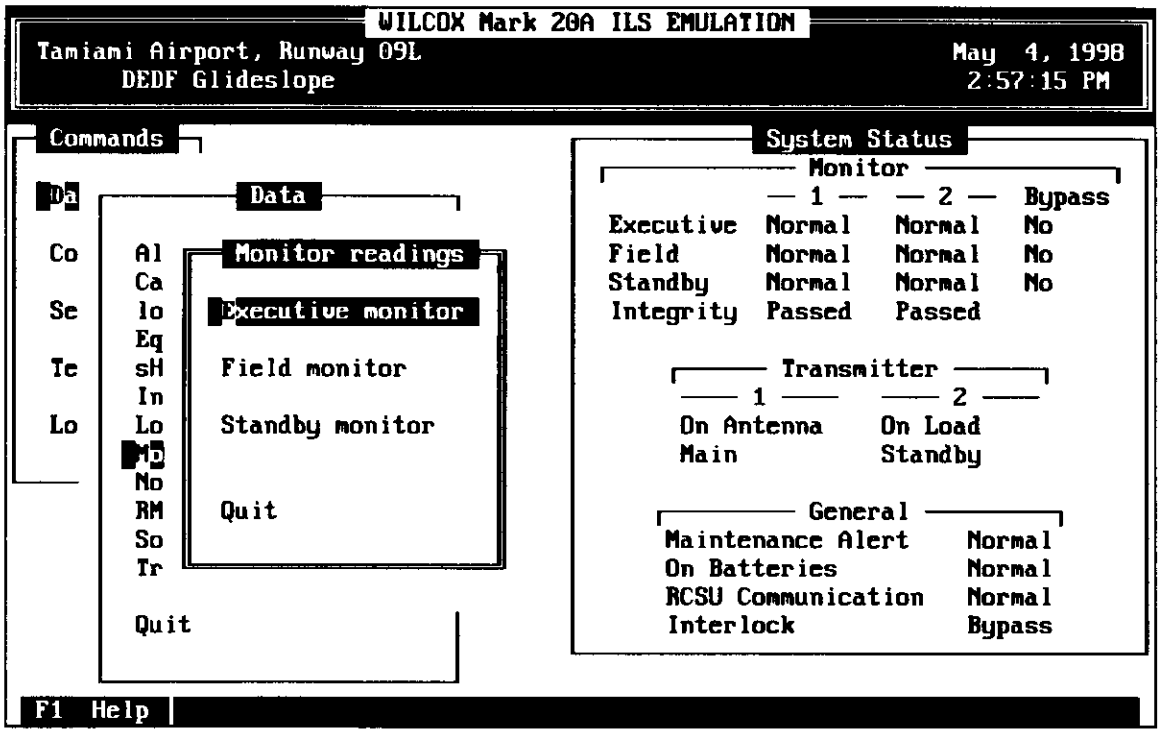


You may specify the path and filename to use when data logging. This may be done by selecting <P>references from the <S>etup commands menu. The drive and path are optional. This entry should conform to DOS conventions with respect to path and file nameing. For example the filename cannot exceed eight characters plus a three character extension. If blank, data will be logged to the default directory of the current default disk drive. If you do not choose a file name, a default file named "mm_dd_yy.LOG" is used, where "mm" is the current month, "dd" is the current day, and "yy" is the current year. All log copies made to disk on this day are written to this file.

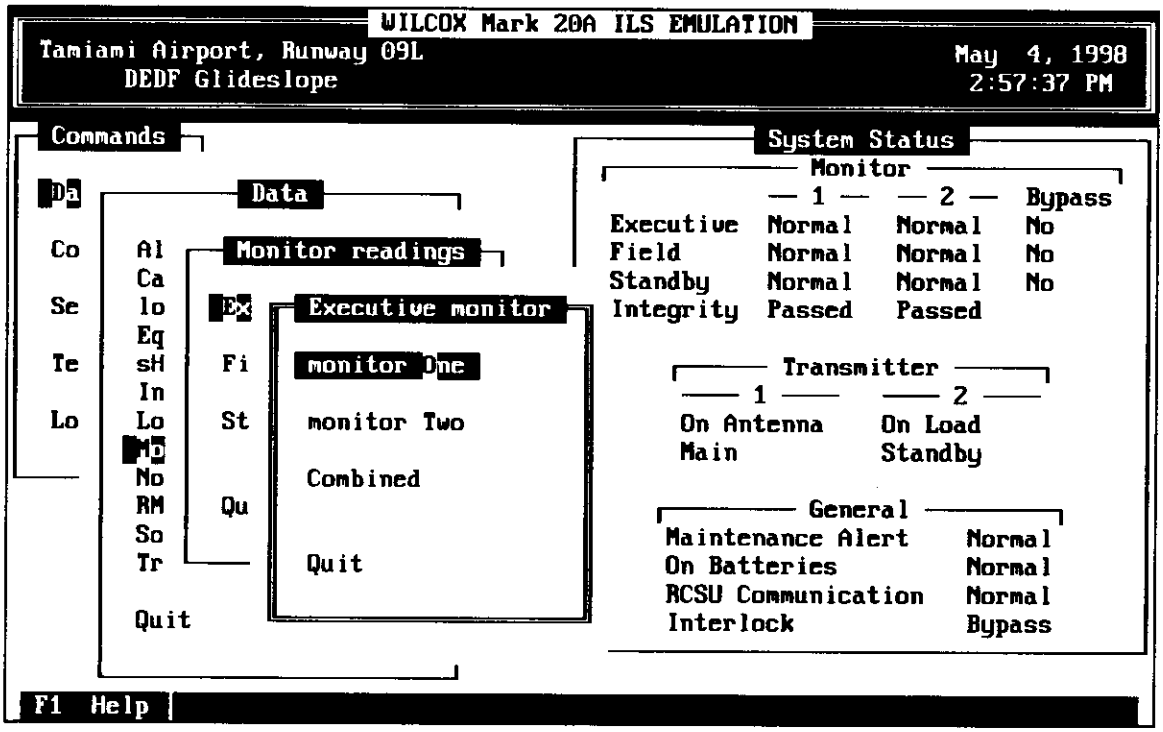

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
2:56:19 PM
Comm
Da
Co
Se
Te
Lo
pass
ATTENTION
The setup screens will be displayed and may be logged to the current disk drive. The amount of data saved to the log file (specified in the RMM Preference screen) will vary based on the system configuration and up to 100K of disk space may be required. If the screens are not logged to disk, you may selectively save screens by use of the <Print Scrn> key.
DO YOU WANT TO LOG SETUP SCREENS TO DISK ?
Yes
No
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
2:56:32 PM
Commands
Da
Co
Se
Te
Lo
Data
Alarm history
Calibration data
log Data
Equip. m
sHutdown
Integrit
Log setu
Monitor
Normaliz
RMM readings
Software versions
Transmitter readings
Quit
The Setup screens display is complete.
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field
Standby Normal Normal No
Passed
ter
— 2 —
n Load
tandby
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help
Press any key to continue...

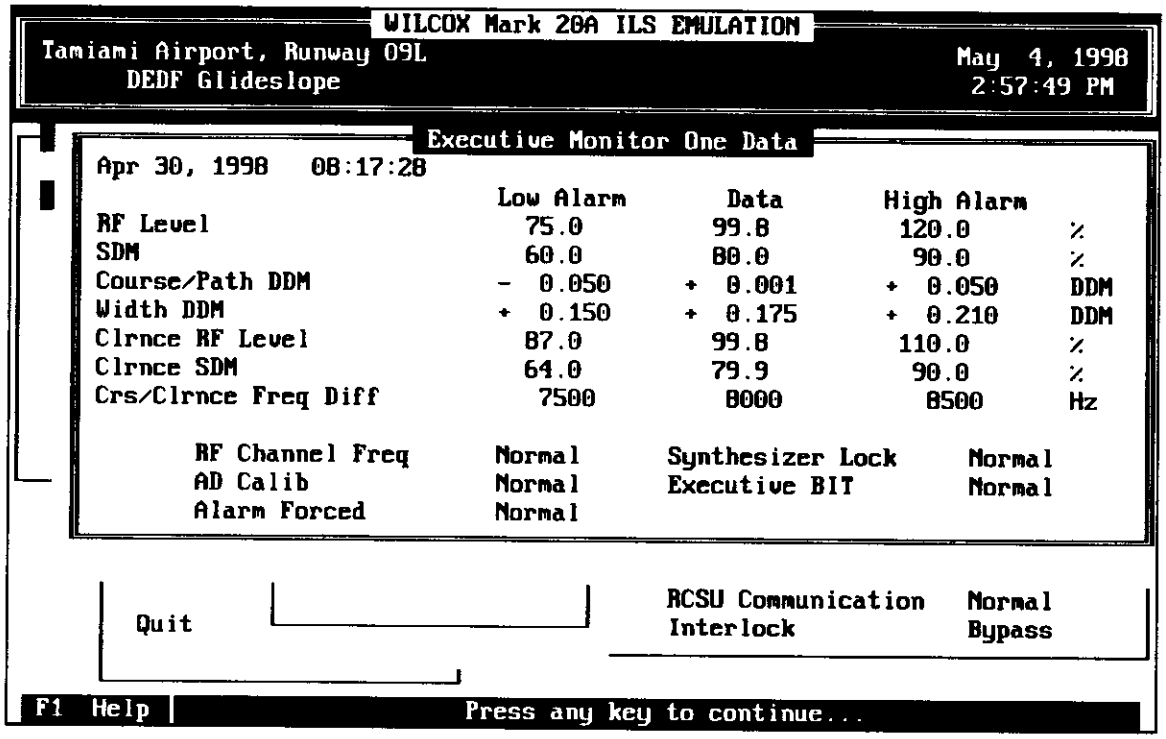
3.7.8 Monitor Readings Menu Screen.- After logging onto the glide slope station, the operator may view the Monitor readings menu screen by selecting <D M>. This screen provides the operator with the option of selecting <E>xecutive monitor, <F>ield monitor (if configured), or <S>tandby monitor.

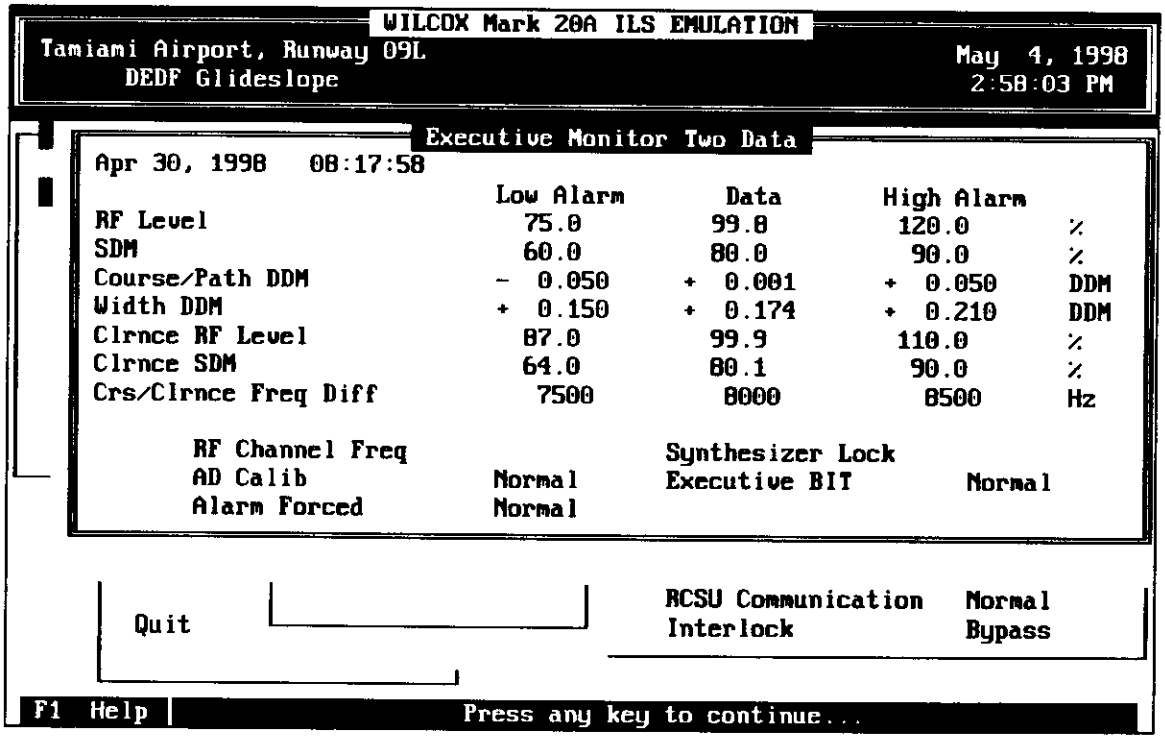


3.7.8.1 Executive Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Executive monitor menu screen by selecting <D M E>. This screen provides the operator with the option of selecting monitor <O>ne, monitor <T>wo, or <C>ombined. The executive monitor screens display real-time readings from the executive monitors, which is the integral monitor data from the radiating antenna. This screen displays real-time data and alarm limits for rf level, sum of depths of modulation (sdm), course/path difference in depth of modulation (ddm), width ddm, clearance rf level, clearance sdm, and clearance frequency difference. The Executive Monitor data screens also identify the status of rf channel frequency, monitor autocalibration, synthesizer lock, and monitor bit parameters. The Executive Monitor One Data screen may also be accessed by pressing function key F2 on the pmdt keyboard from any place in the Mark 20A glide slope screen display. Pressing function key F3 will access the Executive Monitor Two Data screen. Pressing function key F4 will access the Combined Executive Monitor Data screen. The limits displayed on the Executive Monitor data screen are set on the Executive Monitor Alarm/Prealarm Tolerances screen, paragraph 3.9.1.1.1, the Monitor Nominals screen, paragraph 3.9.1.3.1, and the Transmitter Waveform setup screen, paragraph 3.9.4.1.1.

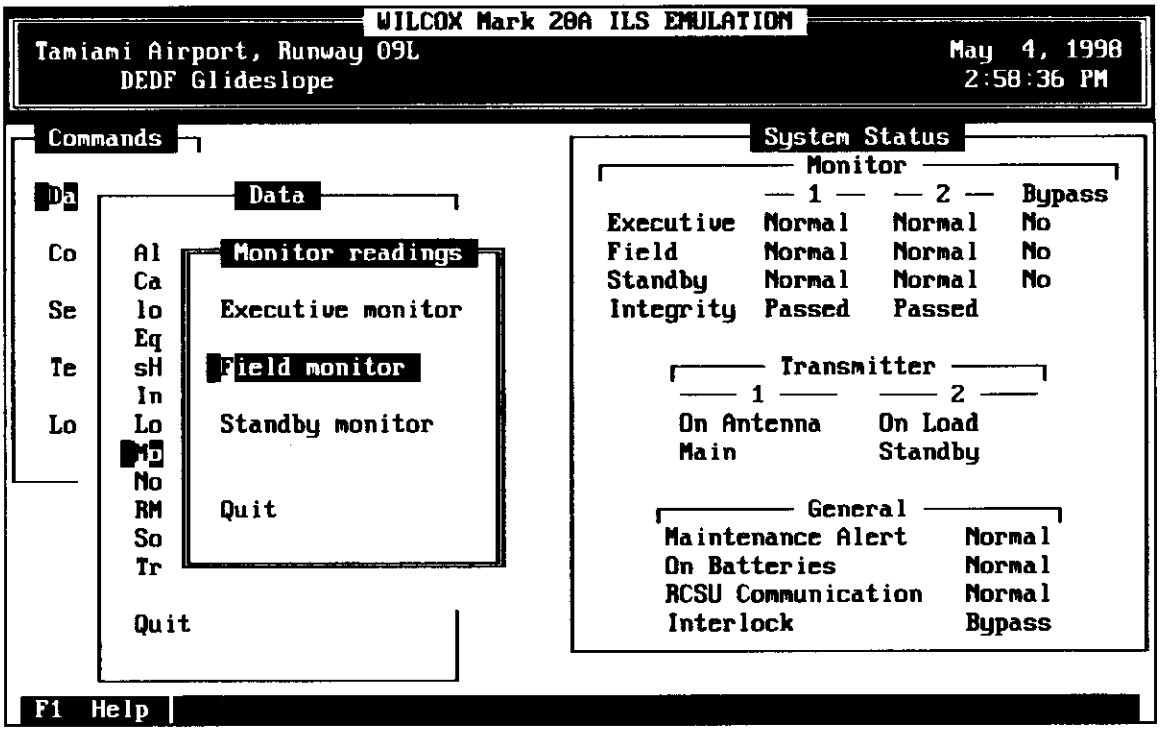


3.7.8.1.1 Executive Monitor One Data Screen.- After logging onto the glide slope station, the operator may view the Executive Monitor One Data screen by selecting <D M E O>. The Executive Monitor Two Data screen may be viewed by selecting <D M E T>. The Combined Executive Monitor Data screen may be viewed by selecting <D M E C>. This screen allows the operator to view real-time operating parameters and high/low alarm limits set in monitor one or monitor two.

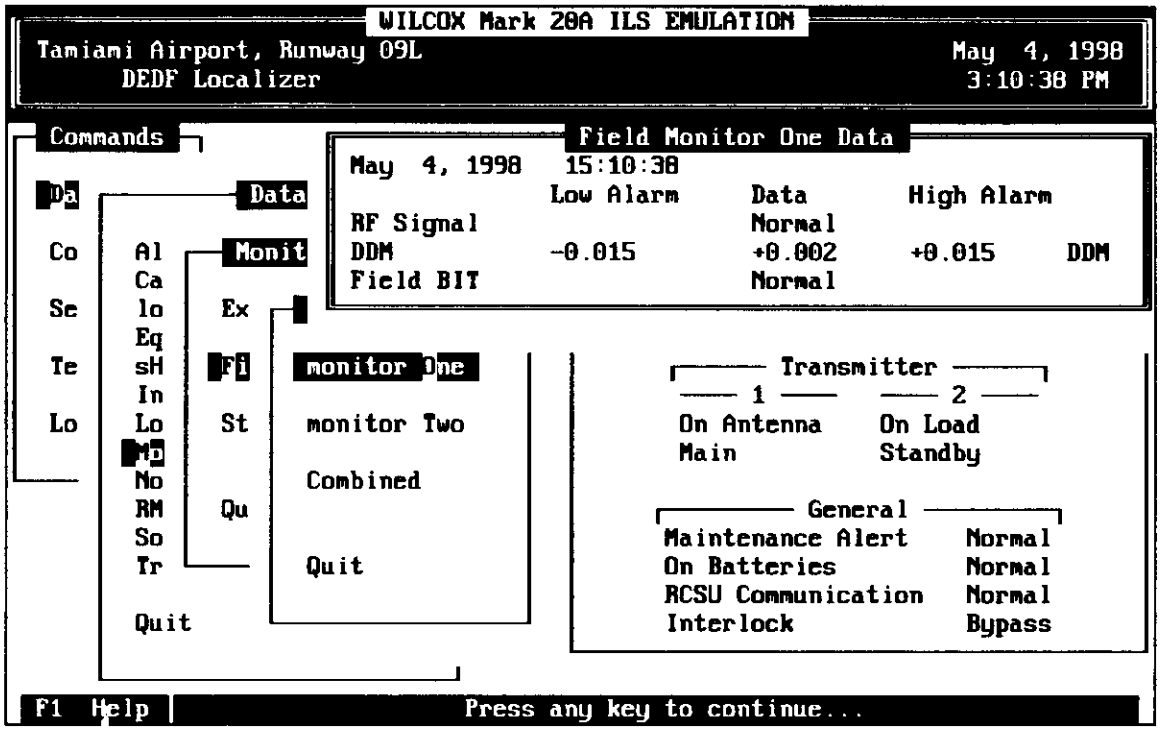




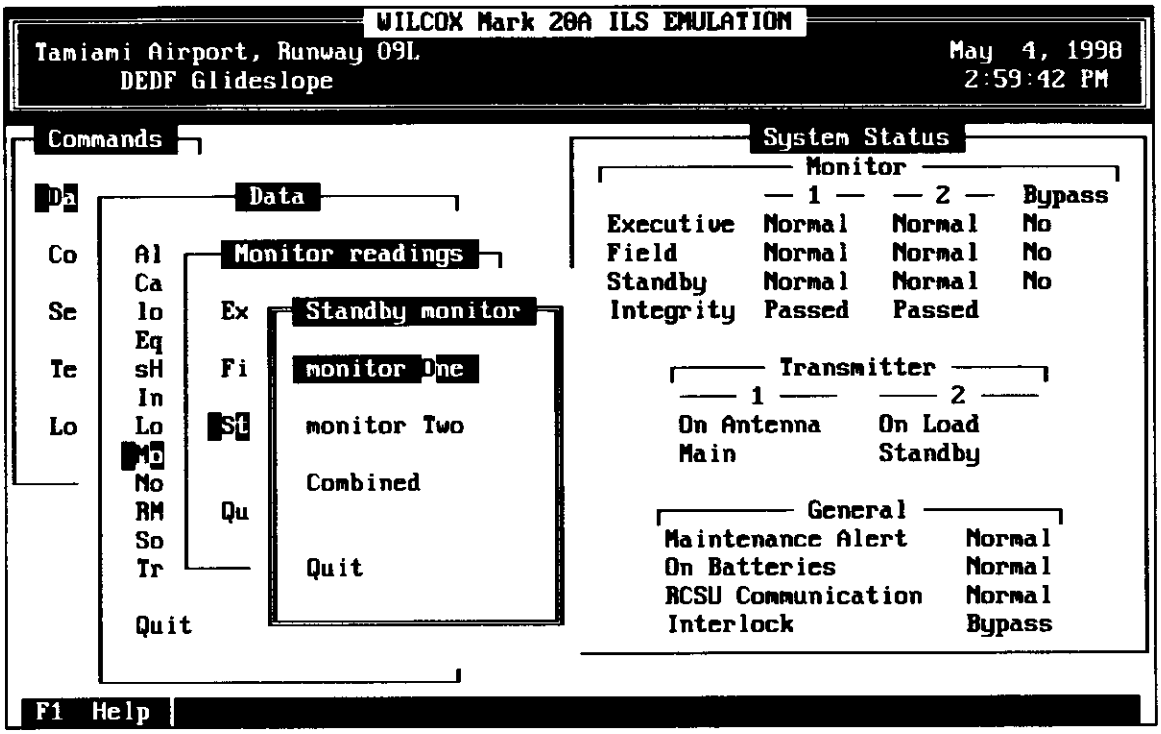
3.7.8.2 Field Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Field monitor menu screen by selecting <D M F>. This menu screen allows the operator to select monitor <O>ne, monitor <T>wo, or <C>ombined. Selecting <Q>uit returns the operator to the Monitor readings menu screen.



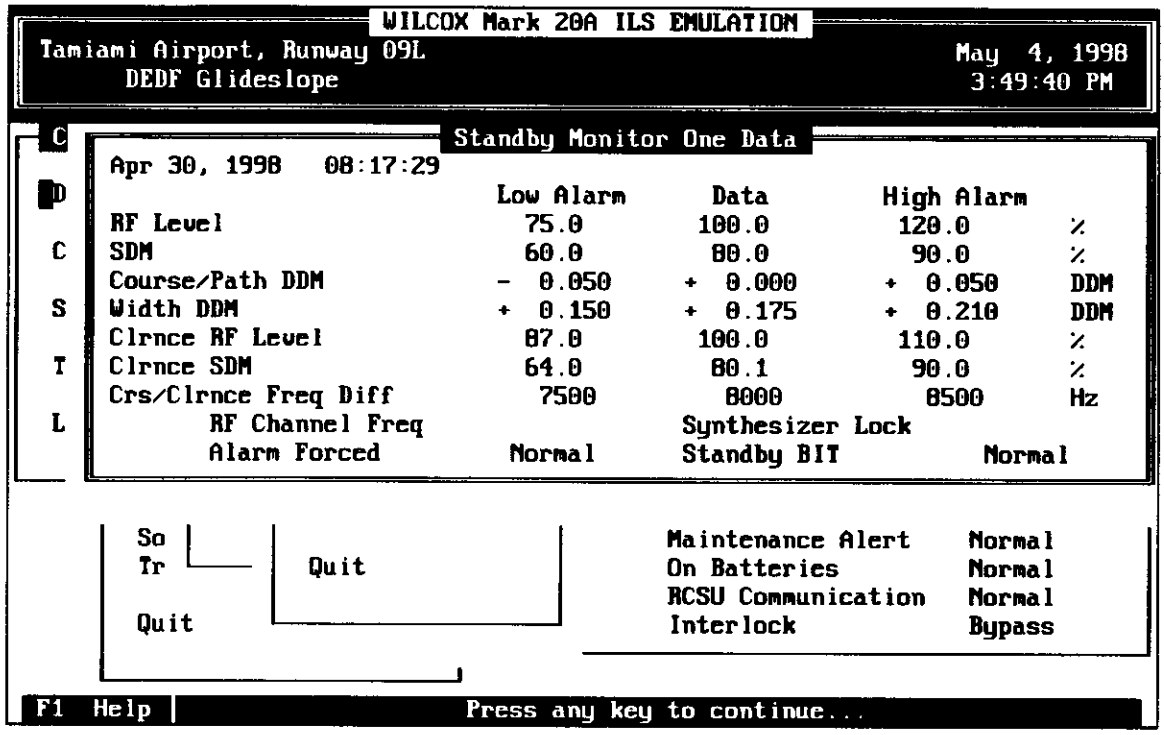
3.7.8.2.1 Field Monitor One Data Screen.- After logging onto the glide slope station, the operator may view the Field Monitor One Data screen by selecting <D M F O>. The Field Monitor Two Data screen may be viewed by selecting <D M F T>. The Combined Field Monitor Data screen may be viewed by selecting <D M F C>. This menu screen allows the operator to view the field monitor data screen.

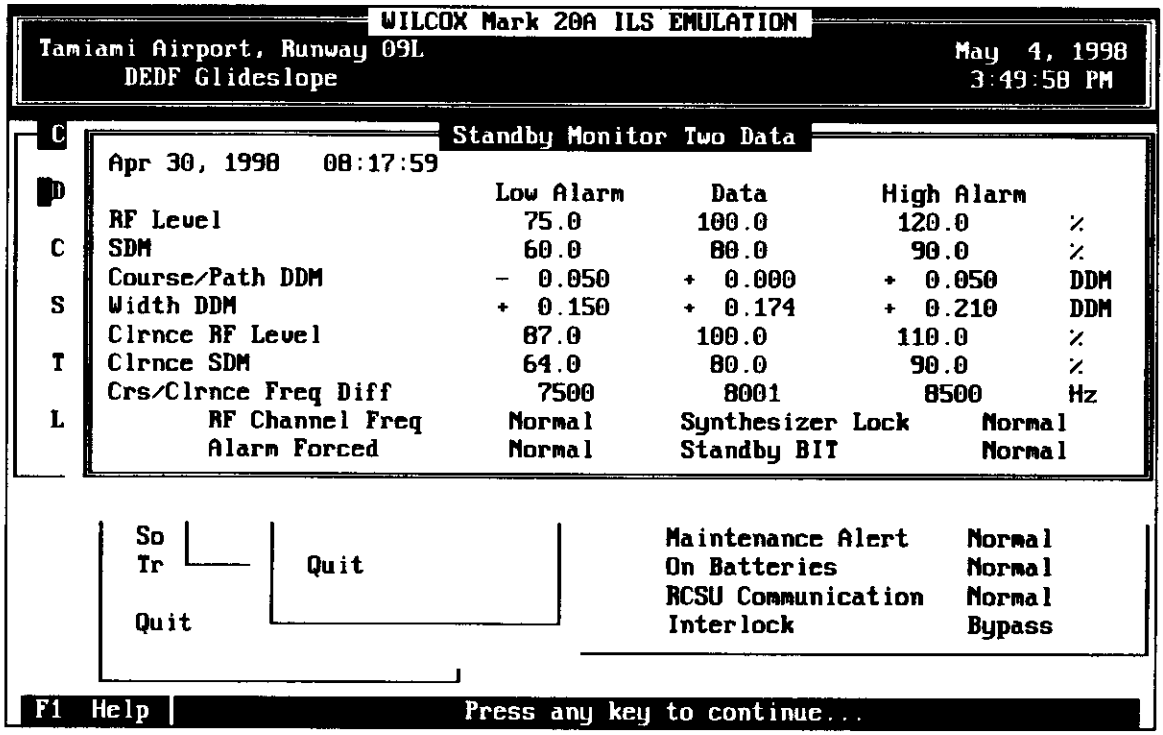


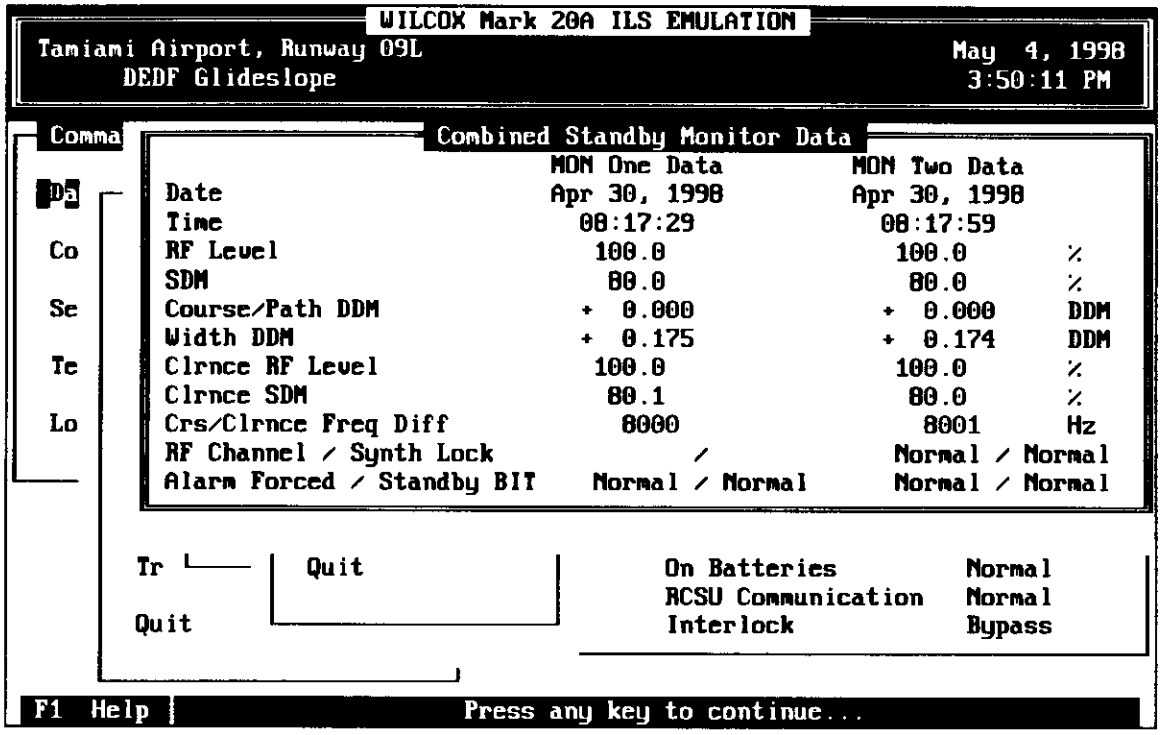
3.7.8.3 Standby Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Standby monitor menu screen by selecting <D M S>. This screen provides the operator with the option of selecting monitor <O>ne, monitor <T>wo, or <C>ombined standby monitor data screens.



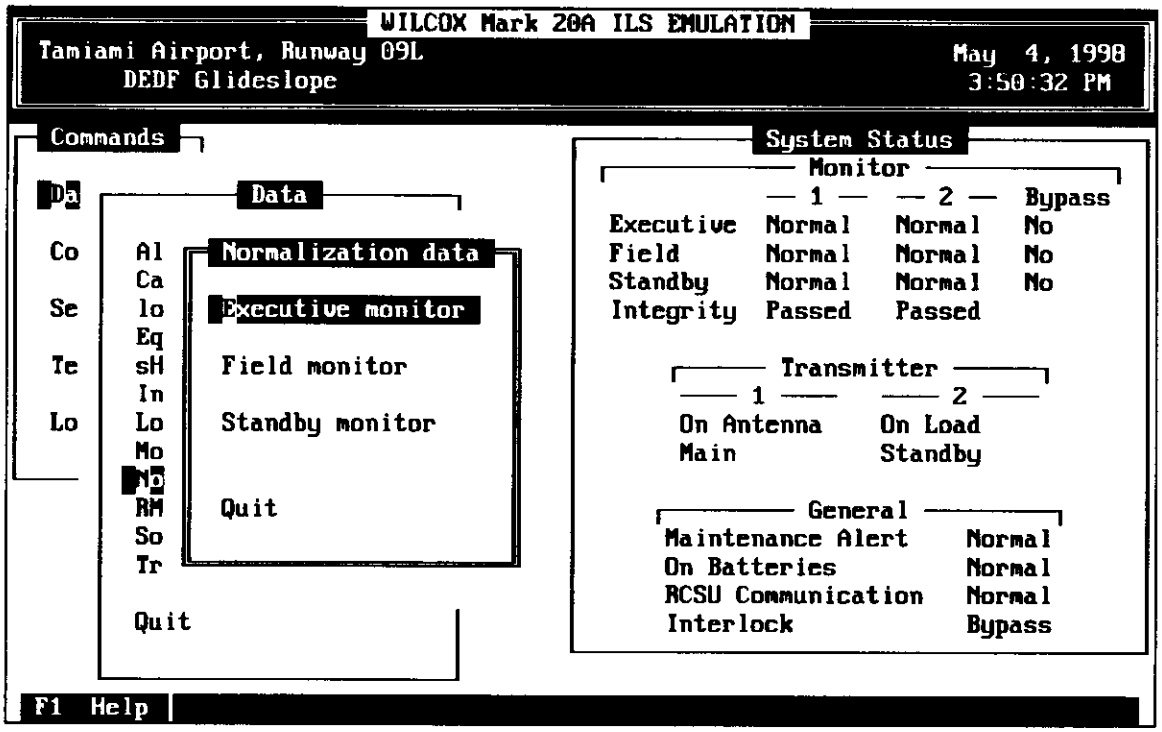
3.7.8.2.1 Standby Monitor Data Screens.- After logging onto the glide slope station, the operator may view the Standby Monitor One Data screen by selecting <D M S O>. The Standby Monitor Two Data screen may be viewed by selecting <D M S T>. The Combined Standby Monitor Data screen may be viewed by selecting <D M S C>.



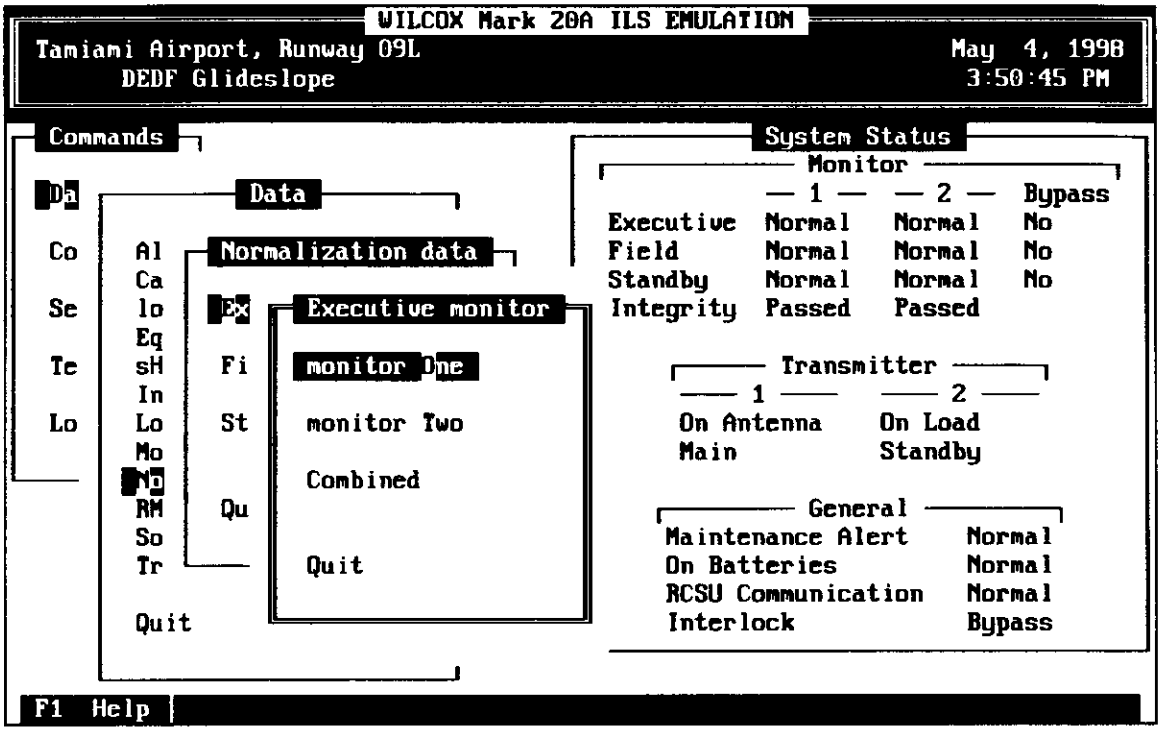



WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
3:50:11 PM
Comma
Combined Standby Monitor Data
MON One Data
MON Two Data
Date
Apr 30, 1998
Apr 30, 1998
Time
08:17:29
08:17:59
RF Level
100.0
100.0 %
SDM
80.0
80.0 %
Course/Path DDM
+ 0.000
+ 0.000 DDM
Width DDM
+ 0.175
+ 0.174 DDM
Clrnce RF Level
100.0
100.0 %
Clrnce SDM
80.1
80.0 %
Crs/Clrnce Freq Diff
8000
8001 Hz
RF Channel / Synth Lock
/
Normal / Normal
Alarm Forced / Standby BIT
Normal / Normal
Normal / Normal
Quit
Quit
On Batteries
Normal
RCSU Communication
Normal
Interlock
Bypass
F1 Help
Press any key to continue...

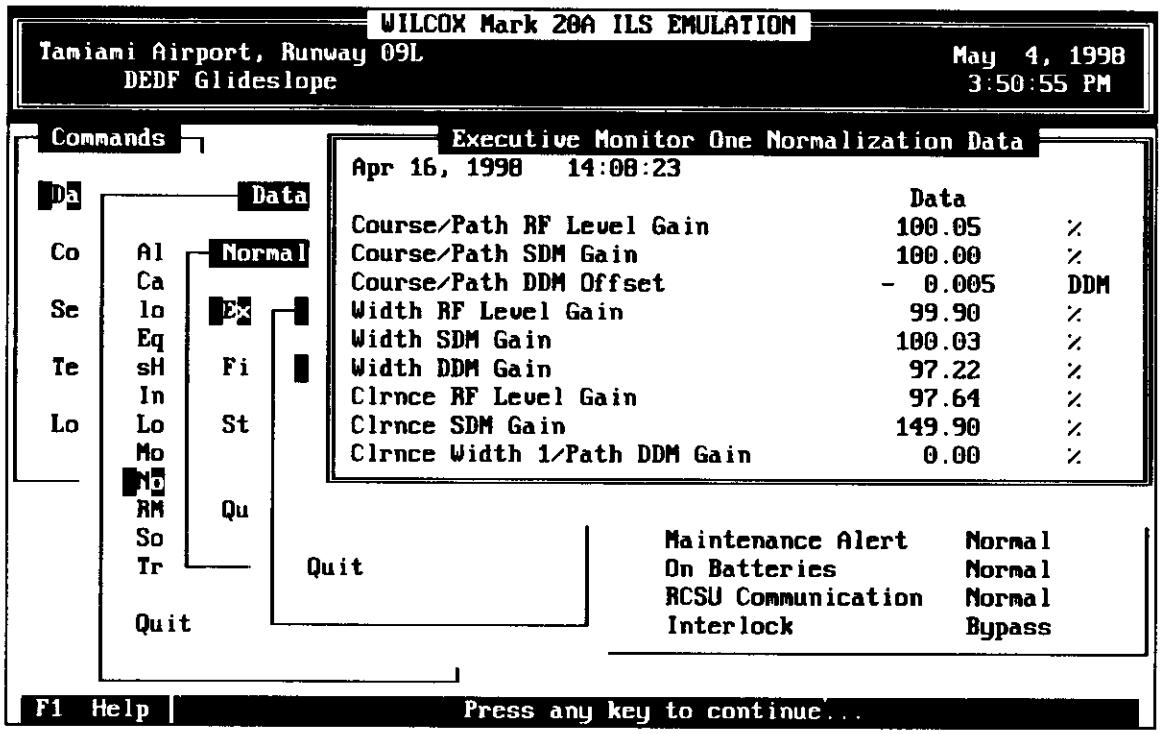
3.7.9 Normalization Data Menu Screen.- After logging onto the glide slope station, the operator may view the Normalization data menu screen by selecting <D N>. This menu screen allows the operator the option of selecting <E>xecutive monitor or <S>tandby monitor. Selecting <Q>uit returns the operator to the Data menu screen. Normalization data represents the amount of gain or offset which was required at normalization to make each parameter equal its nominal. Normalization data represents the amount of gain or offset which was required at normalization to make each parameter equal to nominal. For example: if the standby width ddm reading on a glide slope read 0.059 ddm before normalization and the nominal value was set to 0.175, a gain of 298 percent would be calculated in order to make the width read 0.175 ddm (0.175 / 0.059 = 2.98).

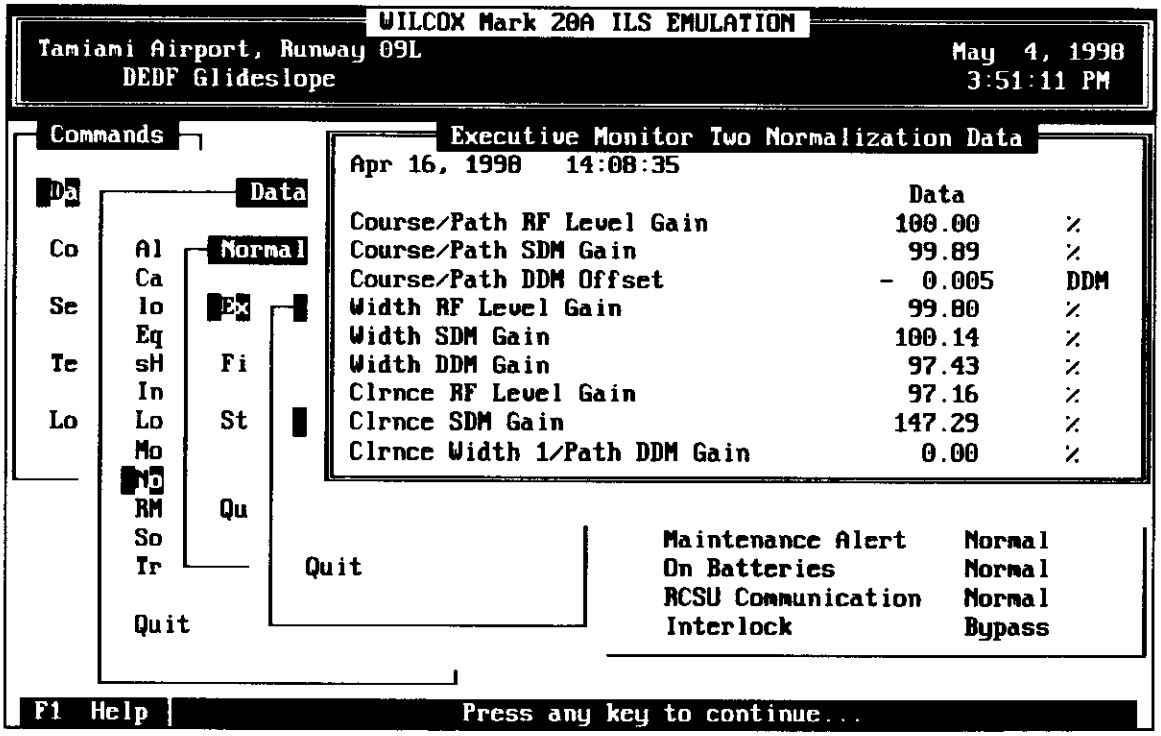


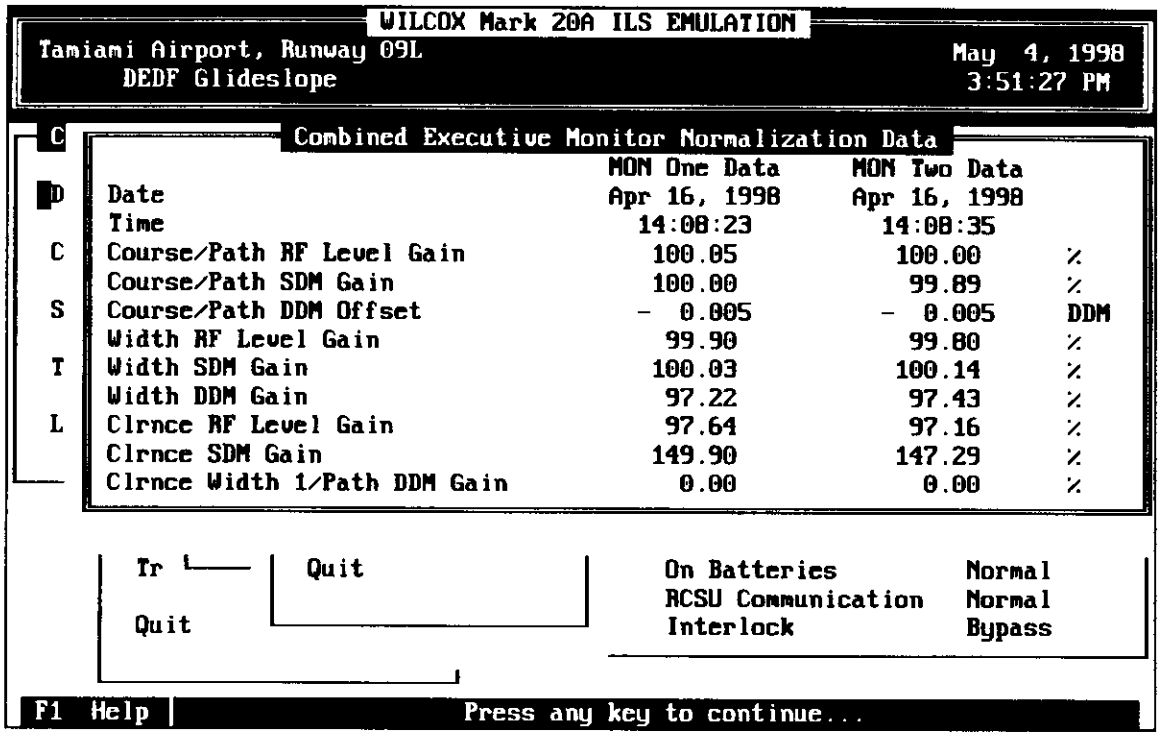
3.7.9.1 Executive Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Executive monitor menu screen by selecting <D N E>. This menu screen allows the operator to select monitor <O>ne, monitor <T>wo, or <C>ombined normalization data for viewing.



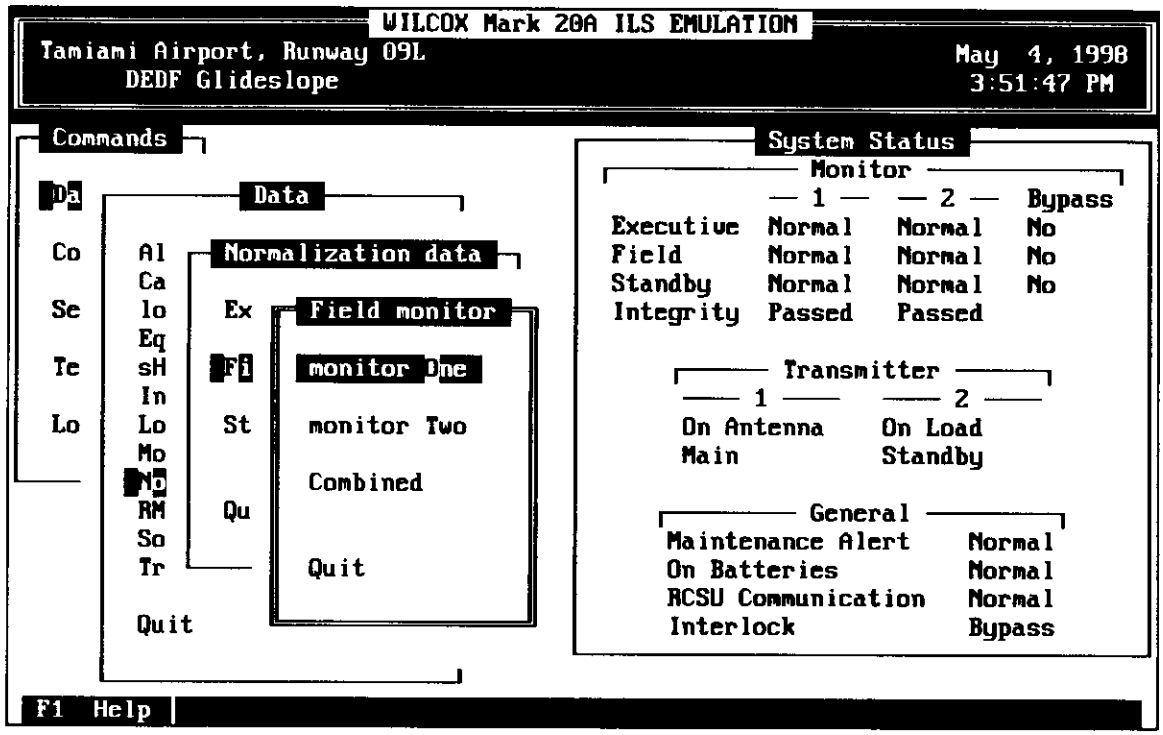
3.7.9.1.1 Executive Monitor Normalization Data Screens.- After logging onto the glide slope station, the operator may view the Executive Monitor One Normalization Data screen by selecting <D N E O>. The Executive Monitor Two Normalization Data screen may be viewed by selecting <D N E T>. The Combined Executive Normalization Data screen may be viewed by selecting <D N E C>. The screens display data from the latest monitor normalization performed on the executive monitors, which is the integral monitor data from the radiating antenna.



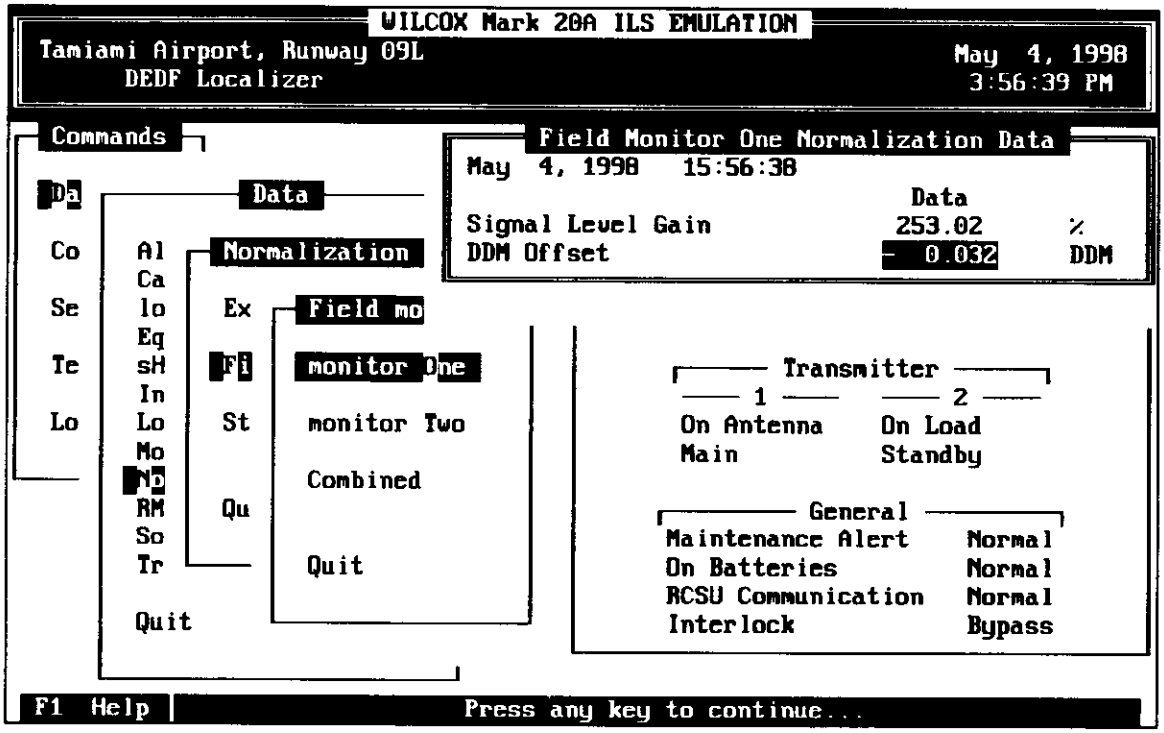



WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 4, 1998
3:51:27 PM
Combined Executive Monitor Normalization Data
MON One Data
MON Two Data
Date
Apr 16, 1998
Apr 16, 1998
Time
14:08:23
14:08:35
Course/Path RF Level Gain
100.05
100.00
%
Course/Path SDM Gain
100.00
99.89
%
Course/Path DDM Offset
- 0.005
- 0.005
DDM
Width RF Level Gain
99.90
99.80
%
Width SDM Gain
100.03
100.14
%
Width DDM Gain
97.22
97.43
%
Clrnce RF Level Gain
97.64
97.16
%
Clrnce SDM Gain
149.90
147.29
%
Clrnce Width 1/Path DDM Gain
0.00
0.00
%
Quit
Quit
On Batteries
Normal
RCSU Communication
Normal
Interlock
Bypass
F1 Help
Press any key to continue...

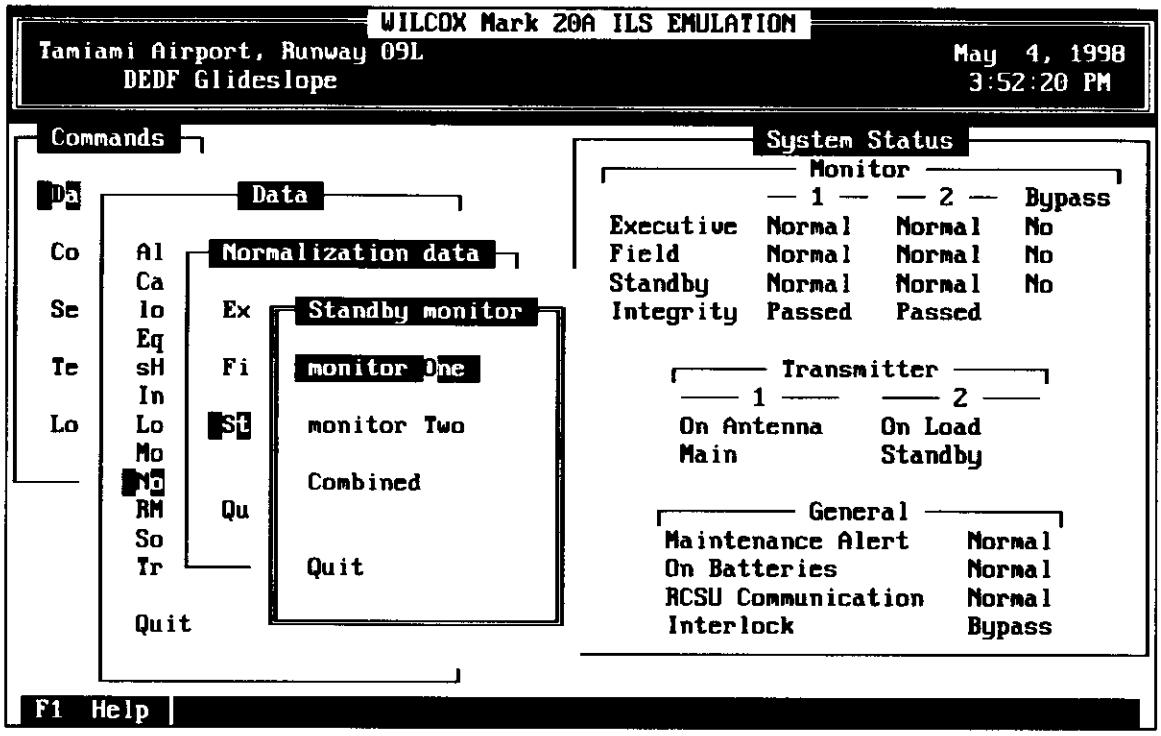
3.7.9.2 Field Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Field monitor menu screen (if the field monitor is configured) by selecting <D N F>. This menu screen allows the operator to select monitor <O>ne, monitor <T>wo, or <C>ombined normalization data for viewing. Selecting <Q>uit returns the operator to the Normalization data menu screen.



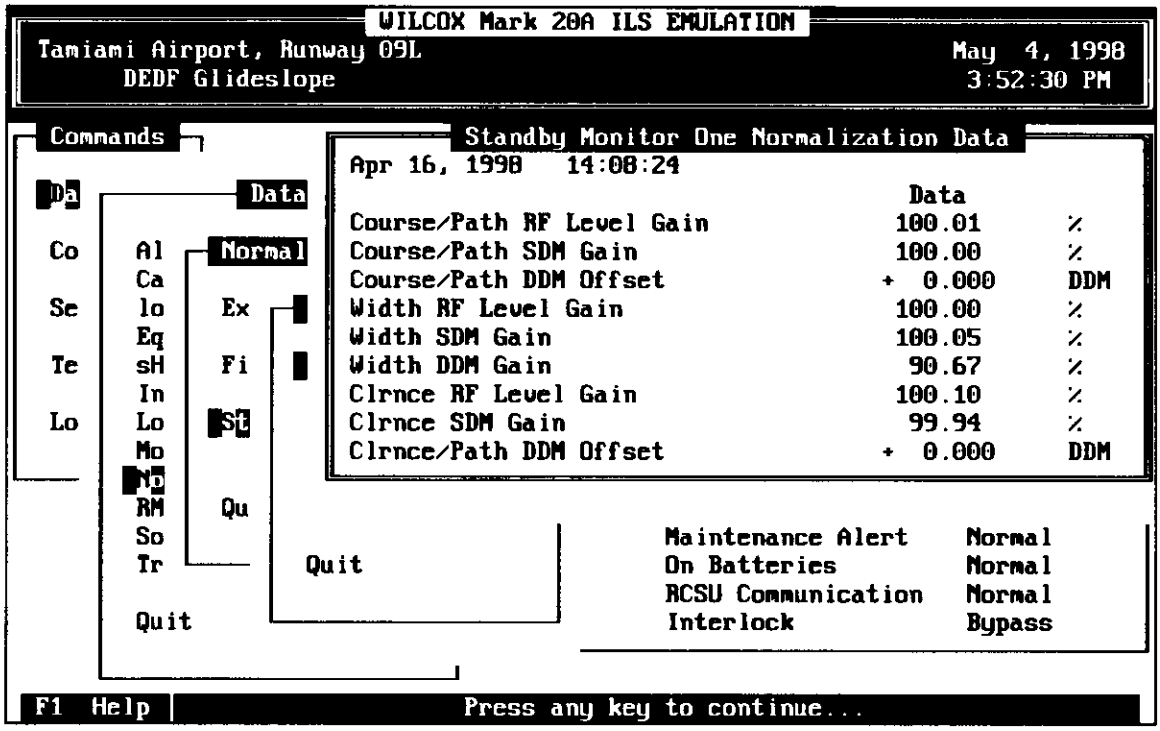
3.7.9.2.1 Field Monitor One Normalization Data Screen.- After logging onto the glide slope station, the operator may view the Field Monitor One Normalization Data screen by selecting <D N F O>. The Field Monitor Two Normalization Data screen may be viewed by selecting <D N F T>. The Combined Field Monitor Normalization Data screen may be viewed by selecting <D N F C>. The field monitor normalization data screens display information from the latest monitor normalization using signals from the field monitor detector.

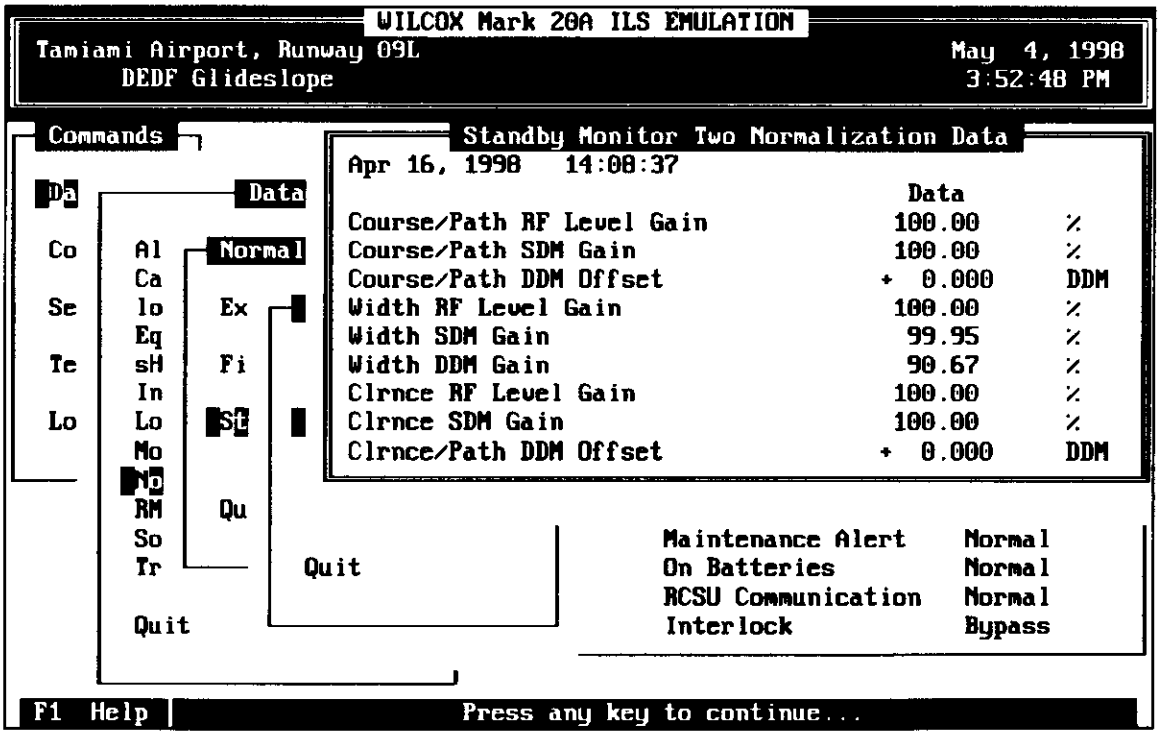


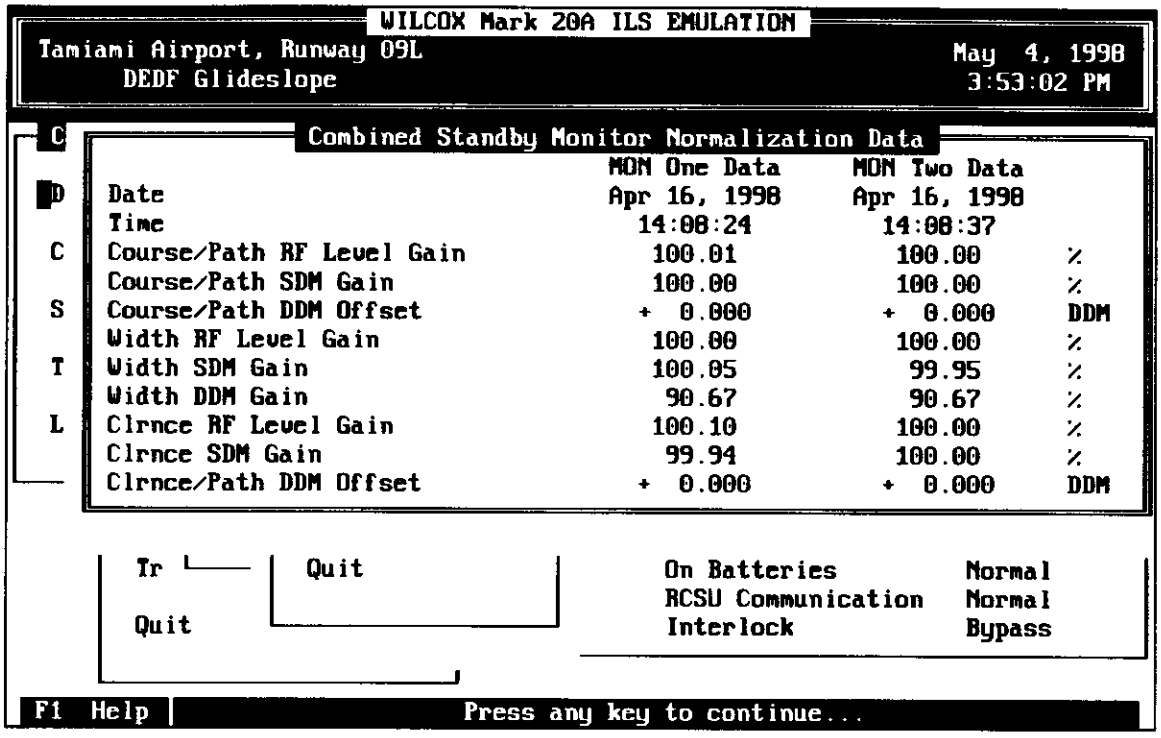
3.7.9.3 Standby Monitor Menu Screen.- After logging onto the glide slope station, the operator may view the Standby monitor menu screen by selecting <D N S>. This menu screen allows the operator to select monitor <O>ne, monitor <T>wo, or <C>ombined normalization data for viewing. Selecting <Q>uit returns the operator to the Normalization data menu screen.



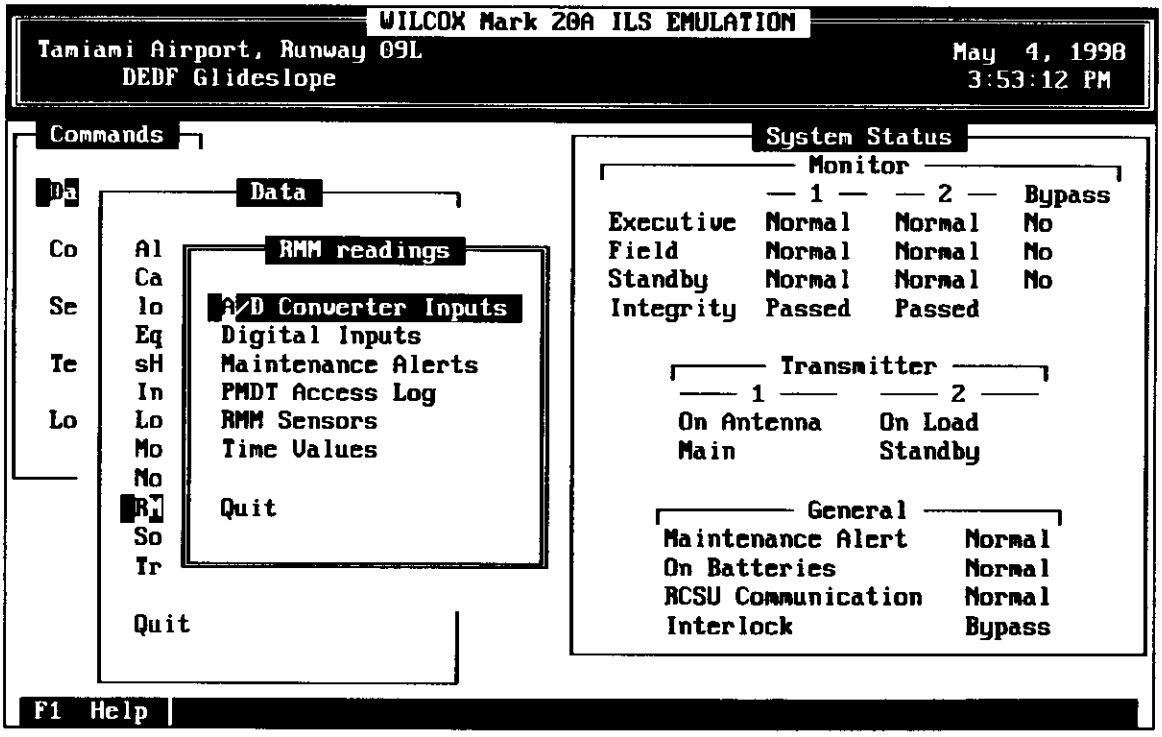
3.7.9.3.1 Standby Monitor Normalization Data Screens.- After logging onto the glide slope station, the operator may view the Standby Monitor One Normalization Data screen by selecting <D N S O>. The Standby Monitor Two Normalization Data may be viewed by selecting <D N S T>. The Combined Standby Monitor Normalization Data screen may be viewed by selecting <D N S C>. The standby monitor normalization data screens display normalization data from the latest normalization performed on the standby monitors using signals obtained from standby integral detectors.







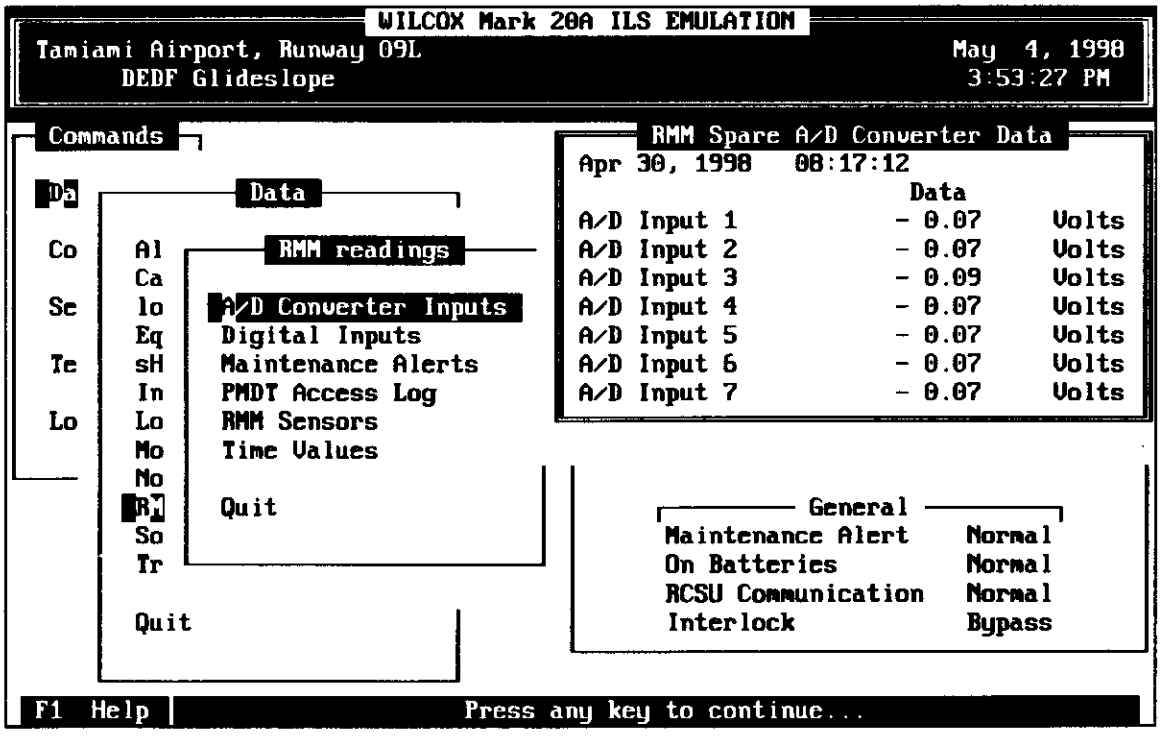
3.7.10 RMM Readings Menu Screen.- After logging onto the glide slope station, the operator may view 8the RMM readings menu screen by selecting <D R>. This screen provides operator access to <A>/D converter inputs, <D>iagnostics, digital <I>nputs, <M>aintenance alerts, <P>mdt Access Log, <R>MM sensors, and <T>ime values selections. Selecting <Q>uit returns the operator to the Data menu.



3.7.10.1 RMM Spare A/D Converter Data Screen.- After logging onto the glide slope station, the operator may view the RMM Spare A/D Converter Data screen by selecting <D R A>. The remote maintenance monitor computer RMM cca has seven spare adc inputs. These inputs are continually measured, and if alarm limits are set, will generate a maintenance alert on either a high-to-low or low-to-high transition when outside the limits. The limits for the displayed data on the RMM Spare A/D Converter Data screen are set on the RMM Spare A/D Alarm Limits screen, paragraph 3.9.3.1. Table 3-10 lists the a/d data connection points.

Table 3-10. A/D Data Measurement Connection Points

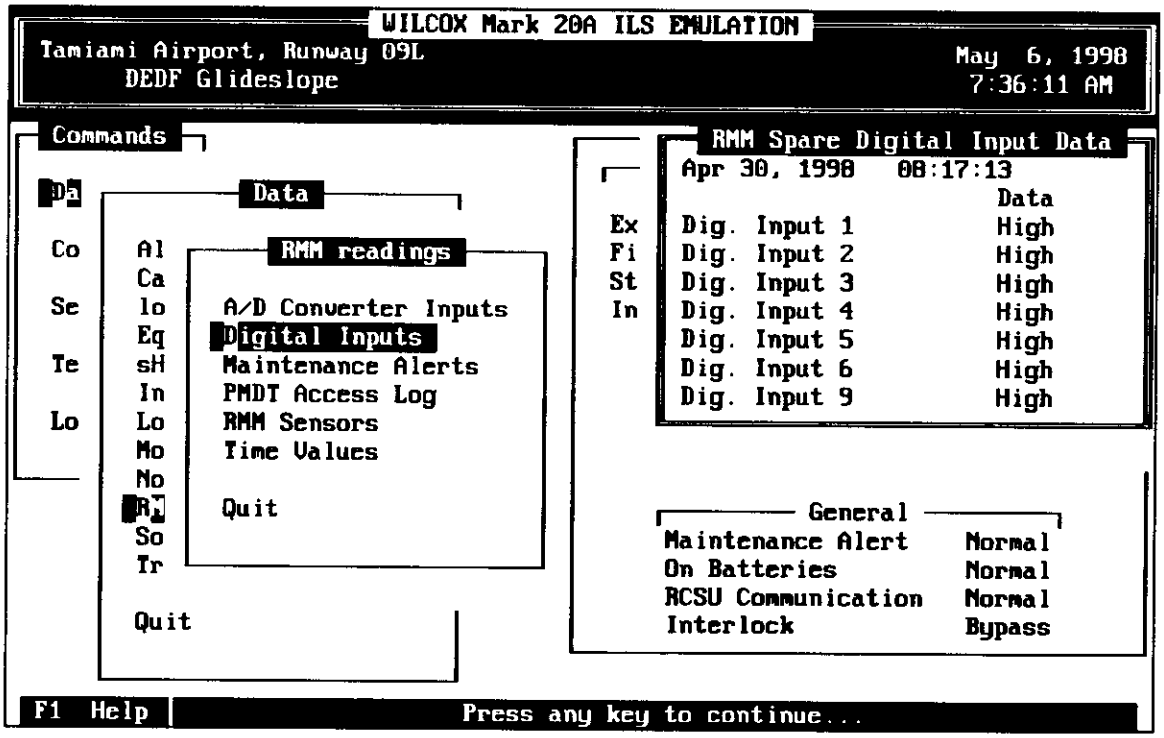
A/D Data	RMM Signal	Backplane Connection
Spare 1	ASIG6	J3-8
Spare 2	ASIG8	J3-2
Spare 3	ASIG10	J3-4
Spare 4	ASIG11	J3-6
Spare 5	ASIG13	J3-5
Spare 6	ASIG14	J3-3
Spare 7	ASIG15	J3-1
GND	...	J3-13



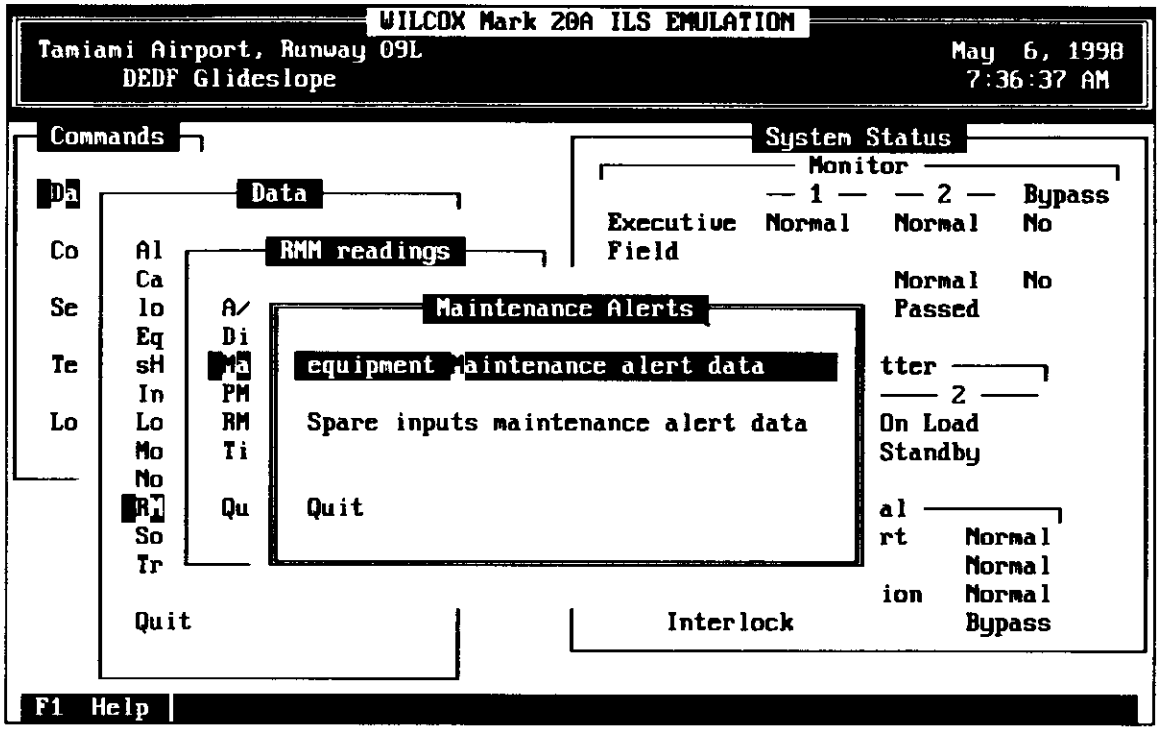
3.7.10.2 RMM Spare Digital Input Data Screen.- After logging onto the glide slope station, the operator may view the RMM Spare Digital Input Data screen by selecting <D R D>. This screen contains status on the spare inputs. The RMM computer cca has seven spare digital inputs implemented. They are continually measured and can be set to generate a maintenance alert on either a high-low or low-high transition. A maintenance alert will not be generated by a level transition when a blank field is selected. The signals are shown in table 3-11. High/low transition alarms are established fron the <S>etup-<R>ms paramenters-<D>igital input screen.

Table 3-11. Digital Inputs Signals

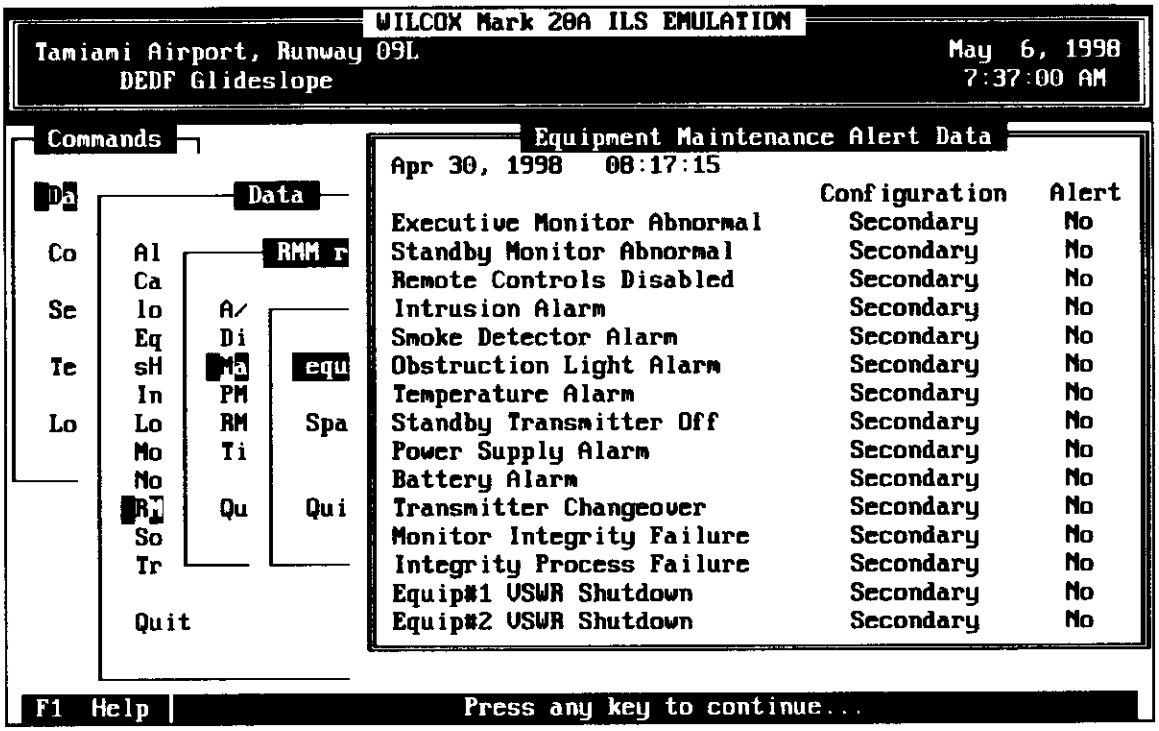
Input Data	RMS Signal	Backplane Connection
Spare 1	DIN0	J3-15
Spare 2	DIN1	J3-17
Spare 3	DIN2	J3-19
Spare 4	DIN3	J3-21
Spare 5	DIN4	J3-23
Spare 6	DIN5	J3-25
Spare 9	DIN10	J3-11
GND		J3-13



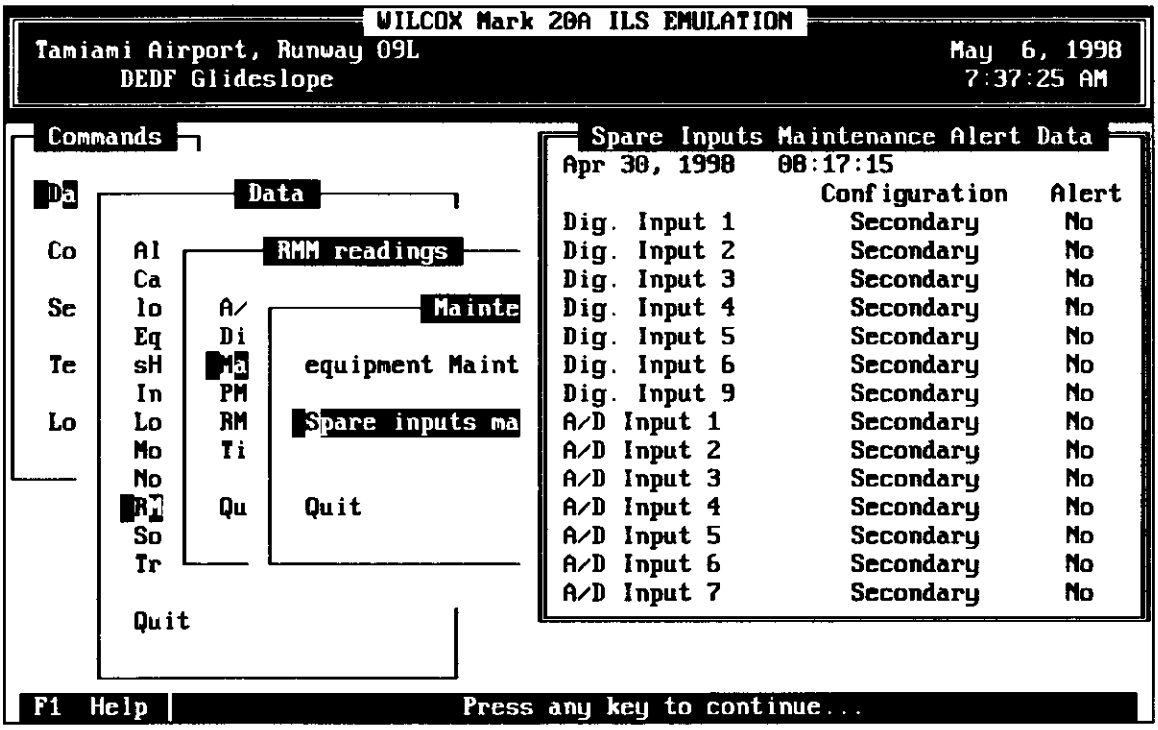
3.7.10.3 Maintenance Alert Menu Screen.- After logging onto the glide slope station, the operator may view the Maintenance Alert Menu screens by selecting <D R M>. The Maintenance Alert Menu screen allows the user to select either the equipment <M>aintenance alert data screen or the <S>pare inputs maintenance aler data screen.



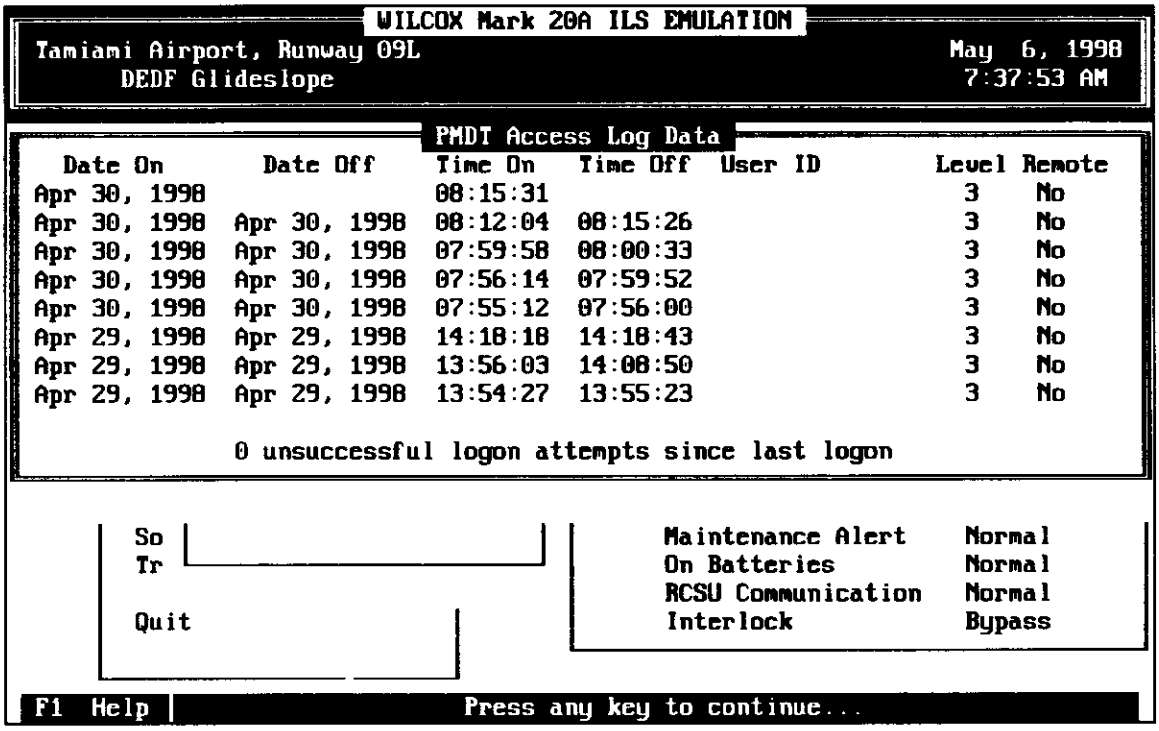
3.7.10.3.1 Equipment Maintenance Alert Data Screen.- After logging onto the glide slope station, the operator may view the equipment Maintenance Alert Data screen by selecting <D R M M>. The equipment maintenance Alert Data screen displays the assembly/parameter that is generating the maintenance alert. YES/NO data is displayed for each parameter which includes monitor prealarms, environmental sensor alarms, power supply alarms, battery. In addition, a maintenance alert is generated when the remote controls are disabled, a transmitter changeover takes place, monitor integrity test fails or the integrity process fails, and when a transmitter VSWR shutdown occurs. Environmental sensors will not appear unless they are enabled in the configuration screen. Note that the maintenance alerts may be labeled as primary or secondary. This is accomplished from the Setup command.



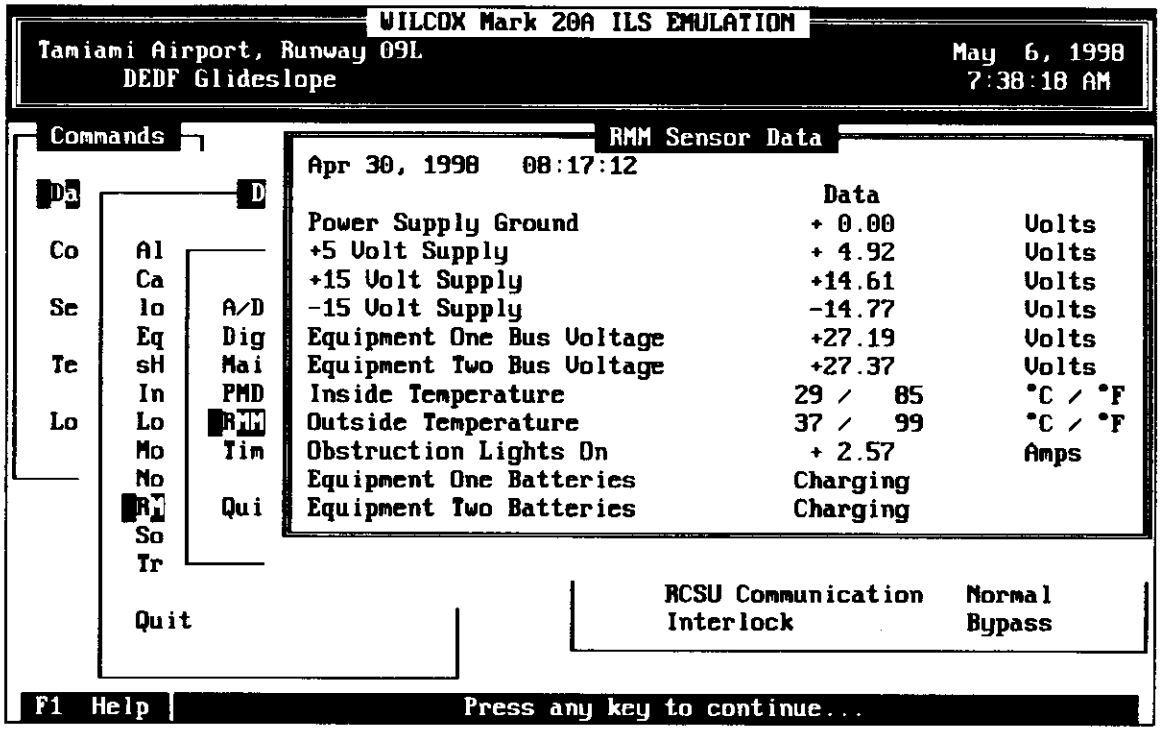
3.7.10.3.2 Spare Inputs Maintenance Alert Data Screen.- After logging onto the glide slope station, the operator may view the Spare Inputs Maintenance Alert Data screen by selecting <D R M S0>. The spare inputs maintenance Alert Data screen displays the spare input parameter that is generating the maintenance alert. YES/NO data is displayed for each parameter which includes the seven spare digital and seven spare analog inputs. Note that the maintenance alerts may be labeled as primary or secondary. This is accomplished from the Setup command.



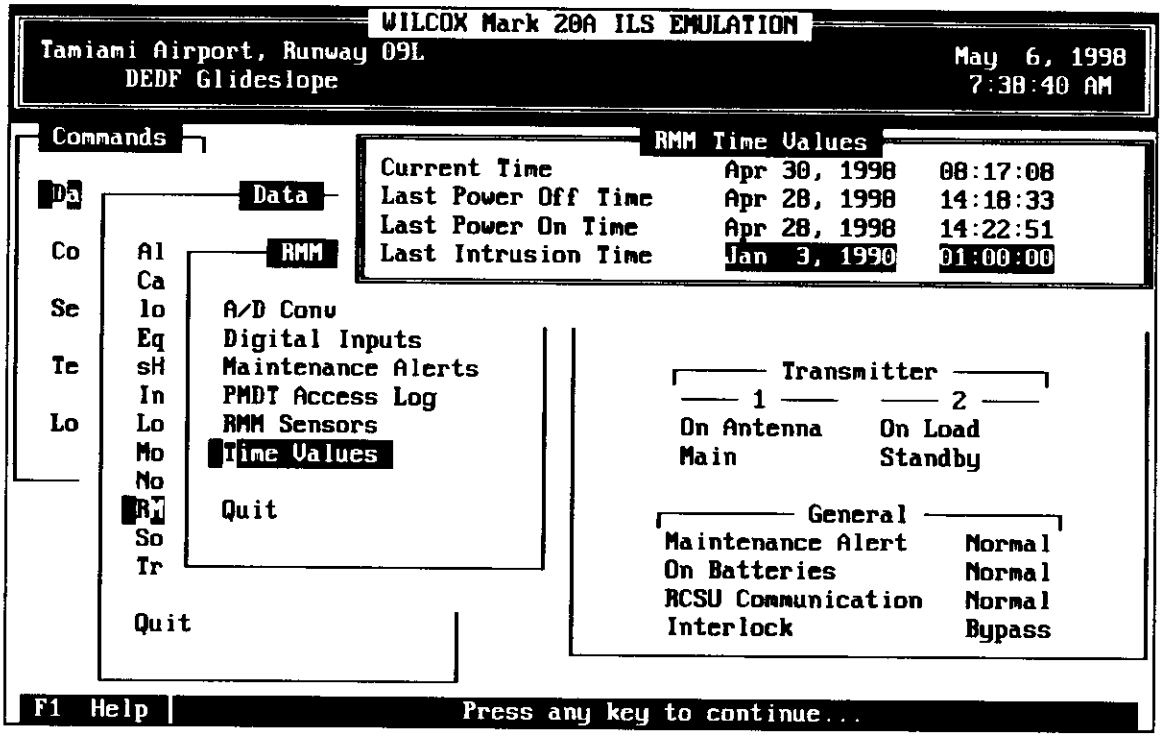
3.7.10.4 PMDT Access Log Data Screen.- After logging onto the glide slope station, the operator may view the PMDT Access Log Data screen by selecting <D R P>. The PMDT Access Log records the last eight logon records. The user ID is recorded along with the logon time, logoff time, and security level. A record is kept of the number of unsuccessful logon attempts since the last successful logon. A successful logon and logoff will clear the unsuccessful logon attempts data.



3.7.10.5 RMM Sensor Data Screen.- After logging onto the glide slope station, the operator may view the RMM Sensor Data screen by selecting <D R R>. Data is displayed for each of the power supply voltages including equipment one and two bus voltage. Equipment one and equipment two battery data indicates if the batteries are charging or discharging. Inside and outside temperature is displayed in degrees C. Obstruction light data is displayed. Note that the inside and outside temperature and obstruction light data will only be displayed if these sensors have been enabled in the configuration screen. The limits displayed on the RMM Sensor Data screen are set on the RMM Sensor Alarm Limits screen, paragraph 3.9.3.5.



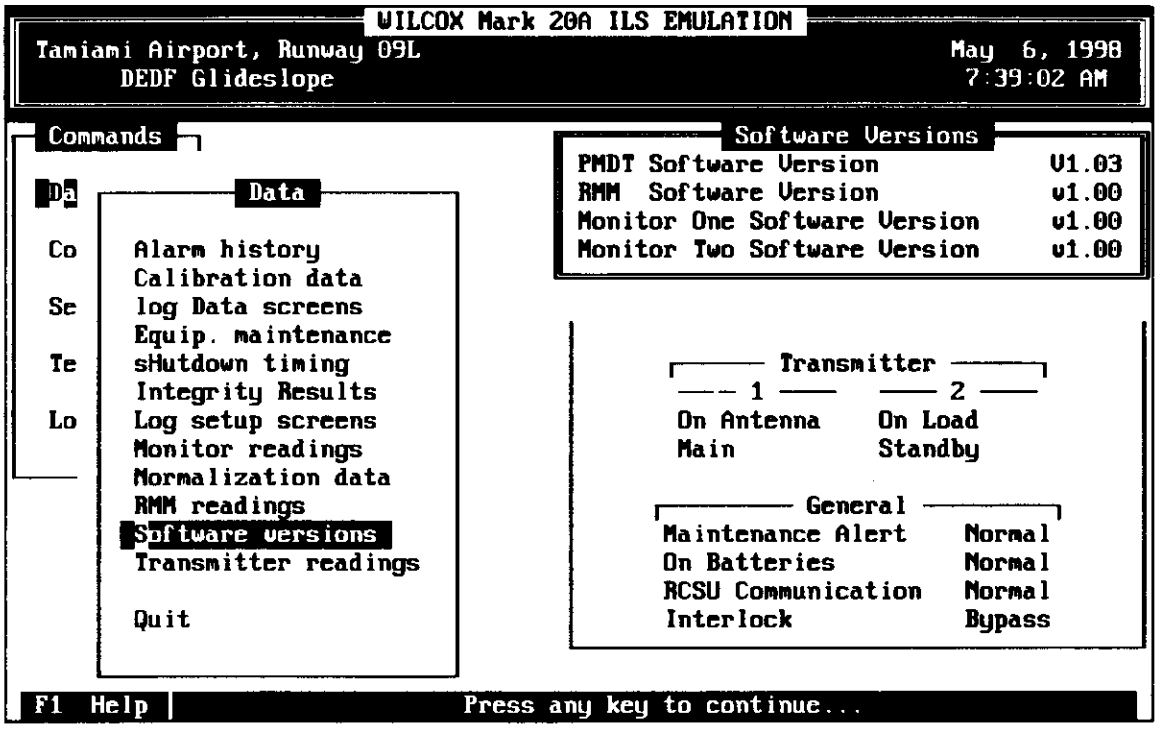
3.7.10.6 RMM Time Values Screen.- After logging onto the glide slope station, the operator may view the RMM Time Values screen by selecting <D R T>. The RMM Time Values screen indicates the current time and the last time power was turned off or on and when the last intrusion alram occurred (if the RMM sensors are configured).



3.7.11 Software Versions Screen.- After logging onto the glide slope station, the operator may view the Software Versions screen by selecting <D S>. The Software Versions screen displays the versions of software installed in the glide slope system and the pmdt software version currently being used. This screen is updated when the software is changed. The contents of this screen are site dependent. The Software Versions screen displays numbers corresponding to the version of software present in all computers in the system.

NOTE

The Software Version screen displayed in this instruction book identifies the version of the pmdt software described and documented in this instruction book.



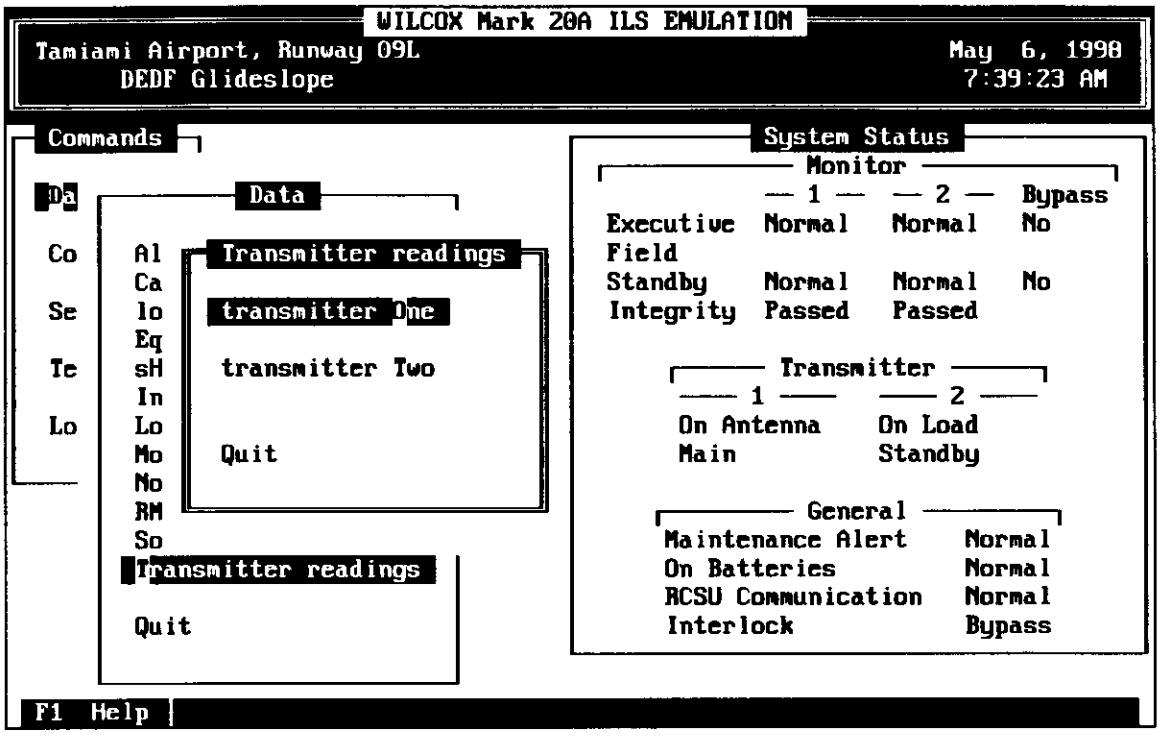
3.7.12 Transmitter Readings Menu Screen.- After logging onto the glide slope station, the operator may view the Transmitter readings menu screen by selecting <D T>. This menu screen allows the operator access to transmitter <O>ne and transmitter <T>wo selections. These selections are described in the following paragraphs.

WARNING

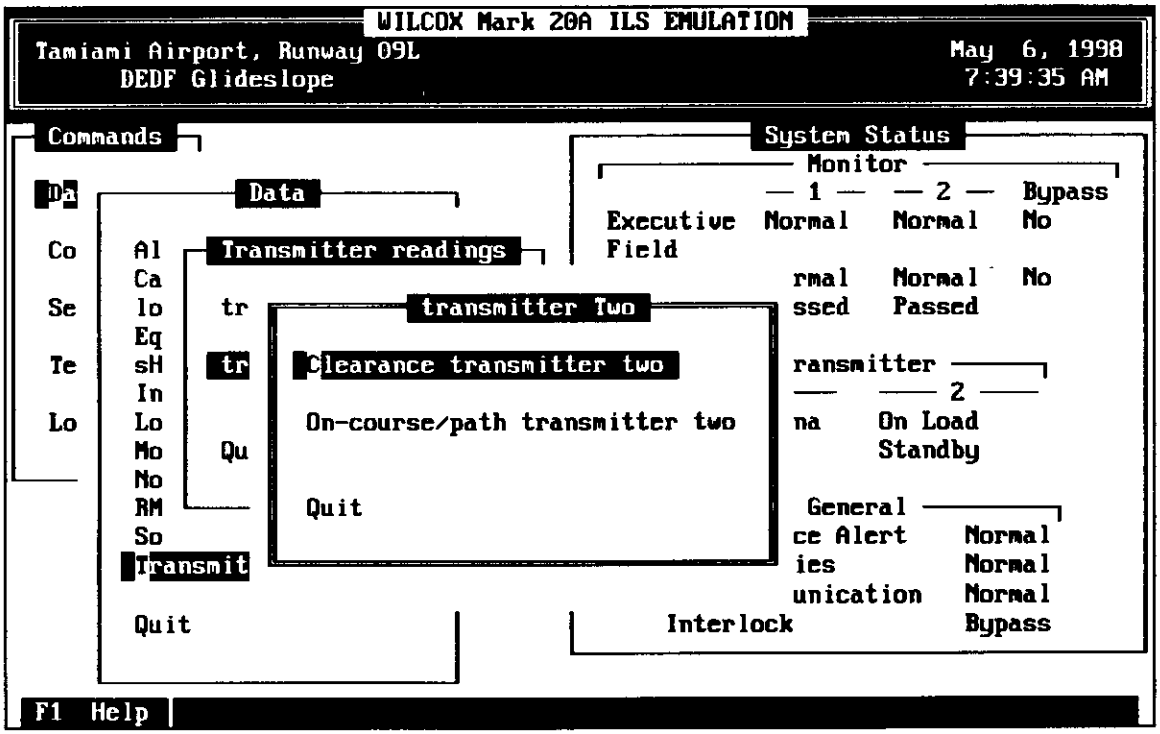
If the executive monitor is bypassed, the rate at which the transmitter readings are collected is increased (at the expense of the normal executive, field, and standby monitor measurements and alarm processing). This may cause the executive, field, or standby monitors to go in and out of alarm. The associated flickering of the monitor alarm LED is to be expected. These measurements are normally made in addition to the executive, field, and standby monitor measurements and alarm processing, reducing the speed of the normal processing. This reduces the sensitivity of the normal monitors to error conditions.

If the executive monitor is not bypassed, accessing multiple transmitter reading screens through the hot keys (see F1) may cause busy status messages and not display the desired data.

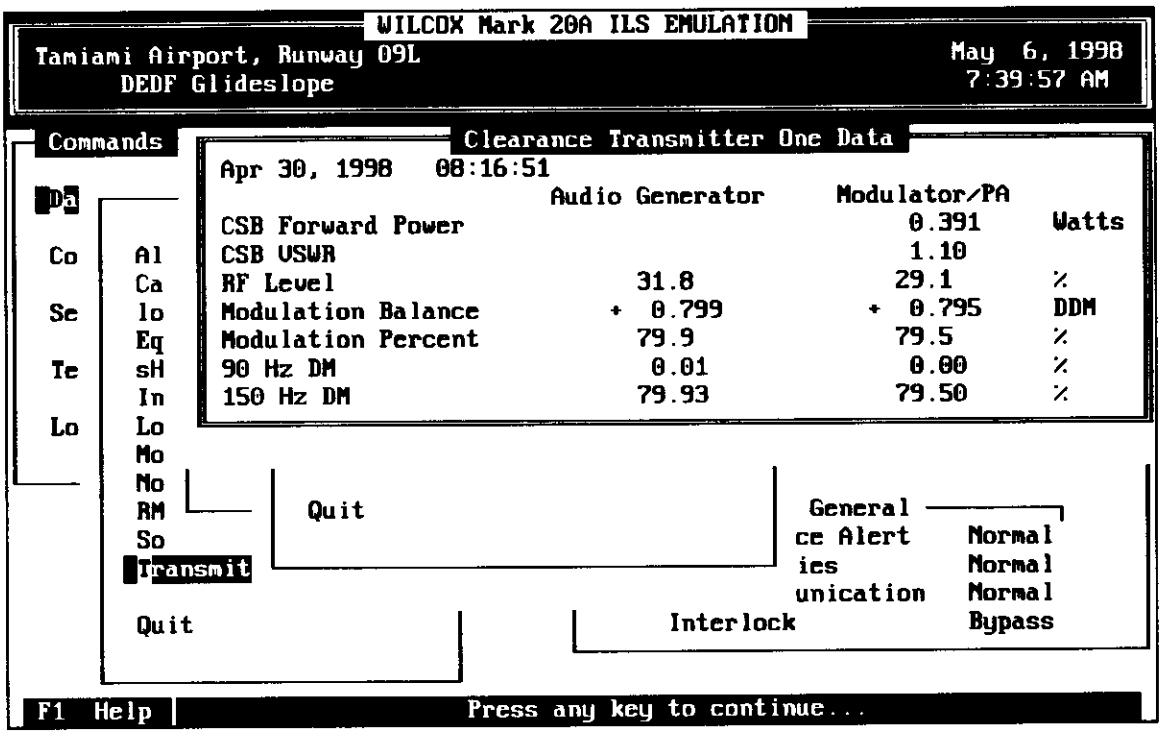
These extra data measurements are only made when the screens are requested and are only updated as long as the screens remain displayed. Two sets of data are displayed; one from the output of the audio generator board and one from the output of the modulator/power amplifier assembly. Data from only one of the four transmitters is displayed at a time. These measurements are performed at the limit of the monitor board accuracy range so a small amount of jitter in the last digit displayed is normal.



3.7.12.1 Transmitter One Menu Screen.- After logging onto the glide slope station, the operator may view the transmitter One menu screen by selecting <D T O>. This screen allows the operator to select <C>learance transmitter one or <O>n-course/path transmitter one.



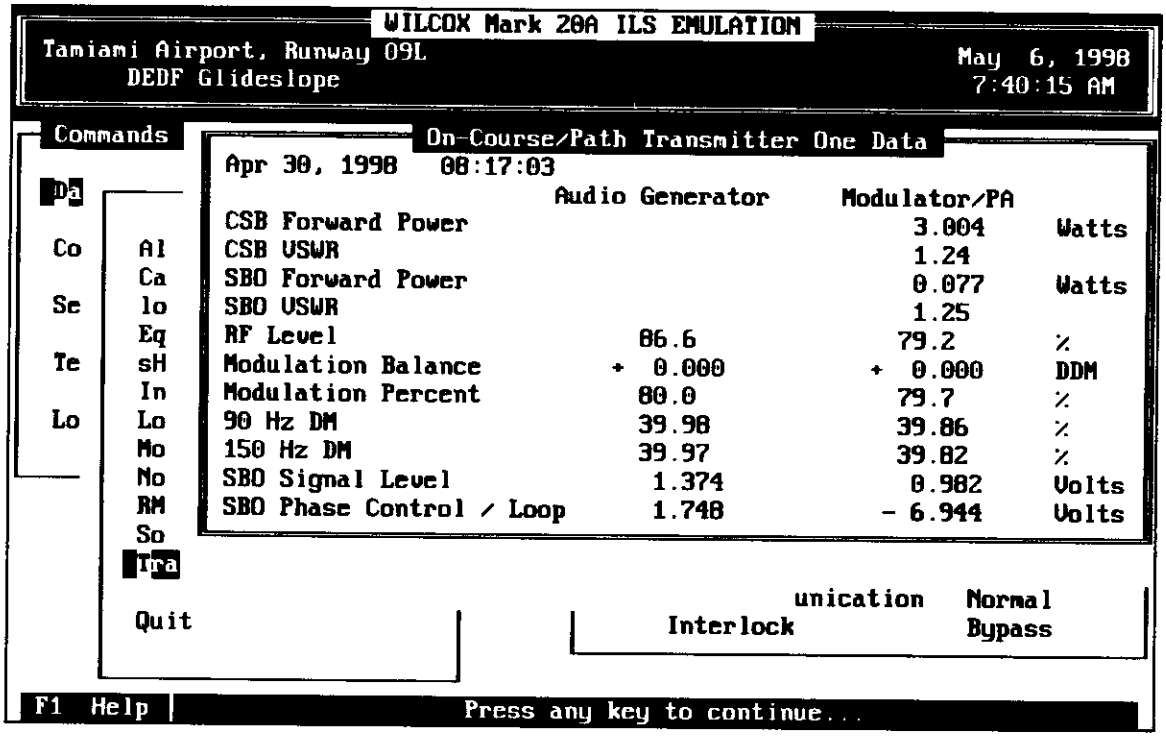
3.7.12.1.1 Clearance Transmitter One Data Screen.- After logging onto the glide slope station, the operator may view the Clearance Transmitter One Data screen by selecting <D T O C>. This screen allows the operator to view real-time operating parameters. This screen may also be accessed by pressing function key F6 on the pmdt keyboard from any place in the Mark 20A glide slope screen display. The screen contains forward power, voltage standing-wave ratio (vswr), rf level, and 150 Hz modulation depth for the audio generator cca and modulator/power amplifier assembly. Transmitter readings display real-time data screens from internal test points in the transmitter. The measurements are made only when these screens are requested and are updated every 12 seconds unless the monitor is bypassed. If the monitor is bypassed, the screen is updated once per second as long as the screens remain displayed. Two sets of data are displayed: one from the output of the audio generator cca and one from the output of the modulator/power amplifier assembly. Data from only one of the four possible transmitters is displayed at a time. The data displayed on the Clearance Transmitter Data screen is set on the Transmitter One Waveform Setup screen, paragraph 3.9.4.1.1.



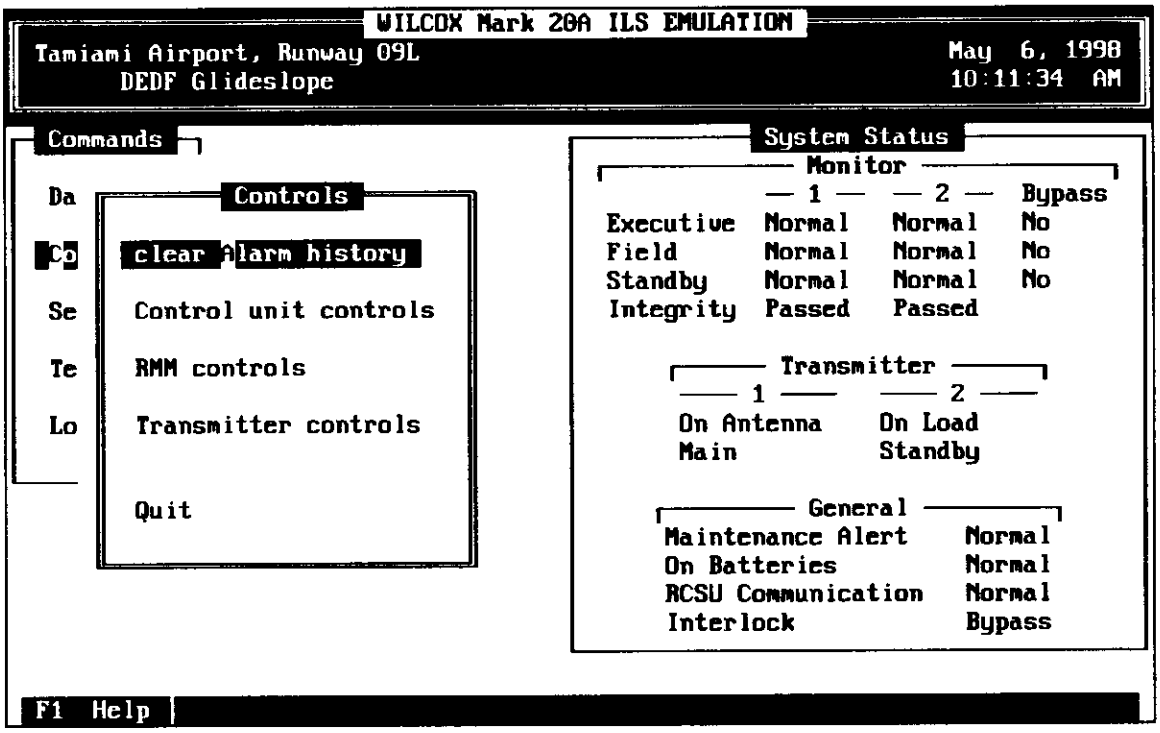
3.7.12.1.2 On-Course/Path Transmitter One Data Screen.- After logging onto the glide slope station, the operator may view the On-Course/Path Transmitter One Data screen by selecting <D T O O>. This screen may also be accessed by pressing function key F5 on the pmdt keyboard from any place in the Mark 20A glide slope screen display. Transmitter readings display real-time data screens from internal test points in the transmitter. The measurements are made only when these screens are requested and are updated every 12 seconds unless the monitor is bypassed. If the monitor is bypassed, the screen is updated approximately once per second as long as the screens remain displayed. Two sets of data are displayed: one from the output of the audio generator cca and one from the output of the glide slope modulator/power amplifier assembly. Data from only one of the four possible transmitters is displayed at a time. The data displayed on the On-Course/Path Transmitter Data screen is set on the Transmitter One Waveform Setup screen, paragraph 3.9.4.1.1.

NOTE

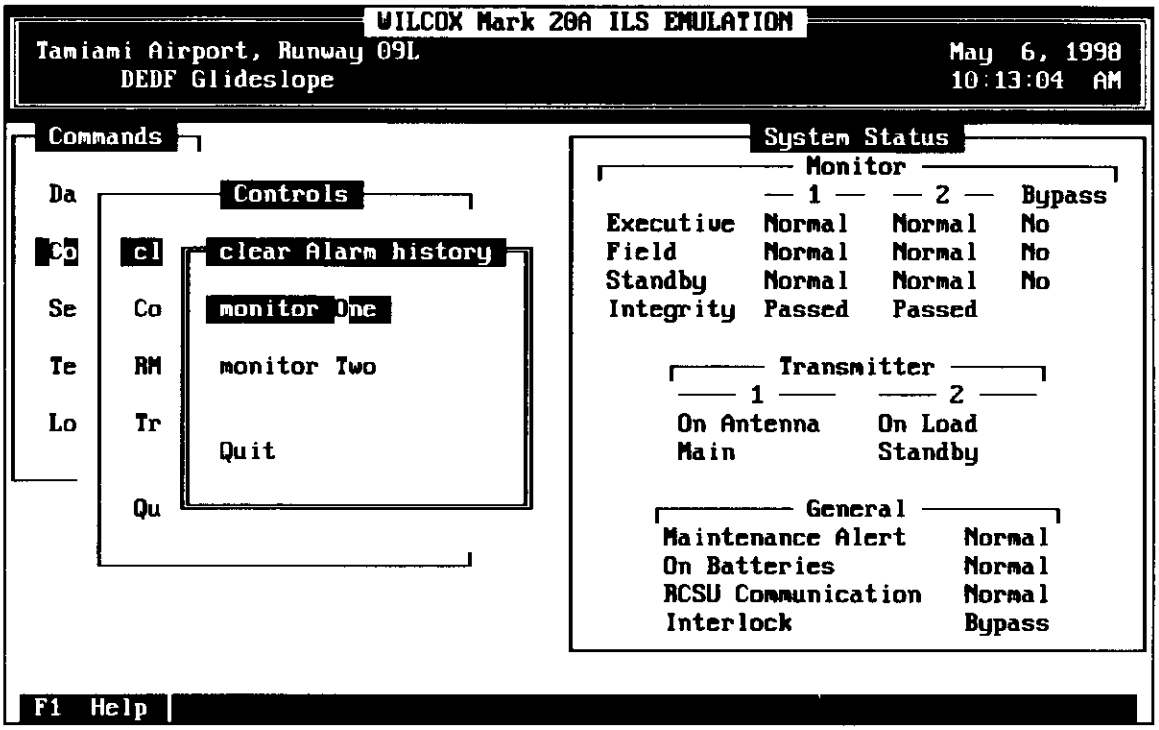
These measurements are made in addition to the normal executive and standby monitor measurements and alarm processing, reducing the speed of the normal processing. This reduces by a slight amount the sensitivity of the normal monitors to error conditions. These measurements are performed at the limit of the monitor accuracy range so a small amount of jitter in the last digit displayed is normal.



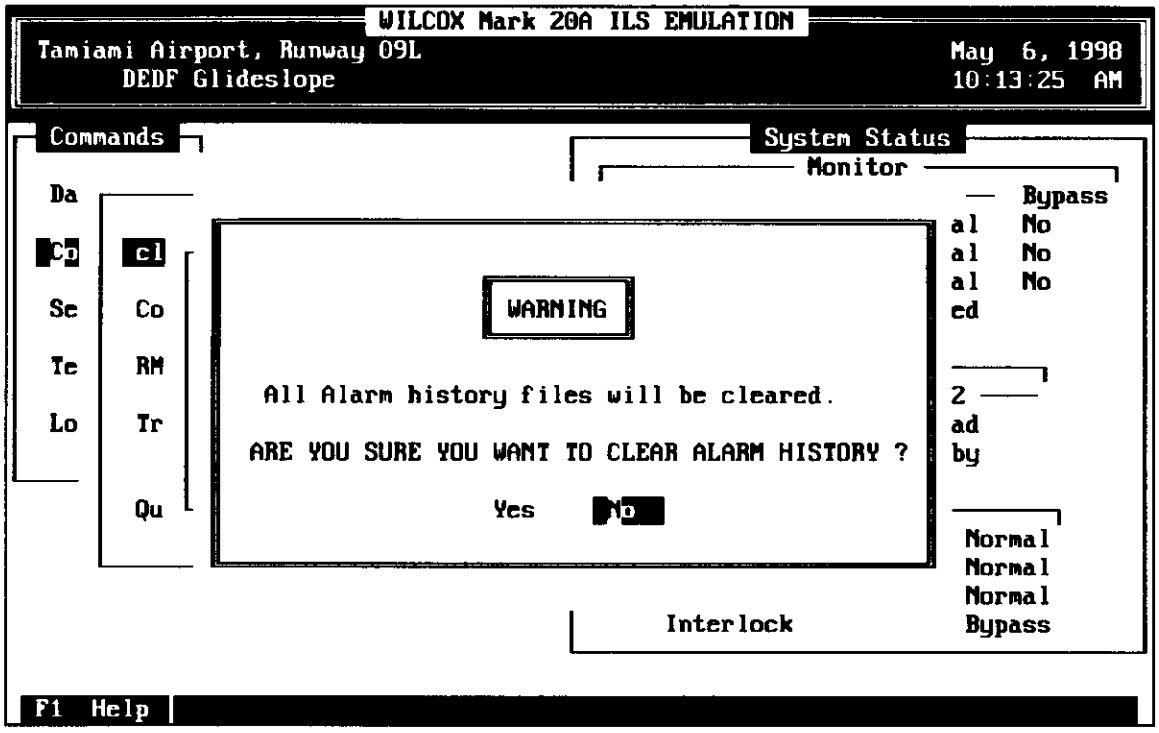
3.8 CONTROLS SCREENS.- After logging onto the glide slope station, the operator may view the Controls menu screen by selecting <C>. This menu screen allows the operator to select clear <A>larm history, <C>ontrol unit controls, <R>MM controls, or <T>ransmitter controls. The Controls screens allow the operator to access controls associated with local control and status unit (lcsu), RMM, and transmitter waveform functions. Selecting <Q>uit returns the operator to the Commands menu screen. The following paragraphs describe the Controls screens.



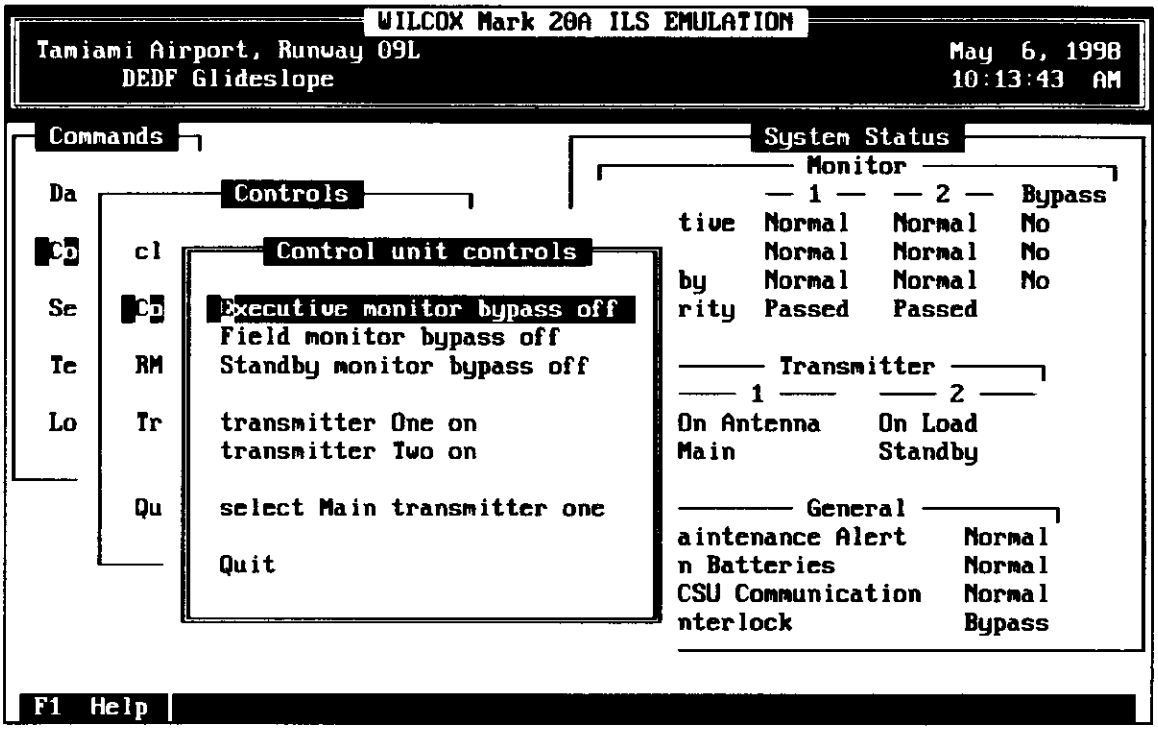
3.8.1 Clear Alarm History.- After logging onto the glide slope station, the operator may view the Clear alarm history menu screen by selecting <C A>. This control allows the user to delete alarm history. This control is accessible only at security level 3. This control is used to delete the Monitor Alarm History files. Once the alarm history file is deleted, it will not exist until a new alarm is generated. Note that no alarm history is generated while you are logged on to at security level 2 or 3.



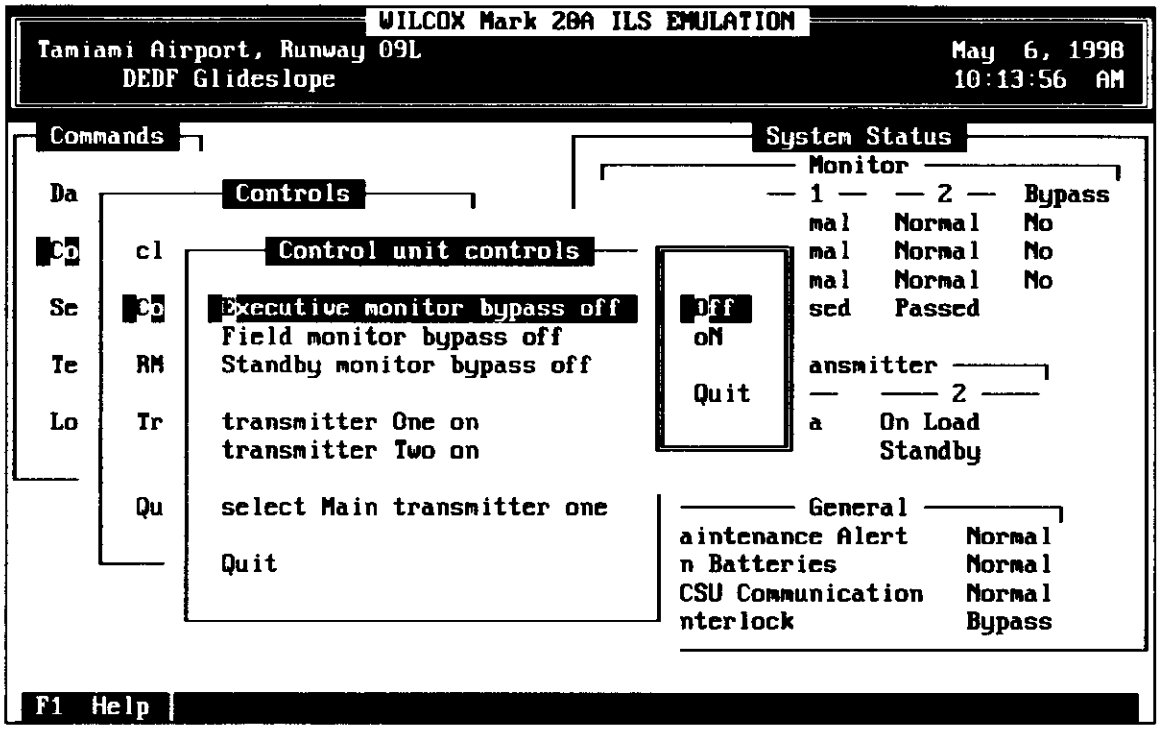
3.8.1.1 Warning Screen.- Prior to deleting the alarm history screnns the following warning will be displayed to confirm that you really want to delete the alarm history.



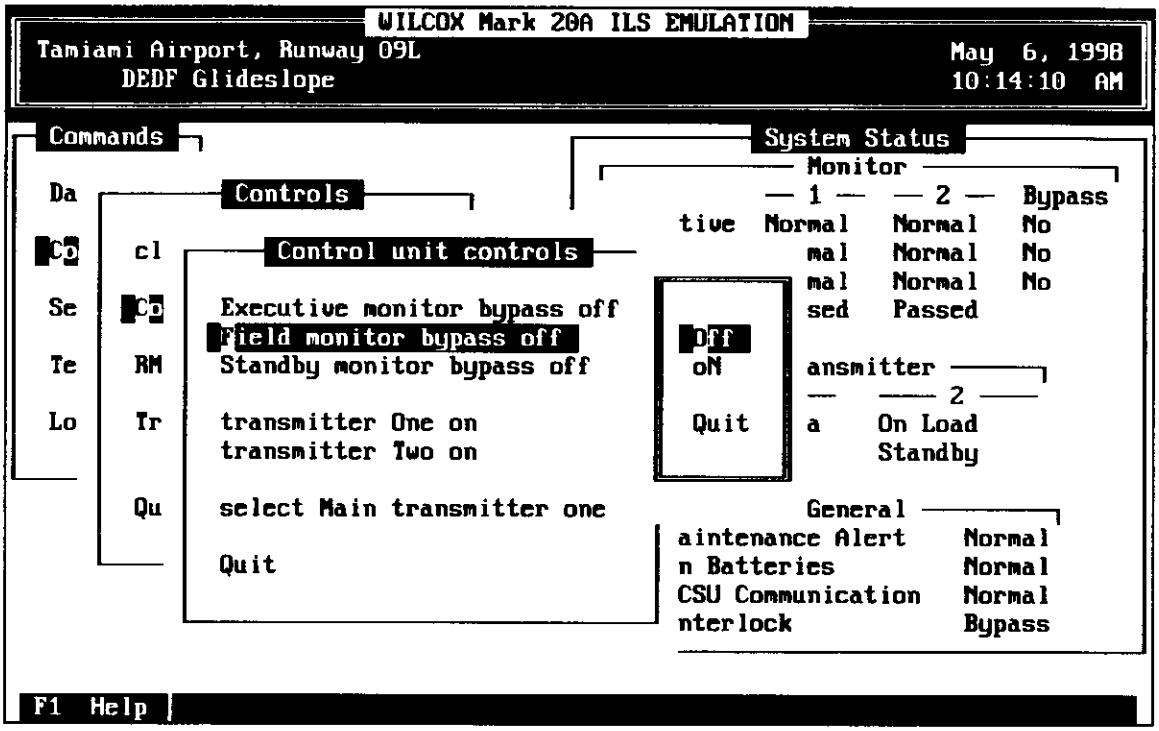
3.8.2 Control Unit Controls Menu Screen.- After logging onto the glide slope station, the operator may view the Control unit controls menu screen by selecting <C C>. This menu screen allows the operator to select <E>xecutive monitor bypass, <F>ield monitor bypass (if configured), <S>tandby monitor bypass, transmitter <O>ne, transmitter <T>wo, or select <M>ain transmitter. The Control unit controls screens allow the operator to access controls associated with lcsu. Selecting <Q>uit returns the operator to the Controls menu screen. The following paragraphs describe the Control unit controls screens.



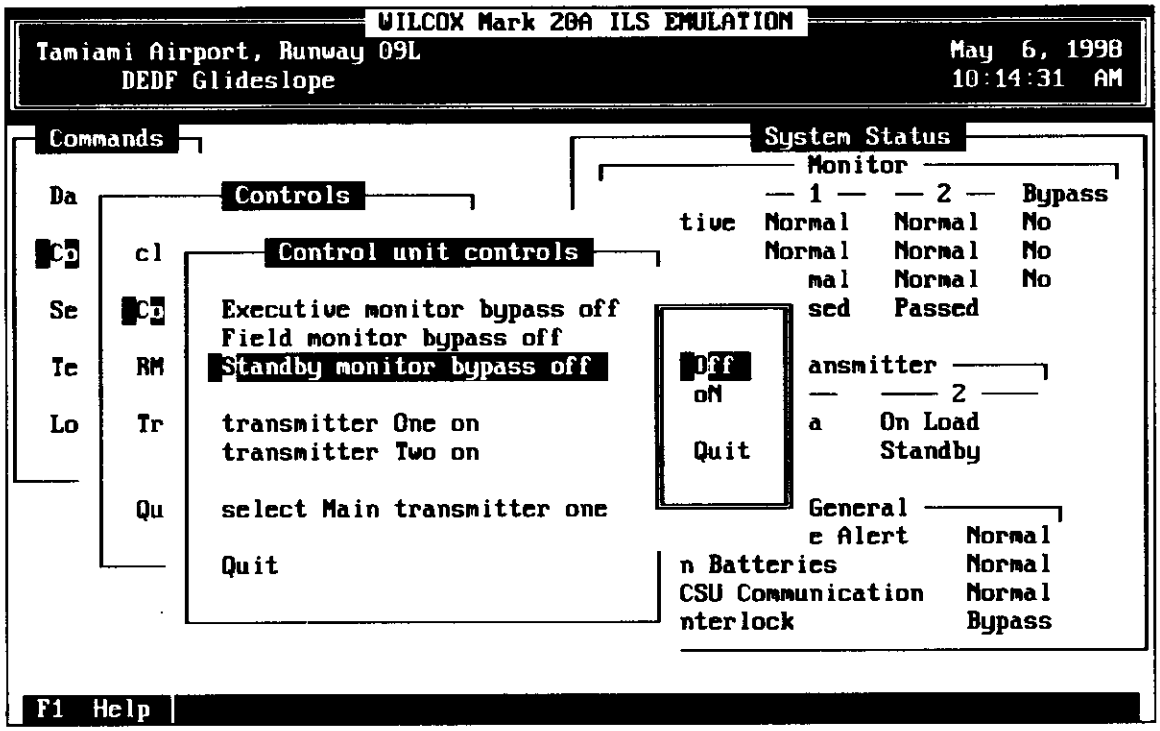
3.8.2.1 Executive Monitor Bypass Menu Screen.- After logging onto the glide slope station, the operator may view the Executive monitor bypass menu screen by selecting <C C E>. This screen allows the operator to turn the bypass function <O>ff or o<N>. This screen allows the operator to enable (on) or disable (off) executive (main) monitor bypass circuitry. A bypassed monitor is unable to initiate a transfer from the main transmitter to the standby transmitter or initiate a station shutdown. Selecting <Q>uit returns the operator to the Control unit controls menu screen. Selecting <O>ff or o<N> automatically initiates the control function and returns the operator to the Control unit controls menu screen.



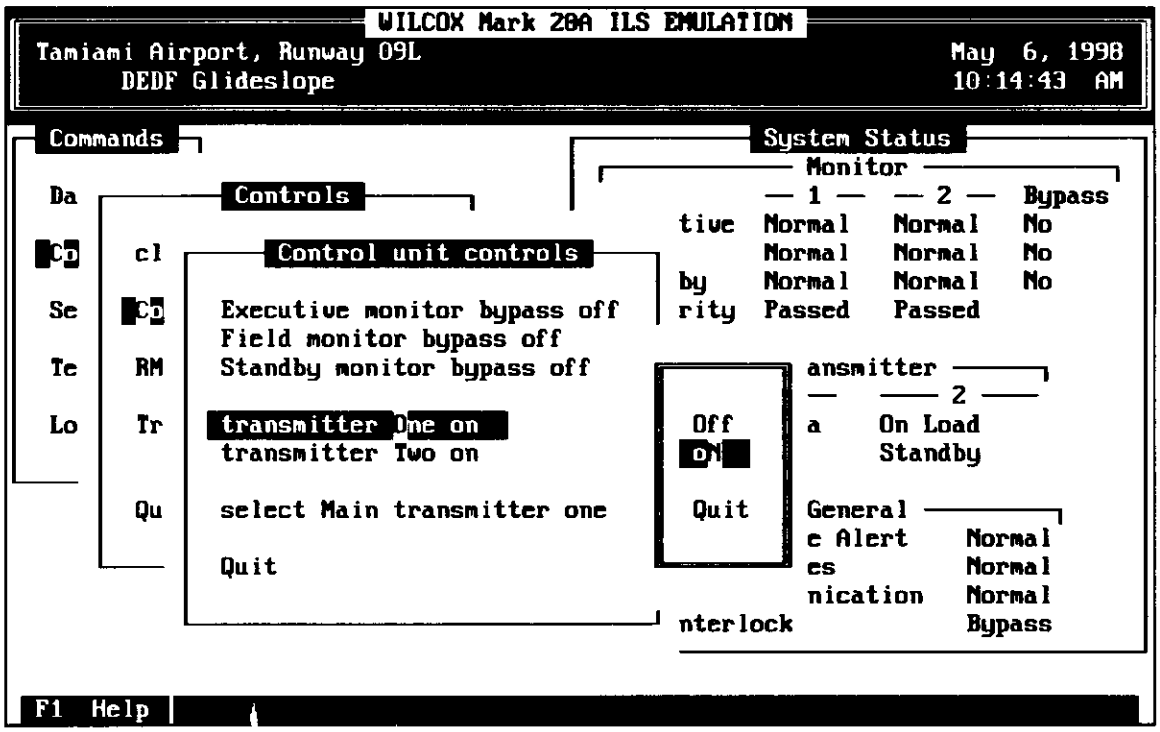
3.8.2.2 Field Monitor Bypass Menu Screen.- After logging onto the glide slope station, the operator may view the Field monitor bypass menu screen by selecting <C C F>. This screen allows the operator to turn the bypass function <O>ff or o<N>. This screen allows the operator to enable (on) or disable (off) glide slope field monitor bypass circuitry. Selecting <Q>uit returns the operator to the Control unit controls menu screen. Selecting <O>ff or o<N> automatically initiates the control function and returns the operator to the Control unit controls menu screen.



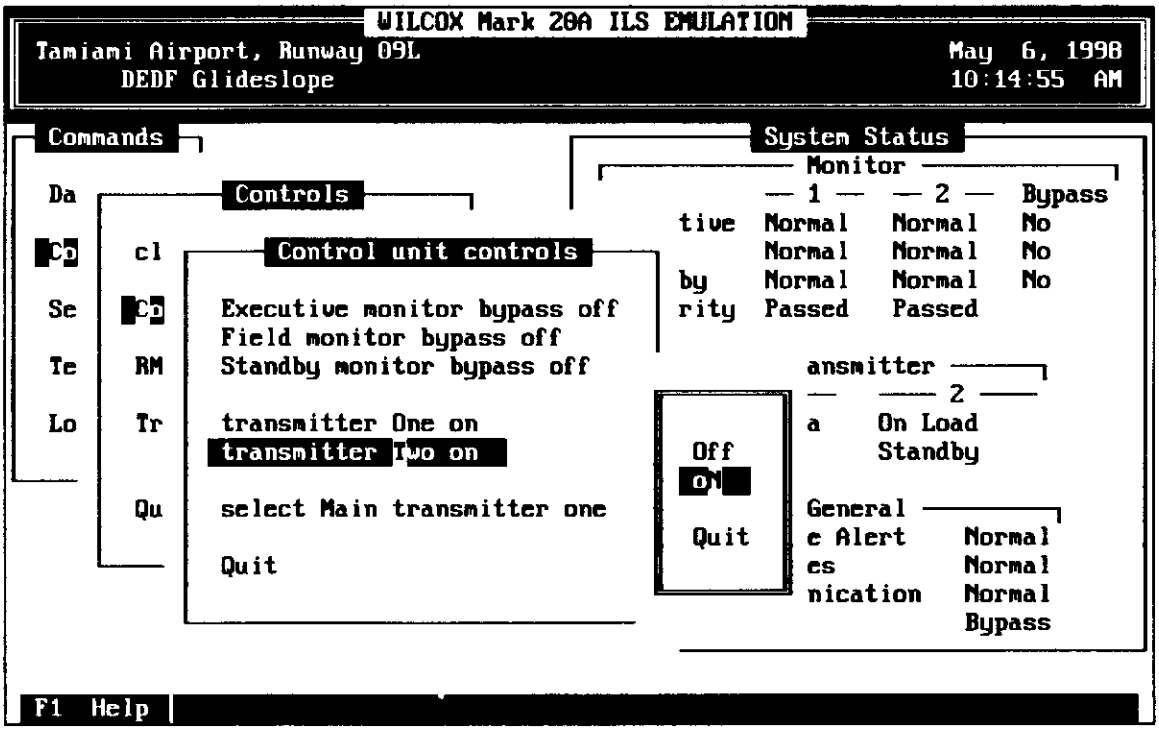
3.8.2.3 Standby Monitor Bypass Menu Screen.- After logging onto the glide slope station, the operator may view the Standby monitor bypass menu screen by selecting <C C S>. This screen allows the operator to turn the bypass function <O>ff or o<N>. This screen allows the operator to enable (on) or disable (off) standby monitor bypass circuitry. A bypassed monitor is unable to initiate a transfer from the main transmitter to the standby transmitter or initiate a station shutdown. Selecting <Q>uit returns the operator to the Control unit controls menu screen. Selecting <O>ff or o<N> automatically initiates the control function and returns the operator to the Control unit controls menu screen.



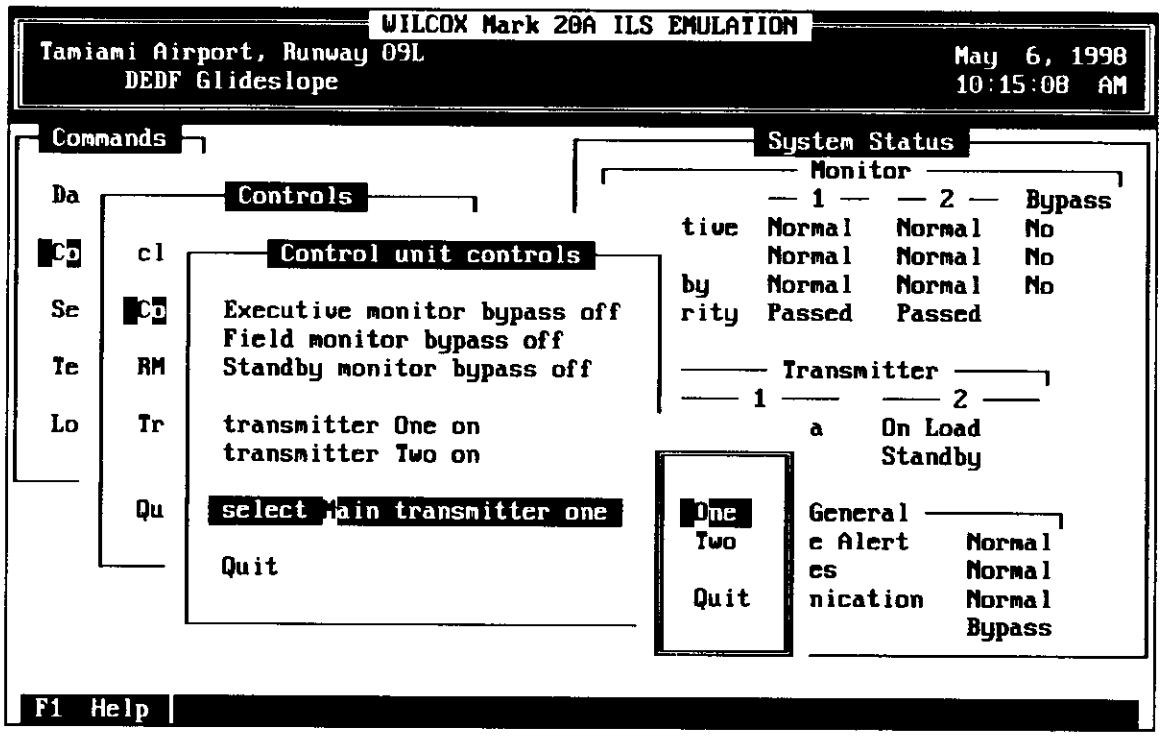
3.8.2.4 Transmitter One Menu Screen.- After logging onto the glide slope station, the operator may view the transmitter One menu screen by selecting <C C O>. This screen allows the operator to turn transmitter 1 <O>ff or o<N>. This screen allows the operator to enable (on) or disable (off) glide slope modulator/power amplifier assembly 10A7 and 10A10 associated with transmitter 1. Selecting <Q>uit returns the operator to the Control unit controls menu screen.



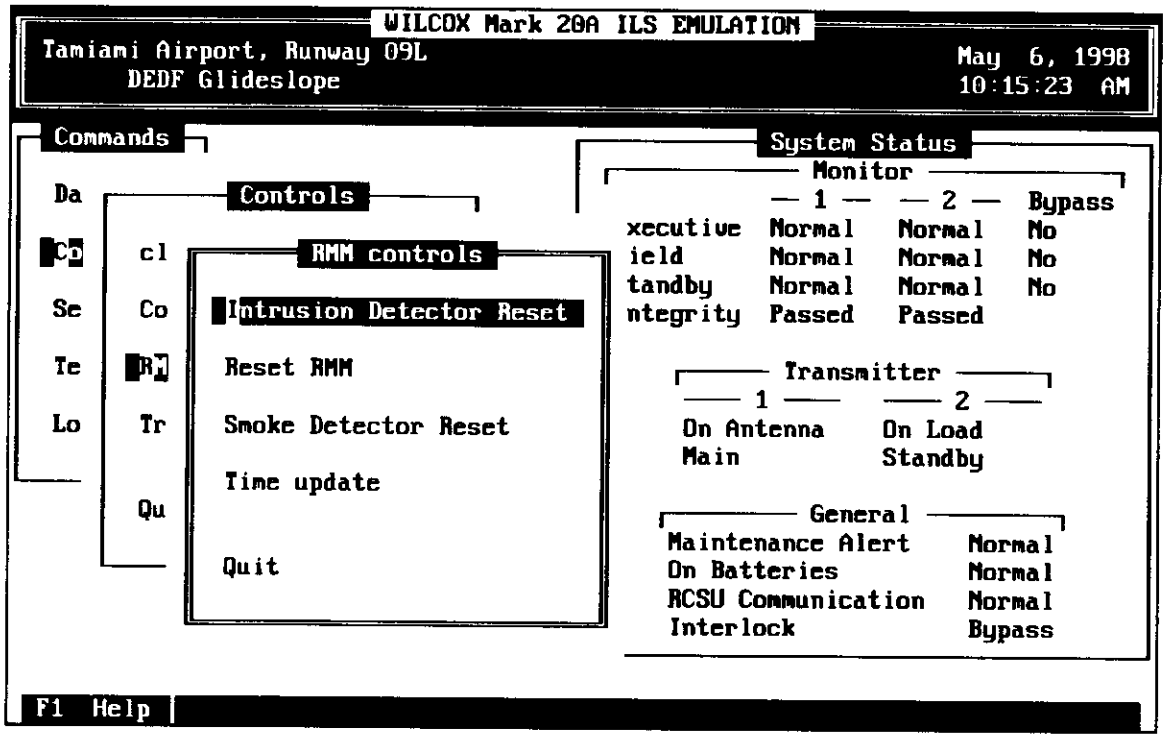
3.8.2.5 Transmitter Two Menu Screen.- After logging onto the glide slope station, the operator may view the transmitter Two menu screen by selecting <C C T>. This screen allows the operator to turn transmitter 2 <O>ff or o<N>. This screen allows the operator to enable (on) or disable (off) glide slope modulator/power amplifier assembly 10A8 and 10A11 associated with transmitter 2. Selecting <Q>uit returns the operator to the Control unit controls menu screen.



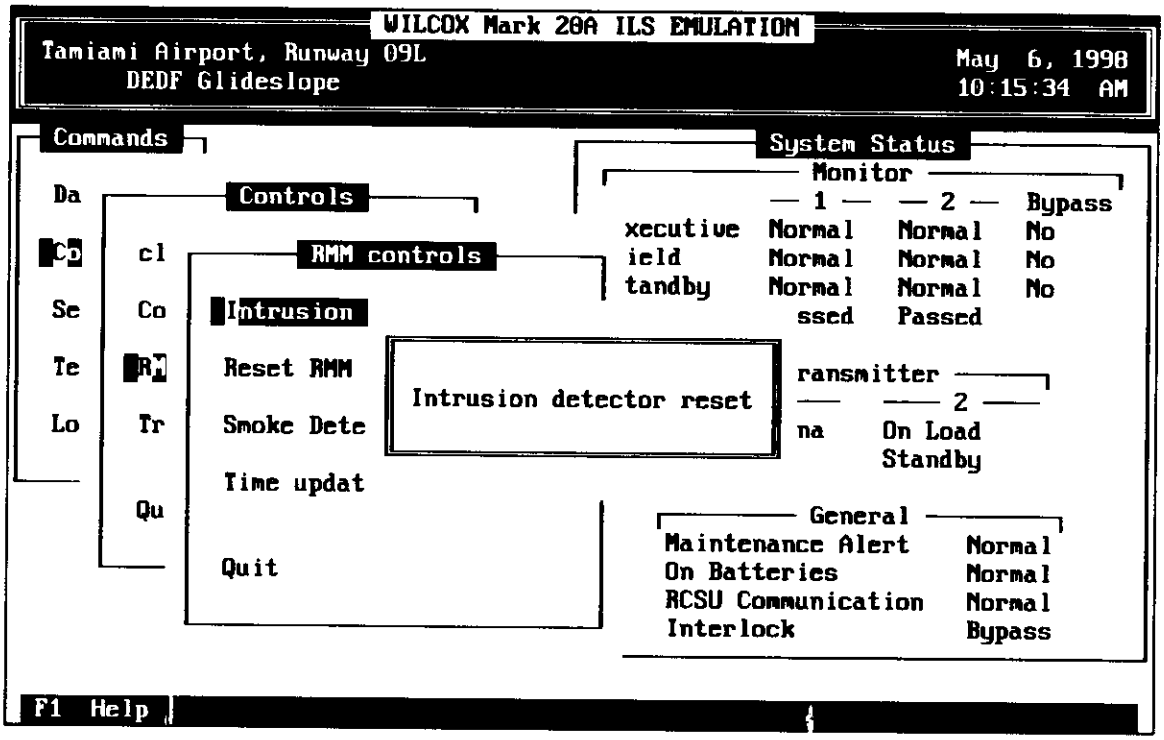
3.8.2.6 Select Main Transmitter Menu Screen.- After logging onto the glide slope station, the operator may view the select Main transmitter menu screen by selecting <C C M>. This screen allows the operator to select transmitter< O>ne or <T>wo as the main transmitter; e.g., connected to the antenna. Selecting <O>ne as the main transmitter automatically causes the selection of transmitter 2 as the standby transmitter. Selecting <T>wo as the main transmitter automatically causes the selection of transmitter 1 as the standby transmitter. Selecting <Q>uit returns the operator to the Control unit controls menu screen.



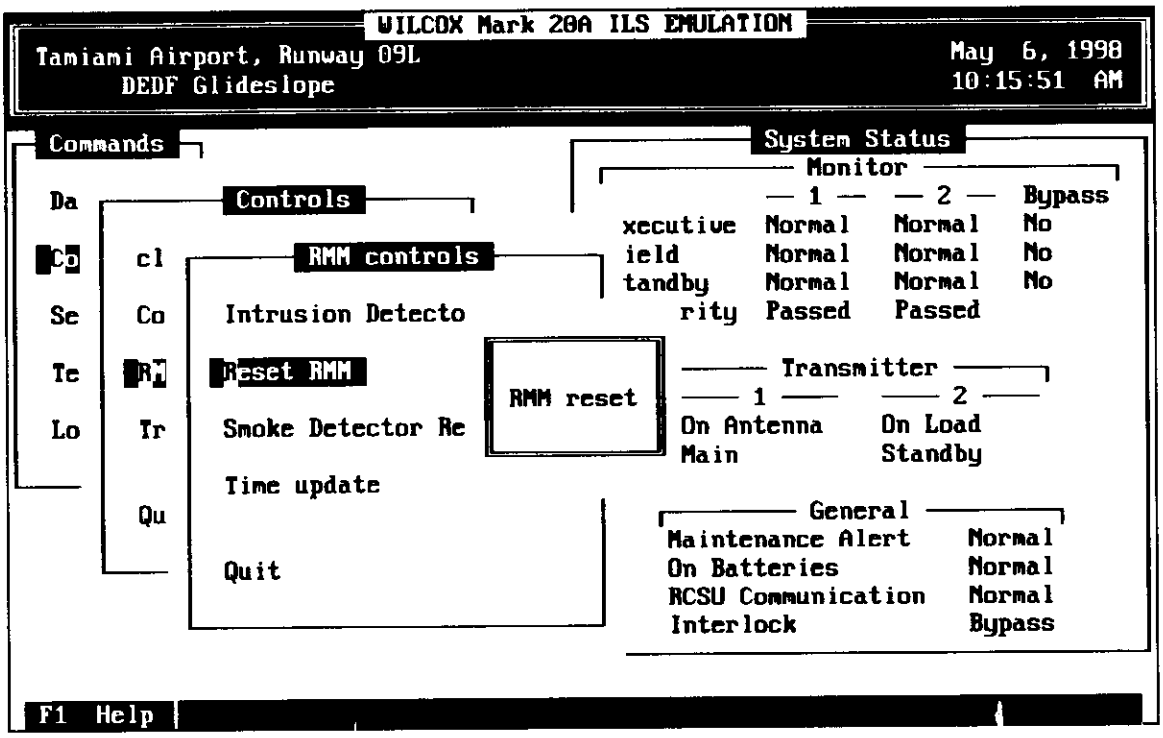
3.8.3 RMM Controls Menu Screen.- After logging onto the glide slope station, the operator may view the RMM controls menu screen by selecting <C R>. This menu screen allows the operator to select <I>ntrusion detector reset, <R>eset RMM, <S>moke detector reset, or <T>ime update screens.



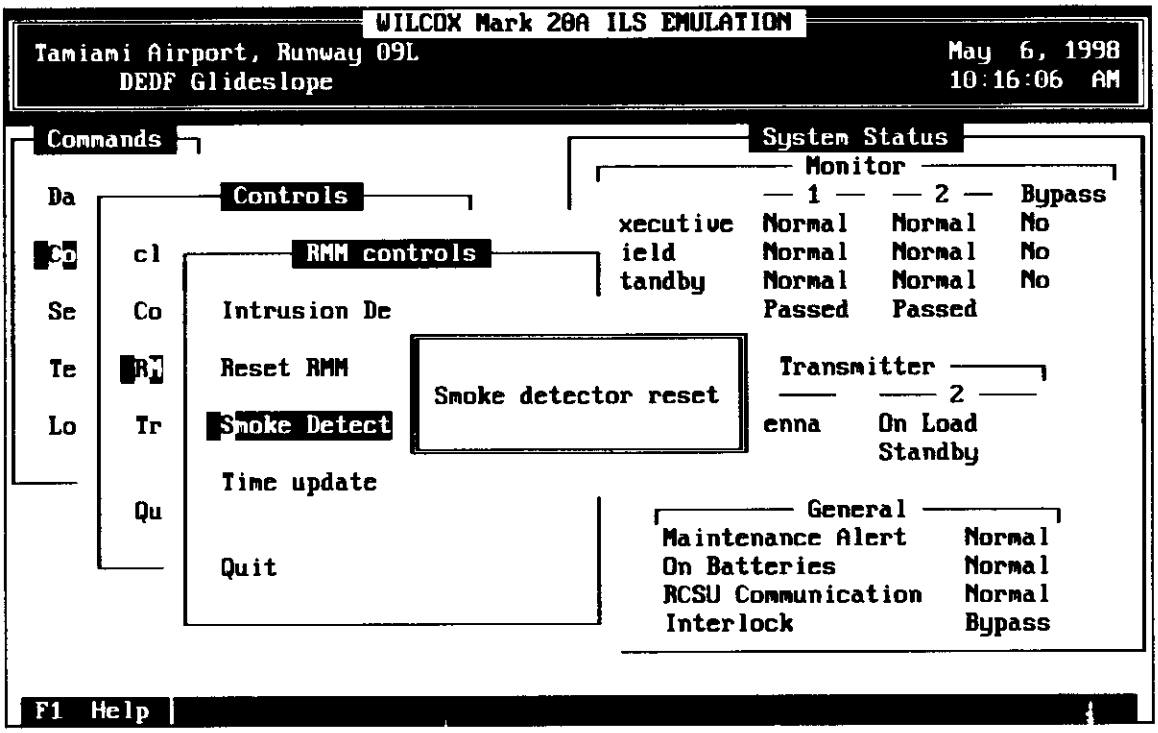
3.8.3.1 Intrusion Detector Reset Selection.- After logging onto the glide slope station, the operator may select the Intrusion Detector reset function by selecting <C R I>. Selecting the Intrusion detector reset function automatically resets the intrusion detector. The following message appears briefly and then operator is returned to Controls menu screen:



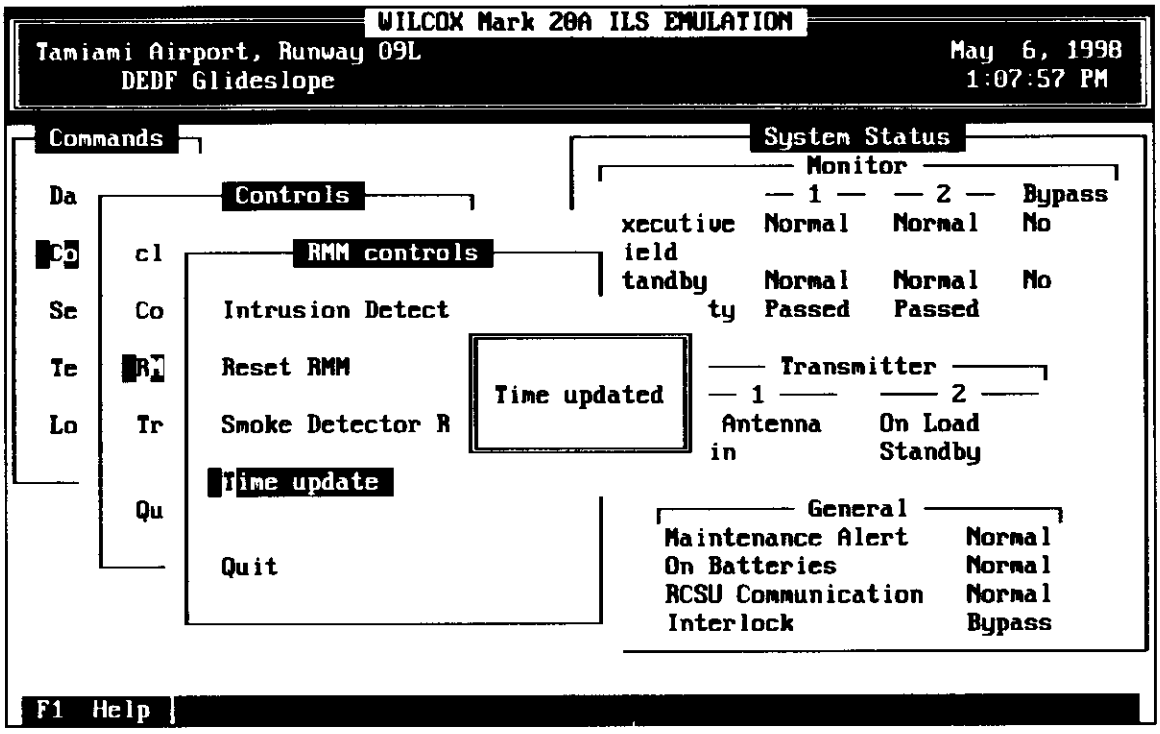
3.8.3.2 Reset RMM Selection.- After logging onto the glide slope station, the operator may select Reset RMM by selecting <C R R>. Selecting Reset RMM automatically resets The RMM and returns operator to Controls menu screen. However, the pmdt is logged off. Automatic re-logon will occur after a few seconds.



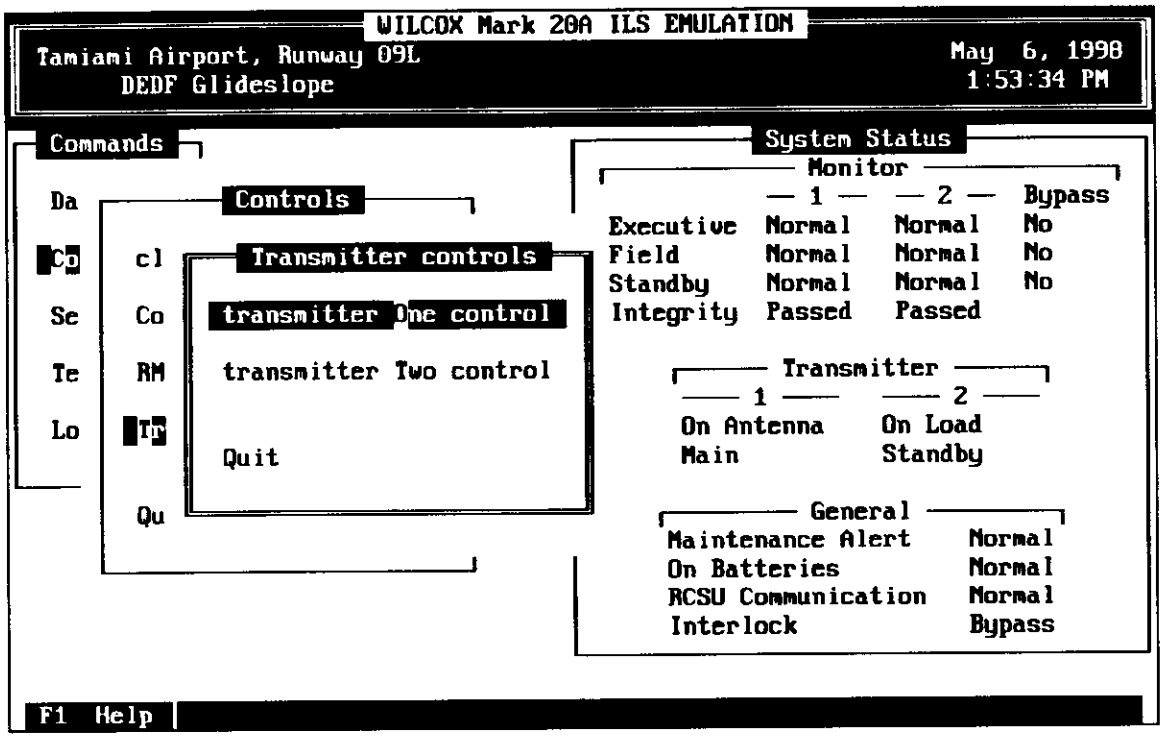
3.8.3.3 Smoke Detector Reset Selection.- After logging onto the glide slope station, the operator may select the Smoke Detector reset function by selecting <C R S>. Selecting the Smoke detector reset function automatically resets the smoke detector. The following message appears briefly and then operator is returned to Controls menu screen:



3.8.4.3 Time Update Selection.- After logging onto the glide slope station, the operator may select the Time update function by selecting <C R T>. Selecting the Time update function synchronizes the PMDT time and the time on rmm. The following message appears briefly and then operator is returned to Controls menu screen:



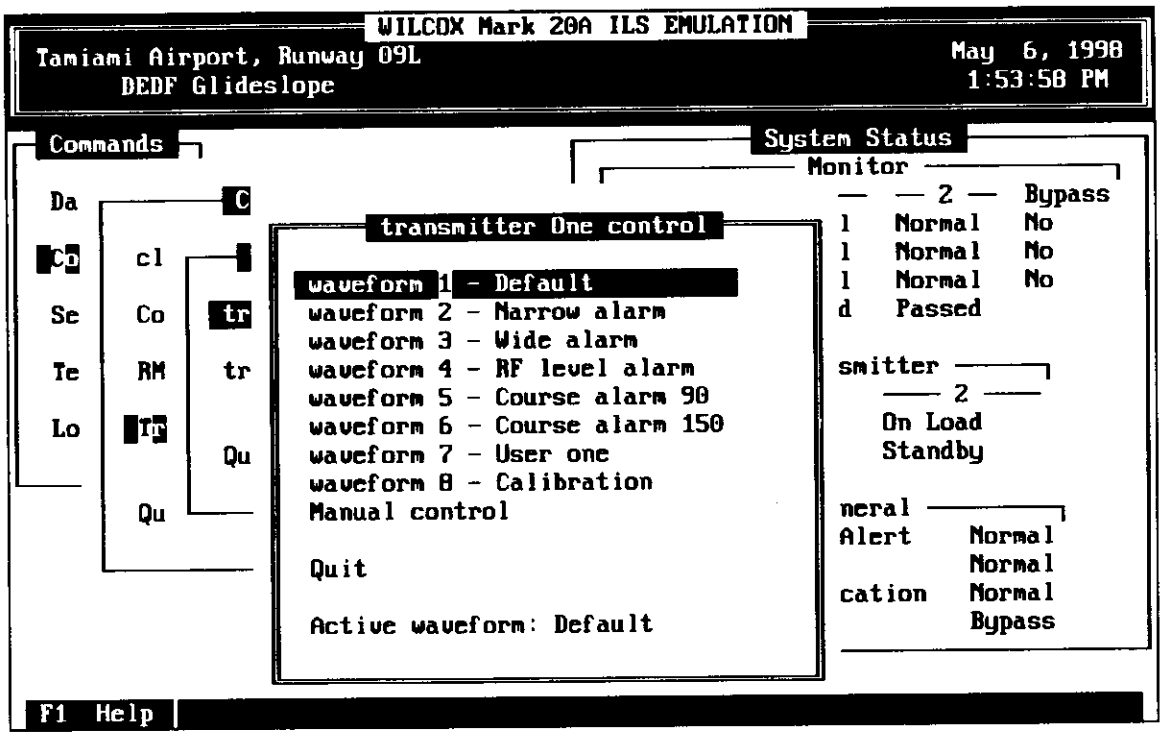
3.8.4 Transmitter Controls Menu Screen.- After logging onto the glide slope station, the operator may view the Transmitter controls menu screen by selecting <C T>. This screen allows the operator to select transmitter <O>ne control or transmitter <T>wo control. The following paragraphs provide an explanation using transmitter one as an example; transmitter two operation is identical.

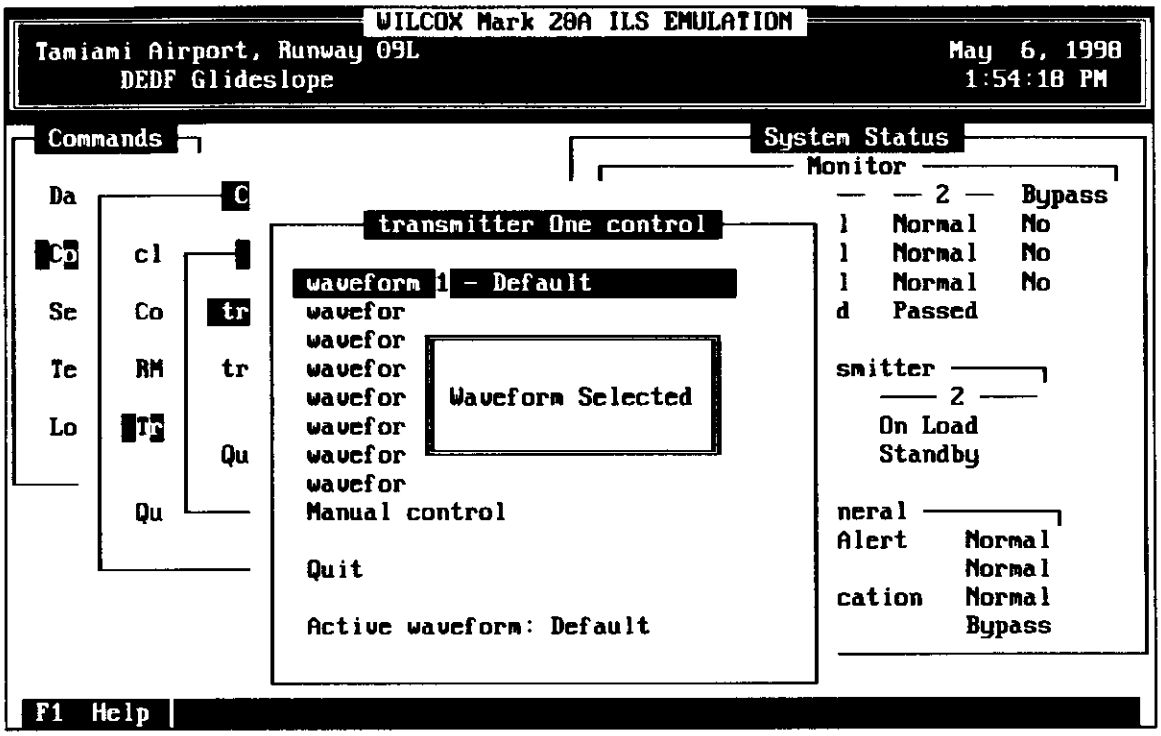


3.8.4.1 Transmitter One Control Screen.- After logging onto the glide slope station, the operator may view the transmitter One control screen by selecting <C T O>. This screen allows the operator to select which waveform will control transmitter 1. Transmitter 2 control screen may be viewed by selecting <C T T>. Selecting a waveform will temporarily bring up the "Waveform Selected" screen.

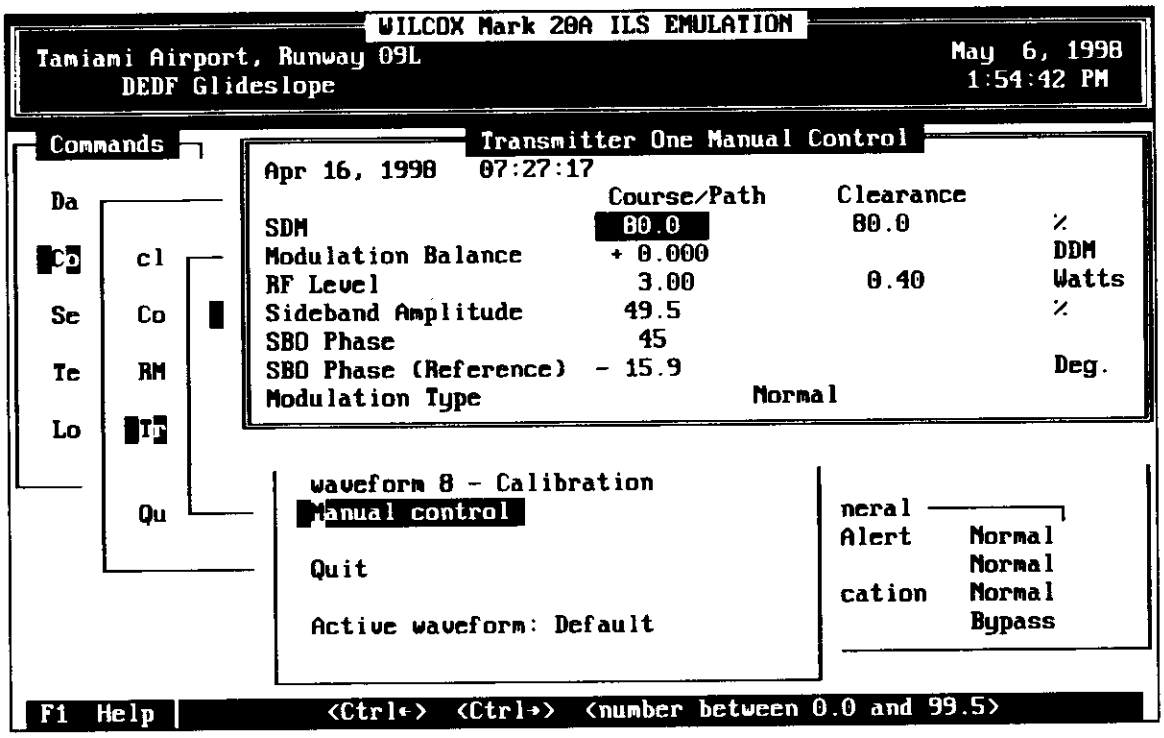
WARNING

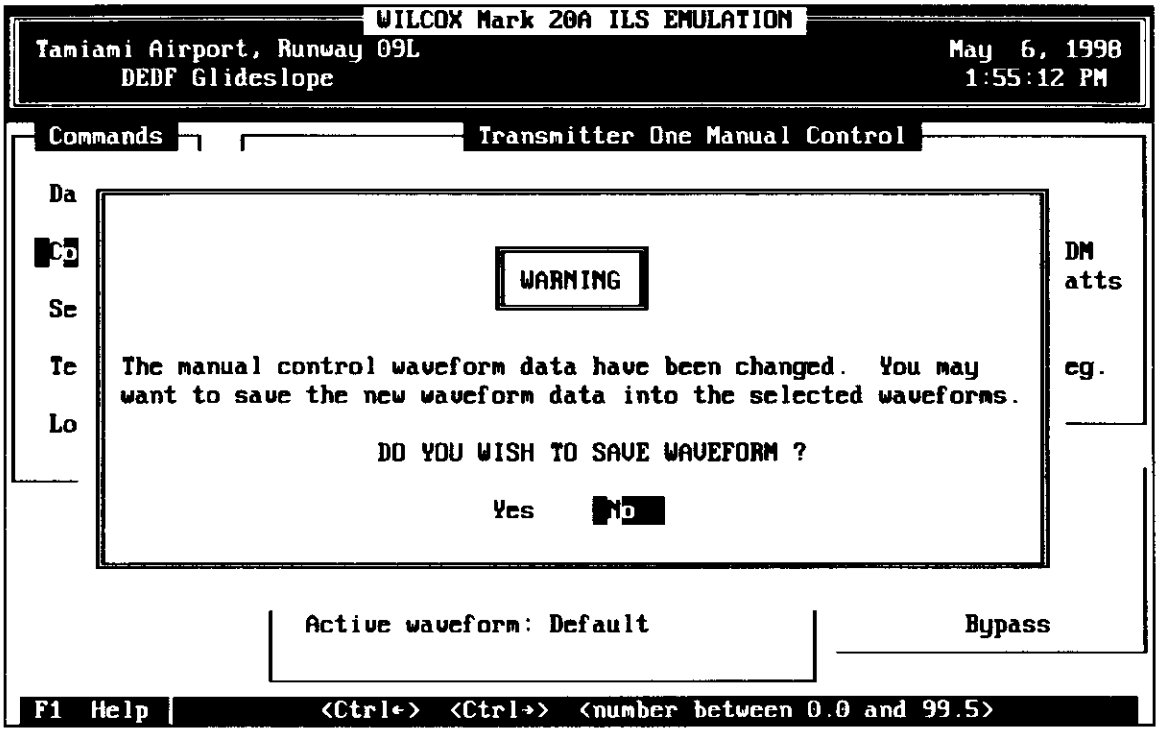
Selecting a waveform, including the active waveform and manual control, causes a temporary interruption of the transmitted signal. In order to avoid having the monitor shut down the transmitter, the executive monitors should be bypassed when a new waveform is selected.

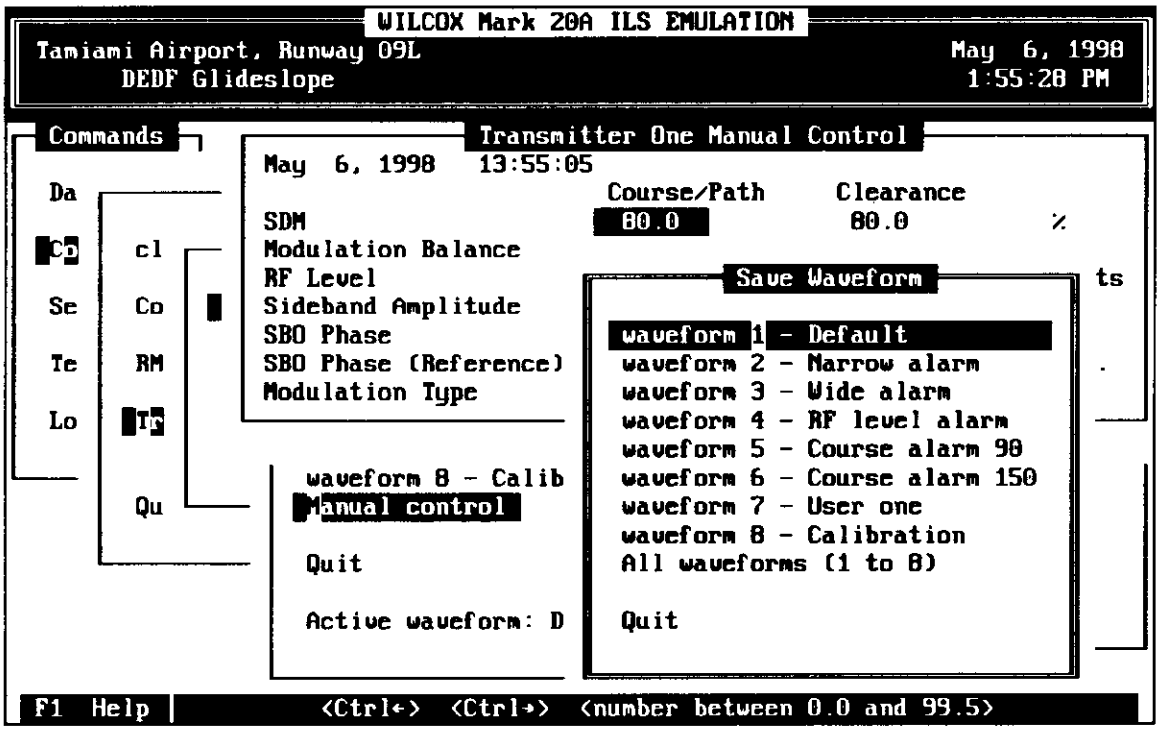



WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 6, 1998
1:54:18 PM
Commands
System Status
Monitor
— — 2 — Bypass
1 Normal No
1 Normal No
1 Normal No
d Passed
smitter
— 2 —
On Load
Standby
neral
Alert Normal
Normal
cation Normal
Bypass
transmitter One control
waveform 1 - Default
wavefor
wavefor
wavefor
wavefor
wavefor
wavefor
wavefor
Manual control
Quit
Active waveform: Default
Waveform Selected
Da
Se
Te
Lo
cl
Co
RM
Qu
Qu
C
tr
tr
F1 Help

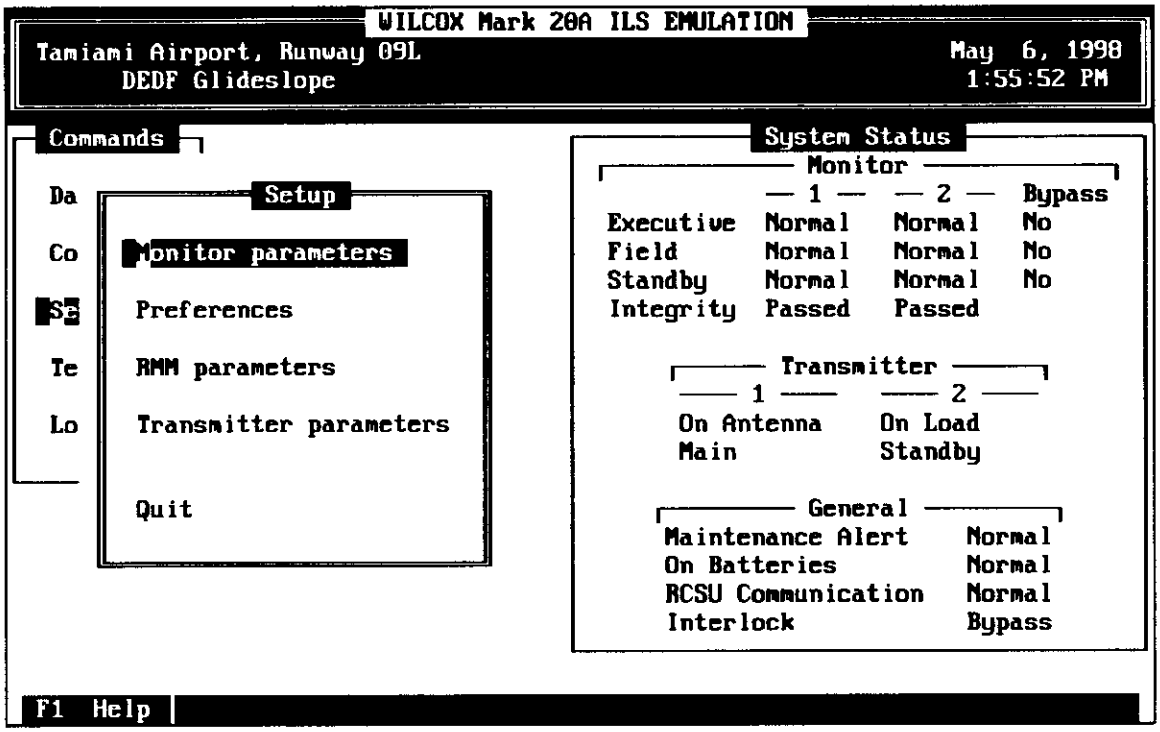
3.8.4.2 Transmitter One Manual Control Screen.- After logging onto the glide slope station, the operator may view the transmitter One Manual control screen by selecting <C T O M>. This screen allows the operator to vary the operating parameters of transmitter 1 during maintenance or flight checks. The manual control screen allows the operator to directly control the transmitter. The monitor and associated audio generator will then be in a manual control mode and will use the parameters in the new transmitter control screen to control the output waveform. The parameters in the manual control screen can be viewed/edited and subsequent transmitter operation will be based on the last parameters received from the pmdt until one of eight programmed waveforms are selected. If changes are made to the manual control screen, the warning screen will appear when you exit from the manual control screen. Selecting yes to the question "DO YOU WISH TO SAVE WAVEFORM ?" brings up the Save Waveform menu screen. From this screen, you may choose the waveform you wish to save to. Note that you may choose to save the changes to ALL waveform files.



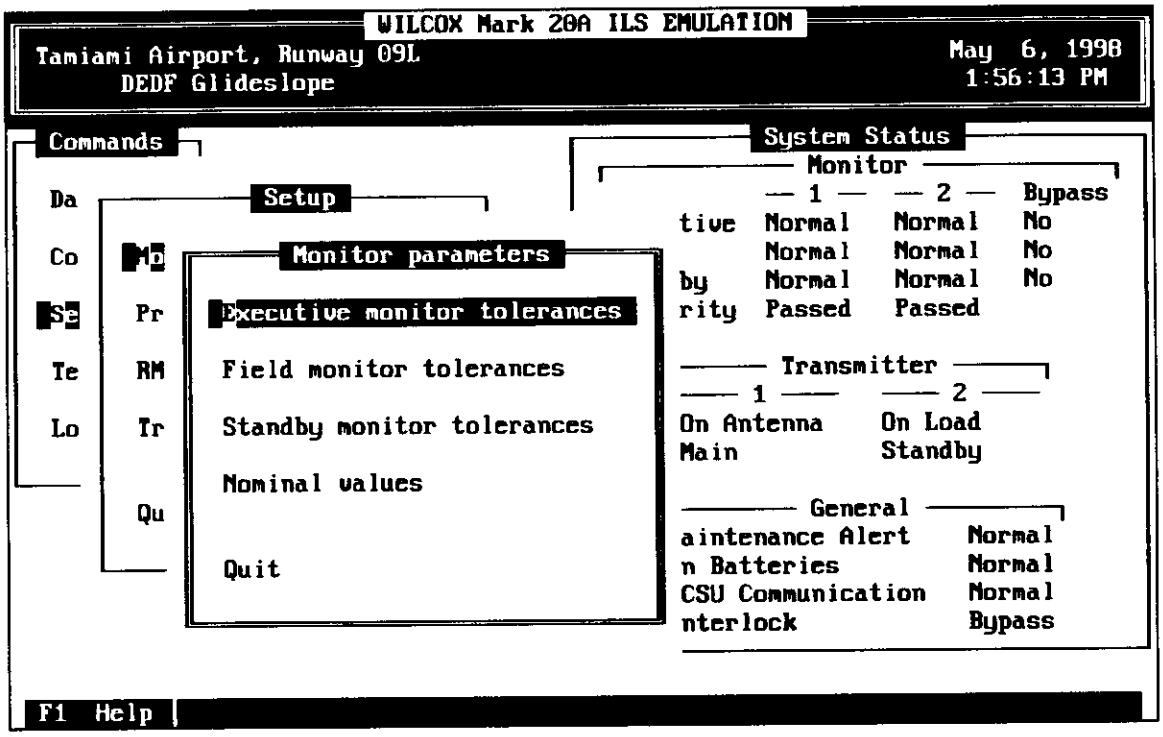

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 6, 1998
1:55:12 PM
Commands
Transmitter One Manual Control
WARNING
The manual control waveform data have been changed. You may want to save the new waveform data into the selected waveforms.
DO YOU WISH TO SAVE WAVEFORM ?
Yes
No
Active waveform: Default
Bypass
F1 Help
<Ctrl←> <Ctrl→> <number between 0.0 and 99.5>


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 6, 1998
1:55:28 PM
Commands
Transmitter One Manual Control
May 6, 1998 13:55:05
Course/Path
Clearance
SDM
80.0
80.0
%
Modulation Balance
RF Level
Sideband Amplitude
SBO Phase
SBO Phase (Reference)
Modulation Type
Save Waveform
waveform 1 - Default
waveform 2 - Narrow alarm
waveform 3 - Wide alarm
waveform 4 - RF level alarm
waveform 5 - Course alarm 90
waveform 6 - Course alarm 150
waveform 7 - User one
waveform 8 - Calibration
All waveforms (1 to 8)
Quit
waveform 8 - Calib
Manual control
Quit
Active waveform: D
F1 Help
<Ctrl←> <Ctrl→> <number between 0.0 and 99.5>

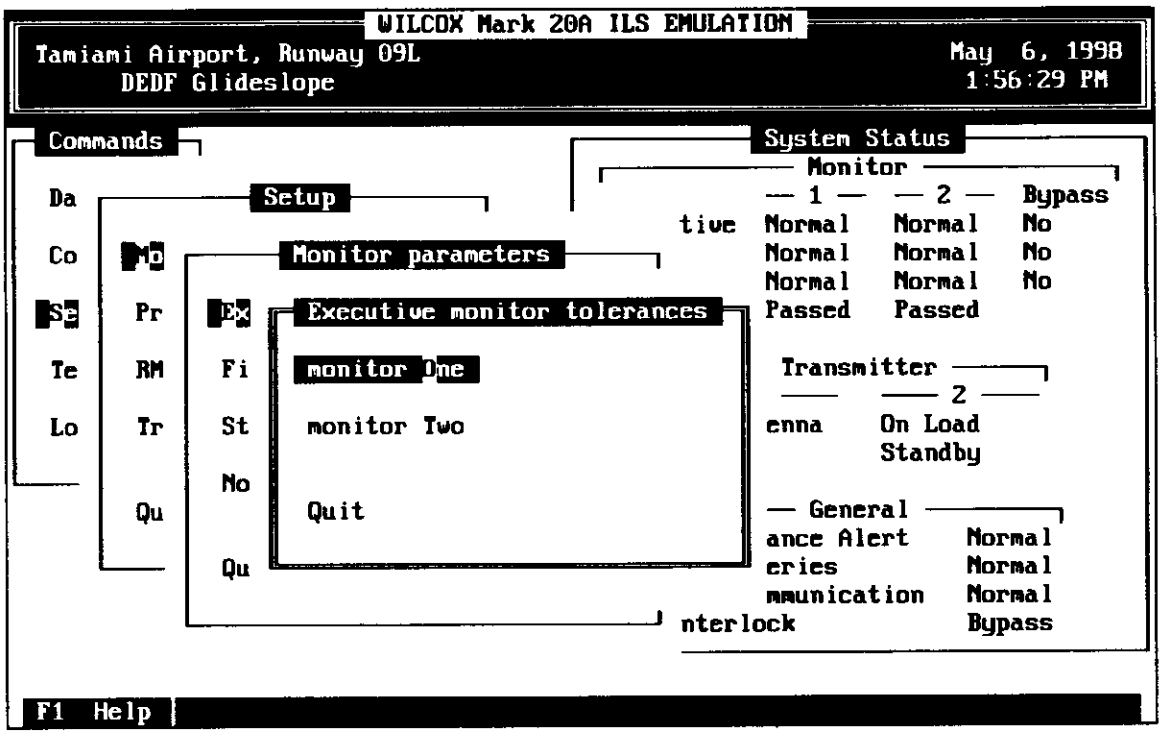
3.9 SETUP SCREENS.- After logging onto the glide slope station, the operator may view the Setup menu screen by selecting <S>. This menu screen allows the operator to select <M>onitor parameters, <P>references, <R>MS parameters, or <T>ransmitter parameters. The Setup menu screens allow the operator access to the permanent controls of the monitors, RMM, and all modulator/power amplifier assemblies. The following paragraphs describe the Setup menu screens.



3.9.1 Monitor Parameters Menu Screen.- After logging onto the glide slope station, the operator may view the Monitor parameters menu screen by selecting <S M>. This menu screen allows the operator to select <E>xecutive monitor tolerances, <S>tandby monitor tolerances, or <N>ominal values. The Monitor parameters menu screens allow the operator to adjust all parameters associated with the monitors. Adjustable parameters include prealarm/alarm tolerances, alarm delay, and alarm limit nominal values. The following paragraphs describe the Monitor parameters menu screens.



3.9.1.1 Executive Monitor Tolerances Menu Screen.- After logging onto the glide slope station, the operator may view the Executive monitor tolerances menu screen by selecting <S M E>. This menu screen allows the operator to select monitor <O>ne or monitor <T>wo. The Executive monitor tolerances screens allow the operator to change the alarm and prealarm tolerances and the alarm delay time used by the executive monitor function of the monitors. The following paragraphs describe the executive monitor tolerances selections/parameters.



3.9.1.1.1 Executive Monitor One Alarm/Prealarm Tolerances Screen.- After logging onto the glide slope station, the operator may view the Executive Monitor One Alarm/Prealarm Tolerances screen by selecting <S M E O>. This screen allows the operator to change the alarm and prealarm tolerances and the alarm delay time used by the executive monitor function of monitor one. Executive Monitor Two Alarm/Prealarm Tolerances screen may be viewed by selecting <S M E T>. These are the monitor's alarm/prealarm processing limits and alarm delay timer values. The limits are expressed as absolute limits. Thus, an upper alarm limit of 0.007 DDM indicates that the station will alarm when that DDM measurement is greater than 0.007 ddm.

A prealarm or alarm limit is enabled if it is NOT set to its corresponding nominal value. Expressed in another way, any alarm or prealarm set to its corresponding nominal value is disabled (or software bypassed). Thus, alarm limits set to the Nominal value CANNOT cause an alarm and subsequent station shutdown, while prealarm limits set to the Nominal value CANNOT cause a maintenance alert. Otherwise, an upper alarm or prealarm must be GREATER THAN its nominal while a lower alarm or prealarm must be LESS THAN its nominal. Additionally, each alarm or prealarm that is enabled, must be a minimum of three resolution units from its nearest enabled neighbor; i.e., if both an upper alarm and prealarm exist, then the upper prealarm can be NO SMALLER THAN NOMINAL+3, while the upper alarm can be NO SMALLER THAN PREALARM+3. This also affects the ORDER that alarm limits may be edited on the PMDT since the affected monitor files are updated after EVERY entry. For all MONITOR LIMIT FILE write attempts, if the above conditions are NOT met, the monitor responds with a FILE CONTEXT ERROR. (The monitor may also respond with an OUT-OF-RANGE ERROR if any parameter is NOT within the valid range of input values allowed.)

The Mark 20A monitor AUTOMATICALLY calculates hysteresis for all ENABLED alarm and prealarm limits. The actual value of the hysteresis depends on which limits are enabled. For the standard case where all four variants exist, the prealarm hysteresis is 10 percent of the distance from the prealarm point to its nominal or 1, whichever is greater, while the alarm hysteresis is 10 percent of the distance from the alarm to its corresponding prealarm or 1, whichever is greater. When there is no prealarm, then the alarm hysteresis is programmed as in the description for prealarm. Should either the pair of prealarms or pair of alarms be UNBALANCED; i.e., their distance to the nominal is not equal, then the SMALLER OF TWO is used to determine the (single) alarm or prealarm hysteresis. Thus, FOR ALARM OR PREALARMS THAT ARE VERY TIGHT, THERE MAY NOT BE ADEQUATE HYSTERESIS to prevent what alarm hysteresis is designed to prevent, namely alarm or prealarm thrashing for a signal that has a jitter larger than the available hysteresis.

A 0 alarm timer value disables alarm filtering such that ANY parameter in alarm will cause an IMMEDIATE ILS ALARM. Actually, any alarm timer value SMALLER than the monitor's measurement rate is equivalent to a zero alarm timer value. The monitor's measurement rate is dependent on the LOADING of the processor. Thus, for a system configured as dual frequency with both hot-standby and a field monitor is the slowest in terms of measurement periodicity since it has more measurements to perform.

The limits set on the Executive Monitor Alarm/Prealarm Tolerances screen are displayed on the Executive Monitor Data screen, paragraph 3.7.8.1.1. Table 3-12 lists the selections available on the Monitor Alarm/Prealarm Tolerances screen.

Table 3-12. Monitor Alarm/Prealarm Tolerances

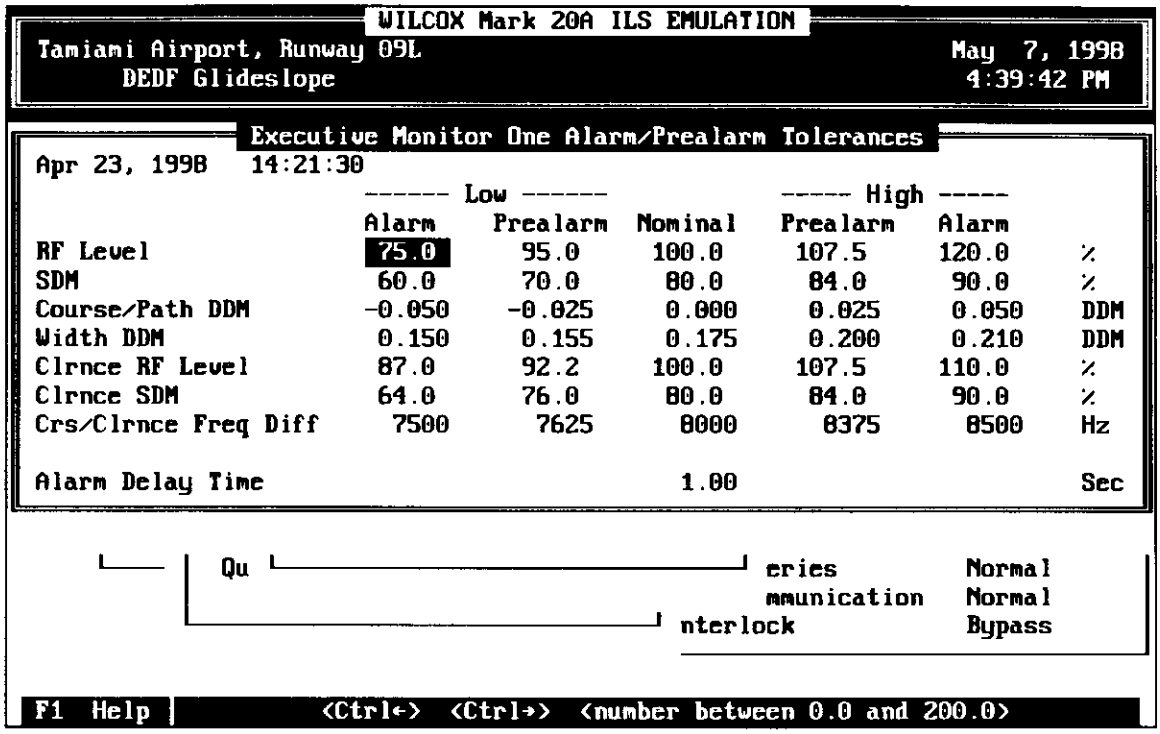
Parameter	Range	Increment	Unit	Description
RF Level	...	...	...	Calibrated and normalized to 100% at the nominal power output (usually 3 Watts).
Prealarm	...	...	...	A maintenance alert will be generated if rf level exceeds prealarm limits.
Low	0 to 200	0.1	%	...
High	0 to 200	0.1	%	...
Alarm	...	...	...	An executive monitor alarm will be generated if rf level exceeds alarm limits.
Low	–0.999 to 0.999	0.1	%	...
High	–0.999 to 0.999	0.1	%	...
SDM	...	...	...	Sdm is sampled from integral detector assembly 11A3. Normal sdm is 80%.
Prealarm	...	...	...	A maintenance alert will be generated if sdm exceeds prealarm limits.
Low	0 to 100	0.1	%	...
High	0 to 100	0.1	%	...
Alarm	...	...	...	An executive monitor alarm will be generated if sdm exceeds alarm limits.
Low	0 to 100	0.1	%	...
High	0 to 100	0.1	%	...
Course/Path DDM	...	...	...	Course/path ddm at runway centerline is 0.0 ddm. Signal samples are obtained from integral detector assembly 11A3 (transmitting equipment) or 10A9A2 (standby equipment).
Prealarm	...	...	...	A maintenance alert will be generated if ddm exceeds prealarm limits.
Low	–0.999 to 0.999	0.001	ddm	...
High	–0.999 to 0.999	0.001	ddm	...
Alarm	...	...	...	An executive monitor alarm will be generated if ddm exceeds alarm limits.
Low	–0.999 to 0.999	0.001	ddm	...
High	–0.999 to 0.999	0.001	ddm	...

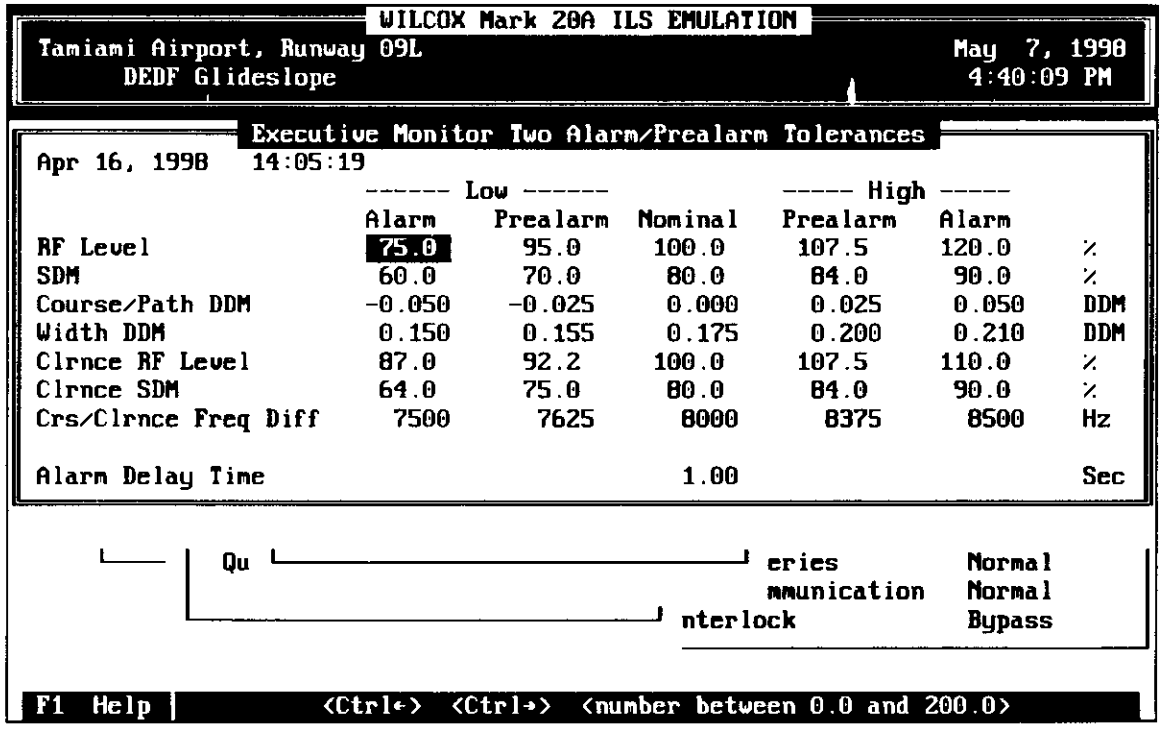
Table 3-12. Monitor Alarm/Prealarm Tolerances

Parameter	Range	Increment	Unit	Description
Width DDM	...	...	...	Width ddm is the measure of the path width (1.4°). Width ddm should be 0.175 ddm. Signal samples are obtained from integral detector assembly 11A1 (transmitting equipment) or 10A9A6 (standby equipment).
Prealarm	...	...	...	A maintenance alert will be generated if ddm exceeds prealarm limits.
Low	–0.999 to 0.999	0.001	ddm	...
High	–0.999 to 0.999	0.001	ddm	...
Alarm	...	...	...	An executive monitor alarm will be generated if ddm exceeds alarm limits.
Low	–0.999 to 0.999	0.001	ddm	...
High	–0.999 to 0.999	0.001	ddm	...
Clrnce RF Level	...	...	...	Clearance rf level is indicated in percent where 100% is the nominal output power (usually about 300 mW).
Prealarm	...	...	...	A maintenance alert will be generated if rf level exceeds prealarm limits.
Low	0 to 200	0.1	%	...
High	0 to 200	0.1	%	...
Alarm	...	...	...	An executive monitor alarm will be generated if rf level exceeds alarm limits.
Low	0 to 200	0.1	%	...
High	0 to 200	0.1	%	...
Clrnce SDM	...	...	...	Sampled at integral detector assembly 11A2.
Prealarm	...	...	...	A maintenance alert will be generated if sdm exceeds prealarm limits.
Low	0 to 100	0.1	%	...
High	0 to 100	0.1	%	...
Alarm	...	...	...	An executive monitor alarm will be generated if sdm exceeds alarm limits.
Low	0 to 100	0.1	%	...

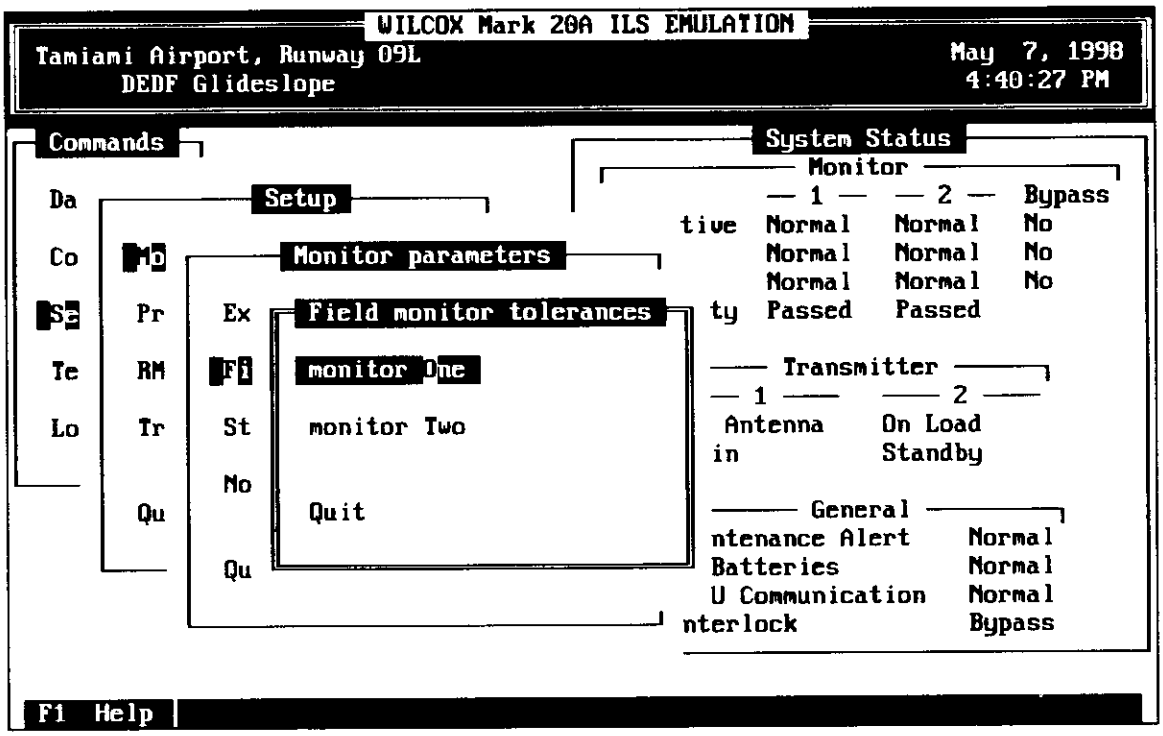
Table 3-12. Monitor Alarm/Prealarm Tolerances

Parameter	Range	Increment	Unit	Description
High	0 to 100	0.1	%	...
Clrnce Frequency Diff	...	...	...	Clearance frequency difference originates at glide slope synthesizer assembly 10A3A1/10A3A12 and is fixed at 8 kHz.
Prealarm	...	...		A maintenance alert will be generated if frequency difference exceeds prealarm limits.
Low	0 to 10.000	0.001	kHz	...
High	0 to 10.000	0.001	kHz	...
Alarm	...	...		An executive alarm will be generated if frequency difference exceeds alarm limits.
Low	0 to 10.000	0.001	kHz	...
High	0 to 10.000	0.001	kHz	...
Alarm Delay Time	0 to 100.00	0.01	s	The time delay before the monitor takes action on an alarmed parameter.


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 7, 1998
4:39:42 PM
Executive Monitor One Alarm/Prealarm Tolerances
Apr 23, 1998 14:21:30
------ Low ------ ----- High -----
Alarm Prealarm Nominal Prealarm Alarm
RF Level 75.0 95.0 100.0 107.5 120.0 %
SDM 60.0 70.0 80.0 84.0 90.0 %
Course/Path DDM -0.050 -0.025 0.000 0.025 0.050 DDM
Width DDM 0.150 0.155 0.175 0.200 0.210 DDM
Clrnce RF Level 87.0 92.2 100.0 107.5 110.0 %
Clrnce SDM 64.0 76.0 80.0 84.0 90.0 %
Crs/Clrnce Freq Diff 7500 7625 8000 8375 8500 Hz
Alarm Delay Time 1.00 Sec
Qu eries Normal
mmunication Normal
nterlock Bypass
F1 Help <Ctrl←> <Ctrl→> <number between 0.0 and 200.0>


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 7, 1998
4:40:09 PM
Executive Monitor Two Alarm/Prealarm Tolerances
Apr 16, 1998 14:05:19
------ Low ------ ----- High -----
Alarm Prealarm Nominal Prealarm Alarm
RF Level 75.0 95.0 100.0 107.5 120.0 %
SDM 60.0 70.0 80.0 84.0 90.0 %
Course/Path DDM -0.050 -0.025 0.000 0.025 0.050 DDM
Width DDM 0.150 0.155 0.175 0.200 0.210 DDM
Clrnce RF Level 87.0 92.2 100.0 107.5 110.0 %
Clrnce SDM 64.0 75.0 80.0 84.0 90.0 %
Crs/Clrnce Freq Diff 7500 7625 8000 8375 8500 Hz
Alarm Delay Time 1.00 Sec
Qu eries Normal
mmunication Normal
nterlock Bypass
F1 Help <Ctrl←> <Ctrl→> <number between 0.0 and 200.0>

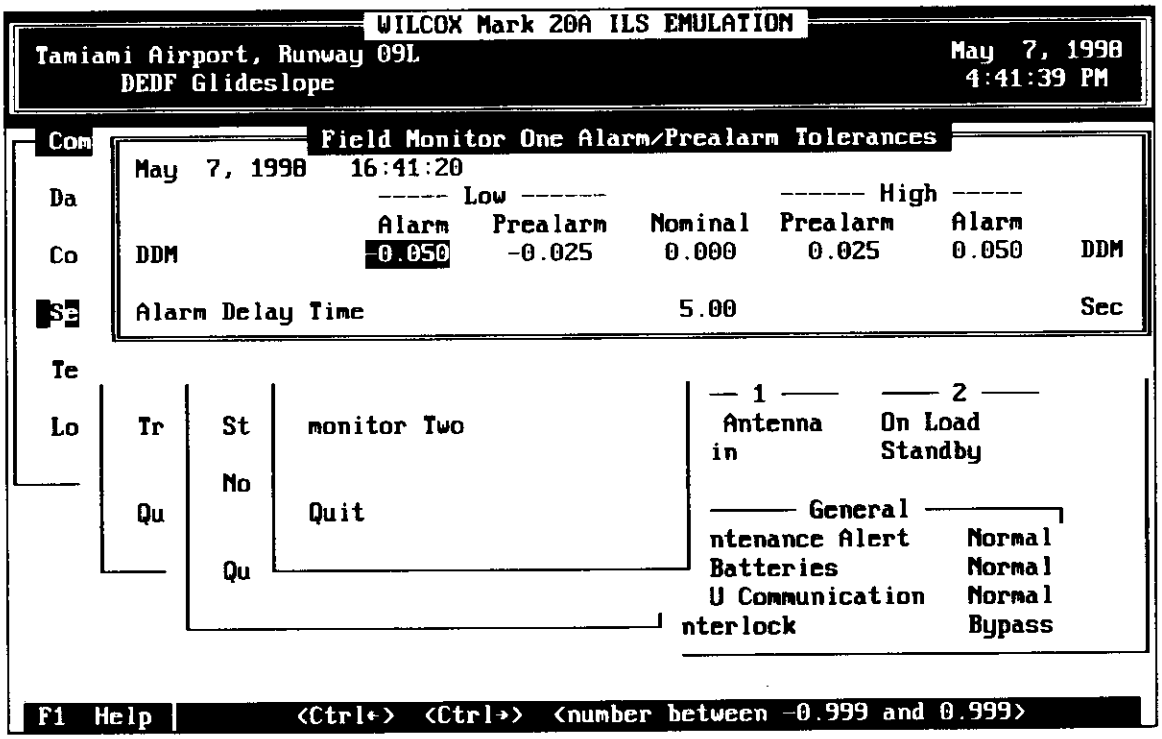
3.9.1.2 Field Monitor Tolerances Menu Screen.- After logging onto the glide slope station, the operator may view the Field monitor tolerances menu screen by selecting <S M F>. This menu screen allows the operator to select monitor <O>ne or monitor <T>wo. The Field monitor tolerances screens allow the operator to change the alarm and prealarm tolerances and the alarm delay time used by the field monitor. The following paragraphs describe the field monitor tolerances selections/parameters.

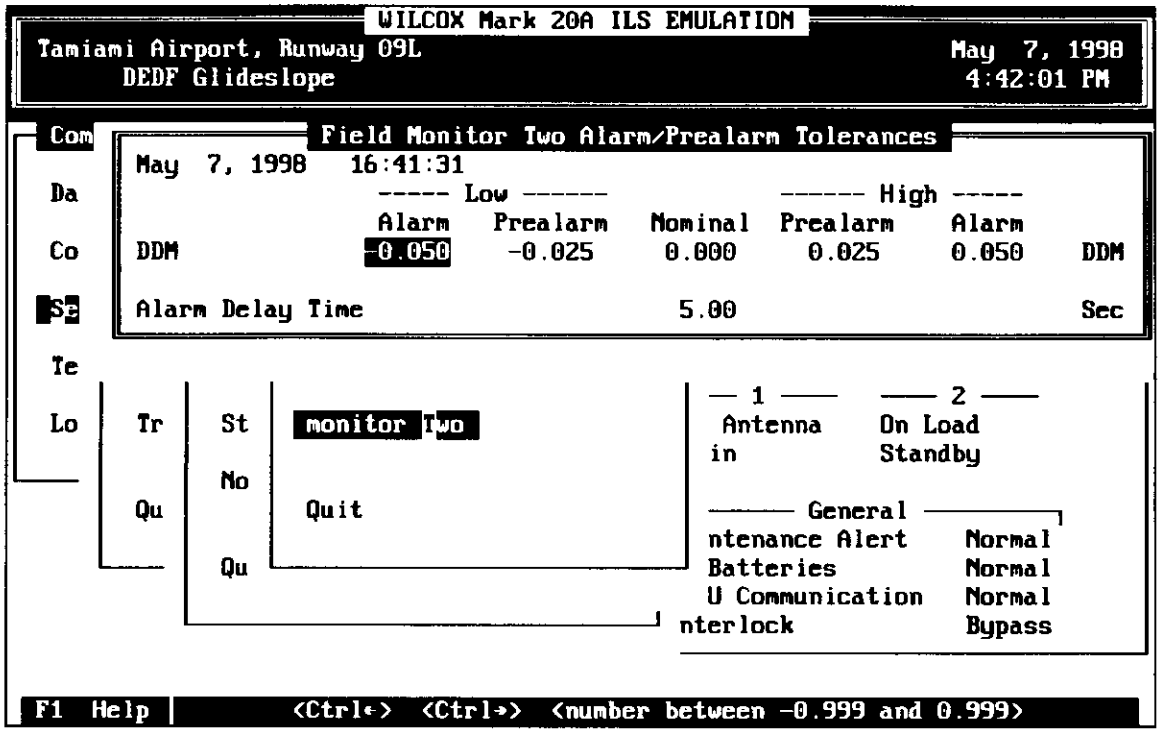


3.9.1.2.1 Field Monitor One Alarm/Prealarm Tolerances Screen.- After logging onto the glide slope station, the operator may view the Field Monitor One Alarm/Prealarm Tolerances screen by selecting <S M F O>. The Field Monitor Two Alarm/Prealarm Tolerances screen may be viewed by selecting <S M F T>. This screen allows the operator to change the alarm and prealarm tolerances and the alarm delay time used by the field monitor function of the monitor. Explanation of values set on this screen are the same as for Executive Monitor Alarm/Prealarm Tolerances screens, paragraph 3.9.1.1.1.1, except limits set on the Field Monitor Alarm/Prealarm Tolerances screen are displayed on Field Monitor Data screen, paragraph 3.7.6.2.1. Selections available on the Field Monitor Alarm/Prealarm Tolerances screen are listed in table 3-12.

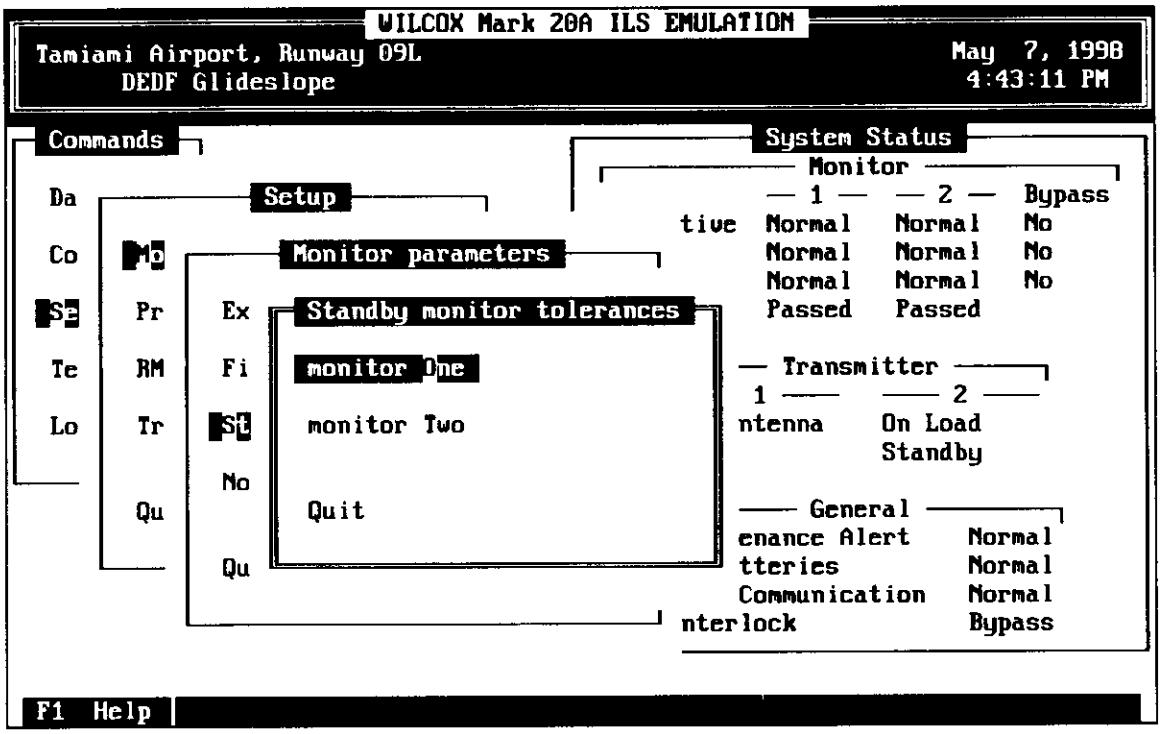
Table 3-12. Field Monitor Alarm/Prealarm Tolerances

Parameter	Range	Increment
DDM	...	...
Prealarm	...	...
Low	–0.999 to 0.999	0.001 ddm
High	–0.999 to 0.999	0.001 ddm
Alarm	...	...
Low	–0.999 to 0.999	0.001 ddm
High	–0.999 to 0.999	0.001 ddm
Alarm Delay Time	0 to 120.00	0.01 second

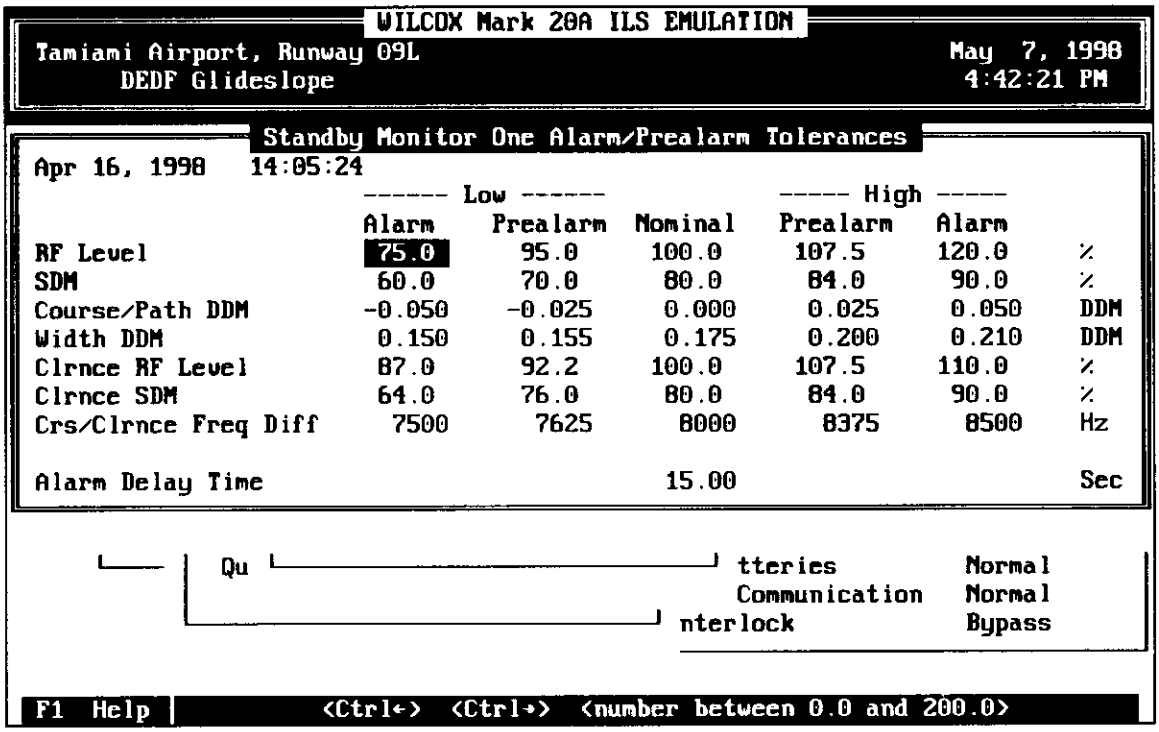



WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 7, 1998
4:42:01 PM
Com
Field Monitor Two Alarm/Prealarm Tolerances
May 7, 1998 16:41:31
Low
High
Alarm
Prealarm
Nominal
Prealarm
Alarm
DDM
-0.050
-0.025
0.000
0.025
0.050
DDM
Alarm Delay Time
5.00
Sec
Da
Co
Se
Te
Lo
Tr
St
monitor Two
No
Qu
Quit
Qu
1
2
Antenna in
On Load Standby
General
ntenance Alert
Normal
Batteries
Normal
U Communication
Normal
nterlock
Bypass
F1 Help
<Ctrl←> <Ctrl→> <number between -0.999 and 0.999>

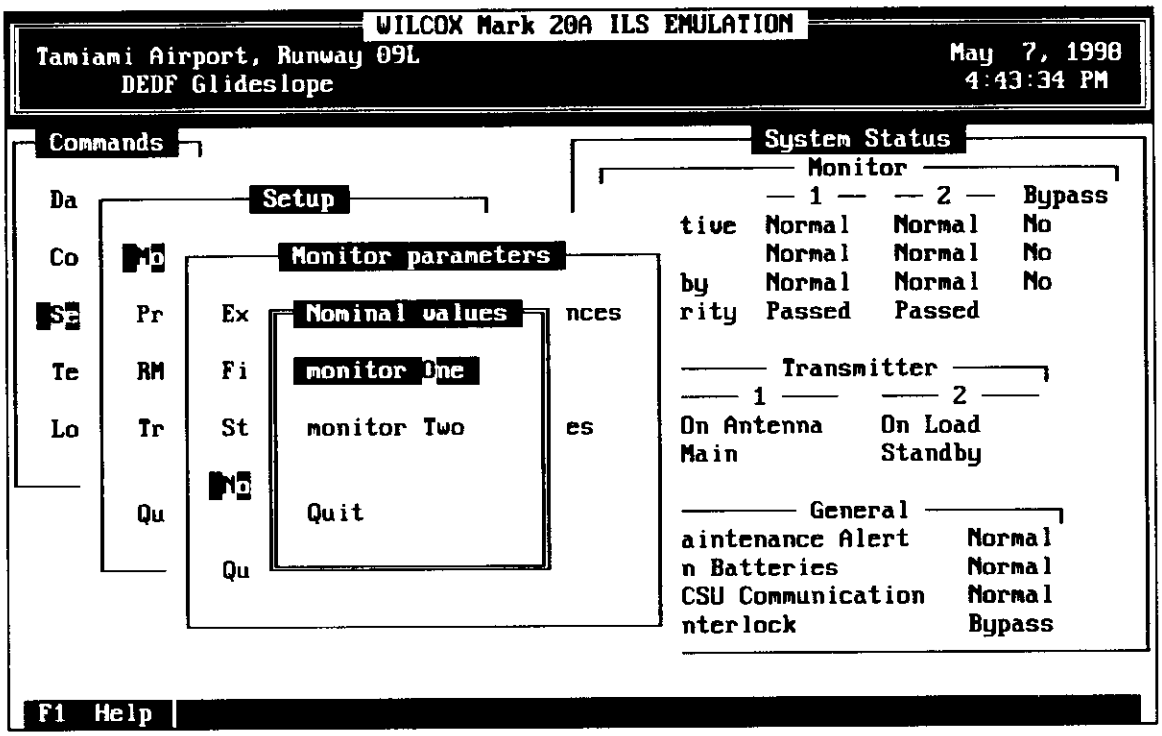
3.9.1.3 Standby Monitor Tolerances Menu Screen.- After logging onto the glide slope station, the operator may view the Standby monitor tolerances menu screen by selecting <S M S>. This screen allows the operator to select monitor <O>ne or monitor <T>wo. The Standby monitor tolerances screens allow the operator to change the alarm and prealarm tolerances and the alarm delay time used by the standby monitor function of the monitors. The following paragraphs describe the Standby monitor tolerances selections/parameters.



3.9.1.3.1 Standby Monitor One Alarm/Prealarm Tolerances Screen.- After logging onto the glide slope station, the operator may view the Standby Monitor One Alarm/Prealarm Tolerances screen by selecting <S M S O>. This screen allows the operator to change the alarm and prealarm tolerances and the alarm delay time used by the standby monitor function of monitor one. Explanation of values set on this screen are the same as for Executive Monitor Alarm/Prealarm Tolerances screens, paragraph 3.9.1.1.1. The Standby Monitor Two Alarm/Prealarm Tolerances screen may be viewed by selecting <S M S T>.



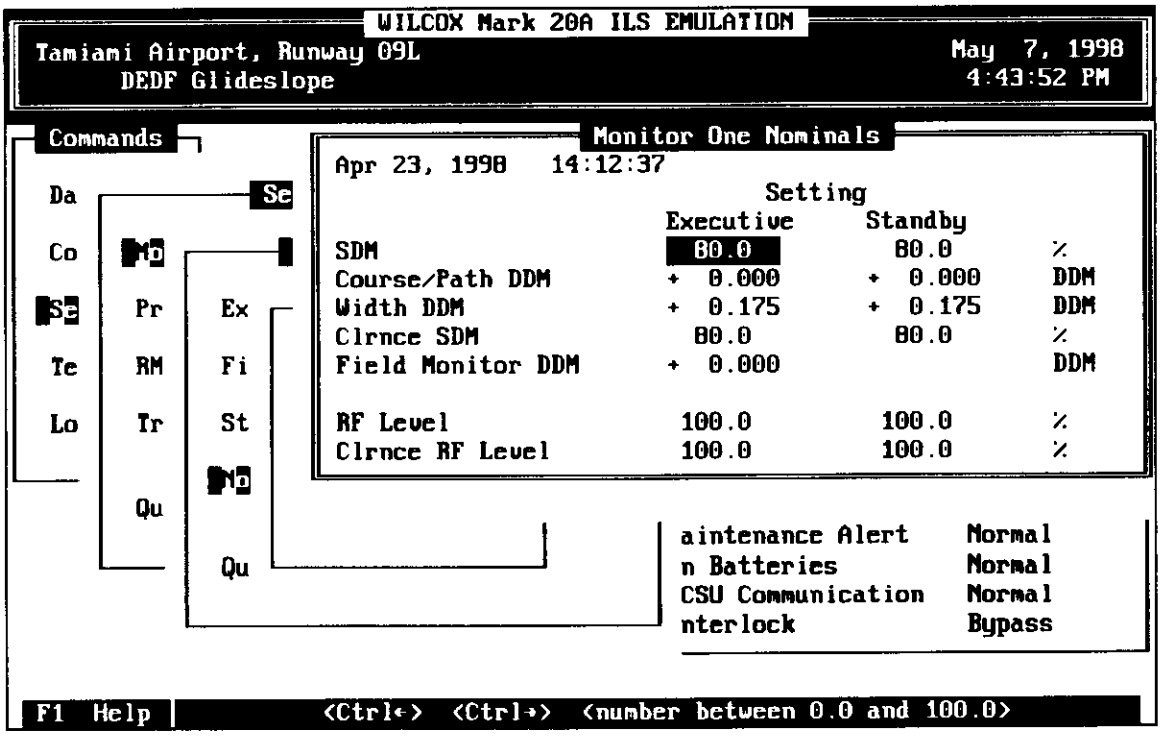
3.9.1.4 Nominal Values Menu Screen.- After logging onto the glide slope station, the operator may view the Nominal values menu screen by selecting <S M N>. This menu screen allows the operator to select monitor <O>ne or monitor <T>wo. The Nominal values menu screens allow the operator to input a nominal (normal) value for each parameter monitored by the monitors. These are the values around which the alarm and prealarm high/low limits are calculated. These are also the values to which each parameter is normalized.

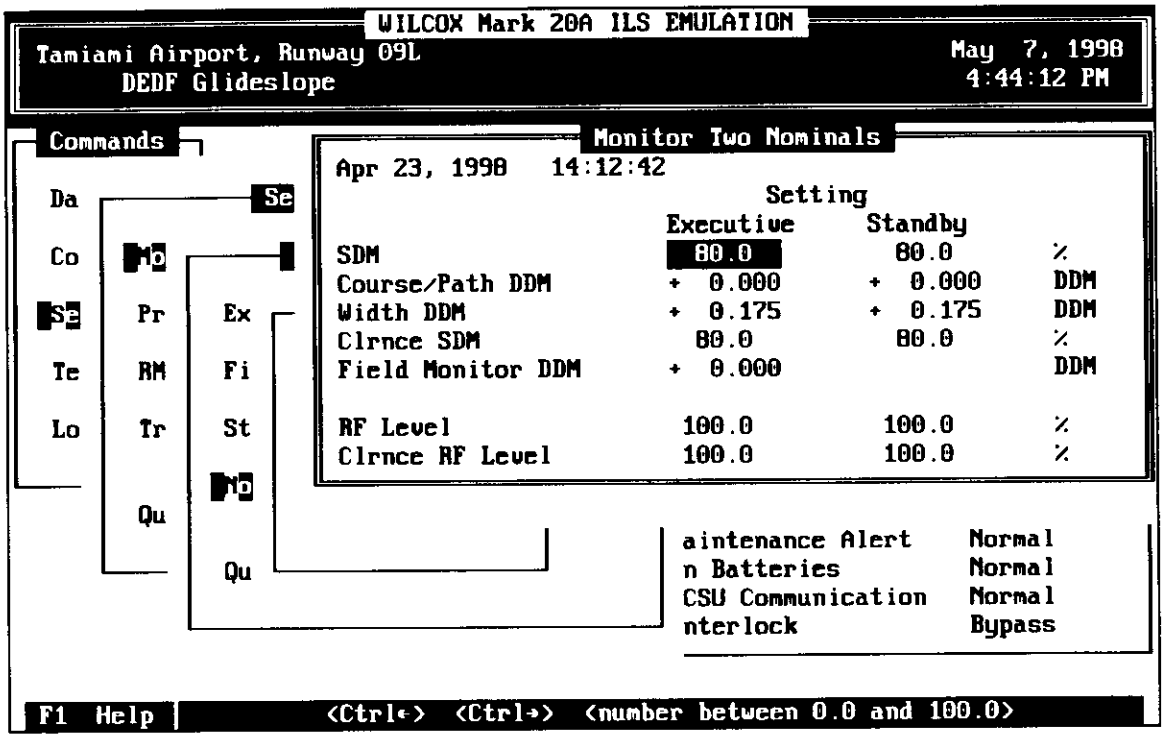


3.9.1.4.1 Monitor One Nominals Screen.- After logging onto the glide slope station, the operator may view the Monitor One Nominals screen by selecting <S M N O>. This screen allows the operator to input the nominal values used by the monitor function of monitor one. This screen allows the operator to set the monitor nominals for detector calibration. The bottom line on the screen displays the lower and upper limit the program will accept for the highlighted parameter. The limits displayed on the Monitor One Nominals and Monitor Two Nominals screens are displayed on the Executive Monitor Data screen, paragraph 3.7.8.1.1 or the Standby Monitor Data screen, paragraph 3.7.8.2.1. Table 3-13 lists the selections available on the monitor nominals screen. The operator may view the Monitor Two Nominal Values screen by selecting <S M N T>.

Table 3-13. Monitor Nominals

Parameter	Range	Increment	Unit	Description
SDM	0 to 100	0.1	%	Normally set for 80.0%
Course/Path DDM	–0.999 to 0.999	0.001	ddm	Normally set for 0.000 ddm.
Width DDM	–0.999 to 0.999	0.001	ddm	Normally set for 0.175 ddm.
Clrnce SDM	0 to 100	0.1	%	Normally set for 80.0%.
RF Level	100 (fixed)	...	%	Set on transmitter waveform setup screen.
Clrnce RF Level	100 (fixed)	...	%	Set on transmitter waveform setup screen.





3.9.2 User Preferences Screen.- After logging onto the glide slope station, the operator may view the User Preferences screen by selecting <S P>. Selecting <P>references allows you to tailor the operation of this program to your own wishes. The information that you enter is saved in a disk file called RMM.CFG in the default directory of the current default disk drive.

You may select separate foreground and background colors for different areas of the display screen. The Text Color is used for most information in the main window on the screen. The Title Box Color is used for information in the top window on the screen. The Status Line Color is used for information on the bottom line on the screen. The Alarm Color and Prealarm Color are used in data screens to highlight values that are in an alarm or prealarm state.

Force Black and White - usually, this program can sense the type of monitor being used and automatically adjust itself to color or black and white. Some computers, especially laptop computers with liquid crystal displays, emulate a color display using shades of gray, most often with less than spectacular results. Setting this switch to Yes forces the program to use its internal black and white settings, even when it senses a color display. The same result can be obtained on a temporary basis by using the /BW switch on the command line.

Eliminate Snow - select Yes to eliminate flashing dots of interference on monitors using older cga display adapters. Using this option considerably slows down the display update rate.

Logging Device - allows you to select the device that will be used to log information when the <Print Screen> key is pressed. Select Disk to always log to the default directory of the current default disk drive. Select Printer to always log to the current default print device. Select Ask if you would like the program to always ask which of the two devices to use.

Add Formfeed When Logging - select Yes to cause each screen of information to be printed on a separate sheet of paper.

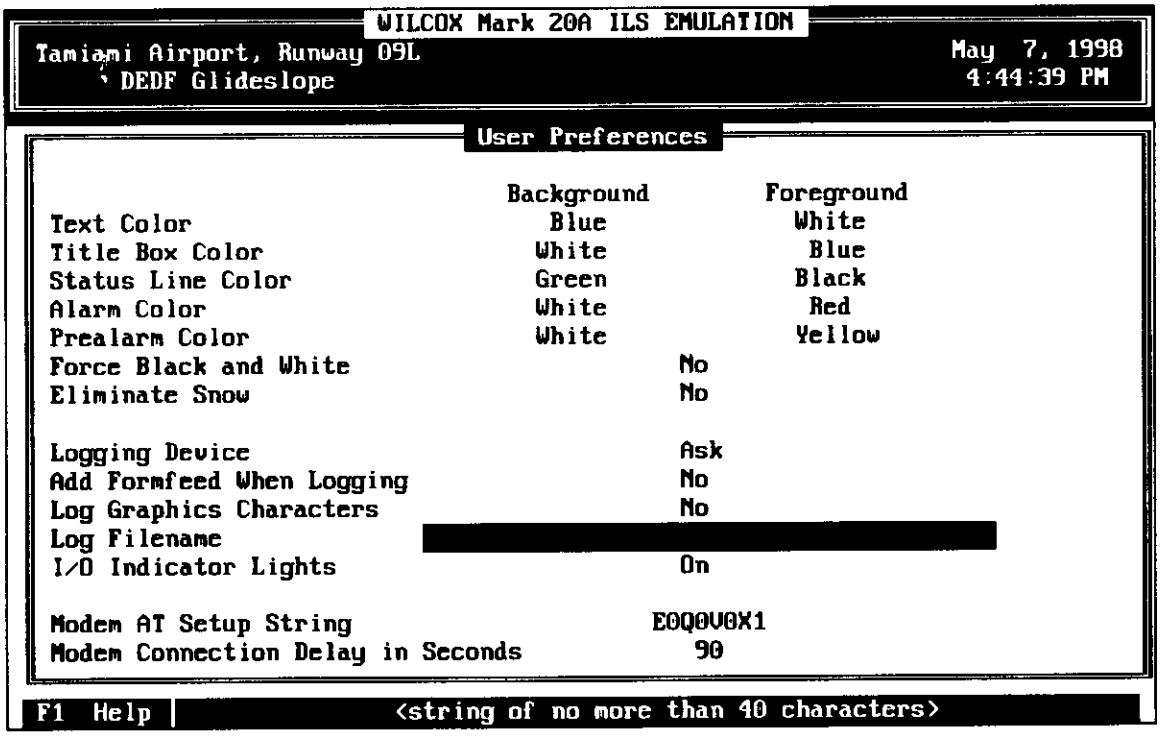
Log Graphics Characters - select Yes to cause the graphics characters on the monitor display to be printed as is. Select No to cause the graphics characters to be translated to space characters. Your printer must be capable of printing graphics characters if you select Yes, otherwise strange results may be obtained.

Log Filename - specify the path and filename to use when data logging. The drive and path are optional. This entry should conform to DOS conventions with respect to path and file nameing. For example the filename cannot exceed eight characters plus a three character extension. If blank, data will be logged to the default directory of the current default disk drive. If you do not choose a file name, a default file named "mm_dd_yy.LOG" is used, where "mm" is the current month, "dd" is the current day, and "yy" is the current year. All log copies made to disk on this day are written to this file. Maximum filename length is 40 characters.

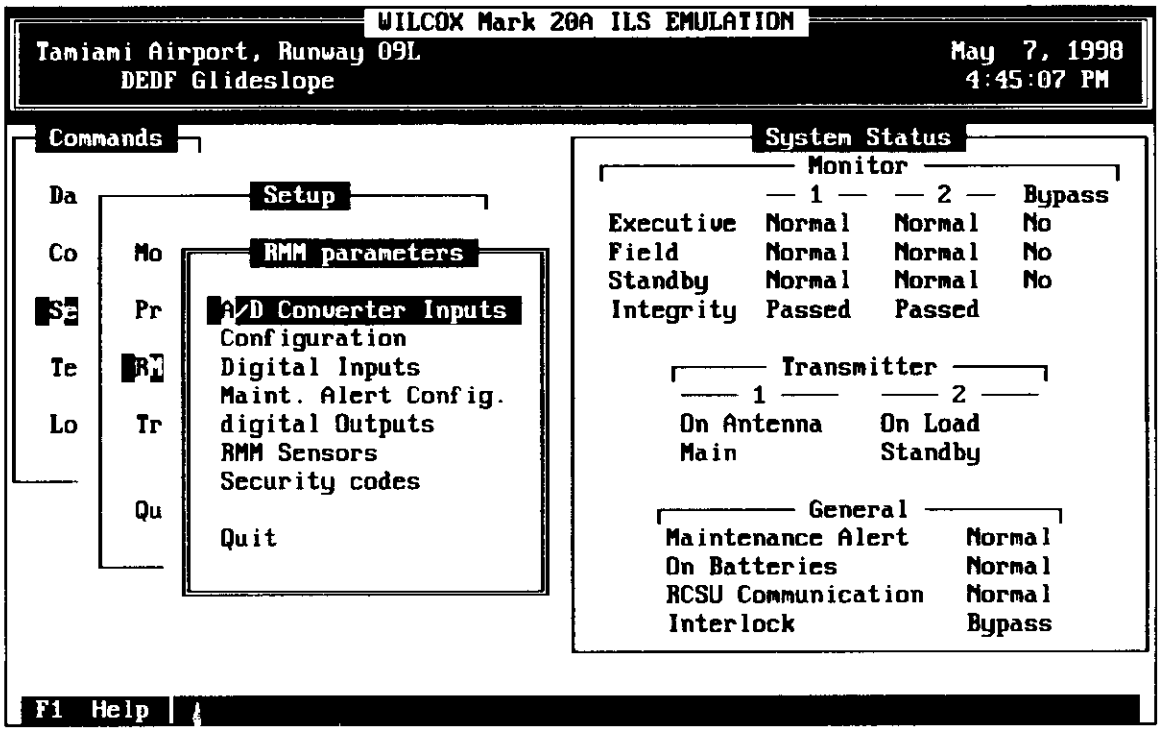
I/O Indicator Lights - select Yes to display communication activity indicators in the top window of the screen. These indicators show when the portable computer (pc) is talking to or receiving from the connected navaid.

Modem AT Setup String - the setup string is sent to the modem at the start of operation in order to program it for proper operation. The default string is proper for most Hayes compatible modems. Consult your modem instruction manual for further information.

Modem Connect Time in Seconds - this is the time allowed for the modem in the pmdt to connect to the modem in the Mark 20A when dialed up through the switched telephone network. The only way to change the modem connect time is to logon in the emulation mode, go to the preferences screen, and change the time setting.



3.9.3 RMM Parameters Menu Screen.- After logging onto the glide slope station, the operator may view the RMM parameters menu screen by selecting <S R>. This screen allows the operator to select <A>/D converter limits, <C>onfiguration, <D>igital inputs, digital <O>utputs, <R>MM sensors, or <S>ecurity codes.



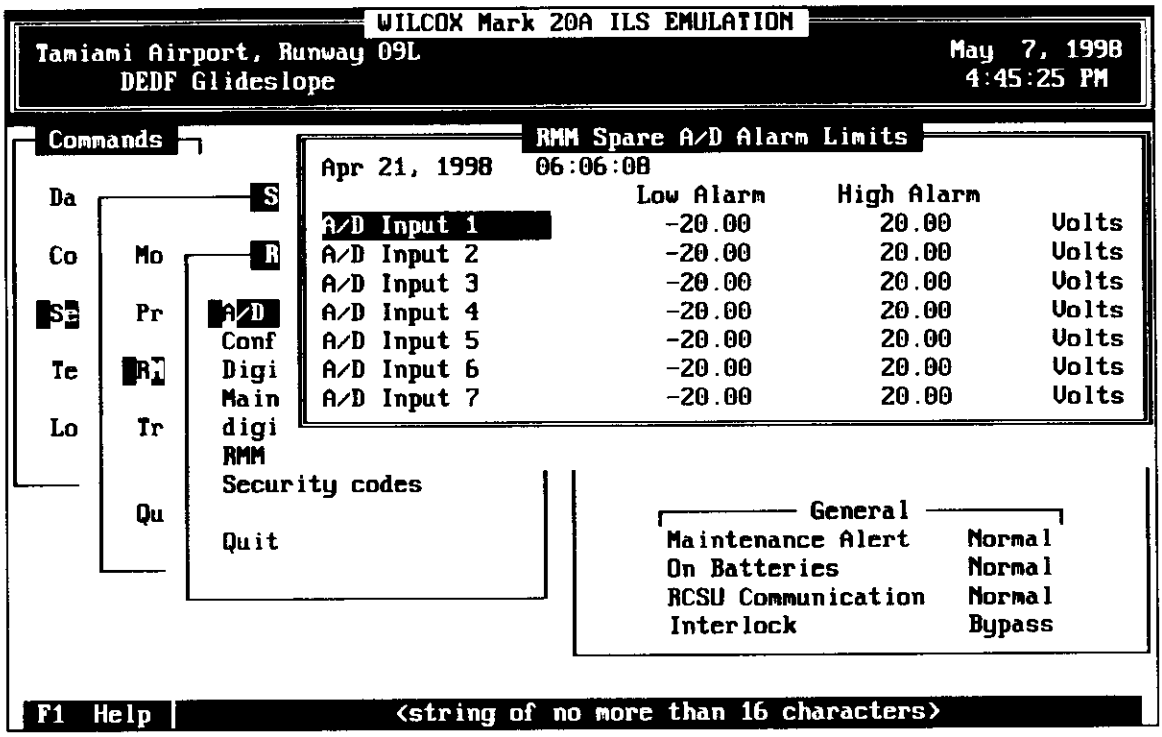
3.9.3.1 RMM Spare A/D Alarm Limits Screen.- After logging onto the glide slope station, the operator may view the RMM Spare A/D Alarm Limits screen by selecting <S R A>. This screen is used to set the high and low limits for alarm conditions for the seven spare a/d inputs. The bottom line on the screen displays the lower and upper limit the program will accept for the highlighted parameter. The bottom line information is not necessarily the limits to be set on the highlighted parameter. Table 3-14 lists the RMM spare a/d signal points. Table 3-15 lists the parameter, range, and increment for each spare a/d input.

Table 3-14. RMM Spare A/D Signal Points

A/D Data	RMM Signal	Backplane Connection
Spare 1	ASIG6	J3-8
Spare 2	ASIG8	J3-2
Spare 3	ASIG10	J3-4
Spare 4	ASIG11	J3-6
Spare 5	ASIG13	J3-5
Spare 6	ASIG14	J3-3
Spare 7	ASIG 15	J3-1
GND	...	J3-13

Table 3-15. RMM Spare A/D Alarm Limits

Parameter	Range	Increment	Unit	Description
Spare input 1	–20.00 to 20.00	0.01	volt	The RMM has seven spare a/d converter inputs. These are continuously monitored and, if alarm limits are set, will generate a maintenance alert when outside of the limits.
Spare input 2	–20.00 to 20.00	0.01	volt	
Spare input 3	–20.00 to 20.00	0.01	volt	
Spare input 4	–20.00 to 20.00	0.01	volt	
Spare input 5	–20.00 to 20.00	0.01	volt	
Spare input 6	–20.00 to 20.00	0.01	volt	
Spare input 7	–20.00 to 20.00	0.01	volt	


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 7, 1998
4:45:25 PM
Commands
Da
Co
Se
Te
Lo
Mo
Pr
Tr
Qu
S
R
A/D
Conf
Digi
Main
digi
RMM
Security codes
Quit
RMM Spare A/D Alarm Limits
Apr 21, 1998 06:06:08
Low Alarm
High Alarm
A/D Input 1 -20.00 20.00 Volts
A/D Input 2 -20.00 20.00 Volts
A/D Input 3 -20.00 20.00 Volts
A/D Input 4 -20.00 20.00 Volts
A/D Input 5 -20.00 20.00 Volts
A/D Input 6 -20.00 20.00 Volts
A/D Input 7 -20.00 20.00 Volts
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help
<string of no more than 16 characters>

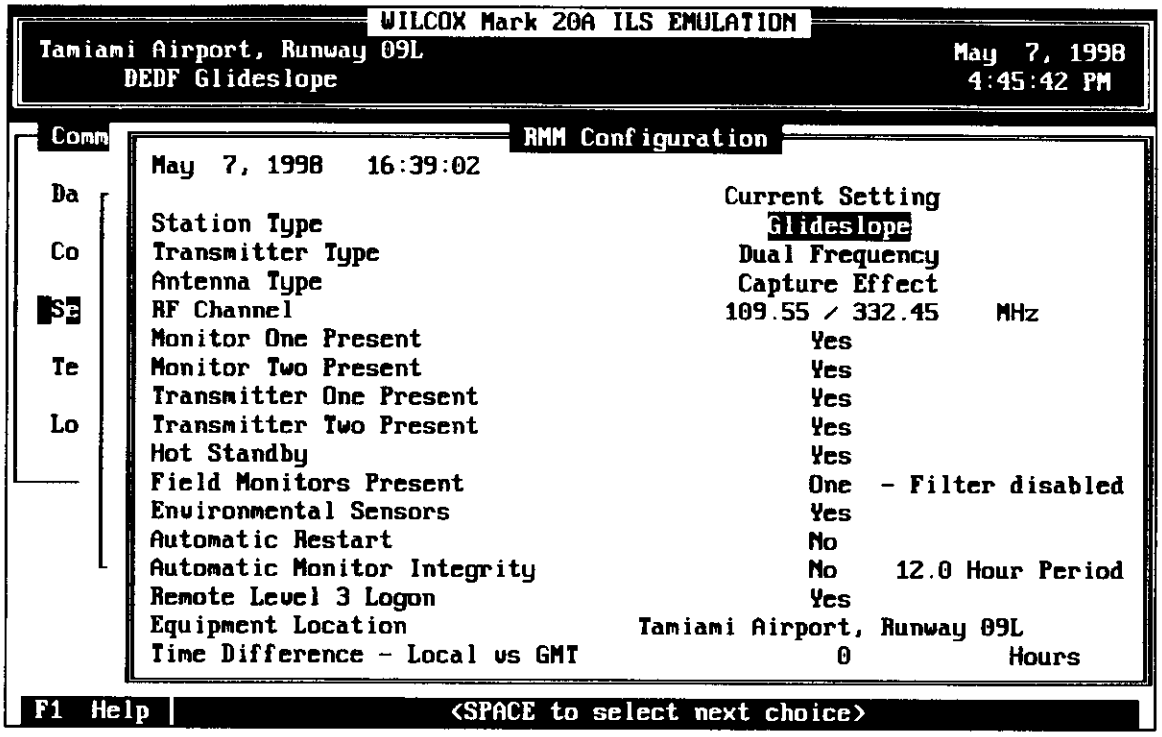
3.9.3.2.2 RMM Configuration Screen.- After logging onto the glide slope station, the operator may view the RMM Configuration screen by selecting <S R C>. This screen allows the operator to enter or change the current system software configuration to match the hardware. This screen is used to configure the RMM program and both monitors to reflect the glide slope station in which they are installed. Table 3-17 lists the configuration items and selections available on the RMM Configuration screen.

Table 3-17. RMM Configuration Screen

Configuration Item	Selection	Remarks
NOTE Unless otherwise indicated in Remarks column, highlight desired selection and press space bar to change selection.		
System Type	Glide Slope or Localizer	...
Transmitter Type	Dual Frequency or Single Frequency	Mark 20A ILS is dual frequency.
Antenna Type	Capture Effect or End Fire: Null Reference or Sideband Reference	Capture effect and end fire are only selections available for dual-frequency glide slope. (Antenna type selections for single-frequency glide slope are Null Reference or Sideband Reference.)
RF Channel	108.10/334.78 to 111.95/330.95	Numbers displayed are frequency in Mhz. Forty rf channels can be selected. Localizer and glide slope channels are automatically paired.
Monitor One Present	Yes or No	...
Monitor Two Present	Yes or No	...
Transmitter One Present	Yes or No	...
Transmitter Two Present	Yes or No	...
Hot Standby	Yes or No	...
Field Monitors Present	One, Two, or None	The Mark 20A ILS glide slope may have a near field monitor.
Environmental Sensors	Yes or No	Select Yes to enable RMM sensors.

Table 3-17. RMM Configuration Screen

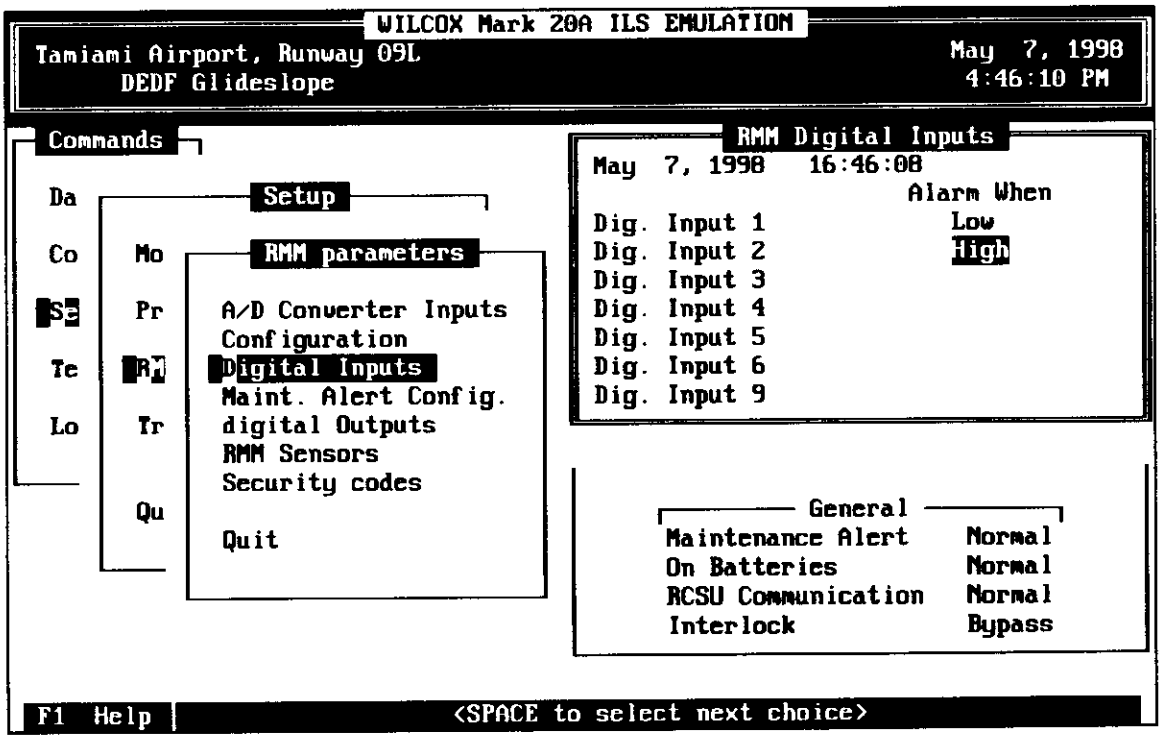
Configuration Item	Selection	Remarks
Automatic Restart	Yes or No	Select "Yes" if you want the system to automatically attempt to turn on after a monitor initiated shutdown. If you enable this feature, a restart will be attempted 50 seconds after the monitor shuts down the transmitter. If the equipment shuts down again, a second restart is attempted 5 minutes after the first monitor shutdown. Automatic Monitor Integrity Yes or No
Automatic Monitor Integrity	Yes or No	Select "Yes" if you want the system to periodically run the monitor integrity test- Set the interval that you desire the automatic integrity test to be repeated.
Remote Level 3 Logon	Yes or No	Setting this to "No" will cause the RMM to deny any future REMOTE access at level 3.
Equipment Location	Airport and runway identifier	Enter maximum of 32 characters. Identifies system on pmdt display and log printouts.
Time Difference - Local vs GMT	Between −12 and 12	It is assumed that pmdt internal clock is set to local time. The RMM and monitors use GMT for time-tagging files, maintenance alerts, and alarms. Enter difference between local time and GMT. Enter 0 to disable feature and use local time throughout system.


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 7, 1998
4:45:42 PM
Comm
RMM Configuration
May 7, 1998 16:39:02
Current Setting
Station Type Glideslope
Transmitter Type Dual Frequency
Antenna Type Capture Effect
RF Channel 109.55 / 332.45 MHz
Monitor One Present Yes
Monitor Two Present Yes
Transmitter One Present Yes
Transmitter Two Present Yes
Hot Standby Yes
Field Monitors Present One - Filter disabled
Environmental Sensors Yes
Automatic Restart No
Automatic Monitor Integrity No 12.0 Hour Period
Remote Level 3 Logon Yes
Equipment Location Tamiami Airport, Runway 09L
Time Difference - Local vs GMT 0 Hours
F1 Help
<SPACE to select next choice>

3.9.3.3 RMM Digital Inputs Screen.- After logging onto the glide slope station, the operator may view the RMM Digital Inputs screen by selecting <S R D>. This screen allows you to enter or change the digital inputs alarm masks. Each digital input can be set to generate a maintenance alert on either a high-low (LOW) or low-high (HIGH) transition. A maintenance alert will not be generated by a level transition when a blank field is selected. The limits set on the RMM Digital Inputs screen are displayed on the RMM Spare Digital Input Data screen, paragraph 3.7.10.3. Table 3-18 lists the digital input signals. Note that the digital inputs screen is where the intrusion detector and smoke detector are selected as present or absent.

Table 3-18. Digital Input Signals

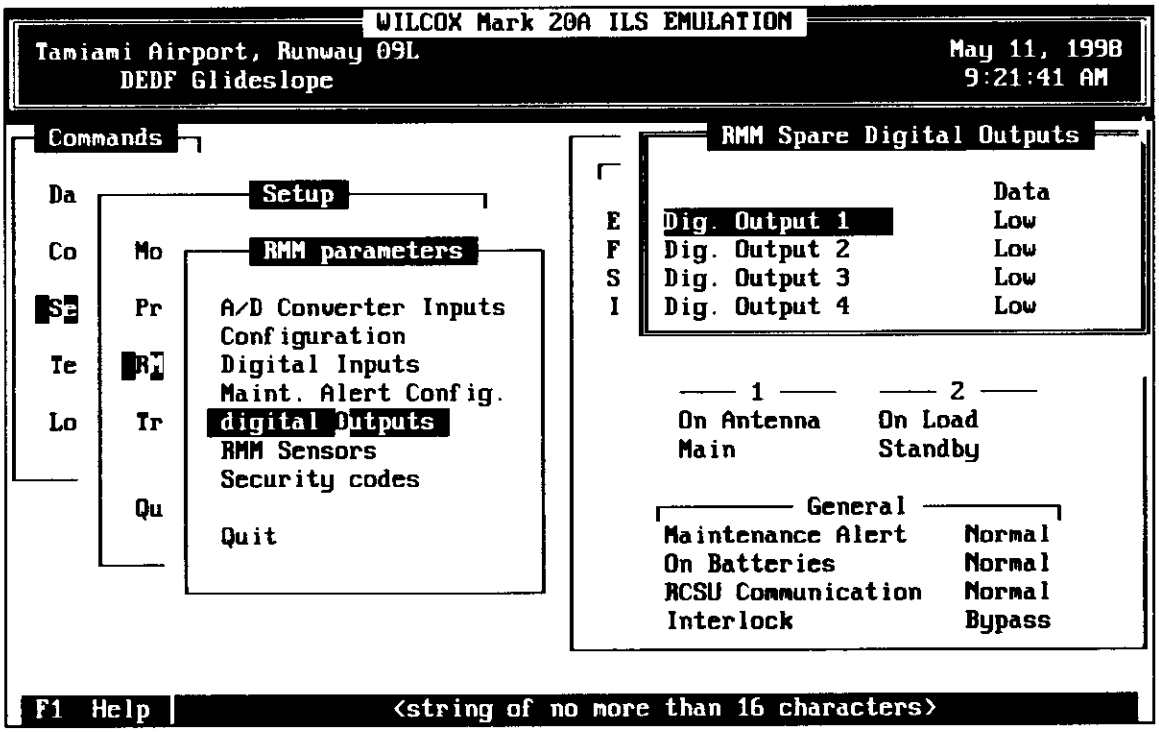
Input Data	RMM Signal	Backplane Connector
Spare 1	DIN0	J3-15
Spare 2	DIN1	J3-17
Spare 3	DIN2	J3-19
Spare 4	DIN3	J3-21
Spare 5	DIN4	J3-23
Spare 6	DIN5	J3-25
Spare 7	DIN10	J3-11
GND		J3-13



3.9.3.4 RMM Digital Outputs Screen.- After logging onto the glide slope station, the operator may view the RMM Digital Outputs screen by selecting <S R O>. This screen allows the operator to enter or change the state of four digital outputs. The RMM Digital Outputs screen limits will generate a maintenance alert when the selected limit is reached. Highlight the desired parameter and use the space bar to select low or high. Table 3-19 lists rms digital outputs.

Table 3-19. RMM Digital Outputs

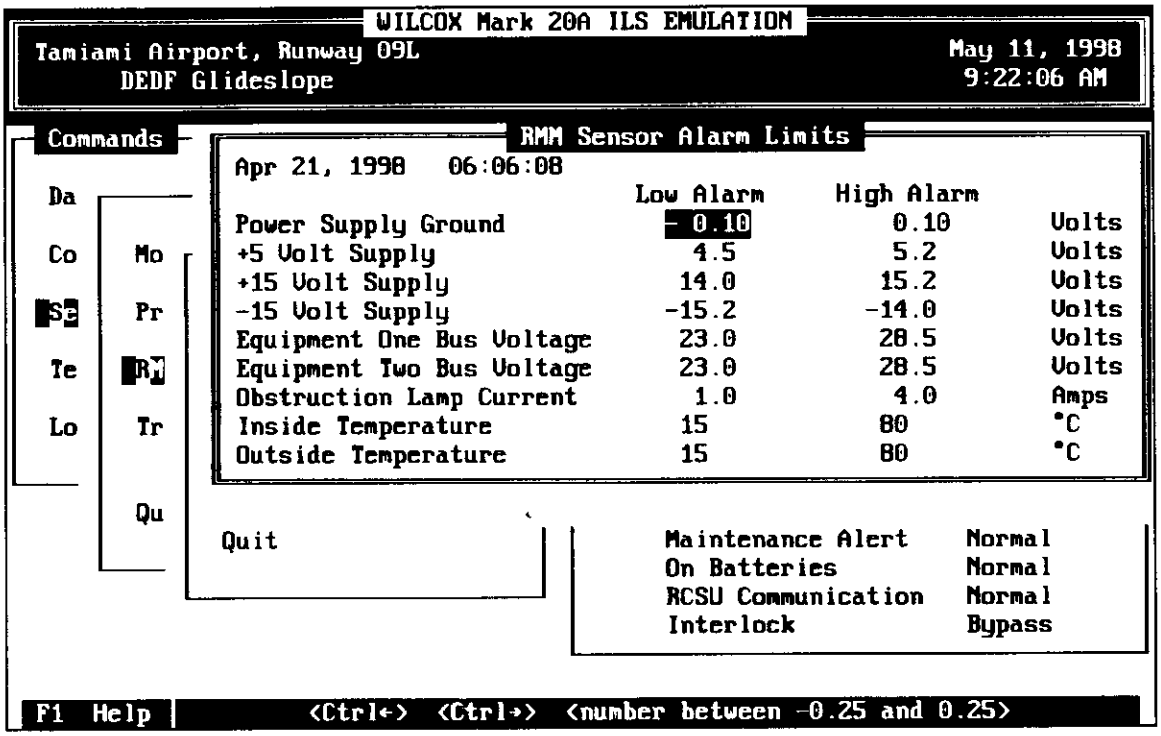
Digital Output Data	RMM Signal	Backplane Connection
Spare 1	DOUT4	J3-22
Spare 2	DOUT5	J3-20
Spare 3	DOUT6	J3-18
Spare 4	DOUT7	J3-16
GND	...	J3-13



3.9.3.5 RMM Sensor Alarm Limits Screen.- After logging onto the glide slope station, the operator may view the RMM Sensor Alarm Limits screen by selecting <S R R>. This screen allows the operator to enter or change the upper and lower limits of the environmental sensor inputs. An out-of-tolerance condition results in a maintenance alert condition being declared. The help line at the bottom of the screen will show the limits for the selected parameter. The limits set on the RMM Sensor Alarm Limits screen are displayed on the RMM Sensor Data screen, paragraph 3.7.10.6. Table 3-20 lists the selections available on the rms sensor alarm limits screen.

Table 3-20. RMM Sensor Alarm Limits

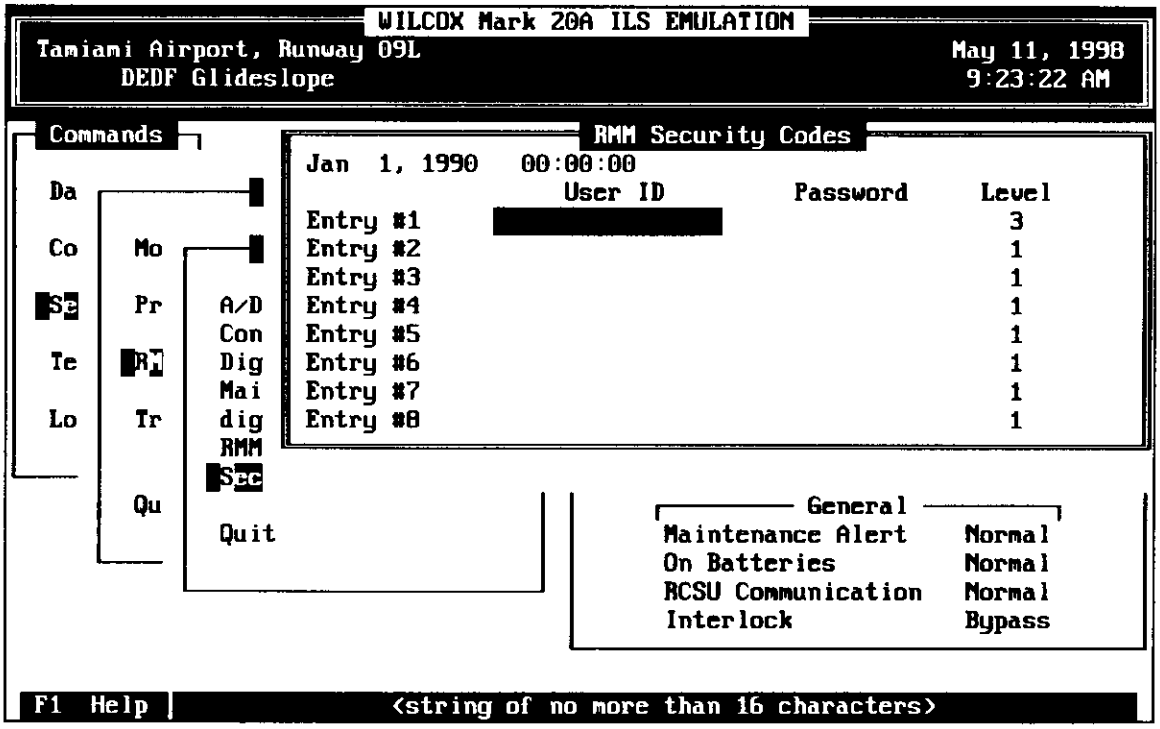
Parameter	Range	Increment
Power Supply Ground	...	...
Low Alarm	-0.25 to 0.25 V	0.01 V
High Alarm	-0.25to 0.25 V	0.01 V
+5-Volt Supply	...	...
Low Alarm	4.5 to 5.5 V	0.1 V
High Alarm	4.5 to 5.5 V	0.1 V
+15-volt supply	...	...
Low Alarm	14.0 to 15.0 V	0.1 V
High Alarm	14.0 to 15.0 V	0.1 V
-15 volt supply	...	...
Low Alarm	-16.0 to -14.0 V	0.1 V
High Alarm	-16.0 to -14.0 V	0.1 V
Equipment One Bus Voltage	...	...
Low Alarm	22.0 to 29.0 V	0.1 V
High Alarm	22.0 to 29.0 V	0.1 V
Equipment Two Bus Voltage	...	...
Low Alarm	22.0 to 29.0 V	0.1 V
High Alarm	22.0 to 29.0 V	0.1 V
Obstruction Light	...	...
Low Alarm	-1.0 to 4.9	0.1 amp
High Alarm	-1.0 to 4.9	0.1 amp
Inside Temperature	...	...
Low Alarm	-10 to 50	1 °C
High Alarm	-10 to 50	1 °C
Outside Temperature	...	...
Low Alarm	-50 to 70	1 °C
High Alarm	-50 to 70	1 °C


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
9:22:06 AM
Commands
Da
Co
Se
Te
Lo
Mo
Pr
RM
Tr
Qu
Quit
RMM Sensor Alarm Limits
Apr 21, 1998 06:06:08
Low Alarm
High Alarm
Power Supply Ground -0.10 0.10 Volts
+5 Volt Supply 4.5 5.2 Volts
+15 Volt Supply 14.0 15.2 Volts
-15 Volt Supply -15.2 -14.0 Volts
Equipment One Bus Voltage 23.0 28.5 Volts
Equipment Two Bus Voltage 23.0 28.5 Volts
Obstruction Lamp Current 1.0 4.0 Amps
Inside Temperature 15 80 °C
Outside Temperature 15 80 °C
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help
<Ctrl←> <Ctrl→> <number between -0.25 and 0.25>

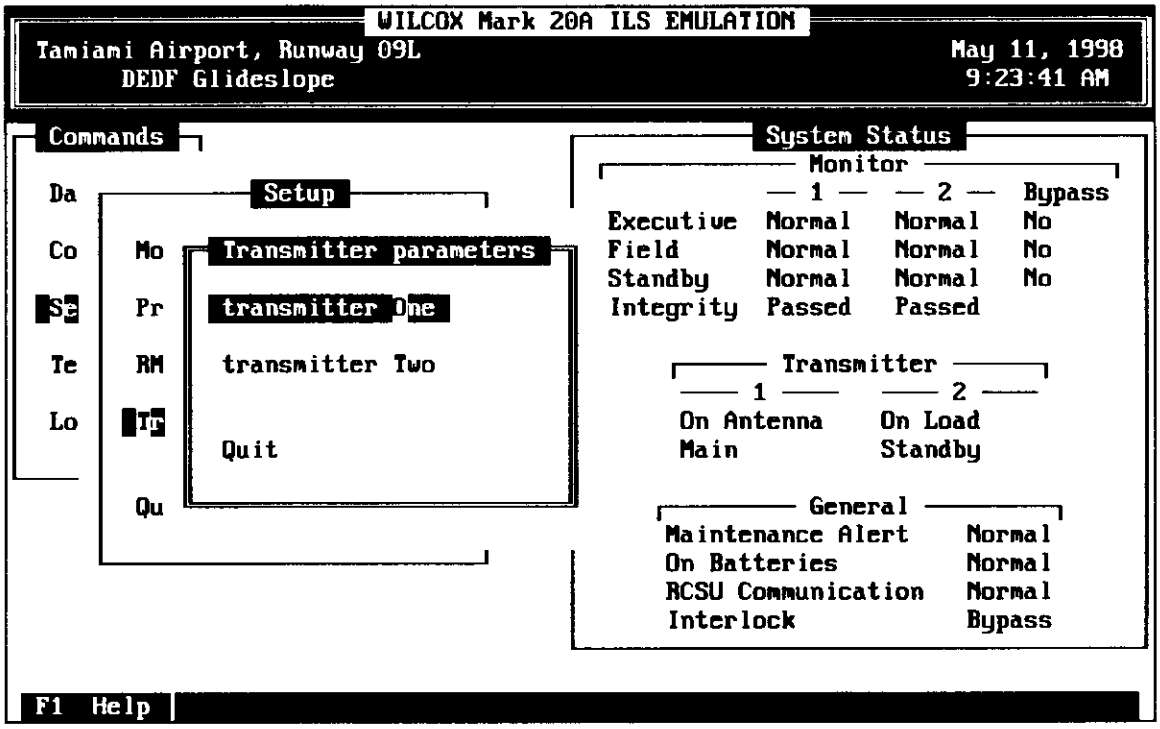
3.9.3.6 Security Codes Menu Screen.- After logging onto the glide slope station, the operator may view the Security codes menu screen by selecting <S R S>. The RMM Security Code screen allows you to control access to different levels of the MK20A PMDT program. The "User ID" is limited to 16 characters and the "Password" is limited to 8 characters. A "User ID" must be entered before a "Password" will be accepted. A level three "User ID" and "Password" must exist before a level one or two code will be accepted. The Security Code screen is accessible only by level three security. Functions available to each level are:

Level 1 = Data, Setup (Preferences only) and Logoff
Level 2 = Data, Control, Setup (Preferences only) and Logoff
Level 3 = Data, Control, Setup, Tests and Logoff

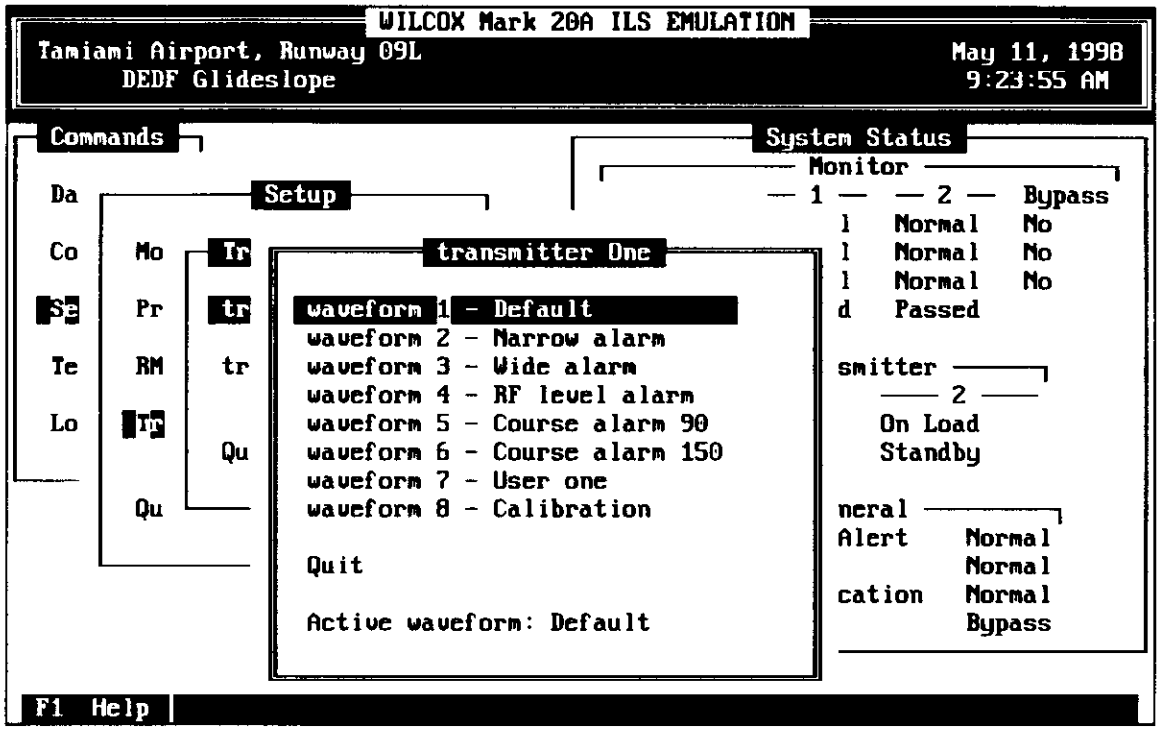
Note also that Remote Level Three logon may be denied in the RMM Configuration screen. If remote level three is denied, a user with a security level three password will be allowed level two logon. Also a security level three User ID must exist before Remote Level Three logon can be denied. If Remote Level Three is denied, the remote level three User ID cannot be removed until remote level three logon is allowed.



3.9.4 Transmitter Parameters Menu Screen.- After logging onto the glide slope station, the operator may view the Transmitter parameters menu screen by selecting <S T>. This menu screen allows the operator to choose transmitter <O>ne or transmitter <T>wo waveforms. Selection of transmitter <O>ne or <T>wo allows the operator to set up or change any of eight waveform data files for each transmitter. Each of the eight waveform data files contain a complete set of programming information for audio generator cca 10A3A3 (transmitter 1) or audio generator cca 10A3A11 (transmitter 2). Data on waveform file 1 is used as the default waveform at power up to program the audio generators for the operational signal in space (main transmitter) and the standby transmitter signal to the internal load. Data on waveform files 2 through 8 are used only upon operator request. These waveform files are typically used for testing only. The following paragraphs describe the waveform files.



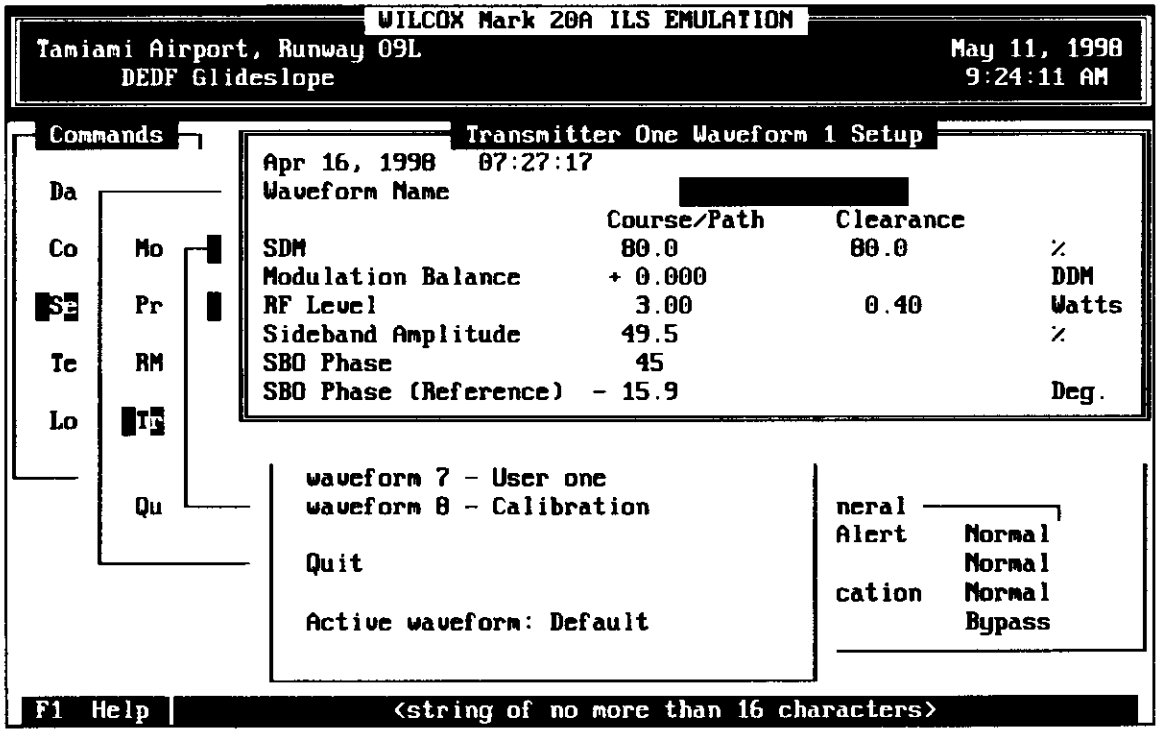
3.9.4.1 Transmitter One Menu Screen.- After logging onto the glide slope station, the operator may view the transmitter One menu screen by selecting <S T O>. This screen allows the operator to select waveforms 1 through 8. The names of the waveforms displayed on the screen are recommended. The operator may change the name/function of waveforms 2 through 8 to meet site dependent functions. Accessing the active waveform will cause a warning message to be displayed prior to proceeding.



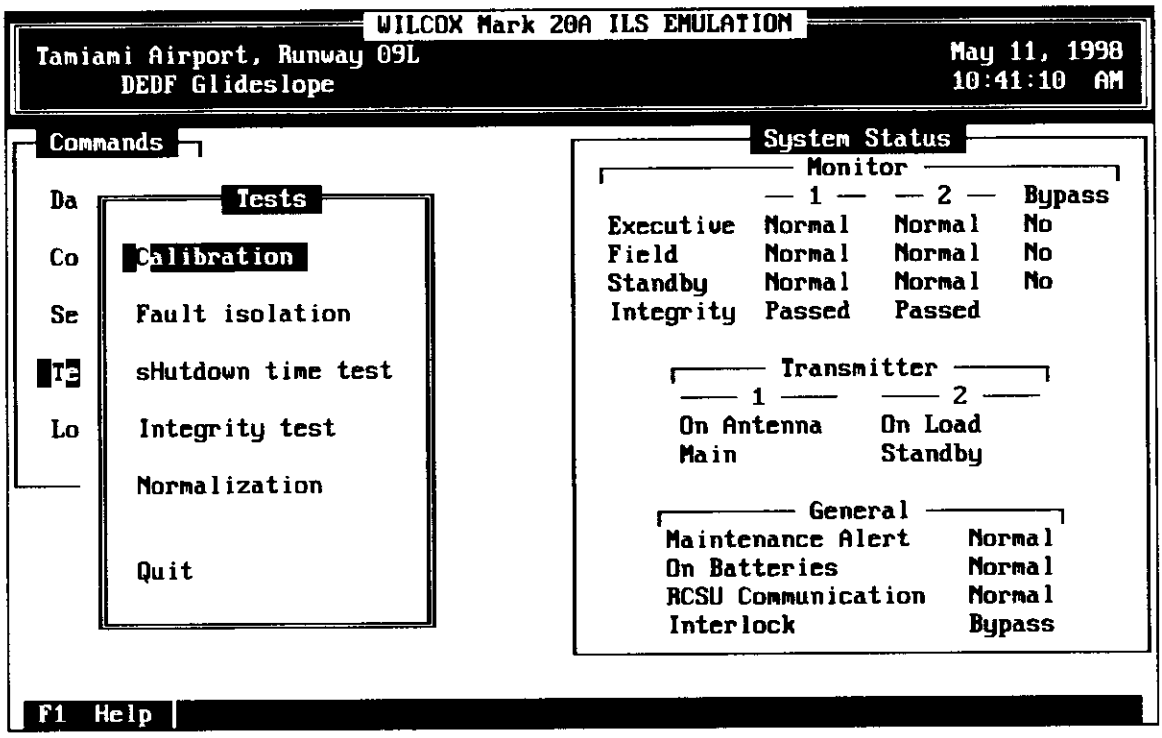
3.9.4.1.1 Transmitter One Waveform 1 Setup Screen.- After logging onto the glide slope station, the operator may view the Transmitter One Waveform 1 Setup screen by selecting <S T O 1>. Waveform 1 is the default waveform that establishes normal operating conditions for the equipment. On power up and reset, the equipment is programmed to waveform 1. SBO Phase (Reference) is not a settable parameter. It follows the setting of the SBO Phase control and provides an accurate indication of the phase change as the SBO Phase control is varied. Range and increments for parameters shown on Transmitter One Waveform Setup screens are listed in table 3-22.

Table 3-22. Transmitter One Waveform Setup

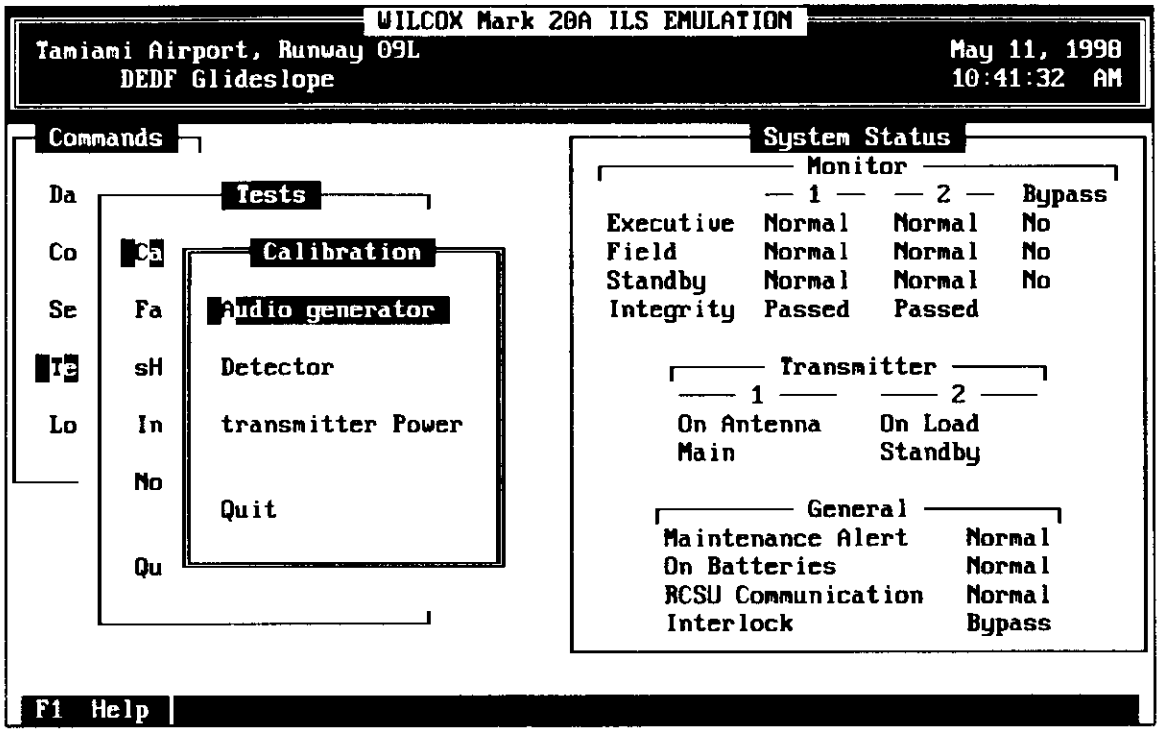
Parameter	Range	Increment
Waveform Name	Maximum of 16 characters	...
SDM	0.0 to 99.5	0.1%
Modulation Balance	–0.800 to 0.800	0.001 ddm
RF Level	0.00 to 4.00	0.01 W
Sideband Amplitude	0.0 to 100.0	0.1%
SBO Phase	0 to 255	1
SBO Phase (Reference)	≈ ±35°	...



3.11 TESTS MENU SCREEN.- After logging onto the glide slope station, the operator may view the Tests menu screen by selecting <T>. This screen allows the operator to select <C>alibration, <F>ault Isolation, s<H>utdown timing test, <I>ntegrity test, or <N>ormalization. Selecting <Q>uit returns the operator to the Commands menu.



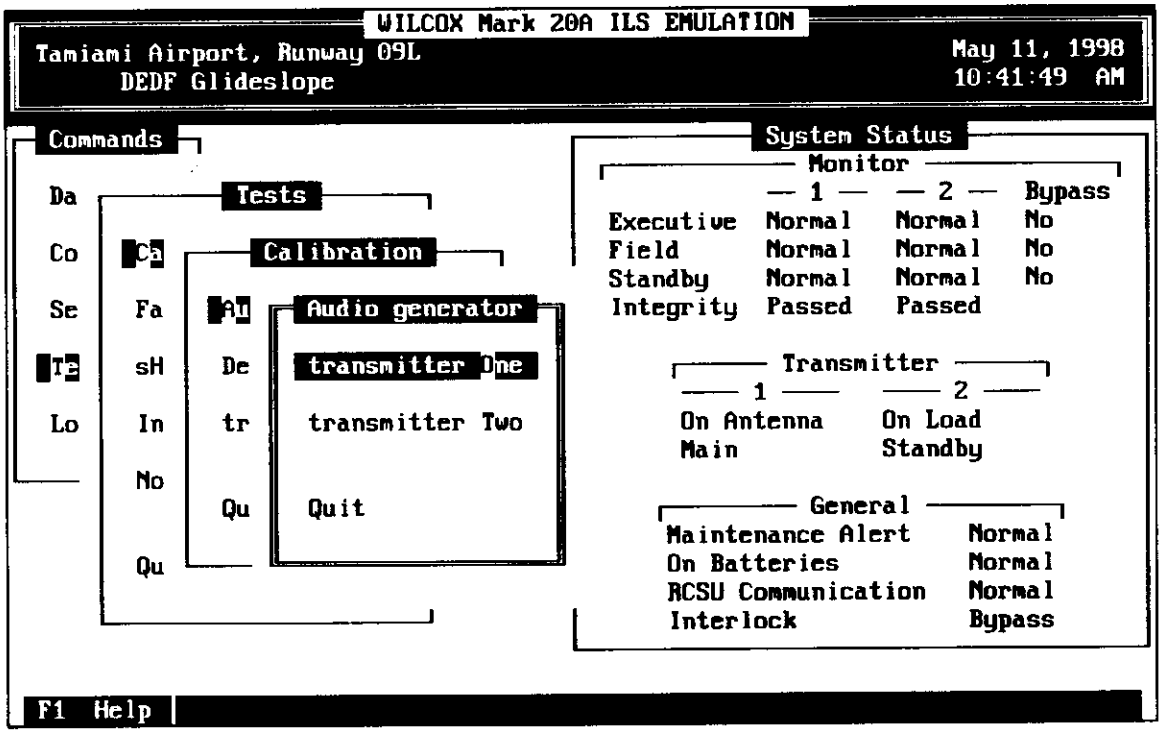
3.11.1 Calibration Menu Screen.- After logging onto the glide slope station, the operator may view the Calibration menu screen by selecting <T C>. This screen allows the operator to select <A>udio generator, <D>etector, or transmitter <P>ower. These selections are described in the following paragraphs.

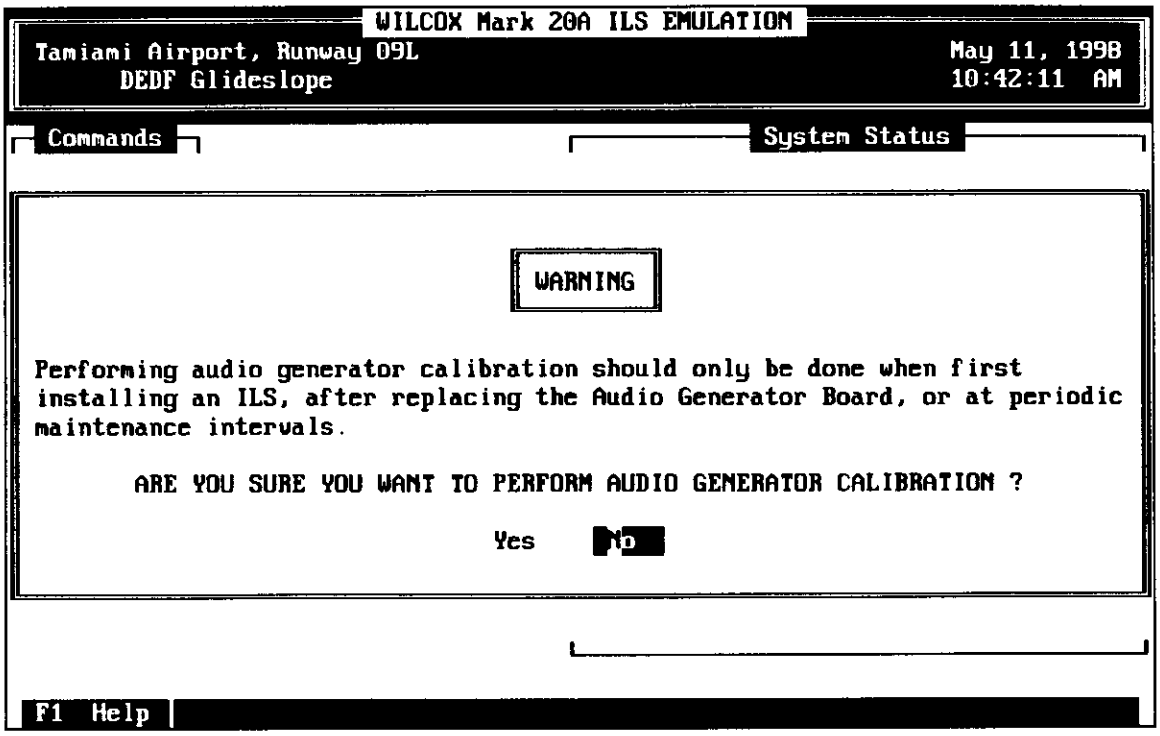


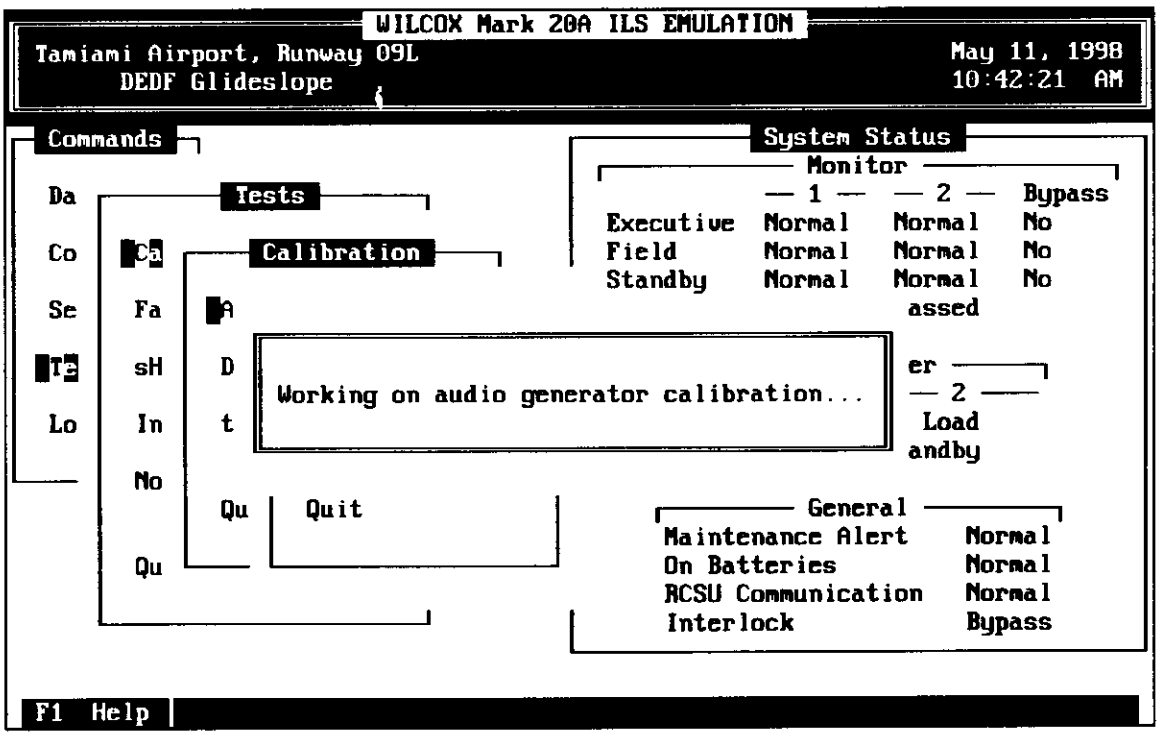
3.11.1.1 Audio Generator Menu Screen.- After logging onto the glide slope station, the operator may view the Audio generator menu screen by selecting <T C A>. This screen allows the operator to select transmitter <O>ne or transmitter <T>wo. Selecting <Q>uit will exit the menu screen. During calibration, the normal ILS signal is corrupted as different elements of audio generator cca 10A3A3 (transmitter 1) and 10A3A11 (transmitter 2) are calibrated, disrupting normal ILS signal monitoring and possibly resulting in alarm and shutdown (if not bypassed). For best results, run or rerun this test on a properly operating ILS that has stabilized to the ambient temperature. After selecting transmitter <O>ne or transmitter <T>wo, a WARNING screen is displayed that informs the operator when to perform the test. The operator must then answer the question, "ARE YOU SURE YOU WANT TO PERFORM AUDIO GENERATOR CALIBRATION?" If the answer is No, the operator is returned to the Calibration menu screen. If the answer is Yes, audio calibration will be performed. Results of the audio generator calibration are displayed on the Audio Generator (AGEN) Calibration Data screen, paragraph 3.7.2.1.1.

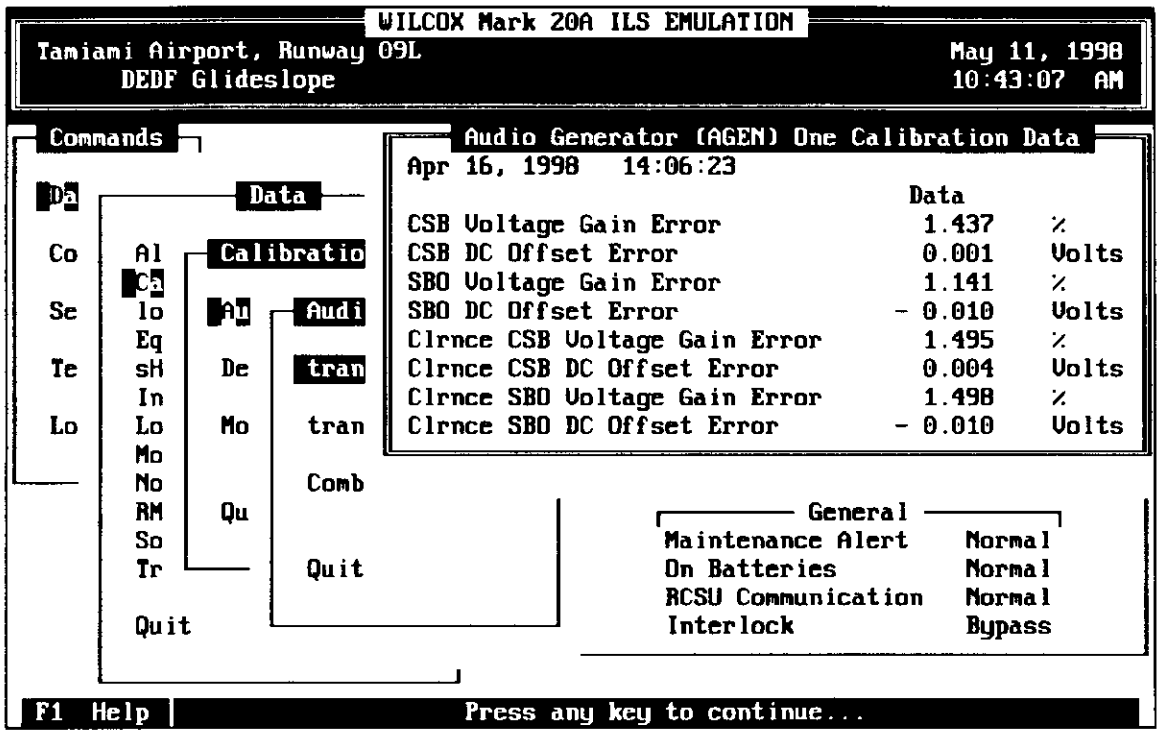
WARNING

During this test, the normal ILS signal is corrupted as different elements of the audio cca are calibrated, disrupting normal ILS signal monitoring and possibly resulting in alarm and shutdown (if not bypassed).




WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
10:42:11 AM
Commands
System Status
WARNING
Performing audio generator calibration should only be done when first installing an ILS, after replacing the Audio Generator Board, or at periodic maintenance intervals.
ARE YOU SURE YOU WANT TO PERFORM AUDIO GENERATOR CALIBRATION ?
Yes
No
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
10:42:21 AM
Commands
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field Normal Normal No
Standby Normal Normal No
Tests
Calibration
Working on audio generator calibration...
Quit
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help



The Audio Generator Calibration data represents the measured error components removed by the Monitor during waveform calculation. Each monitor can only calibrate (and/or program) its associated Audio Generator. The allowable error limits are hard-coded within the Monitor software. Errors outside of these limits prevents successful calibration of the Audio Generator which then disables the monitors ability to program the Audio Generator. These limits are based on the Audio Generator Board's design and component tolerances. Removal of these errors during waveform calculations guarantees both the precision of the ILS modulation and the ability of the ILS to generate modulations within the specified operating limits. The calibration data is permanently stored within a Monitor file until new data replaces it as the result of executing a new Audio Generator calibration command.

There are two output channels per Audio Generator:

- Course/Path
- Clearance

and two types of waveform outputs per channel:

- CSB (carrier plus sideband)
- SBO (sideband only)

Each output signal amplitude is controlled by Digital-to-Analog Converters (DAC) configured as attenuators. The audio outputs are controlled by a 12-bit DAC and the DC output (CSB channels only) is controlled by an 8-bit DAC. The DC output sets the RF power level at the MOD/PA output.

Notice that in the Audio Generator calibration data screen there are DC offset and gain error pairs for each CSB and SBO output. These errors are measured and calculated during audio calibration and are explained as follows:

Voltage Gain Errors -

Each gain error is the measured and calculated correction necessary to assure that the magnitude of the output is an accurate representation of any programmed level. The ideal or "perfect-by-design" gain error is the typical value (see below). A (Course/Path) CSB Voltage Gain Error of +1.198 means that this output of the Audio Generator must be attenuated by 1.198% in order to achieve the desired ideal level. The hard-coded limits for Voltage Gain Errors are:

	Minimum	Typical	Maximum
CSB	+0.147	+1.198	+5.262
SBO	+0.245	+2.763	+5.262

DC Offset Errors -

Since the DC level controls the RF power level, the monitor also measures and compensates for DC offset errors produced in each CSB/SBO output path of the Audio Generator. This is essentially accomplished by programming the output for zero volts and measuring the resultant offset. The measured DC offset is then used to trim the output to zero volts during waveform programming. The hard-coded limits for DC Offset Errors, in Volts are:

	Minimum	Typical	Maximum
CSB	-0.020	0.000	+0.020
SBO	-0.012	0.000	+0.020

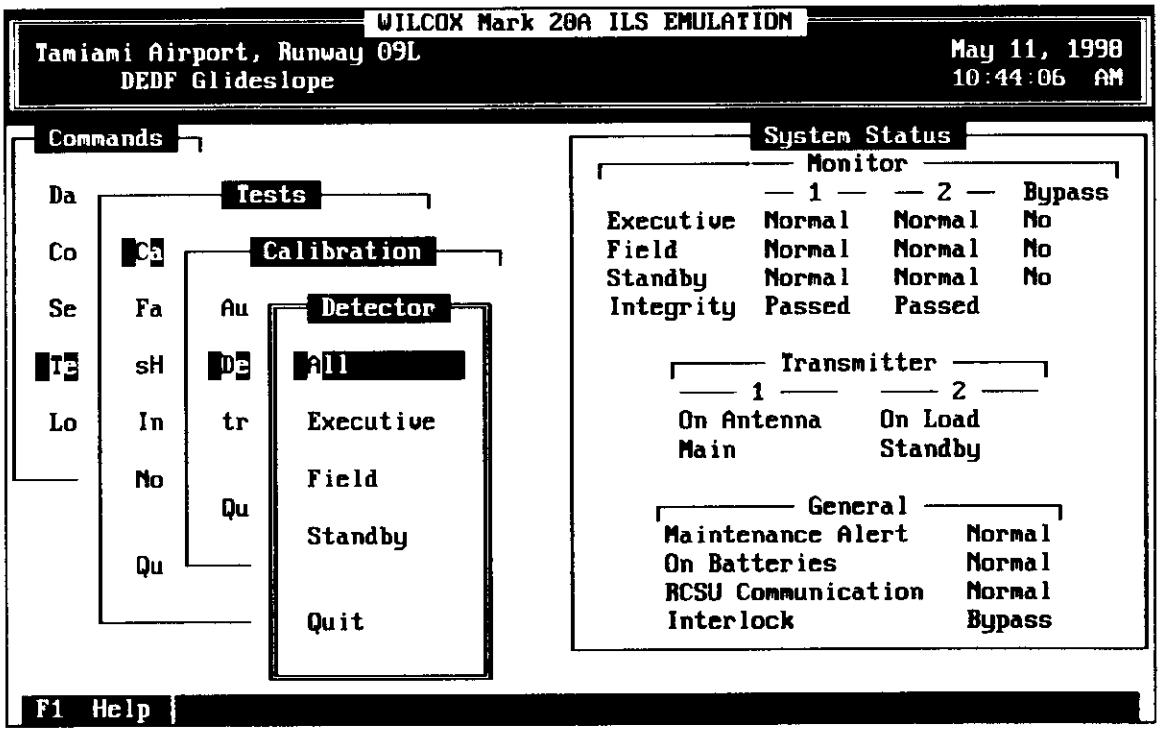
NOTE: Whenever changing an Audio Generator Board, a new calibration test MUST BE RUN, since the data is associated only with a specific Audio Generator Board.

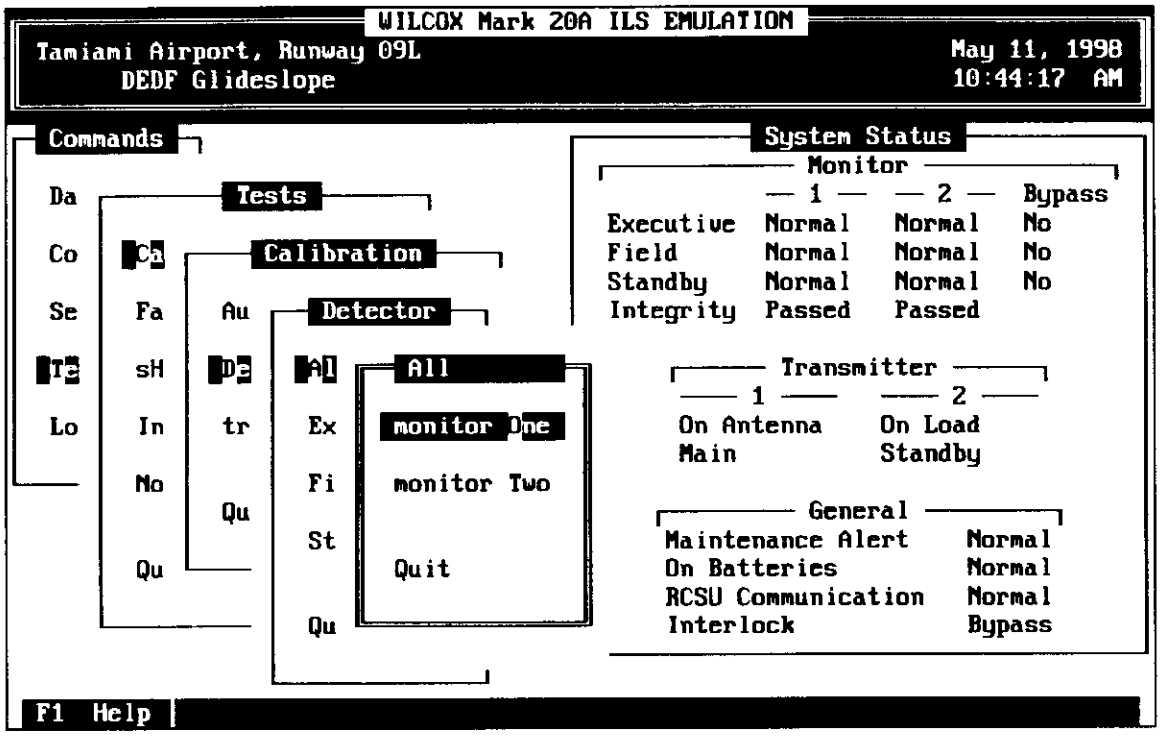
3.11.1.2 Detector Calibration Menu.- After logging onto the glide slope station, the operator may view the Detector menu screen by selecting <T C D>. This menu screen allows the operator to select <A>ll detectors for calibration (executive, field and standby), <E>xecutive monitor detector only, or <F>ield detector or <S>tandby monitor detector only for calibration. After selecting <A>ll, <E>xecutive, <Field>, or <S>tandby; the All, Executive, field or Standby menu screen is displayed. These menu screens allow the operator to select monitor <O>ne or monitor <T>wo for calibration. After selecting monitor one or monitor two, two warning screens are displayed. The first warning screen describes conditions under which detector calibration should be performed. The operator is prompted as to whether to continue detector calibration or abort. The second warning screen describes equipment configuration and status required before performing detector calibration. The operator is again prompted for a decision to continue or abort detector calibration. When calibration begins, one of four in-process messages will appear depending upon which selection was made at the Detector menu.

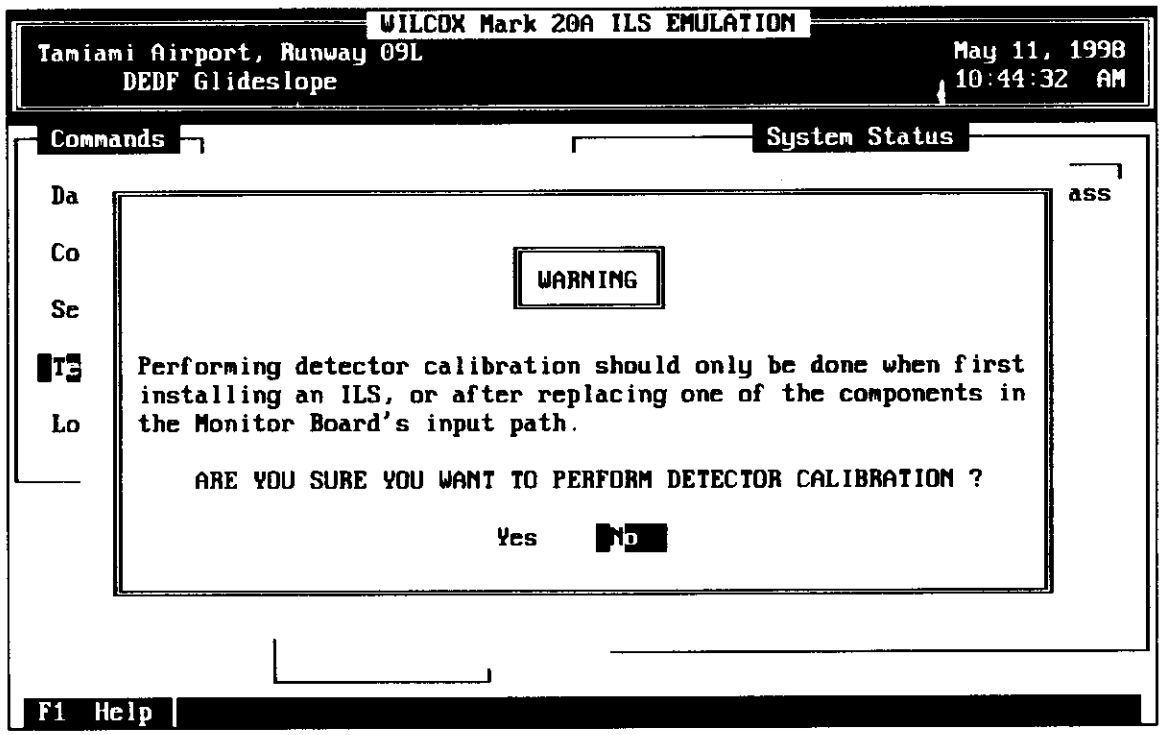
NOTE

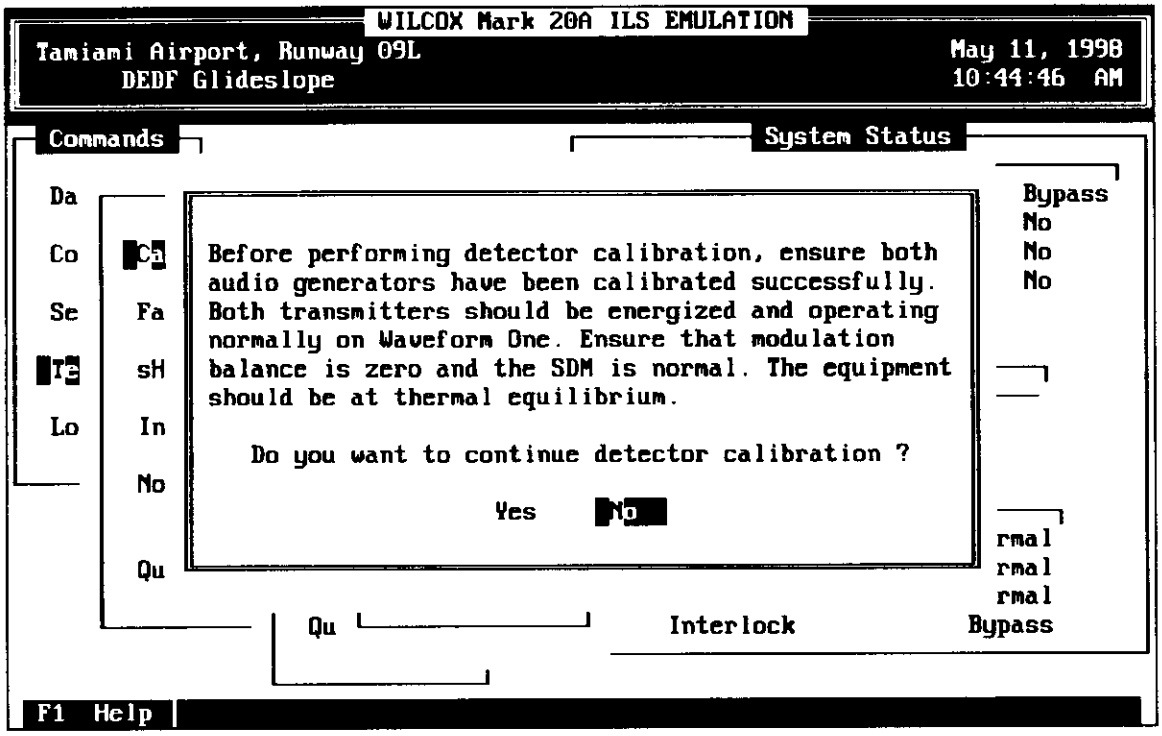
During this test, ILS signal monitoring speed is reduced.

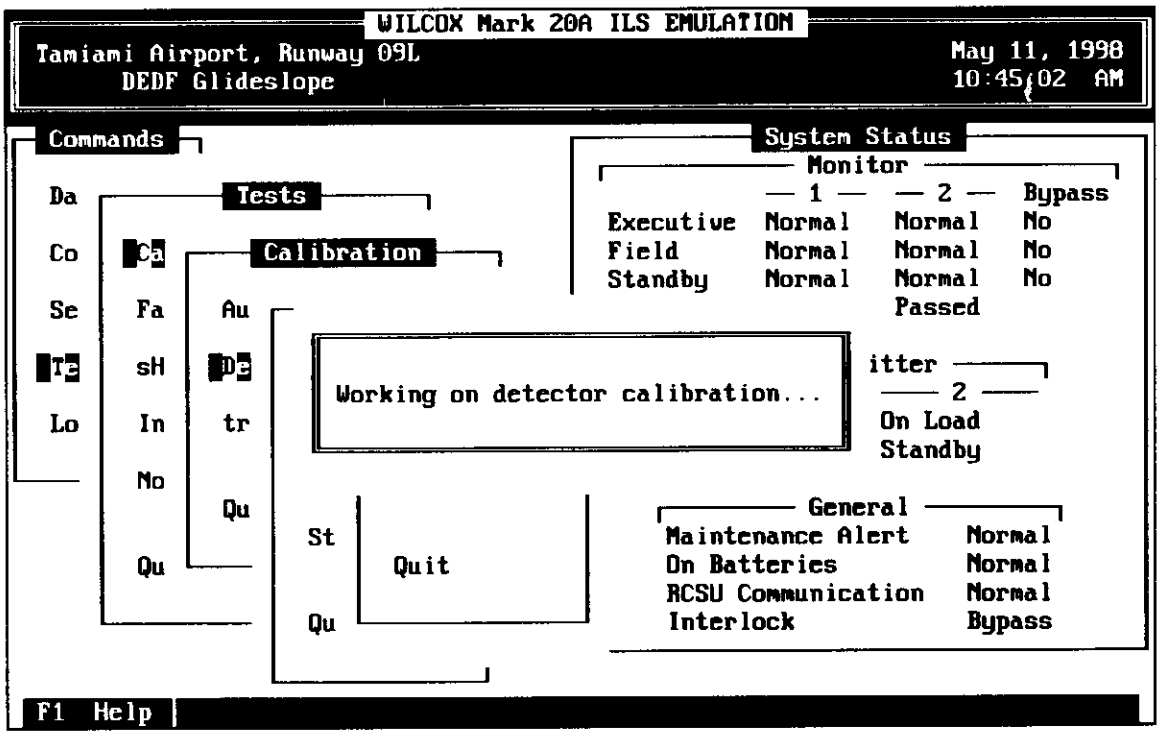
Before activating this test audio calibration data must apply to the installed audio cca.



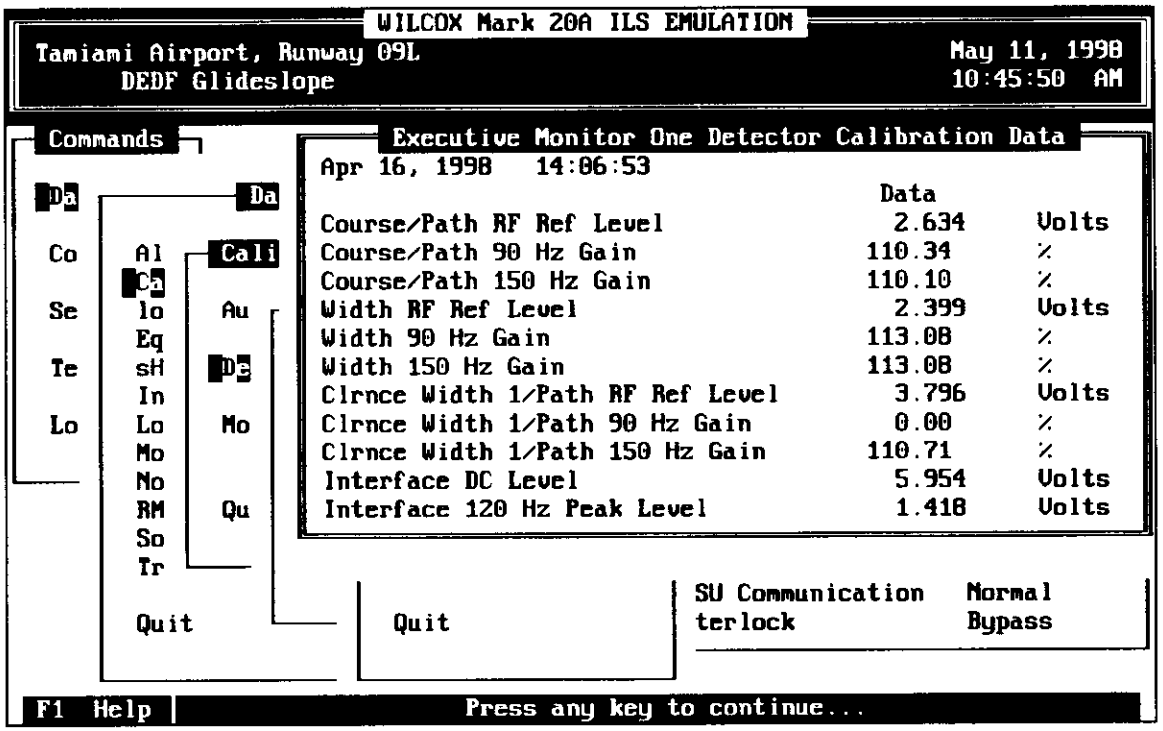

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
10:44:17 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Qu
Calibration
Au
De
tr
Qu
Detector
Al
Ex
Fi
St
Qu
All
monitor One
monitor Two
Quit
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field Normal Normal No
Standby Normal Normal No
Integrity Passed Passed
Transmitter
— 1 — — 2 —
On Antenna Main
On Load Standby
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
10:44:32 AM
Commands
System Status
Da
Co
Se
Te
Lo
ass
WARNING
Performing detector calibration should only be done when first installing an ILS, or after replacing one of the components in the Monitor Board's input path.
ARE YOU SURE YOU WANT TO PERFORM DETECTOR CALIBRATION ?
Yes No
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
10:44:46 AM
Commands
System Status
Bypass
No
No
No
Before performing detector calibration, ensure both audio generators have been calibrated successfully. Both transmitters should be energized and operating normally on Waveform One. Ensure that modulation balance is zero and the SDM is normal. The equipment should be at thermal equilibrium.
Do you want to continue detector calibration ?
Yes
No
Interlock
Bypass
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 11, 1998
10:45:02 AM
Commands
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field Normal Normal No
Standby Normal Normal No
Passed
Tests
Calibration
Working on detector calibration...
On Load
Standby
Quit
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help

3.11.1.2.1 Executive Monitor Detector Calibration Data Screen.- When executive monitor detector calibration is completed, the Executive Monitor Detector Calibration Data screen will be updated and displayed. Executive Monitor Detector One and Two Data screens are identical. Executive Monitor Two Data screen will be displayed when monitor <T>wo is selected at the Executive menu screen. When <A>ll is selected at the Detector menu, the Executive Monitor Detector Calibration Data screen is the first screen displayed. Calibration of the executive monitor detector also results in Executive Monitor Detector Calibration Data screen (paragraph 3.7.2.2.1.1) being updated.



This data represents the results of the Monitor's ILS detector signal calibration process. There are three detector data groups: Executive, Field and Standby. Prior to detector calibration, all input RF sources must be present. The SBO outputs will automatically have their amplitudes set to 0% during calibration. A detector calibration failure causes the Monitor to set the tested detector group's BIT (Built-In-Test) status to alarm until a subsequent successful calibration (plus successful normalization). Also, whenever a group's detector calibration has any parameters in alarm, no detector measurements are performed for that group (indicated by the all zero data). The detector data can be categorized in two types:

(1) Adjustments to "center" and "size" the ILS input signal.

The DC offset and gain parameters are similar to the adjustments on an oscilloscope when examining a signal with both AC and DC components.The DC offset setting provides a virtual ground reference by moving the AC signal vertically to the "CRT screen" center. The offset range is -10 to +10 Volts. The gain resembles a scope's attenuator control, but is capable of both gain and attenuation in the range of 1/3 to 2.7. These parameters and their adjustment ranges are designed to minimize errors introduced into the ILS monitoring process. Removal of the DC component prior to application of gain (or attenuation) allows a larger dynamic range for processing the AC component by the Monitor's 12 bit Analog-to-Digital converter (ADC). This maximizes the signal-to-noise ratio for the Monitor's subsequent digital signal processing, increasing the resolution of critical DDM calculations.

This portion of the detector calibration will FAIL if the input signal does not meet built-in programmed limits for both DC and AC peak-to-peak levels which guarantee the ability of the Monitor to accurately monitor the ILS signals within normal programmed alarm limits. These limits check input signal "clipping" to both the plus and minus input limits, a DC offset which is too large, or an AC peak-to-peak which is too small. Upon failure, the Monitor outputs a constant Executive alarm status until a subsequent recalibration is successful.

(2) Error adjustments to the measured ILS input signal.

After adjustments in (1) above are applied to an ILS detector signal, the result is processed into RF level (DC) plus 90Hz, 150Hz, and 1020Hz (localizer only) modulation calibration values. The 1020 Hz data is derived from a sample of the Localizer Course Position signal processed by a dedicated demodulator on the Interface Board. Eight (8) consecutive samples are averaged to achieve a higher resolution.

Calibration values "normalize" (i.e. correct) the raw detector input signals to the values specified in the Monitor's Nominals file (except for the modulation balance). The measured DDM should be nearly correct once SBO is restored and set to the proper level. These adjustments remove minor errors caused by the various ILS signal paths, including the recombining unit, detectors and Interface Board, prior to alarm processing by the monitor.

The measured DC (about 1.8 to 6.5 volts) becomes the RF Level's 100% reference relative to the nominal RF level. The measured 90 and 150 Hz modulations are used to determine the gain correction needed for the "Nominal" SDM (not the programmed SDM). The Modulation balance is assumed to be 0 DDM (except for the Glideslope clearance signal). The correction values should be between 90% to 130% (100% represents that no correction is needed to the raw signal values).

For dual equipment, the calibration values should be similar for the same signals.

Detector Calibration Data -

The following is an explanation of the Detector Calibration Screen data:

Course/Path RF Level

This data is based on the detector input level and may vary between approximately 1.8 to 6.5 volts. This measured value is used as a reference when the monitor calculates the displayed RF Level. The formula is:

$$\text{RF Level} = \frac{\text{Current RF DC level}}{\text{CAL DC level}} \times \frac{\text{Current IF DC level}}{\text{CAL IF level}} \times 100\%$$

Course/Path 90 Hz Gain

The calculated gain error factor represents the multiplier necessary in order for the monitor to display the ideal SDM (i.e. 40% for the Loc). It is calculated using the following formula:

$$\text{Gain Error} = \frac{\text{SDM}}{100\%} \times \frac{\text{AC Peak (detector)}}{\text{DC level (detector)}}$$

The displayed SDM value is then calculated using the following formula:

$$SDM = \frac{\text{DC level}}{\text{AC Peak}} \times \frac{\text{Current IF AC Peak}}{\text{CAL IF AC Peak}} \times \text{Gain Error} \times 100\%$$

Course/Path 150 Hz Gain

The calculated gain error factor represents the multiplier necessary in order for the monitor to display the ideal SDM (i.e. 40% for the Loc).It is calculated using the following formula:

$$\text{Gain Error} = \frac{\text{SDM}}{100\%} \times \frac{\text{AC Peak (detector)}}{\text{DC level (detector)}}$$

The displayed SDM value is then calculated using the following formula:

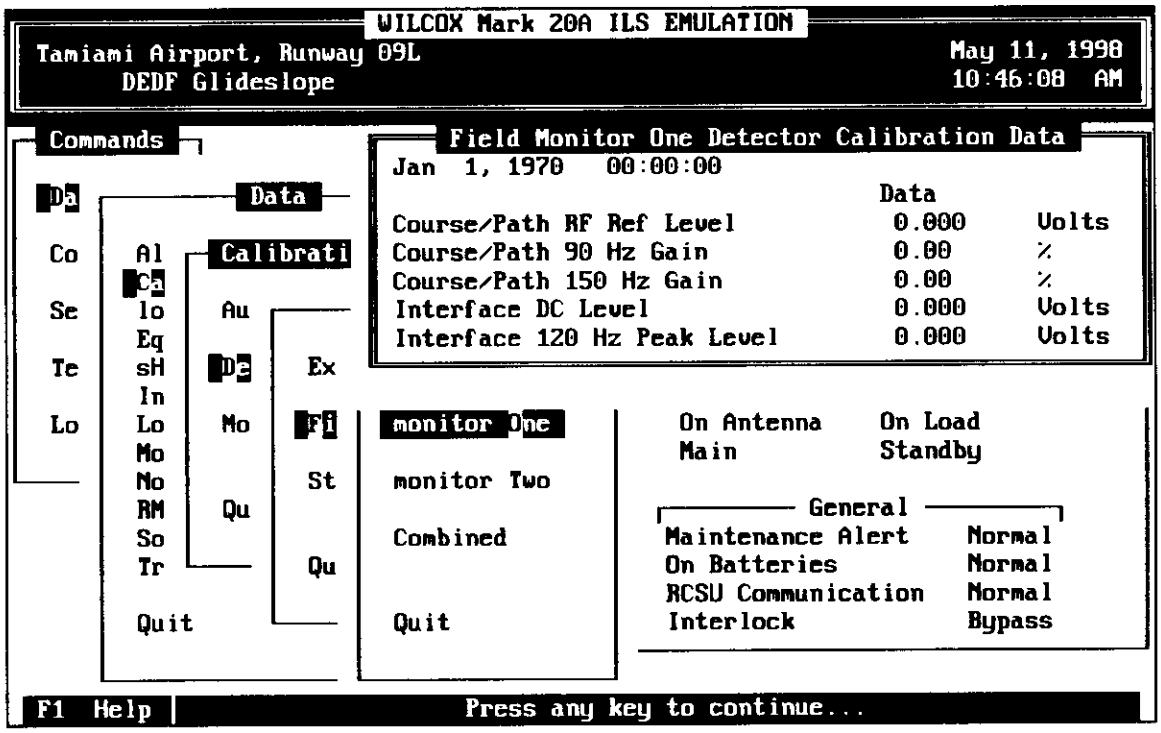
$$SDM = \frac{\text{DC level}}{\text{AC Peak}} \times \frac{\text{Current IF AC Peak}}{\text{CAL IF AC Peak}} \times \text{Gain Error} \times 100\%$$

The Width and Clearance measurements and measurement error correction factors work as described for the Course/Path signals.

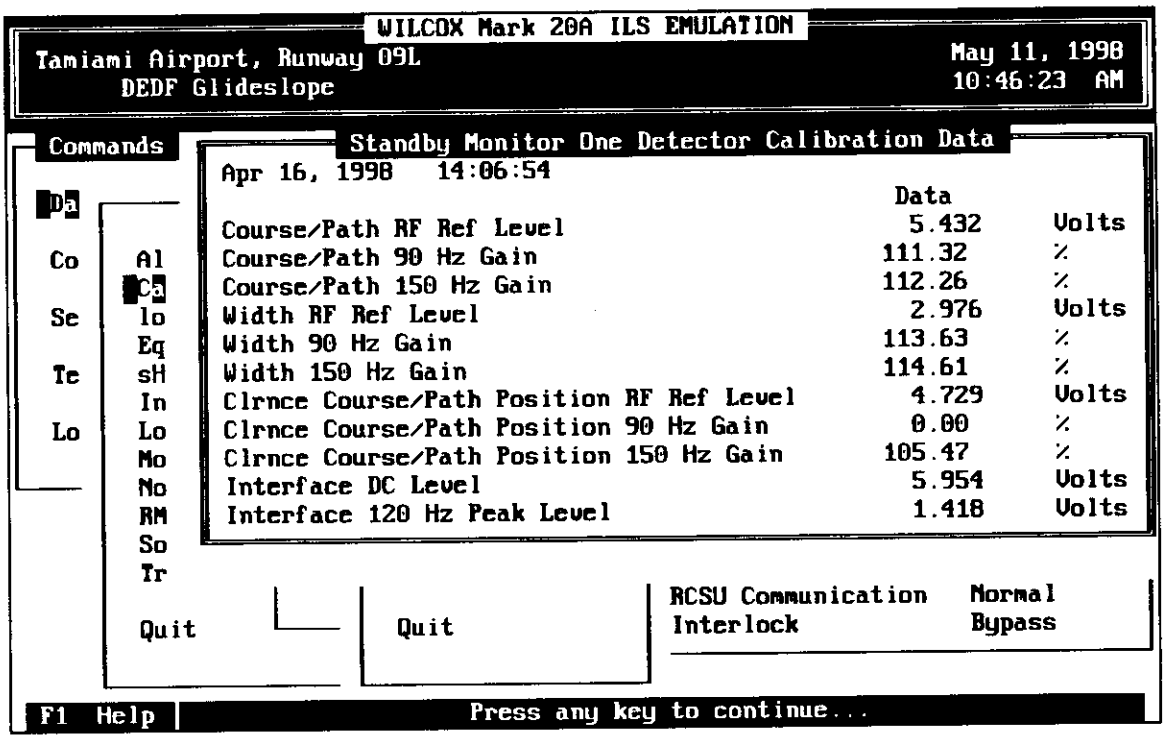
Interface (IF) DC Level	6.480	Volts
Interface (IF) 120 Hz Peak Level	1.596	Volts

The 120 Hz signal is a test signal generated on the Interface Board and measured by the Monitor during calibration and concurrently with Monitor measurements. Typical values are shown above. This data is used in formulas (1) and (3) above to remove drift in the Interface Board detector demodulators due to aging or the environment.

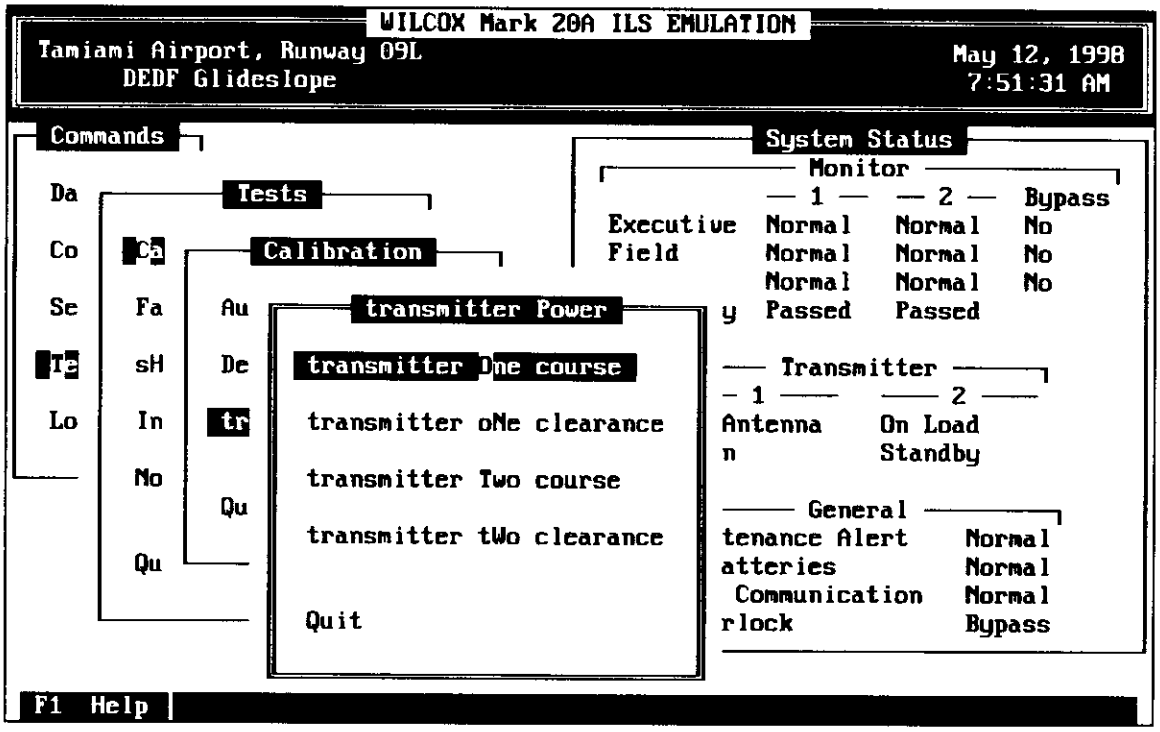
3.11.1.2.2 Field Monitor Detector Calibration Data Screen.- When field monitor detector calibration is completed, the field Monitor Detector Calibration Data screen will be updated and displayed. Field Monitor Detector One and Two Data screens are identical. Field Monitor Two Data screen will be displayed when monitor <T>wo is selected at the Standby menu screen. When <A>ll is selected at the Detector menu, the Field Monitor Detector Calibration Data screen is the second screen displayed and is selected by typing any key from the Executive Monitor Detector Calibration Data screen. Calibration of the field monitor detector also results in Field Monitor Detector Calibration Data screen (paragraph 3.7.2.2.2.1) being updated.



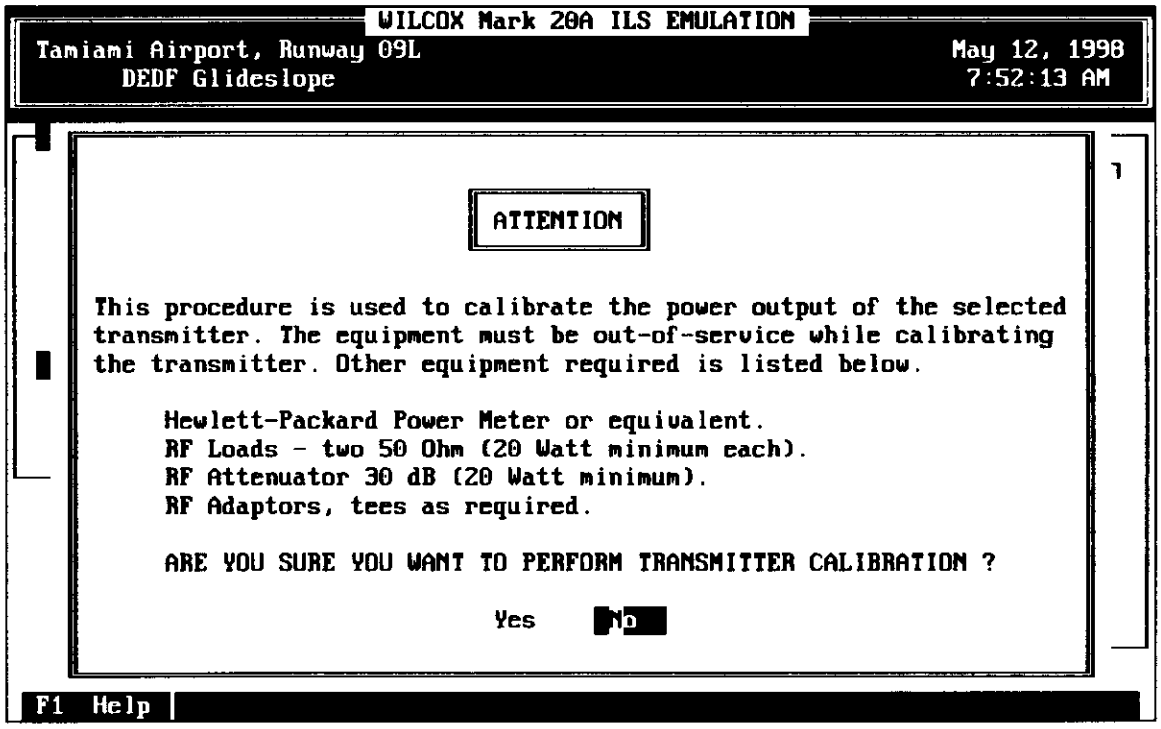
3.11.1.2.3 Standby Monitor Detector Calibration Data Screen.- When standby monitor detector calibration is completed, the Standby Monitor Detector Calibration Data screen will be updated and displayed. Standby Monitor Detector One and Two Data screens are identical. Standby Monitor Two Data screen will be displayed when monitor <T>wo is selected at the Standby menu screen. When <A>ll is selected at the Detector menu, the Standby Monitor Detector Calibration Data screen is the second screen displayed and is selected by typing any key from the Executive Monitor Detector Calibration Data screen. Calibration of the standby monitor detector also results in Standby Monitor Detector Calibration Data screen (paragraph 3.7.2.2.3.1) being updated.



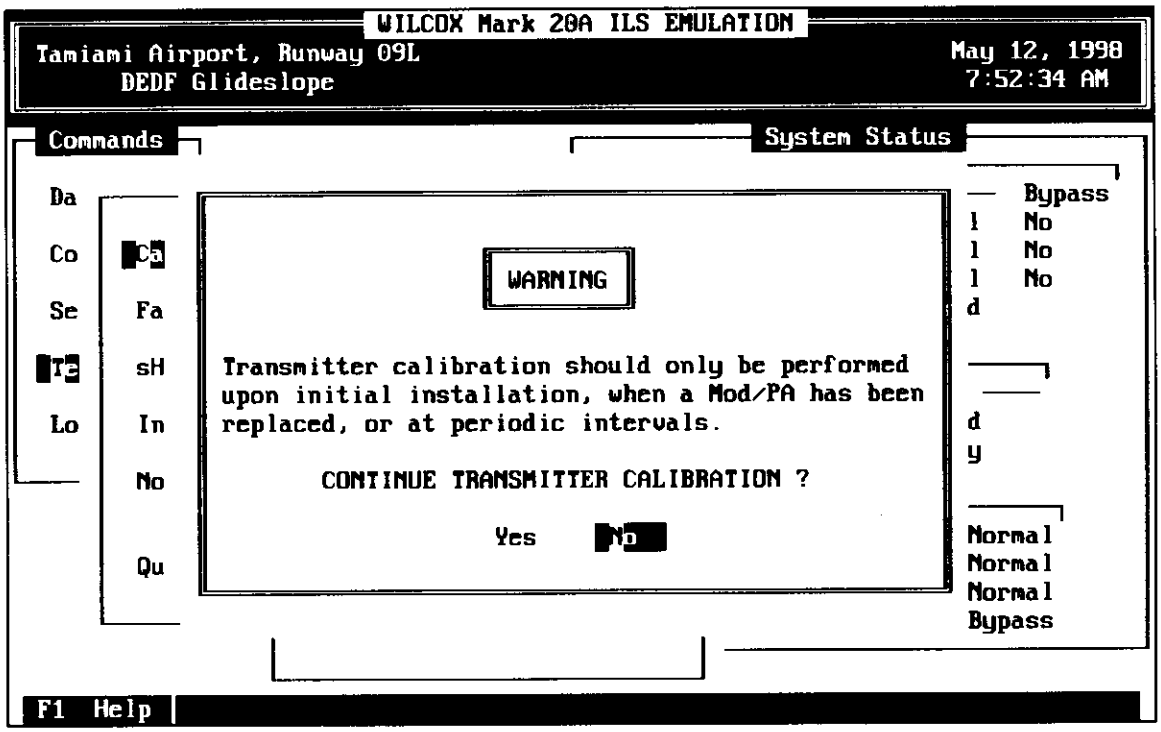
3.11.1.3 Transmitter Power Calibration Screen.- After logging onto the glide slope station, the operator may perform transmitter power calibration by selecting <T C P>. Selecting transmitter <P>ower on the Calibration menu screen brings up the Transmitter Power menu screen that allows the operator to choose which of the four transmitters to calibrate. Once a transmitter has been selected to calibrate, the operator will be prompted by the screen messages through the calibration procedure. The purpose of this test is to adjust the transmitter power output and then to adjust the pmdt transmitter data screen power reading so that it agrees with the power measured on the HP power meter. Read and follow the screen instructions carefully. The procedure for each transmitter is nearly identical. The exception is that the clearance transmitters do not have an sbo output. Before proceeding, familiarize yourself to the modulator/power amplifier controls as to function and location. Refer to figures 11-33 and 11-34.

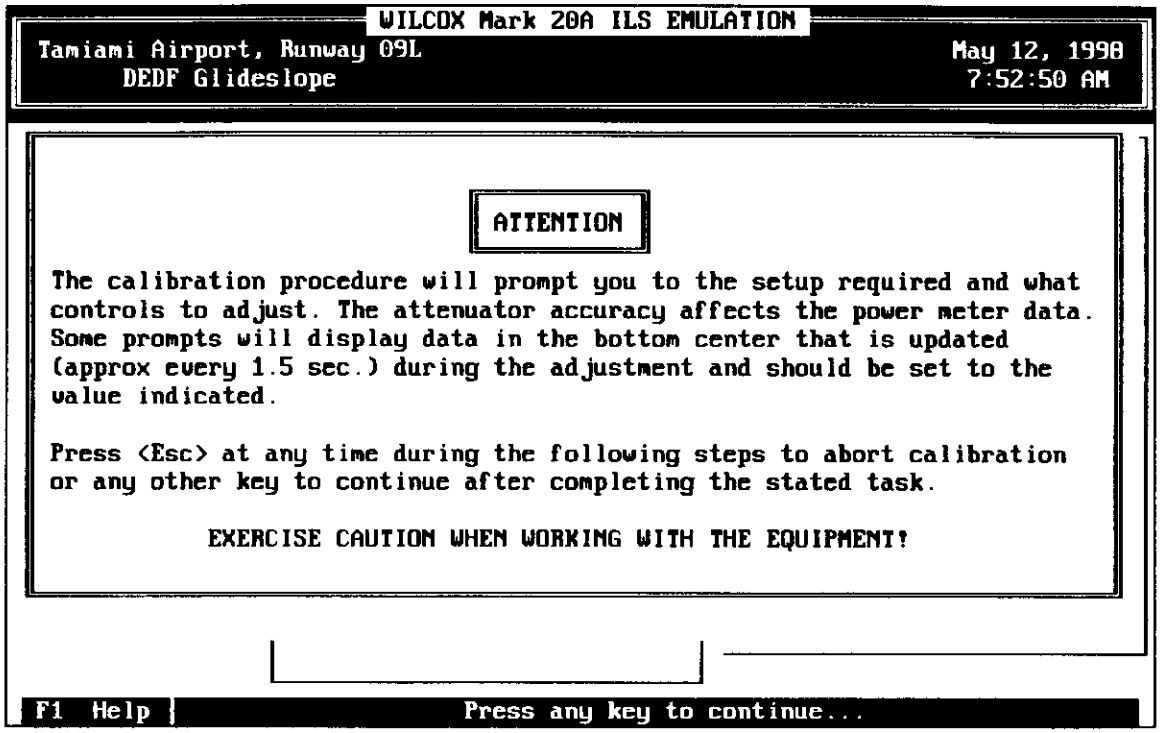


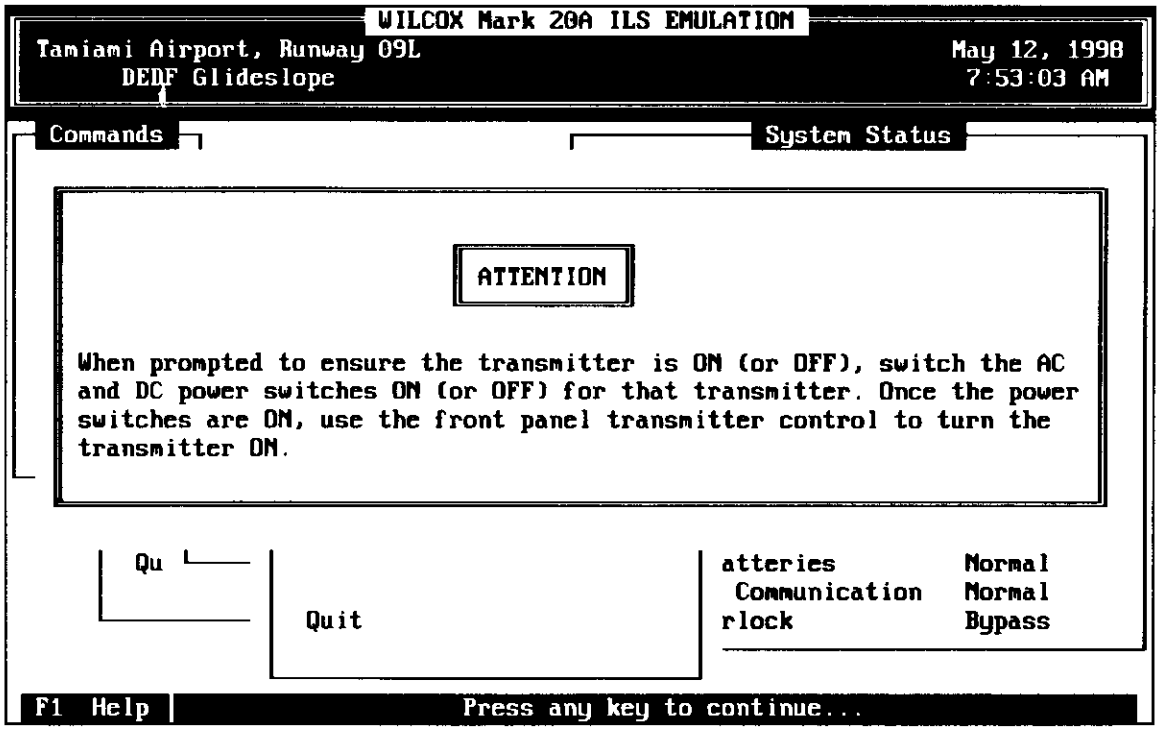
3.11.1.3.1 Display ATTENTION Screen.- After selecting a transmitter, the following screen is displayed. Note that the system must be taken out of service for this procedure. Test equipment required is an HP 436A or 437B power meter, two 20-watt (minimum) 50-ohm loads, a 30-dB rf attenuator, a test cable with known rf loss (recommended), and miscellaneous adapters. The rf attenuator may be connected directly to the output jack of the modulator/PA assembly but to prevent stress on the connector, it is recommended that the attenuator be connected via a calibrated test cable. This is a TNC female connector. An adapter is required if the attenuator is other than a TNC male connector. The accuracy of the 30-dB attenuator will directly affect the accuracy of the measurements. Be sure to perform the required calibration of the power meter. Refer to the HP instruction manual for this procedure. A T-adapter is required to connect directly to the modulator/power amplifier TNC output jack and the two 50-ohm loads to form a 25-ohm load for the vswr calibration.

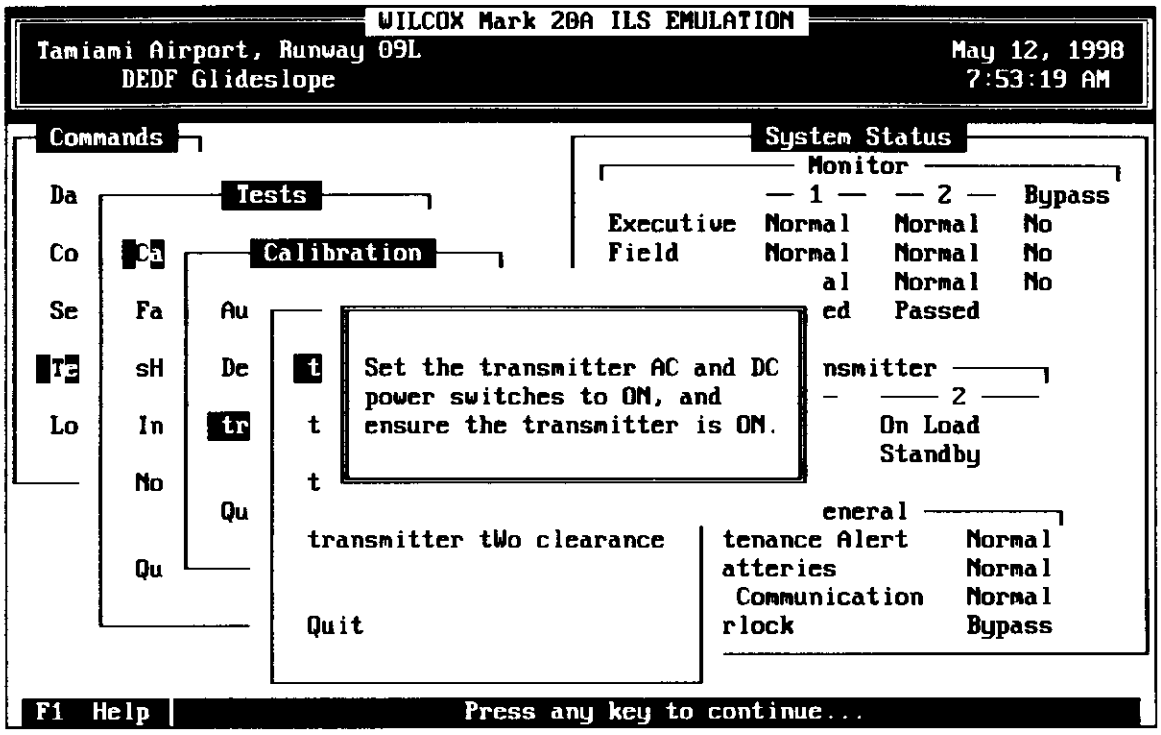


3.11.1.3.2 Display WARNING/ATTENTION Screens.- After selecting <YES>, the following screens are displayed. The warning message informs the user about when to perform the transmitter power calibration and offers an opportunity to exit the procedure. The operator may also exit the procedure at any point by pressing the <Esc> key. Note that the AC and DC switches must be set to the OFF position when the instructions require that the transmitters be turned off. The reason for this is that the transmitters may go into a vswr shutdown mode if the load is removed even though the transmitter is stepped off. Removing the power will preclude this from happening. TURN OFF ONLY THE AC AND DC SWITCHES FOR THE EQUIPMENT BEING ADJUSTED. IF YOU ARE ADJUSTING TRANSMITTER ONE EQUIPMENT, TURN EQUIPMENT ONE AC AND DC SWITCHES OFF. EQUIPMENT TWO AC AND DC SWITCHES MUST REMAIN ON. DO NOT TURN OFF BOTH EQUIPMENT ONE AND EQUIPMENT TWO SWITCHES. Failure to turn the AC and DC power off will not damage the transmitters however, you may have to recycle the power to reset the vswr shutdown circuit.

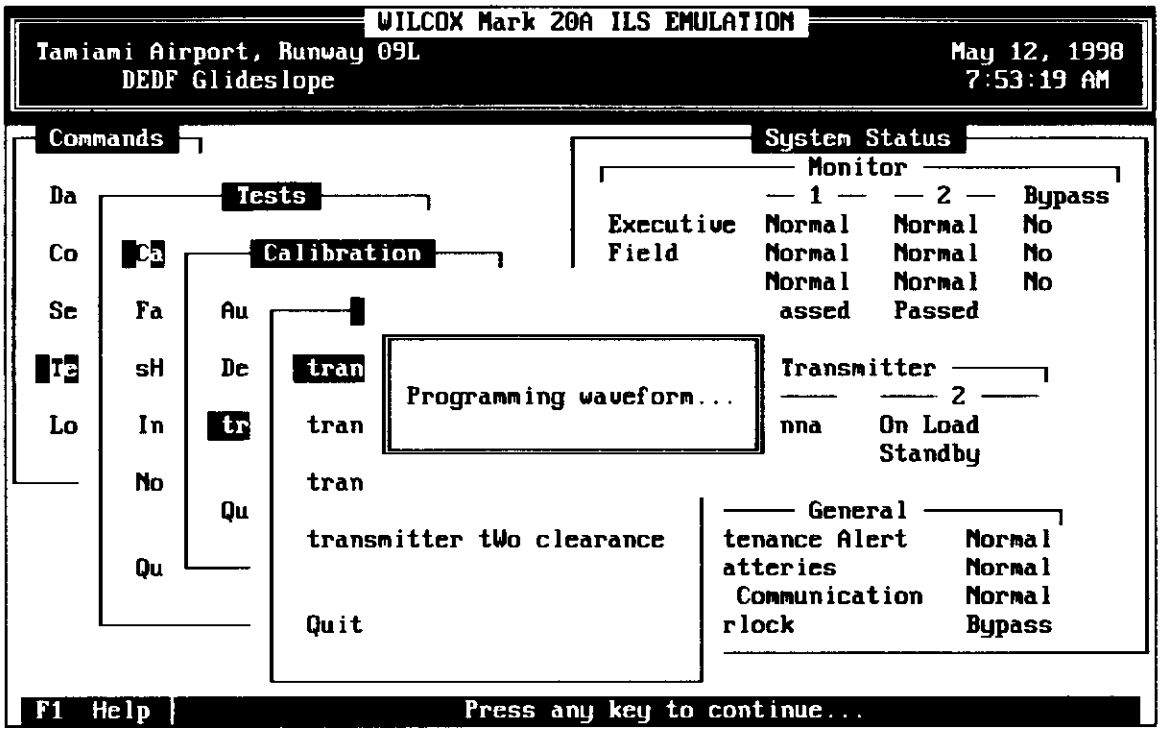


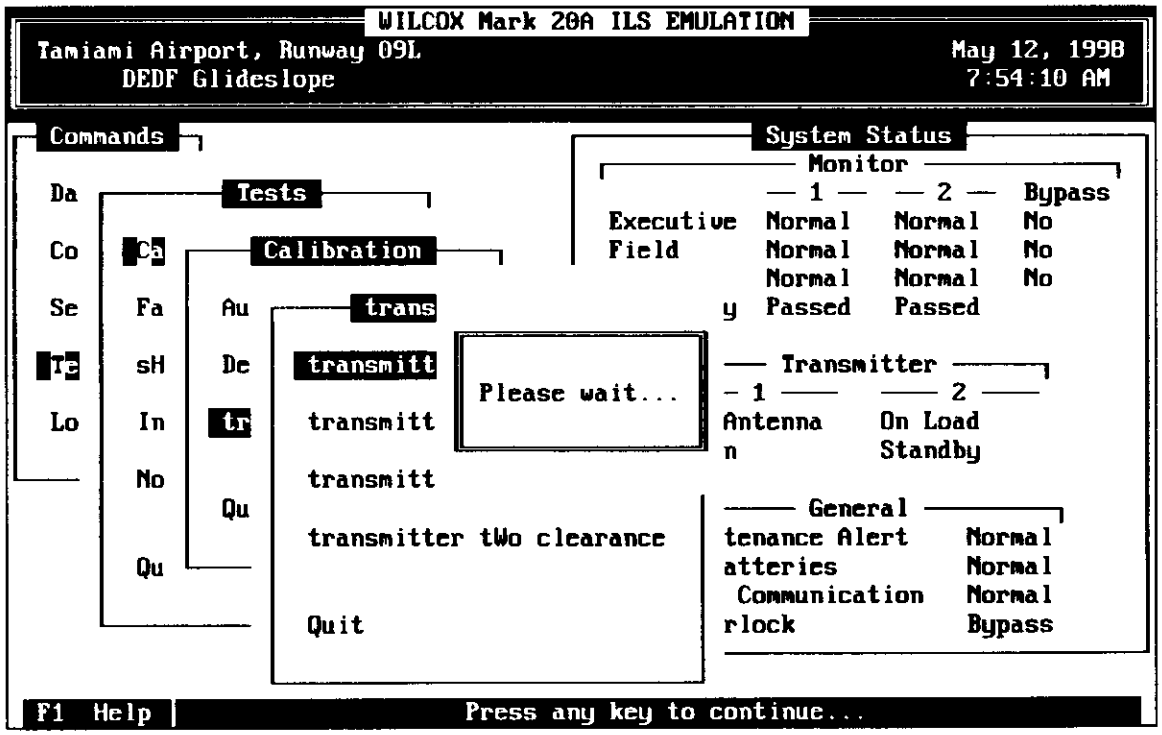

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
7:52:50 AM
ATTENTION
The calibration procedure will prompt you to the setup required and what controls to adjust. The attenuator accuracy affects the power meter data. Some prompts will display data in the bottom center that is updated (approx every 1.5 sec.) during the adjustment and should be set to the value indicated.
Press <Esc> at any time during the following steps to abort calibration or any other key to continue after completing the stated task.
EXERCISE CAUTION WHEN WORKING WITH THE EQUIPMENT!
F1 Help
Press any key to continue...


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
7:53:03 AM
Commands
System Status
ATTENTION
When prompted to ensure the transmitter is ON (or OFF), switch the AC and DC power switches ON (or OFF) for that transmitter. Once the power switches are ON, use the front panel transmitter control to turn the transmitter ON.
Qu
Quit
atteries Normal
Communication Normal
rlock Bypass
F1 Help
Press any key to continue...

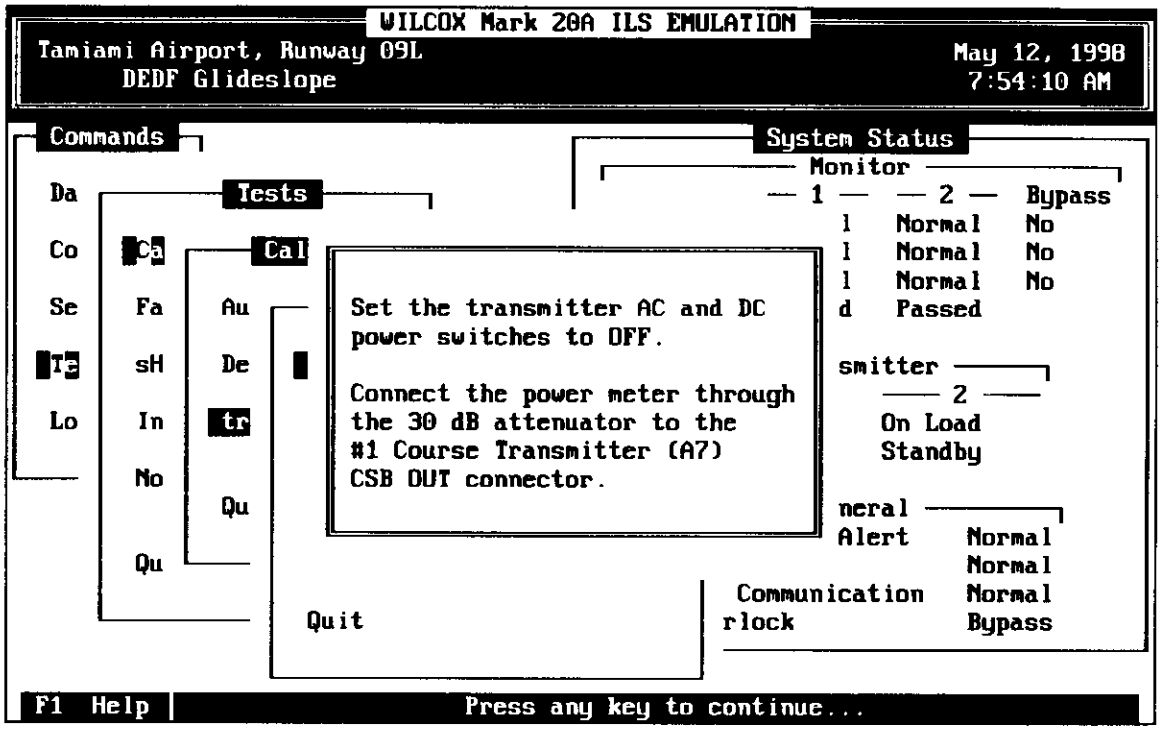

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
7:53:19 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Qu
Calibration
Au
De
tr
Qu
t
t
t
Set the transmitter AC and DC power switches to ON, and ensure the transmitter is ON.
transmitter tWo clearance
Quit
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field Normal Normal No
al Normal No
ed Passed
nsmitter
— — 2 —
On Load
Standby
eneral
tenance Alert Normal
atteries Normal
Communication Normal
rlock Bypass
F1 Help
Press any key to continue...

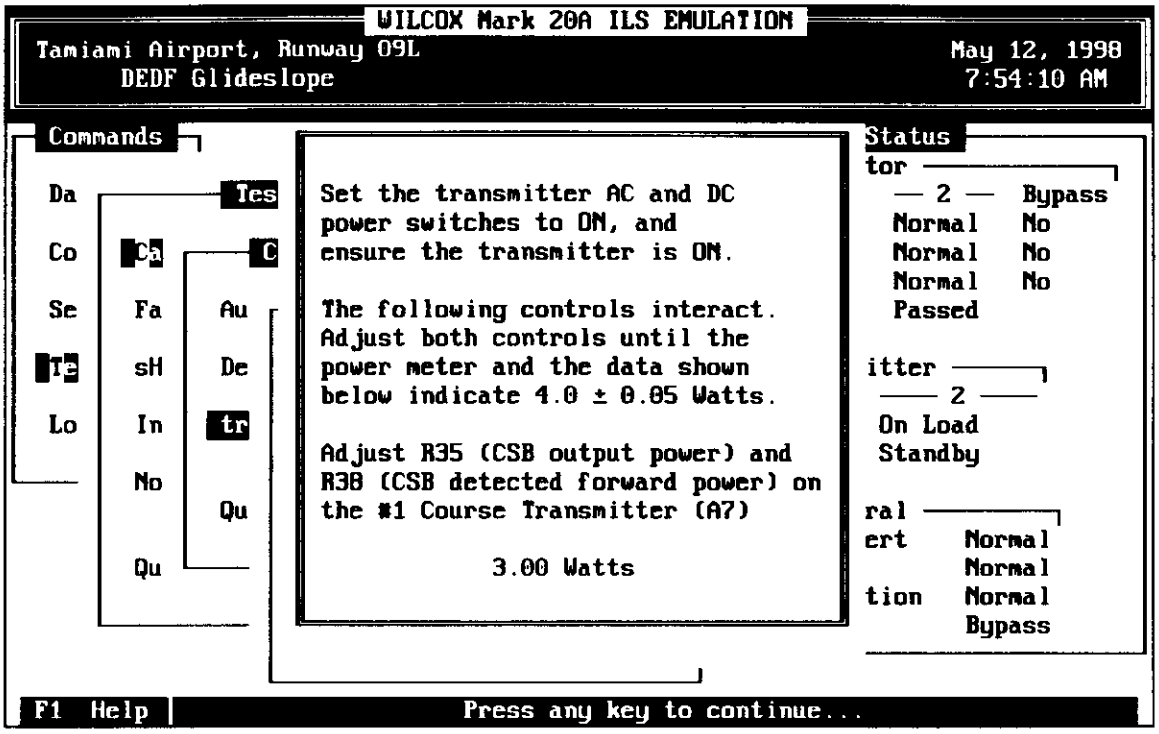
3.11.1.3.3 Programming Waveform Screen.- The software will reprogram the transmitter waveform for this calibration procedure. During this procedure, the transmitter csb and sbo outputs will be an unmodulated cw output. The message "Please wait" will appear throughout this procedure as the equipment is programmed for the next step.

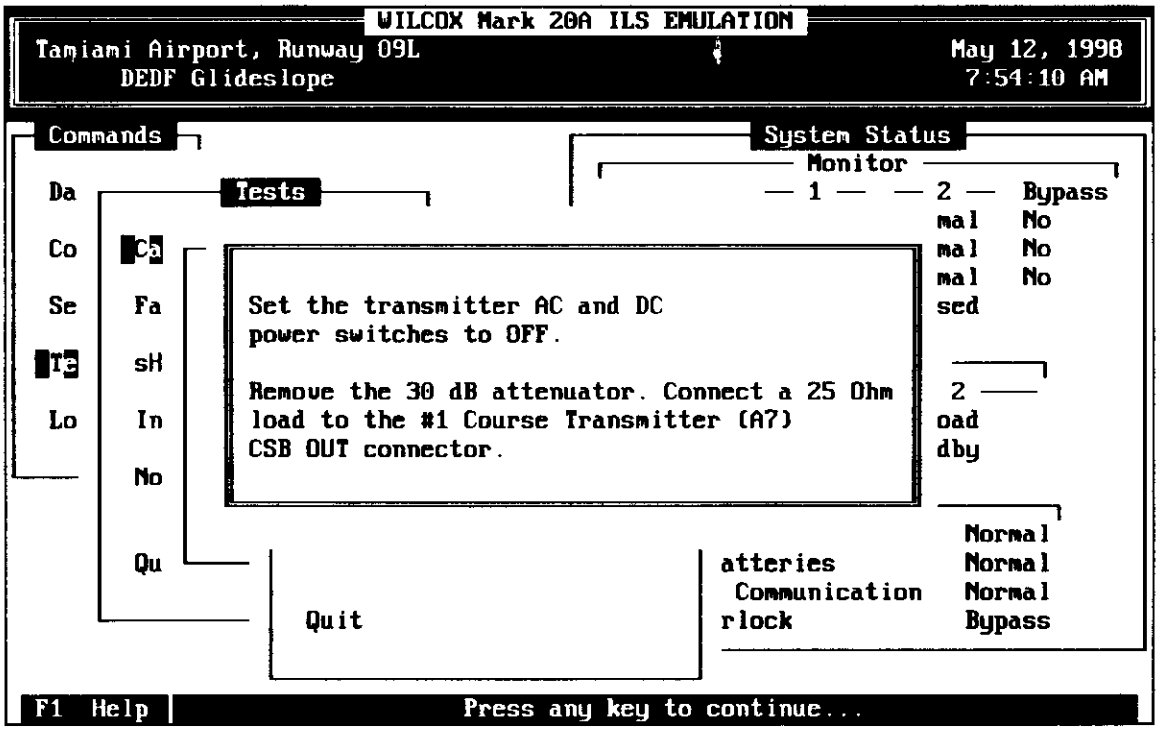




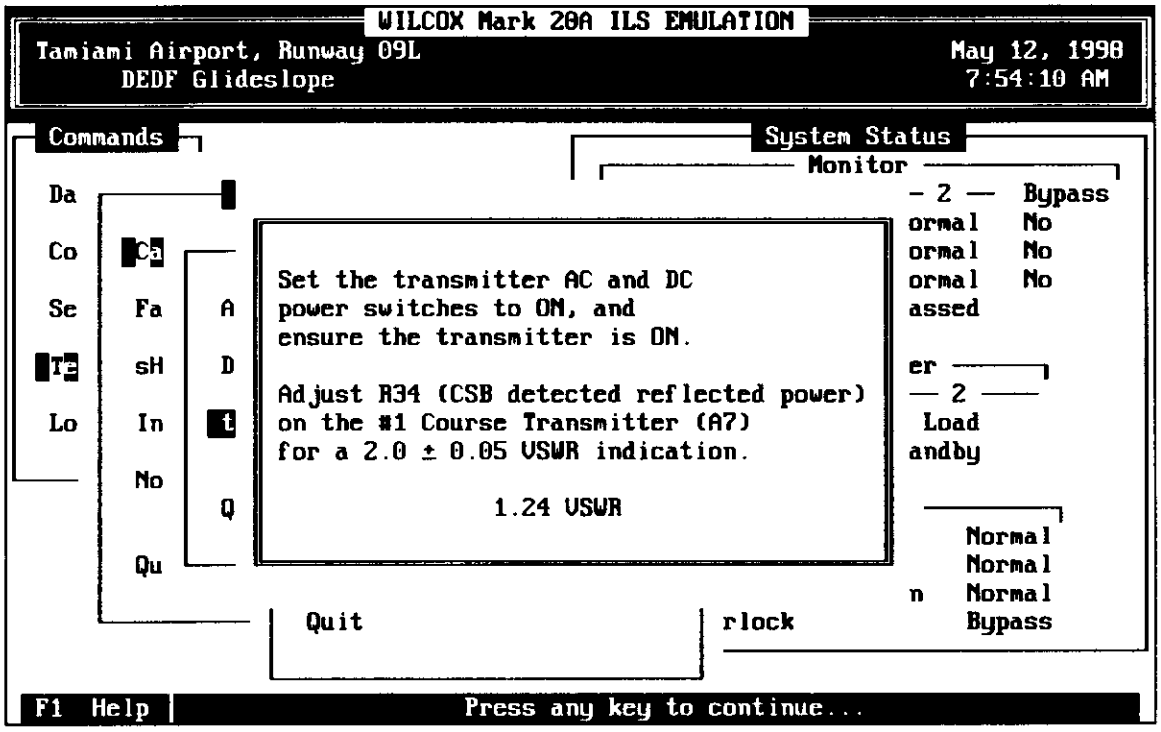
3.11.1.3.4 Adjusting CSB Power Output.- The software has programmed the audio generator to produce 5-volts dc at the csb control input of the selected modulator/power amplifier. The requirement is that the rf output be adjusted for 4.0 ±0.05 watts with a 5-volt dc input. On the modulator/power amplifier assembly, locate potentiometers R35 and R38. Adjust R35 for the required output power as measured on the HP power meter. Note that R35 will change the output power and will also change the power displayed at the bottom of this screen. When adjustment of R35 is complete, adjust R38 so that the displayed power reading on the pmdt is 4.0 ±0.05 watts. Note that R38 affects primarily the displayed power but may also affect the output power slightly. Re-check the power output on the HP power meter after adjusting R38. Alternately adjust both controls until the meter and the data on the screen indicate 4.0 ±0.05 watts. This is the data that is normally displayed on the transmitter data screen.

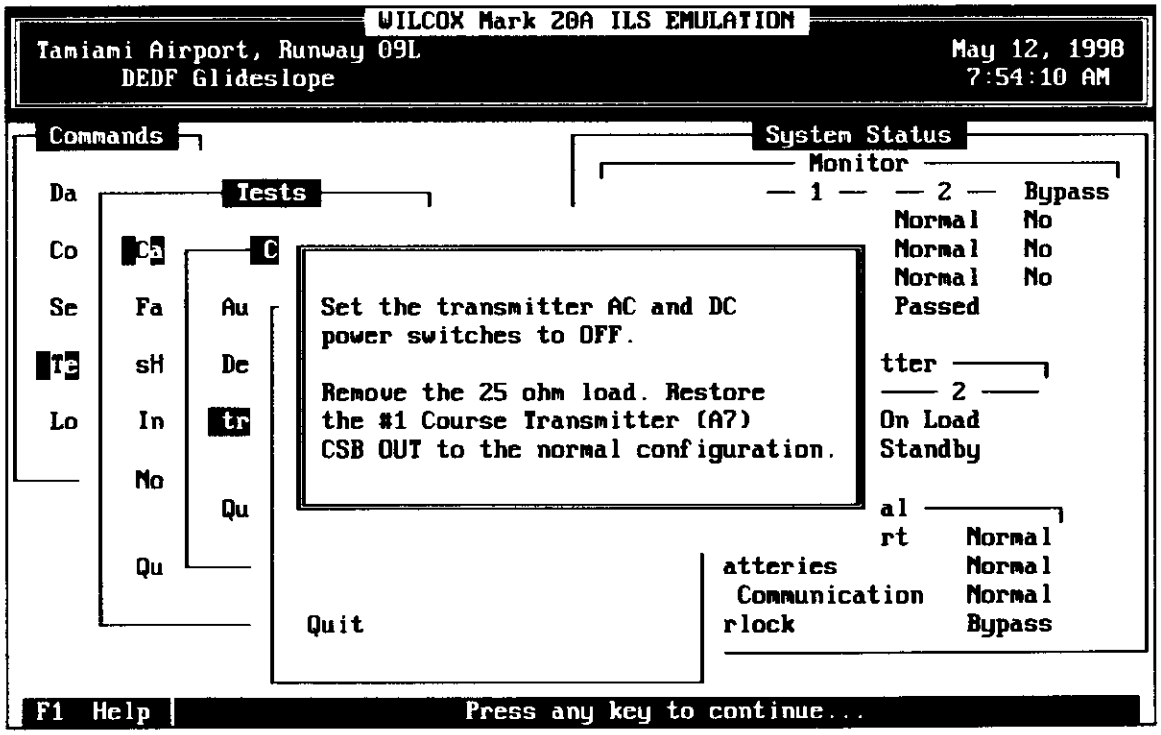



WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
7:54:10 AM
Commands
Da
Co
Se
Te
Lo
Tes
Ca
Fa
sH
In
No
Qu
C
Au
De
tr
Qu
Set the transmitter AC and DC power switches to ON, and ensure the transmitter is ON.
The following controls interact. Adjust both controls until the power meter and the data shown below indicate 4.0 ± 0.05 Watts.
Adjust R35 (CSB output power) and R38 (CSB detected forward power) on the #1 Course Transmitter (A7)
3.00 Watts
Status
tor
— 2 — Bypass
Normal No
Normal No
Normal No
Passed
itter
— 2 —
On Load
Standby
ral
ert Normal
Normal
tion Normal
Bypass
F1 Help
Press any key to continue...

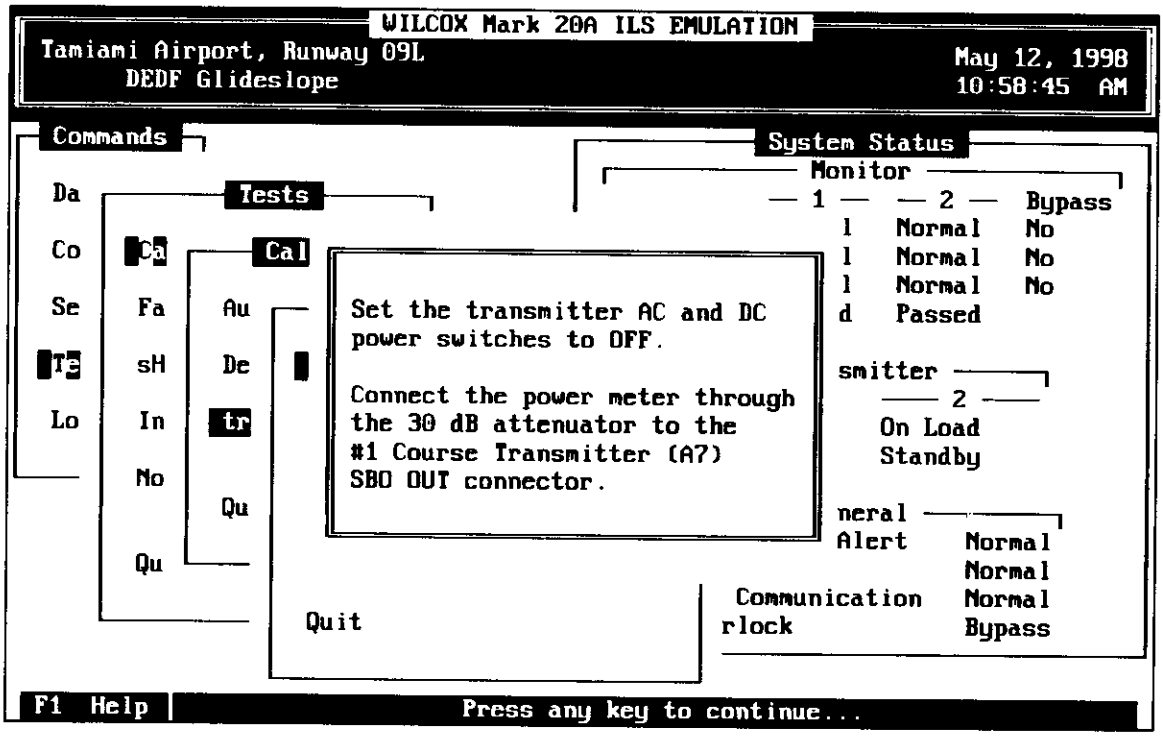

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
7:54:10 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Qu
Set the transmitter AC and DC power switches to OFF.
Remove the 30 dB attenuator. Connect a 25 Ohm load to the #1 Course Transmitter (A7) CSB OUT connector.
Quit
System Status
Monitor
— 1 — — 2 — Bypass
mal No
mal No
mal No
sed
2 —
oad
dby
Normal
atteries Normal
Communication Normal
rlock Bypass
F1 Help
Press any key to continue...

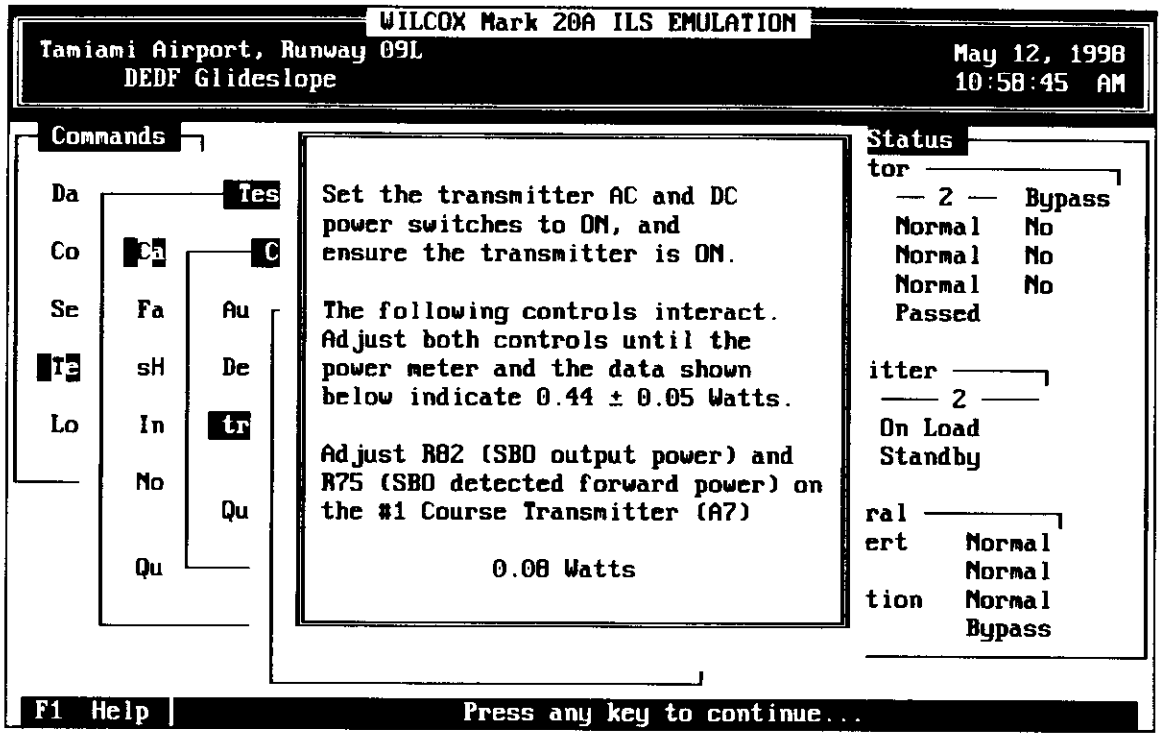
3.11.1.3.5 Adjusting CSB VSWR.- The purpose of this adjustment is to calibrate the csb vswr reading displayed on the pmdt. To accomplish this, a load (25 ohms) is connected to the csb output of the modulator/power amplifier assembly. The 25-ohm load is made by connecting two 50-ohm loads in parallel using a T-adapter. The 25-ohm load represents a 2:1 vswr. Locate R34 on the modulator/power amplifier assembly. Adjust R34 until the indicated vswr on the pmdt is 2.0 ±0.05. This is the csb vswr normally displayed on the pmdt transmitter data screen.

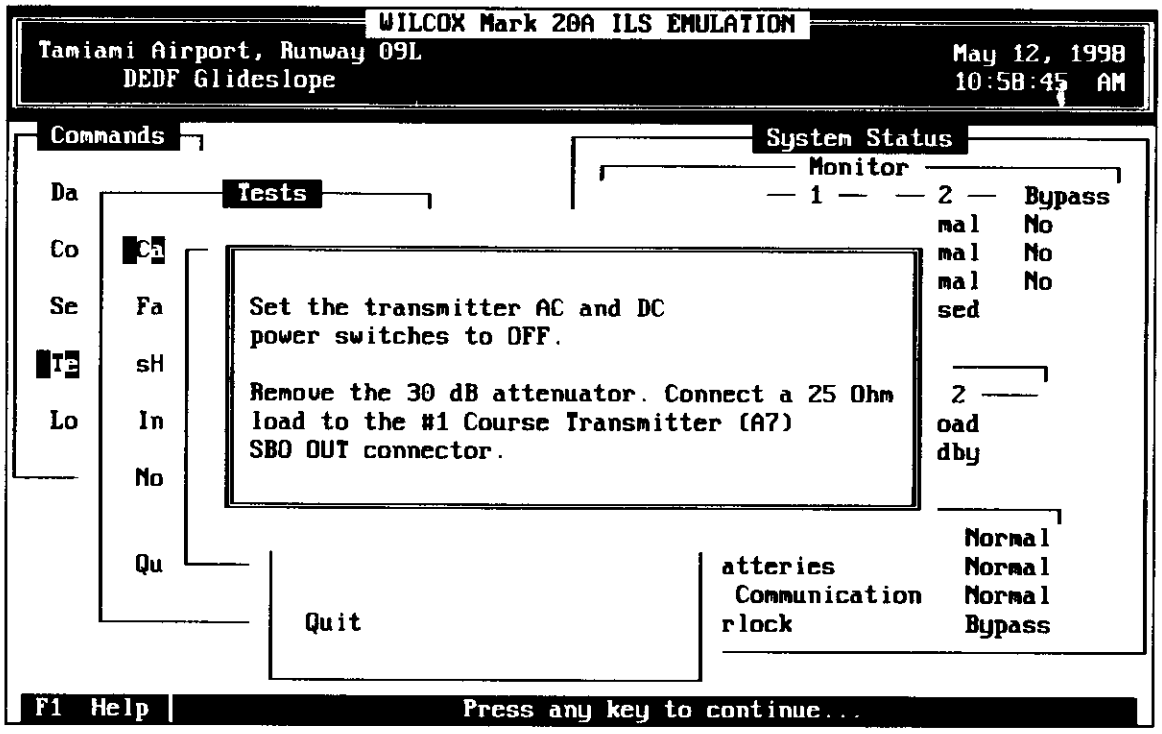




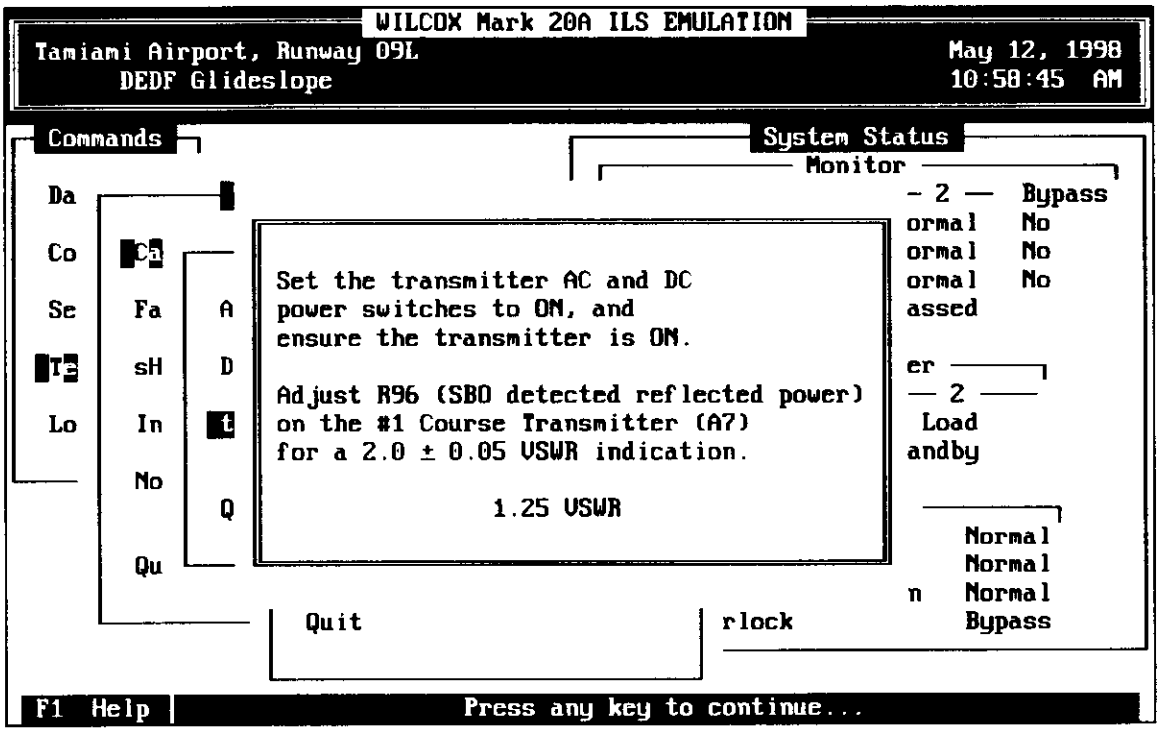
3.11.1.3.6 Adjusting SBO Power Output.- The software has programmed the audio generator to produce 3.2-volts dc at the sbo control input of the selected modulator/power amplifier. The requirement is that the rf output be adjusted for 0.44 ±0.05 watts with a 3.2-volt dc input. On the modulator/power amplifier assembly, locate potentiometers R82 and R75. Adjust R82 for the required output power as measured on the HP power meter. Note that R82 will change the output power and will also change the power displayed at the bottom of this screen. When adjustment of R82 is complete, adjust R75 so that the displayed power reading on the pmdt is 0.44 ±0.05 watts. Note that R75 affects primarily the displayed power but may also affect the output power slightly. Re-check the power output on the HP power meter after adjusting R75. Alternately adjust both controls until the meter and the data on the screen indicate 0.44 ±0.05 watts. This is the data that is normally displayed on the transmitter data screen.

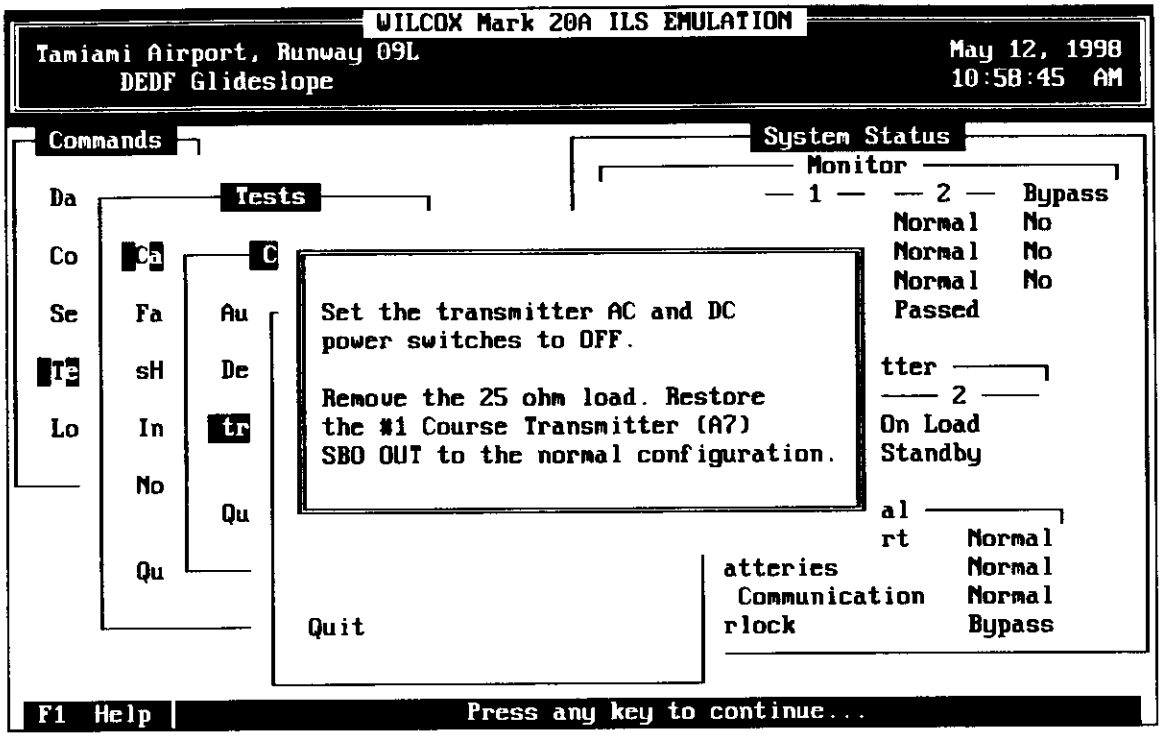


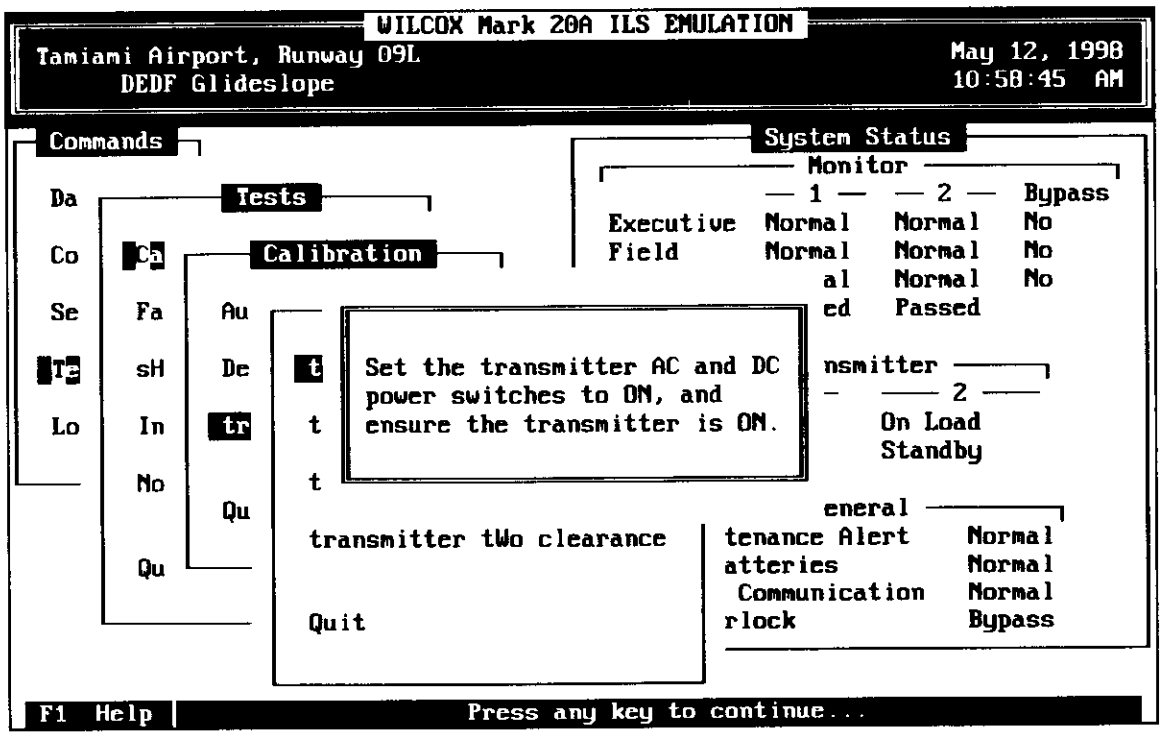

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
10:58:45 AM
Commands
Da
Co
Se
Te
Lo
Tes
Ca
Fa
sH
In
No
Qu
C
Au
De
tr
Qu
Set the transmitter AC and DC power switches to ON, and ensure the transmitter is ON.
The following controls interact. Adjust both controls until the power meter and the data shown below indicate 0.44 ± 0.05 Watts.
Adjust R82 (SBO output power) and R75 (SBO detected forward power) on the #1 Course Transmitter (A7)
0.08 Watts
Status
tor
— 2 — Bypass
Normal No
Normal No
Normal No
Passed
itter
— 2 —
On Load
Standby
ral
ert Normal
Normal
tion Normal
Bypass
F1 Help
Press any key to continue...


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
10:58:45 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Qu
Quit
Set the transmitter AC and DC power switches to OFF.
Remove the 30 dB attenuator. Connect a 25 Ohm load to the #1 Course Transmitter (A7) SBO OUT connector.
System Status
Monitor
— 1 — — 2 — Bypass
mal No
mal No
mal No
sed
2 —
oad
dby
Normal
atteries Normal
Communication Normal
rlock Bypass
F1 Help
Press any key to continue...

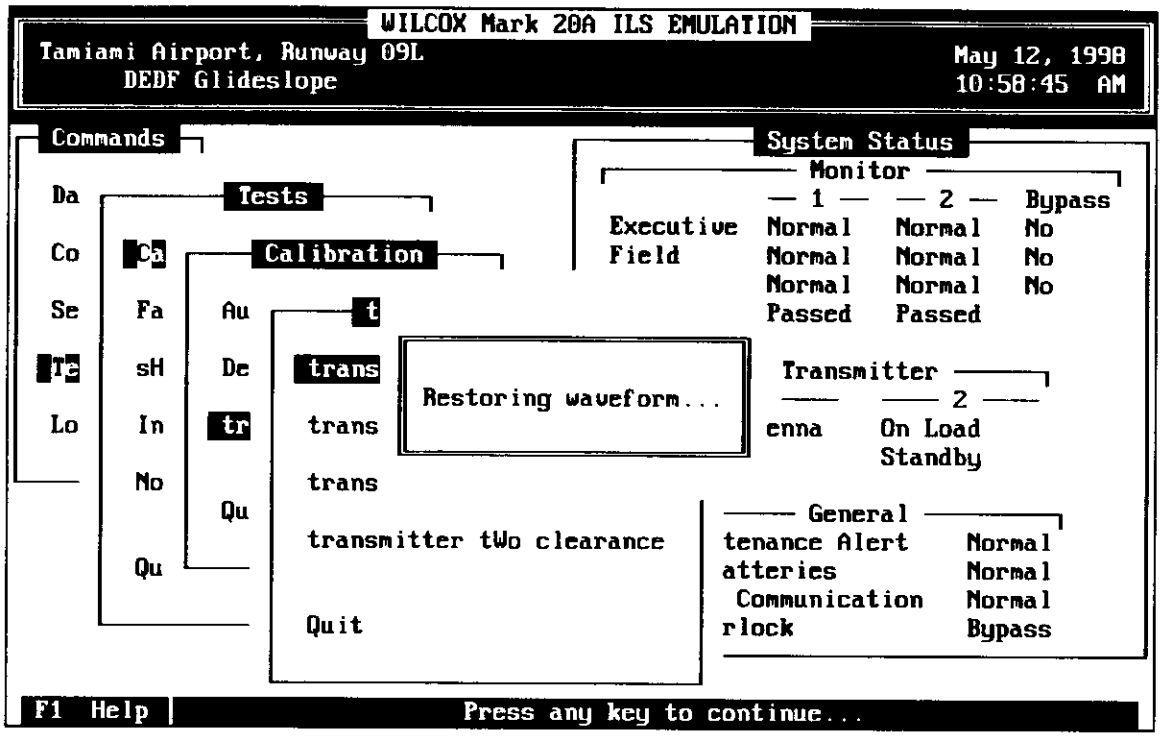
3.11.1.3.7 Adjusting SBO VSWR.- The purpose of this adjustment is to calibrate the sbo vswr reading displayed on the pmdt. To accomplish this, a load (25 ohms) is connected to the sbo output of the modulator/power amplifier assembly. The 25-ohm load is made by connecting two 50-ohm loads in parallel using a T-adapter. The 25-ohm load represents a 2:1 vswr. Locate R96 on the modulator/power amplifier assembly. Adjust R96 until the indicated vswr on the pmdt is 2.0 ±0.05. This is the sbo vswr normally displayed on the pmdt transmitter data screen.



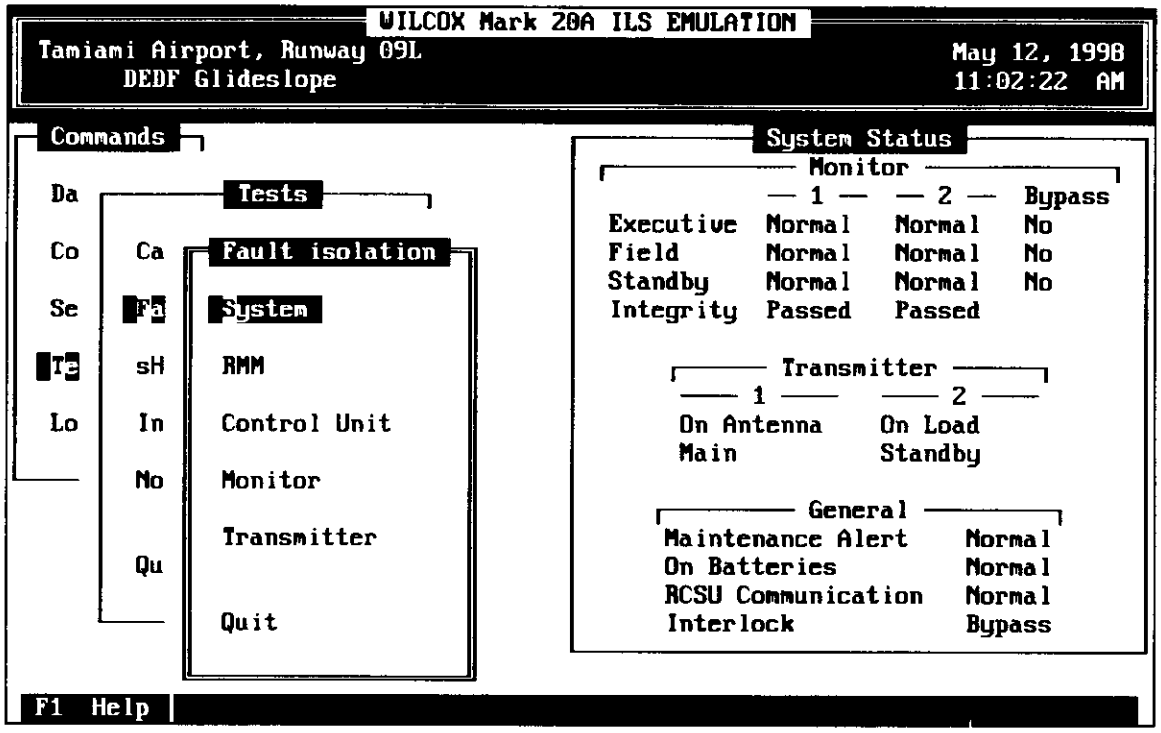

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
10:58:45 AM
Commands
System Status
Monitor
— 1 — — 2 — Bypass
Normal Normal No
Normal Normal No
Normal Normal No
Passed
Tests
Calibration
Set the transmitter AC and DC power switches to OFF.
Remove the 25 ohm load. Restore the #1 Course Transmitter (A7) SBO OUT to the normal configuration.
On Load
Standby
Quit
Normal
Normal
Normal
Bypass
F1 Help
Press any key to continue...


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
10:58:45 AM
Commands
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field Normal Normal No
Normal Normal No
Passed
Tests
Calibration
Set the transmitter AC and DC power switches to ON, and ensure the transmitter is ON.
On Load
Standby
Quit
Normal
Normal
Normal
Bypass
F1 Help
Press any key to continue...

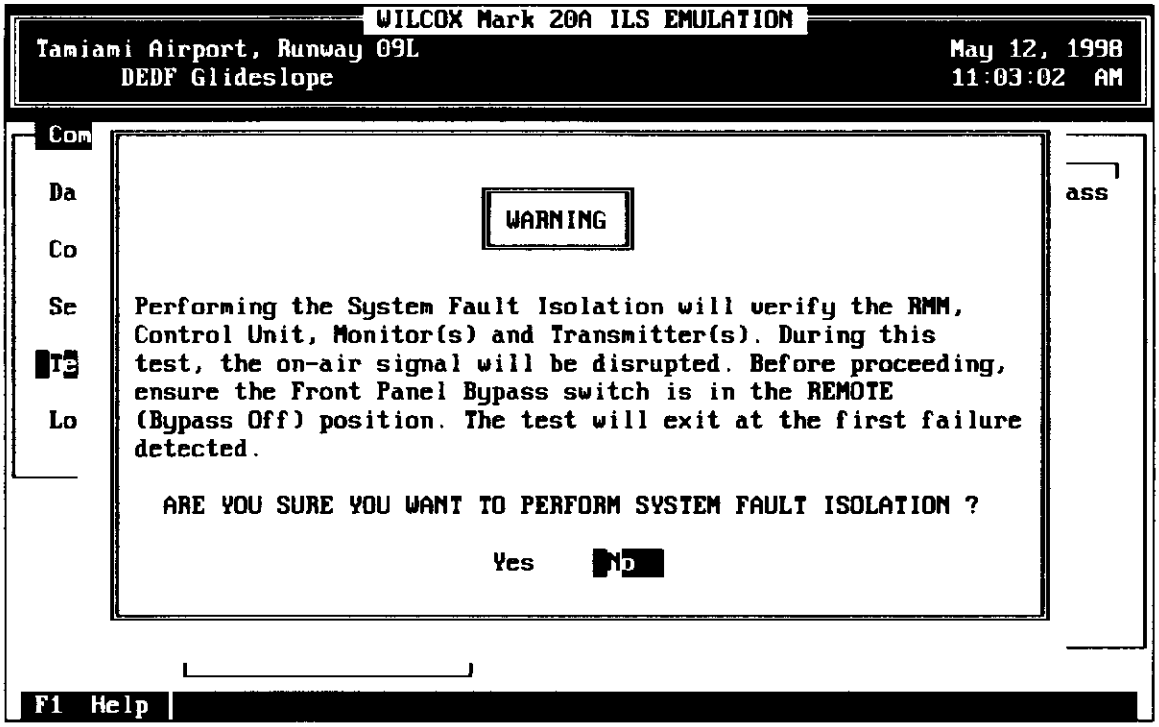
3.11.1.3.8 Restoring Waveform Screen.- Transmitter power calibration is complete and the system is restoring the transmitter waveform to waveform 1.

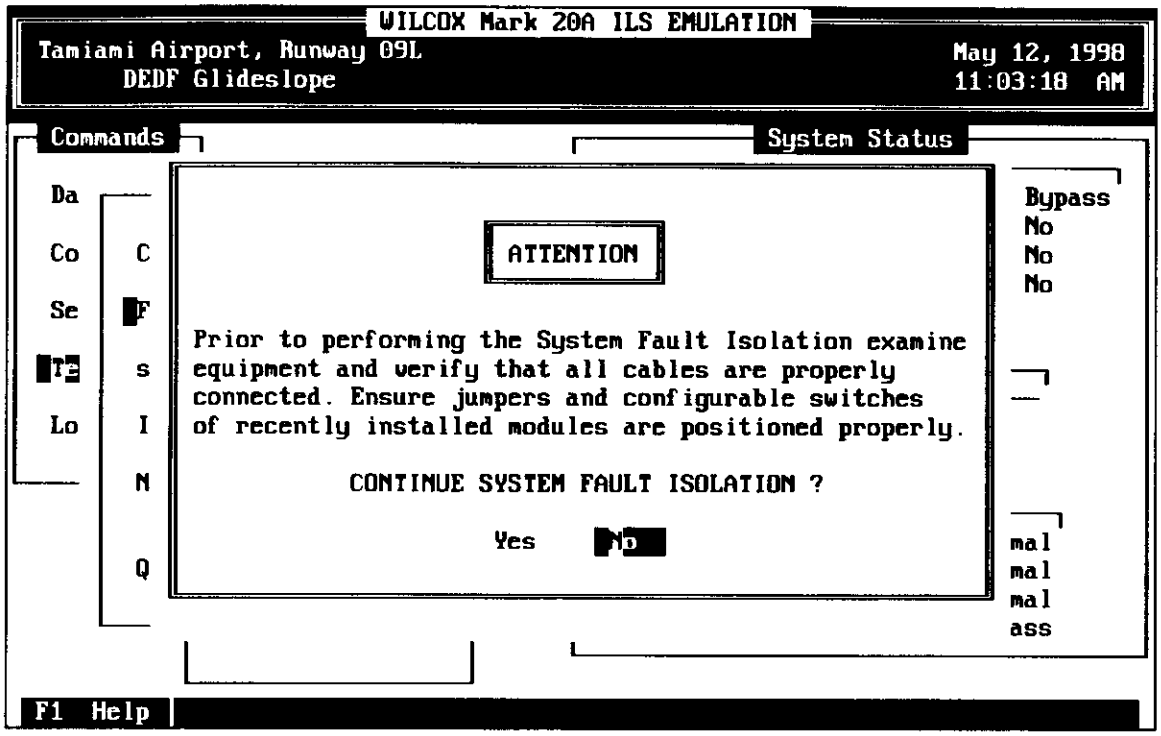


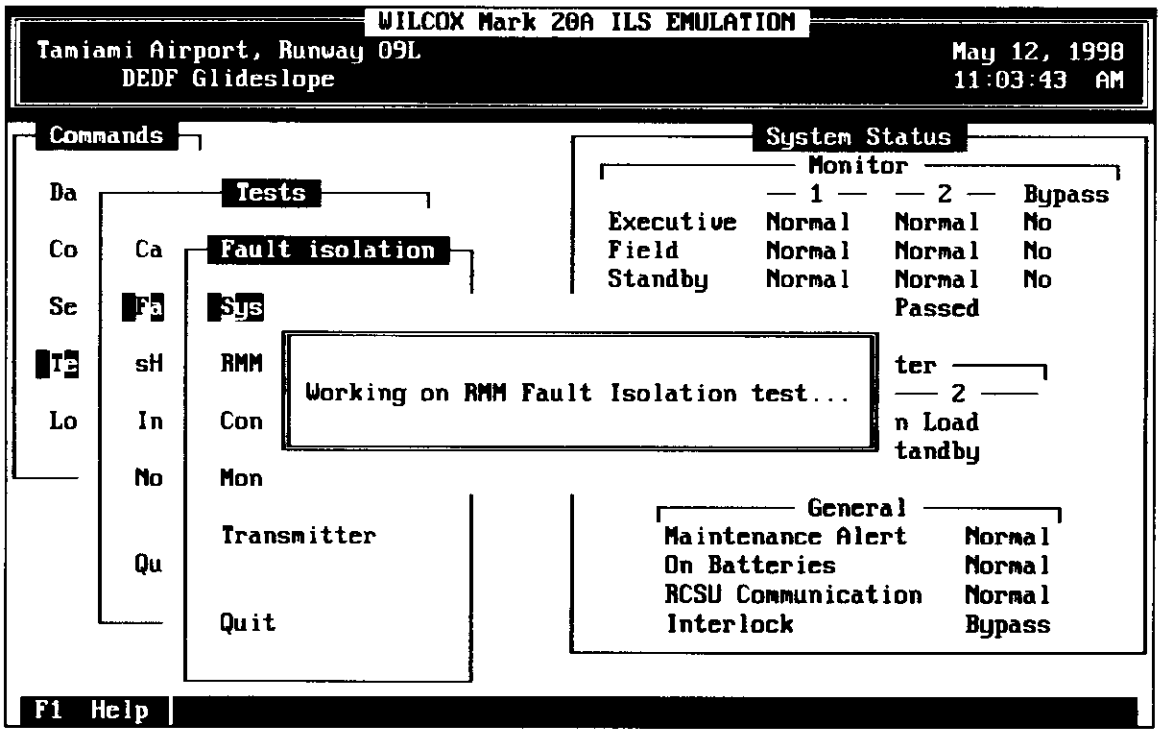
3.11.2 Fault Isolation Menu Screen.- After logging onto the glide slope station, the operator may perform fault isolation by selecting <T F>. Selecting <F>ault isolation on the Tests menu screen brings up a Menu screen that allows the operator to select <S>ystem, <R>MM, <C>ontrol unit, <M>onitor or <T>ransmitter fault isolation.

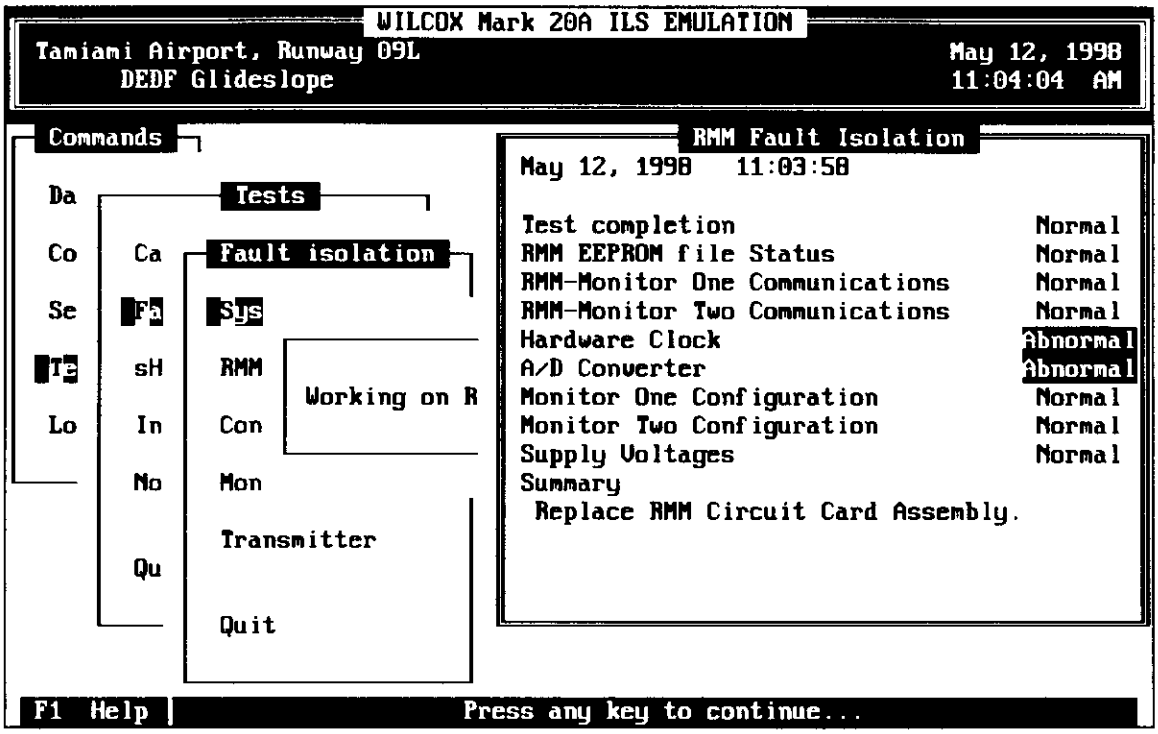


3.11.2.1 System Fault Isolation.- After logging onto the glide slope station, the operator may perform system fault isolation by selecting <T F S>. Selecting <S>ystem brings up a WARNING screen that warns the operator of performing system fault isolation. The operator must then answer the question, "ARE YOU SURE YOU WANT TO PERFORM SYSTEM FAULT ISOLATION?". If the answer is Yes, the ATTENTION screen will be displayed. The operator must answer Yes to continue fault isolation. The system fault isolation will perform isolation on the RMM, Control Unit, Monitor(s) and Transmitter(s). Testing will stop at the first indicated failure. The screen will display the diagnostic function being performed such as " Working on RMM Fault Isolation test..". In this case the system fault isolation detected abnormal conditions in the RMM. The test is stopped and the results displayed.



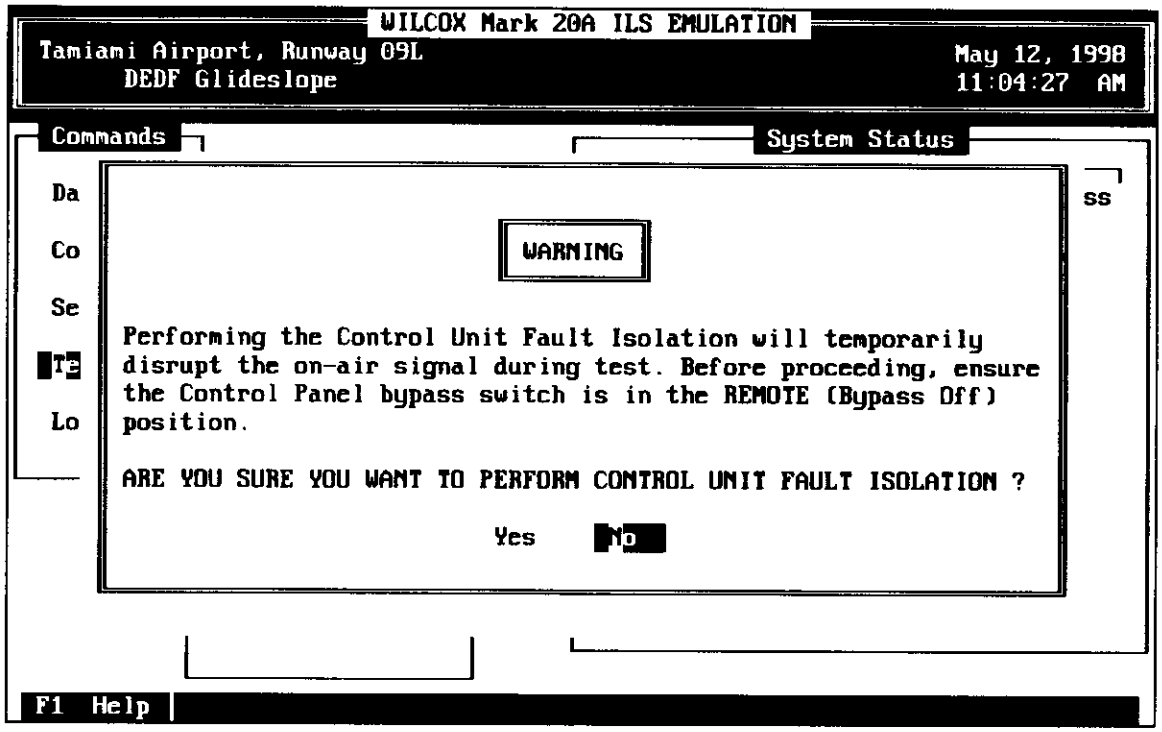

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:03:18 AM
Commands
System Status
Da
Co
Se
Te
Lo
C
F
s
I
N
Q
ATTENTION
Prior to performing the System Fault Isolation examine equipment and verify that all cables are properly connected. Ensure jumpers and configurable switches of recently installed modules are positioned properly.
CONTINUE SYSTEM FAULT ISOLATION ?
Yes
No
Bypass
No
No
No
mal
mal
mal
ass
F1 Help

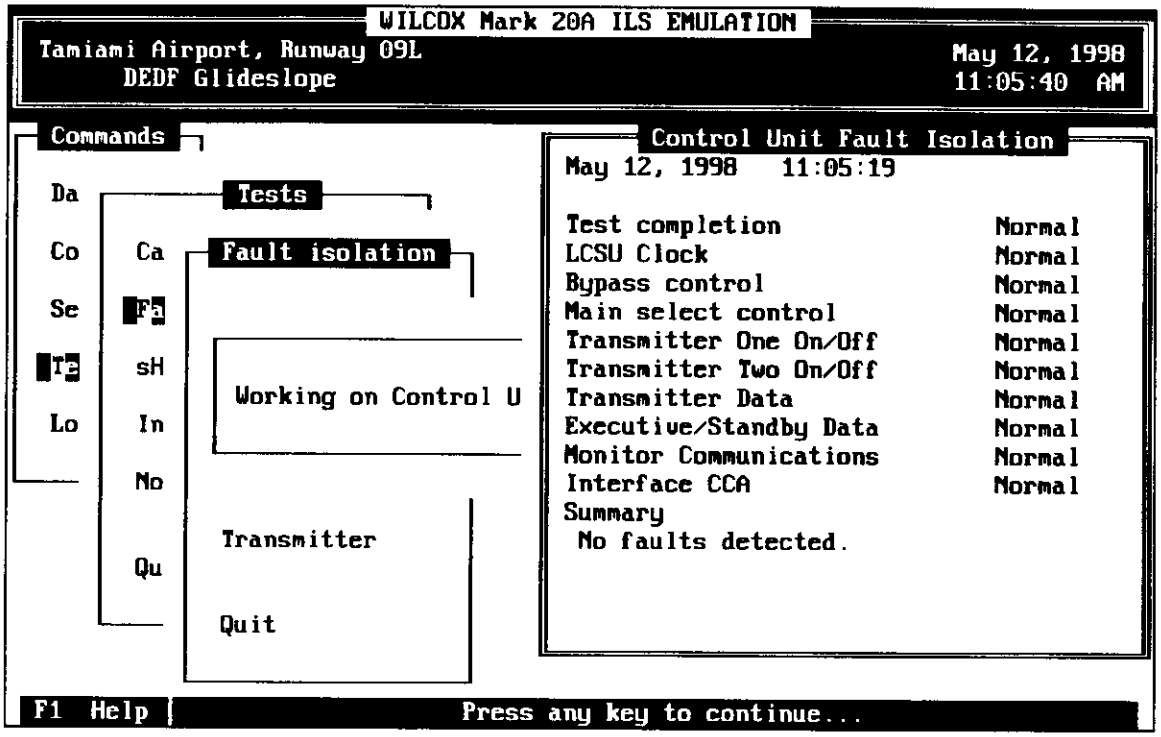

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:03:43 AM
Commands
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field Normal Normal No
Standby Normal Normal No
Passed
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Qu
Fault isolation
Sys
RMM
Con
Mon
Transmitter
Quit
Working on RMM Fault Isolation test...
ter
— 2 —
n Load
tandby
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help



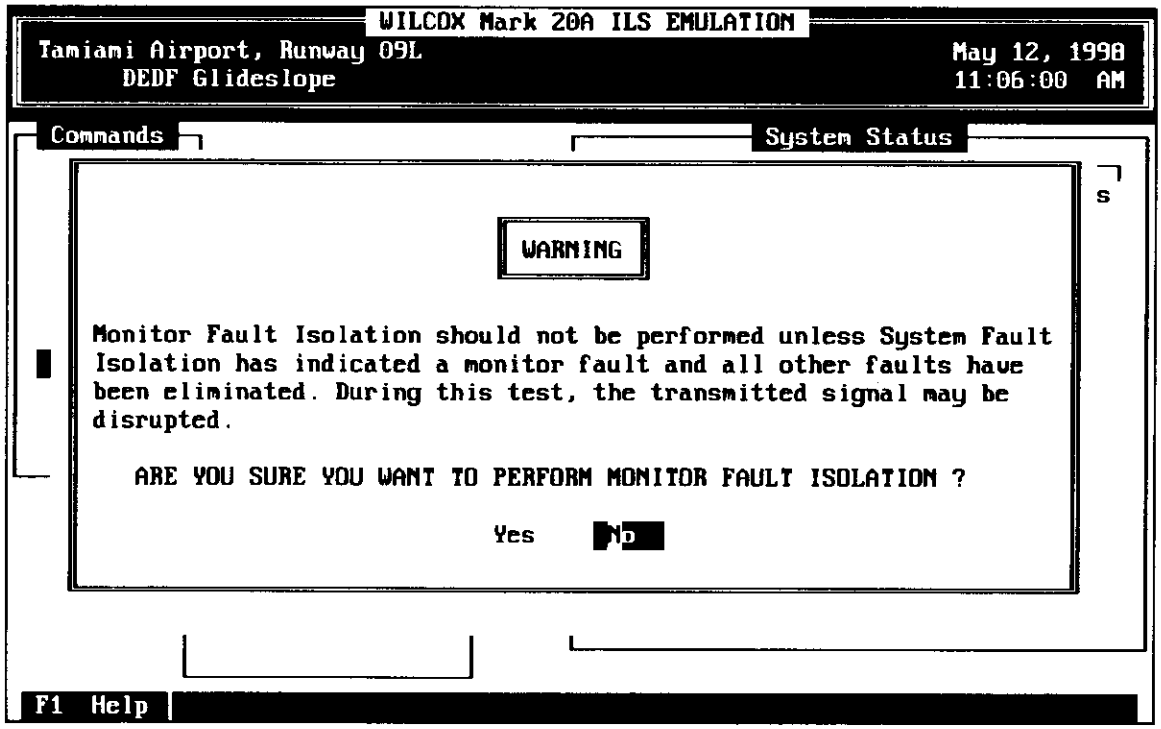
3.11.2.2 RMM Fault Isolation.- After logging onto the glide slope station, the operator may perform RMM fault isolation by selecting <T F R>. The above two screens will be displayed. No warning screen is required since the RMM fault isolation does not interrupt the on-air signal.

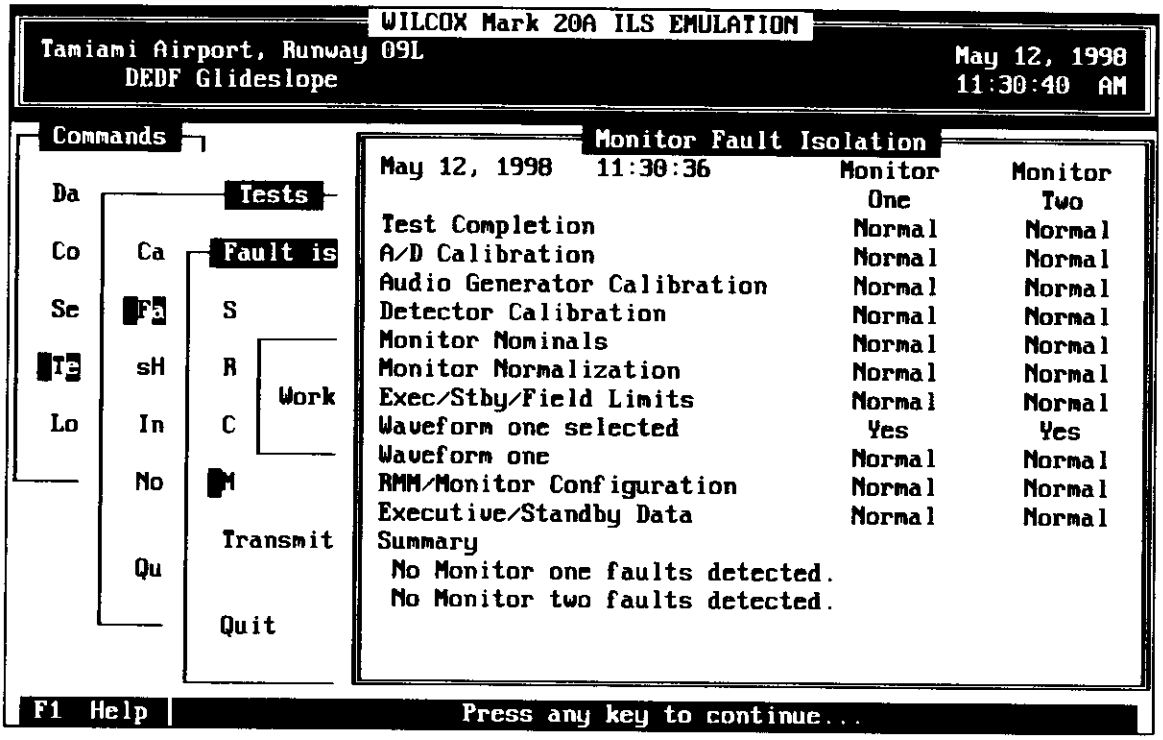
3.11.2.3 Control Unit Fault Isolation.- After logging onto the glide slope station, the operator may perform control unit fault Isolation by selecting <T F C>. Selecting <C>ontrol unit brings up a WARNING screen that warns the operator of performing control unit fault isolation. The operator must then answer the question, "ARE YOU SURE YOU WANT TO PERFORM CONTROL UNIT FAULT ISOLATION?". The operator must answer Yes to continue fault isolation. The screen will display "Working on Control Unit Fault Isolation test..". The Control Unit Fault Isolation results are displayed at completion of the test. Selection of the Control Unit Test command causes the equipment to transfer and then shutdown twice before returning a pass/fail status and resetting both monitors. Before running this test, insure that the station monitors are NOT bypassed. This test will fail if the monitors are bypassed. Failure of this test may indicate a problem with the LCSU CCA or the Transfer Switch ASSY.



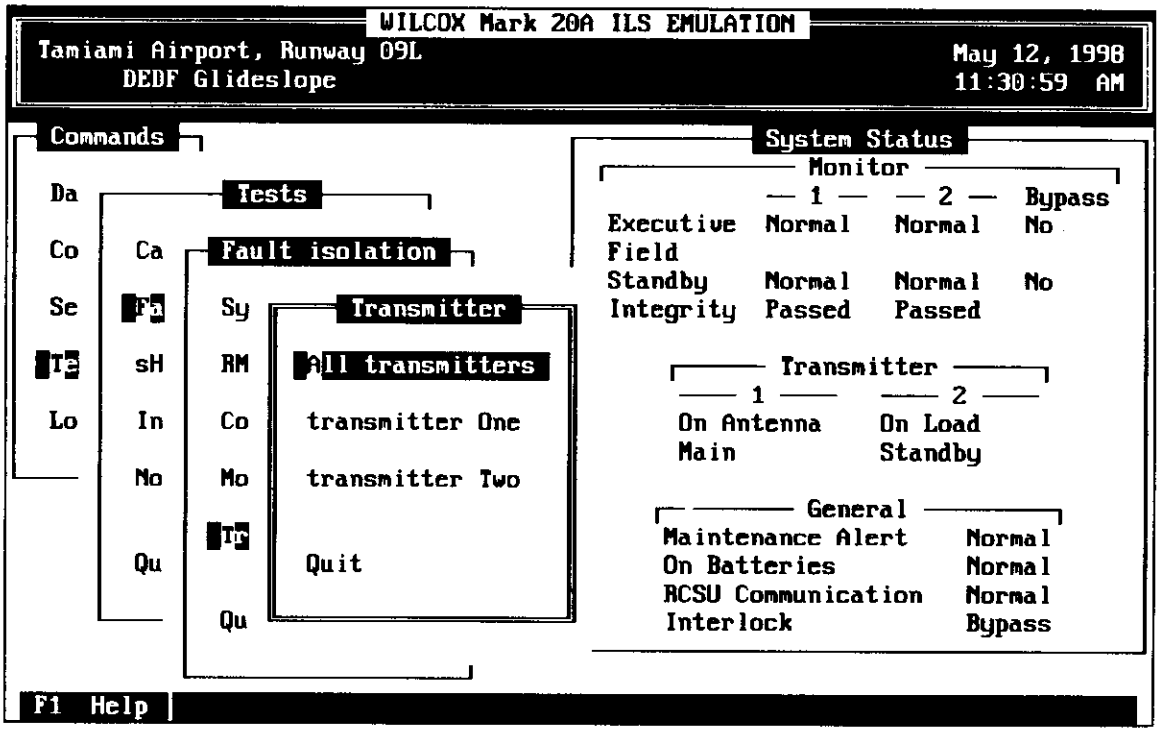

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:05:40 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fault isolation
Fa
sH
In
No
Qu
Working on Control U
Transmitter
Quit
Control Unit Fault Isolation
May 12, 1998 11:05:19
Test completion Normal
LCSU Clock Normal
Bypass control Normal
Main select control Normal
Transmitter One On/Off Normal
Transmitter Two On/Off Normal
Transmitter Data Normal
Executive/Standby Data Normal
Monitor Communications Normal
Interface CCA Normal
Summary
No faults detected.
F1 Help
Press any key to continue...

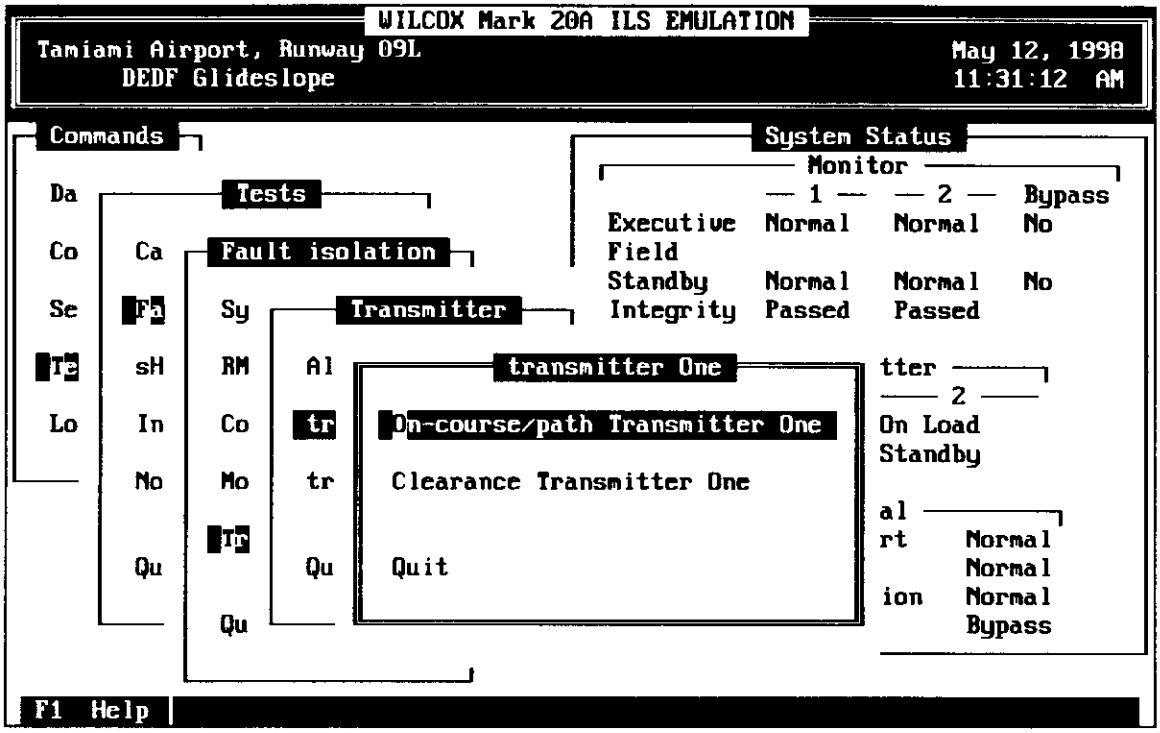
3.11.2.4 Monitor Fault Isolation.- After logging onto the glide slope station, the operator may perform Monitor fault isolation by selecting <T F M>. Selecting <M>onitor brings up a WARNING screen that warns the operator of performing Monitor fault isolation. The operator must then answer the question, "ARE YOU SURE YOU WANT TO PERFORM MONITOR FAULT ISOLATION?". The operator must answer Yes to continue fault isolation. The screen will display "Working on Monitor Fault Isolation test..". The Monitor Fault Isolation results are displayed at completion of the test. Performing monitor diagnostics will verify the various files that determine the detector calibration values, monitored signal limits, and transmitter waveform parameters. Checks are performed to verify the A/D signal converter is performing properly and measurements of the transmitter and monitored signal in space are used to verify system operation. Audio Generator/Detector Calibration faults are usually cleared by performing calibration. If calibration cannot be performed successfully there may be a problem with the monitor or the Audio Generator/Detector being calibrated. In fault cases where the monitor is periodically resetting itself (i.e. the front panel alarm lamp blinks at a 3-5 second rate) the problem may be caused by the monitor itself or the associated Audio Generator. In dual equipment systems swapping the monitors and determining if the fault stays with the monitor will aid when multiple boards may be the cause of the problem. These tests are performed on both monitors in a dual monitor system.

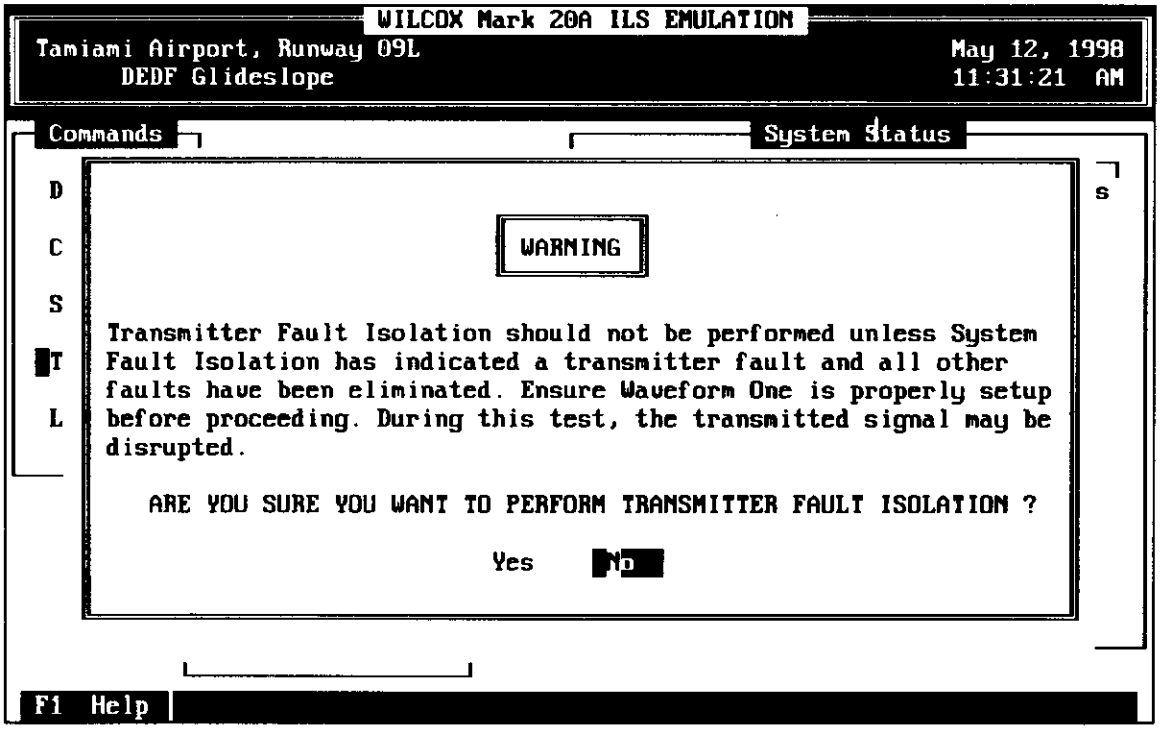


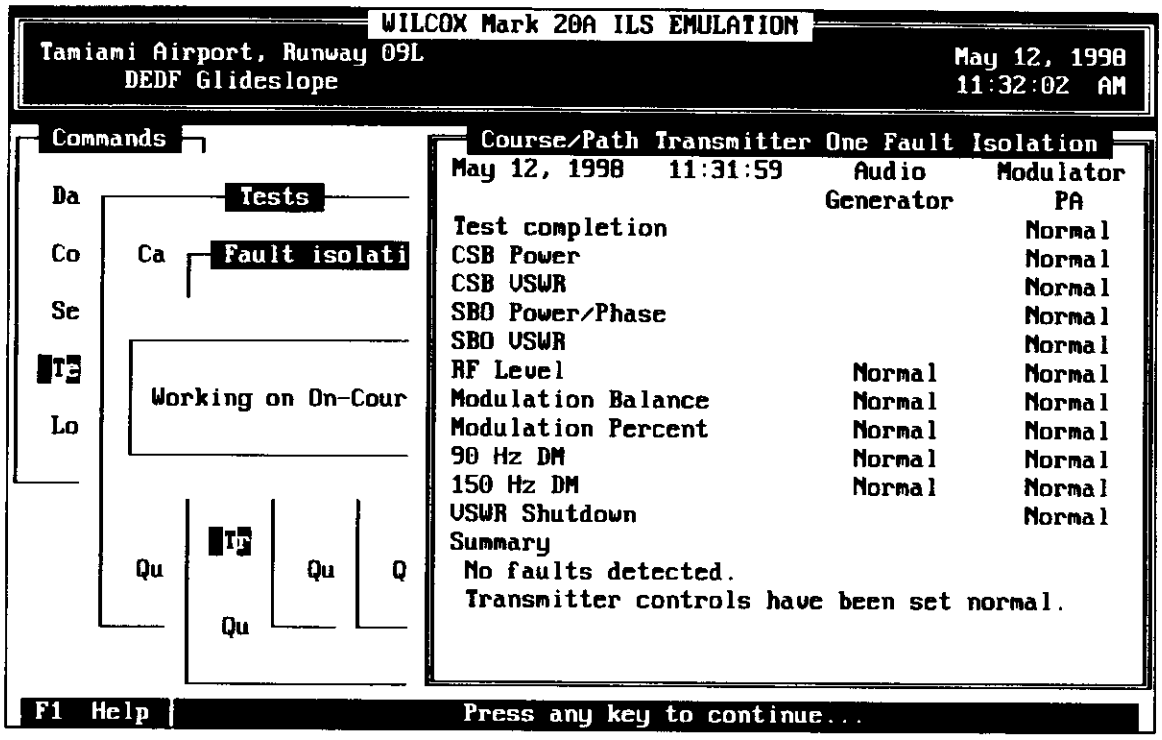

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:30:40 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Qu
Fault is
S
R
C
M
Work
Transmit
Quit
Monitor Fault Isolation
May 12, 1998 11:30:36
Monitor One
Monitor Two
Test Completion Normal Normal
A/D Calibration Normal Normal
Audio Generator Calibration Normal Normal
Detector Calibration Normal Normal
Monitor Nominals Normal Normal
Monitor Normalization Normal Normal
Exec/Stby/Field Limits Normal Normal
Waveform one selected Yes Yes
Waveform one Normal Normal
RMM/Monitor Configuration Normal Normal
Executive/Standby Data Normal Normal
Summary
No Monitor one faults detected.
No Monitor two faults detected.
F1 Help
Press any key to continue...

3.11.2.5 Transmitter Fault Isolation.- After logging onto the glide slope station, the operator may bring up the transmitter fault isolation menu by selecting <T F T>. Selecting <A>ll transmitters will cause fault isolation to be performed automatically on all transmitters. However, the test will stop at the first fault detected. A WARNING screen that warns the operator of performing transmitter fault isolation will be displayed. The operator must then answer the question, "ARE YOU SURE YOU WANT TO PERFORM TRANSMITTER FAULT ISOLATION?". The operator must answer Yes to continue fault isolation. The screen will display "Working on Transmitter Fault Isolation test..". The Transmitter Fault Isolation results are displayed at completion of the test. Individual transmitter fault isolation may be run on each transmitter by selecting transmitter <O>ne or <T>wo and then <O>n-course/path transmitter or <C>learance transmitter.



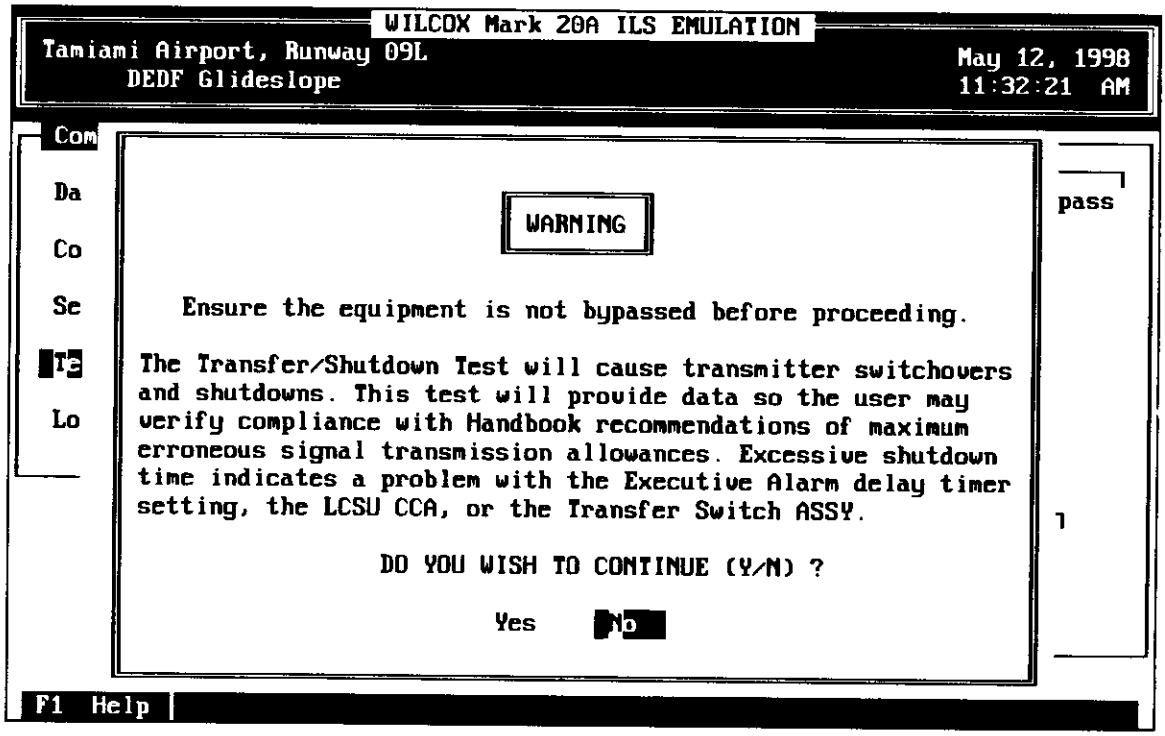

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:31:12 AM
Commands
System Status
Tests
Fault isolation
Transmitter
transmitter One
On-course/path Transmitter One
Clearance Transmitter One
Quit
Monitor
— 1 —
— 2 —
Bypass
Executive Normal Normal No
Field
Standby Normal Normal No
Integrity Passed Passed
On Load
Standby
Normal
Normal
Normal
Bypass
F1 Help

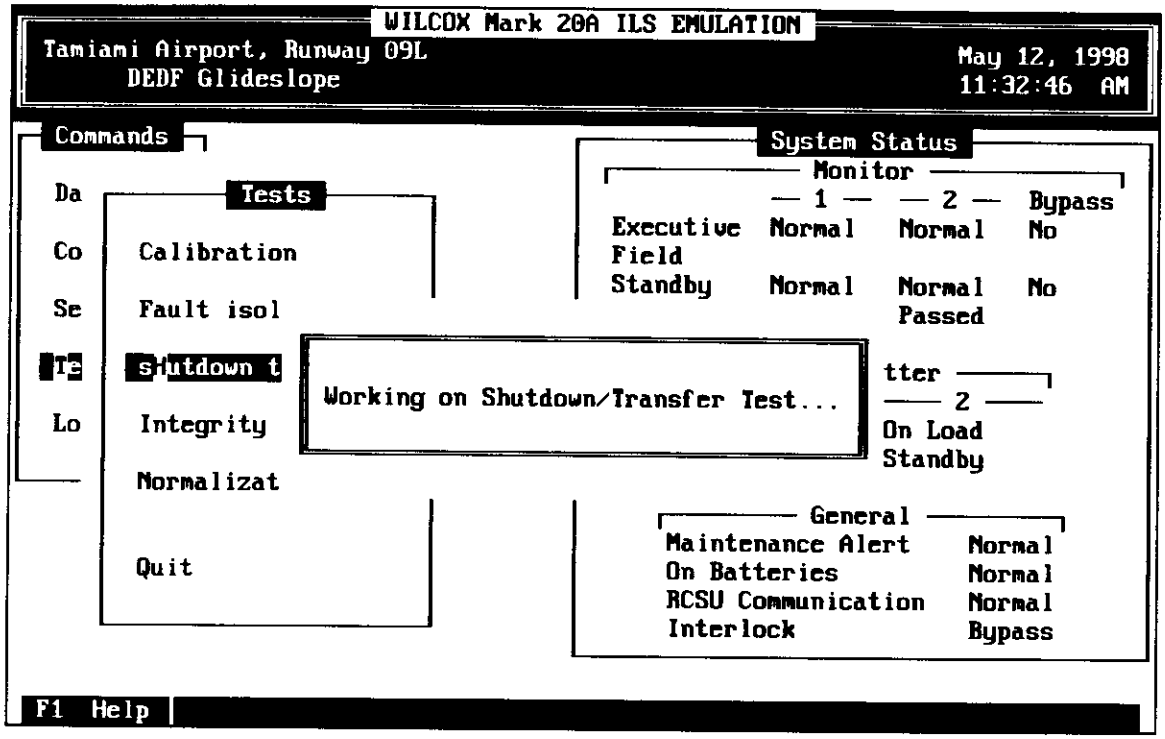

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:31:21 AM
Commands
System Status
WARNING
Transmitter Fault Isolation should not be performed unless System Fault Isolation has indicated a transmitter fault and all other faults have been eliminated. Ensure Waveform One is properly setup before proceeding. During this test, the transmitted signal may be disrupted.
ARE YOU SURE YOU WANT TO PERFORM TRANSMITTER FAULT ISOLATION ?
Yes
No
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:32:02 AM
Commands
Da
Co
Se
Lo
Tests
Ca
Fault isolati
Working on On-Cour
Qu
Qu
Qu
Q
Course/Path Transmitter One Fault Isolation
May 12, 1998 11:31:59
Audio Generator
Modulator PA
Test completion Normal
CSB Power Normal
CSB VSWR Normal
SBO Power/Phase Normal
SBO VSWR Normal
RF Level Normal Normal
Modulation Balance Normal Normal
Modulation Percent Normal Normal
90 Hz DM Normal Normal
150 Hz DM Normal Normal
VSWR Shutdown Normal
Summary
No faults detected.
Transmitter controls have been set normal.
F1 Help
Press any key to continue...

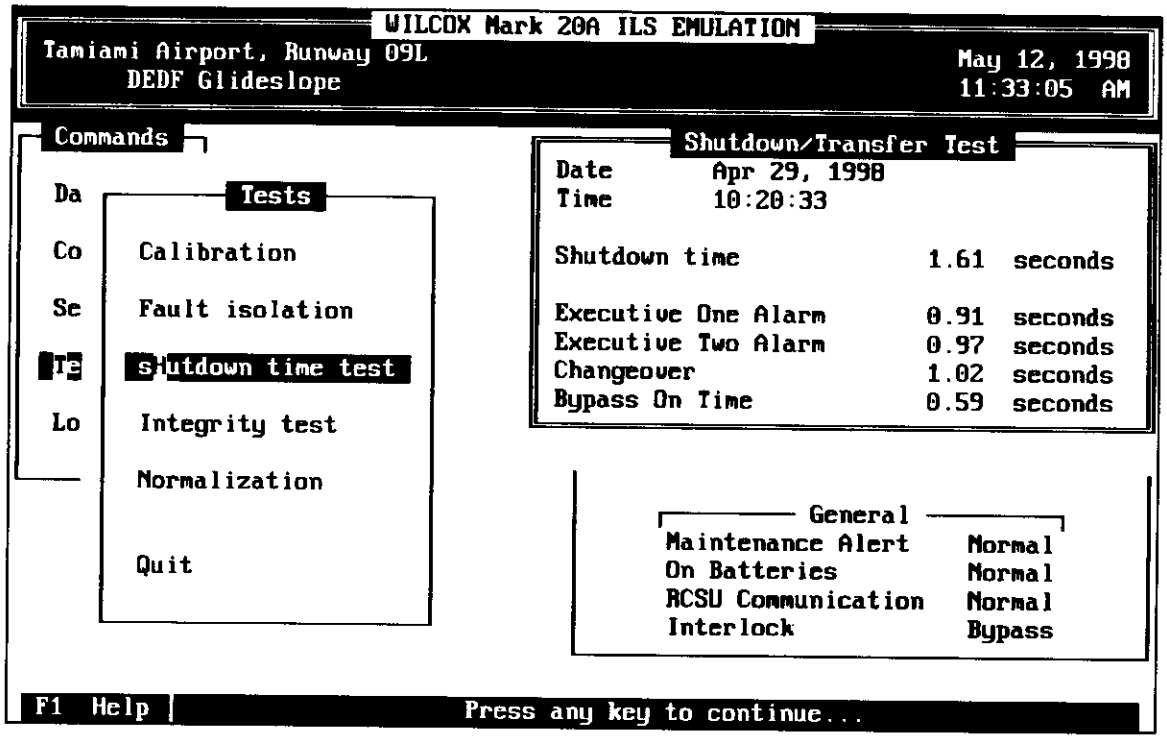
3.11.3 Shutdown Time Test.- After logging onto the glide slope station, the operator may select the Shutdown Time test by selecting <T H>. Selecting s<H>utdown time test on the Tests menu screen brings up a WARNING screen that warns the operator of the consequences of performing the shutdown time test. The operator must then answer the question, "DO YOU WISH TO CONTINUE?" If the answer is No, the operator is returned to the Commands menu screen. If the answer is Yes, the shutdown time test is initiated. Results are displayed on the Shutdown/Transfer Time data screen.

Before proceeding with this test, ensure that the equipment monitors are NOT BYPASSED. Bypassed monitors will result in a test Process Failure. The Transfer/Shutdown test causes transmitter switchovers and shutdowns. This test measures the transfer/shutdown time so the user may verify compliance with Handbook recommendations of maximum erroneous signal transmission allowances. Excessive shutdown time indicates a problem with the Executive Alarm delay timer setting, the lcsu cca, or the transfer switch assembly.

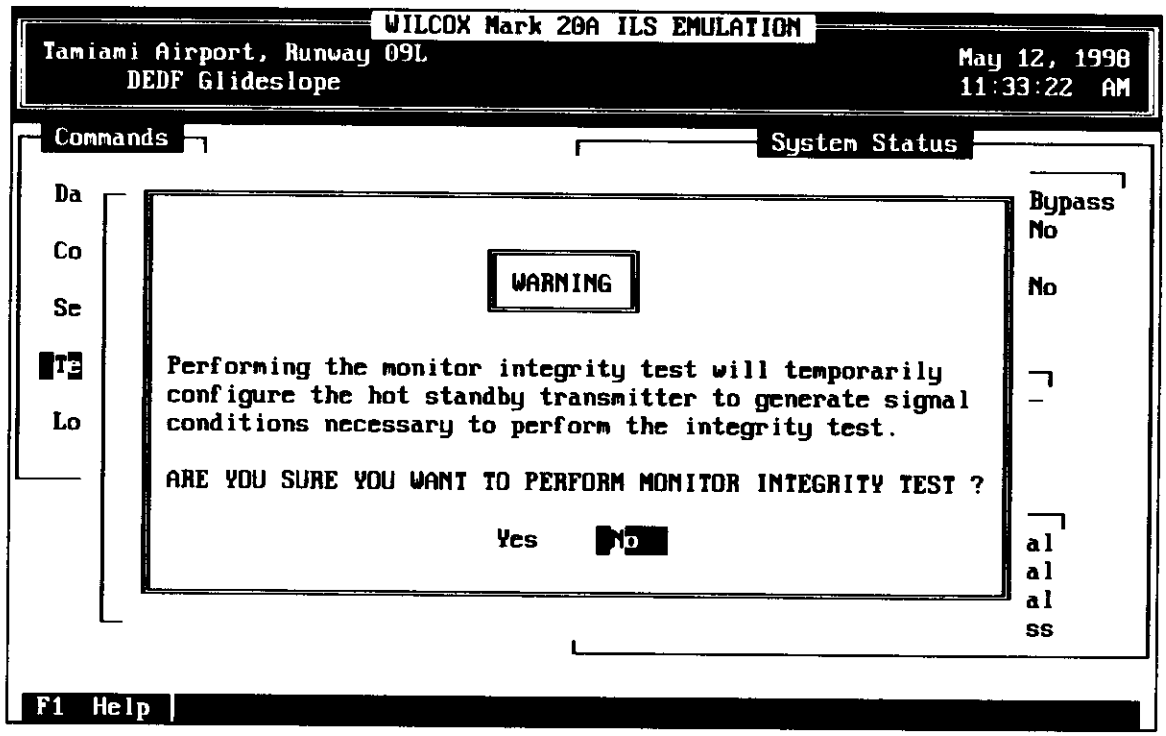


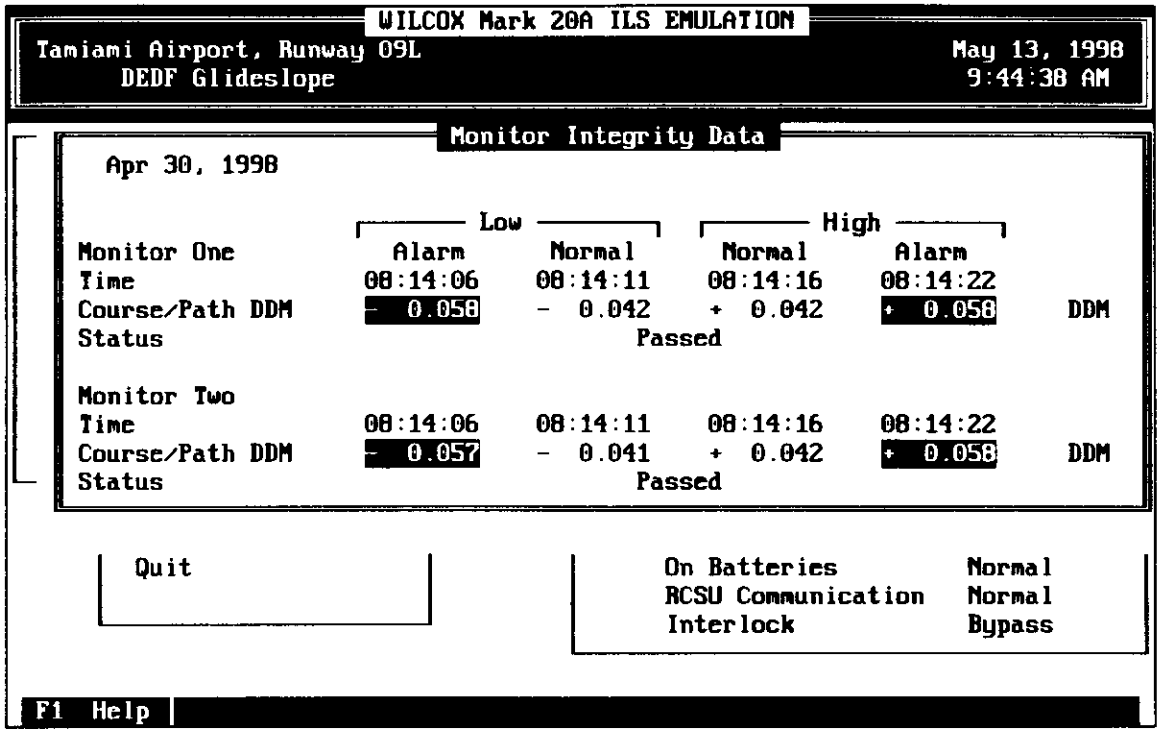

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 12, 1998
11:32:46 AM
Commands
Da
Co
Se
Te
Lo
Tests
Calibration
Fault isol
Shutdown t
Integrity
Normalizat
Quit
Working on Shutdown/Transfer Test...
System Status
Monitor
— 1 —
— 2 —
Bypass
Executive
Normal
Normal
No
Field
Standby
Normal
Normal
No
Passed
tter
— 2 —
On Load
Standby
General
Maintenance Alert
Normal
On Batteries
Normal
RCSU Communication
Normal
Interlock
Bypass
F1 Help

3.11.3.1 Shutdown/Transfer Time Results.- This screen displays the results of the latest STT. The STT verifies the Mark 20A's ability to meet the specified requirements in responding to an invalid on-the-air condition. The data recorded is the total time to system shutdown, the time each executive monitor first goes into alarm, the time when the antenna select (change-over) first changes state, and the bypass on time. If the test is not completed within it's allotted time, it will timeout. On timeout, the test status will be set to timeout (a failure). This test is conducted for information purposes so no executive action results from a failed test.

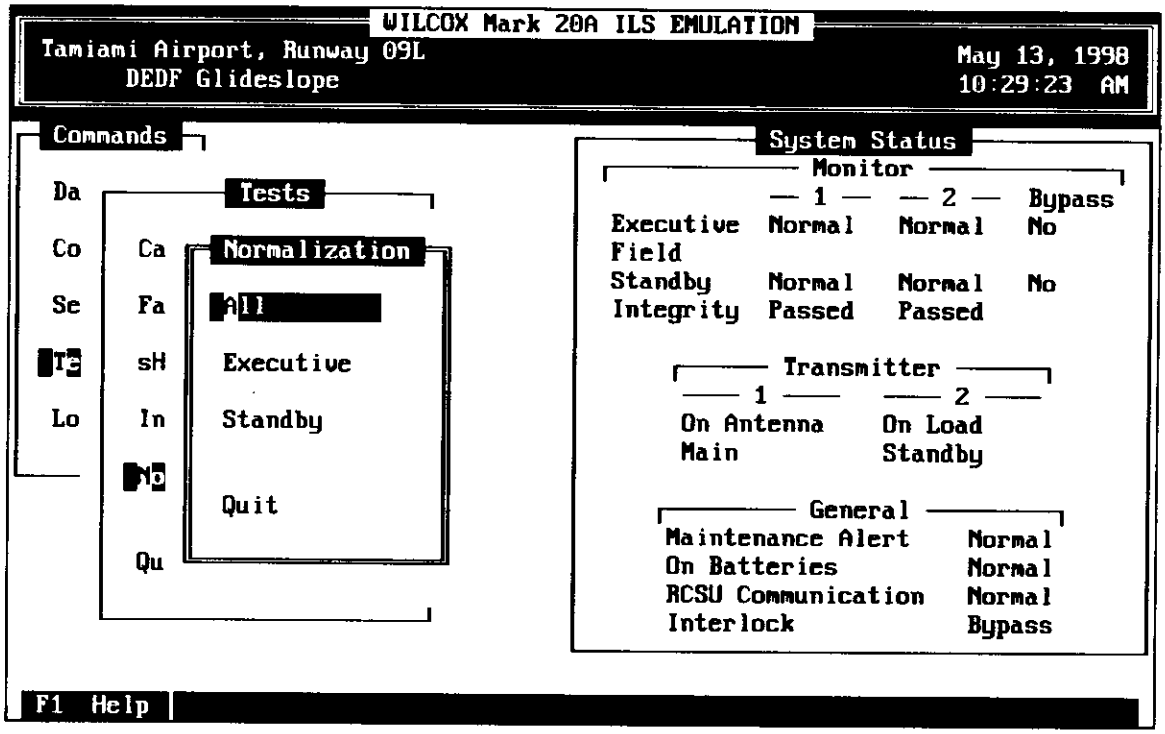


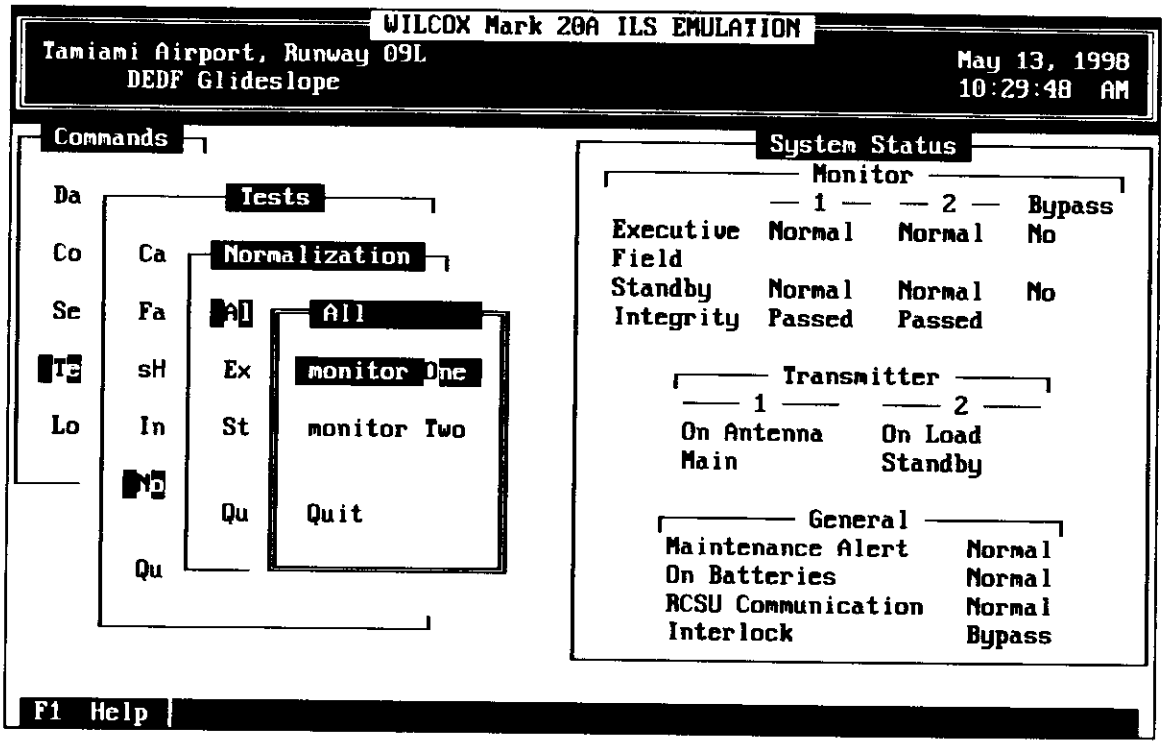
3.11.4 Integrity Test Selection.- After logging onto the glide slope station, the operator may select the Integrity test by selecting <T I>. Selecting <I>ntegrity test on the Tests menu screen brings up a WARNING screen that warns the operator of the consequences of performing the monitor integrity test. The operator must then answer the question, "ARE YOU SURE YOU WANT TO PERFORM MONITOR INTEGRITY TEST?" If the answer is No, the operator is returned to the Commands menu screen. If the answer is Yes, the monitor integrity test is initiated. Results are displayed on the Monitor One Integrity Data Readings screen, paragraph 3.7.6.2.1. Category III stations are required to run an integrity check of the equipment. Performing the integrity test momentarily sets the hot standby transmitter to values that will cause a standby alarm condition to occur. Standby monitor data will be collected from both monitors and will be stored within the rms and may be accessed by use of the Data - Integrity screen. An integrity test failure of either monitor will result in a forced alarm condition until operator intervention or an integrity pass condition occurs, restoring that monitor to normal.

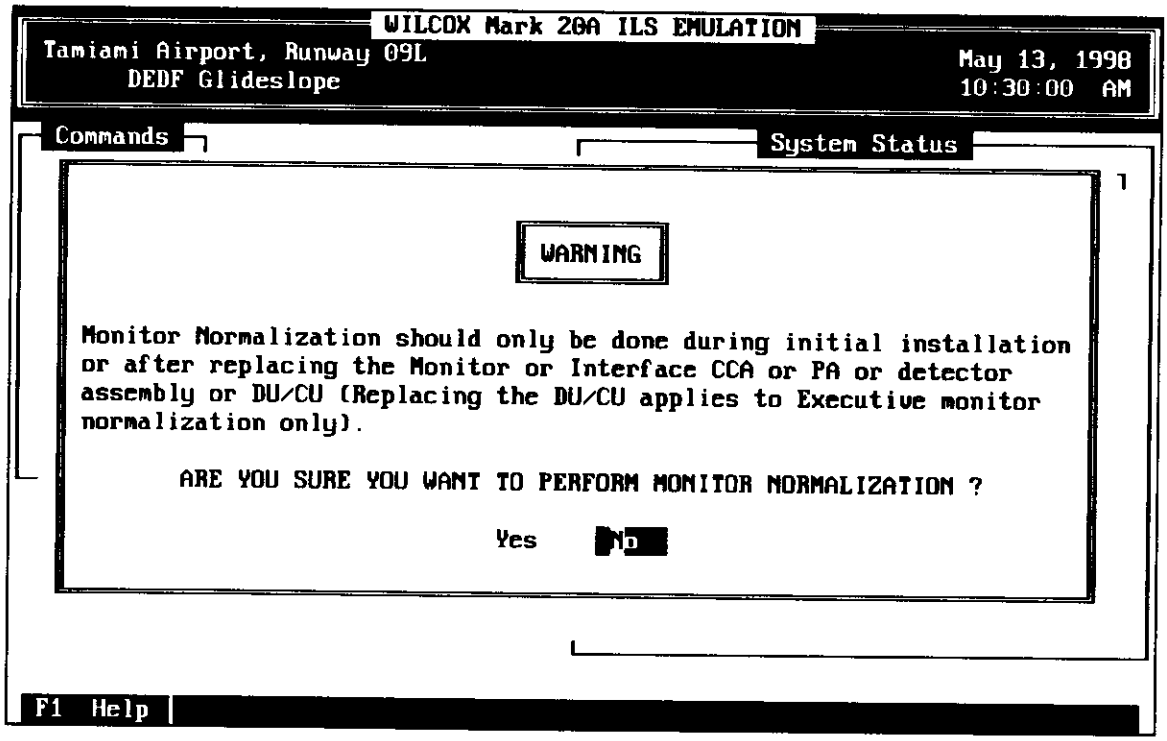


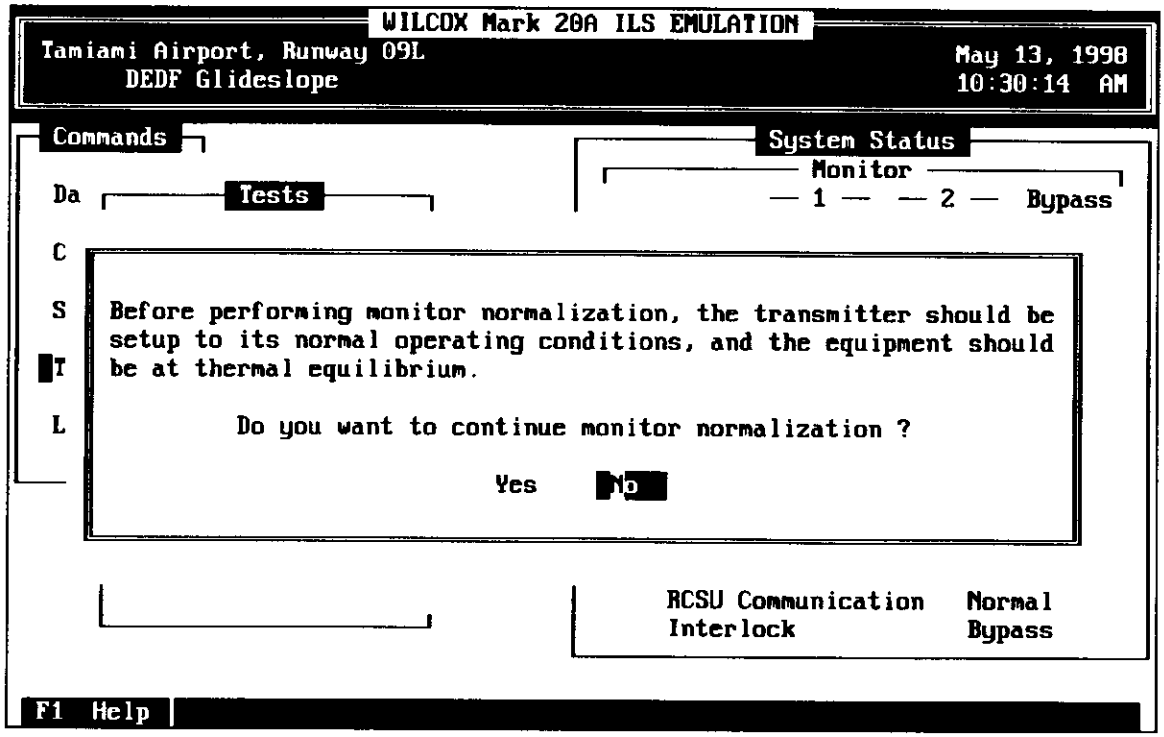

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
9:44:38 AM
Monitor Integrity Data
Apr 30, 1998
Low
High
Monitor One
Alarm
Normal
Normal
Alarm
Time
08:14:06
08:14:11
08:14:16
08:14:22
Course/Path DDM
- 0.058
- 0.042
+ 0.042
+ 0.058
DDM
Status
Passed
Monitor Two
Time
08:14:06
08:14:11
08:14:16
08:14:22
Course/Path DDM
- 0.057
- 0.041
+ 0.042
+ 0.058
DDM
Status
Passed
Quit
On Batteries
Normal
RCSU Communication
Normal
Interlock
Bypass
F1 Help

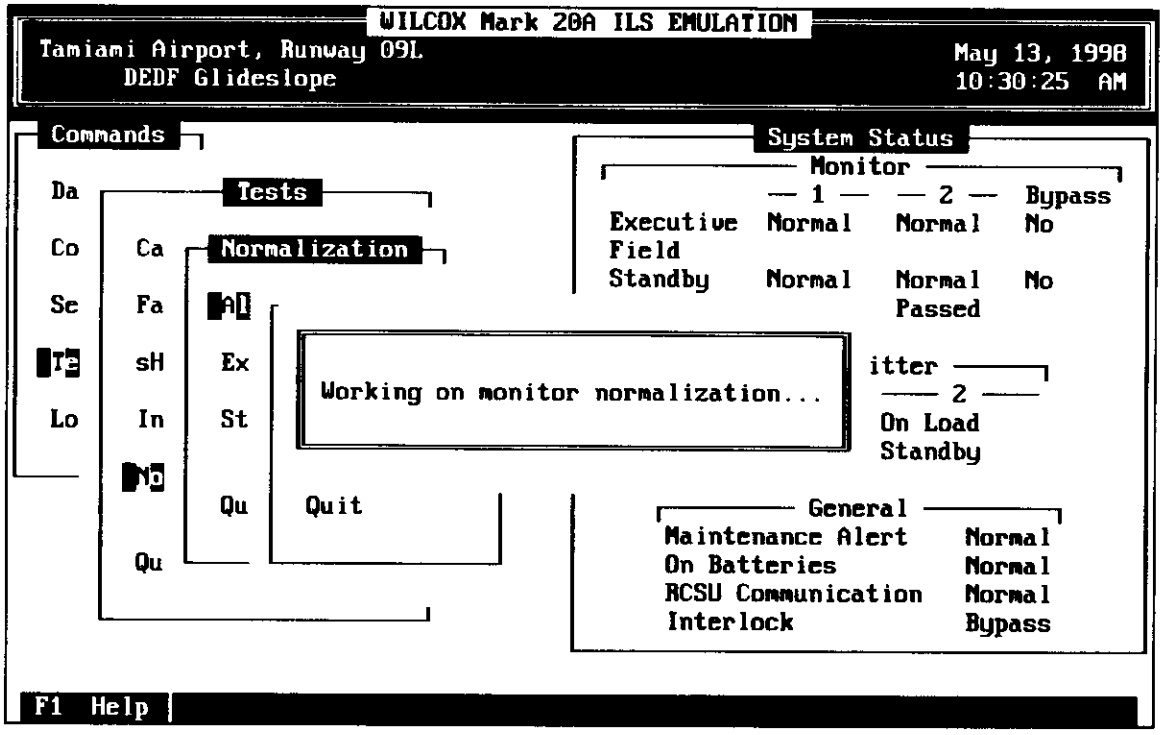
3.11.5 Normalization Menu Screen.- After logging onto the glide slope station, the operator may perform monitor normalization by selecting <T N>. Normalization may be performed in two separate parts (executive and standby) by selecting <E>xecutive or <S>tandby at the Normalization menu or simultaneously by selecting <A>ll. After selecting <A>ll, <E>xecutive, or <S>tandby; the All, Executive, or Standby menu screen is displayed. These menu screens allow the operator to select monitor <O>ne or monitor <T>wo for normalization. After selecting monitor one or monitor two, two warning screens are displayed. The first warning screen describes conditions under which monitor normalization should be performed. The operator is prompted as to whether to continue monitor normalization or abort. The second warning screen describes equipment configuration and status required before performing monitor normalization. The operator is again prompted for a decision to continue or abort monitor normalization. When normalization begins, one of four in-process messages will appear depending upon which selection was made at the Normalization menu. Normalization takes each monitor parameter and applies a gain to non-zero values and an offset zero value in order to make those values read the same as nominal values. For example: if the standby width ddm reading on a glide slope read 0.052 ddm (after detector calibration and restoring sidebands) and the nominal was set to 0.175 ddm, a gain of 336 percent would be applied to this reading in order to make it read 0.175 ddm (0.052 x 3.36 = 0.175).



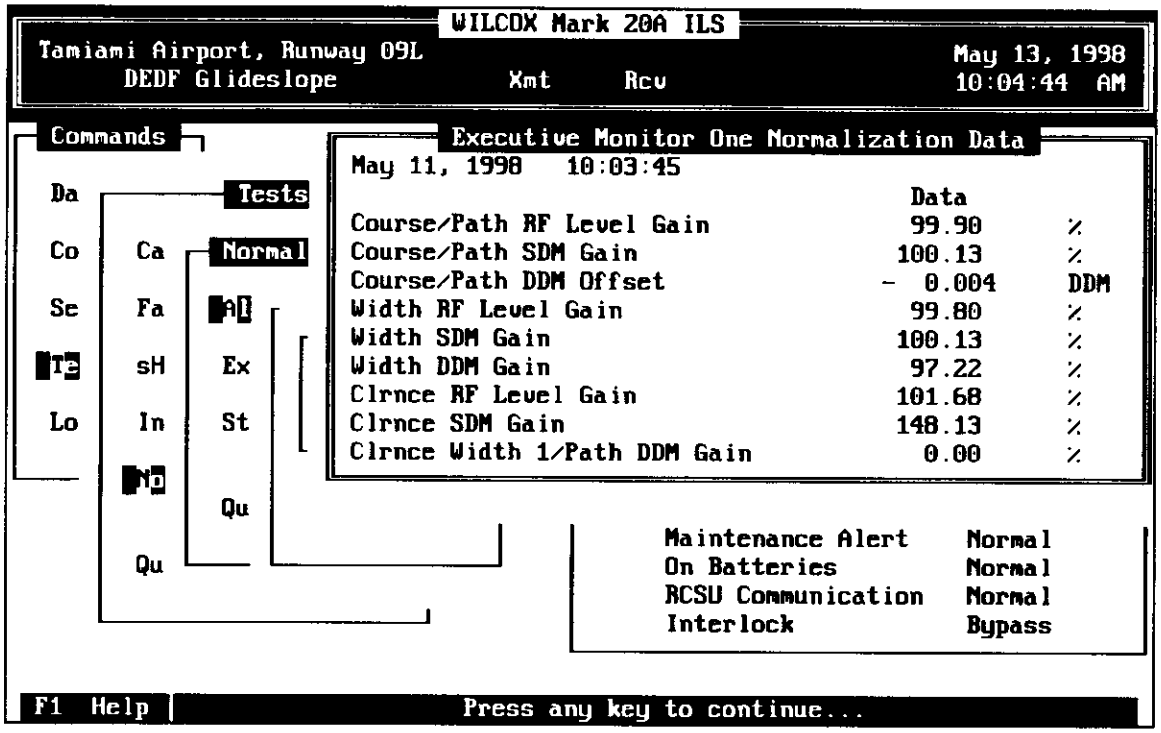

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
10:29:48 AM
Commands
Da
Co
Se
Te
Lo
Tests
Ca
Fa
sH
In
No
Normalization
Al
Ex
St
Qu
Qu
All
monitor One
monitor Two
Quit
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field
Standby Normal Normal No
Integrity Passed Passed
Transmitter
— 1 — — 2 —
On Antenna On Load
Main Standby
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
10:30:00 AM
Commands
System Status
WARNING
Monitor Normalization should only be done during initial installation or after replacing the Monitor or Interface CCA or PA or detector assembly or DU/CU (Replacing the DU/CU applies to Executive monitor normalization only).
ARE YOU SURE YOU WANT TO PERFORM MONITOR NORMALIZATION ?
Yes No
F1 Help

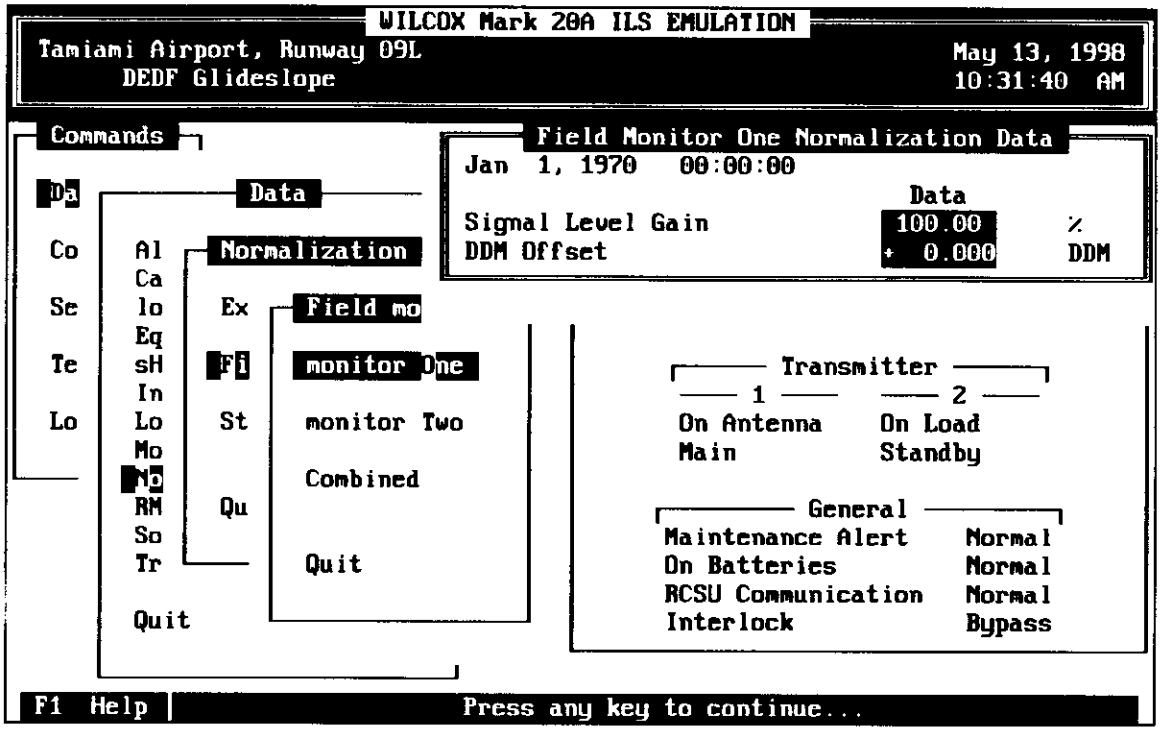

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
10:30:14 AM
Commands
Da
Tests
C
S
T
L
Before performing monitor normalization, the transmitter should be setup to its normal operating conditions, and the equipment should be at thermal equilibrium.
Do you want to continue monitor normalization ?
Yes
No
System Status
Monitor
— 1 — — 2 — Bypass
RCSU Communication Normal
Interlock Bypass
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
10:30:25 AM
Commands
Da
Co
Se
T
Lo
Tests
Ca
Fa
sH
In
No
Qu
Normalization
Al
Ex
St
Qu
Quit
Working on monitor normalization...
System Status
Monitor
— 1 — — 2 — Bypass
Executive Normal Normal No
Field
Standby Normal Normal No
Passed
itter
— 2 —
On Load
Standby
General
Maintenance Alert Normal
On Batteries Normal
RCSU Communication Normal
Interlock Bypass
F1 Help

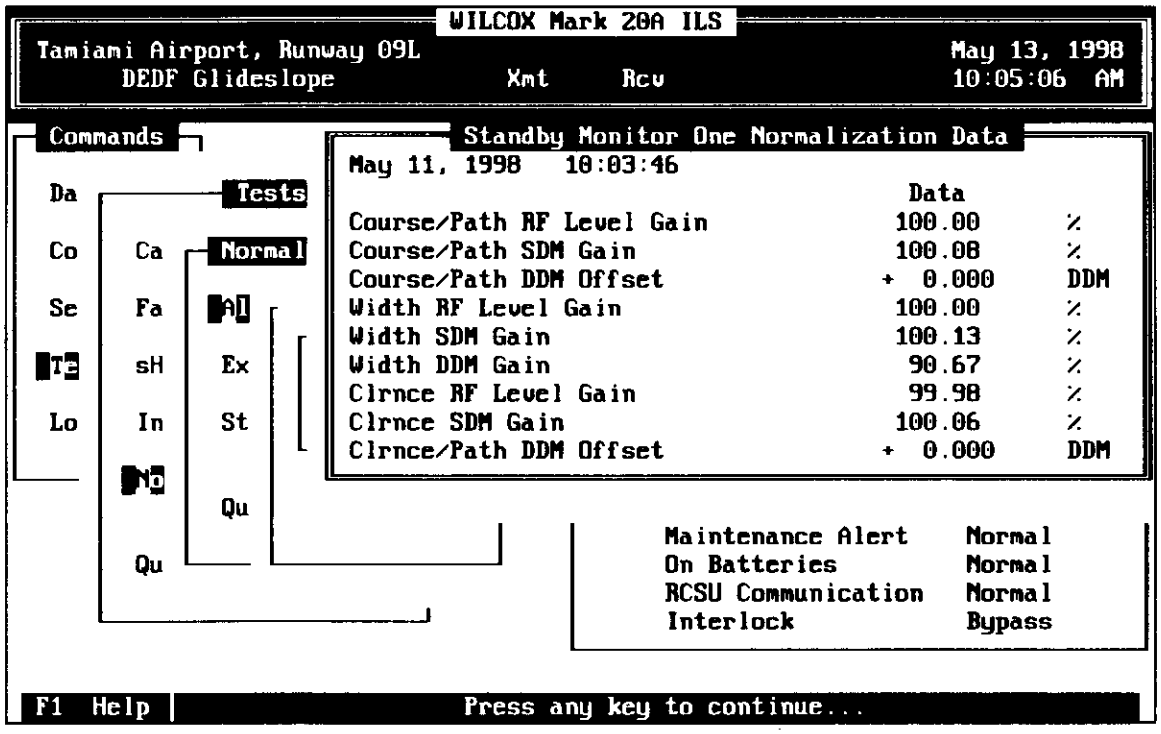
3.11.5.1 Executive Monitor Normalization Data Screen.- When executive monitor normalization is completed, the Executive Monitor Normalization Data screen will be updated and displayed. Executive Monitor One and Two Normalization Data screens are identical. Executive Monitor Two Data screen will be displayed when monitor <T>wo is selected at the Executive monitor menu screen. When <A>ll is selected at the Normalization menu, the Executive Monitor Normalization Data screen is the first screen displayed.



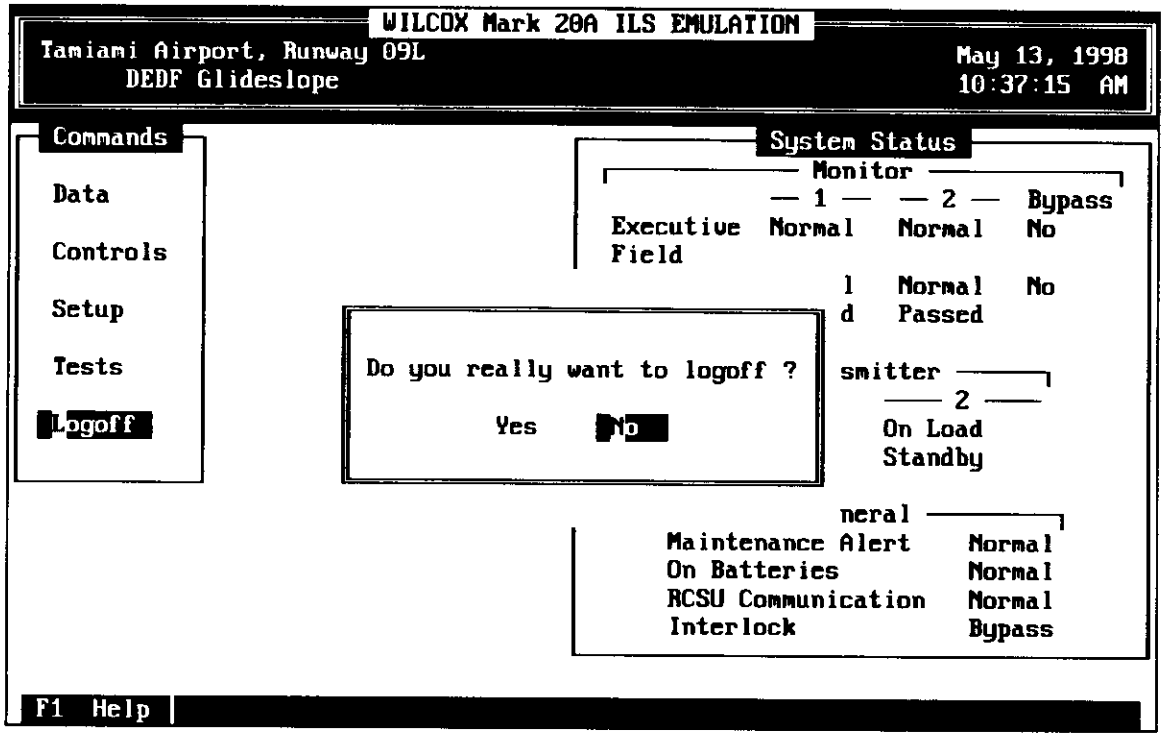
3.11.5.2 Field Monitor Normalization Data Screen.- When field monitor normalization is completed, the Field Monitor Normalization Data screen will be updated and displayed. Field Monitor Normalization One and Two Data screens are identical. Field Monitor Two Data screen will be displayed when monitor <T>wo is selected at the Field monitor menu screen. When <A>ll is selected at the Normalization menu, the Field Monitor Normalization Data screen is the second screen displayed and is selected by typing any key from the Executive Monitor Normalization Data screen.



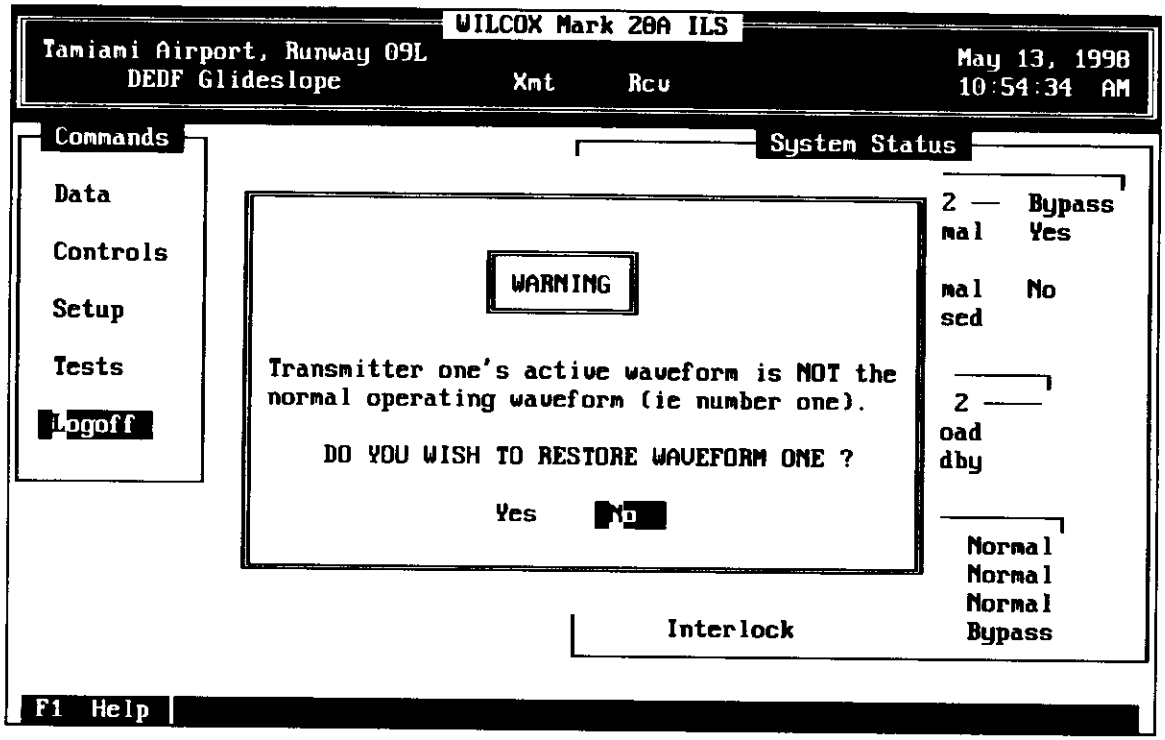
3.11.5.3 Standby Monitor Normalization Data Screen.- When standby monitor normalization is completed, the Standby Monitor Normalization Data screen will be updated and displayed. Standby Monitor Normalization One and Two Data screens are identical. Standby Monitor Two Data screen will be displayed when monitor <T>wo is selected at the Standby monitor menu screen. When <A>ll is selected at the Normalization menu, the Standby Monitor Normalization Data screen is the third screen displayed and is selected by typing any key from the Field Monitor Normalization Data screen.



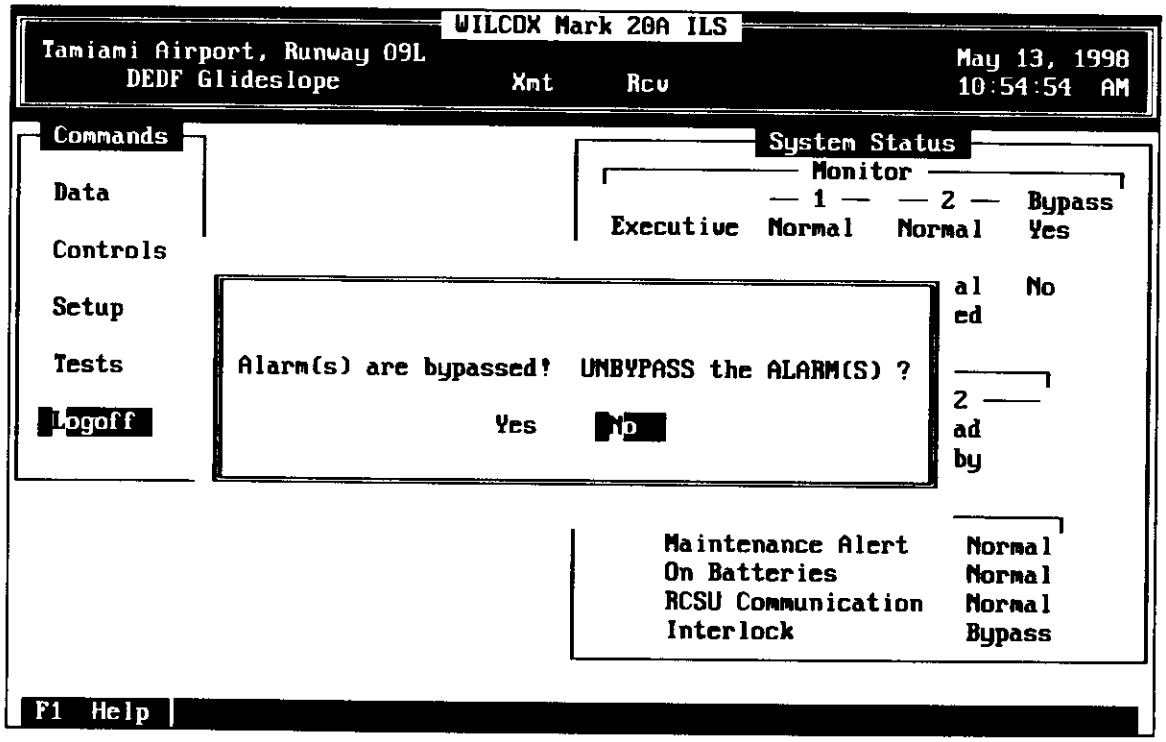
3.12 LOGOFF SCREEN.- After logging onto the glide slope station, the operator may log off the equipment by selecting <L>. The following message will be displayed. Answering <Y>es will begin the log off process. Answering <N>o wil return you to the commands menu screen.



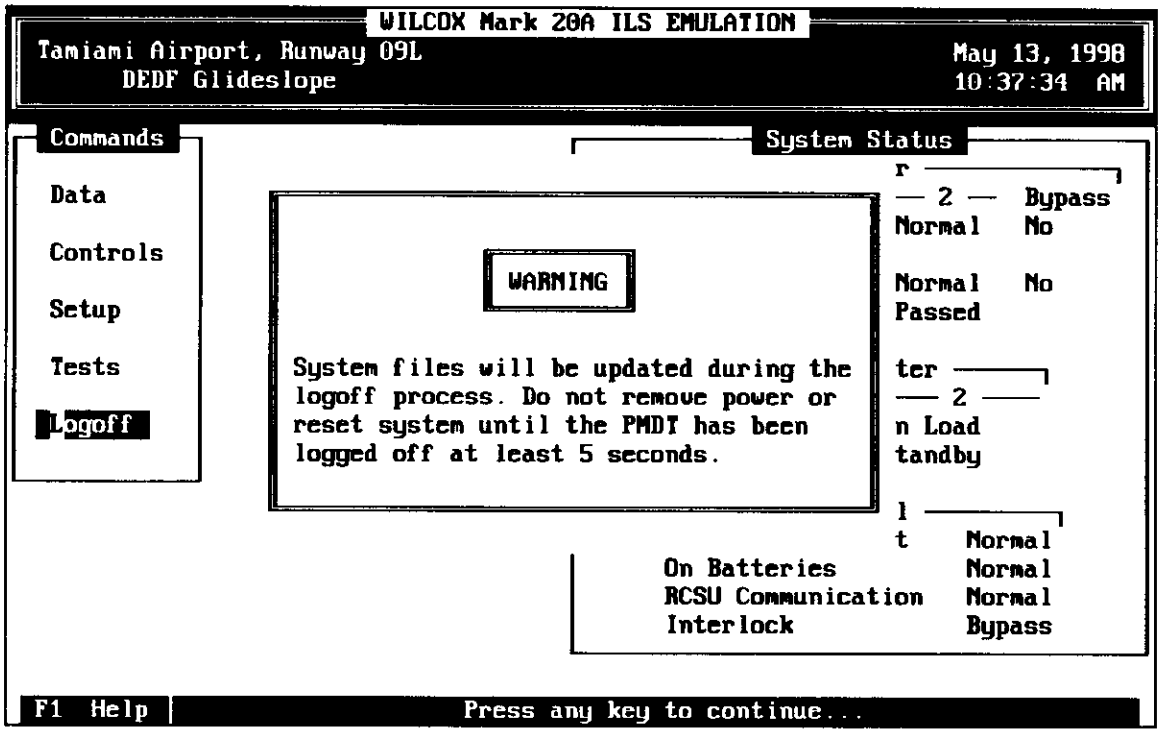
3.12.1 Warning Screen.- If a waveform other than the "Normal" or "Default" waveform has been selected, the operator will be prompted to restore the system to normal before log off is complete. Follow pmdt screen prompts.



3.12.2 Warning Screen.- If the control unit software bypass function has not been unbypassed, the pmdt software will display a warning message. Follow pmdt screen prompts.



3.12.3 Warning Message Screen.- Just before log off is complete, the following message will appear. It is important that this message be observed. Otherwise the RMM EEPROM could be corrupted causing loss of system data.



3.13 FILE STORE/RESTORE UTILITY.- The Mark 20A File Store/Restore software utility provides the capability to save the Mark 20A ILS setup and data files and to restore the setup files. Files are saved to a disk operating system (DOS) diskette using an IBM PC compatible computer. This package consists of three programs; one to support each specific equipment and a common help file. The help files may be accessed by pressing the "F1" key. This software utility is useful for saving and restoring setup files when software has been changed in the system or the monitors and/or RMM computer cca has been replaced. A backup file should be archived so that it can be used later to restore the system setup if necessary. The operator may also view the saved data files when using the MK20A emulation mode by using the /f switch and entering the filename of the saved data.

3.13.1 File Store/Restore Utility Logon Procedure.- Logging on to the system in the file store/restore utility is exactly the same as logging on with the normal PMDT software.

a. Set pmdt power switch to on.

b. The pmdt will display DOS prompt (C>) after computer booting is complete.

c. Connect pmdt serial communications connector to subsystem front panel cca 1A1 PMDT connector J4.

NOTE

Steps d and e are applicable when the store/restore software programs are on floppy disk. For hard disk, access directory where program is installed.

d. Insert Mark 20A File Store/Restore computer disk into pmdt disk drive.

e. Type a: (or A:) and press Enter on pmdt.

NOTE

The number 1 or 2 following the file name fs_mk20a designates the serial communication port and may be 1 or 2 depending on the pmdt used.

f. Type fs_mk20a 1 or 2 (or FS_MK20A 1 or 2) and press Enter.

g. The pmdt will display Enter user ID screen. Enter user identification and press Enter. If identification code has not been assigned to station software, press Enter.

h. The pmdt will display Enter password screen. Enter password and press Enter. If password has not been assigned to station software, press Enter.

i. The pmdt will display "Successful logon at security level three" and then display WILCOX Mark 20A ILS store/restore Commands menu screen.

3.13.1.1 Saving Setup/Data Using FS_MK20A.- Perform the following procedure to save setup or setup and data files using the file save function.

a. Select <C>hange filename from the Commands menu.

b. Enter the desired filename.

c. Escape <Esc> to the Commands menu and select <S>ave.

d. Select save <S>etup only or save setup and <D>ata as desired.

e. At prompt "TOTAL SAVE to file <filename>.GS ?", select <Y>es to save. All setup or setup and data files will be saved. Select <N>o to return to the Save menu.

3.13.1.2 Restoring Data Using FS_MK20A.- Perform the following procedure to restore setup files on in the MK20 using the Restore function.

a. Select <C>hange filename from the commands menu.

b. Select the file from which the setup information is to be restored.

c. Escape <Esc> to the Commands menu and select <R>estore.

d. Select <P>artial (or <T>otal and go to step h).

e. Select <R>MM files or monitor <O>ne or monitor <T>wo files.

f. Select the files to be restored.

g. Answer Yes to the warning message and the selected files are restored.

h. Select <T>otal and answer Yes to the warning message to restore all setup files.

3.13.2 Operator File Store/Restore Utility Screen Selection.- Table 3-22 is the screen selection chart for the glide slope file store/restore utility software operator screens. The letters in brackets < > in the chart are the letters for selecting each screen. To select a screen, the operator can use the keyboard arrow keys to highlight the desired screen and press Enter or type the highlighted letter of the desired screen. To select the Save screen, the operator would type S (uppercase or lowercase) or highlight Save and press Enter. Use the <Esc> key to exit screens.

Table 3-22. Glide Slope File Store/Restore Utility Screen Selection Chart

---

Commands
<S>ave
save <S>etup only
TOTAL SAVE to File *.GS ? (Note: *.GS is not a valid filename, operator must establish the desired filename)
<Y>es <N>o
Reading files from RMM (screen)
Reading files from MON 1 (screen)

Reading files from MON 2 (screen)
Writing file <filename>.GS (screen)
Total save to file <filename>.GS complete (screen)
save setup and <D>ata
TOTAL SAVE to File <filename>.GS ?
<Y>es <N>o
Reading files from RMM (screen)
Reading files from MON 1 (screen)
Reading files from MON 2 (screen)
Data being collected:Please wait (screen)
Reading files from RMM (data) (screen)
Reading files from MON 1 (data) (screen)
Reading files from MON 2 (data) (screen)
Writing file <filename>.GS (screen)
Total save to file <filename>.GS complete (screen)
<R>estore
<P>artial
select <R>MM files
Select files (screen)
WARNING (screen)
Restoring files to RMM (screen)
Partial restoration from file <filename>.GS complete (screen)
select mon <O>ne files

Table 3-22. Glide Slope File Store/Restore Utility Screen Selection Chart

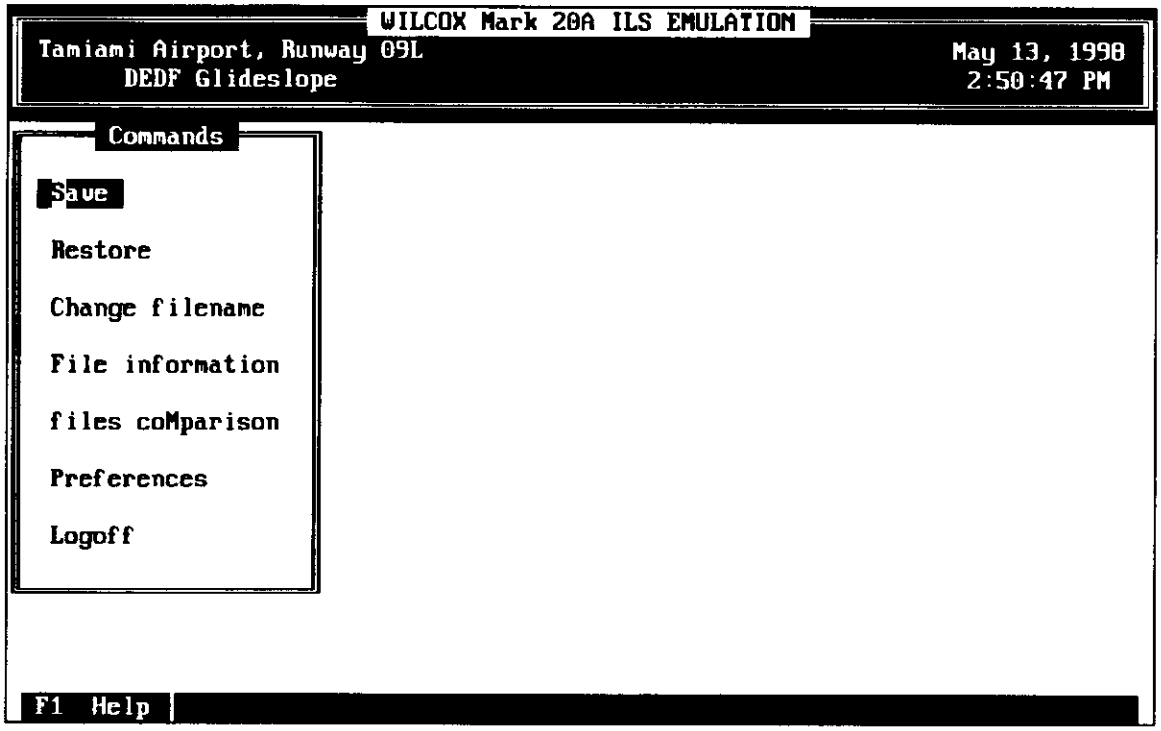
---

Commands - continued
<R>estore - continued
Select files (screen)
WARNING (screen)
Restoring files to MON 1 (screen)
Partial restoration from file <filename>.GS complete (screen)
select mon <T>wo files
Select files (screen)
WARNING (screen)
Restoring files to MON 2 (screen)
Partial restoration from file <filename>.GS complete (screen)
<Q>uit
<T>otal
WARNING (screen)
Restoring files to RMM (screen)
Restoring files to MON 1 (screen)
Restoring files to MON 2 (screen)
Total restoration from file <filename>.GS complete (screen)
<Q>uit
<C>hange filename
Change filename (screen)
<F>ile Information
File Information (screen)
files co<M>parison
Files Comparison (screen)
Comparison Data (screen)

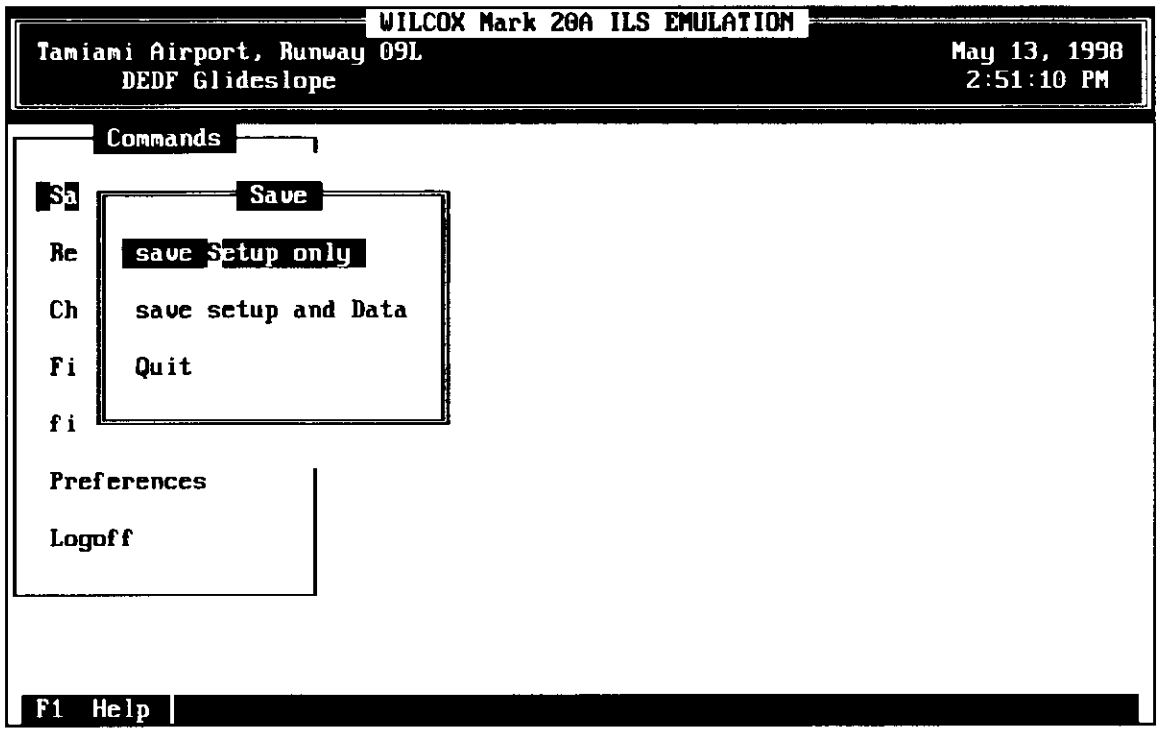
<P>references
    User Preferences (screen)
<L>ogoff
    Do you really want to logoff ?
        <Y>es <N>o

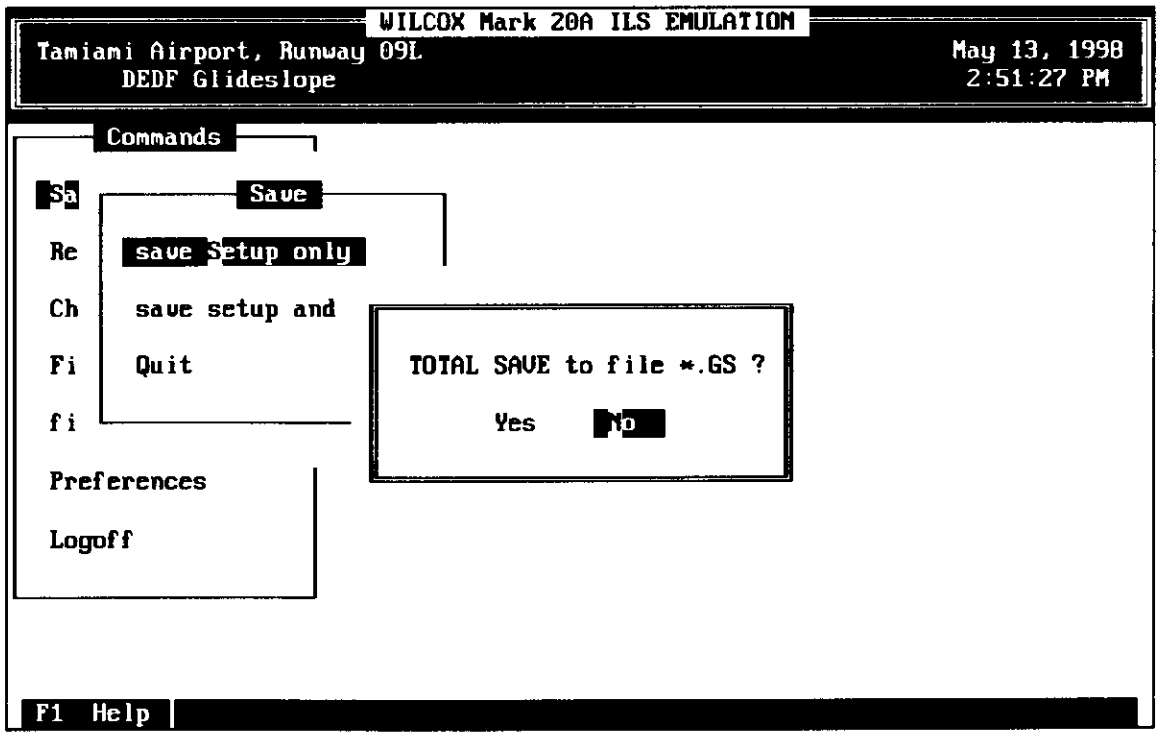
3.13.3 File Store/Restore Utility Screens.- After logging onto the glide slope station via the file store/restore software utility, the operator may review the Commands menu screen.

3.13.3.1 File Store/Restore Utility Commands Menu Screen.- Selecting Save allows the operator to save files to a DOS diskette. Selecting Save brings up the Save menu. Ensure the desired DOS filename has been verified by use of the <C>hange filename menu (paragraph 3.15.3) item before proceeding with this selection.

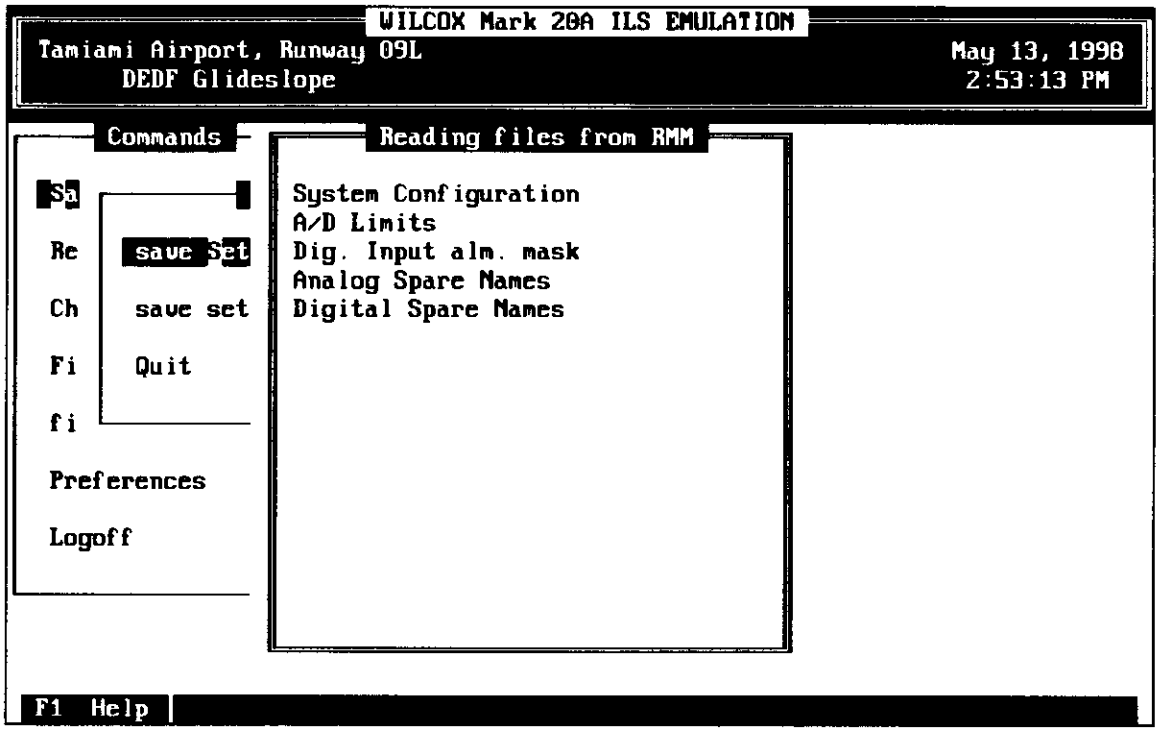


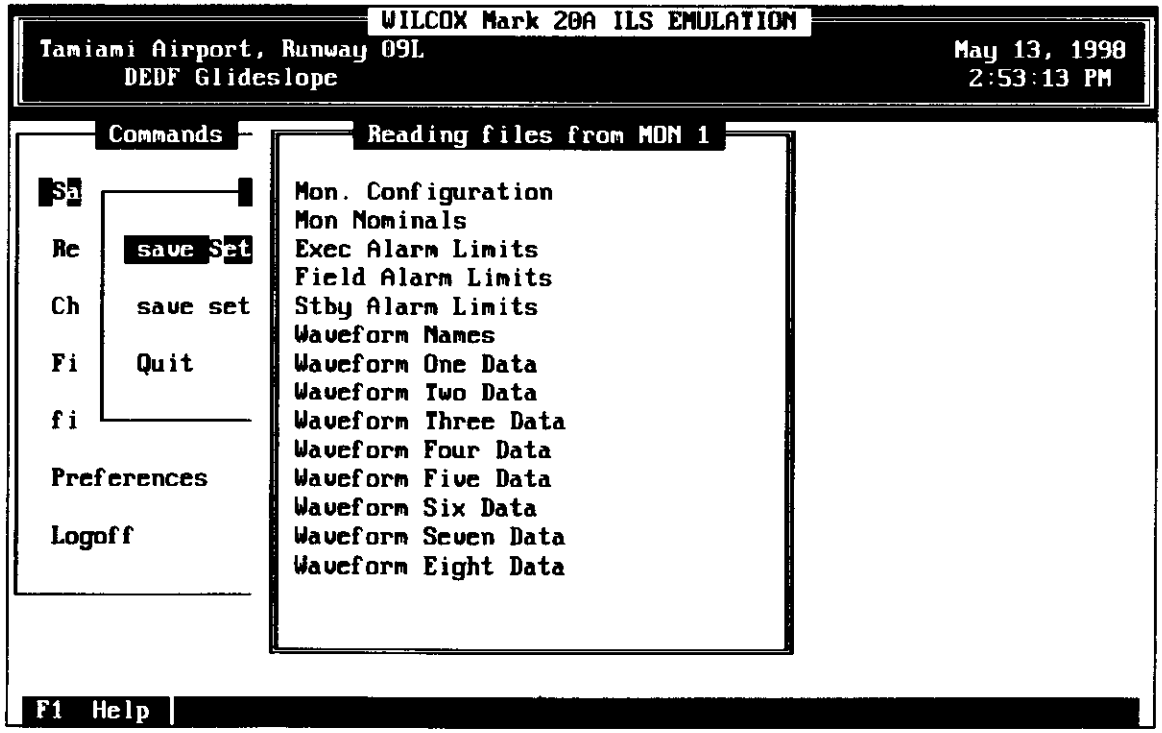
3.13.3.2 Save Menu.- Choose save <S>etup only or save setup and <D>ata files as desired. Saving the Data files allows these files to be viewed in the MK20A pmdt emulation mode by using the /f switch and entering this filename when logging on. Choosing either selection brings up the "TOTAL SAVE to file *.GS ?" question. If this is the filename you want to use, answer Yes. (Note: *.GS is not a valid filename. The operator must establish a filename to be used.) If not, escape and go to the Change filename commands screen (paragraph 3.15.3) and change the filename.



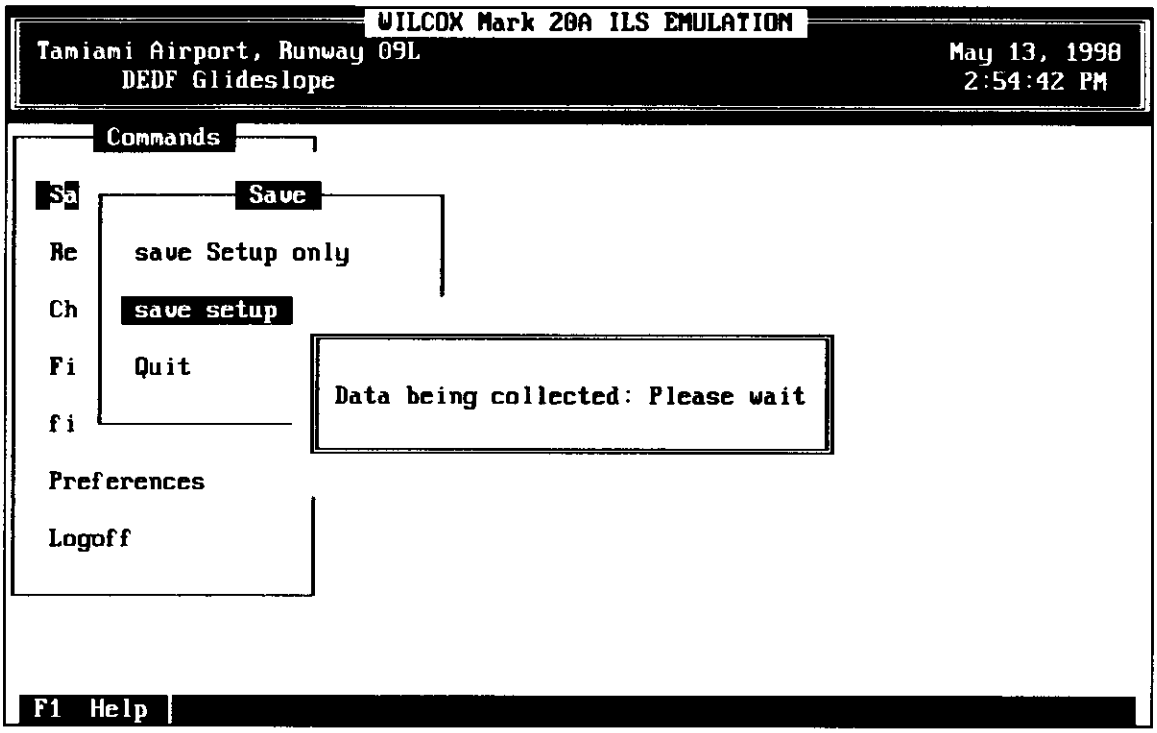


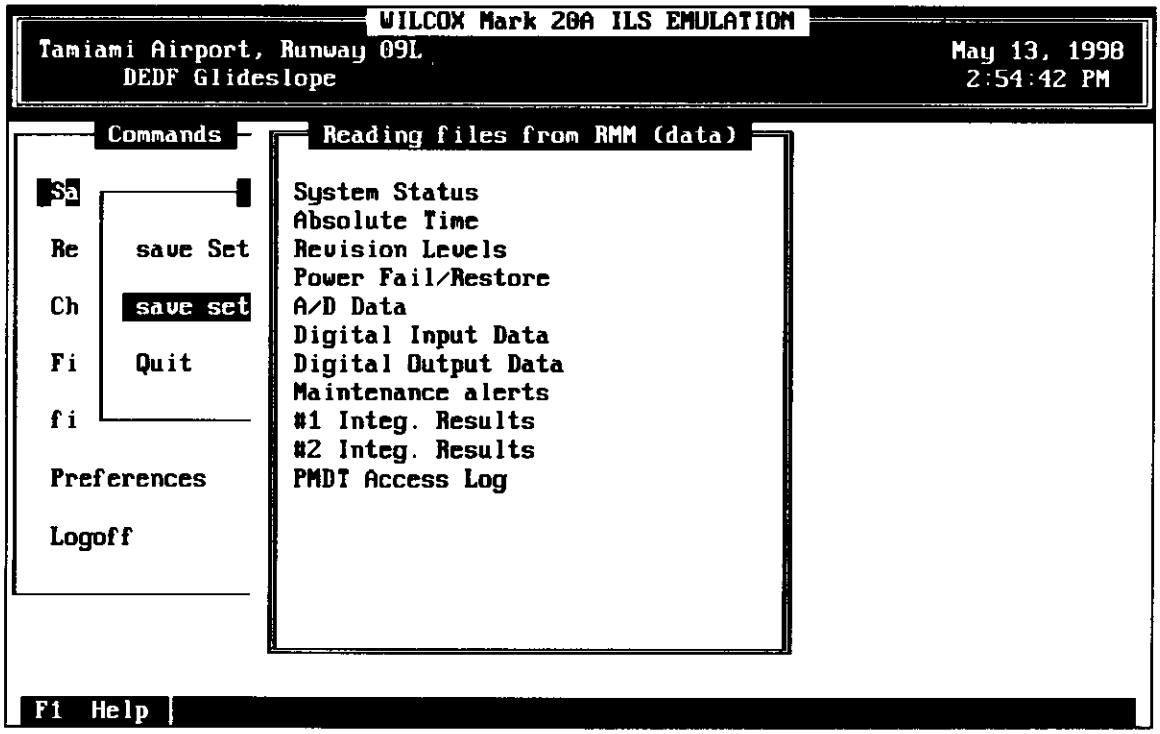
3.13.3.3 Reading Setup Files.- Selecting yes to save the Setup or Setup and data files will result in the following screens being displayed as the files are stored on disk. The RMM files that are saved are displayed as well as the files from monitor one and monitor two. The same files are saved in each monitor so only monitor one is shown here.

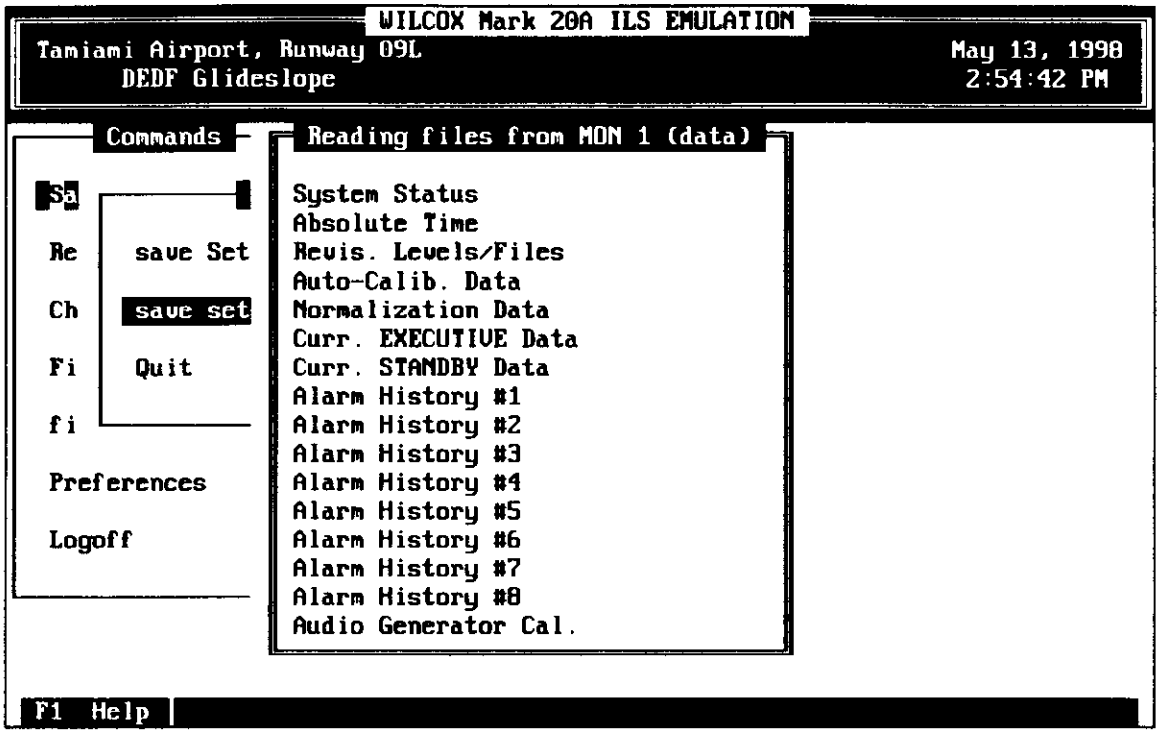


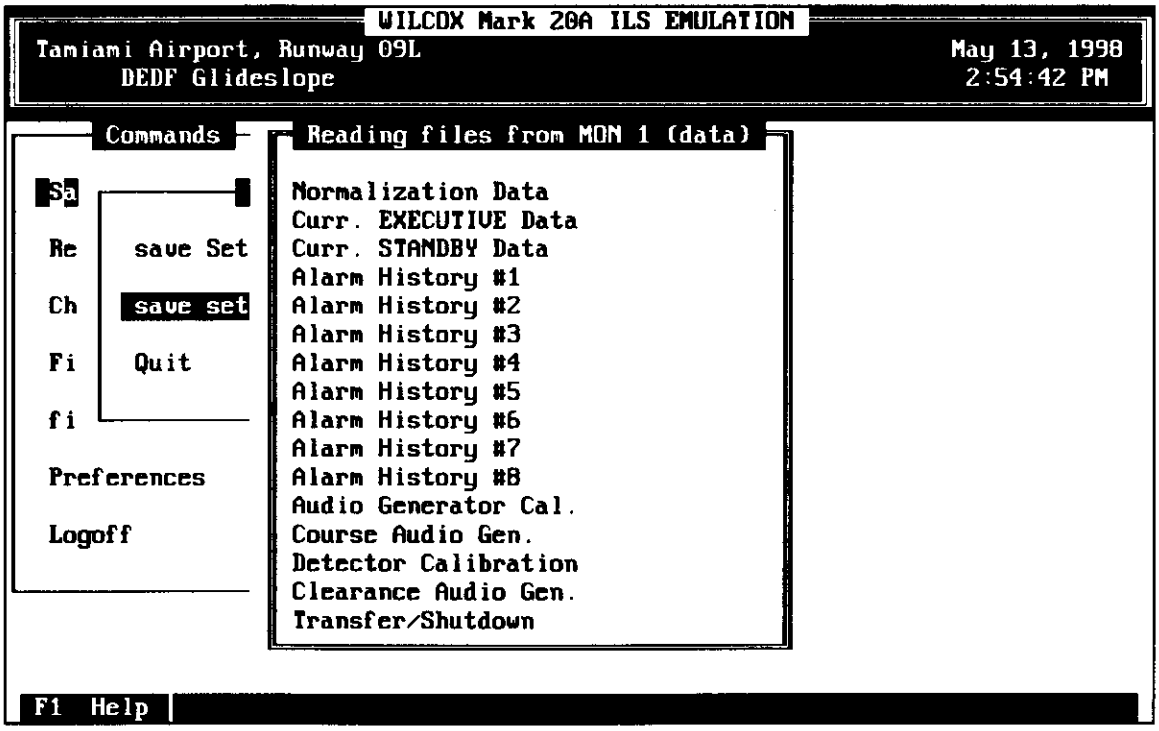


3.13.3.4 Reading Data Files.- Choosing to save the setup and data files will result in the setup files being saved first (paragraph 3.15.1.3). The data files will be saved next and the following screen will be displayed as the data is being collected (takes several seconds). The files saved are then displayed with the RMM data files displayed first followed by monitor one and monitor two files. Note that all the monitor files will not fit in the window so the filenames scroll upward as they are collected.

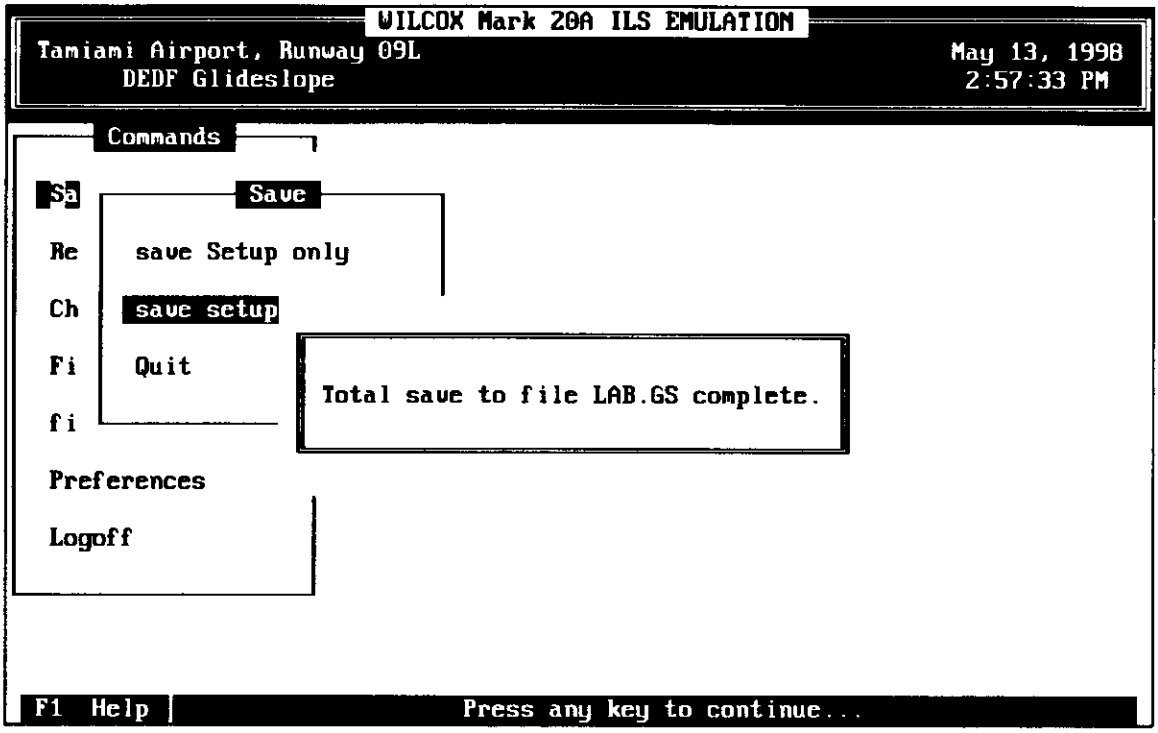




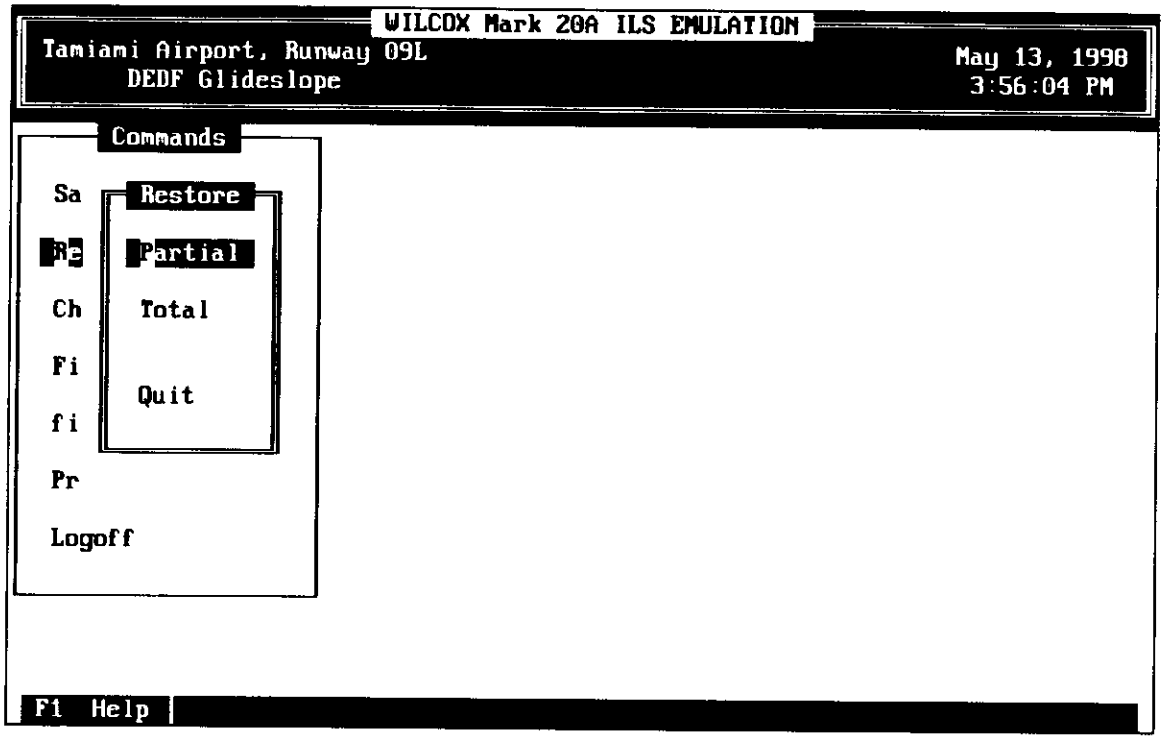

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
2:54:42 PM
Commands
Sa
Re
Ch
Fi
fi
save Set
save set
Quit
Preferences
Logoff
Reading files from MON 1 (data)
System Status
Absolute Time
Revis. Levels/Files
Auto-Calib. Data
Normalization Data
Curr. EXECUTIVE Data
Curr. STANDBY Data
Alarm History #1
Alarm History #2
Alarm History #3
Alarm History #4
Alarm History #5
Alarm History #6
Alarm History #7
Alarm History #8
Audio Generator Cal.
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
2:54:42 PM
Commands
Sa
Re
Ch
Fi
fi
save Set
save set
Quit
Preferences
Logoff
Reading files from MON 1 (data)
Normalization Data
Curr. EXECUTIVE Data
Curr. STANDBY Data
Alarm History #1
Alarm History #2
Alarm History #3
Alarm History #4
Alarm History #5
Alarm History #6
Alarm History #7
Alarm History #8
Audio Generator Cal.
Course Audio Gen.
Detector Calibration
Clearance Audio Gen.
Transfer/Shutdown
F1 Help

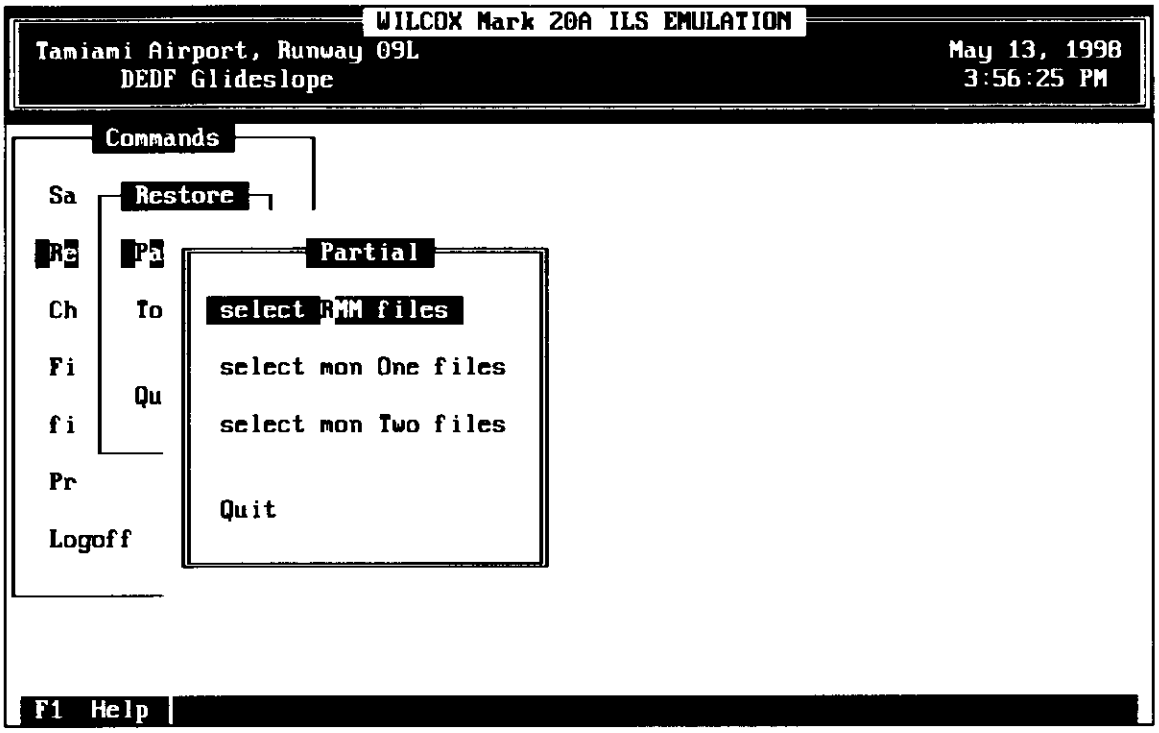
3.13.3.5 Total Save Complete.- When the chosen files have been saved, the following screen will be displayed indicating that the files have been saved. In this case, the files have been saved to a file called "LAB.GS" which was set up from the Change Filename Commands menu.



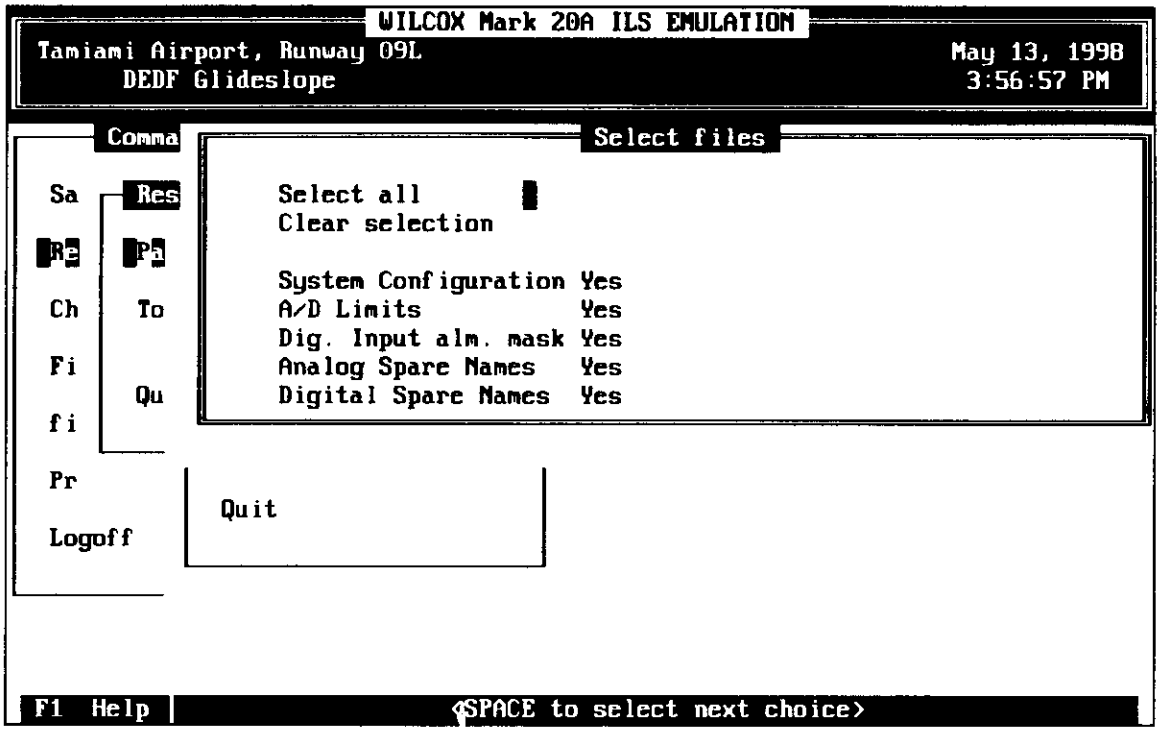
3.13.4 File Store/Restore Utility Restore Screen.- Selecting the Restore command from the Commands menu screen results in the display of the Restore menu. The Restore menu screen gives the operator the choice of Partial restoration or Total restoration.



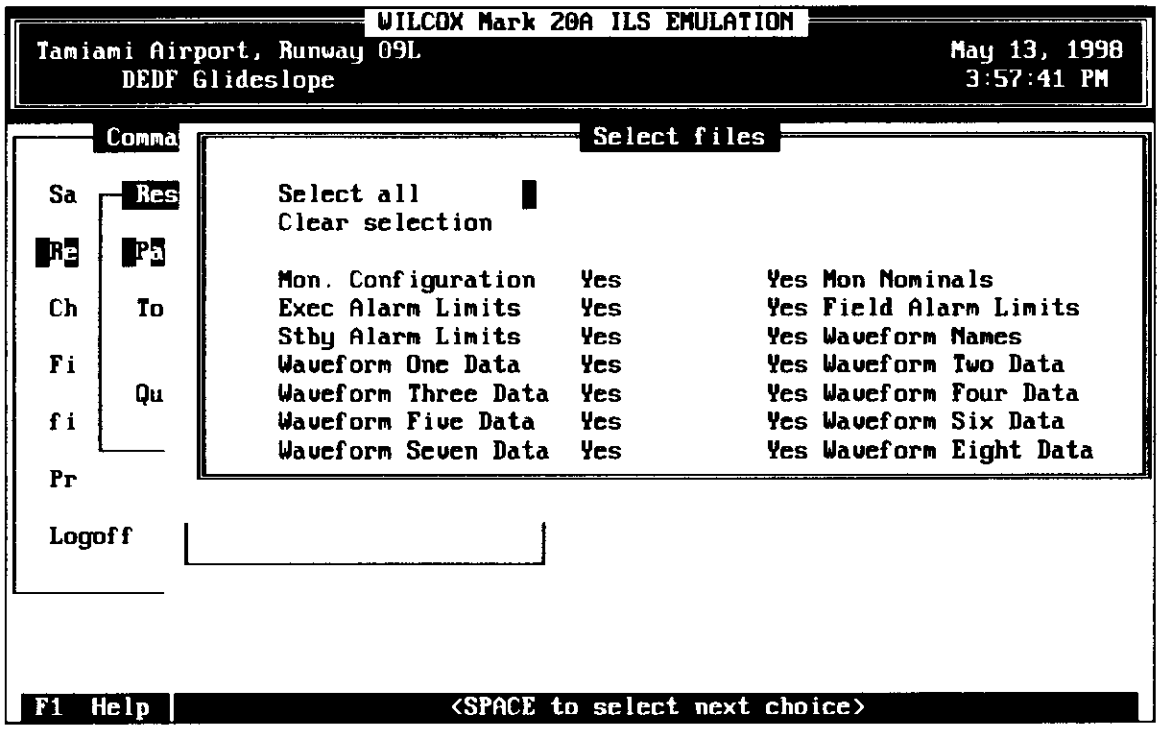
3.13.4.1 Partial Restore Screen.- If partial restoration is selected, the Partial restoration screen is displayed giving the operator the choice of selecting files from the rmm or from the monitor one files or monitor two files.

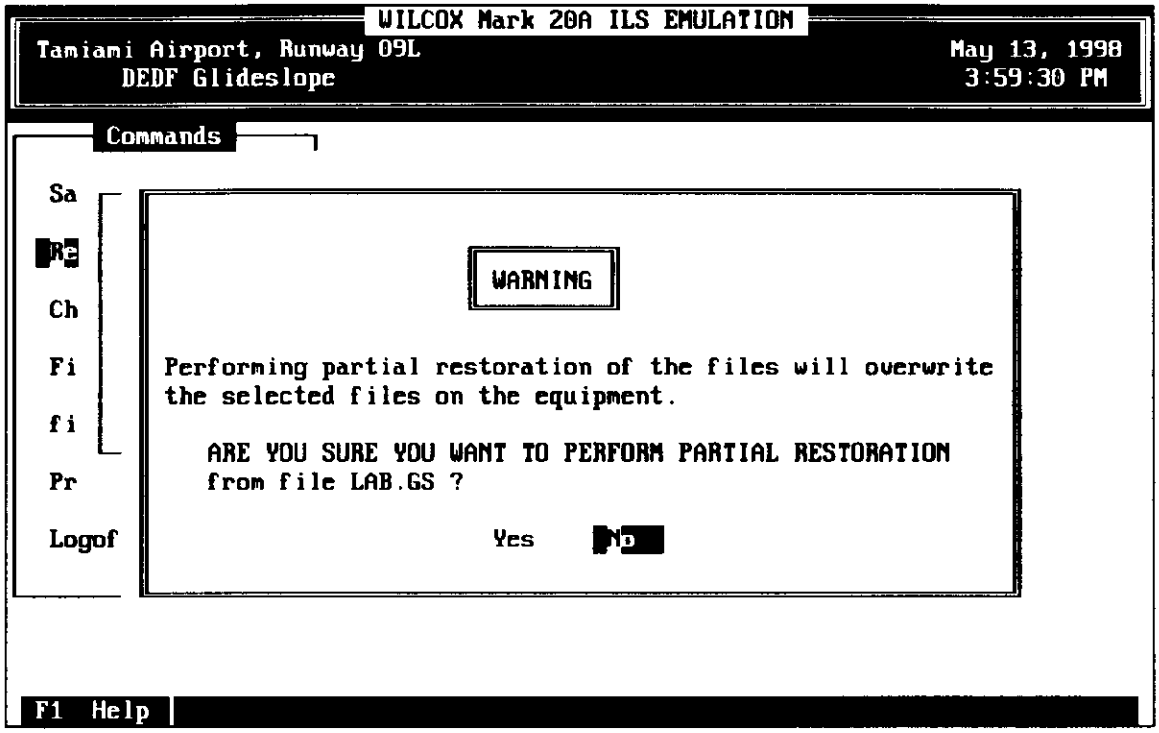


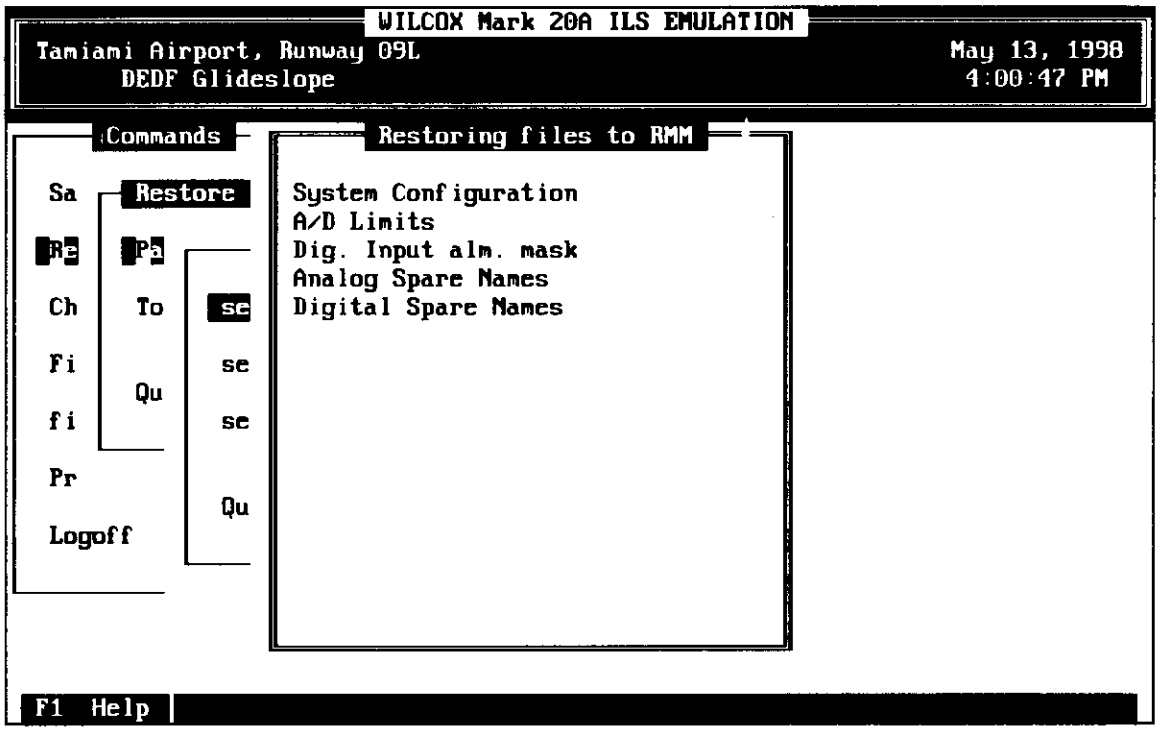
3.13.4.2 Partial Restore RMM Select Files Screen.- The Select files screen is displayed when either the select RMM files or select mon One files is selected from the Partial Restore screen. The Select files screen displayed after choosing RMM files offers the operator the choice to Select all RMM files, Clear selection (clears last selection made), or to restore System Configuration, A/D Limits, Digital Input Alarm Mask, or Analog Spares Names or Digital Spares Names information from diskette.



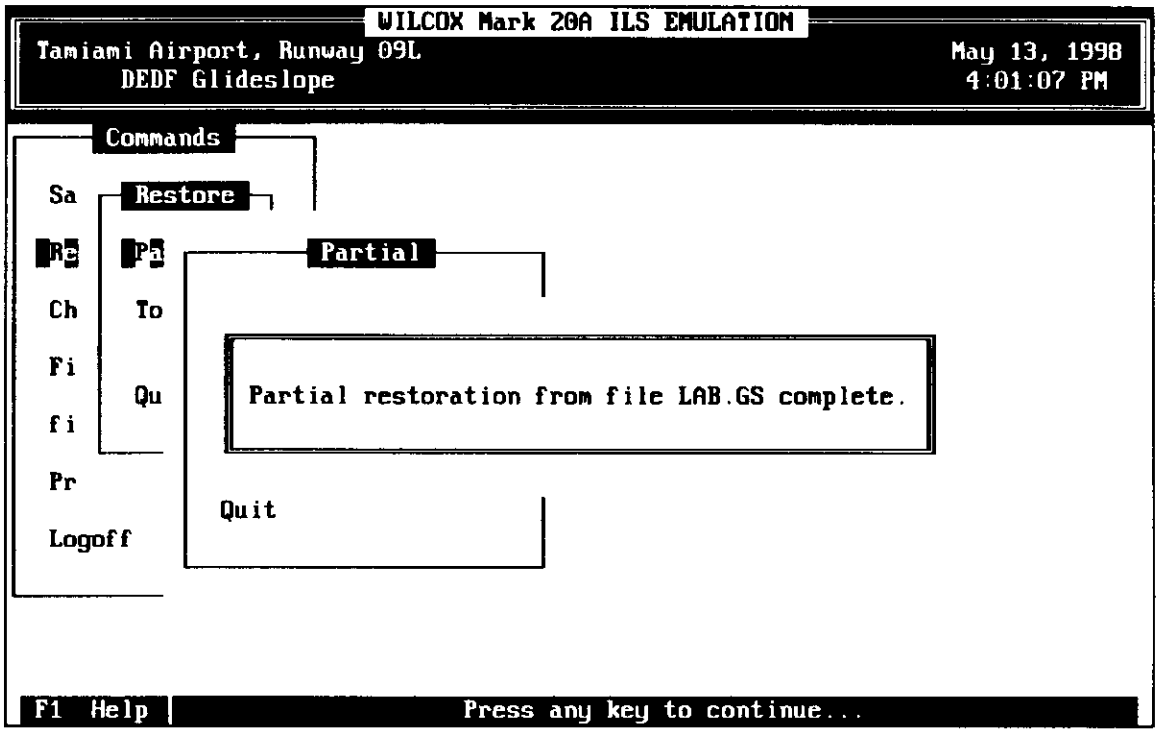
3.13.4.3 Partial Restore Monitor Select Files Screen.-The Select files screen for mon One restoration allows the operator to select all mon One files, Clear selection, or restore data from the Monitor Configuration, Executive Alarm Limits, Field Alarm Limits, Standby Alarm Limits, Monitor Nominals, Waveform Names Waveform One through Waveform Eight Data screens. After selecting the files to be restored, a warning is displayed "Performing partial restoration of the files will overwrite the selected files on the equipment." The operator is then offered a choice "ARE YOU SURE YOU WANT TO PERFORM PARTIAL RESTORATION from file <filename>.GS ?". If this is not the file you want to restore from, go to Change filename (paragraph 3.15.3) on the Commands menu now and select the file you want to restore from. Selecting Yes begins the restoration process. As the files are restored, the filenames will be listed on the "Restoring files to .. " screen. Selecting No returns the operator to Partial Restore screen.



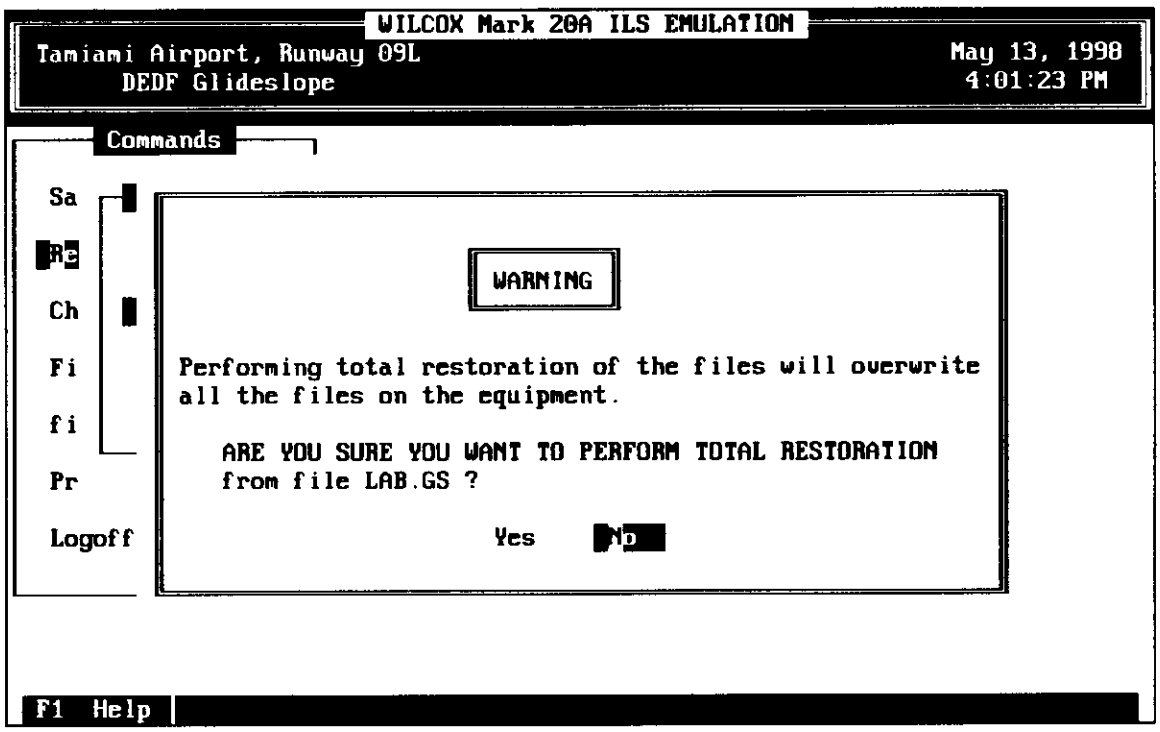

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
3:59:30 PM
Commands
Sa
Re
Ch
Fi
fi
Pr
Logof
WARNING
Performing partial restoration of the files will overwrite the selected files on the equipment.
ARE YOU SURE YOU WANT TO PERFORM PARTIAL RESTORATION from file LAB.GS ?
Yes
No
F1 Help

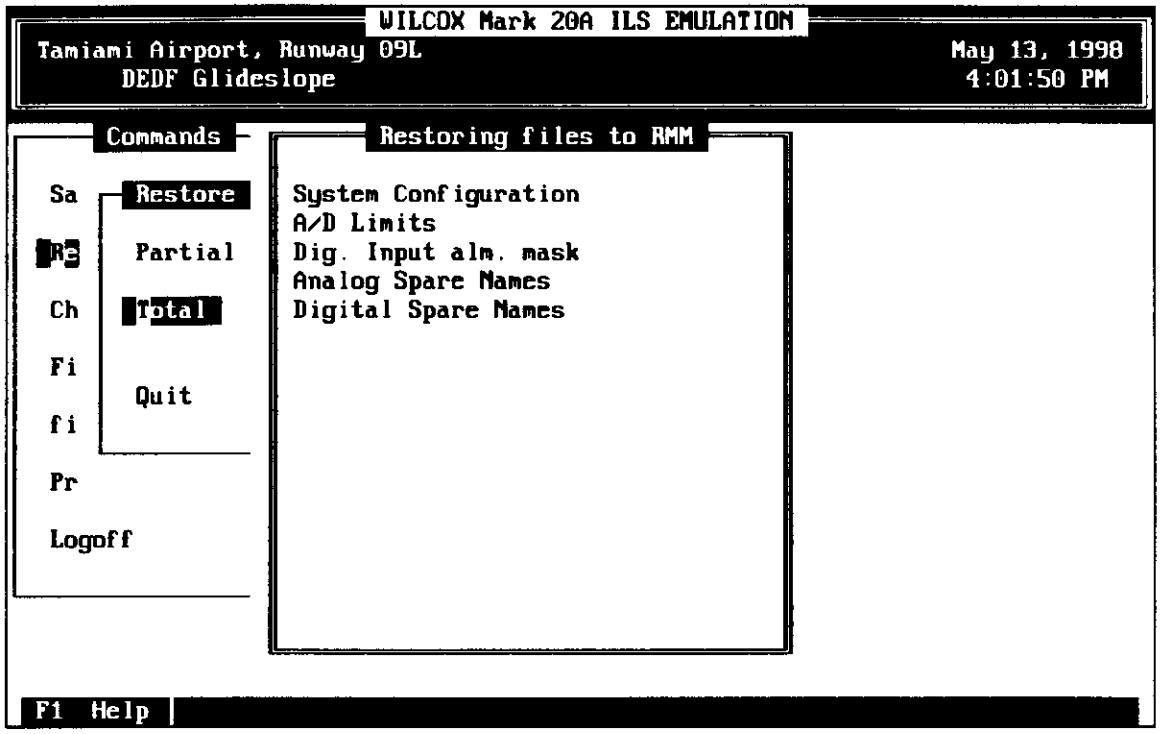

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
4:00:47 PM
Commands
Sa
Re
Ch
Fi
fi
Pr
Logoff
Restore
Pa
To
Qu
se
se
se
Qu
Restoring files to RMM
System Configuration
A/D Limits
Dig. Input alm. mask
Analog Spare Names
Digital Spare Names
F1 Help

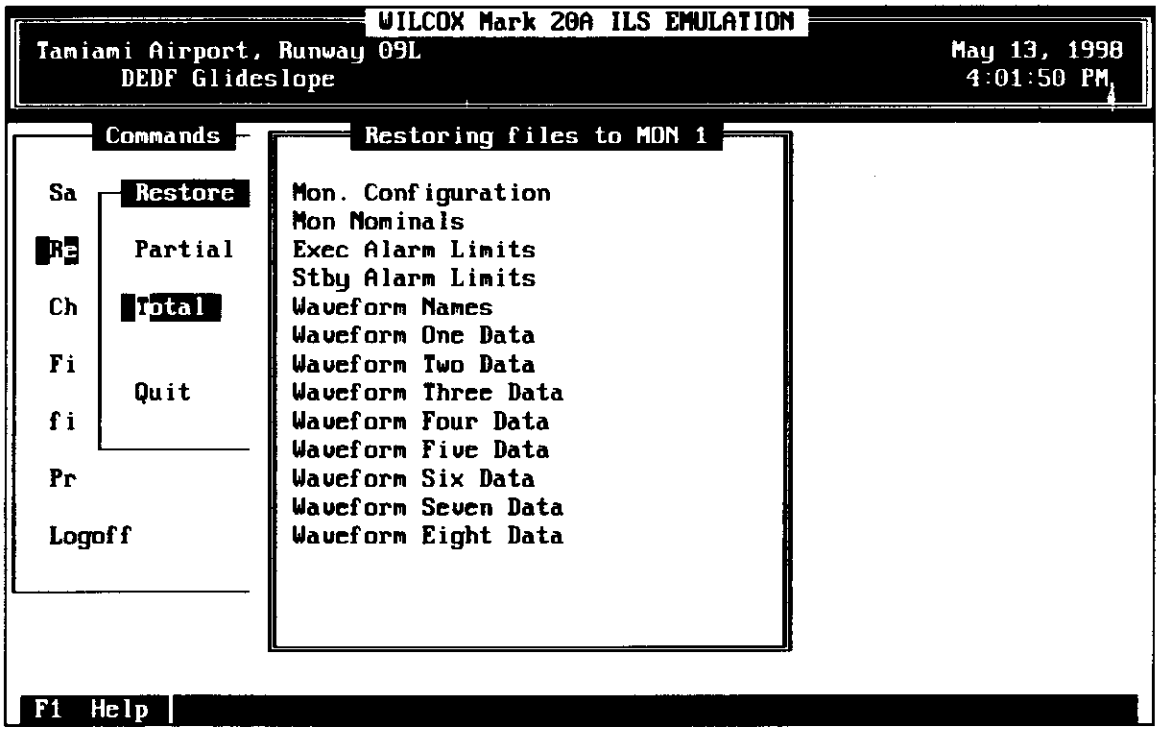
3.13.4.4 Partial Restore Complete.- When the chosen files have been restored, the following screen will be displayed indicating that the files have been restored. In this case, the files have been restored from a file called "LAB.GS" which was set up from the Change Filename Commands menu.

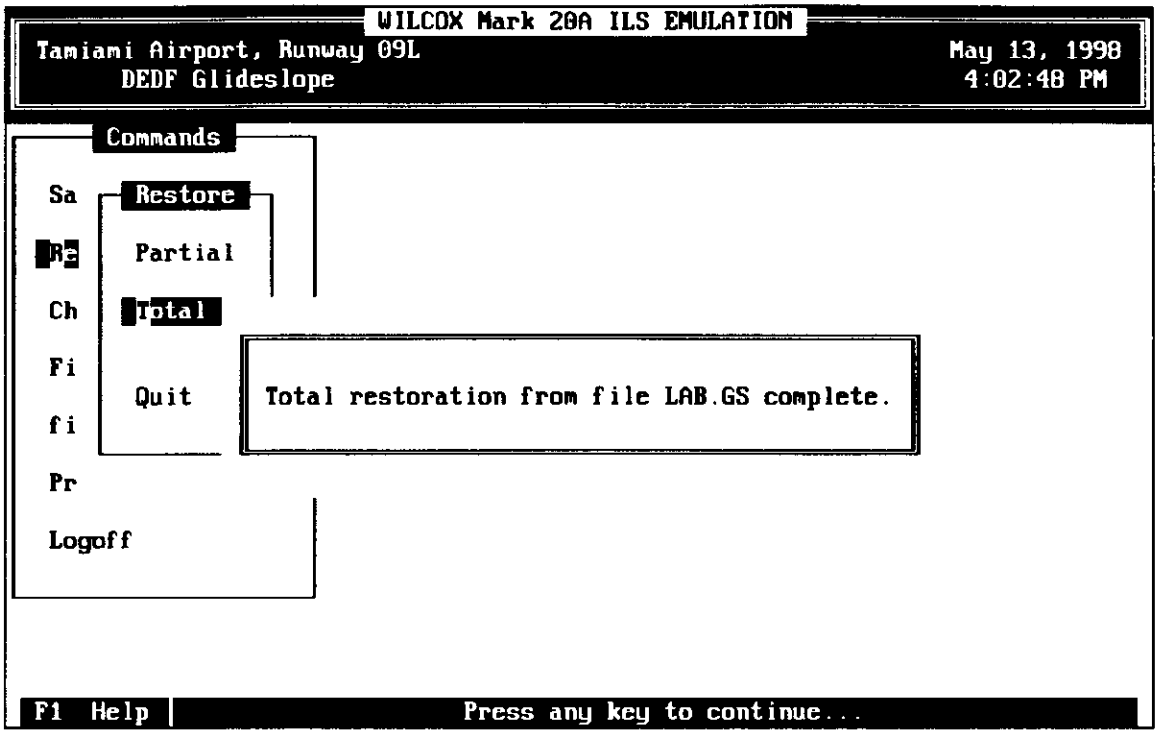


3.13.4.5 Total Restore.- Selecting Total from the Restore screens will restore all rmm and monitor one and monitor two files to the system. Upon selection of Total, the warning "Performing total restoration of the files will overwrite all the files on the equipment." The operator is then offered a choice "ARE YOU SURE YOU WANT TO PERFORM TOTAL RESTORATION from file <filename>.GS ?". If this is not the file you want to restore from, go to Change filename (paragraph 3.15.3) on the Commands menu now and select the file you want to restore from. Selecting Yes begins the restoration process. Selecting No returns the operator to Partial Restore screen. If the file you have selected to restore from has been previously saved from an earlier version of the file store/restore software, you will be advised of this and asked if you want to continue with the restoration. Answering Yes begins the restoration. As the files are restored they will be listed on the "Restoring files to .. " screens. In this example, the files were restored from a file named "LAB.GS". When Total restoration is complete, the "Total restoration from file LAB.GS complete." will be displayed.

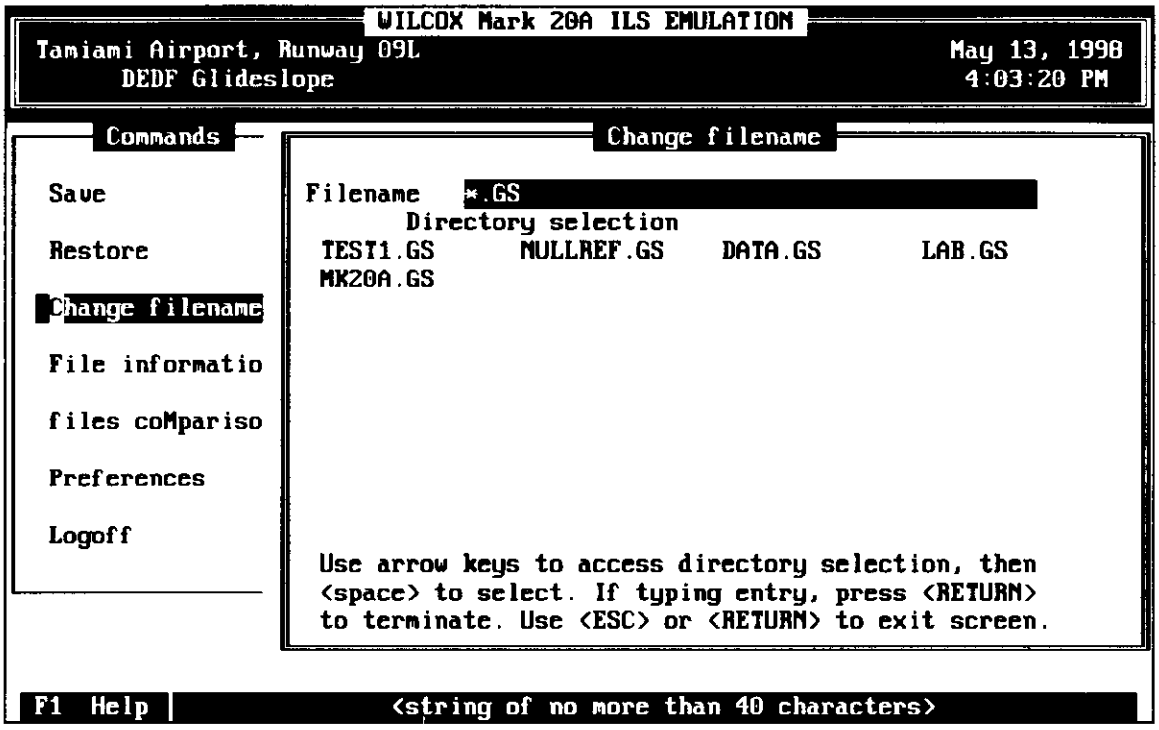


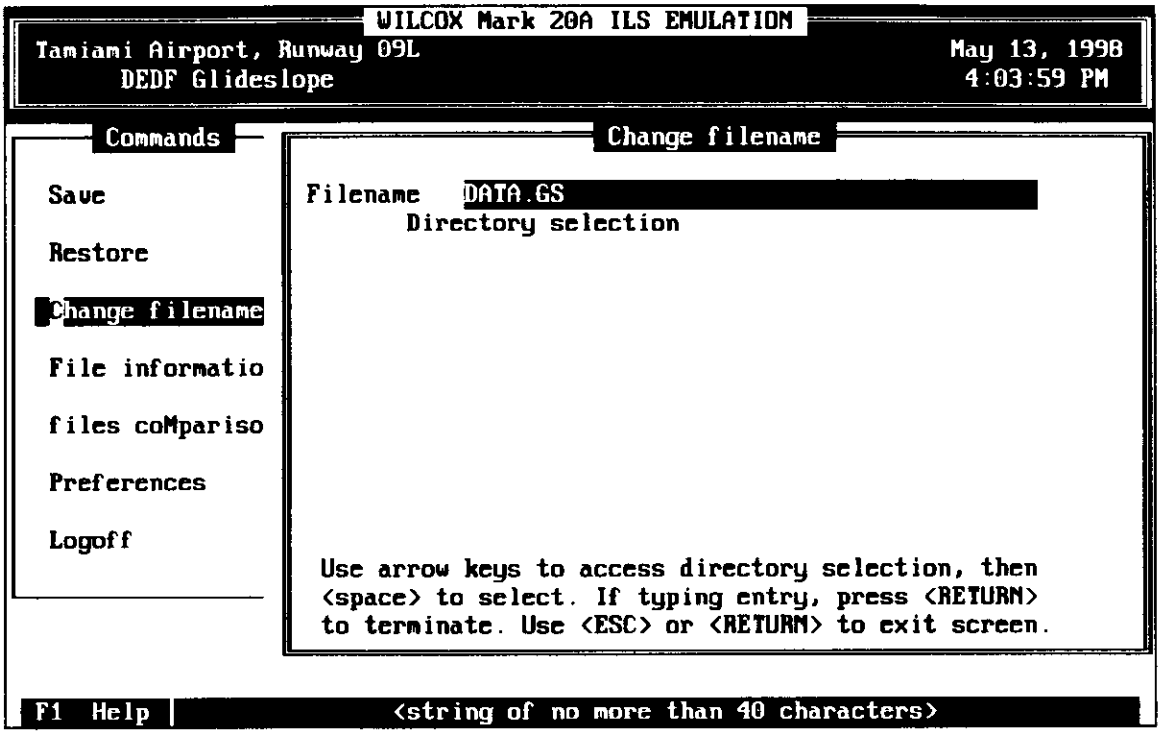

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
4:01:50 PM
Commands
Sa
Re
Ch
Fi
fi
Pr
Logoff
Restore
Partial
Total
Quit
Restoring files to RMM
System Configuration
A/D Limits
Dig. Input alm. mask
Analog Spare Names
Digital Spare Names
F1 Help


WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
4:01:50 PM
Commands
Sa
Re
Ch
Fi
fi
Pr
Logoff
Restore
Partial
Total
Quit
Restoring files to MON 1
Mon. Configuration
Mon Nominals
Exec Alarm Limits
Stby Alarm Limits
Waveform Names
Waveform One Data
Waveform Two Data
Waveform Three Data
Waveform Four Data
Waveform Five Data
Waveform Six Data
Waveform Seven Data
Waveform Eight Data
F1 Help

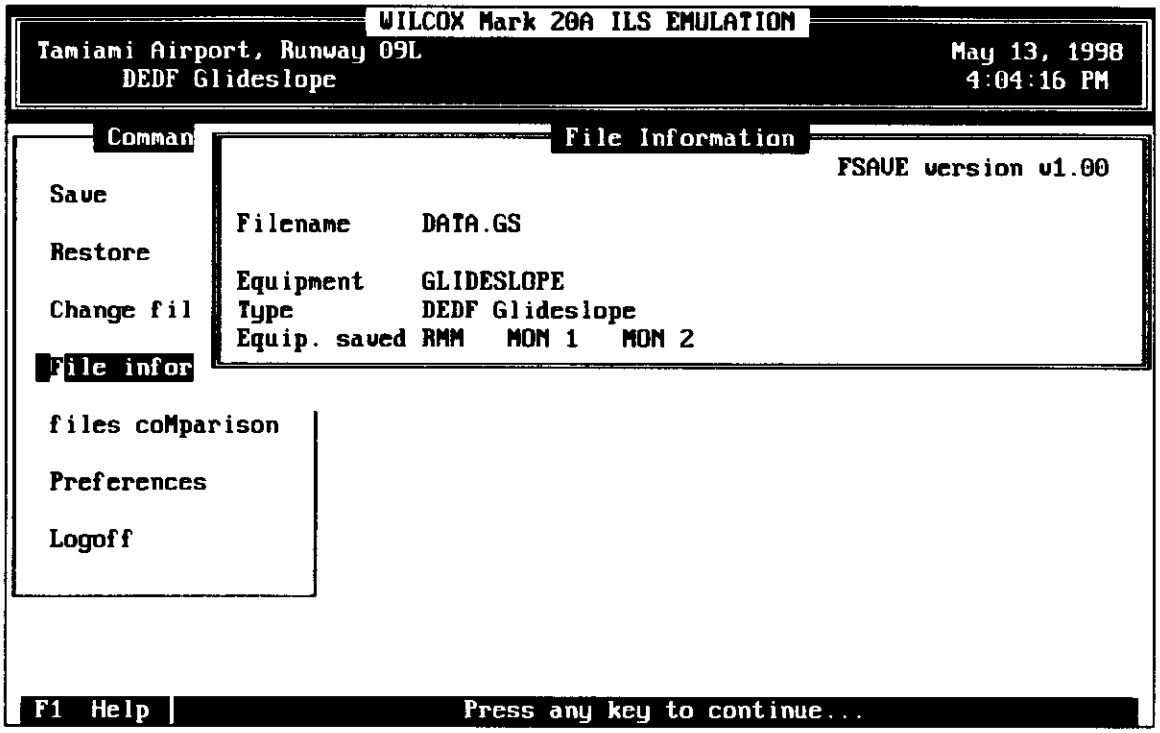

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
4:02:48 PM
Commands
Sa
Re
Ch
Fi
fi
Pr
Logoff
Restore
Partial
Total
Quit
Total restoration from file LAB.GS complete.
F1 Help
Press any key to continue...

3.13.5 Change Filename Command.- Select <C>hange filename to specify the desired DOS filename and its path to save to or restore from. DOS wildcards may be used to display directory information. Exercise care in selecting a filename as it is possible to overwrite files. Terminate path and filename (up to 40 characters) entered with a <RETURN>. Press <ESC> or <RETURN> to exit screen. Use the <arrow> keys to select a file from the directory selection shown and then <space> to terminate or enter the path and DOS filename of the desired file. If entering the filename, terminate with a <RETURN>. Use <ESC> or <RETURN> to exit screen. This screen works like a directory. For example typing "*.GS" will cause all files with a .GS extension to be listed. Once a file has been selected, the other file listings will disappear.

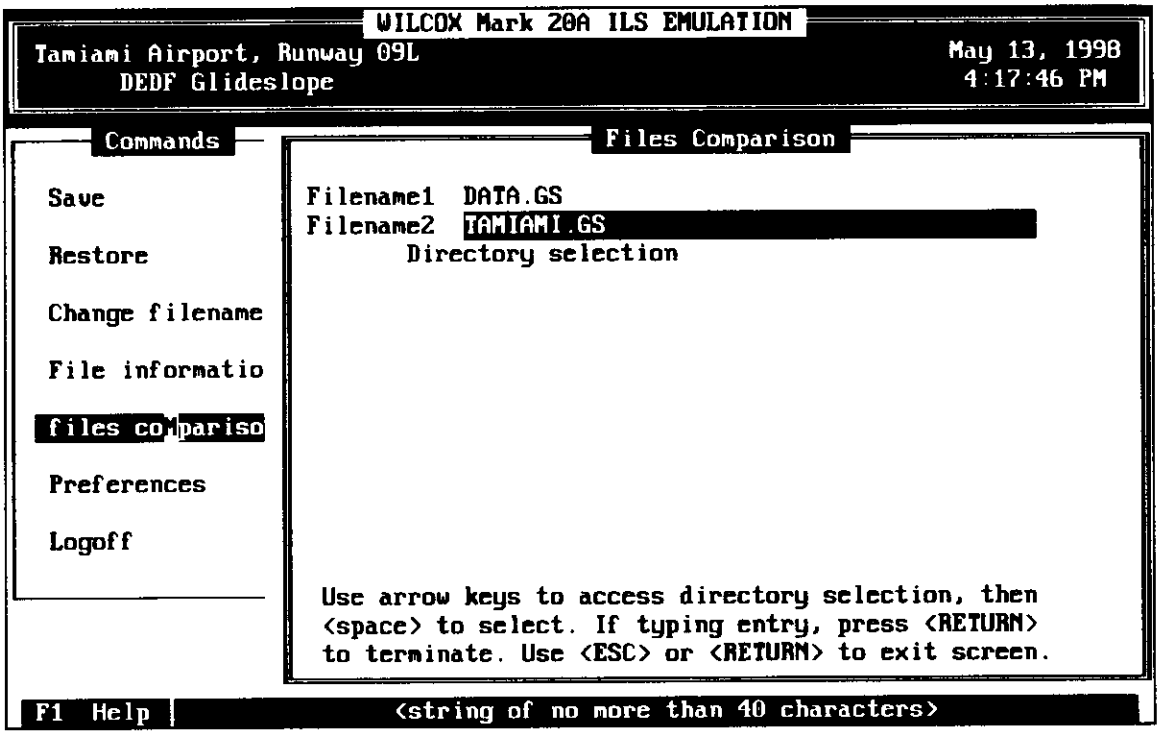


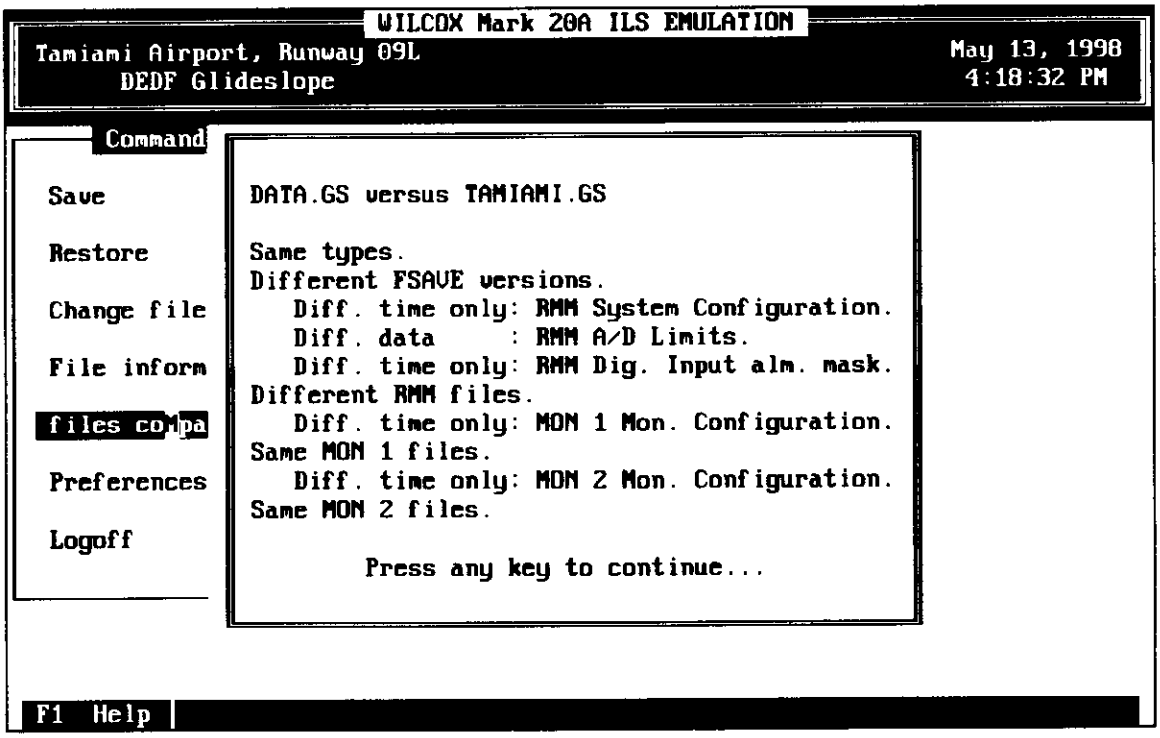

WILCOX Mark 20A ILS EMULATION
Tamiami Airport, Runway 09L
DEDF Glideslope
May 13, 1998
4:03:59 PM
Commands
Save
Restore
Change filename
File informatio
files coMpariso
Preferences
Logoff
Change filename
Filename DATA.GS
Directory selection
Use arrow keys to access directory selection, then <space> to select. If typing entry, press <RETURN> to terminate. Use <ESC> or <RETURN> to exit screen.
F1 Help
<string of no more than 40 characters>

3.13.6 File Information.- Select <F>ile information to display information that includes the software package version, the name of the selected DOS file, and the version of FSAVE software that was used to store the equipment setup files to disk.



3.13.7 File Comparison.- Select files co<M>parison to compare two previously saved equipment files on disk. Only setup related information will be compared. In this example, file DATA.GS and TAMIAMI.GS have been compared.





3.13.8 Preferences Screen.- The users preference screen is identical to the pmdt software user's preference screen. After logging onto the station, the operator may view the User Preferences screen from the Commands menu. This screen allows the operator to adjust the operation of the program to suit operator taste and to match the particular computer/monitor being used. Any changes made to the preferences are stored in a file called RMM.CFG. If FS_MK20A.exe is in the same directory as MK20A.exe, then any changes made to the preferences from either file will effect the other since they will use the common RMM.CFG file. Refer to table 3-24 for details.

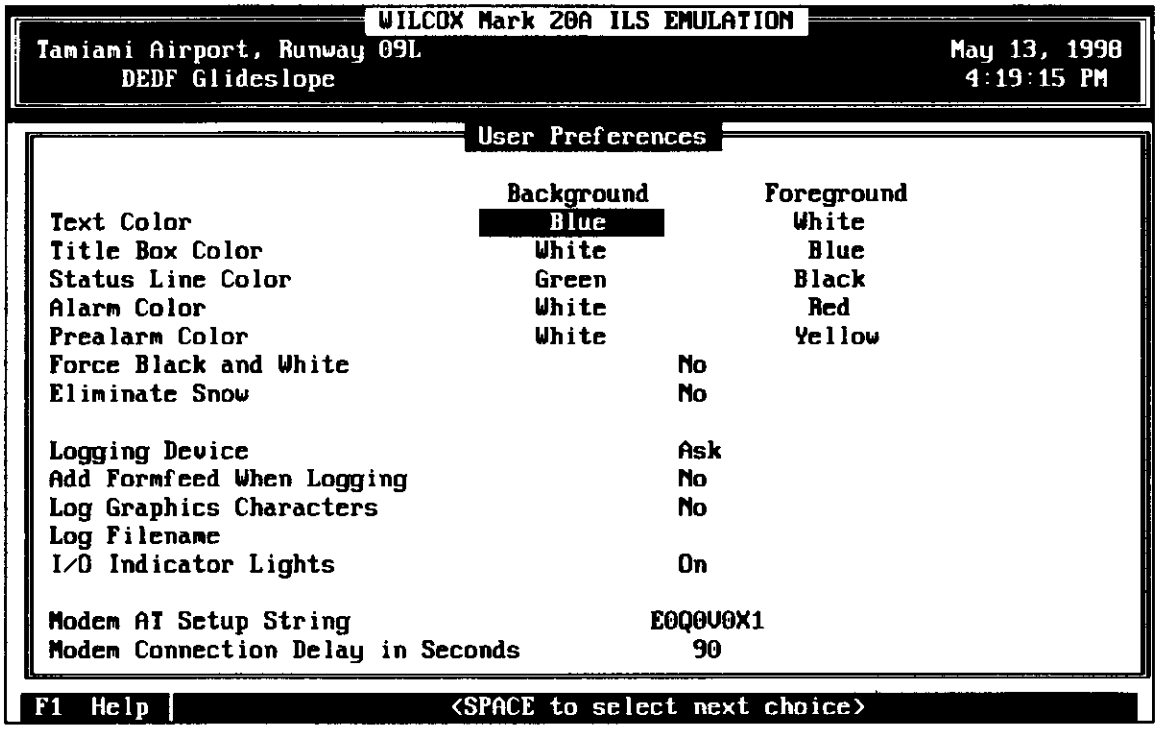


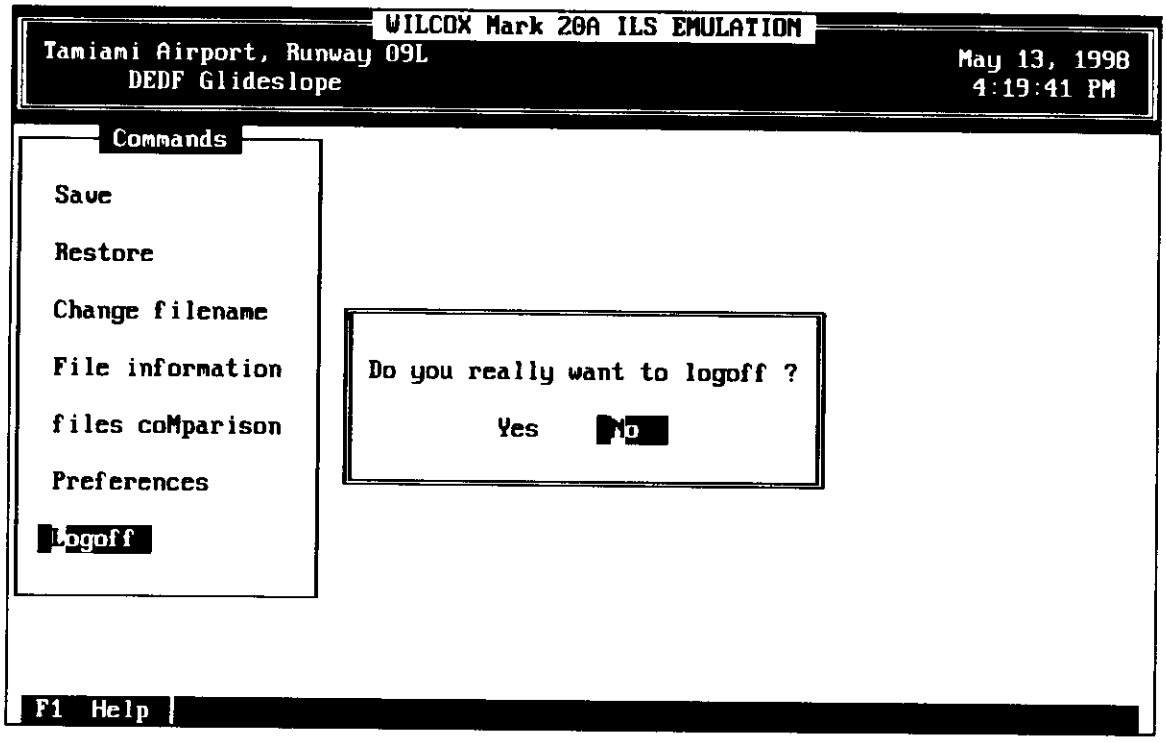
Table 3-24. User Preferences

Item	Function
Text Color	Provides selection of separate foreground and background colors for main window information.
Title Box Color	Provides selection of separate foreground and background colors for top window information.
Status Line Color	Provides selection of separate foreground and background colors for information on the bottom line of the screen.
Alarm Color	Provides selection of separate foreground and background colors on data screens to highlight values that are in fault condition.
Prealarm Color	Provides selection of separate foreground and background colors on data screens to highlight values that are in a prefault condition.

Table 3-24. User Preferences

Item	Function
Force Black and White	Selecting Yes forces computer to use internal black and white settings. Selecting No allows computer to automatically adjust to color or black and white settings, depending on the type of monitor being used.
Eliminate Snow	Selecting Yes eliminates flashing dots of interference. Selecting No allows interference to be displayed.
Logging Device	Selects the device (Printer or Disk) that will be used to log information when the Print Scrn key is pressed. If Ask is selected, program will ask which of the two devices to use.
Add Formfeed When Logging	Selecting Yes causes each screen of information to be printed on a separate sheet of paper. Selecting No causes a continuous printout.
Log Graphics Characters	Selecting Yes causes the graphics characters on the monitor display to be printed as is. Selecting No causes the graphics characters to be translated to space characters. Printer must be capable of printing graphic characters if Yes is selected.
Log Filename	Specify the path and filename to use when data logging. The drive and path are optional. This entry should conform to DOS conventions with respect to path and file nameing. For example the filename cannot exceed eight characters plus a three character extension. If blank, data will be logged to the default directory of the current default disk drive. If you do not choose a file name, a default file named "mm_dd_yy.LOG" is used, where "mm" is the current month, "dd" is the current day, and "yy" is the current year. All log copies made to disk on this day are written to this file. Maximum filename length is 40 characters. (Used only from the MK20A.exe file)
I/O Indicator Lights	Selecting On displays communication activity indicators in top window of screen. These indicators show when the pmdt is communicating.
Modem AT Setup String	The setup string is sent to the modem at the start of operation in order to program it for proper operation. Default string is correct for most Hayes-compatible modems.
Modem Connection Delay in Seconds	Allows selection of delay time from 30 to 120 seconds.

3.13.9 Logoff Screen.- Logoff from the file store/restore utility may be accomplished from the Commands menu. Select <L>ogoff and the message "Do you really want to logoff ?" will be displayed. Selecting Yes will exit program. Selecting No will return the pmdt to the Commands menu screen.



3.14 PMDT Software.- The pmdt has several capabilities heretofore not fully described in this instruction book. Most are identified in the help screen that is accessible by typing MK20A and pressing <Enter> or by typing MK20A /H and pressing <Enter>.

```
MK20A103 V1.03 -- PC to navaid communications program

   Usage:   MK20A103 comm_port [/BW] [/Bbaud_rate] [/Dphone_number] [/Finput_fi
le] [/H]

   The communication port to use must be specified on the command
   line as a number between one and four.

    [/B]   Specify baud rate for a dialup-modem connection as either
           2400, 1200, or 300.  Default baud rate for a local connection
           is 9600 baud.
    [/BW]  Force black and white display.
    [/D]   Specify phone number for dialup connection.  First character
           of the phone number must be "T" for tone dialing or "P" for
           pulse dialing.  Each comma "," in the phone number produces
           a two second dialing delay, while "(", ")", or "-" may be used
           to format phone number with no effect on dialing.
    [/F]   Specify an input file to be used during the emulation mode.
    [/H]   Display this help screen.

   For example: MK20A103 1 /B9600 /DT(816)453-2600

   Copyright (c) Airsys ATM Inc. 1990-1998.  All rights reserved.

C:\HJ2>
```

3.14.1 PMDT Help Screen.- There are four software switches available that allow the user to customize the pmdt.

a. /B. This switch allows the user to specify a baud rate to use when remotely logging onto the equipment. This is not absolutely necessary since there is a default baud rate in the software. The default baud rate for a dial-up modem connection is 2400 baud but may be set to 300 or 1200. The baud rate fro the front panel connection is fixed at 9600.

b. /BW. This switch will force black and white display and may be useful when logging on with a pmdt that only has a black and white display. Note that you may also set the display to black and white in the Preferences screen.

c. /D. This switch allows the user to specify a phone number for a dial-up connection. The default baud rate is 2400 and it is not necessary to specify the baud rate unless you want a baud rate less than 2400. The baud rate will depend on what the selected modems will support and the quality of the phone line connection. The /D switch is followed by a T for tone or a P for pulse dialing and the phone number.

d. /F. The /F switch is used only in the emulation mode. This switch allows the user to specify a previously saved data file to be used for the data displayed on the emulated screens. This provides a convenient way to view data at a later date that was previously saved from an active system. If this switch is not used, the pmdt uses built-in or default

values. The data file that is specified is one that was saved as a "setup and data" file using the file store/restore software. For example, if the glide slope setup and data were saved to a file called TEST1.GS then to use this file, logon as follows:

MK20A 0 /FDATA.GS

e. /H. This switch may be used to display the help screen shown above.

3.14.2 PMDT Emulation Mode.- The pmdt software can be used in the pc without actually connecting to a system. The purpose of the emulation mode is to allow the user to become more familiar with the software. Logging on in the emulation mode is exactly like logging on to a system except that port 0 is used. It is not necessary to enter a user ID or password. Simply press <Enter> at these prompts. The emulation mode has built-in defaults for the data and setup parameters, however, the software allows the user to change the setup parameters. The changes that are made are discarded when the user logs off except for changes made to the Preferences screen. Changes that are made to the Preferences screen are stored in a file called RMM.CFG. This file is created when the user makes any change to the Preferences screen. The RMM.CFG file is then used when the user logs on in the emulation mode or to an active system. This is true as long as the RMM.CFG file remains in the same directory as the LG_RMS.EXE file. If the user has made changes to the Preferences screen but wants to return to the default preferences values, simply delete the RMM.CFG file.

SECTION 4. STANDARDS AND TOLERANCES

4.1 INTRODUCTION.- This section lists and describes the Mark 20A Instrument Landing System Glide Slope Group parameters, standards, and tolerances.

4.2 STANDARDS AND TOLERANCES.- Refer to FAA Order 6750.49 for standards and tolerances or to ICAO Annex 10. Refer to table 9-24, Site Technical Performance Data Record, for site parameters. Refer to table 4-1 for factory default values for glide slope group equipment. The nominal column lists the default value set on the Monitor One/Two Nominals screen. The high and low alarm/prealarm columns list the default value maximum deviation (tolerance) above and below the nominal value that is set on the Monitor Alarm/Prealarm Tolerances and RMS Sensor Alarm Limits screens.

Table 4-1. Standards and Tolerances

Parameter	Low Alarm	Low Prealarm	Nominal	High Prealarm	High Alarm
Path rf level	71.0	92.5	100.0	107.5	112.0
Path SDM	60.0	76.0	80.0	84.0	90.0
Path alignment	-0.050	-0.010	0.000	0.010	0.050
Path width	0.150	0.155	0.175	0.195	0.200
Clearance rf level	87.0	92.5	100.0	107.5	112.0
Clearance SDM	64.0	76.0	80.0	84.0	90.0
Frequency difference	7500	7625	8000	8375	8500
Alarm delay	Executive	1 second	...	Standby	15 seconds

NOTES

These values apply to the executive and standby monitors of transmitter one and two.

The alarm values represent the initial monitor tolerances of Order 6750.49.

The prealarm values represent the standard monitor tolerances.

The rf level as measured by the Mark 20A is a voltage level rather than a power measurement. The power tolerances have been converted to voltage tolerances for inclusion herein.

SECTION 5. PERIODIC MAINTENANCE

5.1 INTRODUCTION.- This section contains the performance checks, other onsite maintenance, and offsite maintenance tasks that must be performed on a recurring basis to ensure proper operation of the Mark 20A Instrument Landing System (ILS) Glide Slope Group.

5.2 PERFORMANCE CHECKS.- Refer to table 5-1. Table 5-1 lists the performance checks for the glide slope group. Performance checks are required after initial installation or subsequent modification of the glide slope, after completion of corrective maintenance, and after the return to service of any unit removed for repair or calibration. The performance check column lists the activity required. The reference paragraph column provides a reference to section 4 for the required results and the applicable maintenance procedure in section 6 for the procedures used to obtain those results.

5.3 OTHER ONSITE MAINTENANCE.- Refer to table 5-2. Table 5-2 lists onsite maintenance tasks that are necessary to prevent deterioration and ensure reliable operation of the localizer group. The maintenance task column lists the activity required. The reference paragraph column provides a reference to section 4 for the required results and the applicable maintenance procedure used to obtain those results.

5.4 OFFSITE MAINTENANCE.- Refer to paragraph 7.5 in section 7 for maintenance tasks that cannot be performed on site and require removal to a central repair facility.

Table 5-1. Performance Checks

Performance Check	Reference Paragraph	
	Standards and Tolerances	Maintenance Procedures
Observe and record monitor, transmitter, and rms sensor data.	4.2	6.2.1
Check upper and lower alarm limits.	4.2	6.2.2
Simulate alarm and shutdown procedures.	4.2	6.2.3
Measure glide slope parameters.	4.2	6.2.4
Check integrity of transmitted signals (Category III only).	4.2	6.2.5
Check glide slope battery operation.	4.2	6.2.6
Check magnetic switch (intrusion detector) S3 operation.	4.2	6.2.7
Check ionization type smoke detector A12 operation.	4.2	6.2.8
Check obstruction light sensor assembly A13 operation.	4.2	6.2.9
Check temperature sensor assembly 11A4 operation	4.2	6.2.10

Table 5-2. Other Onsite Maintenance

Maintenance Task	Reference Paragraph	
	Standards and Tolerances	Maintenance Procedures
Clean and inspect equipment.	...	6.3.1
Inspect batteries.	...	6.3.2
Clean ionization type smoke detector filter.	...	6.3.3

SECTION 6. MAINTENANCE PROCEDURES

6.1 INTRODUCTION.- This section contains procedures for accomplishing the various maintenance activities on the Mark 20A nstrument Landing System (ILS) Glide Slope Group equipment. This section is divided into three parts: performance check procedures, other maintenance procedures, and special maintenance procedures. Other maintenance procedures are the other maintenance procedures listed in section 5. Special maintenance procedures are those procedures that include special adjustment, long-interval alignment, or calibration procedures.

6.2 PERFORMANCE CHECK PROCEDURES.- This part contains procedures for accomplishing the performance checks listed in table 5-1. Procedures for measurements, adjustments, alignments, and repair are included. Each procedure consists of a statement of purpose; a list of any prerequisite procedures; a list of tools, materials, and test equipment required to perform the procedure; a step-by-step procedure; and a test setup diagram, if applicable. Refer to site technical performance data record in section 9 for performance standards. Refer to section 7 if the results of the procedure indicate corrective action is required.

WARNING

Dangerous voltage (120/240 V ac) exists within this equipment. Exercise extreme caution during this procedure. Failure to comply can cause personal injury or death.

CAUTION

This equipment contains parts, components, and assemblies that are sensitive to damage from electrostatic discharge (esd). Follow esd preventive procedures to avoid damage to the equipment. An esd grounding connector is provided in the glide slope equipment cabinet.

6.2.1 Monitor, Transmitter, and RMM Sensor Data Verification Procedure.- The purpose of this procedure is to record the monitor, transmitter, and remote monitoring subsystem (RMM) sensor data stored in the glide slope equipment program. The portable maintenance data terminal (PMDT) software will print to a printer or print to a disk for printing a hard copy at a later time. The print designation function is set up on the User Preferences screen. The printed data should be compared with the site technical performance data record in section 9. If any of the data is approaching a limit, refer to paragraph 6.4 for adjustments. If desired results cannot be obtained after adjustment, refer to paragraph 7.3.

Prerequisite Procedures.

None

Tools, Materials, and Test Equipment.

PMDT
Printer or formatted computer disk

Procedure.

NOTE

Mark 20A ILS will be in service during this procedure.

a. Log on. Refer to paragraph 3.3.2.

NOTE

Screen selection. The procedural steps will define the screen to be selected and list the letters to be entered from the Commands menu to access the screen.

b. **MONITOR DATA**. Press F4 key on PMDT. Combined Executive Monitor Data screen will be displayed.

c. Press Print Scrn key on PMDT to record data.

d. Press Alt-F4 keys on PMDT. Combined Standby Monitor Data screen will be displayed.

e. Press Print Scrn key on PMDT to record data.

f. **TRANSMITTER DATA**. Press F5 key on PMDT. On-Course/Path Transmitter One Data screen will be displayed.

g. Press Print Scrn key on PMDT to record data.

h. Press F6 key on PMDT. Clearance Transmitter One Data screen will be displayed.

i. Press Print Scrn key on PMDT to record data.

j. Press F7 key on PMDT. On-Course/Path Transmitter Two Data screen will be displayed.

k. Press Print Scrn key on PMDT to record data.

l. Press F8 key on PMDT. Clearance Transmitter Two Data screen will be displayed.

m. Press Print Scrn key on PMDT to record data.

n. **SENSOR DATA**. Select RMM Sensor Data screen <D R R>.

o. Press Print Scrn key on PMDT to record data.

p. Log off. Refer to paragraph 3.3.3.

6.2.2 Upper and Lower Alarm Limits Verification Procedure.- This procedure records the upper and lower alarm limits of the executive monitor, standby monitor, rmm analog-to-digital (a/d) converter, and the rmm sensors. The PMDT software will print to a printer or print to a disk for printing a hard copy at a later time. The print destination function is set up on the User Preferences screen. The printed data should be compared with the site technical performance data record. Refer to section 9. If any of the data is

approaching a limit, refer to paragraph 6.4 for adjustments. If desired results cannot be obtained after adjustment, refer to paragraph 7.3.

Prerequisite Procedures.

None

Tools, Materials, and Test Equipment.

PMDT
Printer or formatted computer disk

Procedure.

NOTE

Mark 20A ILS will be in service during this procedure.

a. Log on. Refer to paragraph 3.3.2.

NOTE

Screen selection. The procedural steps will define the screen to be selected and list the letters to be entered from the Commands menu to access the screen.

b. **MONITOR**. Select Executive Monitor One Alarm/Prealarm Tolerances screen <S M E O>.

c. Press Print Scrn key on PMDT to record data.

d. Press Esc key on PMDT to return to Executive Monitor Tolerances menu.

e. Select Executive Monitor Two Alarm/Prealarm Tolerances screen <T>.

f. Press Print Scrn key on PMDT to record data.

g. Select Standby Monitor One Alarm/Prealarm Tolerances screen <S M S O>.

h. Press Print Scrn key on PMDT to record data.

i. Select Standby Monitor Two Alarm/Prealarm Tolerance screen <S M S T>.

j. Press Print Scrn key on PMDT to record data.

k. Select RMM Spare A/D Alarm Limits screen <S R A>.

l. Press Print Scrn key on PMDT to record data.

m. **RMM SENSOR**. Select RMM Sensors Alarm Limits screen <S R R>.

n. Press Print Scrn key on PMDT to record data.

o. Log off. Refer to paragraph 3.3.3.

6.2.3 Simulate Alarm and Shutdown Procedure.- This procedure verifies that a monitor alarm will occur when a transmitted parameter exceeds the established monitor alarm limits. The PMDT software will print to a printer or print to a disk for printing a hard copy at a later time. The print destination function is set up on the User Preferences screen. The printed data should be compared with the site technical performance data record. Refer to section 9. If any of the data is approaching a limit, refer to paragraph 6.4 for adjustments. If desired results cannot be obtained after adjustment, refer to paragraph 7.3.

Prerequisite Procedures.

None

Tools, Materials, and Test Equipment.

PMDT
Printer or formatted computer disk

Procedure.- See figure 3-2.

NOTE

Mark 20A ILS will be out of service during this procedure.

a. Log on. Refer to paragraph 3.3.2.

b. Set MONITOR EXEC BYPASS ON/RMT switch, FIELD MONITOR BYPASS ON/RMT switch, and MONITOR STBY BYPASS ON/RMT switch on subsystem front panel circuit-card assembly (cca) 10A1 to ON.

NOTE

Screen selection. The procedural steps will define the screen to be selected and list the letters to be entered from the Commands menu to access the screen.

c. Select Transmitter One Waveform 1 Setup screen <S T O 1>.

CAUTION

Do not use Transmitter One Waveform 1 Setup screen for testing. Transmitter One Waveform 1 Setup screen is the default screen for transmitter 1 and contains the default program parameters for transmitter 1. Changing the default data for testing could result in loss of data.

d. Press Print Scrn key on PMDT to record data.

e. Select Transmitter One Manual Control screen <C T O M>.

f. **COURSE/PATH SUM OF DEPTHS OF MODULATION (SDM) ALARM**. Using arrow keys on PMDT, move cursor to Course/Path SDM data field.

NOTE

Values indicated within screen data fields can be varied by holding down Ctrl key on PMDT and pressing right or left arrow key on PMDT. Right arrow will increase value and left arrow will decrease value.

g. Observe subsystem front panel cca 10A1 MONITOR EXEC indicators and decrease Course/Path SDM in 0.1-step increments until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

h. Press Print Scrn key on PMDT to record data.

i. Observe MONITOR EXEC indicators and increase Course/Path SDM in 0.1-step increments until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

j. Press Print Scrn key on PMDT to record data.

k. Return SDM setting to original value.

l. Move cursor to Course/Path Modulation Balance data field.

m. **COURSE/PATH MODULATION BALANCE ALARM**. Observe MONITOR EXEC indicators and adjust Course/Path Modulation Balance in 0.001-step increments from 0 (90 Hz predominate, negative indication of ddm [difference in depth of modulation]) until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

n. Press Print Scrn key on PMDT to record data.

o. Observe MONITOR EXEC indicators and adjust Course/Path Modulation Balance in 0.001-step increments from 0 (150 Hz predominate, positive indication of ddm) until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

p. Press Print Scrn key on PMDT to record data.

q. Return Modulation Balance setting to original setting.

r. Move cursor to Course/Path RF Level data field.

s. **COURSE/PATH RF LEVEL ALARM**. Observe MONITOR EXEC indicators and decrease Course/Path RF Level in 0.1-step increments until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

t. Press Print Scrn key on PMDT to record data.

u. Observe MONITOR EXEC indicators and increase Course/Path RF Level in 0.1-step increments until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

v. Press Print Scrn key on PMDT to record data.

w. Return RF Level setting to original setting.

x. Move cursor to Course/Path Sideband Amplitude data field.

y. **COURSE/PATH SIDEBAND AMPLITUDE ALARM**. Observe MONITOR EXEC indicators and decrease Course/Path Sideband Amplitude in 0.1-step increments until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

z. Press Print Scrn key on PMDT to record data.

aa. Observe MONITOR EXEC indicators and increase Course/Path Sideband Amplitude in 0.1-step increments until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

ab. Press Print Scrn key on PMDT to record data.

ac. Return Sideband Amplitude setting to original setting.

ad. Move cursor to Course/Path SBO Phase data field.

ae. **COURSE/PATH SIDEBAND ONLY (SBO) PHASE ALARM**. Observe MONITOR EXEC indicators and decrease Course/Path SBO Phase in 1.0-step increments until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

af. Press Print Scrn key on PMDT to record data.

ag. Observe MONITOR EXEC indicators and increase Course/Path SBO Phase in 1.0-step increments until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

ah. Press Print Scrn key on PMDT to record data.

ai. Return SBO Phase setting to original setting.

aj. Move cursor to Clearance SDM data field.

ak. **CLEARANCE SDM ALARM**. Observe MONITOR EXEC indicators and decrease Clearance SDM in 0.1-step increments until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

al. Press Print Scrn key on PMDT to record data.

am. Observe MONITOR EXEC indicators and increase Clearance SDM in 0.1-step increments until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

an. Press Print Scrn key on PMDT to record data.

ao. Return Clearance SDM setting to original setting.

ap. Move cursor to Clearance RF Level data field.

aq. **CLEARANCE RF LEVEL ALARM**. Observe MONITOR EXEC indicators and decrease Clearance RF Level in 0.01-step increments until MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 go out and MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 light.

ar. Press Print Scrn key on PMDT to record data.

as. Observe MONITOR EXEC indicators and increase Clearance RF Level in 0.01-step increments until MONITOR 1 EXEC ALARM indicator DS6 and MONITOR 2 EXEC ALARM indicator DS7 go out and MONITOR 1 EXEC NORMAL indicator DS1 and MONITOR 2 EXEC NORMAL indicator DS2 light.

at. Press Print Scrn key on PMDT to record data.

au. Return Clearance RF Level setting to original setting.

av. Select Transmitter One Waveform 1 <C T O 1>.

CAUTION

Do not use Transmitter Two Waveform 1 Setup screen for testing. Transmitter Two Waveform 1 Setup screen is the default screen for transmitter number 2 and contains the default program parameters for transmitter 2. Changing the default data for testing could result in loss of data.

aw. **TRANSMITTER TWO ALARMM**. Repeat steps c through av using transmitter two and transmitter two screens.

ax. Set MONITOR EXEC BYPASS ON/RMT switch, FIELD MONITOR BYPASS ON/RMT switch, and MONITOR STBY BYPASS ON/RMT switch on subsystem front panel circuit-card assembly (cca) 10A1 to RMT.

ay. **EQUIPMENT SHUTDOWN**. Perform control unit test <T U>.

az. Log off. Refer to paragraph 3.3.3

6.2.4 Glide Slope Parameters Measurement Procedure.- This procedure connects the portable ILS receiver (pir) to the integral detector assembly input and measures selected glide slope group parameters. If desired results are not obtained, refer to paragraph 7.3.

Prerequisite Procedures.

None

Tools, Materials, and Test Equipment.

Pir
Termination load, 50-ohm, 1-watt (or greater) (4 required)
Adapter, BNC male to TNC male

Procedure.- See figures 3-1, 3-2, 6-1, 11-2, 11-3, 11-35, 11-36, and 11-45.

NOTE

Mark 20A ILS will be out of service
during this procedure.

a. Hold LAMP TEST switch S7 on subsystem front panel cca 10A1 in up position. See figure 3-2.

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Figure 6-1. Glide Slope Parameters Measurement, Test Setup

b. Verify that all subsystem front panel cca 10A1 indicators light.

c. Release LAMP TEST switch S7 on subsystem front panel cca 10A1.

d. Verify that MAINTENANCE ALERT indicators DS26, MONITOR 1 EXEC ALARM indicator DS6, MONITOR 2 EXEC ALARM indicator DS7, MONITOR 1 STBY ALARM indicator DS24, and MONITOR 2 STBY ALARM indicator DS25 on subsystem front panel cca 10A1 are off.

e. **COURSE MEASUREMENTS**. Set MONITOR EXEC BYPASS ON/RMT switch, FIELD MONITOR BYPASS ON/RMT switch, and MONITOR STBY BYPASS ON/RMT switch on subsystem front panel circuit-card assembly (cca) 10A1 to ON.