ARTISAN®
TECHNOLOGY GROUP

Your **definitive** source for quality pre-owned equipment.

Artisan Technology Group
(217) 352-9330 | sales@artisantg.com | artisantg.com

Full-service, independent repair center
with experienced engineers and technicians on staff.

We buy your excess, underutilized, and idle equipment
along with credit for buybacks and trade-ins.

Custom engineering
so your equipment works exactly as you specify.

- Critical and expedited services
- In stock / Ready-to-ship
- Leasing / Rentals / Demos
- ITAR-certified secure asset solutions

Expert team | Trust guarantee | 100% satisfaction

All trademarks, brand names, and brands appearing herein are the property of their respective owners.

Find the *Sage Instruments 930A* at our website: ***Click HERE***

930A COMMUNICATIONS TEST SET

BUYER'S GUIDE

Software Version 4.06 and above



This buyer's guide is designed to assist buyers and purchasing agents in determining their need for the **Sage Instruments 930A Communications Test Set** and its purchaseable options. As a condensed document, it describes only the main features of the unit and available options. A full description of all **930A** features, including specific applications, is contained in the ***930A Communications Test Set Operating Manual***.

9108-0001-01 Rev. 2 062597

SAGE INSTRUMENTS
240 Airport Boulevard
Freedom, CA 95019
Phone 408-761-1000
www.sageinst.com

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

TABLE OF CONTENTS

Contents	Description	Page
Contacting Sage Instruments		**1**
The Basic 930A	**Product Description**	**3**
	Applications	**3**
	Standard Features	**3**
930A Purchased Options	**Overview of Optional Features**	**5**
Option 930A-01	DP, MF, DTMF Receiver/Analyzer	**6**
Option 930A-02	SF Supervision	**6**
Option 930A-06	Peak-to-Average Ratio (P/AR)	**6**
Option 930A-07	3-Level Impulse Noise	**7**
Option 930A-09E	DS-1 PCM Dual Direction Drop/Insert with D4 Superframe and ESF Capibility	**7**
Option 930A-10C	RS-232C Remote Control/Printer Interface	**8**
Option 930A-12	Remote Office Test Line (ROTL), Interrogator, Responder (Type 105 Format)	**8**
Option 930A-13	Ring Generator/True REN-3 Load	**9**
Option 930A-16	-48 VDC Power Supply	**9**
Option 930A-17	Removes 2W/4W Analog Interface	**9**
Option 930A-18	Phase /Amplitude Jitter and Hits	**10**
Option 930A-19	Envelope Delay Distortion	**10**
Option 930A-20	4-Tone Intermodulation Distortion	**10**
Option 930A-21	Absolute Delay	**10**
Option 930A-22	DS-1 and DS-0 (56/64 kbps) Bit Error Rate Testing (BERT)	**10**
Option 930A-23	DS-1 and DS-0 (56/64 kbps) Bit Error Rate Testing (BERT) with Long User Pattern	**11**
Option 930A-25	FXO/FXS PCM Supervision	**12**
Option 930A-28	Analog Rear Panel Access	**12**
Option 930A-29	Batch Mode Testing	**12**
Option 930A-30	Analog and Digital Rear Panel Access	**12**
Option 930A-31	Digital Rear Panel Access	**12**
Option 930A-34	Dual Direction Fractional T1/DDS	**13**
Option 930A-36	Extended Warranty	**14**
Option 930A-40	Wideband TIMS with Enhanced TIMS Package	**14**
Option 930A-44	Customer Service Unit (CSU)	**15**
Option 930A-45	DTAU/DCS Interface	**15**
Option 930A-46	Wideband TMS	15
Option 930A-47	Remote Audio Monitor	**15**
Option 930A-51	Fractional T-1	**16**
Option 930A-52	Digital Data Service (DDS)	**17**
Option 930A-54	23 Tones	**17**

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contents	Description	Page
Option 930A-67	SS7 Error Monitor	**18**
Option 930A-90	High Stability Clock for ESF	**18**
Option 930A-100	Data Test Package	**18**
Option 930A-300	Enhanced Digital Signal Processor.....	**18**
Configurator Panels	**Front Panel Configurator Options.....	**19**

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Contacting Sage Instruments

To contact Sage Instruments in writing, send correspondence to:

Sage Instruments, Inc.
240 Airport Blvd.
Freedom, CA 95019-2614

or send E- mail to:

sales@sageinst.com or support@sageinst.com

or fax inquiries to our main office at:

(408) 761-2452

To reach our Technical Support and Customer Service Departments by phone, call:

(408) 761-1000, M-F, 9 a.m. to 5 p.m., Pacific Time.

or fax our Technical Support and Customer Service Departments any time at:

(408) 761-9246

To receive company and product information via the World Wide Web, visit our home page at:

http://www.sageinst.com

Be sure to specify **Model 930A** when asking for technical support. Customers located outside of the U.S. may also contact their nearest Sage distributor for assistance.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

THE BASIC 930A COMMUNICATIONS TEST SET

Description

The **930A Communications Test Set** combines the functions of a Voiceband Transmission Measurement Set, Return Loss Measurement Set, and a Dial Pulse, Touch Tone (DTMF), and Multi-Frequency (MF) Sender in one lightweight package. The test set also provides Talk Battery to enable the user to talk over the trunk under test.

Applications

This test set, while of general purpose in nature, is particularly useful for DEMARC and Central Office testing, as well as PBX and Digital Switch installation testing. It is capable of performing all transmission and signaling tests required at these locations, including those for Feature Groups A - D (Equal Access). The **930A** can completely simulate either a PBX or Central Office switch (Local or Toll).

Standard Features

The following list shows the standard features and capabilities of the standard **930A** *(for standard Voice Band applications)*.

The standard **930A** transmission measurements are:

- Level and Frequency
- Noise (C-Message, C-Notch, and 3 kHz Flat Weighted)
- Noise-to-Ground
- Signal-to-Noise Ratio
- Return Loss (2- and 4-wire)

The standard **930A** signaling and supervision simulation capabilities are:

- Loop Start (2- and 4-wire, normal and reverse battery)
- Ground Start (normal and reverse battery)
- E&M Signaling Types I through V
- Wink Detection and Timing
- Delay Dial
- SX Supervision
- DP, MF, and DTMF Signaling (parameters may be varied from nominal)

In addition to its supervisory signaling capability, the **930A** can establish the talk conditions for transmission testing and has the ability to hold circuits for testing.

The basic **930A** also includes the ability to store and recall up to 999 tests, receive multi-wink sequences, and perform frequency sweeps such as those used for attenuation distortion measurements.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

SAGE INSTRUMENTS 930A PURCHASED OPTIONS

OVERVIEW

The purchased options enhance the feature set of the **930A** and greatly extend its testing capabilities. Listed below are some of the major extended test functions that can be performed only if the appropriate options are purchased:

- 23 tones testing
- Fractional T1 testing
- FXO/FXS Supervision
- Wideband testing
- 4-Tone Intermodulation Distortion Measurement
- Batch testing
- SS7 Call Tracing
- DS-0, DS-1 Bit Error Rate (BERT) Testing
- Absolute Delay Measurement
- 3 Level Impulse Noise measurement
- PCM Dual Drop and Insertion
- Peak to Average Ratio (P/AR) measurement
- DP, MF, and DTMF call receipt/analysis
- Phase Amplitude and Jitter measurement

Each of these options, which are described in this buyer's guide, is designated (**SOFTWARE ONLY**), (**SOFTWARE/HARDWARE**), or (**HARDWARE ONLY**) in the description headers. If an option says (**SOFTWARE ONLY**) then it can be installed in the field. If it is designated (**SOFTWARE/HARDWARE**) or (**HARDWARE ONLY**), it may be necessary to return the unit to the factory to have the option installed. The factory should be consulted on options requiring (**HARDWARE ONLY**) to determine whether or not the unit must be returned.

Optional enhancements are described in the following sections.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

PURCHASED OPTIONS LIST

Option Number	Description	Upgrade Type

OPTION 930A-01 DP, MF, DTMF RECEIVER/ANALYZER (HARDWARE/SOFTWARE)

This option enables the **930A** to emulate a Central Office. The **930A** can receive and analyze strings of **DP**, **MF**, and **DTMF** digits up to a length of 72 digits. The digits may be analyzed for **% break, dial speed, interdigit time, amplitude of the low and high tones, frequency of the low and high tones, timing,** and **spurious tones**.

A **930A** equipped with this option can also send winks to emulate the far-end office receiver. The wink and pre-wink duration can be modified to allow the sending office to perform a margining analysis. Due to the need to receive **MF** digits in **Type 105** testing, this option is also required if **Option 930A-12** is purchased.

OPTION 930A-02 SF SUPERVISION (HARDWARE/SOFTWARE)

This option enables the **930A** to send and detect the **2604 Hz SF** supervisory signal on 4-wire analog carrier derived circuits and other special circuits which may require this type of signaling.

The current **SF** option as described does not support **SF** on 2-wire circuits, or 2-tone **SF** types such as **SS1, SS4,** or **SF** on PCM trunks.

OPTION 930A-06 PEAK-TO-AVERAGE RATIO (P/AR) (SOFTWARE ONLY)

This option enables the **930A** to send and measure the **P/AR** waveform over a 0–120 **P/AR** unit range. The **P/AR** test provides a measure of the channel dispersion (amplitude and phase distortion over time) due to transmission impairments. The **P/AR** waveform is a complex signal consisting of 16 non-harmonically related tones with a spectrum which approximates modem type data signals on VF trunks.

The **P/AR** test provides a quick method of gauging the deterioration of a channel, if any, without having to resort to the very expensive and time consuming tests such as **Attenuation Distortion**, **Envelope Delay Distortion**, **4-Tone Intermodulation Distortion**, or **Phase Jitter**.

It is important to note that **P/AR** is only valid as an end-to-end measurement. Test sets are required at both ends of the circuit.

The **930A** is fully compatible with existing **P/AR** test sets.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-07 3-LEVEL IMPULSE NOISE (SOFTWARE ONLY)

This option enables the **930A** to measure **3-level Impulse Noise**. This measurement is described in **AT&T** and **IEEE** published standards and specifications for measurements on voice band data circuits. The default settings in the **930A** take note of the fact that **Impulse Noise** is usually measured with the holding tone present. The **930A** will allow a user to select the **C-Message filter** instead of the **C-Notch filter** default. This parameter, while not a tariffed parameter, is extremely important on circuits carrying voice band data.

The **low threshold level** setting range is **30–106 dBrnC**. The measurement spread between the low, medium, and high thresholds may be set in **2, 4, 6**, or **8 dB** steps. The time duration of the measurement may be adjusted from **1–99 minutes** or set to run continuously, although the standard duration is **15 minutes**. The number of measurements per second can be varied from the standard value of **7**, and up to **99 measurements per second**.

OPTION 930A-09E DS-l PCM DUAL DIRECTION DROP/INSERT WITH D4 SUPERFRAME AND ESF CAPABILITY (HARDWARE/SOFTWARE)

This option enables the **930A** to simultaneously monitor both directions of transmission on digital facilities and to perform true **Drop and Insert** tests. The **930A** can be connected to a T1 carrier and perform the same measurements on **PCM** trunks as it does on metallic trunks. It also provides a dual direction test capability and can monitor or do out-of-service testing when terminating a T1 span.

The **Dual Direction Drop and Insert** capability allows the **930A** to sit in series with an in-service T1 facility between two offices. One of the incoming 24 channels may be dropped out and a test may be inserted into the outgoing channel without taking the other 23 channels carrying traffic out-of-service. In addition, this option allows the user to compare the T1 clocks in both directions of transmission to measure wander or drifting clocks.

The **PCM** interface accommodates **D1D, D2,** and **D3/D4** channel numbering sequences, accesses standard **D4 Superframe, Extended Superframe** format, and **SLC-96®** trunks.

This option allows for both **robbed-bit** and **CCIS** signaling, as well as **AMI** or **B8ZS** line codes. Other features of the digital interface include:

- Internal/External (Loop Timed) Clock Source Operation
- 100 Hz Internal Clock Offset to determine Loop Timing status
- Send Remote (Yellow) Alarm and Blue Alarm signals
- Normal Loop supervision or User Definable supervision states
- Detection and counting of:

Bipolar Violations	Frame Loss (Red Alarm)
Frame Slips	Loss of PCM or >15 consecutive zeroes
Bit Slips	Remote Alarm (Yellow Alarm)
Frame Errors	Blue Alarm
CRC Errors (ESF Mode)	

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type
OPTION 930A-09E (Continued)	**DS-l PCM DUAL DIRECTION DROP/INSERT WITH D4 SUPERFRAME AND ESF CAPABILITY**	**(HARDWARE/SOFTWARE)**

- Real time display of A and B Signaling Bits on all 24 channels simultaneously
- Manual manipulation of A and B Signaling Bits on a selected channel
- Measurement of DSX voltage
- Error History in 15 minute blocks, for up to 24 hours
- Single error injection of BPVs, Frame Errors, or CRC Errors (ESF)
- DS-0 Loopback when ordered with **Option 930A-01**

Option 930A-09E includes **Option 930A-25 (FXO/FXS)** and **Option 930A-44 (CSU)** when ordered with **Option 930A-300**.

OPTION 930A-10C — **RS-232C REMOTE CONTROL/PRINTER INTERFACE WITH REAL TIME CLOCK/CALENDAR** — **(HARDWARE/SOFTWARE)**

This option enables the user to control a **930A** from a display terminal or computer, and provides an interface to connect an 80 column serial printer. A standard female **DB-25** connector is provided on the rear panel of the **930A**.

The **930A** has been designed so that operation under remote control closely parallels manual operation. Each front panel key on the **930A** can be activated remotely from a keyboard by pressing a single ASCII character.

The **930A** does not use OpCodes. **Section V** of the **930A Communications Test Set Operating Manual** gives full details.

A real time clock/calendar function places a day/date/time stamp on printouts showing when a test or event occurred. This option is included with **Option 930A-300**.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-11 **ATME DIRECTOR/RESPONDER** **(SOFTWARE ONLY)**

The ATME Director enables you to set up the **930A** as an **ATME** near end responder that controls the **ATME** far end responder. This feature enables you to conduct level, noise, **BERT** and echo canceller tests, including:

- 1020Hz@0dBm
- 400Hz@0dBm
- 2800Hz@0dBm
- 1020Hz@-10dBm
- 400Hz@-10dBm
- 2800Hz@-10dBm
- Noise/CMS
- S/TDHz with -10dBm tone
- S/TD with -25dBm tone
- EC LEVEL
- Far to Near Noise
- Near to Far noise
- Bypass Loss
- BER test (in PCM only)

The **echo canceller** feature provides echo cancellation over programmable delays and echo levels, and gives the echo cancellers the ability to remove themselves from a circuit when given a standard disabler signal.

The ATME Far End Responder feature enables you to configure the **930A** the far end for the ATME Director. ATME can also provide this function directly on an **E-1** channel.

OPTION 930A-12 **REMOTE OFFICE TEST LINE (ROTL), INTERROGATOR, RESPONDER (TYPE 105 FORMAT) (REQUIRES OPTION 930A-01)** **(SOFTWARE ONLY)**

This option enables the **930A** to emulate either a **Type 105 Test Line**, a manual **Remote Office Test Line/Near End Responder**, or a **ROTL Interrogator**. When equipped with **Option 930A-12**, the **930A** provides a test capability similar to that provided by the **CAROT** system for automated routining of trunks in either manual or remote control applications. The tests performed by the **930A** in this mode are:

- 1004 Hz Loss
- Noise
- Noise with Tone
- Gain/Slope Tones
- ERL
- SRL-LO
- SRL-HI

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-12 (Continued) — **REMOTE OFFICE TEST LINE (ROTL), INTERROGATOR, RESPONDER (TYPE 105 FORMAT) (REQUIRES OPTION 930A-01)** — **(SOFTWARE ONLY)**

The user can perform two-way end-to-end testing without the necessity to have technicians at both ends of the circuit under test. All that would be required is a **930A**, or a **Type 105** responder at the far-end.

If the **930A** is equipped with one or more of the voice band data tests (**P/AR, Impulse Noise, Envelope Delay Distortion, Phase/Amplitude Jitter and Hits**), then this option will allow the **930A** to extend the 105 testing to those measurements as well. The **930A** can interrogate another **930A** (equipped with the appropriate options) acting as a far-end responder, or a **Sage Instruments 356E Far-End Responder**, and perform the following tests in addition to those mentioned above:

- Attenuation Distortion
- Signal-to-Noise Ratio
- 3 kHz Flat Noise
- 4-Tone Intermodulation Distortion
- Phase/Amplitude Jitter (20-300 Hz)
- Phase/Amplitude Jitter (4-300 Hz)
- 3-Level Impulse Noise and Hits

OPTION 930A-13 — **RING GENERATOR/TRUE REN-3 LOAD** — **(HARDWARE/SOFTWARE)**

This option provides the **930A** with a true sinewave ringing supply. The ringing frequency, ring voltage, and ring duration may all be varied from the standard default values. This option also includes a three ringer equivalent number load. The ringing frequency and voltage level are also measured in **Option Menu #: 5, REN-3 Load**.

OPTION 930A-16 — **-48 VDC POWER SUPPLY** — **(HARDWARE ONLY)**

This option enables the **930A** to be powered from the **-48 VDC** Central Office battery supply. This provides operation from essentially an uninterruptible power supply, but removes the capability for the **930A** to operate from **110 VAC**. As such, this means that this option is intended for **930A**s which are rack-mounted or otherwise permanently installed in systems, etc., and not for portable operation. The **930A** can be powered either from **110 VAC** or **-48 VDC**, but not both in the same unit.

OPTION 930A-17 — **REMOVES 2W/4W ANALOG INTERFACE (REQUIRES OPTION 930A-09E) (NOT COMPATIBLE WITH OPTION 930A-46)** — **(HARDWARE/SOFTWARE)**

This option restricts the **930A** to operation on DS-1 (T1) facilities by removing the metallic interface from the unit. This option is intended as a cost savings for those users who have an entirely digital network and do require access to metallic trunks for test purposes. **(This option <u>can not</u> be ordered with Option 930A-02** or **-13.)**

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description Upgrade	Type

OPTION 930A-18 PHASE/AMPLITUDE JITTER AND HITS (REQUIRES OPTION 930A-07) **(SOFTWARE ONLY)**

This option enables the **930A** to measure **Phase and Amplitude Jitter** simultaneously, as well as count **Phase Hits, Gain Hits,** and **Dropouts** in conjunction with the **Impulse Noise** counters. This option may be used on **metallic** (analog) trunks, or on **PCM** channels on a T1 span. Do not confuse this measurement with Timing Jitter Measurements on a T1; they are different measurements.

The range of measurement is 0–25 degrees peak-to-peak Phase Jitter, and 0–25% peak Amplitude Jitter. Phase Hits are counted up to 999 events, and the threshold is adjustable over the range of 5–45 degrees. Gain Hits up to 999 events are counted, and the threshold is adjustable from 2 dB–10 dB. Dropouts use a fixed threshold of 12 dB relative to the level of the holding tone. The received holding tone level is measured at the start of testing; if the level drops more than 12 dB below the reference level, a dropout is declared.

OPTION 930A-19 ENVELOPE DELAY DISTORTION **(SOFTWARE ONLY)**

This option enables the **930A** to measure the **Envelope Delay Distortion** on either **metallic** or **PCM** trunks. The measurement range is up to 12000 microseconds, ±10 µsecs, with a resolution of 1 µsec. The SEND mode of **Option 930A-19** is equivalent to other test sets in MASTER mode, and the REPEAT mode is equivalent to other sets in SLAVE mode.

OPTION 930A-20 4-TONE INTERMODULATION DISTORTION **(SOFTWARE ONLY)**

This option enables the **930A** to measure the 2nd and 3rd order harmonic distortion products using the 4-Tone method. The **930A** automatically adjusts itself for the **Signal-to-Noise**, and requires no manual calculations to obtain the test results.

OPTION 930A-21 ABSOLUTE DELAY **(SOFTWARE ONLY)**

This option enables the **930A** to measure **roundtrip absolute delay** on a **4-wire metallic** or **PCM** circuit with loopback. This measurement is made in milliseconds with a range of 0-1.2 seconds and an accuracy of ± 1 ms.

OPTION 930A-22 DS-1 and DS-0 (56/64 kbps) BIT ERROR RATE TESTING (BERT) (REQUIRES OPTION 930A-09E) **(SOFTWARE ONLY)**

DS-1 BERT

DS-1 BERT allows the **930A** to send patterns and detect logic errors in addition to **bipolar violations, frame errors,** and **CRC errors** which are already monitored. This option also gives the **930A** a dual **BERT** capability. That is, a single **930A** can emulate two ordinary **BERT** sets.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type
OPTION 930A-22 (Continued)	**DS-1 and DS-0 (56/64 kbps) BIT ERROR RATE TESTING (BERT) (REQUIRES OPTION 930A-09E)**	**(SOFTWARE ONLY)**

The following patterns are available in **Option Menu #: 46 DS-1 Bit Error Rate**:

QRSS	User (3-24 bit)	1:1 (alternating)	1:7
3 in 24	All Ones	55 Octet	2^{23}-1
2^{20}-1	2^{15}-1	2^{11}-1 (2047)	2^{9}-1 (511)

DS-0 (56/64 kbps) BERT

DS-0 BERT allows the **930A** to send patterns and detect logic errors within a single time slot of the **DS-1** bit stream.

The following patterns are available in **Option Menu #: 56 DS-0 Bit Error Rate**:

211-1 (2047)	29-1 (511)	User (3-8 bit)	1:7

OPTION 930A-23	**DS-1 AND DS-0 (56/64 kbps) BIT ERROR RATE TESTING (BERT) (REQUIRES OPTION 930A-09E)**	**(SOFTWARE ONLY)**

DS-1 BERT

This option is identical to **Option 930A-22** except for the addition of the long user patterns when **Option 930A-300** is installed. **Option 930A-23** enables the user to send patterns and detect bit or logic errors in addition to **bipolar violations, frame errors**, and **CRC errors** which are already monitored.

With system software version **4.xx**, this option also gives the **930A** a dual **BERT** capability. That is, a single **930A** can emulate two ordinary **BERT** sets.

The following patterns are available in **Option Menu #: 46 DS-1 Bit Error Rate**:

QRSS	User (3-24 bit)	1:1 (alternating)	1:7	Long
3 in 24	All Ones	55 Octet	223-1	
220-1	215-1	211-1 (2047)	29-1 (511)	

DS-0 (56/64 kbps) BERT

This option allows the **930A** to send patterns and detect logic errors within a single time slot of the **DS-1** bit stream. With **Option 930A-09E** the user may perform this test on a single channel without affecting other channels on the T1.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type
OPTION 930A-23 (Continued)	**DS-1 AND DS-0 (56/64 kbps) BIT ERROR RATE TESTING (BERT) (REQUIRES OPTION 930A-09E)**	**(SOFTWARE ONLY)**

The following patterns are available in **Option Menu #: 56 DS-0 Bit Error Rate**:

211-1 (2047)	29-1 (511)	User (3-8 bit)	1:7	Long

OPTION 930A-25 **FXO/FXS PCM SUPERVISION (REQUIRES OPTION 930A-09E)** **(SOFTWARE ONLY)**

This option applies only to those **930A**s that are equipped with **DS-1** interface capability (**Option 930A-09E**). It provides a simulation of the tri-state signaling on **Ground Start Foreign Exchange** trunks being carried on **PCM** trunks. This option is included when ordering both **Option 930A-09E** and **Option 930A-300**.

OPTION 930A-28 **ANALOG REAR PANEL ACCESS** **(HARDWARE ONLY)**

This option enables the **930A** to obtain **metallic** (**analog**) access to the **930A**. It is generally used with the **930A** and is rack mounted for a hard-wired connection.

OPTION 930A-29 **BATCH MODE TESTING** **(SOFTWARE ONLY)**

This option enables you to program a **930A** to place up to 200 calls to far-end responders, and to store the results of the tests for downloading at some future time.

The memory capacity of the **930A** has 998 storage locations available. For example, the user can set the **930A** to perform up to 100 tests, and then have it download the results to a computer on a dial-up basis, rather than have the **930A** remote port continuously tied to a dedicated phone line.

OPTION 930A-30 **ANALOG AND DIGITAL REAR PANEL ACCESS (REQUIRES OPTIONS 930A-09E)** **(HARDWARE ONLY)**

This option provides two sets of wire-wrap terminals, one for **metallic (analog)** connection on rack mount (permanent) **930A** installations and another for **PCM** connection.

OPTION 930A-31 **DIGITAL REAR PANEL ACCESS (REQUIRES OPTIONS 930A-09E)** **(HARDWARE ONLY)**

This option provides wire-wrap terminals for **PCM** connection on rack mount (permanent) **930A** installations.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type
OPTION 930A-34	**DUAL DIRECTION FRACTIONAL T1/DDS (REQUIRES OPTION 930A-09E and -22)**	**(SOFTWARE/HARDWARE)**

This option allows **Fractional T1** and **DDS** testing from a T1 access point. When installed with **Option 930A-22** , **DS-1 Bit Error Rate Testing**, each option also adds long pattern testing (up to 256 byte long pre-programmed and user programmable patterns.

Fractional T1

Three modes of **Fractional T1** testing are available: **contiguous, noncontiguous** and **true noncontagious**. Selected **DS-0**s can be tested at **56** or **64 Kbit/s.**

- **Contiguous Fractional T1** testing allows channel selection on an **N x 56** or **N x 64** basis, where the channels are sequential and carried on the same transmission facilities.
- **Noncontiguous Fractional T1** testing allows any combination of **DS-0**s to be specified for testing; the **DS-0**s must still be carried on the same transmission facilities. Remote loopbacks can be performed with **V.54** loopback codes.
- **True noncontiguous Fractional T1** testing allows any combination of **DS-0**s to be tested. The **DS-0**s can be carried on separate transmission facilities (i.e., have unequal network delays). This allows testing of facilities at the T1 access point that are used with inverse multiplexers for resynchronization. With true noncontiguous testing, pattern synchronization and error indications are available on a per **DS-0** basis.

The following patterns are available in **Option Menu #: 55 DS-1 Fractional T1 BERT** when **Option 930A-22 DS-1 Bit Error Rate Testing**, is installed :

True Noncontiguous:				
2^{15}-1	2^{11}-1 (2074)	2^{9}-1 (511)	User (3-8 bit)	
Contiguous/Noncontiguous:				
2^{20}-1	2^{14}-1	2^{11}-1 (2074)	2^{9}-1 (511)	User (3-8 bit)

DDS Testing

DDS testing can be performed on **DS0-A** or **DS0-B** formatted signals at a T1 access point. Data rates from **56K** to **2400 bits per second** are supported in **DS0-A**, and from **9600** to **2400 bits per second** in **DS0-B**. Testing can be performed with standard **PRBS** patterns and the special **DDS** stress patterns. Both latching and alternating loopbacks are available in all modes. **Multiport junction unit (MJU)** control and testing are supported.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-34 (Continued) **DUAL DIRECTION FRACTIONAL T1/DDS (REQUIRES OPTION 930A-09E and -22)** **(SOFTWARE/HARDWARE)**

The following patterns are available in **Option Menu #: 58 DDS Bit Error Rate** when **Option 930A-22 DS-1 Bit Error Rate Testing**, is installed :

Switched 56 Kbit access:

215-1	211-1 (2074)	29-1 (511)	User (3-8 bit)

64 Kbit / DS0-A / DS0-B access:

223-1	220-01	215-1	211-1 (2074)
29-1 (511)	DDS stress 1	DDS stress 2	DDS stress 3
DDS stress 4	DDS stress 5*		

*DDS stress pattern 5 is a composite of patterns 1 through 4.

DS-0 (56/64 kbps) BERT

Switched 56 Kbit and **64 Kbit clear channel** testing are both supported. Echo canceller disable tone is available, compliant with **CCITT G.164 / G.165**. **V.54 loopback** is supported in **switched 56** testing.

When installed in conjunction with **Option 930A-22**, **Option 930A-34** adds long test patterns for full **DS-1** testing. Several pre-programmed patterns are available, and user patterns up to 256 bytes long can be entered.

The following long patterns are available in **Option Menu #:46 DS-1 Bit Error Rate** when **Option 930A-24** or **-34** is installed in conjunction with **Option 930A-22:**

55 Octet	55 Octet Daly*	72 Octet	96 Octet
120 Octet	User (1-256 bytes)		

*55 Octet Daly is a 55 Octet pattern modified not to cause excess zeros when sent framed.

OPTION 930A-36 **EXTENDED WARRANTY**

This option increases the warranty on **930A** parts and labor from **1 year** to **3 years**.

OPTION 930A-40 **WIDEBAND TIMS WITH ENHANCED TIMS PACKAGE (INCLUDES OPTION 930A-100)** **(SOFTWARE/HARDWARE)**

This option extends the measurement range of the **930A** from **20 Hz – 5 kHz** to **20 Hz – 300 kHz** (this covers the **HDSL** testing range). Wideband provides additional noise filters for the **930A**, including **Program, 15 kHz Flat, 50 kB, E-Filter** (**IEEE** standard for **ISDN** testing), and **3-Level Impulse Noise**.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-40 (Continued) **WIDEBAND TIMS WITH ENHANCED TIMS PACKAGE (INCLUDES OPTION 930A-100)** **(SOFTWARE/HARDWARE)**

In addition to **wideband TIMS**, this option also includes the **enhanced TIMS** package:

- Peak-to-Average Ratio
- 3-Level Impulse Noise
- Phase/Amplitude Jitter and Hits
- Envelope Delay Distortion
- 4-Tone Intermodulation Distortion.

Refer to the descriptions in this guide for **Options 930A-06, -07, -18, -19,** and **-20**.

OPTION 930A-44 **CUSTOMER SERVICE UNIT (CSU) (REQUIRES OPTION 930A-09E)** **(SOFTWARE/HARDWARE)**

This option provides **CSU** emulation which allows low-level direct connection of the **930A** to a T1 span without an intermediate office repeater or **CSU** unit. This option is included when ordering both **Option 930A-09E** and **Option 930A-300**.

OPTION 930A-45 **DTAU/DCS INTERFACE (REQUIRES OPTION 930A-09E)** **(SOFTWARE ONLY)**

This option adds **Digital Cross-Connect (DCS)** support to the **930A**. This option also supports the **DCS 1/0** as described in **Bellcore** specification **TR-TSY-000170** and allows the monitoring and testing of the different channels on a single bit stream. Any **DS-0** which is terminated on the **DCS** can be delivered to the designated **Test Access Di-group (TAD)** via a **Test Access Path (TAP).**

OPTION 930A-46 **WIDEBAND TMS (INCLUDES OPTION 930A-07) (REQUIRES OPTION 930A-300)** **(SOFTWARE/HARDWARE)**

This option provides the **930A** with additional noise filters that enable it to operate in **wideband**, including **Program, 15 kHz Flat, 50 kb, E-Filter** (**IEEE** standard for **ISDN** testing), and **3-Level Impulse Noise.** This option also includes **3-Level Impulse Noise** measurement capability.

OPTION 930A-47 **REMOTE AUDIO MONITOR** **(SOFTWARE/HARDWARE)**

This option allows monitoring of the test progress of a remote **930A** over a telephone line, and allows telephone conversation over the line under test from a remote site.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-51 FRACTIONAL T1 (SOFTWARE/HARDWARE)
(REQUIRES OPTIONS 930A-09E, -23, -300)

This option enables the **930A** to perform **Fractional T1** testing from a T1 access point. It also adds long pattern testing (up to 256 byte long pre-programmed and user-programmable patterns) to **Option Menu #: 55 Fractional T1 BERT** and **Option Menu #: 46 DS-1 Bit Error Rate**.

Three modes of **Fractional T1** testing are provided:

- **Contiguous Fractional T1** allows channel selection on an **N x 56** or **N x 64** basis, where the channels are sequential and carried on the same transmission facilities.
- **Noncontiguous Fractional T1** allows any combination of **DS-0**s to be specified for testing; the **DS-0**s must still be carried on the same transmission facilities. Remote loopbacks can be performed with **V.54** loopback codes.
- Sage Instruments' **True-Noncontiguous Fractional T1** allows any combination of **DS-0**s to be tested. The **DS-0**s can be carried on separate transmission facilities (i.e., have unequal network delays). This allows testing of facilities at the T1 access point that are used with inverse multiplexers for resynchronization.

Selected **DS-0**s can be tested at **56** or **64 Kbits**

The following patterns are available in **Option Menu #: 55 Fractional T1 BERT:**

True Noncontiguous:

215-1	211-1 (2074)	29-1 (511)	User (3-8 bit)	

Contiguous/Noncontiguous:

220-1	214-1	211-1 (2074)	29-1 (511)	User (3-8 bit)

The following patterns are available in **Option Menu #: 46 DS-1 Bit Error Rate:**

55 Octet	55 Octet	Daly*	72 Octet	96 Octet
120 Octet	User (1-256 bytes)			

*55 Octet Daly is a 55 Octet pattern modified not to cause excess zeros when sent framed.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-52 **DIGITAL DATA SERVICE (DDS)** **(SOFTWARE/HARDWARE)**
(REQUIRES OPTION 930A-300)

This option allows the user to perform **DDS** testing from a T1 access point. When **Option 930A-23, DS-1 Bit Error Rate Testing** is also installed, long user pattern testing (up to 256 byte long pre-programmed and user programmable patterns) is added to **Option Menu #: 58** and **Option Menu #: 46**.

DDS testing can be performed on **DS0-A** or **DS0-B** formatted signals at a T1 access point. Data rates from **56K** to **2400 bits** per second are supported in **DS0-A**, and from **9600** to **2400** bits per second in **DS0-B**. Testing can be performed with standard **PRBS patterns** and the special **DDS** stress patterns. Both latching and alternating loopbacks are available in all modes. **Multiport junction unit (MJU)** control and testing are supported.

The following patterns are available in **Option Menu #: 58 DDS Bit Error Rate:**

Switched 56 Kbit access:

215-1	211-1 (2074)	29-1 (511)	User (3-8 bit)

64 Kbit / DS0-A / DS0-B access:

223-1	220-01	215-1	211-1 (2074)
29-1 (511)	DDS stress 1	DDS stress 2	DDS stress 3
DDS stress 4	DDS stress 5*		

*DDS stress pattern 5 is a composite of patterns 1 through 4.

OPTION 930A-54 **23 TONES** **(SOFTWARE/HARDWARE)**
(REQUIRES OPTION 930A-300)

This option enables the **930A** to make a variety of transmission impairment measurements across the full channel spectrum in a short period of time. The test signal consists of 23 equally spaced, phase coherent tones ranging from **203 Hz** to **3228 Hz**. The phase relationships of the tones create a signal that simulates the probability density of high speed modems such as **V.29**, **V.32**, and **V.34**. A single burst of **23 tones** lasting only **three seconds** can yield multiple measurements:

- **Attenuation Distortion** at 23 frequencies
- **Envelope Delay Distortion (EDD)** at 22 frequencies
- **Signal to Total Distortion Ratio (S/TD)**
- **Second and Third Order Intermodulation Distortion (IMD)**

In addition, **23 tones** has capabilities not available with traditional techniques:

- **Two wire EDD** is measured immediately without a repeater set or a return path.
- The **23-Tone S/TD** measurement uses a complex signal that stresses the channel much better than a single tone and intermodulation products are included in the reading.
- **ADPCM detection**: the complexity of the 23-Tone signal causes channels that use signal compression to exhibit a characteristically high S/TD ratio.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Option Number	Description	Upgrade Type

OPTION 930A-67 **SS7 ERROR MONITOR (SOFTWARE/HARDWARE)**
(REQUIRES OPTION 930A-300 and -09E)

This option allows non-intrusive error monitoring with direct T1 access. The **930A** can monitor two **56** or **64 kbps SS7** links in both directions. This option allows you to determine link status and isolate transmission from protocol problems, trap and trace individual or multiple call segments and determine line activity and percent line utilization. The powerful pre-written programs auto-configure the unit, automatically find the **SS7** links and allow the user to perform call trace functions. Use of this option with **Option 930A-23, BERT** will further quantify error analysis.

OPTION 930A-90 **HIGH STABILITY CLOCK FOR ESF (SOFTWARE/HARDWARE)**
(REQUIRES OPTION 930A-09E)

This option provides a **high stability clock** source for **Extended Superframe (ESF)** operation. This option is included when ordering both **Option 930A-09E** and **Option 930A-300**.

OPTION 930A-100 **ENHANCED TIMS PACKAGE (SOFTWARE ONLY)**

This option includes the following testing capabilities:

- Peak-to-Average Ratio
- 3-Level Impulse Noise
- Phase/Amplitude Jitter and Hits
- Envelope Delay Distortion
- 4-Tone Intermodulation Distortion.

For information regarding these options, refer to the descriptions in this buyer's guide for **Options 930A-06, -07, -18, -19,** and **-20**.

OPTION 930A-300 **ENHANCED DIGITAL SIGNAL PROCESSOR (SOFTWARE/HARDWARE)**

This option adds an enhanced digital signal processor (**DSP**) to the **930A** hardware configuration, enabling you to run the latest versions of the **930A** system software. It also includes:

- RS-232 remote control/printer interface.
- Customer Service Unit (CSU) (when **Option 930A-09E** is also ordered)
- FXO/FXS PCM Supervision (when **Option 930A-09E** is also ordered)
- High stability clock. (when **Option 930A-09E** is also ordered)

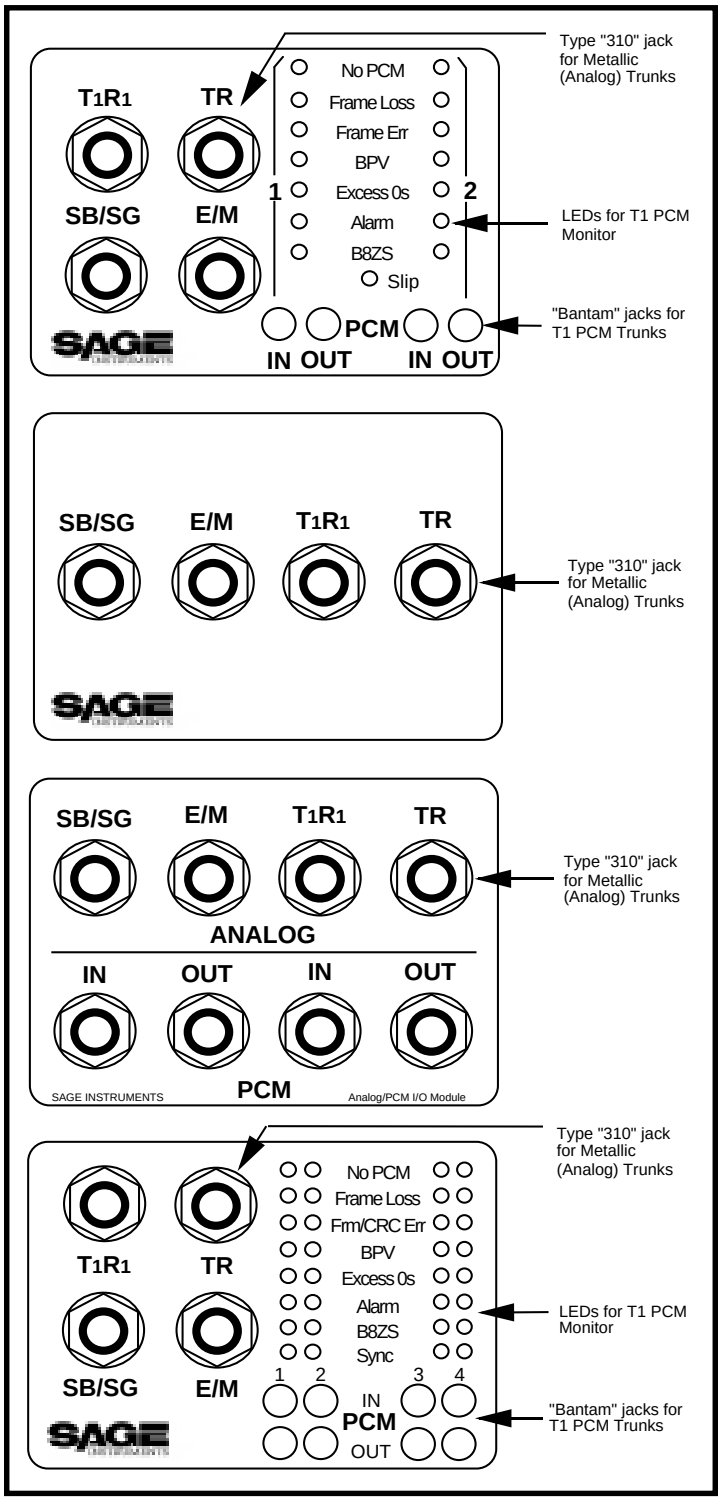
For information regarding these features, refer to the descriptions in this guide for **Options 930A-10C, -25, -44** and **-90.**

Option 930A-300 is a prerequisite for many of the extended testing features such as **SS-7 testing, 23 tones measurements,** and **extended BERT tests**.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

CONFIGURATOR PANELS



The **LED Configurator** is the standard configurator for **PCM** units. LEDs indicate status and errors on the 2 **T1** lines (**PCM1** & **PCM2**).

This configurator also has 310-type jacks for the analog input/output that are labeled **SB/SG** (Signal Battery/Signal Ground), **E/M** (The "E"- and "M"-leads), **T/R** (Tip and Ring), and **T1/R1** (Tip1 and Ring1). The **E/M** and **SB/SG** leads are used for E&M signaling. **TR** and **T1R1** are used by all 4–wire analog trunks. All 2-wire signaling and transmission is done over **TR**.

The **Analog Configurator** is used in **930A**s intended for entirely analog operation and have no PCM options. The 310-type jacks are for the analog input/output and are labeled **SB/SG** (Signal Battery/ Signal Ground), **E/M** (The "E"- and "M"-leads), **T/R** (Tip and Ring), and **T1/R1** (Tip1 and Ring1). The **E/M** and **SB/SG** leads are used for E&M signaling. **TR** and **T1R1** are used by all 4–wire analog trunks. All 2-wire signaling and transmission is done over **TR**.

The **310 A/P Configurator** is intended for use in those units which have both analog and digital (T1 PCM) capability. (*Purchased Option 930A-08E* or *-09E* has been installed.) Both sets of jacks are 310-style and they are labeled **PCM1 IN, PCM1 OUT, PCM2 IN, PCM2 OUT, SB/SG** (Signal Battery/ Signal Ground), **E/M** (The "E"- and "M"-leads), **T/R** (Tip and Ring), and **T1/R1** (Tip1 and Ring1).

The **SS-7 Configurator** is available with the SS-7 line signaling purchased option. It is similar to the standard **LED Configurator**, except that the there are four sets of LEDs that indicate the status and errors on four **T1** lines carrying SS7 links. (**PCM1**, **PCM2**, **PCM3** & **PCM4**). These **PCM** lines connect to the **930A** via the four sets of PCM bantam jacks.

This configurator also has 310-type jacks for the analog input/output that are labeled **SB/SG** (Signal Battery/Signal Ground), **E/M** (The "E"- and "M"-leads), **T/R** (Tip and Ring), and **T1/R1** (Tip1 and Ring1). The **E/M** and **SB/SG** leads are used for E&M signaling. **TR** and **T1R1** are used by all 4-wire analog trunks. All 2-wire signaling and transmission is done over **TR**.

© Sage Instruments 1997

Artisan Technology Group - Quality Instrumentation ... Guaranteed | (888) 88-SOURCE | www.artisantg.com

Artisan Technology Group is an independent supplier of quality pre-owned equipment

Gold-standard solutions

Extend the life of your critical industrial, commercial, and military systems with our superior service and support.

We buy equipment

Planning to upgrade your current equipment? Have surplus equipment taking up shelf space? We'll give it a new home.

Learn more!

Visit us at **artisantg.com** for more info on price quotes, drivers, technical specifications, manuals, and documentation.

Artisan Scientific Corporation dba Artisan Technology Group is not an affiliate, representative, or authorized distributor for any manufacturer listed herein.

We're here to make your life easier. How can we help you today?

(217) 352-9330 | sales@artisantg.com | artisantg.com

ARTISAN® TECHNOLOGY GROUP