

# AHG16 TIMING INTERFACE DATA SHEET CLOCK DISTRIBUTION UNIT

## GENERAL

The Timing Interface (TI) plug-in unit, AHG16 is used in the Clock Distribution Unit (CDU). It enables the CDU to provide synchronization from input of either a 16.384 MHz composite timing signal (CTS) or a 2.048 MHz sine wave signal. The TI, AHG16 recovers either the 16.384 MHz CTS clock output of the 4ESS switch or the 2.048 MHz clock output of the Digital Access Cross Connect System (DACS). The 16.384 MHz CTS signal is a pulsed output having every 2048th pulse missing. The TI may also be used in a concentrated configuration (main-auxiliary timing arrangement). In the concentrated configuration, the main panel supports up to two auxiliary panels for a total of 120 DS-1 outputs at a single location. Since the auxiliary panels do not require TI plug-in units, the expansion is cost efficient.

## FEATURES

The Timing Interface (TI), AHG16 provides:

- Direct connection of input signals (without need for the bridging repeaters),
- Output "cutoff" capability ensuring phase coherent outputs,
- Dedicated output taps for supporting up to two auxiliary CDU panels,
- Input and output alarm status indication through LED lamps on the TI faceplate.

## DESCRIPTION

The input recovery circuitry of the timing interface (TI) allows the phase alignment between the input

signal and the output timing signal (output from designated CDU timing distributor circuit packs) to be phase coherent within 50 ns over a  $\pm 10$  degree C temperature shift (typically less than 10 ns). The TI also inhibits the output timing signal if the input signal becomes corrupted (for example, loss of input signal or inability to lock to the input signal). Two TI plug-in units are used in the CDU and are designated TI A and TI B. Each TI recovers its timing inputs independent of the other without any redundancy.

Each TI supplies input timing signals to only two timing distributor (TD) positions via backplane connections. These signals have dual-rail unipolar composite clock format. TI A supplies output signals to timing distributor (TD) positions 1 and 3; TI B will supply output signals to TD positions 2 and 4. This TD arrangement is referred to as a "duplex" configuration. The "duplex" configuration is used to create two separate timing sources (A and B respectively) from the CDU. The A and B timing sources are not guaranteed to be in phase but each will not change in relative phase for more than 50 ns over a  $\pm 10$  degrees C temperature shift, provided the inputs remain valid. Any switching between the A and B sources is done external to the CDU. These external switching machines perform a phase build-out, so that, at the time of a switch, an error of less than 10 ns may be realized. The IN SCE TR switch on the faceplate of the TI, AHG16 is non-functioning and will not cause input transfers.

## TIMING INTERFACE FAILURE INDICATION

The TI detects input signal failures, as well as, TI

output driver failures. These failures are classified as either input or output failures (IN FAIL, OUT FAIL) and are displayed by red LEDs on the faceplate of the TI.

Input signal failures are monitored by a two stage input detector. The first stage monitors the presence of input signals. Because this detector directly examines the input, it can sense problems in the input signal level continuity before the TI tries to use the input. The second stage monitors the relative phase alignment between the TI's input frequency and the recovered frequency. The TI uses phase-locked loop (PLL) to perform the frequency recovery with a center frequency of 4.096 MHz. If the input and recovered frequencies differ by more than two clock cycles then an input failure is registered. The PLL's output frequency is divided by 2 and the resulting 2.048 MHz frequency may be monitored at the TST jack on the TI faceplate.

When an input failure is registered, two stages of signal interruption occur. The first stage of interruption inhibits the outputs of the affected timing interface. This prevents any signals from reaching the assigned timing distributor (TD) plug-in units. The second stage of interruption occurs at the timing distributor (TD) where a hard-wired "cutoff" signal from the failed TI inhibits all outputs from the assigned TDs. This "cutoff" condition is indicated on the affected TD plug-in unit by the CUTOFF LED.

TI output driver failures are those that involve the timing signals from the TIs to the TDs. Outputs from each TI are three individual signal pairs. One of these signal pairs is for TDs located in the main CDU panel. The other two pairs are for TDs in the auxiliary panels (see auxiliary panel expansion). If any of these outputs fail, the affected TI issues an output failure indication. This indication is displayed by the IN FAIL LED on the TI's faceplate. The TI also transmits a "cutoff" command to the assigned TD plug-ins. The "cutoff" inhibits the signal, output by the affected TDs. When all TI alarms have cleared, only the IN SCE and DUPLEX LEDs shall be lighted on each TI.

## OPTIONS

The TI, AHG16 has only two input option settings. The options are set by switch S1 as shown in Figure 1 and labeled (2M) for the 2.048 MHz input and (16M) for the 16.384 MHz CTS input. These options redefine the input path counters so that the same set of input punchings may be used for both inputs. If the wrong input option is selected, the TI will reject the input and report an input failure as indicated by the IN FAIL LED on the TI's faceplate.

**WARNING:** *This plug-in unit contains devices that are subject to damage or decreased reliability from static discharges. When handling this unit, proper anti-static measures should be taken, such as wearing grounding bracelets and handling by the faceplate only.*

## AUXILIARY PANEL EXPANSION

The auxiliary panel expansion may be used to increase the maximum output capacity of a single CDU installation by a factor of two or three. This output expansion is performed by using an auxiliary panel in conjunction with an existing main panel. The main panel consists of a J98726Z-1 CDU shelf, one AHG1 TA, two AHG16 TIs, and up to four TDs. Each auxiliary panel consists of a J98726Z-1 shelf, one AHG1 TA and at least one TD. Timing input signals to the auxiliary panels are supplied directly by the dedicated output signals from the AHG16 TIs. Each AHG16 provides a dual rail unipolar signal and alarm information to each auxiliary panel. The auxiliary panel reports input alarm failures as if the TI plug-ins were actually being used. The timing and alarm signals between the main and auxiliary panels are carried by a multi-paired shield cable which may have a maximum length of six feet.

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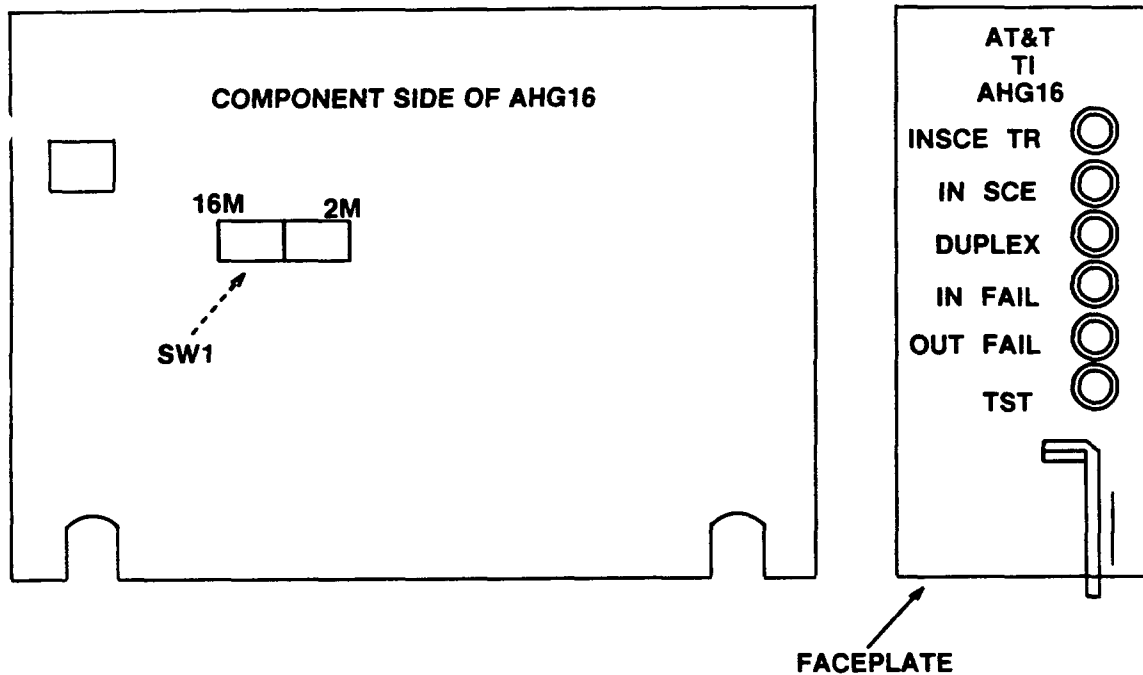


FIGURE 1:

Location of options on the Timing Interface plug-in unit, AHG16

Specific connection information for the auxiliary panel is shown in Figure 2 and Table A. Depending on the need, up to two auxiliary panels may be added. As an Electro-Static Discharge (ESD) precaution, it is recommended that the dummy board ED-3C647-30 (or equivalent) be placed in the vacant TI slots of the auxiliary panel.

**TIMING INTERFACE REMOVAL**

*CAUTION: CDU signal architecture provides for non-redundant A and B sides. The removal of a TI, AHG16 may be service affecting. The removal should only be done in cases where the TI, AHG16 is thought to be defective.*

Before starting the removal procedure, obtain a working TI plug-in unit, AHG16 and set

the options in it for the intended application.

The removal procedure is initiated as follows:

1. Press the ACO switch on the Fuse & Alarm (F&A) panel. The switch lamp will light. This will silence local audible alarms.
2. Have a replacement TI, AHG16 ready.
3. Remove the designated TI plug-in unit, AHG16 and insert the new TI in the same slot.

The IN FAIL and OUT FAIL LEDs should stay lighted for approximately ten seconds. When the IN FAIL and OUT FAIL LEDs extinguish, only the IN SCE and DUPLEX LEDs shall be lighted on the replaced TI, AHG16.

4. Press the MEM switch on the TA, AHG1. This will clear the alarm memory.

5. Press the ACO switch on the F&A panel.  
The switch lamp will extinguish. Future  
alarms will now be reported.

This completes the TI plug-in unit, AHG16  
replacement process.

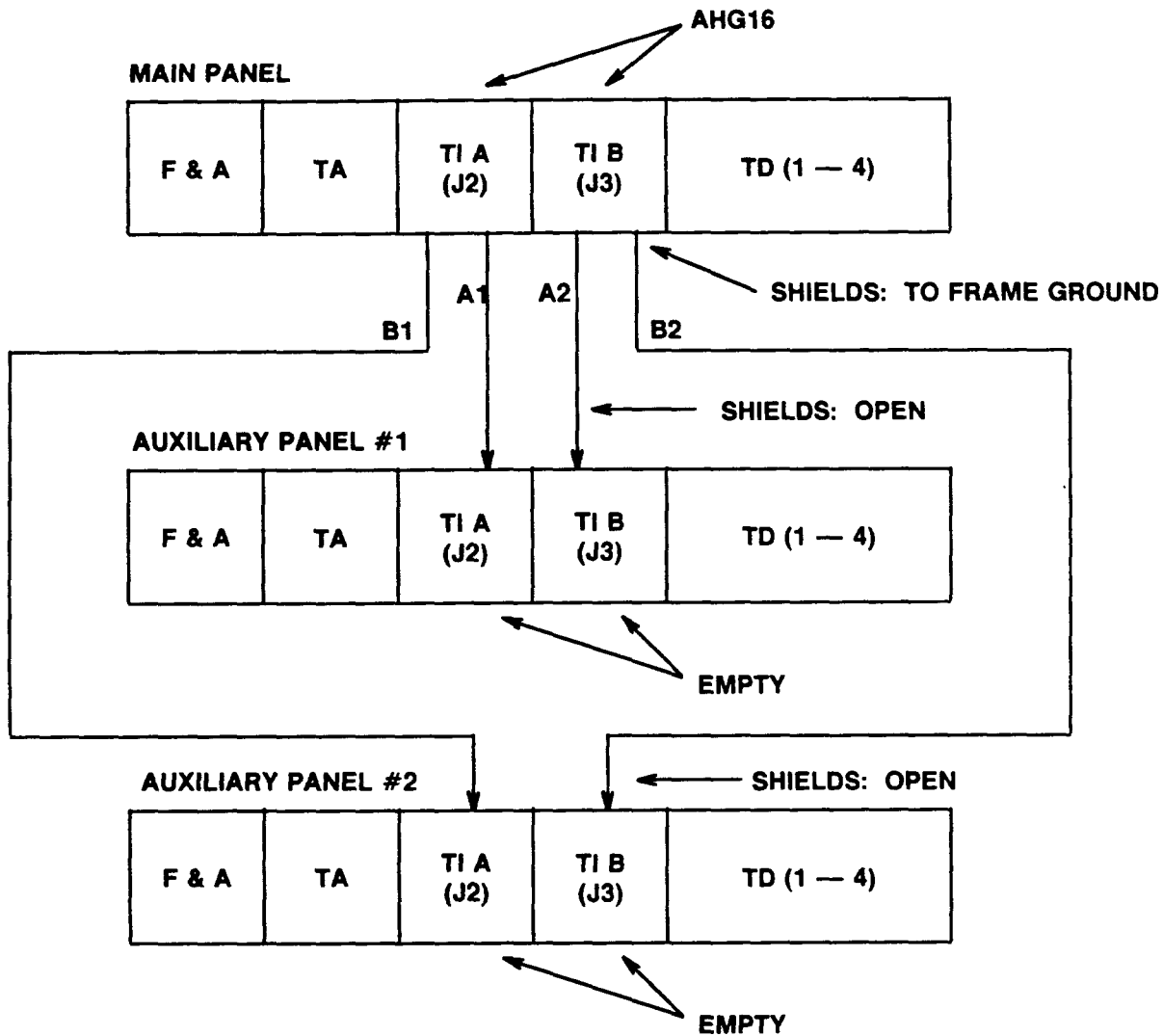


FIGURE 2

Cabling Diagram Showing Wiring Between Main and  
Auxiliary Panels Using the TI plug-in unit, AHG16.

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TABLE A (NOTES 1, 2 AND 3)				
CABLING CONNECTIONS FOR AHG16 AUXILIARY PANEL EXPANSION				
FROM		TO		
MAIN PANEL		AUXILIARY PANEL 1		
CONNECTOR	TERMINALS	CONNECTOR	TERMINALS	CABLE
J2 (TIA)	15	J1 (TA)	2	A1
J2 (TIA)	7	J2 (TIA)	3	A1
J2 (TIA)	34	J2 (TIA)	30	A1
J3 (TIB)	15	J1 (TA)	3	B2
J3 (TIB)	7	J3 (TIB)	2	B2
J3 (TIB)	34	J3 (TIB)	29	B2
FROM		TO		
MAIN PANEL		AUXILIARY PANEL 2		
CONNECTOR	TERMINALS	CONNECTOR	TERMINALS	CABLE
J2 (TIA)	42	J1 (TA)	2	B1
J2 (TIA)	8	J2 (TIA)	3	B1
J2 (TIA)	35	J2 (TIA)	30	B1
J3 (TIB)	42	J1 (TA)	3	B2
J3 (TIB)	8	J3 (TIB)	2	B2
J3 (TIB)	35	J3 (TIB)	29	B2

**NOTES**

- Each auxiliary panel is fed by two shielded cables (A1 & A2 for auxiliary panel 1, and B1 & B2 for auxiliary panel 2). Each cable contains three twisted pairs of 26-gauge wire.
- The shield connection is tied to frame ground on the main panel but not connected on the auxiliary panel.
- The maximum overall cable length for each auxiliary panel should not exceed six feet.

**SPECIFICATIONS**

**16.384 MHz FREQUENCY INPUT:**

V = 1.73 Vp-p nominal

Vmin = 300 mv p-p @ 1500 ft (with 728A or equivalent coaxial cable)

Hysteresis ≥ 75 mv

Termination = 75 ohms unbalanced

Waveshape = pulsed

Format = composite timing signal (CTS)

**2.048 MHz FREQUENCY INPUT:**

V = 1.5 Vp-p

Vmin = 300 mv p-p @ 1500 ft (with 22BF or equivalent twisted shielded pair)

Hysteresis ≥ 75 mv

Termination = 75 ohms balanced

Waveshape = sinusoidal

**FREQUENCY RECOVERY:**

Short term stability (24 hours) :  $3 \times 10^{-13}$   
(Allan standard deviation)

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**Long term stability (7 days) :**  $1 \times 10^{-13}$   
(Allan standard deviation)

**Phase variation :** Less than 10 ns peak-to-peak over any 10 degree C range.

## TEMPERATURE

+40 to +100 degree F - long term

+4.4 to +37.8 degree C

+35 to +120 degree F - short term

+1.6 to +49 degree C

## HUMIDITY

Min. Relative Range: 20 to 80 percent (Short term)

Min Relative Humidity: 20 to 55 percent (Operating)

## ORDERING INFORMATION

A single AHG16 plug-in unit may be ordered using:

**CLEI code D4PQ114AXX**

## REFERENCES

The following publications provide more information on the CDU:

- T-7C389-33 Issue 5 (or higher)
- SD-7C389-02 Issue 3 (or higher)
- AT&T Practice 314-813-101 - CDU (Clock Distribution Unit) - Description and Operation
- AT&T Practice 314-813-201 - Clock Distribution Unit - Installation and Maintenance
- AT&T Practice 314-913-222 - Data Sheet - AHG1 Timing Alarm

- AT&T Practice 314-913-223 - Data Sheet - AHG4 Timing Distributor

- AT&T Practice 314-913-228 - Data Sheet - AHG25 Timing Distributor

## GLOSSARY

Terms used in this document are identified as follows:

- **CDU:** Clock Distribution Unit
- **CTS:** Composite Timing Signal
- **DACS:** Digital Access and Cross Connect System
- **ESD:** Electro-Static Discharge
- **IN FAIL:** Input Failure
- **IN SCE TR:** Input Source Transfer
- **LED:** Light Emitting Diode
- **PFS:** Primary Frequency Supply
- **PLL:** Phase-Locked Loop
- **TA:** Timing Alarm Circuit Pack
- **TD:** Timing Distributor Circuit Pack
- **TI:** Timing Interface Circuit Pack
- **TST:** Test Access Jack
- **4ESS:** Number 4 Electronic Switching System

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