

# AHG15, S2:2 TIMING INTERFACE

## DATA SHEET

### SYNCHRONIZATION DISTRIBUTION EXPANDER

#### INTRODUCTION

The AHG15 is a TI (Timing Interface) plug-in for the SDE (Synchronization Distribution Expander) that may be used to recover the timing signals from any one of a number of inputs: a DS-1C (M1C compatible) input, DS-1 input with ESF (Extended Superframe) or D4/SF (super frame) framing, or an 8/64 kb/s composite clock input. In addition, the AHG15 has hitless input switching capability to allow uninterrupted timing during input reference switching. A pair of AHG15 TI units must be used in a single SDE shelf.

This data sheet is reissued for a Class A change. The COMCODE and the CLEI \* code have been changed. Figure 2 indicates that the AHG15 is a Series 2 version of the timing interface.

AHG15	COMCODE	CLEI CODE
Series 2	106794720	D4PQA18AAA

#### FEATURES

The Timing Interface plug-in unit, AHG15, provides:

- Hitless input switching
- DS-1 input with selectable D4 or ESF format (B8ZS [Bipolar Eight-Zero Substitution] or AMI [Alternate Mark Inversion])
- Recovery from DS-1C input.

\* COMMON LANGUAGE is a registered trademark and CLEI, CLLI, CLCI, and CLFI are trademarks of Bell Communications Research, Inc.

#### DESCRIPTION

The basic circuit operation is very similar to that of the AHG2B. However, there are some improvements in the circuit operation including: DS-1C input, cabling, automatic input reference switching, and alarm features. Additional features include improved input failure detection as well as dedicated output timing taps on each TI. These dedicated output timing taps allow connection to two auxiliary SDE panels without requiring TI's for these additional panels.

The DS-1 and DS-1C inputs are processed by a dual phase-locked circuit with built in jitter suppression. Options on the input circuitry enable various framing and error conditions to be monitored to allow only good signals to be used for an input source. The frequency that is recovered from the DS-1/DS-1C circuitry is processed by a dual-rail unipolar generator. This generator sends timing signals to the TD (timing distributor) circuit packs. The composite clock inputs are fed directly into the dual-rail unipolar generator which keeps the throughput delay to a minimum.

If both inputs to the SDE are lost, the Timing Interface, AHG15, allows the SDE to enter either a holdover or free-run mode of operation. The holdover mode is used with DS-1 and DS-1C inputs. The holdover mode sets the TI's oscillator to the frequency equal to that of the last good input and maintains the frequency to within Stratum III accuracy. When at least one of the inputs is restored, the oscillator locks to the frequency of the restored input and uses this to generate the output signals for the SDE. The free-run mode is used with a CC (composite clock) input or with no input.

If both CC inputs fail or the bipolar violation density changes, the oscillator will enter a Stratum III free-run mode where the oscillator will select a factory set frequency reference to generate the output timing signals for the SDE. When at least one of the inputs is restored, the oscillator reference is disregarded and the CC input is used. The frequency of the oscillator may be monitored at the faceplate TST jack.

Hitless input transfer switching is also incorporated in the AHG15. This allows a pair of Timing Interface Units, AHG15s, to make automatic or manual input reference switches without timing discontinuities. Timing discontinuities can cause data hits on the equipment that is receiving timing. The hitless switching feature also extends

to the recovery switching that takes place when an input is restored after a dual-input failure. In this case, the SDE mode would be switching from the holdover or free-run mode to synchronize to a good input. Therefore, the hitless switching feature ensures that the SDE generates error-free timing signals during most troubled conditions. The TI, AHG15, also has the capability of driving two auxiliary SDE panels. The auxiliary panels contain all normal circuit packs with the exception of TI's. The AHG15 has two pairs of dedicated output taps (one pair for each auxiliary panel). These dedicated output taps are connected by cables via the backplane pins on each panel. Both power and alarm for the auxiliary panel are carried separately to preserve redundancy. The auxiliary panel connections are shown in Figure 1 and Table A.

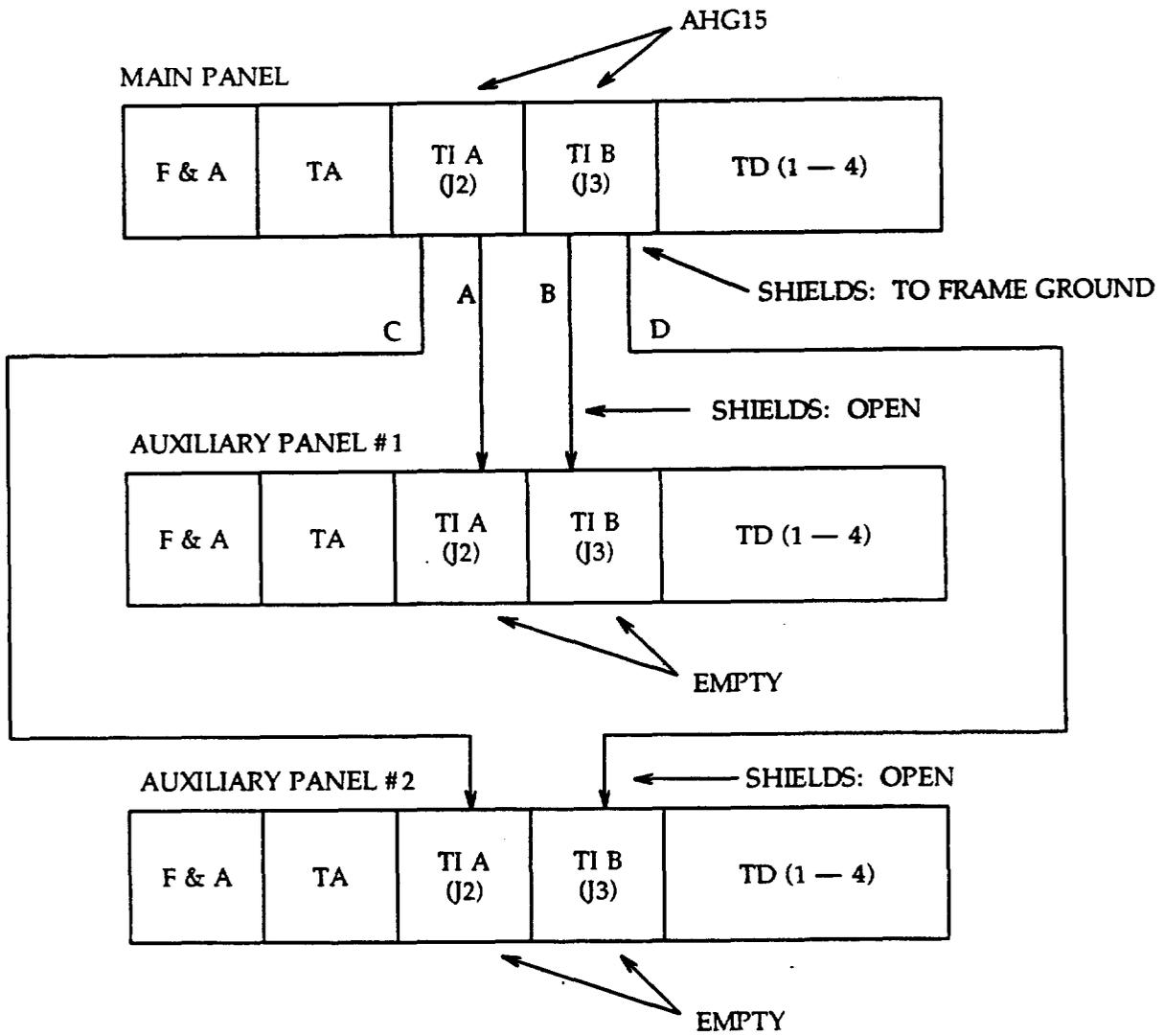


Figure 1-1. Cabling Diagram Showing Wiring Between Main and Auxiliary Panels Using the AHG15

TABLE A (NOTES 1,2, and 3)					
CABLING CONNECTIONS FOR AHG15 AUXILIARY PANELS					
FROM MAIN PANEL			TO AUXILIARY PANEL 1		
CONNECTOR	TERMINALS	CONNECTOR	TERMINALS	CABLE	
J2 (TIA)	15	J1 (TA)	2	A	
J2 (TIA)	7	J2 (TIA)	2,3	A	
J2 (TIA)	34	J2 (TIA)	29,30	A	
J3 (TIB)	15	J1 (TA)	3	B	
J3 (TIB)	7	J3 (TIB)	2,3	B	
J3 (TIB)	34	J3 (TIB)	29,30	B	
FROM MAIN PANEL			TO AUXILIARY PANEL 2		
CONNECTOR	TERMINALS	CONNECTOR	TERMINALS	CABLE	
J2 (TIA)	42	J1 (TA)	2	C	
J2 (TIA)	8	J2 (TIA)	2,3	C	
J2 (TIA)	35	J2 (TIA)	29,30	C	
J3 (TIB)	42	J1 (TA)	3	D	
J3 (TIB)	8	J3 (TIB)	2,3	D	
J3 (TIB)	35	J3 (TIB)	29,30	D	

**NOTES:**

1. Each twisted shielded pair consists of two 26-gauge wires P1 and P2. The P1 connections are shown above. The P2 connections are all tied to the frame ground on each panel. Any unused wires should also be tied to frame ground at both ends.
2. The shield connection is tied to frame ground on the main panel but not connected on the auxiliary panel.
3. The maximum overall cable length for each auxiliary panel should not exceed six feet.

*Caution: 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.*

**OPTIONS AND INSTALLATION**

**Options**

The AHG15 has three classes of options: those that control the input bridging capability, those that affect input recovery, and those that are used in input failure conditions.

**Input Bridging Option**

The normal AHG15 DS-1 termination is 100 Ohms. A working DS-1 line may only have a single 100-Ohm termination. When it is desired to use the AHG15 as this single termination, the switch SW101 (Figure 2) should be set to the NORM position. However, if the timing information is to be extracted from a working, terminated DS-1 line, the input bridging option should be used. The bridging option changes the input impedance presented by the AHG15 to be approximately 1000 Ohms and allows the timing interface to accept the lower (monitor level) input signal. To use the bridging option, set SW101 to the BR position and connect two external 432-Ohm bridging resistors at the DS-X. Care should be taken to keep unshielded wires as short as possible.

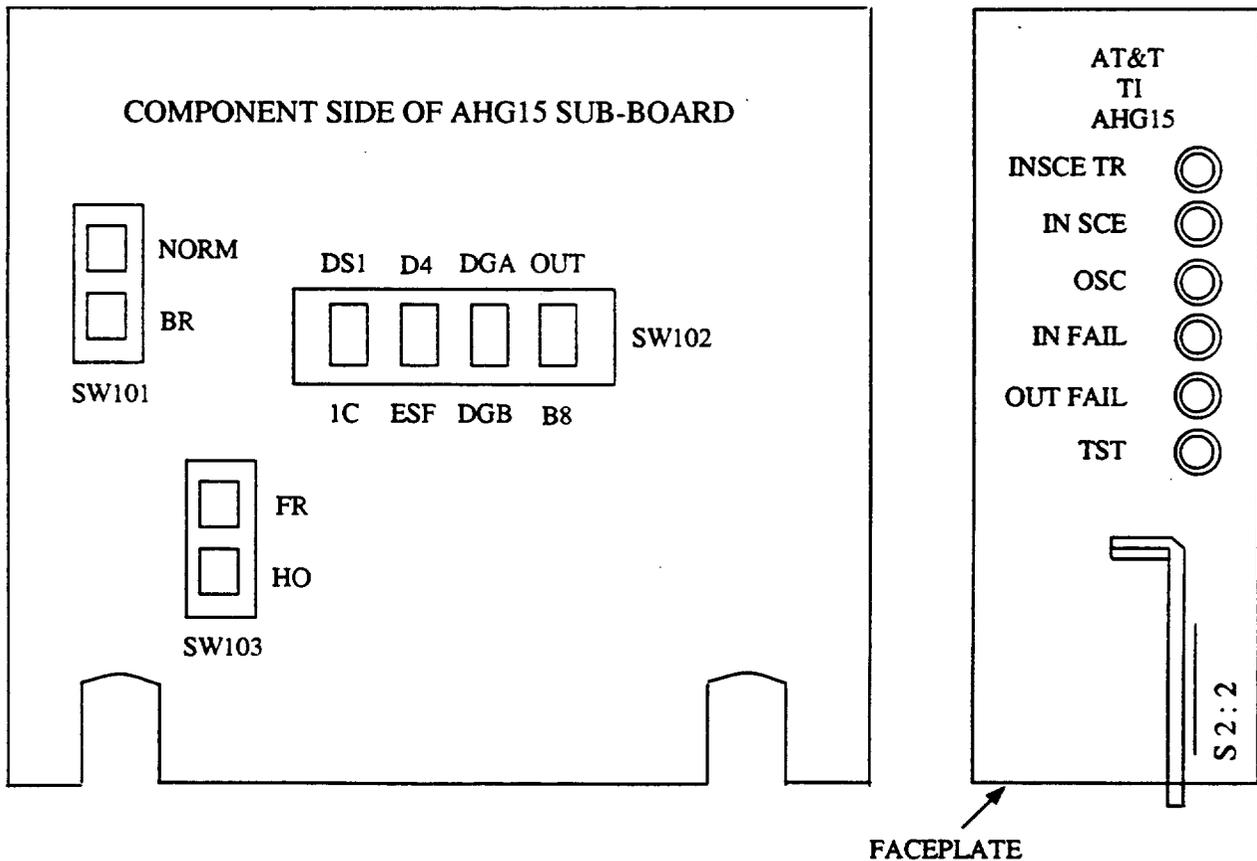


Figure 1-2. Location of Options on the Timing Interface Plug-In Unit, AHG15

## Input Recovery Option

The options used to modify the input recovery include the input type ( DS-1 or DS-1C), input framing format (D4 or ESF), B8ZS coding (IN or OUT) and the choice of digroup timing if DS-1C inputs are used (DGA or DGB). These input options are located on a four-position DIP (dual in-line pin) switch, SW102 (Figure 2). Position 1 controls the input signal type. The OPEN setting is for DS-1C inputs and the other setting is for DS-1 inputs. Position 2 controls the input framing format that is to be detected. The OPEN setting is for ESF framing and the other setting is for D4 framing. Position 3 accepts inputs with B8ZS coding. The OPEN setting is for inputs with B8ZS coding and the CLOSE setting is for inputs without B8ZS coding.

Position 4 is for the digroup in a DS-1C input which is used for timing. The OPEN setting is for digroup B, and the other setting is for digroup A.

## Mode Option

The other set of options controls the oscillator mode in case there is a dual-input failure. There are two modes to choose from: holdover and free-run. The holdover and free-run options may be selected by using switch SW103 (Figure 2). Setting HO selects the holdover mode and setting FR selects the free-run mode.

## Change-Out of AHG2/2B TI to AHG15 TI

An SDE installation with a pair of AHG2/2B TI circuit packs may be upgraded to a pair of AHG15 TI circuit packs by using the following procedure:

1. Verify that the AHG15 TIs are available and optioned correctly for the input signal type.
2. Remove the AHG2/2B TI with the extinguished IN SCE LED.
3. Insert an AHG15 TI in the empty TI slot and wait approximately ten seconds for the RED faceplate LEDs to extinguish.
4. Remove the remaining AHG2/2B TI and observe the IN SCE LED light on the AHG15 TI.
5. Insert the remaining AHG15 into the empty TI slot and wait approximately ten seconds for the RED faceplate LEDs to extinguish.

## SPECIFICATIONS

The acceptable limits are as follows:

### General:

#### Composite Clock Input:

Input Impedance - 133-Ohms nominal  
 Input Type - Transformer Coupled  
 Input Signal - Standard Composite Clock  
 Min. Input Signal Level - 2.1 volts p-p  
 (peak-to-peak)  
 Type of Detection - Amplitude Regeneration

### Alarms:

Input Failure Detection - 20  $\mu$ s resolution  
 Output Failure Detection - 30  $\mu$ s resolution  
 Failure Detection Scheme - Pulse Width  
 Measurement

### Auxiliary Outputs:

Output Type - Open Collector, TTL  
 Output Signals - Dual-Rail Unipolar, TI [ ]  
 Alarm  
 Cable Length - Maximum distance of 6 feet from  
 Main to Auxiliary backplanes.

### DS-1 Input:

Input Impedance - 100-Ohms nominal  
 Input Type - Transformer coupled  
 Input Signals - Standard DS-1 with D4 or ESF from  
 DS-1C mode 2 with D4 or ESF.  
 Type of recovery - Dual PLL  
 Jitter Rejection - Above 10Hz, greater than ten  
 times. Under 10Hz, less than or equal to ten  
 times.  
 Holdover Accuracy - Stratum III over 24 hours with  
 temperature change of 3 degree Celsius.

### 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 Humidity Range

20 to 80 percent - short term  
 20 to 55 percent - operating

### ORDERING INFORMATION

Only one AHG15 Timing Interface plug-in may be used in a single SDE panel at a time. The AHG15 TI may be ordered as a single circuit pack unit.

PLUG-IN UNIT	CLEI CODE
AHG15 S2:2	D4PQA18AAA

### REFERENCES

The following publications provide more information on the SDE.

- SD-7C389-01
- SD-7C389-02
- AT&T Practice 314-913-220, Description and Operation
- AT&T Practice 314-913-221, Installation and Maintenance.

### GLOSSARY

The acronyms used in this data sheet are listed and defined below.

CC	Composite Clock
ESD	Electro-Static Discharge
ESF	Extended Superframe Format
F&A	Fuse and Alarm Panel
IN FAIL	Input Failure
IN SCR TR	Input Source Transfer
LED	Light Emitting Diode
PLL	Phase-Locked Loop
TA	Timing Alarm
TD	Timing Distributor
TI	Timing Interface
TST	Test
SDE	Synchronization Distribution Expander.