

Sentinel 16 Remote Control



SPECIFICATIONS

Type of System:
Studio and Control Units - each contains micro-processor and software

Type of Memory Used:
ROM Memory contains all Harris software
RAM Memory contains all system setup parameters
RAM Memory is protected by on-board NICAD Battery

System Configuration:
Sentinel 16 Studio Unit can communicate with only one Sentinel 16 Control Unit. Sentinel 16 Control Unit can communicate with any Sentinel Studio Unit or Sentinel 48 Unit

Command Lines:
32 relays, assigned 2 per channel; 1 raise, 1 lower. Momentary or accessible as latching
Command Response Time to implementation: 500 ms
SPDT relay: 125 VAC, 50 watts DC, max 150V AC or DC

Telemetry Channels:
16 unbalanced inputs
4 Pseudo-channels for calculation of indirect power from any two actual channels times a user-programmable efficiency factor. Calibration at either Control or Studio Unit as linear, power, or direct (millivolt)
Two sets of limits per channel per Database:
Upper Alarm/Lower Alarm
Upper Failure/Lower Failure
4-Digit Display with sign and settable decimal position
Resolution: 1 mV (1 in 4096)
Overall Measurement Accuracy: .5%
Response Time: 60 ms
Input Levels: +/− 0 to 4.096V

Status Channels:
16 status inputs, corresponding to 16 LED indicators on front panels.
User-programmable trigger conditions: Open, close, or transition (low to high or high to low)
Alarm condition programmable
Logging on trigger condition programmable
Status response time: 310 mS
TTL-level inputs (10K ohm pull-ups to +5v)
Programmable time-out for automatic action

Partitions:
Three - Used to mute alarms from telemetry and status channel monitoring.

Databases:
Three - One database active at a time
Each channel has three sets of limits for monitoring

Time Functions:
15 User-programmable by Date and/or Time
Matched against internal clock
Can change Databases or Print Logs
Turn Command functions, Partitions, or Time Function On or Off

Internal Real-time Clock:
Settable for date and time
Accurate to +/- 1 second per month
Battery Backed-up to 7 Days

Alarms:
Visual - Red LED on front panels
Aural - Defeatable and Remotable (open collector output - 30V at 100 mA)

Failsafe:
Programmable and Defeatable
Both Visual indication and SPDT relay at output
Compliant with current FCC regulations when programmed by user

Maintenance Override:
Visual Indicator on Front Panels
One-Key operation locks out Studio Unit and closes SPDT relay for external alarm
Number of Data Communications Links
Two - Main and Alternate
If available, automatic switching to ALT link

Data Transmissions:
8-Bit Data
Data Packets with 16-bit CRC checking
300 Baud Simplex, Half-Duplex, or Full-Duplex (FSK encoded)
1200 Baud Full-Duplex with external modems

Wire Interconnections:

Two or Four Wire (Telco or microwave)
Bell 3002 Equivalent

Radio Interconnections:

Single or Duplex Sub-carrier Generator/
Demodulator optional.
Available on Standard Freq. (26-185 kHz)
Minimum Send Level: 1.5v P-P normal
Minimum Receive Level: .25v P-P

Control Unit Terminal Connections:

Terminal strip for all inputs and outputs

Environment:
0 to 50°C (32°F to 122°F)
Relative Humidity (5 to 95% - non-condensing)
Altitude: 0 to 10,000 Feet above Sea Level
RFI: AM - 2 V/meter at 100% AM modulation
FM/TV - 0.5 V/meter at 100% AM modulation in FM/TV Bands

Power Requirements:
100/115/120/230/240 Volts AC; 50/60 Hz
Studio terminal - 12 watts typical
Control terminal - 30 watts typical
(not including CRT and printer)

Physical Size:
Both Control and Remote Units are: 8.75" H x 19" W x 10"D (22.2 cm H x 48.3 cm W x 25.4 cm D)

ORDERING INFORMATION

Sentinel 16 Remote Control System .....	.994-8962-001
Monochrome CRT Terminal Option .....	.994-8969-001
Monochrome CRT Rack Mount .....	.994-8968-001
Color CRT Terminal Option	(Summer 1985) .994-8971-001
Color CRT Rack Mount .....	.994-8972-001
Logging Printer Option .....	.994-8967-001
TSL Sub-Carrier Generator/Demodulator .....	.994-8970-XXX

(Indicate required frequency from Sub-Carrier Frequency Table)

26 kHz - 994-8970-001
39-41 kHz - 994-8970-002
67 kHz - 994-8970-003
94-110 kHz - 994-8970-004
152 kHz - 994-8970-005
185 kHz - 994-8970-006

STL/TSL Sub-Carrier Generator/Demodulator

(Indicate required frequencies from table)

Send/ Receive (kHz)	Pair 1					
	26	39-41	67	94-110	152	185
P	26	011				
A	39-41	012	022			
I	67	013	023	033		
R	94-110	014	024	034	044	
	152	015	025	035	045	055
2	185	016	026	036	046	056
						066

Modulation Monitor/Control .....	.Avail. Fall 1985
Potomac AM-19 Antenna Monitor Interface .....	.Avail. Fall 1985
Line Voltage Sampling Unit .....	.994-8935-001
Tower Light Sampling Unit .....	.994-8936-001
Temperature Sampling Unit (incl. 2 probes) .....	.994-8937-002
Temperature Probes .....	.994-8934-001

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE.

HARRIS CORPORATION BROADCAST GROUP
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200



- 16 Telemetry Channels
- 16 Status Inputs
- 32 Control Outputs

- Intelligent Remote Control
- Simple to Operate
- Easy to Set Up

The Sentinel 16 is a complete remote control system developed by Harris to meet the needs of the radio or low power television broadcaster. This system consists of a studio unit and a control unit installed at the transmitter site. The system has 16 status input channels, 16 telemetry channels, and 32 control relays.

Although sophisticated computer control is built into the system, the front panel controls and readouts are very straightforward and readily understood by even inexperienced and non-technical operators. The computer is controlled by a simple key pad, while status conditions are displayed on one of 16 LEDs on the front panel.

How The System Operates

As a convenience in the operation of the remote control system, there can be three separate data bases and three partitions. A data base contains information about limits and operation of the system. Partitions are based on equipment configurations.

The three data bases are mutually exclusive, so only one database can be used at a time. A simple example is to use the databases for the setting of upper and lower alarm and failure limits

for different power levels, such as daytime, nighttime and PSSA operations.

The partitions are not mutually exclusive and any combination of the three partitions may be active at any time. For example, Partition 1 may be associated with readings from the main transmitter, Partition 2 with readings from the standby transmitter and Partition 3 with environmental conditions. In this way alarms associated with the transmitter could be muted by turning Partition 2 off, while at the same time continuing to monitor the standby transmitter readings. Any telemetry channel, status channel or time function can be assigned to one or more of the partitions.

Limits Monitoring and Analog Telemetry Channels

The channels can be assigned to any combination of the three partitions. For each of the three data bases, an upper/lower alarm and upper/lower failure limit can be set. For example, when the power levels of the transmitter exceed either an upper or lower alarm limit, the unit will sound an alarm. The operator can go to the studio control unit, select the channel that caused the alarm, and if required, press the raise or lower command keys

to bring the power level to within operating parameters.

If you have programmed the system to do so, it will attempt to automatically adjust the channel when it exceeds the alarm range. The Sentinel 16 can maintain the power levels by automatically pulsing either a raise or lower relay associated with the channel, as required. If the Sentinel 16 cannot return the reading to within the desired operating range within 20 seconds, the alarm will be sounded while the Sentinel 16 continues to bring the channel reading into range. If the actual reading exceeds the failure ranges, a count-down timer begins. If the channel has not been brought into range before the time runs out, the system will activate the function of your choice, including the failsafe.

In addition to the 16 telemetry channels, the Sentinel 16 has 4 calculation channels for the calculation of indirect power. These channels are assigned to channels 17 through 20. The channels are defined by indicating the two direct channels to be included in the calculation and an efficiency factor. The system then displays the result of this calculation as the channel reading. The limits monitoring features of the system are also available for the indirect channels.

Calibration of the channels can be done directly from either the studio or control site. If the millivolt suffix is chosen, the reading is directly from the input, acting like a digital voltmeter. If the reading is to be linearly calibrated, the desired reading is entered and a scaling is automatically performed on all further readings. You can also choose that the channel be calibrated with power (proportional to the square of the input voltage).

To make the telemetry channels easier to read, a channel can be assigned a units suffix, such as millivolts, volts, linear, power, fahrenheit or centi-

grade. The decimal position can be set as required. For example:

01CH+9.100 V

Status Monitoring

As with the telemetry channels, each status condition can be assigned to any combination of the three partitions. The 16 status lines can be monitored for a change in condition. The condition that is to cause an indicator light to illuminate is programmable. It can be programmed to light the status indicator on high or low voltage or a transition from high to low or vice-versa. If programmed, this change in condition can cause an alarm. If an automatic response to a condition change is desired, a timer can be started when the condition changes. If the status indicator has not cleared before the timer has run out, any function can be performed, including the failsafe relay.

Time Functions

The Sentinel 16 can perform 15 different functions based on time. It can change data bases or turn partitions on or off. Sentinel 16 can turn a control function on or off at a specific time. The

time functions can print the log at a specific time. A time entry can be made to operate repetitively. If only the minute and second are specified, the function repeats every hour. A time function can be made to operate only on a certain day of the month (i.e. the third of every month) or on a specific date (i.e. October 5th).

System Set-up

Because every remote control situation has its own requirements, the Sentinel 16 allows you to set the amount of time before the failsafe relay is opened. As the rules of the Federal Communications Commission change you will be able to take the changes into account.

Communications

The Sentinel 16 is able to communicate to your remote site in a number of ways. The system includes built-in 300 Baud modems. The output of these modems can be connected to private wire between your sites or they can be duplexed on to your microwave. If desired, the internal 300 Baud modem can be disabled and the units connected to external modems for communications at higher speeds. The re-

turn link can be on your FM/TV SCA or via private wire. As an option, the Sentinel 16 has internal SCA generators and demodulators. The unit can automatically switch from the main communications link to an alternate link if the main link fails. When this happens, an alarm is sounded.

Diagnostics

In order to assure reliable operation, the Sentinel 16 is constantly monitoring itself. It will check that the clock and analog/digital conversion circuitry are performing accurately. The current status of the system is available from either the studio or control units.

Power Failure

The unit will protect itself during a power failure. Your programming is protected by a Nicad battery on the RAM memory card. This battery will hold your programming for several days. If the power is lost and restored at the control site, the studio and control units will sound an alarm for power failure and the control unit will begin monitoring the control site. All partitions will be turned off to prevent the system from adjusting equipment affected by the power failure.

Line Voltage Kit

This kit reduces AC voltages to DC of about 1.0 volt that can be read directly by the remote control system. The kit has inputs for AC voltages of 115, 230, 345 and 460.



OPTIONS

ATS/Modulation Monitoring

If you want to operate under ATS rules, the Sentinel 16 interfaces to an optional Modulation Monitor and Control. This unit monitors the modulation into the transmitter and when modulation exceeds the specified levels, will reduce the gain. Once the modulation levels have fallen below the maximum, the modulation control device will begin to raise the audio levels at 0.05 db per minute.

CRT

The Sentinel 16 offers you a choice for an optional CRT. You can add a monochrome (green letters on black background) or you can attach a color CRT. A terminal can be placed at the studio and/or control units. The terminals allow direct continuous monitoring of the entire system. Using the terminal, your operator has the same control capabilities that he had at the front panel of the Sentinel 16.

Logging

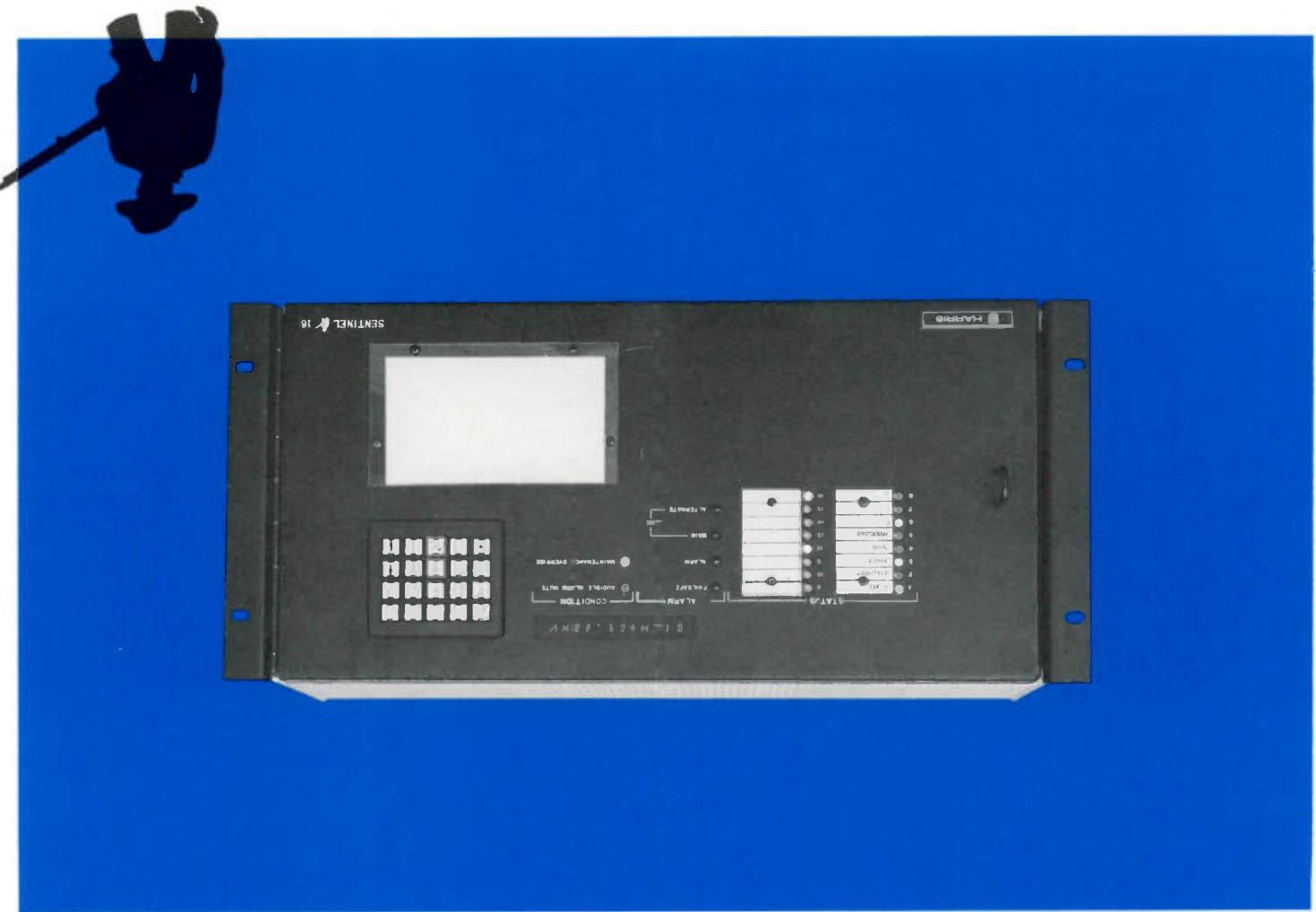
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Temperature Kit

In order to bring temperature into the digital world, Harris has developed a temperature sensing kit. The kit includes a power supply and two temperature probes. The power supply will support as many as four probes. This kit can be used to determine outside temperatures, transmitter temperatures, and transmitter coolant temperatures. Each probe will provide a DC reading that can be calibrated to temperature. The voltage varies 10mV/F in a temperature range from -40 F to 230 F.

	Daytime Database 1	Nighttime Database 2	PSSA Database 3
Partition 1	xmtr 1	xmtr 1	xmtr 1
Partition 2	xmtr 2	xmtr 2	xmtr 2
Partition 3	site security	site security	site security

In this example, you choose a Data base based on time of day and choose a Partition based on equipment configuration. If Daytime and running on standby transmitter, Database 1 and partitions 2 and 3 would be on, partition 1 would be off. Limits would be set based on time of day; channels and status would be monitored based on which equipment configurations are in operation.



Remote Control
Sentinel 16

HARRIS 

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for different power levels, such as daytime, nighttime and PSSA operations.

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OPTIONS

ATS/Modulation Monitoring

If you want to operate under ATS rules, the Sentinel 16 interfaces to an optional Modulation Monitor and Control. This unit monitors the modulation into the transmitter and when modulation exceeds the specified levels, will reduce the gain. Once the modulation levels have fallen below the maximum, the modulation control device will begin to raise the audio levels at 0.05 db per minute.

CRT

The Sentinel 16 offers you a choice for an optional CRT. You can add a monochrome (green letters on black background) or you can attach a color CRT. A terminal can be placed at the studio and/or control units. The terminals allow direct continuous monitoring of the entire system. Using the terminal, your operator has the same control capabilities that he had at the front panel of the Sentinel 16.

Logging

By attaching the logging printer, you can get a printout of the operating parameters of your system. This printout can be programmed to occur at specific times using the time functions or the printout can be caused by an alarm. A change in status condition or exceeding the limits for an operating

channel can cause an alarm and/or print the log. The logging option does not require the use of the CRT. The logging printer can be placed at either the studio or control site or both.



INTERFACING

The control unit is easy to interface. Convenient terminals are located on the rear of the control unit. They are neatly segregated into raise relays, lower relays, status indications and telemetry channels. Harris has developed several interface kits to provide access to specific readings.

Line Voltage Kit

This kit reduces AC voltages to DC of about 1.0 volt that can be read directly by the remote control system. The kit has inputs for AC voltages of 115, 230, 345 and 460.

Tower Light Kit

The tower light kit is connected so that the need for direct visual inspection is eliminated. The kit includes the hardware necessary to connect between the power line and lighting package. Currents from 5 to 30 amps are converted into DC voltages from 2 to 12 volts. Using this kit it is possible to determine if the side lights are illuminated and whether or not the strobe at the top of the tower is working.

Temperature Kit

In order to bring temperature into the digital world, Harris has developed a temperature sensing kit. The kit includes a power supply and two temperature probes. The power supply will support as many as four probes. This kit can be used to determine outside temperatures, transmitter temperatures, and transmitter coolant temperatures. Each probe will provide a DC reading that can be calibrated to temperature. The voltage varies 10mV/F in a temperature range from -40 F to 230 F.

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Two sets of limits per channel per Database:
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4-Digit Display with sign and settable decimal position
Resolution: 1 mV (1 in 4096)
Overall Measurement Accuracy: .5%
Response Time: 60 mS
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Settable for date and time
Accurate to +/− 1 second per month
Battery Backed-up to 7 Days

Alarms:

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Aural - Defeatable and Remotable
(open collector output - 30V at 100 ma)

Failsafe:

Programmable and Defeatable
Both Visual indication and SPDT relay at output
Compliant with current FCC regulations when programmed by user

Maintenance Override:

Visual Indicator on Front Panels
One-Key operation locks out Studio Unit and closes SPDT relay for external alarm

Number of Data Communications Links

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If available, automatic switching to ALT link

Data Transmissions:

8-Bit Data
Data Packets with 16-bit CRC checking
300 Baud Simplex, Half-Duplex, or Full-Duplex (FSK encoded)
1200 Baud Full-Duplex with external modems

Wire Interconnections:

Two or Four Wire (Telco or microwave)
Bell 3002 Equivalent

Radio Interconnections:

Single or Duplex Sub-carrier Generator/Demodulator optional.

Available on Standard Freq. (26-185 kHz)

Minimum Send Level: 1.5v P-P normal

Minimum Receive Level: .25v P-P

Control Unit Terminal Connections:

Terminal strip for all inputs and outputs

Environment:

0 to 50°C (32°F to 122°F)
Relative Humidity (5 to 95% - non-condensing)

Altitude: 0 to 10,000 Feet above Sea Level

RFI: AM - 2 V/meter at 100% AM modulation
FM/TV - 0.5 V/meter at 100% AM modulation in FM/TV Bands

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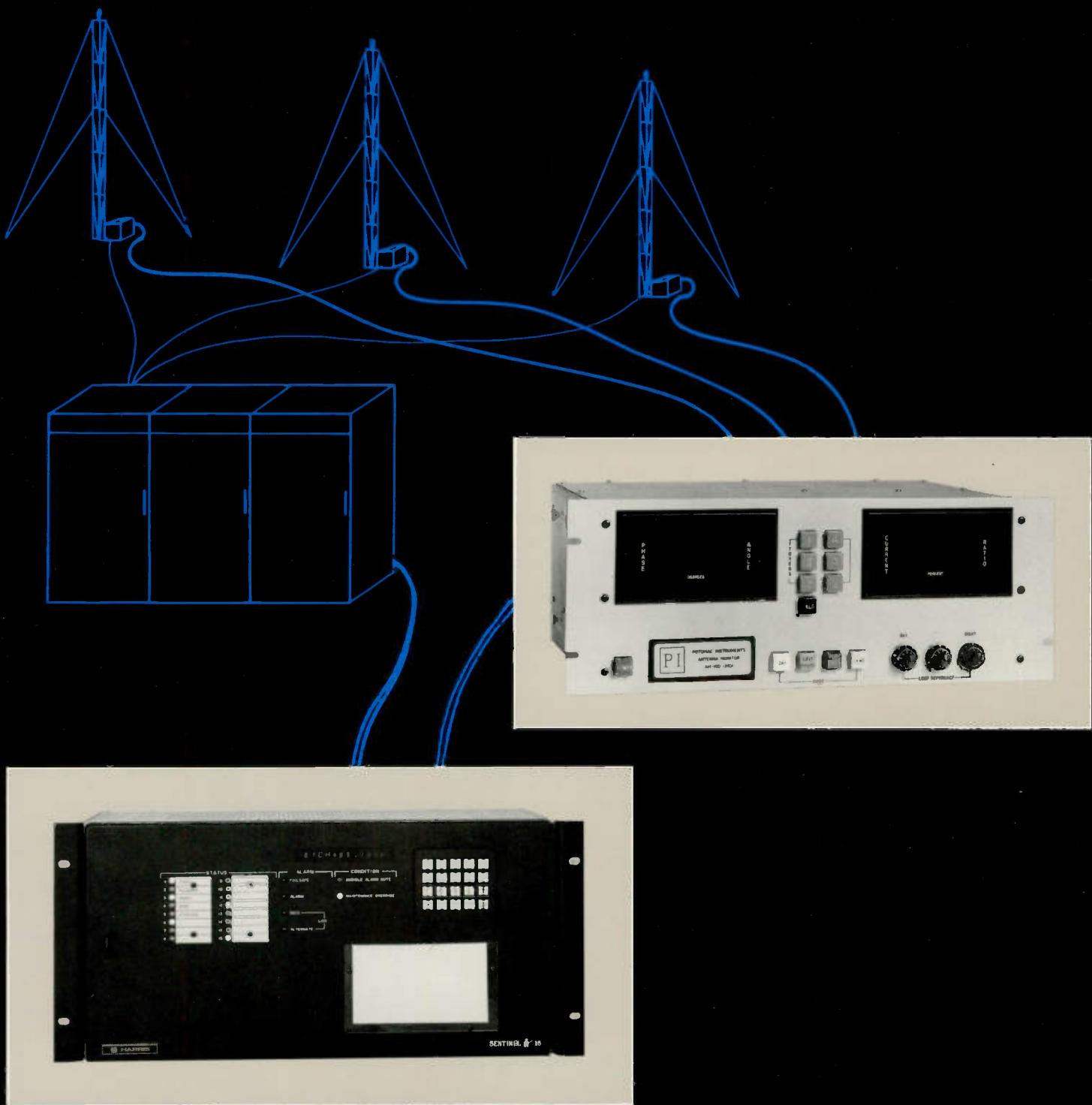
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Temperature Sampling Unit (incl. 2 probes)	994-8937-002
Temperature Probes	994-8934-001

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HARRIS CORPORATION STUDIO DIVISION
P. O. BOX 4290, QUINCY, ILLINOIS 62305-4290 U.S.A. 217/222-8200



SENTINEL 16 REMOTE CONTROL OPTION POTOMAC AM-19™ INTERFACE



Monitor up to six towers with the newest option to Harris's Sentinel 16 Remote Control System—the Potomac AM-19™* Interface.

With the newest option to Harris's Sentinel 16 Remote Control System—the Potomac AM-19™ Antenna Phase Monitor Interface, AM broadcasters can now easily monitor up to six towers with DA1, DA2 and DA3 operating modes.

YOUR HARDWARE/SOFTWARE
SOLUTION

The Potomac AM-19™ Interface software package provides for multiple databases; alarm and failure level limits monitoring, and full logging.

As part of the tower scan routine, the system goes through an auto calibration cycle of the reference tower before each scan sequence, and zeros out any drift factor in the ratio reading related to the reference tower. Once this is accomplished, the Sentinel 16 takes a series of tower phase and ratio readings from the Potomac AM-19™; stores them in appropriate memory locations, and configures them for display on the CRT, the LED display, or the log printout.

INCREASED TIME FUNCTIONS
AND SPECIAL SEQUENCE
FUNCTIONS PROVIDED

The Potomac AM-19™ Interface option increases the number of time functions from 15 to 20, and also offers three special sequence functions. Special sequence functions can be activated by the system's executive action or manually from the keypad or keyboard.

PROVIDES TOTAL AUTOMATIC MODE CHANGEOVER CAPABILITIES

By using these special sequence functions, you can have total automatic mode changeover by:

- Turning “off” partitions 1 and 2.
 - Changing databases.
 - Activating a mode changeover relay.
 - Waiting for a 15-second “time-out” period.
 - Restoring partitions 1 and 2 to their former condition.
 - Waiting for a 30-second “time out” period.
 - Activating the tower scan routine.

PROVIDES OTHER UPDATED FEATURES

FEATURES
Additionally, other Sentinel 16 features have been updated for your convenience:

- The system now shows the main/alternate link condition at the studio location.
 - The system provides for a 1200 baud default option on communication port 1 for use with external modems.
 - A revised channel setup "units" menu is offered.
 - The FNC CTRL has been removed from Maintenance Override lockout.
 - The fail-safe relay action inhibit has been removed if the Failsafe Override is on.
 - The system logs all reset conditions

FOR MORE INFORMATION

For more information on the Sentinel 16 Remote Control System's Potomac AM-19™ Interface Option, please contact:

**Harris Corporation
Broadcast Division
P. O. Box 4290
Quincy, Illinois 62305-4290
217/222-8200**

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Monitor Calibration +180.0		TOWER LOG					Scan Time 00:33:36 SUN	
TOWERS	Tower 1	Tower 2	Tower 3	Tower 4	Tower 5	Tower 6		
PHASE	+015.8	UNUSED	+000.0	UNUSED	+055.6	UNUSED		
RATIO	+131.6	UNUSED	+100.0	UNUSED	+068.3	UNUSED		

TOWER LOG						
Monitor Calibration +180.1					Scan Time	00:35:16 SUN
TOWERS	Tower 1	Tower 2	Tower 3	Tower 4	Tower 5	Tower 6
PHASE	+027.6	+012.1	+000.0	+027.4	+043.6	+073.3
RATIO	+192.7	+164.2	+100.0	+110.1	+099.8	+088.5

TOWER LOG						
Monitor Calibration +180.0					Scan Time 00:36:30 SUN	
TOWERS	Tower 1	Tower 2	Tower 3	Tower 4	Tower 5	Tower 6
PHASE	+000.0	UNUSED	UNUSED	+055.6	UNUSED	UNUSED
RATIO	+100.0	UNUSED	UNUSED	+057.2	UNUSED	UNUSED

ORDERING INFORMATION

Sentinel 16/Potomac AM-19 Tower Scan 994-9035-001