About COTSWORKS

COTSWORKS, INC. is an innovative manufacturer of rugged optical components and subsystems for harsh environment networking and sensing applications.

Commercial OR Custom-Off-The-Shelf components are integrated across multiple engineering disciplines to WORK in the most consistent, highest quality, performance, and cost-effective process and configurations.

Optical Transceivers, Simplex and Complex Cables, and Test Equipment are designed for Commercial and Military Aerospace, Military Tactical, Industrial & Energy, Rugged Networking and Sensor markets.

AS9100, ISO 9001, and ATEX certified, founded in 2006, with 100+ employees in North America, Europe, and representatives in Asia and Middle East. Privately funded with investment from Industry leaders.
Markets and Product Application

- Reduces data wire weight by up to 70%
- Increases network bandwidth and enables multiple protocols on one fiber
- Enables powerful edge computing network architectures
- Reduces EMI concerns in composite airframes vs copper wire

Applications:
- Flight Deck Displays
- In-Flight Entertainment and Cabin Crew Interfaces
- Electronic Warfare
- Radar Systems
- Flight Recorders
- Heads Up and Down Displays
- Storage Devices
- Cameras
- Towed Array Networking

APPLICATIONS

FIBER NETWORK ADVANTAGES

COMMERCIAL AEROSPACE

MILITARY AEROSPACE

TACTICAL VEHICLES

SUB SEA
Elemental Product Platforms

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Opto-Electronic Platform

RJ 1-10G (2 Channel, Dual TX/RX or Duplex, SX, SR, LX, LR, LR4)

RJ-28G (2 Channel, Duplex, possible Dual TX/Rx), SR, SWDM

RJ-10G-CWDM/DWDM (2 Channel Duplex External Modulation), CWDM, DWDM

RCP™ 1-10G (4 Channel, Quad TX/RX or Dual Duplex)
- MM or SM, SWDM or LR4

Essential™ 1-28G (2 Channel, Duplex, TX or RX, LR4 Bi-Di), SWDM or LR4

QSFP 1, 10, 40 or 100G (8 Channel TX or RX, Quad Duplex)

SFF 100M-4G 2 channel Dual TX/RX or Duplex

SFB 1-3G 1 channel, Bi-Di TX and RX)

Ethernet, Fibre Channel, SDI, HDMI, A818, SFPDP protocol support

COTSWORKS ships 100,000 channels/year into Boeing and Airbus commercial aircraft and many USA and EMEA warfighters, transports, rotorcraft, and radar/sonar systems worldwide.

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Interconnect Platform

- LC-T™: All metal body, robust metal clip, no tools needed, high pull force.
- LC-R™: 1.25 mm ferrule with metal screw based latching system. Comes with locking termini & screw kits.
- Lightly™: ARINC 801 innovation to simplify installation. No FOD risks: Built-in insertion/removal tool on back-end.
- POF M29504: Plastic Optical Fiber terminus designed to accept single core 1000µm plastic fiber. MIL-PRF-29504 style.
- C-Beam™: Pin and socket style optical terminus pair with replaceable hood and lens feature.
- LC-T801™/LC-801™: Converts LC receptacles to ARINC 801 receptacles.

COTSWORKS develops its own rugged termini for use with our transceivers or in-line networks in vehicles.

- COTSWORKS manufactures simplex and complex fiber optic cable assemblies using the highest quality materials and processes available.
- Terminated, rugged fiber cables with Military or Commercial Aerospace grade termini and connectors are made to meet and exceed industry certifications.

CONNECTORS
- D38999
- Micro D38999
- EN4165
- EN4694
- GPRB/EPXB
- ARINC 600
- TFOCA
- M28876
- M83526
- MPO
- SMA
- Expanded Beam

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Optical Transceivers

• Better Tx, Rx values
• Wide temperature operation
• Meet Mil/Aero environmental
• Vertically integrated supply of transmitters and receivers
• COTSWORKS’ Firmware: Better control, features, security across platform

Optical Fiber Cables

• Better IL and RL
• Inspected endfaces
• Termini and connectors from major OEMs on same cable
• Internal teams create drawings and build to industry standards or customer needs
• COTSWORKS’ termini adds value in features, usability

Transceivers and cables can be tested with COTSWORKS’ automated test equipment
The (OIT) Platform can be integrated into a production line to test and validate the performance of the optical link while under data or environmental stress testing:

- 2, 4, 12, or 36 port configurations in standard 19" rack
- User specified port operation, function and performance
- Modular internal design allows reduces cost, support time
- Built-in cable calibration tool reduces optical fiber referencing
- API commands for Python and other scripting
- Dedicated interface port for PC monitor and control
- Web server enables software control of hardware functions

COTSWORKS test boards are ideal for testing and troubleshooting optical transceivers. They can be modified into Interposer Boards routing the electrical signals from COTSWORKS' transceivers to an existing PCB:

- SMA electrical interfaces
- Clampdown feature available on all boards
- Spring header receptacles for fast and easy transceiver mounting
- Convenient test points for DDMI interface
- Easy to read LED indicators for visual function verification
- Easy access signal detect test points
- Easy access TX Disable D.I.P. switches
Optical Sub-Assembly Platform

- **ISO 7, Class 10,000 Cleanroom** houses optical alignment, encapsulation, test equipment capable of producing OSAs operating at 100M to 28Gbps.

- **Process Capabilities:** Burn-in, active alignment and capping, curing, performance testing, harsh-environment reliability testing, visual and optical inspection.

- **Next Generation Process Capabilities:** Die attach, fiber metallization, micro-welding, wire bonding, TO-can welding, mechanical test, and hermeticity test.

- **Design Engineering:** Optical paths including lens creation, selection, forming, silicon bench, chip on board taking light from a solid-state semiconductor to precise fiber coupling.

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**TOSA**
Transmitter Optical Sub-Assembly

- 980nm, SWDM, CWDM4, LR4, CWDM, DWDM

**ROSA**
Receiver Optical Sub-Assembly

- 980nm, SWDM, CWDM4, LR4, CWDM, DWDM

**BOSA**
Bi-Directional Optical Sub-Assembly

- 1310nm/1310nm, 1270nm, 1310nm, 1330nm, 1490nm, 1550nm
# Product Features

## COTSWORKS® vs COTS (Commercial-Off-The-Shelf)

<table>
<thead>
<tr>
<th>Feature</th>
<th>COTSWORKS®</th>
<th>COTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>-40°C to +100°C, shock, vibration, humidity, and thermal cycling</td>
<td>-20°C to 70°C usually, some extended temp.</td>
</tr>
<tr>
<td>Solder or screw mount</td>
<td>Solder or screw mount harsh environment electrical with Mil/Aero fiber termini</td>
<td>Limited use card edges, quick releases, plastic tabs</td>
</tr>
<tr>
<td>Configuration management</td>
<td>Configuration management with engineered solutions</td>
<td>Standards based, Off the Shelf</td>
</tr>
<tr>
<td>RoHS</td>
<td>RoHS 5/6 or 6/6, conformal coating, epoxy staking, and more</td>
<td>RoHS 6/6, no-clean flux, no conformal coatings</td>
</tr>
<tr>
<td>Level 1, Level 2, Level 3L, Level 3H</td>
<td>Operational Performance</td>
<td></td>
</tr>
<tr>
<td>Level 1, Level 2, Level 3L, Level 3H</td>
<td>Relative Humidity</td>
<td>Not always specified, common office environment</td>
</tr>
<tr>
<td>Level 1, Level 2, Level 3L, Level 3H</td>
<td>Shock</td>
<td>Not Applicable or tested</td>
</tr>
<tr>
<td>Level 1, Level 2, Level 3L, Level 3H</td>
<td>Functional Vibration</td>
<td>Not Applicable or tested</td>
</tr>
<tr>
<td>Level 1, Level 2, Level 3L, Level 3H</td>
<td>Part # Ordering Options</td>
<td>Commercial configurations, stocking items</td>
</tr>
<tr>
<td>Level 1, Level 2, Level 3L, Level 3H</td>
<td>Operating Temperature</td>
<td>0 to 70°C</td>
</tr>
</tbody>
</table>
Company vs. Industry Standards

**COTSWORKS**© 2024 | COTS (Commercial-Off-The-Shelf)

**Design Goals**
- Tight opto- and electromechanical parameters
- Industry standards, wide tolerances

**Platform Lifecycle**
- 3-5 year design cycle with longer term support
- 18-36 month use and short EOL term

**Market Focus**
- Highly controlled geographical supply chain with vendor reviews
- Commercial use and data/telecom standards based

**Datasheet Detail**
- Comprehensive literature with more parameters than standard
- Industry Standard high level without all OE interfaces and timing defined

**Customer Support**
- Email, advanced web, phone, on-site engineering interaction
- Automated responses, references to constantly changing MSAs

**Export Requirements**
- ITAR compliant with advanced cybersecurity compliance
- Open market use, unrestricted/reviewed firmware
Road to 100Gbps and Beyond

Reliable lasers at 25Gbps or 50Gbps over temp. to get to 100 or 200Gbps means parallel architecture or Wave Division Multiplexing

**Parallel**
- 4, 8, or 12 channels, one controller chip, Multimode only, complex structures
- MT Connector, ribbon fiber, IEC commercial standardized
- Higher aggregate data rates with potentially lower link budget
- Smaller packages than pluggables and high-density electrical interconnect

**WDM**
- Two channels on single fiber or up to 16 channels for single or duplex fiber runs
- M29504, ARINC 801, or LC, simplex or duplex, Military, Commercial standardized
- Very high link budget, Single or Multimode fiber with optical muxes
- Using Mil spec fiber also enables highspeed through slip rings
2024 Product Roadmap

Q1 2024
- Opto-Electronic
  - SFP+10G-LR/SR
  - QSFP 28G
- Interconnect
  - SpliceWORKS (Rugged Mechanical Splice)
  - Potted Pluggable Assemblies
- Optical Sub-Assembly
  - Custom
  - SWDM TOSA 28G
- Test
  - OIT Platform
  - Interposer Boards

Q2 2024
- Interconnect
  - ESL-10G-TX2/RX2
  - ESL-10G-DX
  - SFB-G-BX10
- Optical Sub-Assembly
  - POF-M29504
  - Lightly
- Test
  - OIT Platform Upgrade 1

Q3 2024
- Opto-Electronic
  - ESL-28G-SR
  - Parallel: Option 1
  - RCP-10G-LR-TX/RX/DX
  - RCP-28G
- Interconnect
  - Rugged Test Probe
  - Potted Rugged Connectors
- Optical Sub-Assembly
  - 850 PIN ROSA 5pins
  - 1310 DFB TOSA
- Test
  - OptoCube Upgrade 10G

Q4 2024
- Opto-Electronic
  - ESL-10G-BiDi
  - SFS
  - Parallel: Option 2
- Interconnect
  - Mechanical Splice Field Kits
  - Expanded Beam MT Cable Assembly
- Optical Sub-Assembly
- Test

For more information about COTSWORKS products, please contact our sales support team.

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Facility Overview

- ISO 9001:2015, AS9100:D, JEDEC and IEC certified products
- State of the art with modern power and services for secure operation
- In-house failure analysis rework and repair capabilities
- Production test racks include automated BERTs, optical & electrical scopes, spectrum & protocol analyzers, power meters, light sources with NATA/NIST traceability, high resolution OTDRs, advanced imaging systems, mechanical property analysis, and more

Transceiver Production

- Opto-electronic assembly/test/rework stations: industry leading manufacturer equipment & custom-built stations
- All test data is recorded and readily retrievable by barcode
- All parts tracked by serial ID, lot #, technician, and linked to customer from PO to shipment
- Shipment specific test data and certificates of conformance provided with every delivery

Simplex & Complex Cabling

- SIMPLEX and COMPLEX cable design/fabrication/state of the art test of optical & hybrid assemblies
- Terminates/polishes to customer specified or industry standards: every cable/termini are inspected visually & with an interferometer ensuring they meet or exceed specifications
- IL test data provided with every cable. Screen shots of test measurements available upon request

FORCE

- Fiber Optic Research Center of Excellence (FORCE) packages optical ICs utilizing optical bench design, submounts, enclosures, fiber guides unique packages, optical filters and more
- Lens design, light path analysis, splitter/combiner, laser diode package, and fiber ferrule design
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- **Marc Simms**
  Rex Radabaugh

COTSWORKS’ Manufacturer Representative and Resellers

AIR FRAME

MID-ATLANTIC & CENTRAL SOUTHERN USA
ITALY | SPAIN | PORTUGAL
NORWAY | ISRAEL
CHINA | SOUTH KOREA | JAPAN
COTSWORKS, INC. is an innovative designer, developer and manufacturer of fiber optic transceivers, cables, complex cable assemblies, and optical test equipment for aerospace, defense, oil and gas, and other rugged industrial environments.

Commercial-Off-The-Shelf components are integrated across multiple engineering disciplines to work in the most consistent and highest quality, performance, and cost-effective ways.

Our products are designed for commercial and military aerospace, military tactical, industrial & energy, rugged networking & sensor markets.
Company Information

Quality System:
ISO 9001:2015 + AS9100:D CERT-0136100
ATEX Compliant, OP IS
S20.20 ESD program
J Standard electronic parts work
Compliant to FAR 52.204-2, DFARS 252:204-7012
NIST 800-171 Compliance in process

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