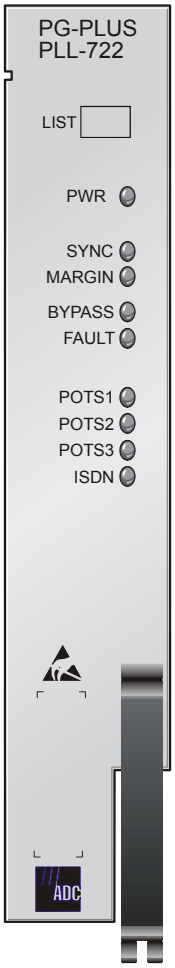
PG-PLUS

TECHNICAL PRACTICE



3 POTS/1 ISDN

CENTRAL OFFICE LINE UNIT

Model	List	CLEI Code
PLL-722	1	S9L1AC0A~~

Revision History of This Practice

Revision	Release Date	Revisions Made
01	August 28, 1997	Initial Release
02	February 26, 1999	Metric values and V2 compliancy for voltage safety added to specifications table
03	February 7, 2002	Release to rebrand document to comply with ADC standards
04	January 6, 2003	Updated Product Support Information

USING THIS PRACTICE

Three types of messages, identified by icons, appear in the text.

Notes indicate information about special circumstances.

Cautions indicate the possibility of equipment damage or the possibility of personal injury.

Electrostatic Discharge (ESD) susceptibility symbols indicate that a device or assembly is susceptible to damage from electrostatic discharge.You must wear an antistatic wrist strap connected to the appropriate ground connection prior to performing installation procedures. You must also observe normal ESD precautions when handling electronic equipment. Do not hold electronic plugs by their edges. Do not touch components or circuitry.

INSPECTING YOUR SHIPMENT

Upon receipt of the equipment:

- Unpack each container and visually inspect the contents for signs of damage. If the equipment has been damaged in transit, immediately report the extent of damage to the transportation company and to ADC. Order replacement equipment, if necessary.
- Check the packing list to ensure complete and accurate shipment of each listed item. If the shipment is short or irregular, contact ADC as described in "Returns" on page 39. If you must store the equipment for a prolonged period, store the equipment in its original container.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

OVERVIEW

This practice describes the ADC® PG-Plus® PLL-722 List 1, PAU-710 List 4B, a COLU that provides interfaces for three POTS and one ISDN interface between a PG-Plus RT and subscribers.

DESCRIPTION AND FEATURES

A PG-Plus application consisting of one COTS, one COLU, and one RT (see Figure 1) provides bidirectional transport of multiple DS0 over a single, unconditioned wire pair using HDSL technology. Using existing cable, PG-Plus provides for higher bandwidth needs of residential and business customers by providing three POTS and an ISDN interface on a single HDSL twisted-pair wire.

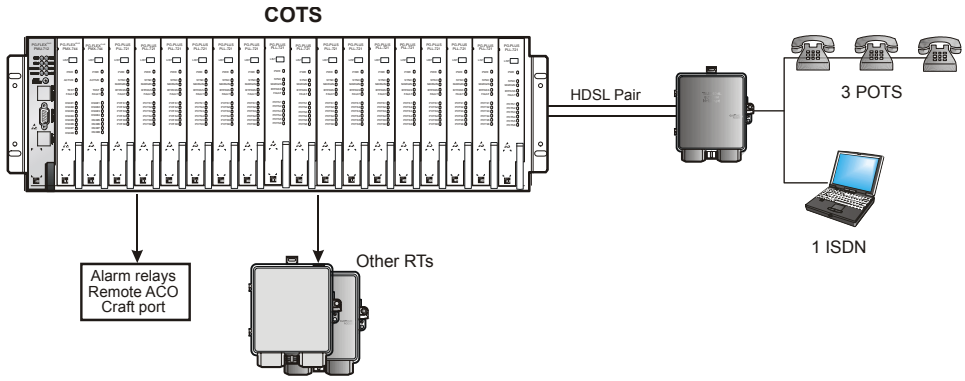


Figure 1. *Typical System Application*

The COLU uses ADC's HDSL technology to provide digital transmission without the need for repeaters, loop conditioning, or pair selection. The COLU can be installed in the PCS-718 19-inch or the PCS-719 23-inch COTS. The COLU operates in the standalone mode with no other COTS circuit cards required. Advanced features such as performance monitoring, alarm reporting, and testing require the addition of the Alarm Unit (PAU). Line power is provided to the RT by the COLU.

The COLU performs the interface functions between the analog POTS circuits of the CO switching system by mapping one POTS line onto one DS0 for transmission to the RT on the HDSL pair. The COLU performs the interface functions between the ISDN circuits of the CO switching system and the internal digital PCM bus. The COLU maps one ISDN line onto three DS0 for transmission to the RT on the HDSL pair. To obtain maximum reach, the HDSL line to the RT is operated at the minimum rate to support the payload.

METALLIC FALLBACK

Metallic fallback provides a direct connection from the CO to one subscriber under fault conditions. Service is provided to the subscriber assigned to the first POTS line in the affected COLU. At the RT, the system exits metallic fallback and attempts to synchronize if either POTS, ISDN, or the HDSL Tip to Ring pair is shorted for at least 3 seconds, and then released for at least 3 seconds. Otherwise, the COLU checks for the presence of an RT every 5 minutes. If an RT is present, the system begins HDSL synchronization acquisition.

SPECIFICATIONS

Power Supply	
Voltage Safety	A2 compliant per GR-1089-CORE
Input Voltage	-42 Vdc to -56 Vdc
HDSL Line	
Output Voltage	± 140 Vdc maximum
Output Power	27 Watts maximum
HDSL Line Code	2B1Q
HDSL Line Rate	196 K symbols/sec; 392 K bps
HDSL Reach	12.5 kft (3.81 km), 26 AWG; 18.0 kft (5.48 km), 24 AWG; 25.2 kft (7.68 km), 22 AWG; 37.8 kft (11.5 km) 19 AWG
Maximum Attenuation	45.9 dB at 65 kHz
POTS	
Analog Impedance	900 Ω
DC On-hook Resistance	4 M Ω minimum
DC Off-hook Resistance	1000 Ω maximum
COTS Input Impedance	0.9 REN @ 20 Hz maximum
COTS Ring Detection	65 Vrms minimum @ 15 to 50 Hz
Provisional EOC	Multipoint EOC transparent
ISDN U Interface	
Input Impedance	135 Ω
Resistive Signature	Tip to Ground 162 K; Ring to Ground 453 K; Tip to Ring 120 K
Performance Monitoring	Interim Path Performance
Provisional Sealing Current	9 mA minimum at RT
Provisional EOC	Multipoint EOC, transparent
Environment	
Operating Temperature	-40° F to +150° F; -40° C to +65° C
Operating Humidity	5 percent to 95 percent noncondensing
Altitude	-200 ft. to 13,000 ft.; -60 m to 4,000 m
Vibration	NEBS
ESD	Per GR-1089-CORE
Power and Lightning	Per GR-1089-CORE
Human Safety	UL 1950 for Restricted Access
Emissions Radiation and Immunity	Per GR-1089-CORE for class A equipment
Connector	50 gold-plated card edge fingers
Dimensions	
Height	5.5 in. (14.0 cm.)
Width	1.1 in. (2.8 cm.)
Depth	10.25 in. (26.0 cm.)
Weight	2.0 lbs. (0.9 kg.)

POWER CONSUMPTION AND HEAT DISSIPATION

The three most important power demands of an COLU on the shelf power supply are its maximum power consumption, its maximum heat dissipation, and its maximum current drain. Table 1 lists the power consumption and heat dissipation for the COLU, on a per slot and per shelf basis.

Table 1. *Power Consumption and Heat Dissipation*

Power	COLU Slot	COTS	
		19-inch	23-inch
Maximum Heat Dissipation			
HDSL Line Power Off	2.8 W	33.6 W	44.8 W
HDSL Line Power On	5.0 W	60.0 W	80.0 W
Maximum Power Consumption			
HDSL Line Power Off	2.8 W	33.6 W	44.8 W
HDSL Line Power On	8.5 W	102.0 W	136.0 W
Maximum Current Drain			
HDSL Line Power Off	0.06 A	0.791 A	1.054 A
HDSL Line Power On	0.198 A	2.380 A	3.174 A

Maximum Heat Dissipation

The maximum heat dissipation measures the power converted into heat that is built up within the COLU. It contributes to the total heat generated in the space around the COLU. It is used to determine the maximum number of fully loaded COTS per bay that will not exceed the maximum allowable power dissipation density in Watts per square foot.

In CO locations, the Maximum Heat Dissipation for open faced, natural convection-cooled mountings is limited to 134.7 W per square foot as per Section 4.1.4 of the NEBS standard *GR-63-CORE*. The footprint of a standard 16-slot, 23-inch COTS is 7.042 square foot. The maximum bay dissipation is therefore limited to 948.6 W. At 80 W per COTS, this limits the number of fully loaded COTS to eleven per bay with a heat baffle above each COTS.

This is a worst case situation in that it assumes the entire CO is subjected to the maximum power density. Conditions other than worst case would permit increasing the number of COTS per bay without jeopardizing the CO thermal integrity. Due to the chimney effect, ADC recommends you install one heat-dissipating baffle between every COTS. This action would prevent exceeding the rated operating temperature of the COLU units.

Thermal Loading Limitations

The thermal loading limitations imposed when using the COLU in a CEV or other enclosures are determined by applying the COLU power parameters to the manufacturer's requirements for each specific housing.

Maximum Power Consumption

Maximum power consumption is the total power that the COLU consumes or draws from its -48 Vdc COTS power source. This parameter is needed when the COLU is located remotely from its serving CO. It determines the battery capacity required to maintain an 8-hour standby battery reserve for emergency situations. This limits the maximum number of line units in a remote enclosure.

Maximum Current Drain

Maximum current drain is the maximum current drawn from the COTS power supply when it is at its minimum voltage (-42.5 Vdc). This determines the COTS fusing requirements.

MONITORING, HISTORY AND DIAGNOSTICS

COLUs provide extensive real-time, non-disruptive monitoring of HDSL transmission performance parameters for all units in a circuit. PG-Plus allows user-selectable threshold settings for performance monitoring measurements. This allows alarms to be activated at the designated threshold setting. Performance of the user interface ports is also monitored. Monitored parameters include the following:

- HDSL Noise margin, pulse attenuation, ES, UAS
- Interface ES, SES, UAS, BPV seconds
- Major Alarm Relay Form-C relay contacts (NO, NC, C). Fail-safe operation
- Loopbacks Local interface loopback, local HDSL loopback, remote loopback
- Test Jacks Bridge jack on the front panel

Performance Parameters

Based on the monitored parameters, the COLUs derive the following performance parameters:

- MAR - A measure of the ratio of signal power to noise power, in dB, at a receiver point. A value of 0 dB means that the predicted transmission BER is equal to 10^{-7}, a value of 6 dB means the predicted transmission BER is equal to 10^{-10}. The Main menu status display of the console continuously updates the margin value.

  HDSL CRC-6: A 6-bit word in every HDSL frame, representing a calculation based on all the bits in that frame. Any mismatch at the receiver, between the received CRC-6 and the one calculated, based on the received data in the frame, indicates that one or more bits were received in error. The units use this parameter to derive the HDSL ES performance parameter.
- LOSW - The COLU has detected an error in one or more bits in six consecutive HDSL SYNC words. Two consecutive SYNC words must be received without error to clear this condition. A LOSW condition generally indicates the loop is down, thus data cannot be transmitted. The COLU use this parameter to derive UAS performance parameter.
- HDSL ES - An interval of 1 second during which at least one error is detected at the incoming HDSL port or there is an LOSW condition.
- HDSL UAS - An interval of 1 second during which a loop is down.

Alarms Names and Types

The COLUs generate alarms for problem conditions on the HDSL transmission facility and at the application interface. From the "System Alarm Types Screen" on page 24, you can set the alarms to the value types of Critical, Major, Minor, Not Alarmed, and Not Reported. You can view the alarm status from the "COLU Summary Screen" on page 14.

- MAR
- ES
- LOSW
- PFO
- PFS
- PGF
- MISMATCH
- NORLUSW
- MISPWRA
- MISPWRB

History

Current cumulative counts of the past twenty-four hours and historical data in the form of 24-hour history and a 7-day history are available to assist in identifying problem sources. You can view the HDSL history from the "HDSL History Screen" on page 21.

LED DESCRIPTIONS

Table 2, in which *n* equals the POTS line, describes the COLU front-panel LEDs depicted in Figure 2. For further details on the LEDs activities, refer to "Initialization Sequence" on page 8 and the "COLU and RT Fault Indicators" on page 36.

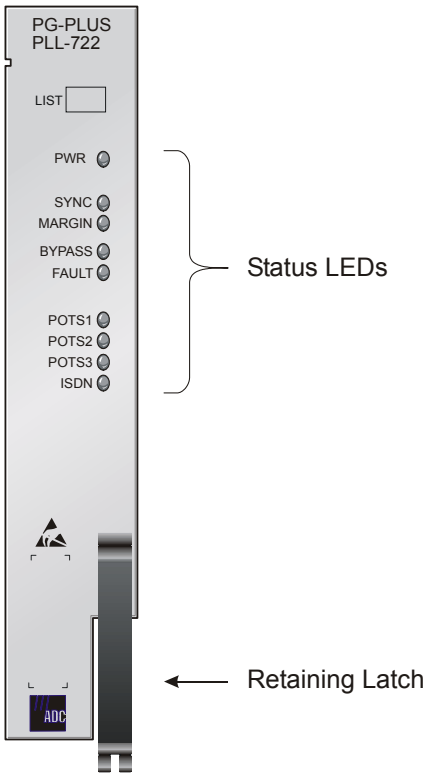


Figure 2. *COLU Front Panel LEDs*

Table 2. *LED Descriptions*

LED	Condition	Mode
PWR	On	COLU is powered and the dc power provided to the HDSL pair is normal.
	Flashing	One battery feed is missing or a battery feed fuse on the COLU is blown.
	On, and FAULT Flashing	DC power provided to the HDSL pair is out of normal range.
	On, all others flashing at 1 Hz	Running in Boot Mode due to invalid Application Program
	On, all others running downward at 1 Hz	Active software download of the COLU
	On, all POTS and ISDN LEDS On, all others running upward at 1 Hz	Active software download of the RT connected to the COLU
SYNC	On	HDSL is in synchronization between COLU and RT.
	Flashing	COLU and RT are attempting to SYNC.
MARGIN	On	COLU HDSL margin is equal to or below the threshold value.
	Flashing	RT HDSL Margin is equal to or below the threshold value.
BYPASS	On	COLU is in fallback to metallic.
	and POTS*n* Flashing	SDT is occurring on POTS*n**.
	and ISDN Flashing	SDT is occurring on ISDN or loopback is active on ISDN.
FAULT	On	COLU has a fault.
	Flashing	Alarm condition exists on the COLU.
ISDN	On	Channel is active and ready for layer 2 communication.
POTS*n*	On	Channel is off-hook.
	Flashing with Ring Cadence	Channel is ringing.

INSTALLATION AND TEST

REQUIRED TOOLS AND TEST EQUIPMENT

No tools are required to install the COLU. For testing, the following tools may be utilized:

- Telephone test set
- ISDN Basic Rate test set
- Optional, PSU-795, COTS Continuity Test Card, 150-1695-01 List 1

INSTALLING THE COLU

You can install the COLU in any slot except the three positions labeled COMMON, MUX 1, and MUX 2. Refer to the cabling tables provided in the COTS documentation for slot and Telco cabling assignment.

1 Open the retaining latch on the front of the COLU.

2 Insert the COLU into the card guides in a vacant slot in the COTS that corresponds to the location of the wiring from the CO switch.

3 Engage the retaining latch to hold the card in place.

All alarms in the PG-Plus application are suppressed when initially installed and powered up. Any alarms that are generated during this process are Suppressed. When the HDSL is synchronized and the COLU and RT margin has cleared; outstanding Suppressed alarms are made Active and reported to the PAU or the PMU, based upon their provisioned types.

INITIALIZATION SEQUENCE

After inserting the COLU into the appropriate slot in the COTS, the following events should occur in the order listed below:

- All LEDs briefly blink On and then Off, with the exception of the PWR and FAULT LEDs that remain Flashing.
- After about 5 seconds, the COLU applies power and goes into Start-Up mode. If an RT is present and no PFSs, PFOs, or PGFs are detected, the PWR LED is On green. If the line is Offhook, the HDSL power is not applied until it goes Onhook for at least 3 seconds. There is a 5 second delay before turning on the HDSL power.
- After applying the HDSL power, the tests for overload/underload conditions are performed. If the HDSL line power is normal, the PWR LED is On and HDSL start-up is initiated.
- As the COLU continues with Start-Up mode, the SYNC LED Flashes, indicating the HDSL line is attempting to acquire synchronization. When synchronization is complete, the SYNC LED is On. It takes approximately 10 to 15 seconds from the system power-up until the HDSL power is normal. If the first HDSL synchronization attempt fails then the system is powered down and put into the Metallic Fallback state. After a 5 minute period, HDSL power is applied again and a second attempt is made to acquire HDSL synchronization. If the second attempt fails, the system goes into Metallic Fallback state.
- The MARGIN LED is On yellow indicating the COLU signal-to-noise ratio is equal or below the selected signal-to-noise ratio threshold on the COLU. The MARGIN LED Flashes if the signal-to-noise ratio of the HDSL line is equal or below the selected signal-to-noise ratio threshold on the RT.

SUBSCRIBER DROP TESTS

You can perform this function in one of two ways:

- Initiate a test by applying a test voltage on the Tip at the COLU through an MLT set
- With the VT-100 Terminal connected to the PAU or PMU maintenance port, select the *Subscriber Drop Test* feature from the Test menu. Relays on the RT provide a path for performing a SDT. The results are reported to the PAU or the PMU and presented as TA-909 resistive signatures.

ADMINISTRATION

Performance monitoring is built into PG-Plus applications. You can access the VT-100 port of the PAU or the PMU to review performance measurements that provide an indication of the quality of transmission to the subscriber. You can perform system administration functions, such as alarm checking and clearing, configuration changes, performance monitoring, and testing for the COLU through the COLU screens.

Connect a VT-100 terminal to the RS-232 interface on the front panel of either the PAU or the PMU to access the COLU screens. If the system does not respond, verify the following values are present:

- VT-100 terminal Hardware Flow Control is set to On
- XON/XOFF is enabled
- ASYNC parameters: Data = 8, Parity = None, Start/Stop = 1.

For further information on connecting a terminal and accessing the screens refer to the PAU or the PMU Technical Practice.

The factory defaults given in this document are standard factory defaults. You may have a customized version of the product, in which case, refer to the PG-Plus Customized Factory Defaults for the values appropriate to the product version you have.

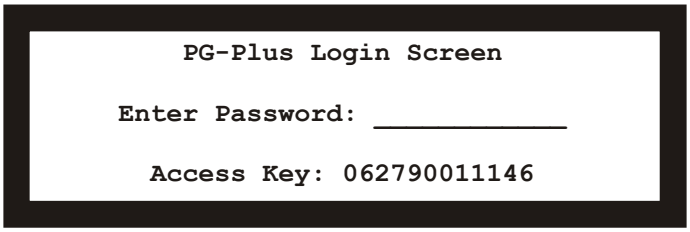
CONVENTIONS USED IN THIS DOCUMENT

Some screen shots in this document come from a prototype setup and may appear slightly different from what you see on your Craft interface screen. The basic information and contents should be similar. This document uses the following conventions for menus and shortcuts:

Example	Describes
menu	name of menu item
submenu	name of submenu item
prompts	the place where you answer yes or no or type some other response
error	the name of what's wrong
error text	an explanation of what's wrong
nnnn	a variable, such as POTS unit 1 in a 6 POTS unit

LOGGING ON

1 Press the SPACEBAR several times to activate the Autobaud feature. Supported baud rates are 1200, 2400, 4800, 9600, and 38400. The Logon Password screen displays.



2 Type the default password and press ENTER to view the PAU or PMU Main menu bar.

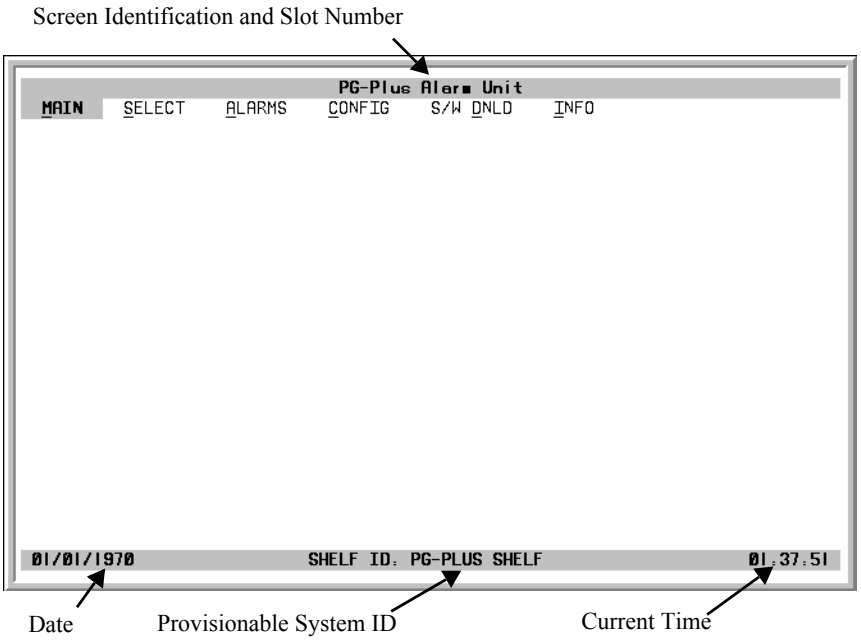
`password#1` **is the factory-default password. If you establish a different password, you must type the new password at a subsequent log on. Passwords are not case sensitive. The password must use at least 6 and no more than 10 characters, and the new password MUST contain at least 1 alpha, 1 numeric, and 1 special character. If the system does not respond, verify that the Hardware Flow Control of the VT-100 terminal is set to On.**

LOGGING OFF

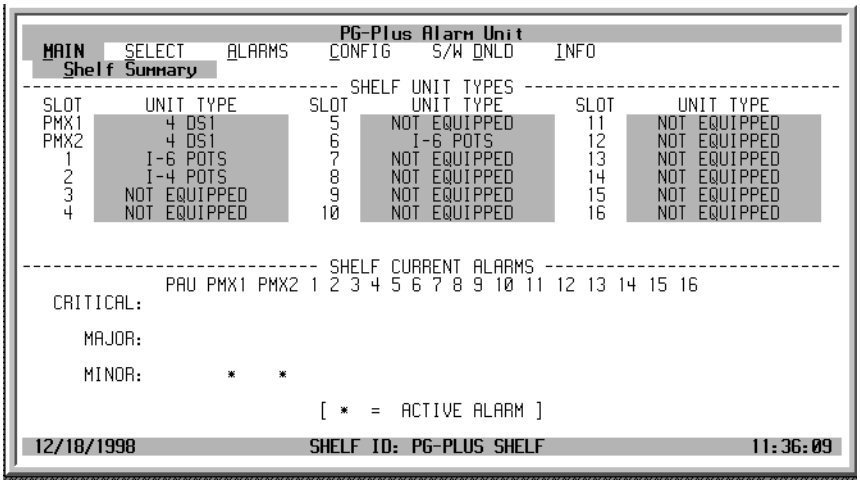
If you must leave your VT-100 terminal unattended, it is good practice to log out until you are ready to resume work. This prevents unauthorized persons from inadvertently changing any of your operating parameters. Log out by choosing *Logout* from the PAU Main menu bar or by disconnecting the cable connecting the console to the PAU/PMU.

PAU OR PMU MAIN SUBMENU

The first screen displays the COTS Main menu bar. The screens are identified by the COTS slot number at the top of each screen. The provisionable System ID string displays at the bottom center, the date displays at the lower left of the screen, and the time in military format displays at the lower right of the screen.



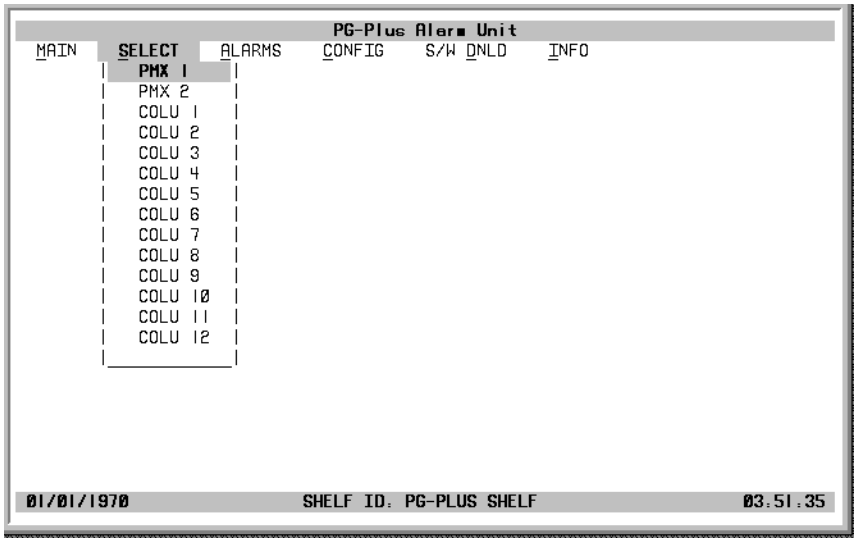
1 To access the PAU-710 when you do not know the PAU/PMU slot number, press **ENTER** to view the COTS summary screen. Note the slot number of the desired COLU. There may be more than one of the COLU type you are installing.



2 Press **ESC** to return to the PAU/PMU Main menu bar.

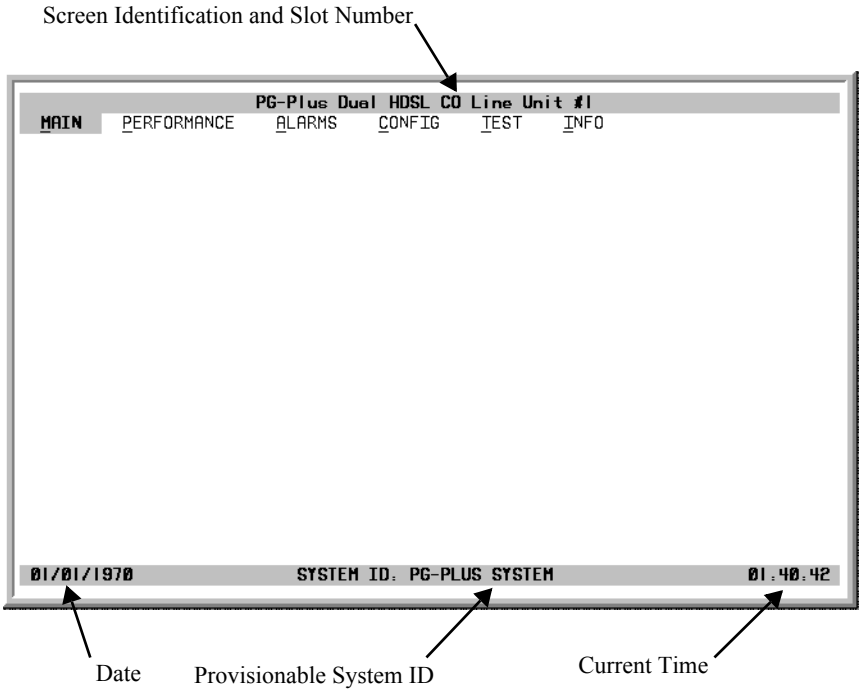
3 Scroll to the *Select* option and press **ENTER** to access the submenu.

4 Scroll to the desired COLU slot number noted above and press **ENTER**.



COLU MAIN MENU

When you select the COLU from the PAU or PMU *Select* option, the COLU Main menu displays. You can perform any of the functions listed in Table 3 from this screen.



Navigational Methods

The following keyboard keys are your means to navigate through the menus and screens:

A - Z keys	Selects and executes an underlined or highlighted menu item.
←	Moves left across main menu. Moves the cursor to the left.
→	Moves right across main menu. Moves the cursor to the right.
↑	Moves up the submenu selection. Moves the cursor up the screen items.
↓	Moves down the submenu selection. Moves the cursor down the screen items.
CTRL + R	Returns to the PAU or PMU Main screen. The ADC banner appears briefly and then the Main menu bar displays.
SPACEBAR	No effect. At COLU screen cycles through choices.
ESC	Exits the current screen and returns to the previous screen. Selection changes made on the current screen are discarded. Press ESC in a text field to cancel the text entry and restore the old value.
ENTER	Moves to submenu or screen selected. At the screen, it submits all selection changes on the current screen and makes them effective in the system.

Menu Bar Selections

Table 3 describes the menus and submenus selectable from the COLU menu bar.

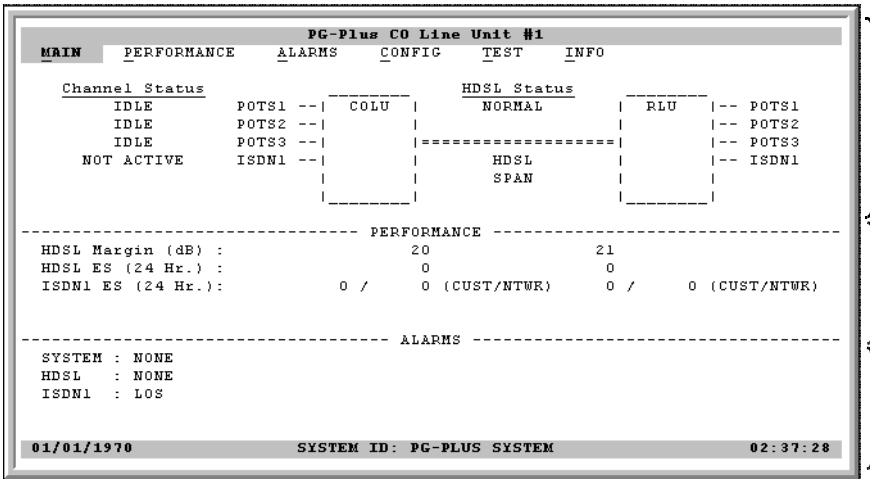
Table 3. *Menu Bar Selections*

Select the underlined alpha character:	To:
Main	View the circuit configuration.
	View performance summary information.
	View alarm summary information.
Performance	View HDSL Summary and reset the minimum and maximum margin counts.
	View date and time of the last reset of the minimum and maximum margin counts.
	View information about the HDSL span, 24-hours of performance history including ES, UAS and validity of counts.
	Clear the history screens.
	View 7-day history plus current day's accumulated performance information including ES, UAS and validity of counts.
	View POTS signal history on any of the POTS units, and clear the Trace buffer.
Alarms	View the HDSL History screen detailing, number of times each alarm occurred, time and date of first and last occurrence, provisioned notification type, and current status.
	Clear the alarm history
Config	View or change options such as SDT, HDSL Periodic Power Up, and System ID.
	View or change alarm types of all System alarms
	View or change threshold crossing values for the 24-hour ES count and low margin dB.
	View or change the HDSL and DSL line power alarms.
	Set or change POTS signaling transmit level at the RT.
	Set all operating parameters to factory defaults.
Test	Test subscriber drop by either of two methods.
	View results that include hazardous voltages, foreign voltages, resistive faults, and CPE termination status.
Info	Summary of navigational methods
	Display registration information to track product manufacturing, configuration, and revision state.

COLU Summary Screen

This screen details the performance condition of the COLU and RT.

1 Select *Main* from the menu bar and press **ENTER** to view this screen.



Status indicators for the HDSL span and the POTS interfaces

HDSL performance summary in terms of margin and ES counts

Status of current HDSL and System alarms

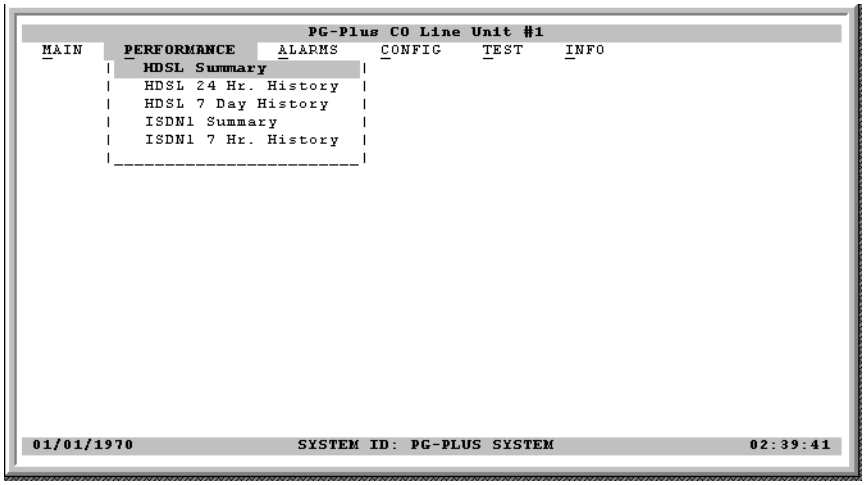
2 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu. Refer to the Performance and Alarms screens for a detailed description of data displayed in these areas.

Table 4. *System Status*

System Status	Description
HDSL Channel Status	
Metallic Fallback	System in metallic fallback and the HDSL link is down.
Start-up	System in start-up mode where the HDSL link is acquiring synchronization.
Normal	System running normal where the HDSL link is synchronized and speech and signaling data are flowing between the COLU and the RT.
POTS during Metallic Fallback and HDSL Startup	
Metallic Fallback	For the POTS1 line; POTS2-3 Not Applicable (N/A) or TEST (if the line is under test).An N/A entry means the value is invalid until HDSL is in SYNC and running in normal mode.
HDSL in SYNC; each POTS Channel Status	
Open	No CO battery detected.If No CO battery is detected, then the Line Status is Open. This status does not change except for Test status.
Idle	CO battery detected and line is Onhook at RT.
Ringing	Line is ringing
Busy	Line is Offhook at RT
Test	Line is under SDT
ISDN Channels Status	
Active	The act bit in the ISDN M-channel is set in the customer direction (towards NT1) and the network direction (towards LT)
Not Active	The act bit in the ISDN M-channel is reset in the customer direction or network direction or both.

PERFORMANCE SUBMENU

The Performance submenu provides access to the COLU performance screens. Select *Performance* at the menu bar and press **ENTER** to display the submenu.

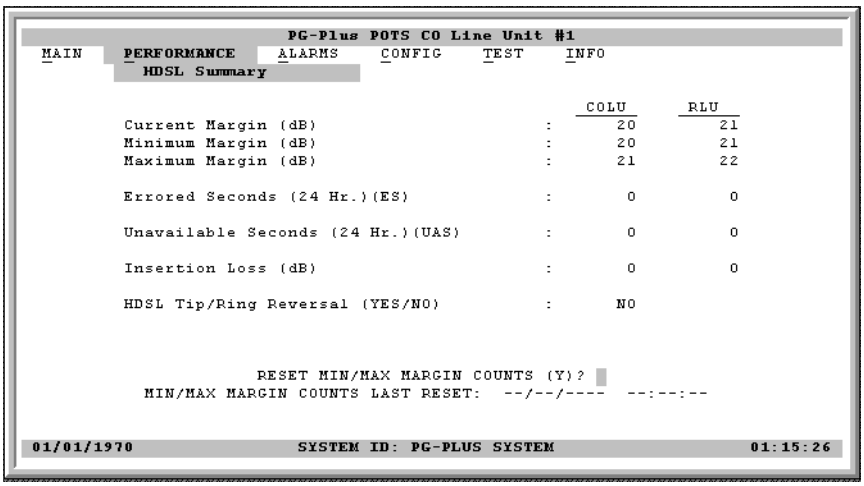


HDSL Summary Screen

This screen depicts an HDSL performance summary in terms of the MAR and ES count. Use the available options to reset the minimum and maximum margin counts.

1 Select *Performance* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *HDSL Summary* option and press **ENTER** to view the screen.



The following performance parameters are reported:

- Margins: A measure of the ratio of signal power to noise power, in decibels (dB), at a receiver point.
  - –Current Margin: The way the line looks now
  - –Maximum Margin: The maximum value measured
  - –Minimum Margin: The minimum value measured

- ES: An interval of 1 second during which at least 1 error is detected at the incoming HDSL port or there is an LOSW condition.
- UAS: An interval of 1 second during which a loop is down.
- Insertion Loss: dB measurement of signal loss

  If your COLU has an earlier software version your screen will display the following two lines instead of the Insertion Loss line:

  –Pulse Attenuation: dB measurement of signal loss

  –PPM Offset: the measure of the PPM difference between the RT and the COLU
- HDSL Tip and Ring Reversal

3 If you want to reset the counts, type **Y** at the Reset MIN/MAX Margin Counts prompt. The current 15-minute interval information shows the real-time updates. The first 15-minute interval is marked 00:00 and represents 12:00-12:15 AM of the current day. The date that the margin counts were last reset displays at the bottom of the screen.

If there are active alarms associated with the current 15-minute and 24-hour performance history information, those alarms become inactive when the 24-hour performance history is cleared. The date and time the 15-minute and 24-hour performance historys were last cleared appears at the bottom of the screen.

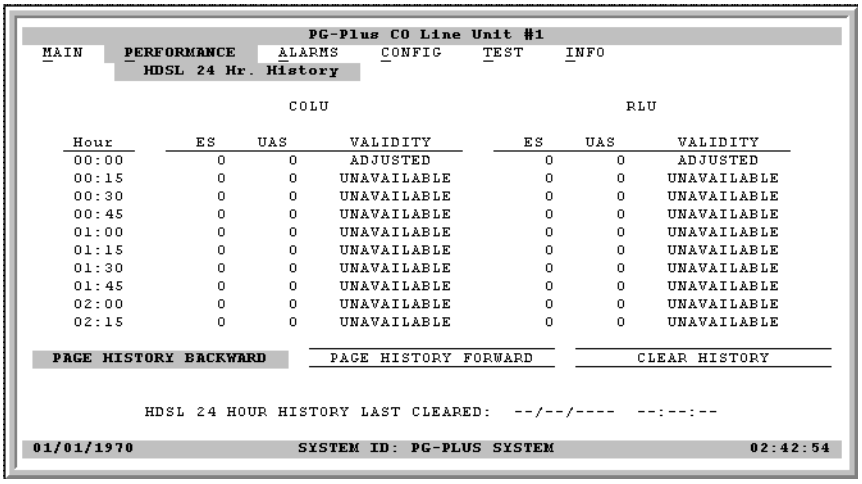
4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

HDSL 24-Hour History Screen

This screen shows twenty-four hours of HDSL performance history. The performance history data displayed includes ES counts, UAS counts, and the validity of the counts.

1 Select *Performance* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *HDSL 24 Hr. History* option and press **ENTER** to view the screen:



The COLU derives the ES and UAS performance parameters with the following field values:

- Unavailable: The system has not run long enough to fill this register.
- Partial: Data is being collected for this register.
- Complete: Data is saved in the history register for the complete interval.
- Adjusted: The time or date has been changed on the system during the interval.

3 Highlight either of the paging fields and press **ENTER** to scroll through all ninety-six 15-minute intervals.

4 To clear the history, highlight the Clear History field and press **ENTER**. The current 15-minute interval information shows the real-time updates. The first 15-minute interval is marked 00:00 and represents 12:00-12:15 AM of the current day.

If there are active alarms associated with the current 15-minute and 24-hour performance history information, those alarms become inactive when the 24-hour performance history is cleared. The date and time the 15-minute and 24-hour performance history was last cleared appears at the bottom of the screen.

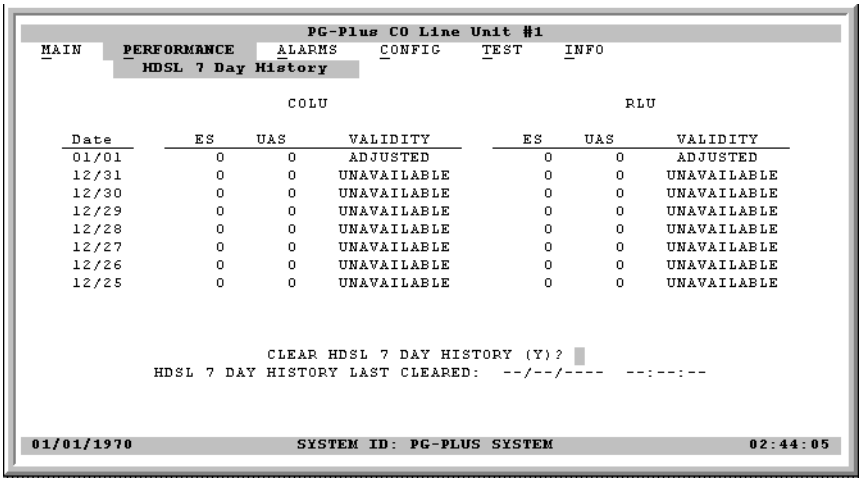
5 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

HDSL 7-day History Screen

Shows seven days of performance history plus the current day's accumulated performance information. The information displayed includes ES counts, UAS counts, and the validity of the counts.

1 Select *Performance* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *HDSL 7 Day History* option and press **ENTER** to view the screen:



The COLU derives the ES and UAS performance parameters with the values of Unavailable, Partial, Complete, and Adjusted.

3 To clear the 7-day history information, type **Y** at the Clear HDSL 7 day History prompt. The current day performance information shows real-time updates. At midnight of every day, the current day performance information is moved into the previous day slot and the current day performance information is cleared.

Clearing the 7-day performance history does not clear the current day performance information. The current day performance information may only be cleared through the HDSL 24-hour performance history screen. The date and time that the 7-day performance history was last cleared appears at the bottom of the screen.

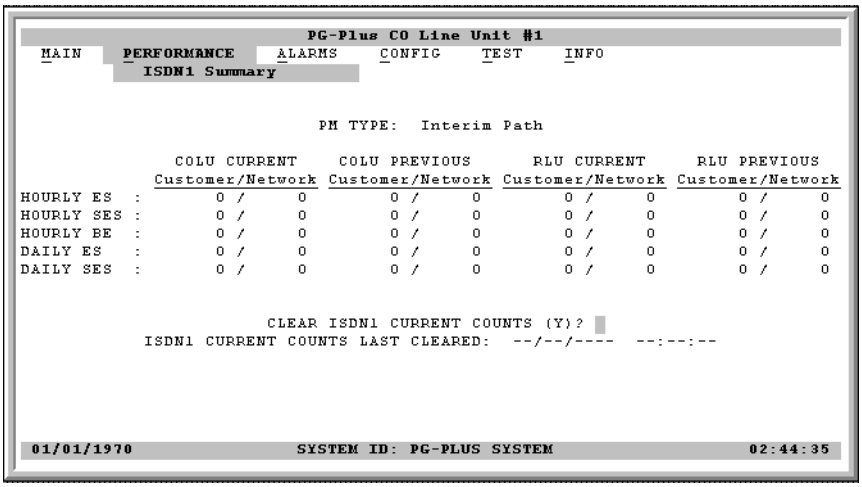
4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

ISDN Summary Screen

Shows all of the stored ISDN performance data for the COLU and the RT. The information includes ES and SES counts for the current hour, the previous hour, the current day and the previous day; and BE counts for the current hour and previous hour. Errors in the Customer column indicate errors in transmission from the Network (ISDN switch) to the Customer. Errors in the Network column indicate errors in transmission from the Customer to the Network (ISDN switch).

1 Select *Performance* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *ISDN Summary* option and press **ENTER** to view the screen:



Clearing the current ISDN performance data clears the performance counts for the COLU and the RT. If there are alarms associated with the performance counts at the COLU and RT, those alarms are reset when the ISDN performance data is cleared.

3 At the prompt, type **Y** to clear the information, or **N** to leave the data as is. You have the option to reset all the information displayed to zero. The date and time the ISDN information was last cleared is displayed at the screen bottom. The PM counts are updated every 15 seconds.

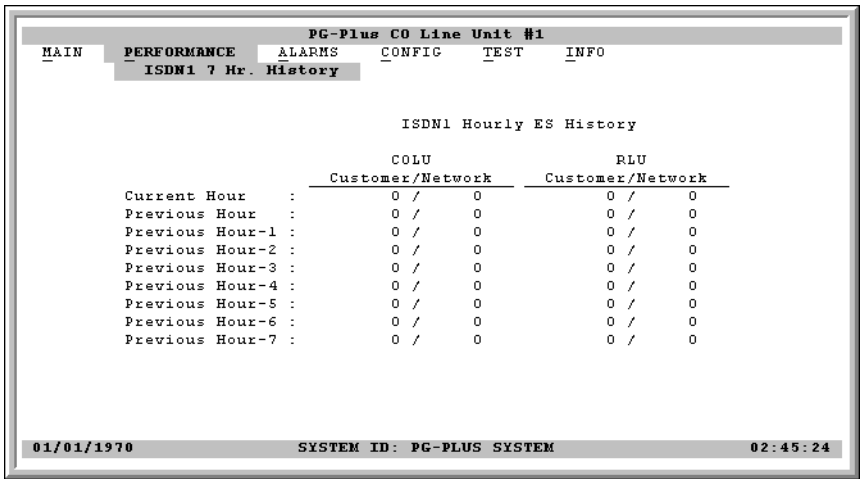
4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

ISDN 7-Hour History Screen

Displays the 7-hour ISDN ES history information for the COLU and the RT. The ES counts for the current hour and the previous hour are also displayed for completeness. This means that the 7-hour history begins with the hour prior to the previous hour. The PM counts are updated every 15 seconds.

1 Select *Performance* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *ISDN 7 Hr. History* option and press **ENTER** to view the screen:

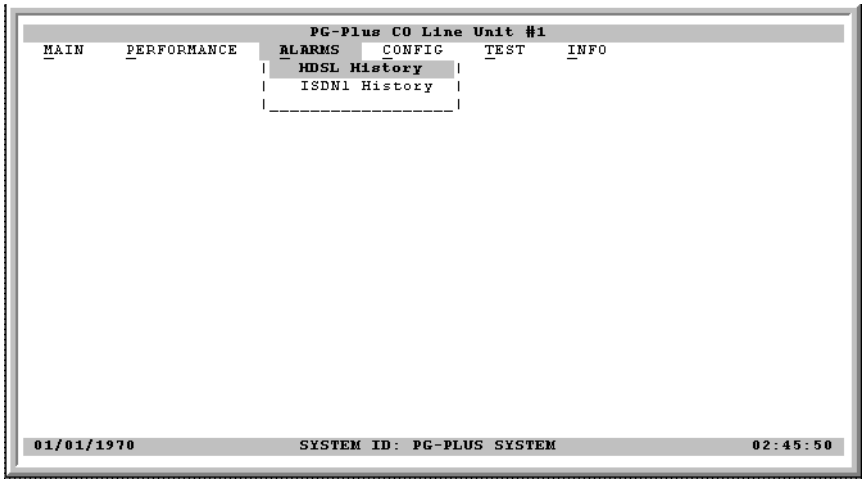


Errors appearing in the Customer column indicate errors in transmission from the Network (ISDN switch) to the Customer. Errors in the Network column indicate errors in transmission from the Customer to the Network (ISDN switch).

3 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

ALARMS SUBMENU

The COLU detects and reports HDSL, POTS, and System related alarmed events to the PAU or the PMU (if present). Only events provisioned for Major or Minor notification types are reported. Select *Alarms* at the menu bar and press **ENTER** to view the submenu.

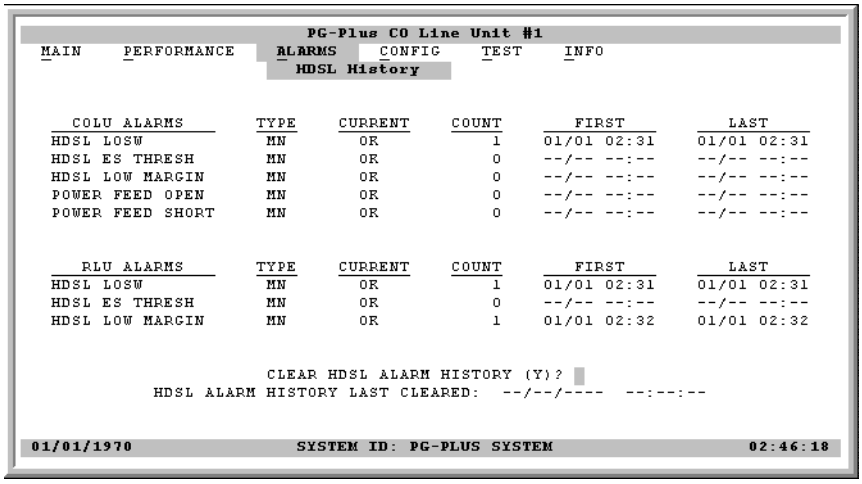


HDSL History Screen

The HDSL history maintained on the COLU contains a count of the number of times each alarm occurred, the time and date of the first and last occurrence, the provisioned notification type, and the current status. At this screen you view the results of the alarms set at the Configuration "HDSL Alarm Types Screen" on page 26.

1 Select *Alarms* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *HDSL History* option and press **ENTER** to view the screen:



If there are no active alarms, the status OK appears in the Current column.

3 To clear the alarm history, type **Y** at the Clear HDSL Alarm History? prompt.

Clearing the alarm history clears the RT and the COLU alarm history, regardless of whether you clear it from the COLU or the RT page of the history screen. If there is an active alarm, then the count is set to 1 and the value in the Last date and time field is set to the First date and time field.

4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

Table 5. *HDSL Alarms Screen*

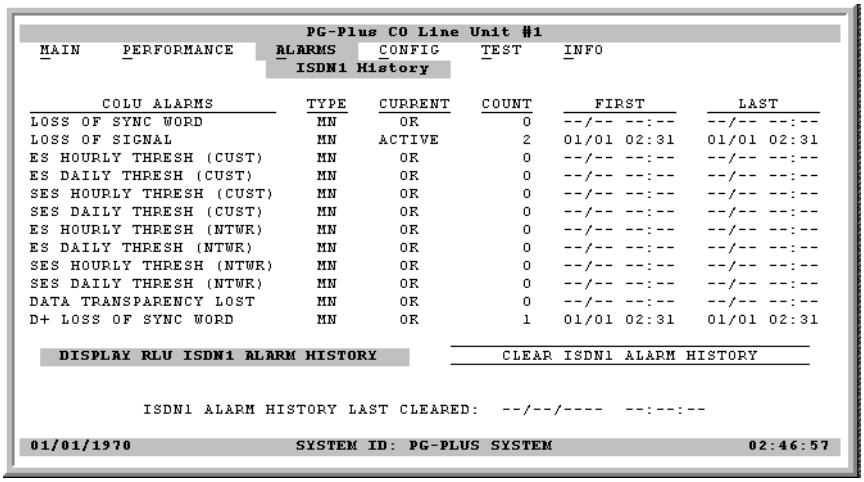
Alarm	Description	Default
LOSW	COLU cannot receive data over the given HDSL loop. COLU and RT cannot synchronize and are out of service.	MN
ES-24 Hr.	Number of HDSL ES exceeded the user-configurable threshold to give advance warning that HDSL performance is deteriorating. Set this threshold from 0-255 ES over a 24-hour period, or disable the alarm completely.	MN
MAR	HDSL noise margin of the loop has fallen below the user-configurable threshold. HDSL margin reaches or drops below the current threshold value.	MN
PFO	COLU cannot power the RT due to an open circuit. An undercurrent condition as detected by the RT exists for the given pair (<20 mA). A possible cause is that there is no RT at the other end of the circuit. No user intervention is required	MN
PFS	COLU cannot power the RT due to a short circuit. An excessive current condition as detected by the COLU exists for either pair (>50 mA). PFS alarm indicates an overcurrent condition due to wire shorting or an RT failure. COLU automatically turns off power feeding to both loops in response to a PFO or PFS condition on a single loop. No user intervention is required.	MN

ISDN History Screen

The ISDN History has two pages: the first relates to the COLU, and the second relates to the RT. The information includes the alarm name, the provisional alarm type, the current status of the alarm, the number of times the alarm was reported, the date and time of the first report alarm that of the last reported alarm. Here you see the results of the alarms set at the Configuration "ISDN Alarm Types Screen" on page 29.

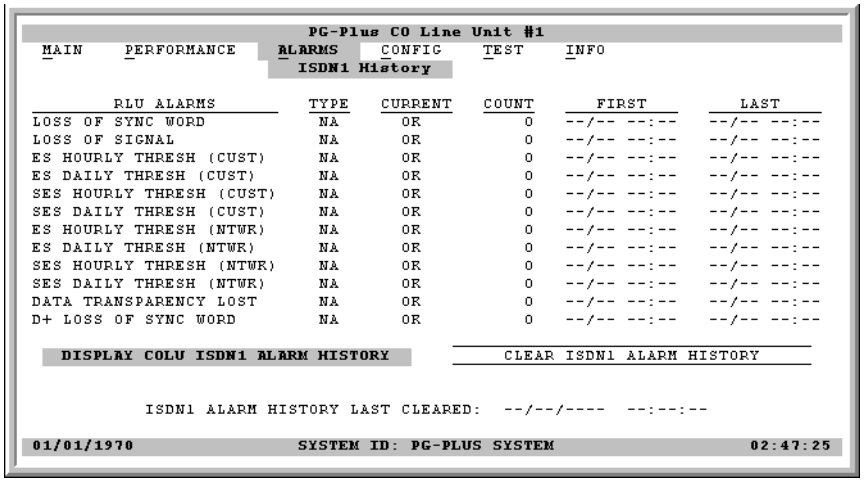
1 Select *Alarms* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *ISDN History* option and press **ENTER** to view the screen:



If there are no active alarms, the value OK displays in the Current column.

3 Select the Display RLU ISDN Alarm History field to move to the RT history page.



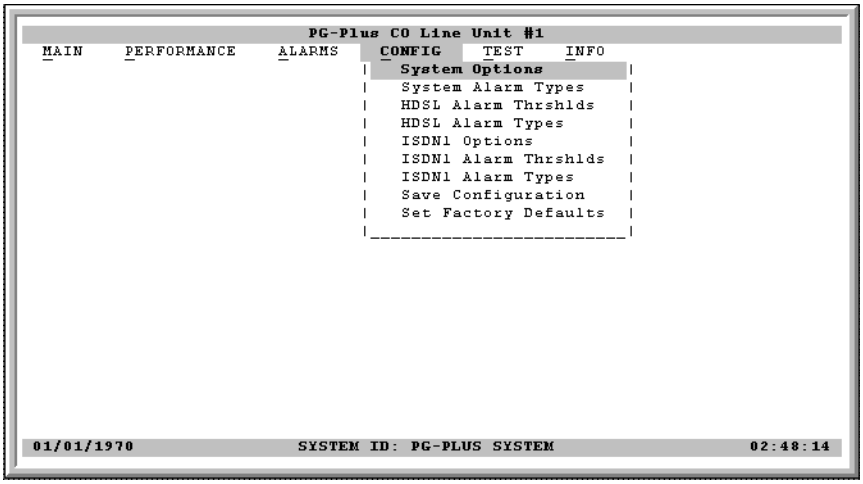
4 Use the Clear ISDN1 Alarm History field at the bottom to clear the history information.

Clearing the alarm history clears the RT and the COLU alarm history, regardless of whether you clear it from the COLU or the RT page of the history screen. If there is an active alarm, then the count is set to 1 and the value in the Last date and time field is set to the First date and time field. If an alarm is not active, the count is reset to 0 and the time stamps for the first and last alarms are cleared.

5 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

CONFIGURATION SUBMENU

Provides access to system provisioning screens, and an easy means of resetting all options to factory defaults. Select *CONFIG* at the menu bar and press **ENTER** to view the submenu.

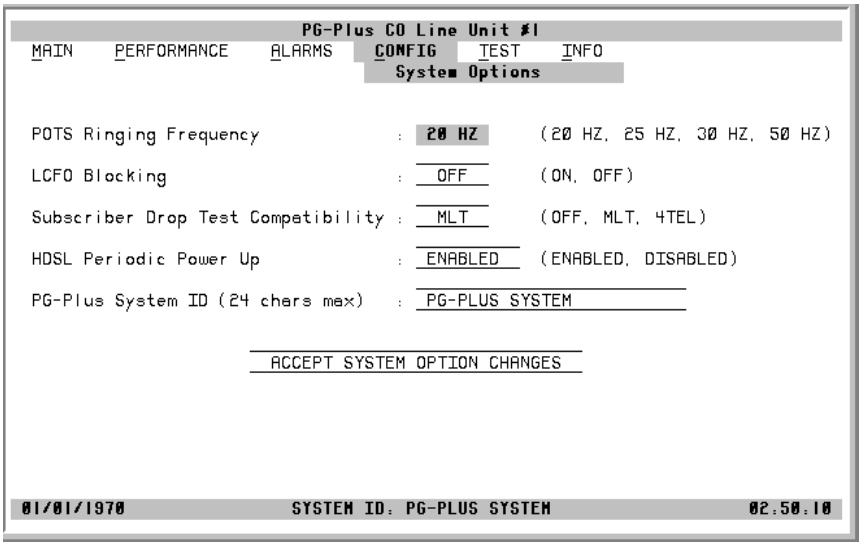


System Options Screen

Allows the provisioning of options such as ringing frequency, SDT, HDSL Periodic Power Up, and a System ID. Table 6 shows the configured system data and their factory default value.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *System Options* line and press **ENTER** to view the screen:



3 Highlight the desired field and press **SPACEBAR** to toggle to the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Accept System Option Changes field, and press **ENTER** to accept the changes.

6 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

Table 6. *System Options Configuration Fields*

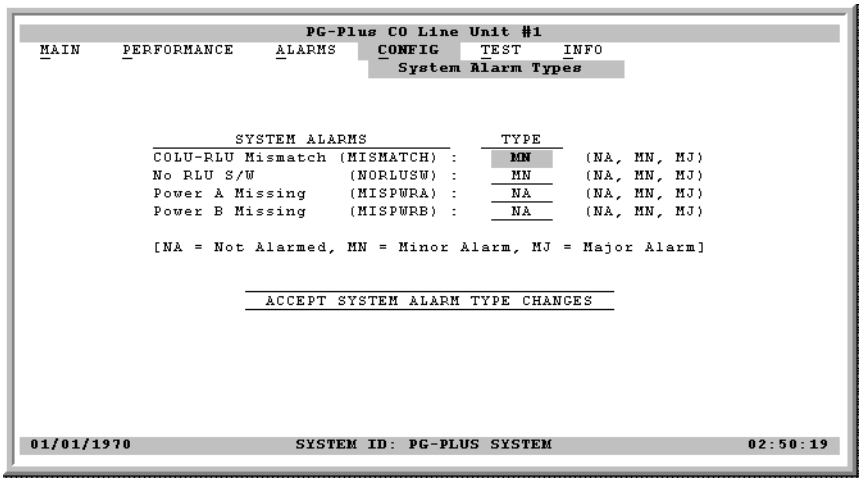
Options	Description	Default
POTS Ringing Frequency	The ringing frequency sent from the RLU to the subscriber. Possible values include 20 HZ, 25 HZ, 30 HZ, and 50 HZ.	20 Hz
LCFO Blocking	OFF, Detecting Removal of Battery command from CO causes RT to remove battery feed to the subscriber pair. ON, the detection of Removal of Battery command from CO does not cause the RT to remove battery feed to the subscriber pair.	Off
SDT Compatibility	Specifies whether the PG-Plus initiates and operates with MLT or 4TEL loop test systems. Possible values include Off, MLT, and 4TEL. Craft initiated drop tests work in any selection.	Off
HDSL Periodic Power Up	Enabled, PG-Plus in Metallic Fallback attempts to power up the HDSL line every five minutes or anytime the HDSL pair is shorted for two seconds and then opened. Disabled inhibits the power-up sequence under any circumstances and the system remains in Metallic Fallback.	Enabled
PG-Plus System ID	Configurable identification string for system can be up to 24 characters. Because the System ID is always visible at the bottom of the every COLU screen, it is easy for a user to know which COLU screens are being displayed. There are no special rules for changing the System ID. Any printable character, including space, is valid.	PG-Plus System

System Alarm Types Screen

Allows the provisioning of the alarm types of all System alarms including incompatible COLU and RT hardware. Table 7 shows the System Alarms and their factory default settings.You can view the results of these settings from the "COLU Summary Screen" on page 14.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *System Alarm Types* option and press **ENTER** to view the screen:



3 Highlight the `COLU RLU Mismatch` option and press the **SPACEBAR** to toggle to the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Accept System Alarm Types Changes field, and press **ENTER** to accept the changes.

6 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the Main menu.

Table 7. *System Alarms*

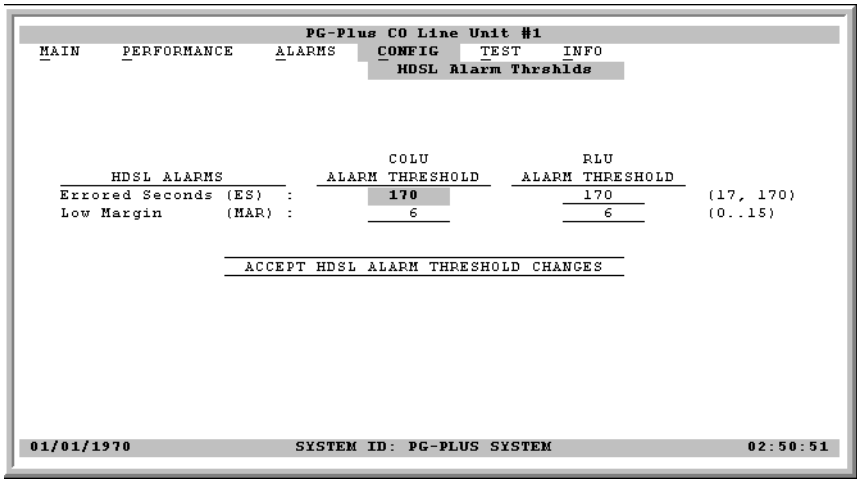
Abbreviation	Description	Default
MISPWRA	-48 V A power is missing on the COLU or a fuse is blown.	NA
MISPWRB	-48 V B power is missing on the COLU or a fuse is blown.	NA
MISMATCH	COLU and RT hardware type incompatible.	MN
NORLUSW	RLU has no software; awaiting software download.	MN

HDSL Alarm Thresholds Screen

This screen is a means to provision the threshold crossing values for the15 minute and 24-hour ES and UAS counts and low margin dB. Table 8 lists the fields of the HDSL Alarm Thresholds and the default factory values.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *HDSL Alarm Thrshlds* option and press **ENTER** to view the screen:



3 With the desired field highlighted, press **SPACEBAR** to toggle to the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Accept HDSL Alarm Threshold Changes field and press **ENTER** to accept the changes.

6 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

Table 8. *HDSL Alarm Thresholds*

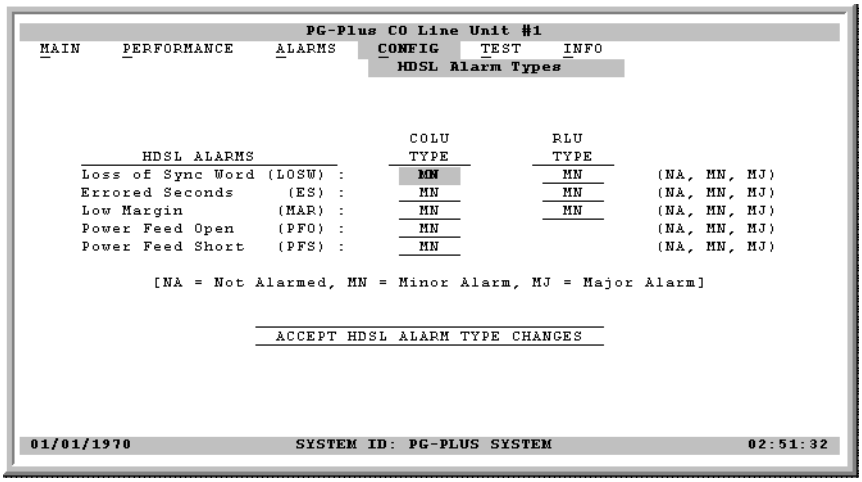
Thresholds	Description	Default
ES(24 Hr. count)	HDSL ES alarm is set active if ES counts become equal to or exceeds this threshold. Possible HDSL ES threshold values include 17 and 170.	170
MAR (dB)	HDSL Low Margin alarm is set active if margin drops equal to or less than this threshold. Possible HDSL low margin threshold values include values from 0 through 15.	6

HDSL Alarm Types Screen

Allows the provisioning of the alarm types for all HDSL Alarms. Table 9 lists the Alarm Reports and Table 10 shows the HDSL Alarms, the possible alarm Types, and the default factory settings. You can view the results of these settings from the "HDSL History Screen" on page 21.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *HDSL Alarm Types* option and press **ENTER** to view the screen:



3 At the LOSW field in the COLU Alarm Type column, press **TAB** to toggle to the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Accept HDSL Alarm Type Changes field, and press **ENTER** to accept the changes.

6 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

Table 9. *Alarm Reports*

Settings	PAU/PMU Reports	Fault LED Affected	Main Summary Listing	Alarm History Updated
MJ/MN	Yes	Yes	Yes	Yes
NA	No	No	No	No
NR	No	Yes	Yes	Yes

Table 10. *HDSL Alarms*

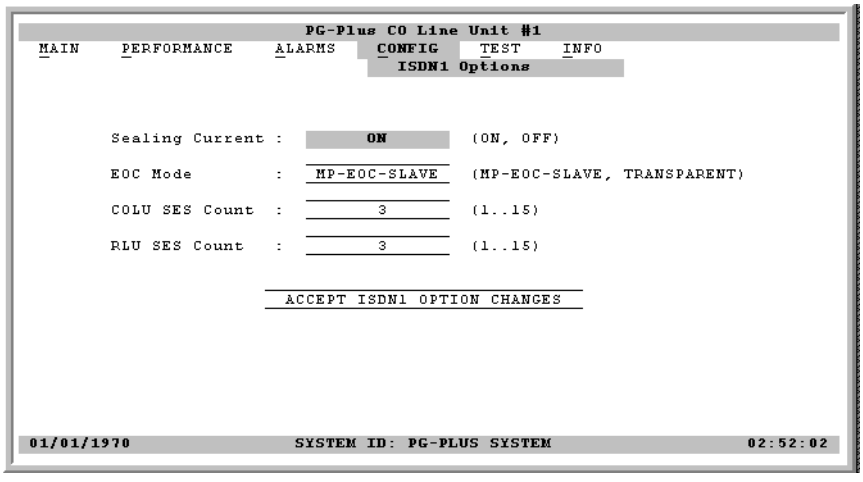
Alarm	Description	Default
LOSW	COLU cannot receive data over the given HDSL loop. COLU and RT cannot synchronize and is out of service.	MN
ES-15 Min.	Number of HDSL ES has exceeded the user-configurable threshold to give advance warning that HDSL performance is deteriorating. You can set this threshold from 0-15 ES over a 15-minute period, or disable the alarm completely. 24 hour ES alarm threshold reached or exceeded.	MN
ES-24 Hr.	Number of HDSL ES has exceeded the user-configurable threshold to give advance warning that HDSL performance is deteriorating. You can set this threshold from 0-255 ES over a 24-hour period, or disable the alarm completely. 24 hour ES alarm threshold reached or exceeded.	MN
MAR	HDSL noise margin of the loop has fallen below the user-configurable threshold. HDSL MAR reaches or drops below the current threshold value.	MN
PFO	COLU cannot power the RT due to an open circuit. An undercurrent condition as detected by the RT exists for the given pair (<20 mA). A possible cause is that there is no RT at the other end of the circuit. No user intervention is required.	MN
PFS	COLU cannot power the RT due to a short circuit. An excessive current condition as detected by the COLU exists for either pair (>50 mA). A PFS alarm indicates an overcurrent condition due to wire shorting or an RT failure. The COLU automatically turns off power feeding to both loops in response to a PFO or PFS condition on a single loop. No user intervention is required.	MN

ISDN1 Options Screen

Provides access to configure the ISDN parameters. The values on the screen are the factory defaults. The Sealing Current fields allows the current to be turned On or Off between the RT and the CPE. The EOC Mode field allows the EOC processing type to be selected. The COLU and RT SES counts are the number of ISDN BE allowed before SES count is incremented.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *ISDN1 Options* line and press **ENTER** to view the screen:



3 At the Sealing Current field, use the **SPACEBAR** to toggle to the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Accept ISDN Option Changes field, and press **ENTER** to accept the changes.

6 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

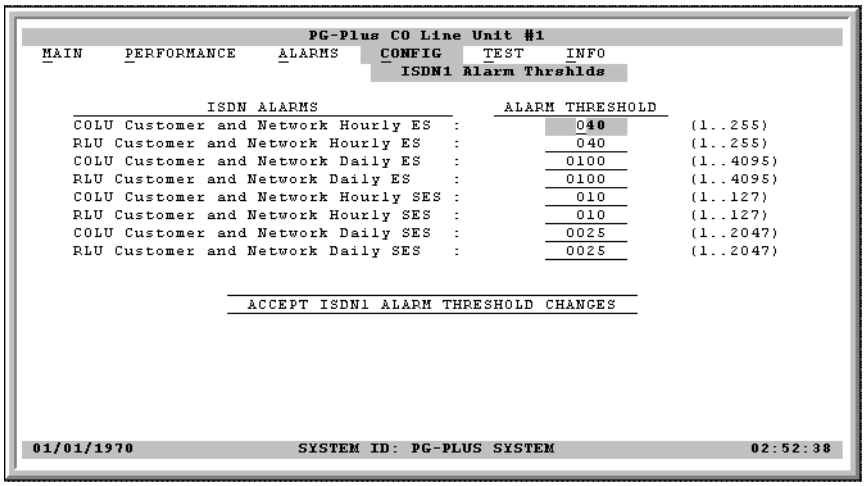
ISDN Alarm Thresholds Screen

The fields on this screen are measured hourly and daily:

- COLU/RT Customer and Network Hourly ES - An ISDN hourly ES alarm is generated if the accumulated hourly ES count at the COLU/RLU reaches or exceeds this threshold value. A single threshold value is used for thresholding errors in the customer or network direction. The range of values is from 1 to 255. The default value is 40.
- COLU/RT Customer and Network Daily ES - An ISDN daily ES alarm is generated if the accumulated daily ES count at the COLU/RLU reaches or exceeds this threshold value. A single threshold value is used for thresholding errors in the customer or network direction. The range of values is from 1 to 4095. The default value is 100.
- COLU/RT Customer and Network Hourly SES - An ISDN hourly SES alarm is generated if the accumulated hourly SES count at the COLU/RLU reaches or exceeds this threshold value. A single threshold value is used for thresholding errors in the customer or network direction. The range of values is from 1 to 127. The default value is 10.
- COLU/RT Customer and Network Daily SES - An ISDN daily SES alarm is generated if the accumulated daily SES count at the COLU/RLU reaches or exceeds this threshold value. A single threshold value is used for thresholding errors in the customer or network direction. The range of values is from 1 to 2047. The default value is 25.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *ISDN1 Alarm Thrshlds* option and press **ENTER** to view the screen:



3 At the COLU Customer and Network Hourly ES field, type in the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Accept ISDN1 Alarm Threshold Changes field, and press **ENTER** to accept the changes.

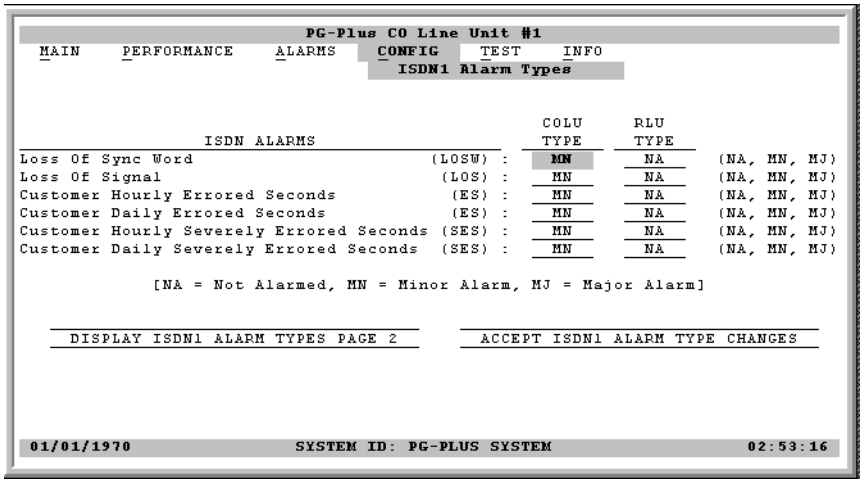
6 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

ISDN Alarm Types Screen

Allows the provisioning of the alarm types. Table 11 shows the ISDN Alarms, the possible alarm Types, and the default factory settings. All Alarm fields can be set to Major, Minor, or Not Alarmed.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

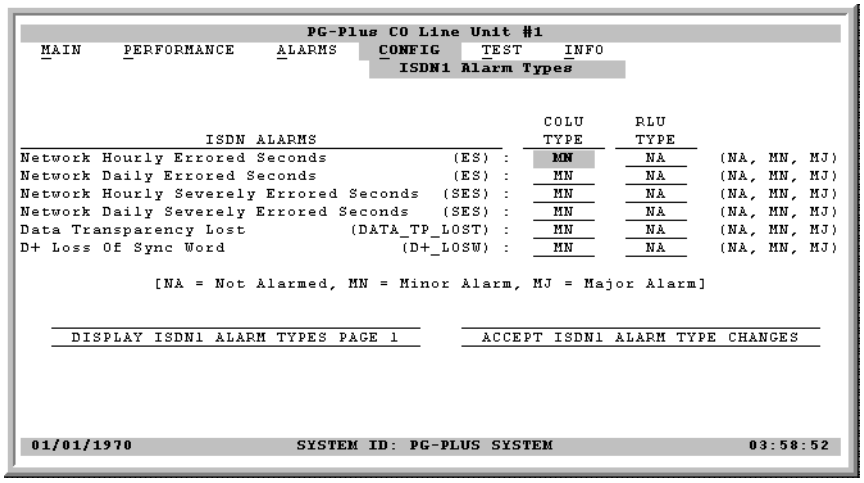
2 Scroll to the *ISDN1 Alarm Types* line and press **ENTER** to view the screen:



3 At the LOSW field, use the **SPACEBAR** to toggle to the desired value.

4 Move to the next option. Continue until you have completed your changes.

5 Move to the Display ISDN1 Alarm Types Page 2 field and press **ENTER**.



6 At the Network Hourly Errored Seconds field, press the **SPACEBAR** to toggle to the desired value.

7 Move to the next option. Continue until you have completed your changes.

8 Move to the Accept ISDN1 Alarm Type Changes field, and press **ENTER** to accept the changes.

9 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

Table 11. *ISDN Alarms*

Alarm	Description	Default
LOS	ISDN loss of signal condition at COLU and/or RT.	MN
LOSW	ISDN loss of SYNC word condition at COLU and RT.	MN
ES	ISDN hourly and/or daily ES count has reached or exceeded the configured value at COLU or RT.	MN
SES	ISDN hourly and/or daily SES count has reached or exceeded the value at the COLU or RT.	MN
DATA-TP-LOST	An unusually high number of bit errors has been detected on the ISDN link at the COLU or RT.	MN
D+-LOSW	ISDN M-channel framing pattern has been lost on the HDSL link.	MN

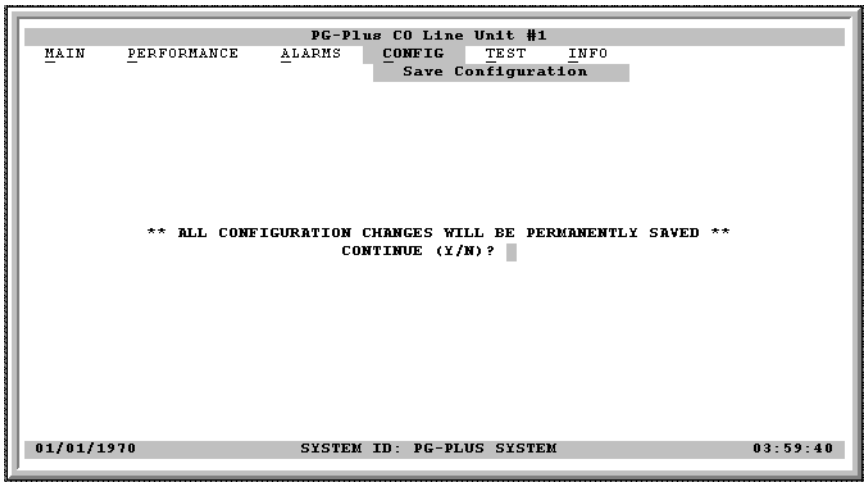
Save Configuration Screen

At this screen you can save your configuration changes in nonvolatile memory.

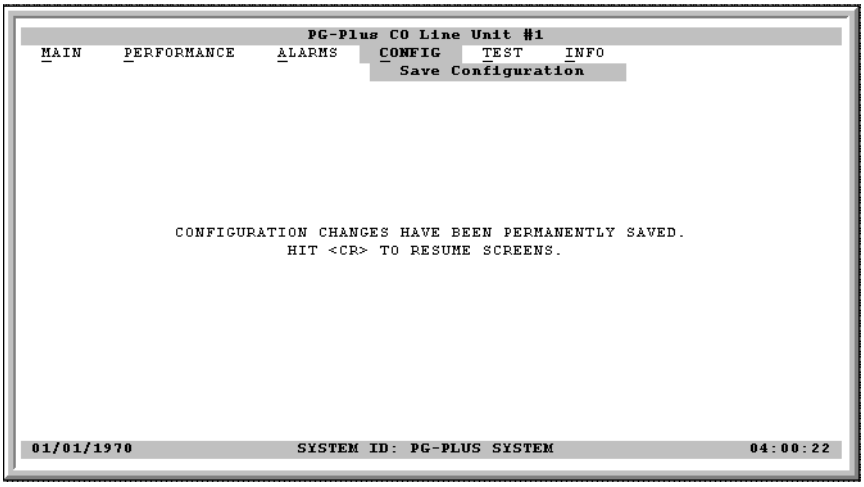
Changes made through all other configuration screens do not become permanent changes until the changes are saved through the Save Configuration screen.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *Save Configuration* option and press **ENTER** to view the screen:



3 Type **Y** at the Continue? prompt to save the changes you made, or **N** to leave the values in their original setting. A confirmation message is displayed.



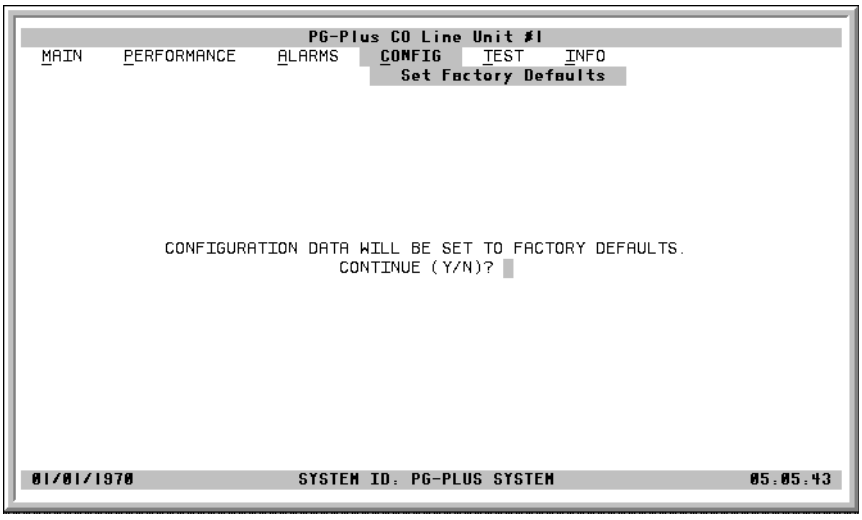
4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

Set Factory Defaults Screen

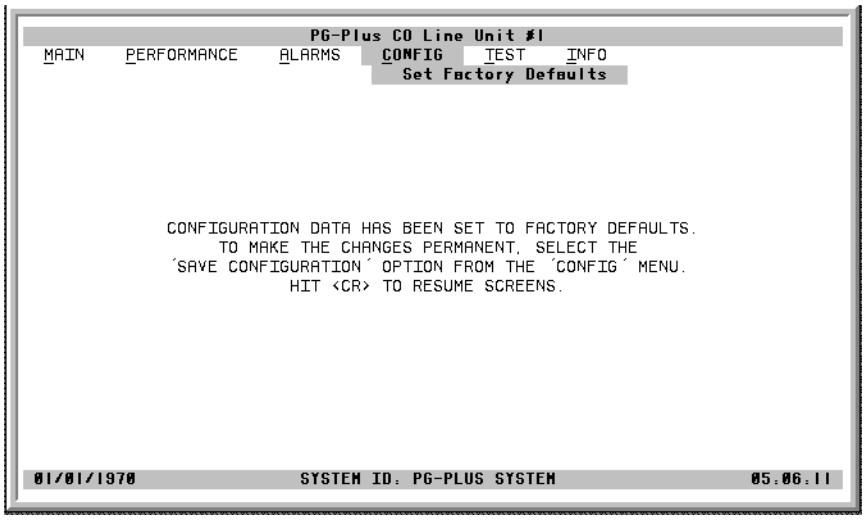
Sets all configuration data back to factory default values.

1 Select *CONFIG* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the *Set Factory Defaults* option and press **ENTER** to view the screen:



3 Type **Y** at the Continue? prompt to reset the system to the Factory Default values, or **N** to leave the values as is. A confirmation message is displayed.



4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

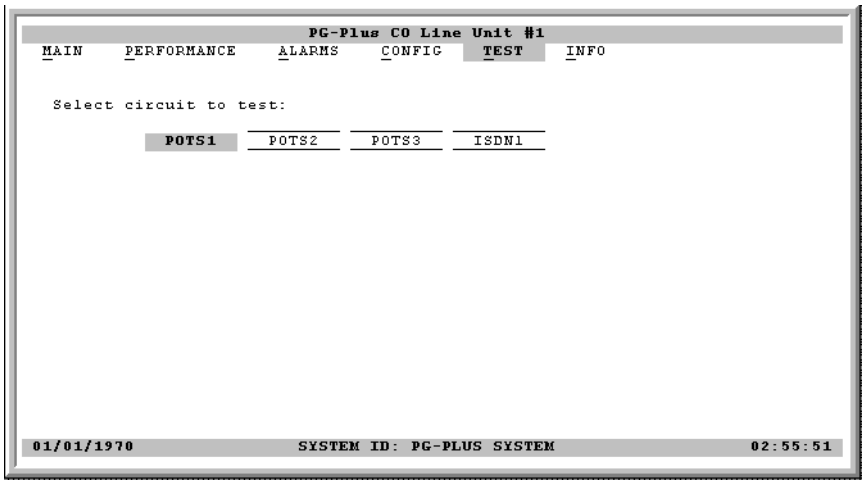
This does not make the configuration changes permanent. The *Save Configuration* option must be used to make the changes permanent.

TEST SUBMENU

PG-Plus supports testing of a subscriber drop in two ways. A test can be initiated by applying a test voltage between the Tip and Ring at the COLU through an MLT test set, or by selecting it from the menu item through the VT-100 terminal connected to the PAU/PMU maintenance port. The relays in the COLU and RT provide a path for performing a SDT.

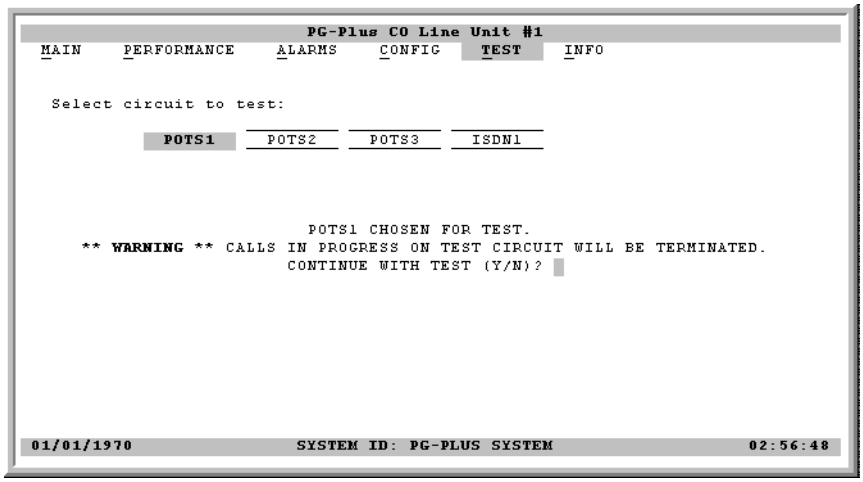
1 Select *Test* at the menu bar and press **ENTER** to display the submenu.

2 Scroll to the desired *POTSn* or *ISDN1* option and press **ENTER** to start the test:



3 Use the **TAB** key to move to the desired circuit to test, then press **ENTER**.

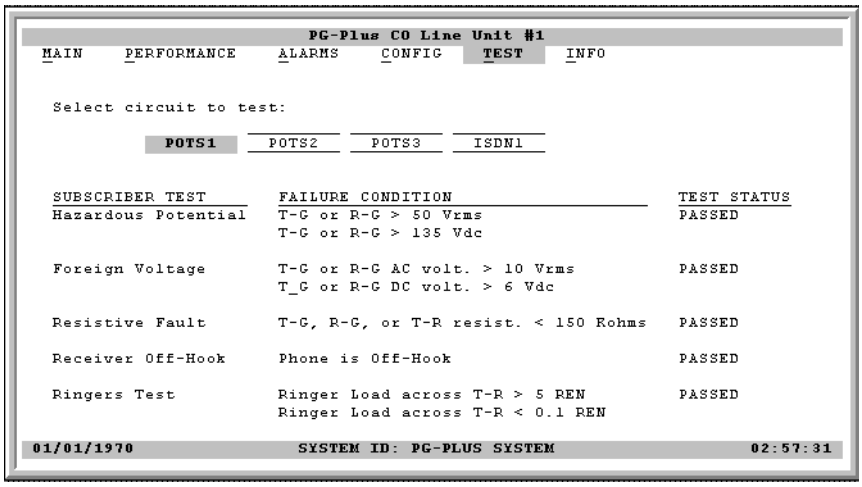
A warning displays when a channel is selected for the test.



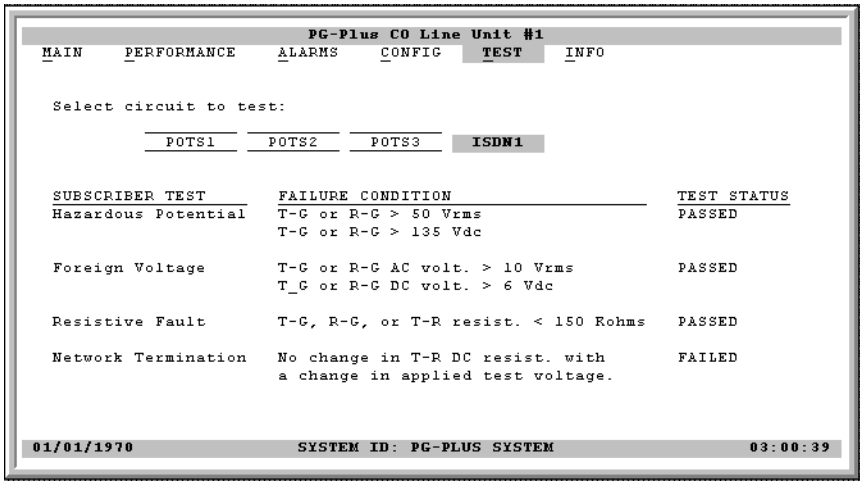
Performing an SDT on one of the POTS or ISDN channel interrupts service on the line under test. The remaining lines on the PG-Plus system remains in service.

Upon tests completion the SDT Results screen displays Subscriber Test, Failure Condition, and Test Status. Tests are performed in the order of display. If a test fails, the remaining tests are not performed (as per TR-909). It takes approximately seven to eight seconds for all tests to complete.

If you selected the POTS option, the following screen displays:



If you selected the ISDN option, the following screen displays:

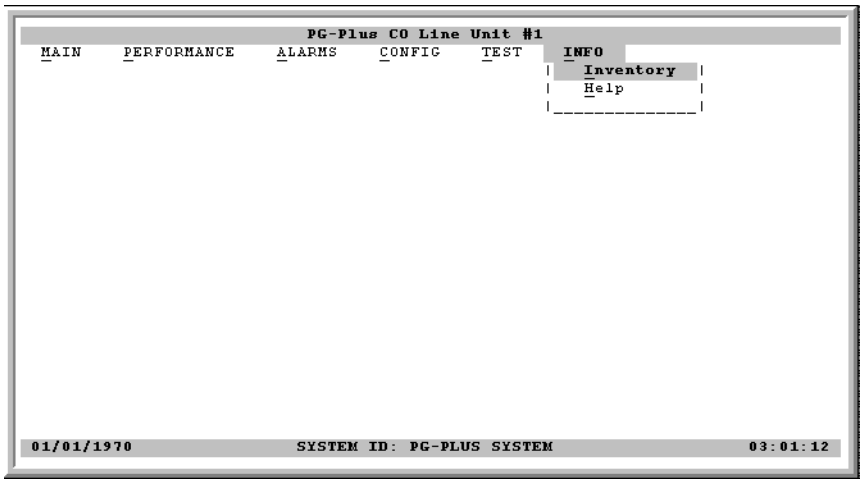


4 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the Main menu.

INFORMATION SUBMENU

Provides technical information about the COLU and contact information for ADC Technologies, Inc.

1 Select *INFO* from the menu and press **ENTER** to view the submenu.

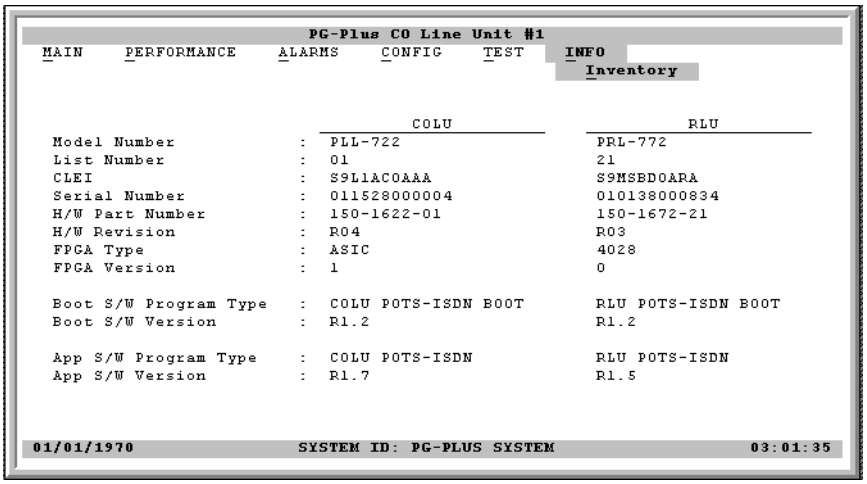


2 Select either *Inventory* or *Help* to view the associated screen.

3 Press **ESC** to move up a menu level, or **CTRL**+**R** to return to the PAU/PMU Main menu.

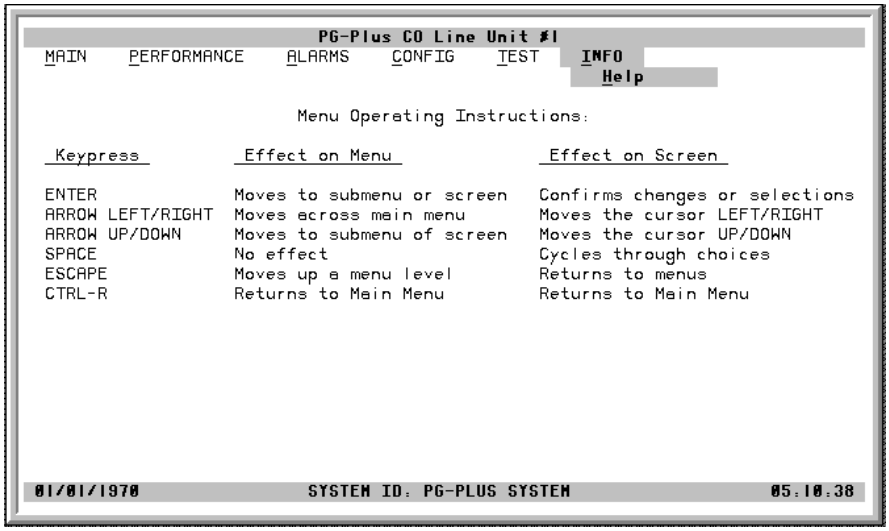
Inventory Screen

Displays all the critical information about the COLU and RT. Press ESC to move up a menu level, or CTRL+R to return to the PAU/PMU Main menu.



Help Screen

Provides information on using the screens and menus. The Help screen also lists the ADC Customer Support and Bulletin Board telephone numbers. Press ESC to move up a menu level, or CTRL+R to return to the PAU/PMU Main menu.



FAULT ISOLATION

The following sections detail the fault isolation procedures. For sections that indicate a condition such as "distance limitation exceeded", refer to "Specifications" on page 2 for these values.

COLU AND RT FAULT INDICATORS

At the CO, you can use the Craft interface to initiate a SDT to determine the cause of any of the following problems. The SDT test performs Hazardous Potential, Foreign Voltage, Resistive Faults, Receiver Off-Hook, and Ringers Tests. At the customer site, the following sections provide procedures for isolating faults indicated by the COLU LEDs.

LED	Mode	Condition	Procedure
None	On	processor in the COLU stopped	**1** Remove and re-insert the COLU. **2** At the VT-100 interface, go to the COLU Main screen to view the Performance report to verify that no alarms exist. If the COLU Main screen cannot be viewed, a communication error exists, indicating a faulty COLU. **3** If the LEDs do not illuminate, replace the COLU.
Fault	On	indicates an existing alarm condition on the COLU	**1** At the VT-100 interface, go to the COLU Main screen to view the Performance report to determine the cause of the alarm. Correct the condition, if possible. If the COLU Main screen cannot be viewed, a communication error exists. **2** Remove and re-insert the COLU. **3** If the communication error still exists, replace the COLU.
Margin	On	distance limitation exceeded fault in HDSL line faulty COLU	**1** At the VT-100 interface, go to the COLU Main screen to view the Performance report to verify that no alarms exist. **2** Initial installation, check engineering records for distance between COTS and RT. **3** If existing installation, measure loss of HDSL line to ensure that the maximum attenuation value has not been exceeded. **4** Replace COLU and/or the RT.
Margin	Flashing	distance limitation exceeded fault in HDSL line faulty RT	**1** Initial installation, check engineering records for distance between COTS and RT. **2** If existing installation, measure loss of HDSL line to ensure that the maximum attenuation value has not been exceeded. **3** Replace the COLU or the RT or both.
SYNC	Off	HDSL line has lost synchronization distance limitation may have been exceeded COLU is faulty	**1** Initial installation, check engineering records for distance between COTS and RT. **2** If existing installation, measure loss of HDSL line to ensure that the maximum attenuation value has not been exceeded. **3** Replace the COLU or the RT or both.

LED	Mode	Condition	Procedure
PWR	Off	no input power on-board fuse is blown on COLU	**1** Ground fault condition exists. **2** Check input power at COTS backplane with COLU removed. **3** If power is present at COTS backplane, replace the COLU.
PWR	Flashing	HDSL line open an overload exists	**1** Check line continuity and resistance. **2** COLU power supply or RT may be faulty.
ISDN Activity	Off	ISDN channel is not active	**1** Make sure the customer ISDN terminal equipment is connected and operational at RT. **2** Check that the HDSL link is normal. The HDSL SYNC LED should be On solid green and the HDSL Margin LED should be Off. **3** Disconnect the customer side terminal equipment by opening the protector module and disconnecting the ISDN RJ-11 jack. Configure the ISDN Basic Rate Test set and verify the ISDN activity LED is On green after approximately 30 seconds. Check for shorts or opens towards the subscriber side or on the customer premises.

SUBSCRIBER REPORTED FAULTS

At the CO, you can use the Craft interface to initiate a SDT to determine the cause of any of the following problems. The SDT test performs Hazardous Potential, Foreign Voltage, Resistive Faults, Receiver Off-Hook, and Ringers Tests. At the customer site, the following sections provide procedures for isolating faults, based on subscriber reports.

Conditions	Causes	Procedures
no dialtone, can not dial	Short-circuit or open-circuit faulty COLU or RT	**1** At the CO using the Craft interface, select *TEST* option, and view the test results. The tests run are for Hazardous Potential, Foreign Voltage, Resistive Fault, and CPE Termination. **2** At the RT, lift the subscriber pair at the RT by opening the RJ-11 connector on the Integrated Protector Module. If dialtone is present at the RT and calls can be placed, the fault is in the subscriber side. Check for shorts or opens towards the subscriber or on the customer premise. **3** If dialtone is not present with the RJ-11 test connector lifted, lift the jumper in the CO between the CO switch and the COTS. If dialtone is present at the switch, replace the COLU. **4** If after replacing the COLU the dialtone is still not present, the fault is in the RT. Replace the RT.
Phone does not ring	high-resistance short on subscriber drop (REN load exceeded, see Specifications) faulty RT or COLU	**1** At the CO, using the Craft interface, go to the COLU Main screen to verify the correct operation of the COLU. If you cannot view the COLU Main screen, a communication error exists indicating a faulty COLU. Remove and re-insert the COLU. **2** Go to the *Test* option, and select the desired circuit to test. **3** View the SDT results. Refer to the Test Submenu section for specific results. **4** At the RT, check for ringing at the RT with the RJ-11 test jack open. If ringing is not present, check for ringing on another line terminated on the same RT. If ringing is present on other lines, check for high-resistance shorts on the subscriber drop. If no high resistance shorts, replace the RT. **5** If ringing is not present on another circuit terminated on the RT, lift the jumper between the CO switch and the COTS. If ringing is present, replace the COLU. If ringing is not present, the fault is in the switch.

Conditions	Causes	Procedures
Phone does not stop ringing	faulty subscriber station instrument	**1** If phone stops ringing when using a butt set at the subscriber location, the subscriber's station internal resistance is too high. Replace phone.
	loop length too long	**2** If phone does not stop ringing when using a butt set at the subscriber location, one or both of these conditions exist:
	faulty RT	• loop length is too long (refer to Specifications) • or the RT is faulty
Can not hear,can not be heard	subscriber problem	**1** Open the RJ-11 test jack at the RT. If audible level is acceptable, the problem is with subscriber equipment.
	faulty COLU or RT	**2** If audible level is too low at the RT with the RJ-11 test jack lifted, lift the jumper in the CO between the CO switch and the COTS. • If audible level is acceptable, replace the COLU or RT • otherwise, the problem is in the CO switch

PRODUCT SUPPORT

TECHNICAL SUPPORT

Technical Assistance is available 24 hours a day, 7 days a week by the contacting Customer Service Engineering group at:

Telephone:	800.366.3891 The 800 telephone support line is toll-free in the U.S. and Canada.
Email:	wsd_support@adc.com
Knowledge Base:	http://adc.com/Knowledge_Base/index.jsp
Web:	www.adc.com

LIMITED WARRANTY

Product warranty is determined by your service agreement. Refer to the ADC Warranty/Software Handbook for additional information, or contact your sales representative or Customer Service for details.

RETURNS

To return equipment to ADC:

1. Locate the number of the purchase order under which the equipment was purchased. To obtain a return authorization number, you need to provide the original purchase order number to ADC's Return Material Authorization (RMA) Department.
2. Call or write ADC's RMA Department to ask for an RMA number and any additional instructions. Use the telephone number, fax number or email address listed below:
   - Telephone: 800.366.3891
   - Email Address: rma@ADC.com
3. Include the following information, in writing, along with the equipment you are returning:
   - Company name and address.
   - Contact name and telephone number.
   - The shipping address to which ADC should return the repaired equipment.
   - The original purchase order number.
   - A description of the equipment that includes the model and part number of each unit being returned, as well as the number of units that you are returning.
   - The reason for the return. For example:
     - The equipment needs an ECO/ECN upgrade.
     - The equipment is defective.

If the equipment is defective, please tell us what you observed just before the equipment malfunctioned. Be as detailed in your description as possible.

If there is another reason for returning the equipment, please let us know so we can determine how best to help you.

4 Pack the equipment in a shipping carton.

5 Write ADC's address and the RMA Number you received from the RMA Department clearly on the outside of the carton and return to:

ADC DSL Systems, Inc.
14352 Franklin Ave.
Tustin, CA 92780-7013

Attention: **RMA (Number)**

All shipments are to be returned prepaid. ADC will not accept any collect shipments.

FCC CLASS A COMPLIANCE

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the use will be required to correct the interference at his own expense.

Modifications

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by ADC voids the user's warranty.

All wiring external to the product(s) should follow the provisions of the current edition of the National Electrical Code.

ACRONYMS

ACO	Alarm Cut-Off
AWG	American Wire Gauge
BER	Bit Error Rate
CEV	Controlled Environmental Vault
CO	Central Office
COLU	PG-Plus Central Office Line Unit
COTS	PG-Plus Central Office Terminal Shelf
CPE	Customer Premises Equipment
CR	Critical
ES	Errored Seconds
FCC	Federal Communications Commission
HDSL	High-Bit-Rate Digital Subscriber Line
ISDN	Integrated Services Digital Network
LCFO	Loop Current Feed Open
LED	Light Emitting Diode
LOSW	HDSL Loss of SYNC Word
mA	Milli-Amps
mV_{pp}	Milli-Volt Peak-to-Peak
MAR	HDSL line margin
MISPWRA	power A missing
MISPWRB	power B missing
MJ	Major
MLT	Mechanized Loop Testing
MN	Minor
NA	Not Alarmed
NORLUSW	No RT Software
NR	Not Reported
NT1	Network Termination Type-1
PAU	PG-Plus Alarm Unit
PFO	Power Feed Open
PFS	Power Feed Short
PGF	Power Feed Ground Fault
PMX	PG–Plus Multiplexer Unit
POTS	Plain Old Telephone Service
RLU	PG-Plus Remote Line Unit
RMA	Return Materials Authorization
RT	PG-Plus Remote Terminal
SDT	Subscriber Drop Test
SES	Severely Errored Seconds
SYNC	Synchronization
UAS	Unavailable Seconds Counts

World Headquarters:
ADC Telecommunications, Inc.
12501 Whitewater Drive
Minnetonka, Minnesota USA 55343

For Technical Assistance:
800.366.3891

ISO 9001
DNV
DNV Certification, Inc.
Certificated Firm

1251788