

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.

Visit our website - *Click HERE*

Broadband Scout



CS1104 Broadband Signal Analyzer

Other analyzers tell you what happened. The Aeroflex BSA shows you why.

The portable Scout CS1104 Broadband Signal Analyzer (BSA) instrument is designed to find and to solve the toughest RF issues. It combines live and off-line signal analysis capabilities to address multiple test applications, including:

- Communications
- Radar
- Satellite
- OTA Testing
- Electromagnetic Environment (EME)
- Drive (mobile collections)

The Aeroflex BSA is used to record, process and analyze RF signals.

The system consists of:



Tunable RF downconverter:
Convert RF signals from RF to baseband IF

A/D converter:
Digitize baseband signal

Digital tuner:
Focus on signal of interest and reduce unnecessary data

Processing:
Process raw digitized samples with various algorithms such as advanced triggering, filtering, scaling, statistics

Signal storage:
Store digitized signal for analysis or archiving

Controller:
Computer used to control the system, perform analysis, display results and write data from RAM to archival storage (disk, RAID, USB device)

The CS1104 BSA supports collecting contiguous recordings up to a 40 MHz instantaneous bandwidth (IBW). It also supports scanning across wider bandwidths using sequential recordings. As it is capable of simultaneously processing and coherently displaying time, spectral, and modulation domain data, the CS1104 BSA is ideal for R&D, Validation & Verification (V&V), and general RF testing. The rich set of analysis tools and features below are included with the CS1104.

- Tunable frequency coverage from 30 MHz to 6 GHz
- Live signal monitoring (display and processing)
- Contiguous signal recording and archiving into 32 GB RAM (160 sec @ 40 MHz BW)
- Scanned sequential mode for monitoring ranges wider than the IBW (SSA Mode)
- Digital tuners from 40 MHz to 41 kHz bandwidth
- Interactive spectrum/spectrogram/time plots
- Results strip charting
- Signal notepad for recording plots and data
- Channel Power and Adjacent Channel Power Ratio (ACPR) analysis functions
- Modulation domain analysis function with simple modulation classification (AM, FM, CW, pulse, other)
- GPS; latitude, longitude, time stamp
- Scanned sequential mode for recording and archiving
- Spectrum Allocation Table (SAT)
- AM/FM/PM analysis functions
- ASK/FSK/PSK/QAM analysis functions

- ASK Burst/FSK Burst/PSK Burst analysis functions
- Pulse/Radar analysis function
- Environmental Signal Parameterization identifies and measures parameters for signals in the environment
- Remote control
- Sequenced recording control (SW Sequencer)

* Selected features subject to export restriction

All Aeroflex products come with the support of highly-experienced and solution-oriented technical staff.

BSA Features and Functions

This section briefly presents some of the BSA features and functions.



Standard BSA software allows the operator to record signals to RAM and then to archive them to internal and external disk drives. These recorded signals can be post-processed by the BSA software suite.

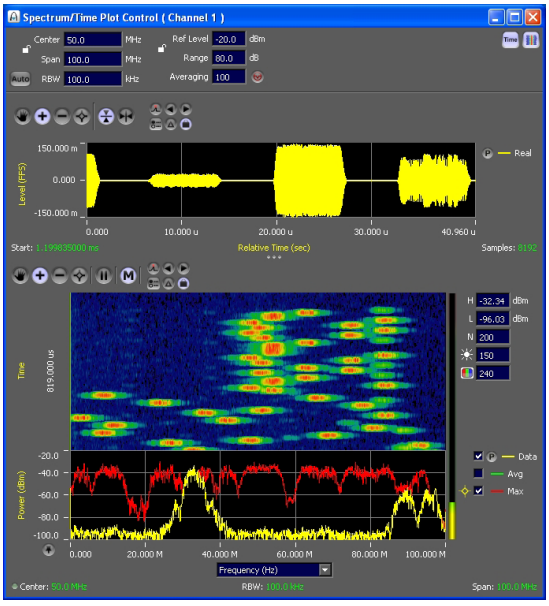
Application Matrix

How BSA features and functions apply to typical BSA applications.

Applications and Descriptions	Included BSA Functions and Features									
	Spectrum/Spectrogram /Time plot	Strip Chart	Signal Notepad	Channel Power & ACPR	Modulation Domain	Pulse Analysis	Digital Modulations (PSK/QAM/FSK/ASK)	Burst/Agile Signal Analysis (PSK/QAM)	Environment Signal Parameterization	Spectrum Allocation Table (SAT)
Communications Test This includes testing radios and radio subsystems. The BSA has had the most impact in engineering design, verification and test (DVT) in the lab and in the field. Both commercial and military radio manufacturers should be targeted along with organizations that specialize in testing radios. The BSA is an excellent fit to emerging standards or proprietary radio waveforms where there is no test equipment yet.	•	•	•	•	•		•	•		
Radar Test The BSA has been valuable in a number of radar applications, including DVT, field tests, ECM/ECCM tests, stability measurements and radar cross section measurements. Radar manufacturers, test labs and test ranges have been our best customer for these applications.	•	•	•	•	•	•				
Satellite Test The BSA has been used in a variety of satellite payload, ground station and operational monitoring. The system has been used to test communications satellites, XM and Sirius Radio satellites, radar satellites, photo satellites and others.	•	•	•	•	•	•	•			
Electromagnetic Environment (EME) Test BSAs have been used to characterize the EME in many places around the world for a wide variety of missions. We have additional software aimed at this application, please contact us for details.	•	•	•	•	•	•	•	•	•	•
EW Test The BSA has been used for a number of EW tests, including radar, ECM/ECCM and CREW.	•	•	•	•	•	•		•	•	•
Drive Test BSAs have been used to measure signal characteristics (such as RF power) from a moving vehicle for both civilian and military applications.	•	•	•	•	•	•		•	•	•
General test and debug	•	•	•	•	•					

Spectrum/Spectrogram/Time Plot

Interactive display of the spectrum, spectrogram (waterfall plot) and the time domain waveform. This analysis tool provides a multi-dimensional tool for viewing data that is valuable for every BSA application.



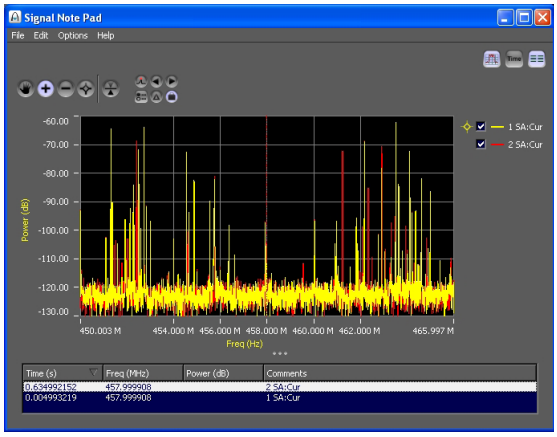
Strip Chart

Various analysis functions calculate numeric values (carrier frequency, power, etc.). Any value from any analysis function can be sent to the strip chart to display the value over time. This display tool provides a multi-dimensional view into data that is valuable for every BSA application.



Signal Notepad

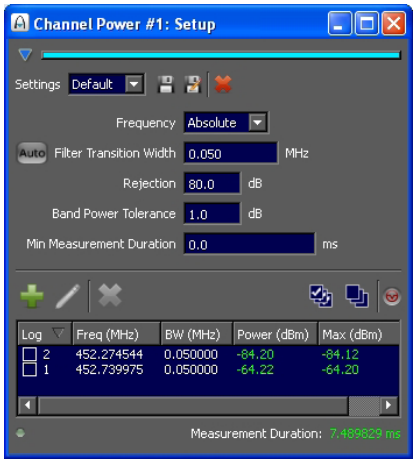
Any spectrum trace can be stored and viewed with the signal notepad. This allows different traces to be overlaid for easy comparison. The traces can be stored to disk in ASCII format.



Channel Power and ACPR

Channel Power measures the power in a user defined frequency band. This function is useful in many applications.

The Adjacent Channel Power Ratio (BSA-ACPR) analysis function measures the power and ratio of the powers in a main frequency band and bands on either side of this band. This can also be used to estimate the Signal-to-Noise-Ratio (SNR) of signals for many applications.



Modulation Domain

Plots and coherently measures parameters on the AM, FM and PM demodulated waveforms. Estimates the basic modulation type. This is one of the most used functions in BSA and is highly recommended for most applications.



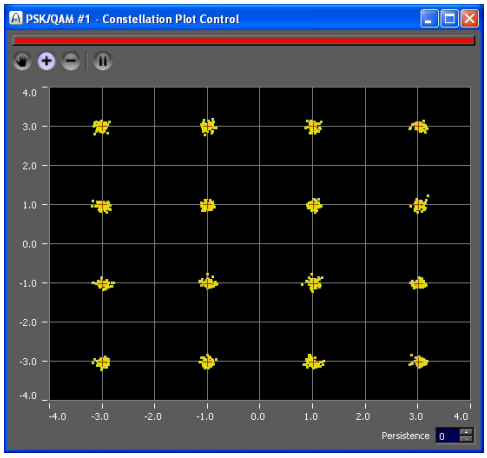
Pulse Analysis

Measures and plots pulse parameters, including carrier frequency, power, pulse width, PRI and modulation (chirp, Barker, etc.) characteristics. This is used for pulse tasks such as radar applications.

Digital Modulations

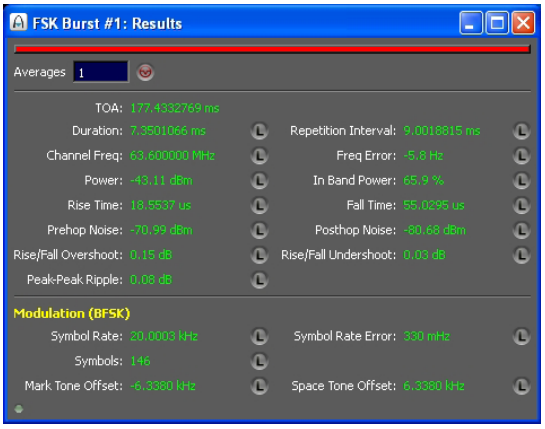
The Vector Signal Analyzer demodulates, plots and characterizes ASK, FSK, PSK and QAM signals. These analysis tools operate on continuous or burst signals.

The PSK/QAM plots eye diagram, constellation, spectrum, and timing offset data. One function will estimate the PSK/QAM signal type order and its fundamental parameters. These functions are useful for digital communications applications.



Burst/Agile Signal Analysis

The burst variants of the digital modulation analysis functions process frequency agile signals such as frequency hoppers. The software adds the pulse width, PRI and carrier frequency of every burst. This function is useful in many digital communications applications.



Environment Signal Parameters (ESP)

Environment Signal Parameterization detects all signals in a band and measures the signal frequency, power, bandwidth and on-time statistics. This function is used in spectrum monitoring and EME characterization applications.



ID	Freq (MHz)	BW (MHz)	Power (dBm)	Persistence (%)
2	856.5749	0.0296	-89.7	100.00
3	857.5503	0.0376	-91.7	100.00
10	857.6373	0.0351	-95.5	64.44
1	857.7748	0.0451	-91.0	57.78
7	857.8614	0.0340	-94.7	44.44
4	859.9004	0.0304	-88.3	100.00
8	861.9386	0.0850	-92.4	37.78
5	864.5998	0.0389	-95.1	53.33
0	865.4501	0.0240	-87.1	100.00
6	865.6004	0.0368	-95.5	60.00
9	867.2141	0.0394	-95.0	44.44

Spectrum Allocation Table (SAT)

The Spectrum Allocation Table (SAT) displays text associated with the spectrum marker frequency. This tool is useful for signal search applications such as spectrum management and EME analysis, but it could be creatively used by all applications.



SPECIFICATION

FREQUENCY RANGE AND TUNING

FREQUENCY RANGE

30 MHz to 6 GHz

Tunable RF center frequency range

Tuning Resolution

1 kHz

Frequency Accuracy

Dependent on 10 MHz reference accuracy

BANDWIDTH

MAXIMUM INSTANTANEOUS BANDWIDTH

RF>200 MHz

40 MHz typical

RF<200 MHz

Bandwidth increases with increasing tuned center frequency, from approx. 6 MHz at 30 MHz center frequency, to 40 MHz at 200 MHz center frequency, typical.

BW can be decreased using digital tuners for increased recording times and lower effective sample rates.

Passband Amplitude Flatness

±2.5 dB, typical

Across maximum passband bandwidth

Selectable Bandwidths

From maximum instantaneous bandwidth down to 41 kHz

Selection range corresponds to digital tuner decimation factors from 4 to 4096 in power-of-two steps, where BW ~= 210.e6 * (0.8/DF), in Hz, where DF is the decimation factor.

INPUT

RF Input

50 ohms, ac coupled

INPUT RETURN LOSS

RF >300 MHz

9.0 dB, (2.1:1) typical worst-case in passband

RF <300 MHz

6.0 dB (3.0:1) typical worst-case at band center

Max RF Input Power, CW Damage Level

+15 dBm

Minimum CW Input Power for Full-Scale at ADC

≤-35 dBm over full frequency range

Maximum gain at all tuned frequencies is at least +35 dB, where (analog-to-digital) gain is measured as:

(Power of signal in dB Full-Scale [dBFS] at ADC) minus

(Power of signal at RF Input [dBm]).

GAIN

Max. Gain

>35 dB, typical

At least 35 dB gain at band center for all tuned frequencies

Gain Range, min.

40 dB, min.

Gain controlled via programmable solid state attenuation

Gain Step

0.5 dB nominal

Gain Linearity

±1.0 dB (typical worst-case)

LINEARITY AND DISTORTION

Input IP3

+3 dBm, typical at +35 dB gain

+8 dBm, typical at +25 dB gain

Applies at any tuned frequency for two tones within the tuned passband.

E.g. Two input tones separated by 1 MHz at -32 dBm each (peak power =-26 dBm) and gain = 25 dB, so that combined peak is approx. -1 dBFS. Third order intermods will typically be less than -32 - 2*(8-(-32)) = -112 dBm, or <-80 dBc relative to each tone.

3rd order intermod levels vary with gain setting

In-band Spurious Free Dynamic Range

60 dB, typical in-band spurious;

55 dB, worst-case

Typical represents a common worst-case in-band spurious from any in-band tone at -1 dBFS, when varying the input tone frequency across the full passband (measured with Gain = +35 dB, CW Input power = -36 dBm)

SPECTRAL PURITY

Phase Noise

Typicals

Offset (Hz)	Phase Noise (dBc/Hz)
100	-60
1 K	-75
10 K	-80
100 K	-100
1 M	-122

Typical worst-case, at RF center frequency of 6 GHz.

LO Spurious

Typical peak spurious levels

-60 dBc for offset >25 kHz

-75 dBc for offset >200 kHz

Frequency Reference

Internal

10 MHz high stability TCXO

5 min. warmup

Stability 1.e-9/day, 1.e-7/year

External 10 MHz Ref. Input

0 to +14 dBm, 50 ohm BNC rear panel input

External GPS Input

Rear panel BNC connector for GPS antenna input, with +5 Vdc bias for active antenna

System will automatically lock to either an applied GPS signal via the GPS antenna port, or to an externally applied 10 MHz reference input. If neither are applied, it will run from its internal 10 MHz TCXO.

Ref. Output

Rear panel BNC output;

+6 dBm sine wave

Extra output of 10 MHz; can be used to lock external equipment to the same reference used by the system.

RESIDUAL AND NOISE

RESIDUAL SPURIOUS

-98 dBm, typical worst-case in passband

This is the typical maximum level of non-signal-related spurious, usually related to leakages and/or mixing products of LOs and/or internal spurious products.

Referenced to RF Input, Gain = +35 dB

Displayed Average Noise Level

-158 dBm/Hz, typical

Referenced to RF Input, at maximum gain setting.

Typical worst-case noise figure = 15 dB

Reverse Leakage

-80 dBm, maximum, all tuned RF frequencies

Worst-case leakage out of the RF input, at any gain setting, tuned to any RF frequency.

FILTERING

Pre-Selection

Voltage-tuned and sub-octave pre-select filtering covers full RF range

Image Rejection

80 dB, typical (60 dB minimum)

IF Rejection

80 dB, typical (65 dB minimum)

OOB Rejection

50 dB, typical worst-case across full RF range, at gain = +35 dB

Other sub-harmonic and non-harmonic related out-of-band signals, at full-scale level, that create in-band spurious products.

Note: To achieve high levels of near-band and out-of-band rejection, system includes RF pre-select and IF bandpass filters.

DIGITAL SAMPLING

ADC Resolution

12 bits (ADC)

RF signal is digitized at 12 bits per real sample; then converted through the internal digital downconverter to I/Q samples at 16 bits per sample, with decimation rates from 4 through 4096.

ADC Sample Rate

210 MSamples/sec

Signals are sampled at 210 MSamples/sec. Effective sample rate of 16-bit I/Q samples out is 210.e6/DecimationFactor, where DecimationFactor can be any power-of-2 from 4 through 4096, for an output complex sample rate of 52.5 MSamples/sec down to 51.3 kSamples/sec, for both I and Q output.

Sample Memory

32 GBytes

8 GSamples of 16-bit Complex samples

Continuous Record Time

>162 seconds at full 40 MHz instantaneous bandwidth;

>46.5 hours of recording at minimum signal bandwidth of 41 kHz

Output complex sample rates from the digital tuner range from 52.5 MS/sec (at full dec-by-2 bandwidth) to 51.27 kS/sec (at minimum dec-by-4096 bandwidth)

TRIGGERING

Sources

Internal (software or user-generated) and external (trigger input on side panel)

Type

Rising edge, falling edge

Functions

Pre-trigger, snapshot

Uncertainty

±1 sample from digital tuner (e.g ±19 nS at 40 MHz bandwidth)

GPS

Receiver Functions

Time, position and frequency reference

In addition to time and position information, the internal 10 MHz reference can also lock to an input L1 C/A signal from an external GPS antenna.

Signal I/F

L1 C/A 1575.42 MHz

Acquisition Level

-142 dBm

Tracking Level

-158 dBm

Start Times

Cold: <45 seconds

Warm: 1 second

Hot: 1 second

SPECTRUM ANALYZER FUNCTION

Frequency Span

Defaults to current selected bandwidth (40 MHz to 41 kHz), can be set from 4 Hz to Nyquist (52.5 MHz)

Resolution Bandwidth

0.4 Hz to 10.0 MHz

Plots

Power vs frequency spectrum, time vs frequency spectrogram, amplitude vs time, interactive signal notepad

Spectral Plot Controls

Center frequency, span, ref level, res BW, gain, power range, # of averages, absolute or relative frequency display

Traces

Live data with selectable persistence, max hold, average N, reference trace

Markers

Current cursor position, delta cursor positions, >20 auxiliary markers, channel markers, event trigger threshold and mask

Marker Functions

Peak search, next peak left/right, cursor readout, nudge left/right, lock

GUI Control

Mouse-enabled multi-level zoom out, pan, markers, custom color controls

SCANNING SPECTRUM ANALYZER (SSA) FUNCTION

Frequency Range

Variable from 40 MHz to 6 GHz. Save/recall band limits

Resolution Bandwidth

Auto or manual

Gain Control

AGS and manual

Plots

Power vs frequency spectrum

Traces

Live data

Max hold

Average N

Min hold

Trace save

SYSTEM HARDWARE

COMPONENTS

Single system chassis containing CPUs, 8 GB RAM standard (OS & signal memory), system drive, system I/O, 30 MHz to 6 GHz RF down-converter, video monitor, keyboard and trackpad, USB, video, ethernet connectors, GPS receiver

Monitor

17" included

Peripherals

Fold-down keyboard, trackpad included

System Drives

1 TB removable (standard) or 120 GB removable SSD

Used for both Data and OS

RAM

8 GB system, 32 GB signal memory

RF Downconverter

30 MHz to 6 GHz, 40 MHz bandwidth, low power, fast tuning, miniature receiver

GPS Receiver

For time, position and frequency reference

CONNECTORS

USB

USB 2.0 (x2) front panel, USB 2.0 (x4) side panel, USB 3.0 (eSATA) (x2) side panel

Video

VGA/DVI/HDMI

Ethernet

1 GBit (x2)

RF In

Side panel precision type-N

Ext Reference In

Side panel BNC, 50 ohm, -2 to +14 dBm

Locks internal 10 MHz to this external 10 MHz input

External GPS Input

Rear panel BNC connector for GPS antenna input, with +5 Vdc output bias for active antenna

GPS L1 used to discipline internal 10 MHz reference, and for GPS time, location data.

Additional Reference Out

Rear panel BNC, 50 ohm, +6 ±3 dBm

Can be used to lock additional chassis or external equipment to the same reference used by the system.

Trigger In

Rear panel BNC, LVCMOS, >100 nS pulse width

Start Record Sync Out

Rear panel BNC, 50 ohm, LVCMOS

PHYSICAL

Power Consumption

160 VA @ 110 VAC or 220 VAC

1.35 A rms at 110 Vac measured while operating

Dimensions

13.60" H x 17.01" W x 9.57" D (345 x 432 x 243 mm)

Weight

40 lbs (18 kg)

ENVIRONMENTAL

Operating Temperature

-10 to +55°C

Operating Humidity

10% to 90%, non-condensing

Storage Temperature

-40 to +65°C

Storage Humidity

5% to 95%, non-condensing

SOFTWARE (SUBJECT TO EXPORT CONTROL)

Included Functions

Spectrum, Spectrogram, Time waveform plot and Analysis

Sofware Analysis Package	Sofware Generation Package
BSA-Basic	VSS-Basic
BSA-Basic (File)	VSS-Agile*
BSA-AM/FM/PM	VSS-AM/FM/PM
BSA-ASK	VSS-ETSI
BSA-ASK Burst*	VSS-FSK/MSK
BSA-Channel Power	VSS-Gain/Phase
BSA-ESP	VSS-Mix
BSA-FM DBL DMOD	VSS-NPR
BSA-FSK	VSS-PNG
BSA-FSK Burst*	VSS-PSK/QAM*
BSA Modulation Domain	VSS-Pulse*
BSA-PSK/QAM*	VSS-TIA
BSA-PSK/QAM Burst*	
BSA-PSK/QAM Est	**Software Application Package**
BSA-PSK/QAM Gain/Phase Est	BSA-Basic
BSA-Pulse*	BSA-Basic
BSA-SV DDC	BSA-Basic
	Scanning Spectrum Analyzer (SSA)
	Range Marshall
	CS RMT
*Export Controlled	

RECOMMENDED CALIBRATION CYCLE

24 months

ORDERING AND CONTACT INFORMATION

www.aeroflex.com/BSA

bsa@aeroflex.com

+1.800.835.2352 (US Only)

+1.316.522.4981(Direct)

FINLAND
Tel: [+358] (9) 2709 5541
Fax: [+358] (9) 804 2441

FRANCE
Tel: [+33] 1 60 79 96 00
Fax: [+33] 1 60 77 69 22

GERMANY
Tel: [+49] 8131 2926-0
Fax: [+49] 8131 2926-130

INDIA
Tel: [+91] 80 5115 4501
Fax: [+91] 80 5115 4502

KOREA
Tel: [+82] (2) 3424 2719
Fax: [+82] (2) 3424 8620

SCANDINAVIA
Tel: [+45] 9614 0045
Fax: [+45] 9614 0047

SPAIN
Tel: [+34] (91) 640 11 34
Fax: [+34] (91) 640 06 40

UK Cambridge
Tel: [+44] (0) 1763 262277
Fax: [+44] (0) 1763 285353

UK Stevenage
Tel: [+44] (0) 1438 742200
Fax: [+44] (0) 1438 727601
Freephone: 0800 282388

USA Wichita
Tel: [+1] (316) 522 4981
Fax: [+1] (316) 522 1360
Toll Free: 800 835 2352

USA Kansas City
Tel: [+1] (913) 693 1700
Fax: [+1] (913) 324 3103

AEROFLEX
A passion for performance.

As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice. All trademarks are acknowledged. Parent company Aeroflex, Inc. ©Aeroflex 2013.

www.aeroflex.com

info-test@aeroflex.com

Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

Part No. 46891/494, Issue 4, 06/14

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