

# 850 Blackbird NextGen

## Integrated Signal Search, Collection, Geolocation and Analysis System

Today's new and emerging threats are driving the need for updated signal intelligence capabilities that not only detect, collect and analyze the newest signal threats, but geolocate them as well. To meet the demand for ever-increasing areas of operation, the system also must be easy to deploy and even easier to operate.

Building on the proven E3238S Blackbird capability and TCI's world-leading direction finding and geolocation technology, the TCI Model 850 Blackbird NextGen SIGINT system combines precision RF hardware with the next generation of the original Blackbird software. The result is a fully integrated, COTS signals intelligence capability providing unparalleled signal survey, search, detection, visualization, collection, wideband recording, analysis and reporting.

The new Blackbird software is a breakthrough in usability. It automatically scans the RF

spectrum, detecting and cataloging all signal activity. Operators use the Blackbird GUI to view the spectrum and signal activity in list, spectrogram and map views using intuitive controls including touchscreen and gesture support. When configured with TCI's Lookback Collection option, you'll never miss a collect of a signal of interest since IQ data for any past signal can be extracted from the Lookback Storage Array without interrupting wideband recording.

Since the spectral data is recorded, operators can scroll "back in time" hours, or even days, and view spectral data which is overlaid with the detection database results. Simply point at any signal to pop up the signal characteristics, or use the new Search pane to find live or past signals of interest based on specific signal characteristics.

Blackbird operators can even use the Lookback Storage Array to go back in time to perform TDOA and hybrid geolocation on past signals.

Once signals of interest are found, a simple right-click is all it takes to record, process, analyze and export results. Or, click the Automate button to select one or more actions that will be triggered when signals arrive that match the automation search criteria. Available actions include Blackbird's Universal Signal Detection capability, which allows operators to create custom signal detectors on the fly without programming. And since the Blackbird NextGen leverages classic Blackbird interfaces and file formats, it is compatible with a large installed base of signal analysis/decode packages including popular GOTS backend signal processors. It's Blackbird — Redesigned for the Next Generation.



# TCI Model 850 Blackbird combines redesigned Blackbird software with updated RF hardware and TCI's world-leading DF/Geo to deliver the next generation of Signals Intelligence.

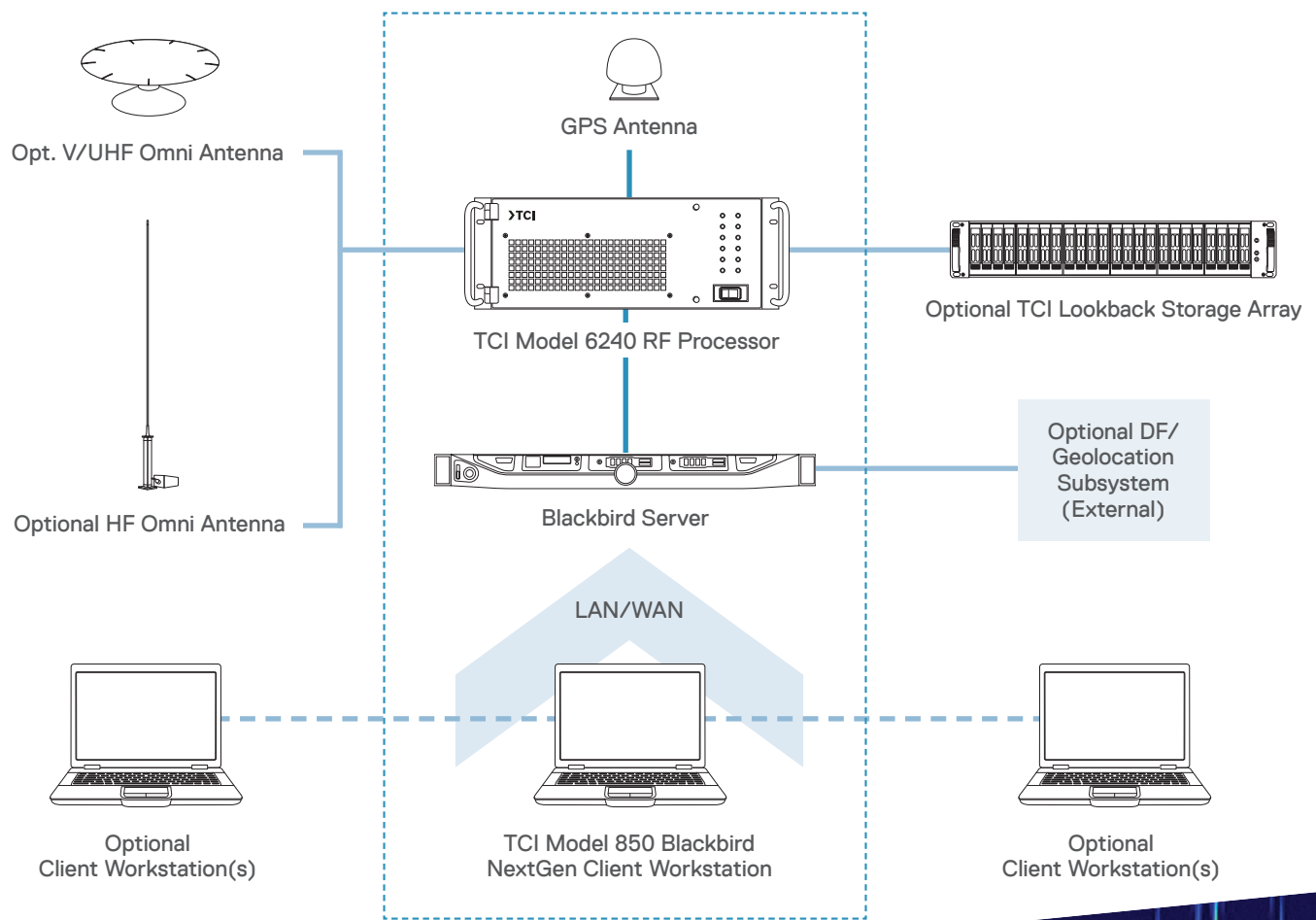
## KEY FEATURES

- › TCI replacement for original E3238S Blackbird Signals Intelligence system.
- › Client/server architecture supports multiple simultaneous remote or local clients (or unattended operation).
- › Fully integrated signal search, visualization, collection, wideband recording, DF/geolocation, analysis and reporting.
- › Easy setup and intuitive operation including touch screen and gesture support.
- › Advanced signal detection, including optional modulation classifier automatically identifies specific signals of interest.
- › Powerful search and lookback visualization allow users to quickly find signals of interest, whether live or previously detected.
- › TCI's DF First® technology provides search by direction and/or geolocation when configured with TCI DF/Geolocation options.
- › Integrated DDCs with delay memory provide multichannel realtime collection.
- › Easy-to-use Automation facility triggers automated actions (collection, alarming, analysis, etc.) when signals of interest are detected.
- › Original Blackbird data interfaces ensure compatibility with existing signal analysis and decode packages including popular GOTS backend processors.
- › HF, VHF, UHF, and low-SHF ranges (20 MHz to 3,000 MHz, 9 kHz to 30 MHz, or 9 kHz to 3,000 MHz).
- › High dynamic range and excellent co-channel frequency resolution.
- › 40 MHz instantaneous bandwidth, expandable to 80 MHz.

## OPTIONS

- › Highest level of performance
- › Frequency extension to 8 GHz.
- › Modular / scalable RF processors for extended stare coverage (HF and V/UHF).
- › Universal Signal Detection (USD) provides the capability to create custom signal detectors on the fly, with no programming required.
- › Modulation recognition for automated signal classification and Smart Recording.
- › TCI's exclusive Lookback Collection capability enables signals to be extracted without interrupting wideband recording.
- › Snapshot Radio Audio Player.
- › Signal Analysis and Decode Suite with over 200 signal types.
- › TCI DF and Geolocation options, including traditional AOA DF, triangulated AOA geolocation, HF DF with optional SSL, TDOA geolocation, hybrid AOA/TDOA geolocation and Lookback TDOA / hybrid geolocation.

## 850 Blackbird NextGen System Components



The RF hardware is based on TCI's modular platform that offers both HF and VHF/UHF receivers and FPGA accelerated signal processing. Choose either the modular compact MIL-STD rackmount chassis, or a new battery-powered ruggedized transportable unit.

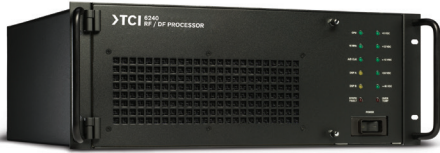
The TCI Model 850 Blackbird NextGen system includes the following subsystems:

- › TCI Model 6240 RF Processor is a compact modular processor that contains wideband receivers, digitizers, delay memory, digital down converters (DDCs), and realtime signal processing.

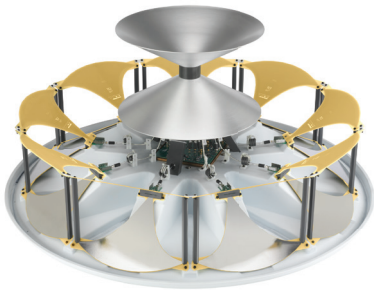
The Model 6240 can be configured with either single or dual-channel HF, single or dual-channel VHF/UHF, or a combination of HF and VHF/UHF channels. Multiple Model 6240s can be used together for increased stare bandwidth.

- › A GPS receiver connects to the RF Processor to provide precision timing and the location data when signals are recorded. A single GPS antenna can be shared among multiple 6240s.
- › The Optional TCI Lookback Storage Array connects to the RF processor to

record and play back wideband IQ data. A unique architecture of high-speed disks, and high-speed connectivity allow data to be read from the disk while writing. Known as Lookback Collection, signals can be extracted from the disk without interrupting wideband recording. The Lookback Storage Array provides high throughput at a reasonable cost. Each standard Lookback Storage Array provides 12TB of storage, or about 15 hours of continuous recording of the full 40 MHz IBW.



> TCI Model 6240 Wideband RF Processor



> TCI 641, V/UHF DF antenna



> TCI Lookback Storage Array



> TCI DF and monitoring system for portable configurations

- > The Blackbird Signal Processing Server performs the signal detection and collection mission, including wideband signal processing, signal detection, realtime signal analysis, automated tasking, and realtime data storage. The server provides the interface to the TCI Blackbird clients, which can reside on the same machine or separate local or remote computers.
- > The TCI Model 850 Blackbird Client workstations run the new NextGen client application, which provides a robust, scalable client/server design that allows local clients to receive high-speed updates, but also allows for remote clients to operate over low-bandwidth networks.
- > Optional TCI omnidirectional antennas: TCI offers a variety of omnidirectional antennas, including full-coverage HF and full-range V/UHF.
- > Optional TCI Wideband DF/Geolocation subsystems: The Model 850 can optionally deploy with a variety of

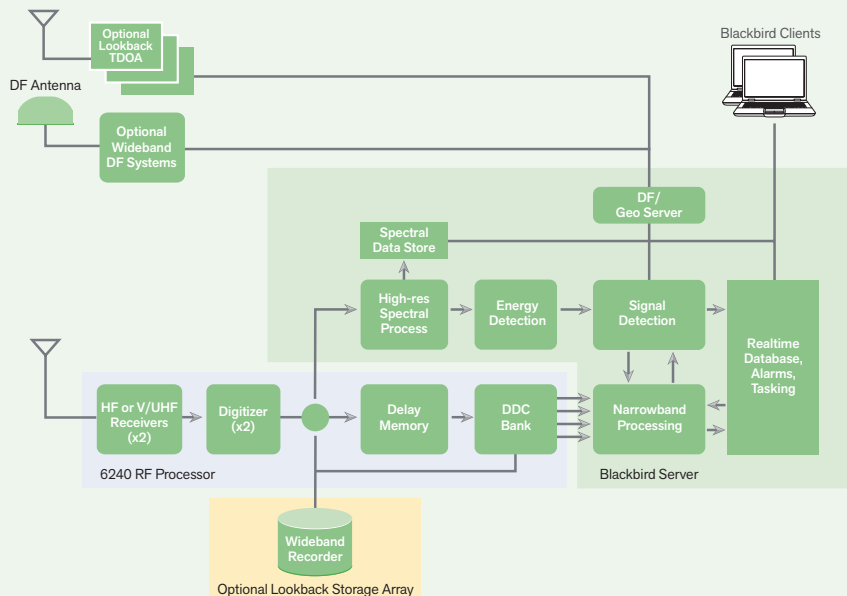
wideband DF/geolocation options from TCI – including HF AOA (Angle of Arrival) DF (with SSL geolocation), VHF/UHF AOA DF to 8 GHz, triangulated AOA geolocation, TDOA (Time Difference of Arrival) geolocation or TCI's unique hybrid AOA/TDOA geolocation.

### Precision HF and V/UHF Front Ends

A quality RF front end must deliver a combination of excellent sensitivity, high dynamic range and speed — and the TCI Model 6240 RF Processor delivers on all counts. Boasting some of the best technical specifications in the business, the TCI RF processor can be configured with single or dual-channel HF, single or dual-channel VHF/UHF, or a combination of HF and VHF/UHF receivers.

The processor's HF receiver provides full HF coverage (9 kHz to 30 MHz) with up to 28 MHz IBW. A bank of HF pre-selectors allows selection of narrower frequency bands with increased rejection of unwanted out-of-band signals.

## TCI 850 Blackbird NextGen Block Diagram



The RF processor's VHF/UHF receiver provides standard coverage from 20 MHz to 3 GHz with optional frequency extension to 8 GHz. The receiver has a maximum IBW of 40 MHz per RF channel (providing up to 80 MHz of instantaneous stare bandwidth for dual-channel configuration). The VHF/UHF receiver contains internal pre-selectors and can operate in a reduced bandwidth mode to maximize dynamic range and increase rejection of unwanted out-of-band signals.

A dual-channel digitizer provides full 16-bit resolution on each RF channel, and the integrated GPS receiver tags the output data with precision timestamps as well as position information.

### Wideband IQ Recording with Lookback Collection

When configured with the optional TCI Lookback Storage Array, the wideband digital data streams are recorded continuously to a RAID disk array. Of course, the recorder provides traditional wideband playback mode (essential for batch post-facto processing of wideband data) but unlike typical wideband recorders, the Lookback Storage Array's unique architecture and high-speed disks also permit data to be read from the disk while writing. This allows extraction of past signal data from the disk without interrupting recording. Known as Lookback Collection, this capability enables users to collect IQ data for any past signal available on the recorder. In addition to providing a data source for automated collection, Lookback Collection provides a collection safety net — ensuring that critical signals of interest can be collected, even if discovered during post-mission analysis.

### High-Resolution Spectral Processing – Frequency and Time

The wideband digital data for each RF channel is sent from the RF processor to the Blackbird server, where it is processed by the high-resolution spectral processing engine. Unlike typical search systems, the TCI RF processor can deliver the data in regular high-speed time intervals. This greatly improves the probability of intercept of short duration signals.

### Spectral Recording

In addition to driving signal detection, the spectral data is saved into the Blackbird NextGen Spectral Data Store where it can be retrieved and sent to clients to provide

historic spectrogram views (known as Lookback Visualization).

To optimize spectrogram transfers, the server resamples and stores the incoming spectrogram data at multiple zoom levels. This ensures smooth scrolling, panning, and zooming for local clients — and makes it possible for remote clients over slow network links to efficiently retrieve past spectrogram views.

### Automated Signal Detection

On every spectral update, Blackbird analyzes the high resolution spectral data and automatically detects and catalogs the individual signal transmissions. For each intercept, the signal's external characteristics are automatically measured including time, frequency, bandwidth, power, and duration. The resulting intercept meta-data is recorded in Blackbird's realtime database where it can be viewed by the user and drive automated tasking.

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### DF First®

When configured with an optional TCI wideband DF subsystem, the Blackbird energy-detection process is augmented with DF information, which is pushed from the DF subsystem to the Blackbird server for all active signals. Known as DF First®, the availability of the angle of arrival for all incoming signals enables manual and automated search by direction — and when configured with multiple DF assets, search by geolocation.

### Multichannel Realtime Signal Collection

Once signals of interest are detected, they can manually or automatically trigger a variety of tasks, including collection and processing of IQ data. To facilitate collection, the RF Processor provides a bank of digital down-converters (DDCs). Each DDC can tune and zoom independently to a specific signal of interest and send the narrowband IQ data to the server for recording and further analysis. A wideband delay memory path preceding the DDC bank allows the DDC to acquire the start of the signal transmission, which compensates for any latency in wideband signal detection processing.

### Automated Classification

Blackbird's Modulation Recognition option provides automated modulation classification for signals of interest. Classification can be initiated manually (via easy right click) using IQ data from the Lookback Collection array, or triggered automatically to use live DDC streams. The modulation classifier automatically determines the signal's modulation characteristics, including:

- > Modulation Type: Analog FM, AM, AM-DSBSC, LSB, USB, CW / pure carrier, BPSK, QPSK, pi/4-DQPSK, 8PSK, 16PSK, binary FSK, MSK, 3FSK, 4FSK, 8FSK, 16QAM, 32QAM, v.29, OOK, 4PAM, Manual Morse, Machine Morse, and Noise (contact factory for additional modulation types.)
- > Symbol Rate
- > Frequency Deviation

The resulting modulation information is appended to the intercept's meta-data record in the realtime database where it can be viewed by the user and drive further automated tasking.

### Smart Recording

Blackbird's Smart Recording feature combines realtime automated modulation classification with IQ recording. Smart Recording buffers the incoming DDC IQ data, while performing automated modulation classification. If a user specified modulation criteria is found, then the signal IQ data is recorded, including the buffered IQ data. This allows capture of first bit collection based on signal modulation characteristics.

### Universal Signal Detection

Blackbird's unique Universal Signal Detection (USD) software option allows operators to quickly and easily create custom signal detectors on the fly without programming. Historically, adding a new custom signal detector to a signal monitoring system requires months of programming effort by highly trained signal analysts and software developers. But with Blackbird's USD option, operators can create a custom signal detector and put it into operation in a matter of minutes. Libraries of user created USD detectors can be created and deployed on Blackbird systems equipped with option USD.

# The Blackbird GUI

## Dashboard

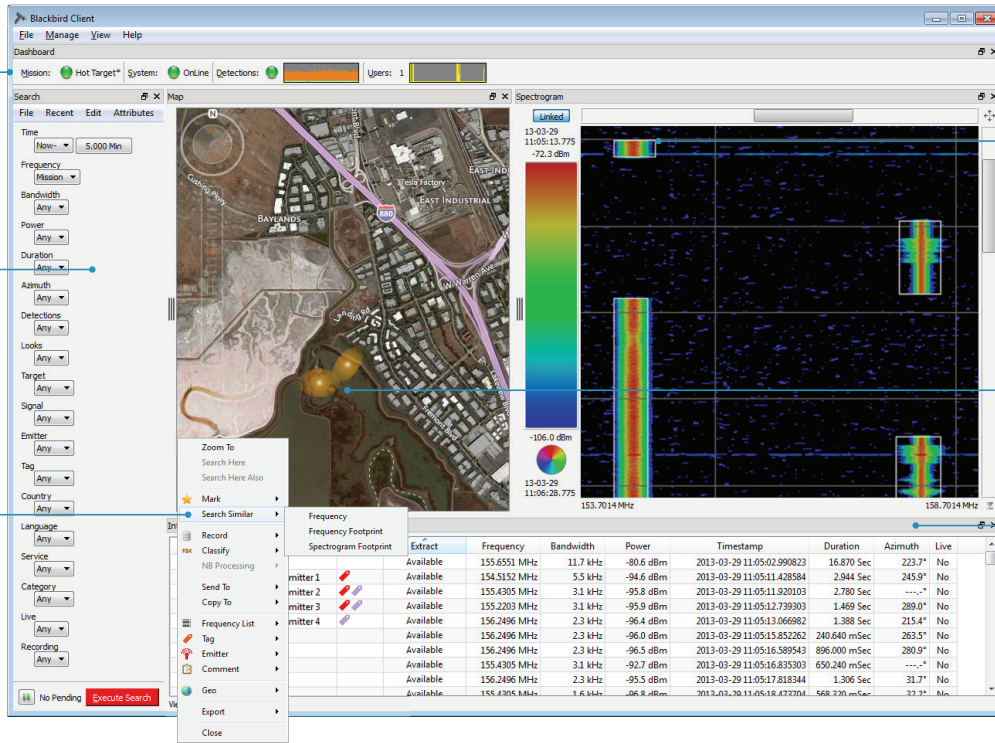
View complete system status at a glance.

## Search Pane

Select desired signal attributes and click Execute Search to launch the search.

## Actions

Right click an intercept in the list, map or spectrogram to instantly access actions such as tagging, analysis and reporting.



## Spectrogram

View search results on spectrogram display. Point at any signal to pop-up the intercept info window. Zoom in / out and scroll back in time to see past signals.

## Map

View search results on intuitive map display.

## List

View search results in list format. Click column heading to select columns and sort.

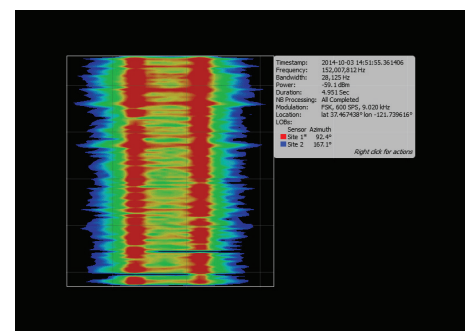


## Redesigned from the Ground Up

The new TCI Blackbird NextGen GUI has been completely reinvented from the ground up to provide the power of Blackbird with push-button simplicity. Since Blackbird is automatically detecting and cataloging all signal activity, the operator can browse all detections or search for specific signals of interest using the integrated list, spectrogram and map displays.

## Point and Shoot Simplicity

The new Blackbird's spectrogram display combines a traditional spectrogram view with an interactive detection database overlay. The unique, semi-transparent overlay shows detected signals from the realtime database. Simply point at any detected signal and a pop-up window shows the metadata for the intercept including any available modulation and DF results. It doesn't get any easier than that!



## Search – Simplified!

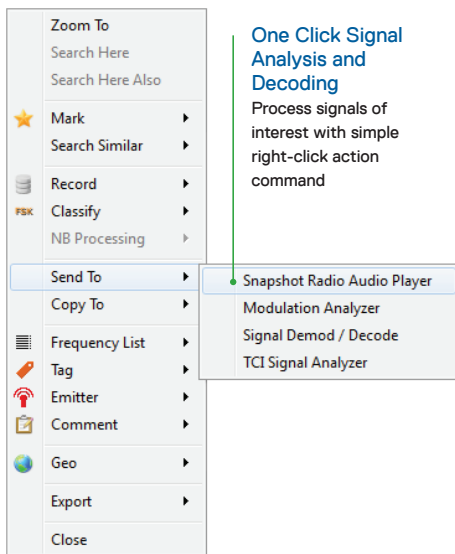
To narrow the displayed results to only specific signals of interest, use Blackbird's easy to use Search pane to select the characteristics of the desired signals of interest. Or simply right click an intercept and use Blackbird's unique new Search Similar function to instantly find similar signals by frequency, spectral footprint or geolocation. No typing required!

## Redefining Search and Visualization

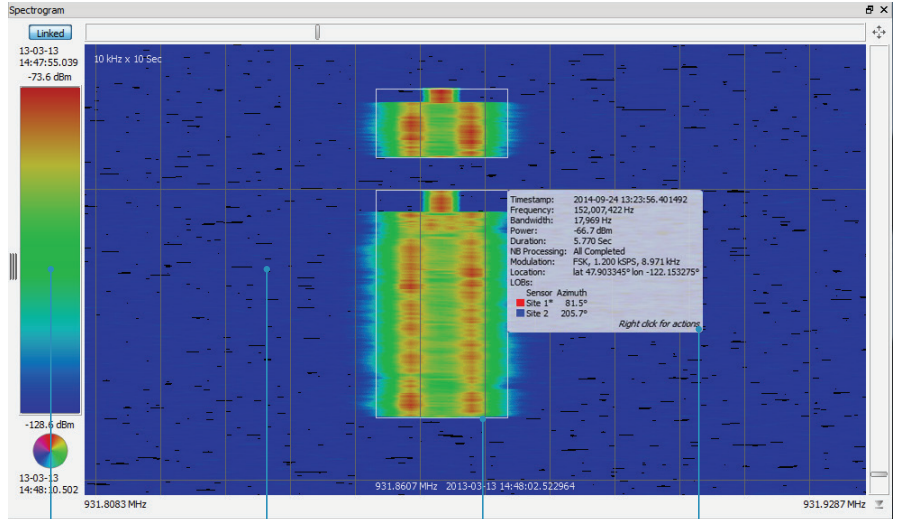
Unlike traditional spectrogram views, the new Blackbird's spectrogram provides a unique, semi-transparent overlay showing the detected signal catalog.

## Take Action

Once signals of interest are found, a simple right click opens the action menu. A variety of actions are available depending on loaded software options, including tagging, recording, Lookback Collection, modulation classification, AOA and TDOA geolocation, and reporting. A "Send-To..." function instantly transfers the signal IQ data to signal analysis and decode tools; and a "Copy-To..." function exports the IQ data to external storage device or archive. The GUI also supports user-added custom actions to extend the analysis capability to instantly provide interoperability with external systems.



**One Click Signal Analysis and Decoding**  
Process signals of interest with simple right-click action command



### Color controls

Spectrogram data can be colored by power, direction or even tag.

### Spectrogram

Full spectrogram data served for live or past data.

### Detection Overlay

Transparent overlay highlights detected signals.

### Pop up Signal Info

Point at any detected signal to pop-up the signal info window. Right click to apply actions to the selected signal.

## Time is on Your Side

Since Blackbird is automatically recording the spectral data along with the signal activity database, the operator can browse or search back in time (hours or even days) and view the past recorded spectral data with the detection database overlay. And since the spectral data is resampled and recorded at multiple zoom levels, zooming and panning with live or recorded spectrograms is fast...lightning fast!

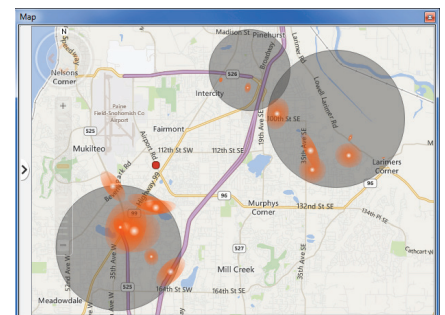
## Lookback Collection

When configured with optional Lookback Collection, you can not only view past signals, but you can collect them as well. Simply browse back in time or search for past signals of interest, then right-click to extract the signal's IQ data from the Lookback Storage Array. The new Lookback Storage Array allows IQ data to be extracted from the wideband recorder without interrupting recording. You'll never again miss a collect for a critical signal of interest.

## Make it Automatic

Blackbird's easy to use Automation facility makes the collection task even easier. Simply click the Automate button after any search and choose your desired auto actions. Blackbird automatically evaluates incoming intercepts against the Automation search criteria. Matching intercepts will trigger automated actions such as operator alerts, tagging, automated modulation classification, realtime or Lookback

recording, Smart Recording (record based on signal modulation criteria), and AOA or TDOA geolocation. Automation tasks can aid online operators with notification and alarms, or used to set up a completely automated search, collection and reporting mission — for unattended operation.



### Search by Geolocation

When configured with TCI's Geolocation option, operators can define areas of interest to search for signals by geolocation.

## Location, Location, Location.

When it comes to direction finding and geolocating signals of interest, TCI is the proven industry leader. And the new Blackbird makes full use of TCI's DF/Geolocation technology, including:

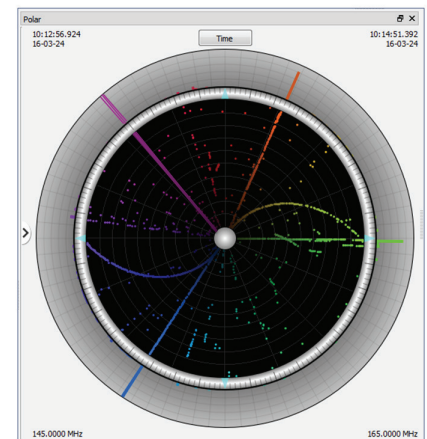
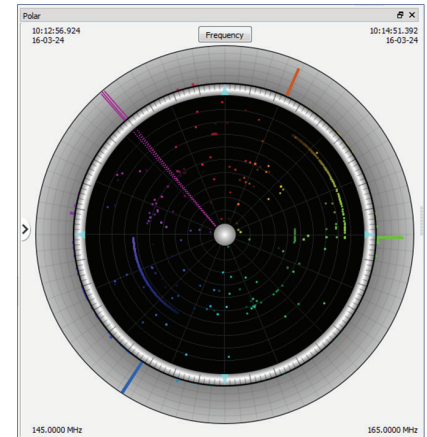
- > **VHF/UHF AOA DF** – TCI's VHF/UHF Angle of Arrival (AOA) DF options provide wideband DF from 20 MHz to 3 GHz, with SHF option up to 8 GHz. Since this is a wideband system, direction is computed for all signals in the scan range and pushed to the Blackbird server. Known as TCI DF First®, this provides DF data for all active signals, enabling Blackbird search by direction and geolocation.
- > **HF DF** – TCI's Wideband HF DF options provide line of bearing and elevation, and can use Single Site Location (SSL) techniques to determine range and geolocate HF transmitters. Again, since this is a wideband system, direction is computed for all signals in the scan range, enabling search by direction.
- > **Triangulated Geolocation** – Multiple AOA DF results are combined to calculate the emitter location. Since the individual AOA sources are wideband systems, geolocation can be performed on multiple simultaneous signals of interest – allowing the new Blackbird to search by geolocation. And since the AOA information is cached in the DF Server, the new Blackbird can go back in time and compute a fix for past signals of interest.
- > **On the move Geolocation** – Moving DF platforms can geolocate transmitters by combining multiple AOA measurements gathered over time. Since the AOA information is pre-calculated with DF First® and stored in the signal database, the new Blackbird can go back in time and compute a fix for a signal of interest collected from multiple locations over time.
- > **TDOA Geolocation** – Leveraging the RF Processor's precision time-stamping, Time Difference of Arrival (TDOA) techniques can be used for precision geolocation of target emitters.

In addition, TCI offers a set of outdoor RF Sensors which can be deployed into a wide area to support distributed monitoring and TDOA geolocation.

- > **Lookback TDOA Geolocation** – When configured with the wideband recording option, precision time-stamped IQ data for past signals can be extracted from the recorder and used for TDOA geolocation. This allows users to perform precision geolocation for past signals of interest.
- > **Hybrid Geolocation** – TCI's unique technology combines AOA and TDOA techniques to achieve precision geolocation with a minimum of TDOA assets. Hybrid TDOA takes advantage of both ground-based or airborne TDOA sensors, including a miniaturized payload for the Boeing/Insitu ScanEagle UAV.



### > Hybrid Geolocation



### > Polar DF Displays

Frequency agile and moving transmitters are easily recognizable on Blackbird's new Polar DF displays.

TCI 645 DF / MONITOR ANTENNA  
CONCEALED IN CARGO CARRIER

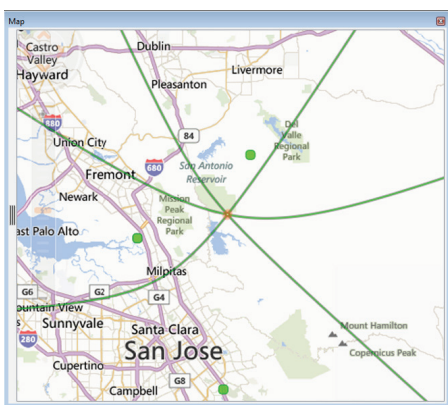
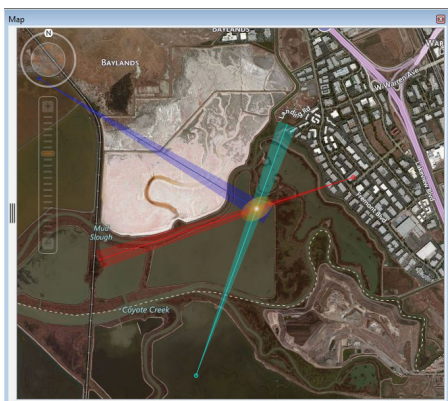
OPERATOR WORKSTATION





## Integrated Mapping

Making the most out of the TCI DF/ Geolocation options, the new Blackbird tightly integrates mapping displays and specialized search by direction/geolocation functions. Operators can zoom and pan the maps with intuitive controls (just like Google Earth) and can choose from satellite, street or terrain views. The new mapping capability makes use of an open industry standard mapping interface, currently providing compatibility with five of the most popular map providers. Custom or user-provided maps can also be supported, either online or from a local map server.



## Intuitive Mapping Displays

The integrated mapping facility displays AOA, TDOA, and Hybrid DF and geolocation results using industry standard map providers or user-supplied maps.

# TCI Model 850 Specifications Overview

## System

### TCI Model 6240 RF Processor

ADC	2-Channels 16-bits per channel 90 dB SFDR
Digital Down-Converter (DDC)	92 Channels
GPS	Internal Receiver
Frequency Reference	OCXO, GPS disciplined
Connectivity	10GbE
Reference Output	10 MHz, GPS disciplined
Mechanical	4U Rackmount
Power	120-240 VAC
Operating Temperature	0° to 50° C
Weight	20 kg typical

### Optional Model 2621 Dual HF Receiver

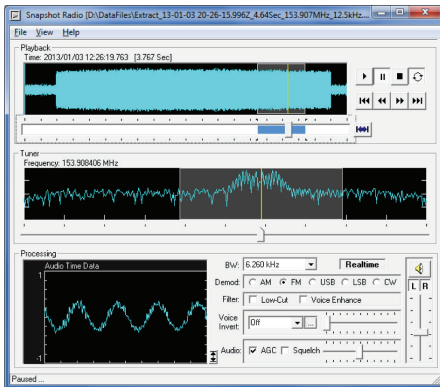
Number of Channels	2
Frequency range	9 kHz to 30 MHz
Receiver in-band dynamic range	>85 dB
Noise Figure	12 dB max
Pre-Selectors	13 bands
Input IP2	+60 dBm typical
Input IP3	+30 dBm typical

### Optional 2614 VHF/UHF Receiver

Frequency Range	20 MHz – 3000 MHz, Optional extension to 8 GHz
Instantaneous Bandwidth	40/4 MHz
Noise Figure	12 dB typical, up to 3 GHz
Pre-Selectors	12 bands
Input IP2	+50 dBm
Input IP3	+16 dBm
In-band Dynamic Range	>85 dB typical (80 dB min.)

## Signal Analysis and Decode Options

Because the new Blackbird builds on a rich legacy and installed base of classic Blackbird systems, it can instantly take advantage of the wide variety of signal analysis tools created over the years for Blackbird. This includes the popular Snapshot Radio audio player, which is now re-branded under the TCI name; and an optional signal analysis and decode package, which offers advanced signal classification and a comprehensive set of HF and VHF/UHF signal decoders (over 200 signal types). The new Blackbird is also compatible with a wide variety of additional third-party signal analysis and decode tools, including popular customer-supplied backend signal processors.



### Notes

<sup>1</sup> Consult factory for specific hardware configurations

<sup>2</sup> See specified datasheet for additional information

<sup>3</sup> See Model 802 and 803 datasheets for DF antenna options

<sup>4</sup> TDOA and Hybrid Geolocation require multiple RF/DF Processors configured with Lookback Recording

<sup>5</sup> Restricted availability, please consult factory

Specifications subject to change without notification.

Export of TCI International, Inc. systems and products may be subject to U.S. export controls. U.S. Export License may be required.

## TCI Model 850 Options

### TCI Model 850 Signals Intelligence System

#### RF Processor Options<sup>1</sup>

HF	HF coverage, 9 kHz to 30 MHz, 28 MHz max IBW
V/UHF	Single channel V/UHF, 20 to 3,000 MHz, 40 MHz max IBW Dual channel V/UHF, 20 to 3,000 MHz, 80 MHz total IBW
HF + V/UHF	Combines HF and single channel V/UHF
SHF	SHF frequency extension for V/UHF (up to 8,000 MHz)
Wideband Recording (WBR-1)	Internal Lookback Storage Array, 1 TB External Lookback Storage Array, 12 TB
Portable	Portable RF Processor (ruggedized, battery operated)
Multi-Processor	Add additional RF Processors for increased stare bandwidth

#### DF/Geolocation Options

HF (Model 802 <sup>2</sup> )	N-Channel Wideband HF DF Subsystem Dual-Channel (commutated) HF DF Subsystem Single-box HF RF-DF Subsystem
V/U/SHF (Model 803 <sup>2</sup> )	Dual-Channel V/U/SHF DF Subsystem Single-box V/U/SHF RF-DF Subsystem
Portable (Model 903S <sup>2</sup> )	Portable V/U/SHF RF-DF Subsystem (ruggedized, battery operated)
DF Antennas <sup>3</sup>	Fixed site, vehicle (including covert), and portable options
TDOA <sup>4</sup>	TDOA / Hybrid Geolocation with Lookback TDOA capability

#### Monitor Antenna Options<sup>2</sup>

Model 640	Omni-directional VHF/UHF Monitoring Antenna, 20 to 3,000 MHz
Model 642	Omni-directional VHF/UHF Monitoring Antenna, 20 to 8,000 MHz
Model 7031	HF Wideband Active Monopole Antenna, 9 kHz to 30 MHz
Model 632F-1	HF Wideband Monopole, 0.3 to 30 MHz
Option 625L	HF Crossed Loop, 0.2 to 30 MHz

#### Blackbird Software Options

MR1	Modulation Recognition
USD	Universal Signal Detection
UVAD	Voice Detection for V/UHF (FM)
HVAD <sup>5</sup>	Voice Detection for HF (SSB)
BCSW-1	Additional Blackbird Client License
SSR	Snapshot Radio Audio File Player

#### Demodulation and Decoding Options

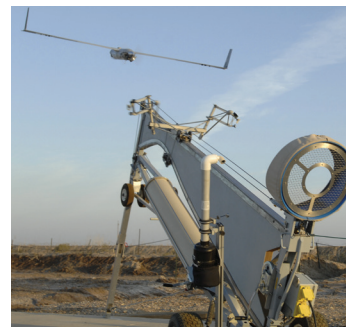
Wavecom (WCODE, WVNBSO, WWBSC, WVBV)	Wavecom Signal Decoding and Analysis
go2DECODE	go2DECODE Signal Decoding and Analysis
Other	Consult factory for additional signal decoding and analysis packages

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## Custom Integrated Solutions

TCI's contribution does not stop at the box level. TCI's Special Programs Group is dedicated to tailoring COTS products to provide fully integrated and customized solutions. This includes everything from a few custom reports or training, to a fully integrated turnkey collection site.



# Enabling Partners to Master the Spectrum

TCI International, Inc. is a global supplier of turnkey solutions for Communications Intelligence (COMINT), ITU-compliant spectrum monitoring & management, direction finding and geolocation, and antennas for communications and high-power radio broadcasting. TCI systems and solutions have been delivered to national defense departments, intelligence agencies, law enforcement bureaus, and spectrum regulators in more than 100 countries.

With advanced spectrum mapping, analytics, data recording, and precision geolocation technology, TCI systems provide solutions for force protection, border security, radio signals intelligence, communication traffic monitoring, and regulatory compliance.

For over 50 years, TCI's technical developments and engineering expertise have earned it a reputation for excellence and innovation supporting an array of customers whose missions depend on having a clear picture of their electromagnetic environment.

Based in Fremont, California, TCI is a wholly-owned subsidiary of SPX Corporation (NYSE: SPXC), a diversified, global supplier of highly-engineered systems for detection & measurement, and products for environmental control. With employees in over 15 countries, SPX team members collaborate across borders and business segments to deliver greater efficiencies and better ideas that help our customers succeed.

TCI delivers specialized expertise in a global family. Learn more about TCI at [www.tcibr.com](http://www.tcibr.com), and SPX at [www.spx.com](http://www.spx.com).

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