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BlackSWIFT™ COMINT Platform

Models 953, 955, 957

The BlackSWIFT™ COMINT platform is TCI's next generation solution for tactical COMINT applications running TCI's Blackbird RF signal acquisition, direction finding (DF), geolocation and processing software.

BlackSWIFT is modular and scalable and is provided in three different base models with a high degree of customization to maximize CONOPS flexibility. BlackSWIFT leverages TCI's 50+ years' RF experience and improves on the current 900-series COMINT platform, providing 80 MHz wide Instantaneous Bandwidth (IBW), faster DF and monitoring scan rates, lower SWaP, ruggedized rack mount and IP67 man portable configurations to optimize deployment capabilities.

Wideband Scan & Simultaneous DF

BlackSWIFT searches, detects, intercepts, collects and locates sources of RF energy and simultaneously DFs all signals in the bands of interest using fast-stepping wideband receivers combined with DSP-based frequency channelization.

Signal Detection and DF

Interlinked fast scanning detection/DF displays combined with powerful signal isolation capabilities enable realtime and post-mission detection and DF of modern signals, including frequency-agile signals.

KEY FEATURES

- **9 kHz to 8.5 GHz base frequency range with extensions to 40 GHz**
- **Multi-channel correlative interferometry AOA DF, TDOA and hybrid AOA/TDOA geolocation**
- **10, 20, 40 and 80 MHz Instantaneous Bandwidths (selectable)**
- **16 or 128 DDCs programmable from 78 Hz to 20 MHz bandwidth**
- **Streaming of 16- and 32-bit I/Q data**

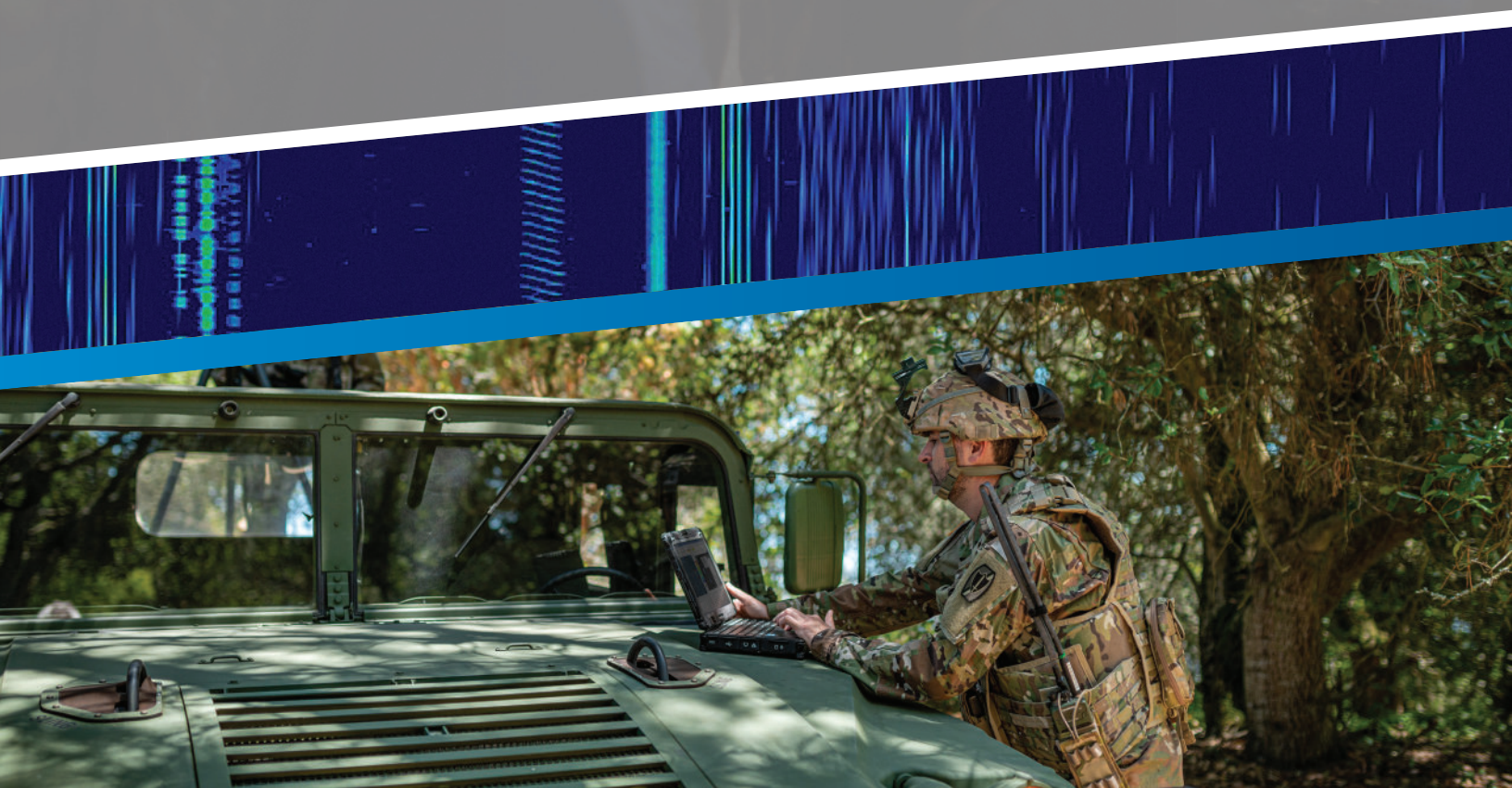
Intercept, locate, identify, and process RF signals with fully integrated solutions.

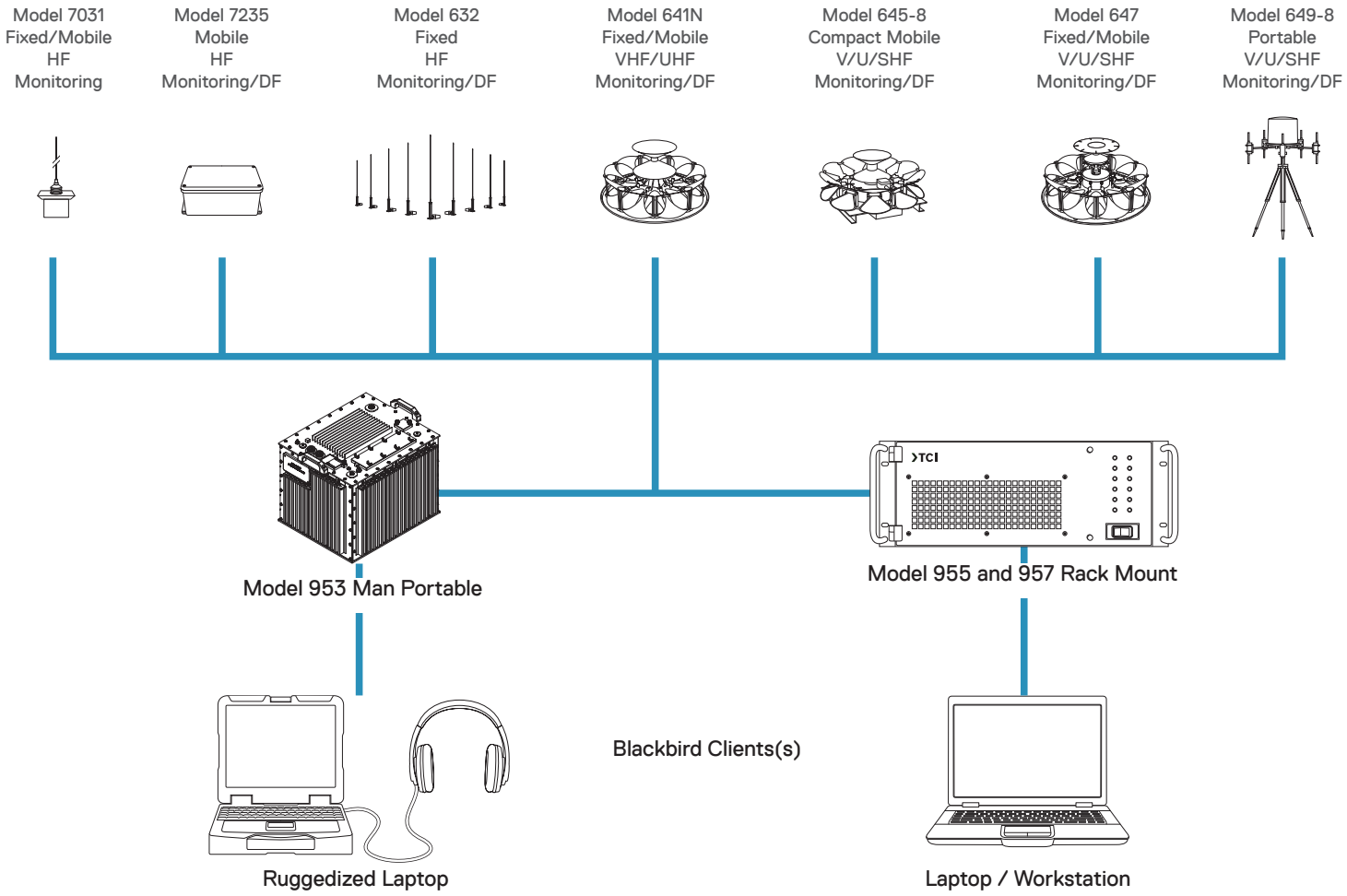
KEY OPERATIONAL FEATURES

- Supports Hybrid AOA/TDOA geolocation.
- Performs continuous, unmanned, remote, realtime signal collection.
- Low size, weight, and power (SWaP) enable flexible deployment options.
- Built-in-self-test provides remote system status and troubleshooting.
- Capable of operating over low-bandwidth and intermittent networks.
- Supports realtime and scheduled tasking.
- Supports multiple users working simultaneous tasks.
- Easy operation using client-server architecture with built-in networking capability.
- Fully interoperable with all TCI 800 and 900-series COMINT systems.
- Built-in-self-test (BIST).
- SSD Zeroize function, removable SSDs.

KEY TECHNICAL FEATURES

- 9 kHz to 8.5 GHz base frequency range with extensions to 40 GHz.
- Multi-channel correlative interferometry AOA DF, TDOA and hybrid AOA/TDOA geolocation.
- 10, 20, 40 and 80 MHz instantaneous bandwidths provides high scanning rates and operation in diverse RF environments.
- I/Q data capture and data streaming (narrowband and wideband).
- Six RF inputs (options for more).
- Internal Automatic Gain Control (AGC) and Manual Gain Control.
- LAN interface supports local and remote control and data output.
- Rugged IP67 enclosure for outdoor deployment (Model 953) and ruggedized rack mount (Models 955 and 957).



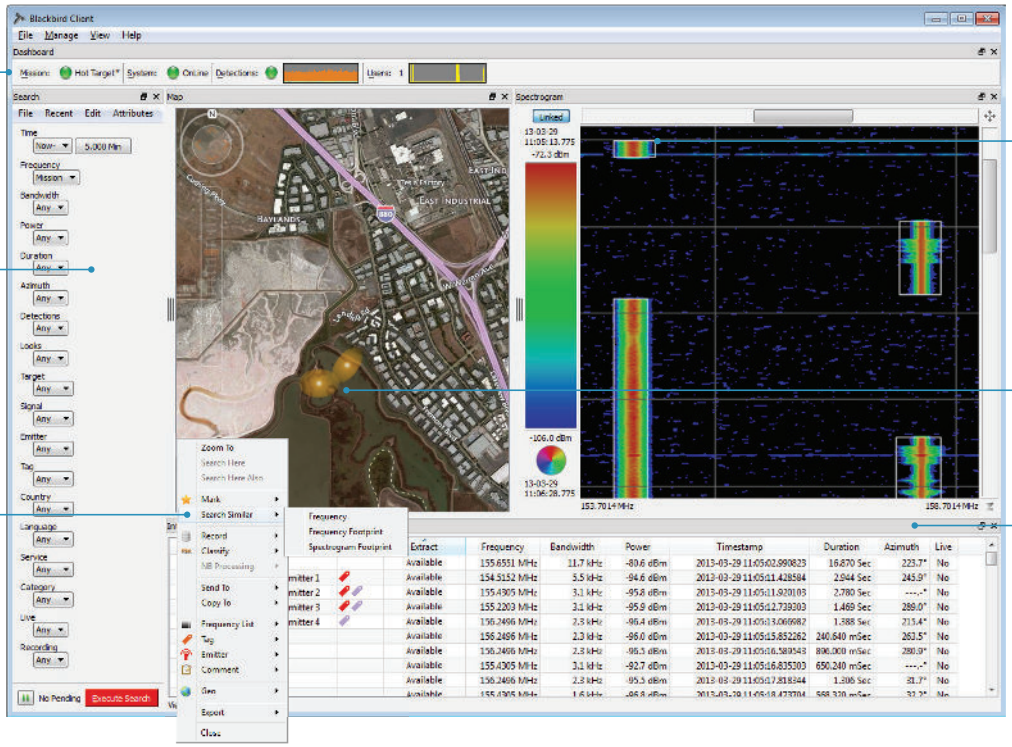

Model 7031
Fixed/Mobile
HF
Monitoring
Model 7235
Mobile
HF
Monitoring/DF
Model 632
Fixed
HF
Monitoring/DF
Model 641N
Fixed/Mobile
VHF/UHF
Monitoring/DF
Model 645-8
Compact Mobile
V/U/SHF
Monitoring/DF
Model 647
Fixed/Mobile
V/U/SHF
Monitoring/DF
Model 649-8
Portable
V/U/SHF
Monitoring/DF
TCI
Model 953 Man Portable
Model 955 and 957 Rack Mount
Blackbird Clients(s)
Ruggedized Laptop
Laptop / Workstation

The Blackbird GUI

Dashboard
View complete system status at a glance.

Search Pane
Select desired signal attributes abnd 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.

Easy to Use

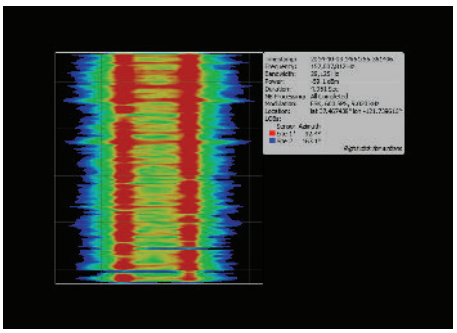
The TCI Blackbird GUI provides the power of Blackbird with push-button simplicity. Blackbird is automatically detecting and cataloging all signal activity, enabling the operator to browse all detections or search for specific signals of interest using the integrated list, spectrogram and map displays.

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!

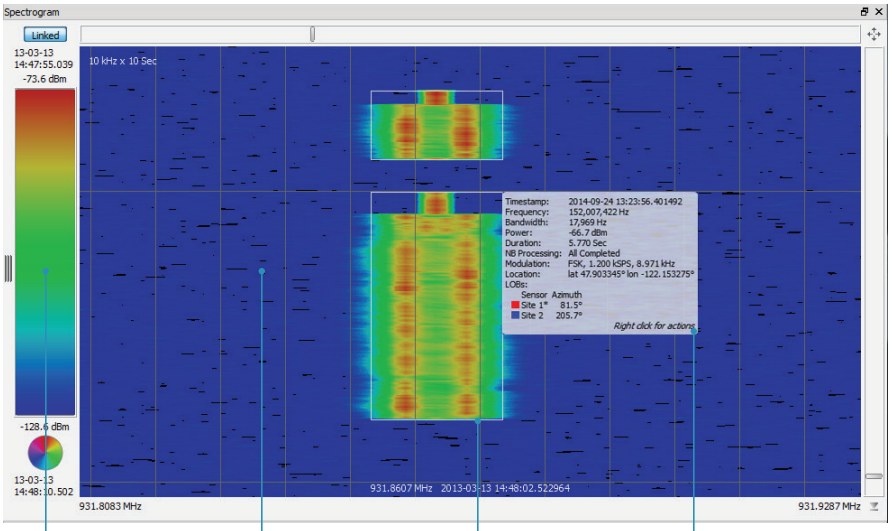


Redefining Search and Visualization

Unlike traditional spectrograms, Blackbird's implementation 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 I/Q data to signal analysis and decode tools; and a “Copy-To...” function exports the I/Q 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.

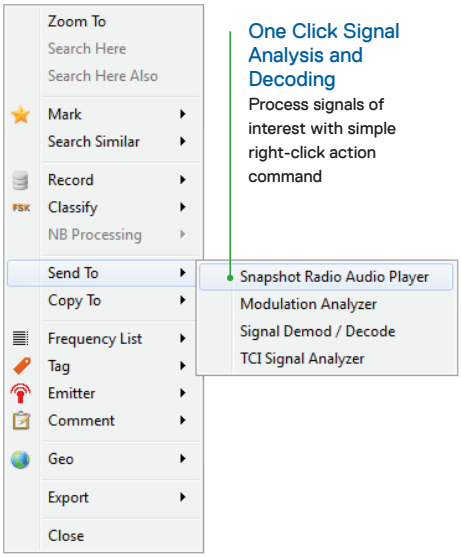


Color controls
Spectrogram data can be colored by power, direction or even tag.

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.



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

Time is on Your Side

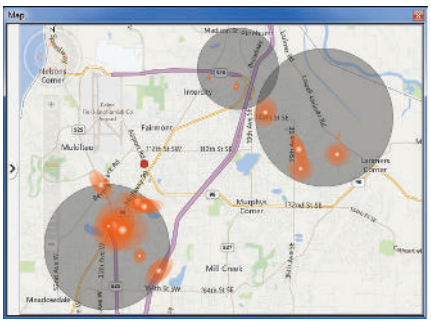
Since Blackbird is automatically recording the spectral data along with the signal activity database, the operator can browse or search back in time (hours or even days) and view the past recorded spectral data with the detection database overlay. And since the spectral data is resampled and recorded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

Lookback Collection

With Lookback Collection, you can view past signals and collect them as well. Simply browse back in time or search for past signals of interest, then right-click to extract the signal’s I/Q data from the built-in Lookback Storage Array. The Lookback Storage Array allows I/Q data to be extracted from the wideband recorder without interrupting recording. You will 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.

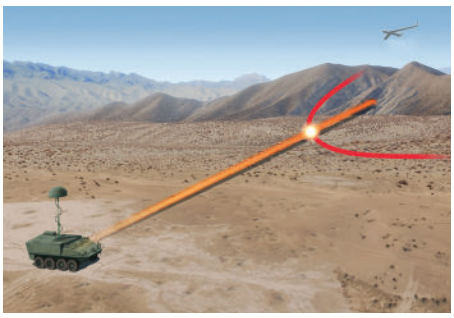


Search by Geolocation
When configured with TCI’s Geolocation option, operators can define areas of interest to search for signals by geolocation.

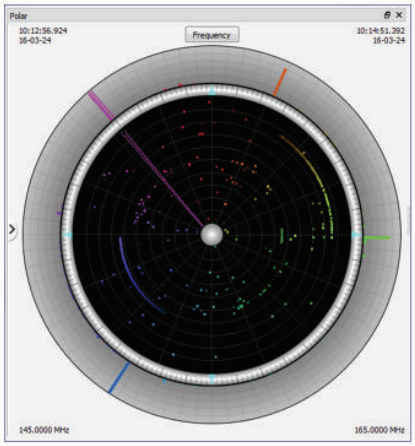
Location, Location, Location.

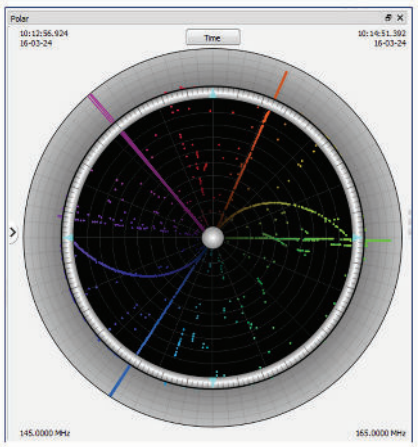
When it comes to direction finding and geolocating signals of interest, TCI is the proven industry leader. And the new Blackbird makes full use of TCI's DF/Geolocation technology, including:

- **VHF/UHF AOA DF** – TCI's VHF/UHF Angle of Arrival (AOA) DF provides wideband DF from 20 MHz to 8.5 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.
- **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** – With TCI's Lookback TDOA Geolocation feature, precision time-stamped I/Q 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.

Integrated Mapping

Making the most out of the TCI DF/Geolocation capabilities, TCI's Blackbird tightly integrates mapping displays and specialized search by direction/geolocation functions. Operators can zoom and pan with intuitive controls (just like Google Earth) and can choose from satellite, street or terrain views. This capability makes use of an open industry standard interface and provides 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.

BlackSWIFT Platform Specifications Overview

General Receiver Specifications – all Models	
Frequency Range	9 kHz to 8.5 GHz (downconverter options support up to 40 GHz)
Instantaneous Bandwidths	10, 20, 40, 80 MHz (selectable)
Noise Figure	12 dB typical
Input 3rd Order Intercept Point (out-of-band)	15 dBm typical in urban mode 30 dBm typical in congested mode
Phase Noise	-110 dBc/Hz @ 10 kHz offset, typical
Tuning Speed	1 millisecond typical
Gain Control	>120 dB
Tuning Resolution	1 Hz
A/D Resolution	16 Bits
Client Digital Interface	1 GbE
Timing Reference (1PPS Accuracy)	GPS+GLONASS Disciplined
Time Stamp Accuracy	50 nsec typical

Model Specifications	953	955	957
Number Receivers & DSPs	2	2	4
Number of DDC Channels	16	128	128
DDC Bandwidths	Max: 20 MHz, Min: 78kHz (74 rates)		
I/Q Resolution (bits)	16 / 32	16 / 32	16 / 32
Network Interfaces	2 x 1 GbE	2 x 10 GbE	2 x 10 GbE
I/Q Recording On-Board Storage (TB)	2TB	2TB	2TB
Form Factor	IP67	Rack Mount	Rack Mount
Size (cm)	42 x 35.5 x 35	2U	4U
Weight (kg)	20	20	22
Electrical Power	Battery, DC, AC, 200W (300W when charging batteries)	110 – 240 VAC, (50/60 Hz), 150W	110 – 240 VAC, (50/60 Hz), 200W
Battery Life	5 Hours	N/A	N/A

Direction Finding	
DF Method	Multi-channel — Correlative Interferometry (V/UHF), Optional HF Interferometry or Watson-Watt
DF Accuracy	0.1° RMS (instrument accuracy) 2 - 5° RMS typical, 1° RMS in scatter-free environment (Antenna specific)
DF Resolution	0.1°

Environmental			
Operational Temperature (°C)	-20 to 50	-20 to 35	-20 to 35
Operational Humidity (%)	0 - 100%	40 to 60%	40 to 60%
Shock and Vibration	MIL-STD-810G	MIL-STD-810G	MIL-STD-810G

Signal Processing Options	
MR1	Modulation Recognition for Server
USD	Universal Signal Detection
UVAD	Voice Detection for V/UHF (FM)
SSR	Snapshot Radio Audio File Player
Demodulation and Decoding	Consult Factory for Options

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Enabling Partners to Master the Spectrum

TCI's diverse hardware and software engineering capabilities provide field-proven COMINT solutions for force protection, border security, intelligence gathering, and communications traffic for military, intelligence and law enforcement agencies globally. TCI's COMINT, Spectrum Monitoring & Management, and Broadcast Antenna products have been delivered to more than 100 countries. Learn more at www.tcibr.com.

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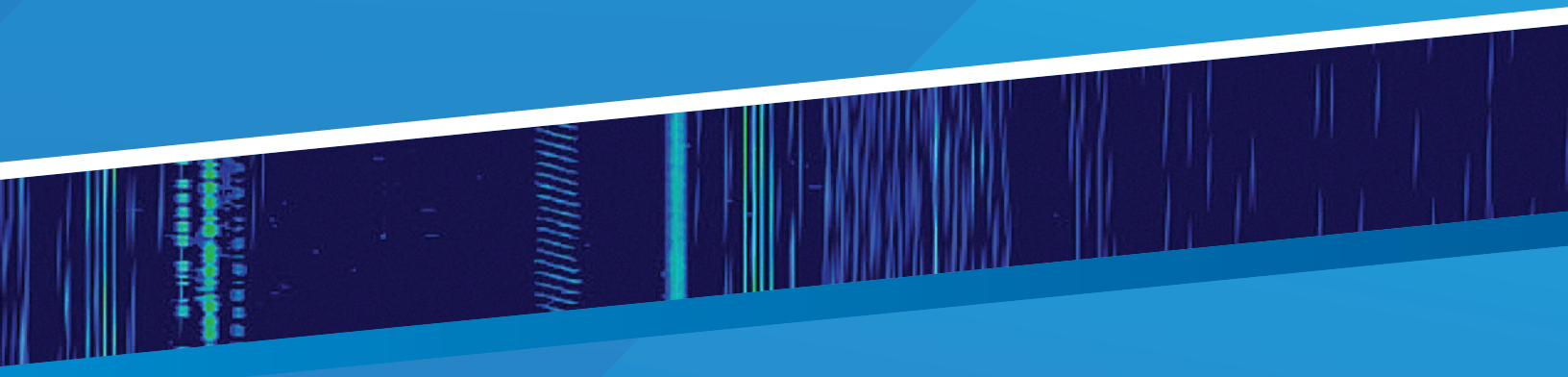

TCI INTERNATIONAL , INC .
3541 Gateway Blvd.
Fremont, CA 94538-6585 USA

TEL: 1-510-687-6100
USA: 1-800-824-8074
FAX: 1-510-687-6101
www.tcibr.com