Arxlight 96410 - Fortified IP-Phone

Confidential - Partners and customers only

Arxlight
Technology fortified to last

Arxlight™ 96410 is a fortified IP-Phone based on Cisco 8800, designed to meet legacy MIL-STD specifications, as well as future demands for higher level of EMP protection, climate demands and system functionality, in one modular chassis. Arxlight™ 96410 can be adapted for a wide range of optional features, based on customer needs tailored for different parts of the world.

Arxlight™ 96410 is designed to follow the very successful history of POTS (Plain Ordinary Telephone Service) over copper loops that has been in reliable operation with one common standard for over 70 years with up to 99.999% availability. Tell us what you need and Arxlight™ products will adapt.

One standard and modular chassis

Arxlight™ 96410 is built on one standard and modular chassis that simplifies long term maintenance, logistics and spare parts availability for decades ahead.

This offers superior TCO (Total Cost of Ownership) by future reuse of expensive fortifications in one basic chassis, when assets must be modified to increase system functionality and improve protection.

Following Cisco 8800 models are available in Arxlight™ 96410 basic chassis excluding Bluetooth and WiFi features that are disabled for EMI and security reasons:

Cisco model:	Arxlight™	Cisco model:	Arxlight™
8841 - Basic	96412	8845 - Video	96415
8851 - USB & KEM (2)	96414	8865 - Video, USB and KEM (3)	96416

Basic chassis includes all standard Cisco 8800 features

Arxlight™ 96410 basic chassis includes all Cisco 8800 standard features in a fortified chassis that is designed to meet high level of mechanical protection, including relevant parts of MIL-STD-810G with for example:

- 507.5 - Humidity
- 512.5 - Immersion
- 513.6 - Acceleration
- 514.6 - Vibration in ground vehicle
- 516.6 - Shock 20G/11ms
- 528 - Mechanical vibrations of shipboard equipm.

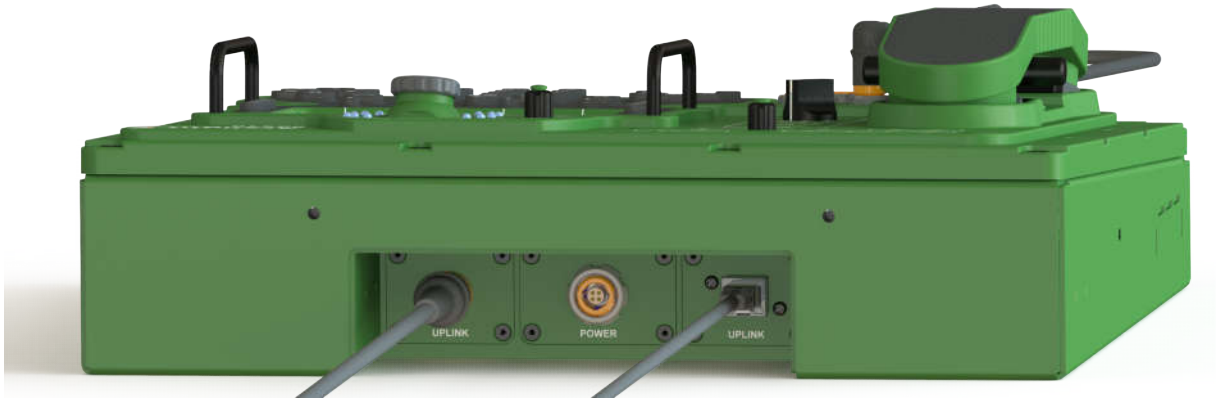
Basic chassis can be used "as is" on desktop, or in fixed installation with standard VESA 200 wall mount adapter, and/or panel mount by 6 x M5 screws from all sides, according to the following picture:

All Cisco 8800 controls with display, dial buttons, and operational connectors like Handset, Headset and USB (only 96414 and 96416) are placed on the front panel, to insure easy integration in command panels, ground vehicles, naval ships and airplanes.

Handset is mechanically locked to basic chassis with release lever on either side, for both left- and right-hand operation.

For sub zero operation down to -30 degrees, all buttons are designed to be operated with gloves. Handset parts that might come in direct contact with ear or face skin is covered with rubber to minimize risk for freezing injuries to users.

External connectors with cables for Uplink, LAN and Power is well protected mechanically by Arxlight™ 96410 basic chassis from rear side underneath the front panel. Exchangeable connection panels can be adopted for most common MIL or civil connector standards, including for example MIL-DTL-38999, ODU AMC, Hirose and LEMO. Basic chassis with no options has two RJ-45 (only) for Uplink with PoE and local LAN PC connection.



Option – NATO TEMPEST certification

Arxlight™ 96400 have optional design to fulfil NATO TEMPEST (Telecommunications Electronics Materials Protected from Emanating Spurious Transmissions) certification, for SDIP-27 Level A, B or C depending on chosen optional features with uplink connectors, power source and EMP filters.

TEMPEST certification is done by CTTA (Certified TEMPEST Technical Authority) for chosen configuration. Colour coded bezel security architecture is also supported by change of keypad cover:

Option – CNSS certified for SCIFs and SAPFs

Telephones are one of the most significant vulnerabilities to areas where sensitive information is handled, like for example conference rooms and offices. Telephones can for example be exploited to clandestine surveillance through remote cyber-attacks.

Arxlight™ 96400 is designed to fulfil U.S. NTSWG (National Telecommunications Security Working Group) approval, formerly known as TSG (Telecommunications Security Group) as a Joint Working Group of the CNSS (Committee on National Security Systems).

TSG ON-HOOK Positive Disconnect option is designed to fulfil TSG-6 Class A approved installation in SCIFs (Sensitive Compartmented Information Facility) and SAPFs (Special Access Programs Facility) environment where sensitive or highly classified information is handled. When fully activated, both microphones (2), speakerphone (2) and camera is mechanically disconnected and insulated. During calls, ON-HOOK provides enhanced “Hold” and “Mute” security.

Status signal for ON-HOOK shows RED for all circuits open, YELLOW for PTT (Push–To–Talk) mode with disconnection of microphones (2) only and GREEN for secured disconnection of microphones (2), speakers (2) and video camera. Configurable options are for example permanent disconnection of conferencing functions and automated activation of ON-HOOK after ending of every call.

Optional choice of fiber uplink and fiber PC enables deployment in SCIF secured facilities with fiber only connection for improved RF shielding without re-cabling. Simply connect the telephone on the fiber uplink and the PC to the telephone. Multiple choices of PSU (Power Supply Unit) is available.

Optional choice is available for secured assembly of Arxlight™ 96400 by TOP SECRET-cleared U.S. personnel for Category I and II countries according to Intelligence Community Standard (ICS) 705 - “Technical Specifications SCIF Construction”, including key lock for chassis, digital timestamped logging of chassis inside access and remote alarm for inside chassis access.

Option – PTT (Push–To–Talk)

Arxlight™ 96400 PTT (Push–To–Talk) or Press–To–Transmit option is an optional momentary button on handset to switch from voice reception mode to transmit mode. PTT option allow communication over TETRA (Terrestrial Trunked Radio), military tactical radio or other half duplex communication lines, but can also be used in combination with TSG ON-HOOK function to activate microphone.

PTT is available on both handset and headset. Handset have haptic response, and both have individual status lights on front panel, indicating “Transmit” activation. PTT signalling is supported for RFC2833 (in band DTMF), SIP INFO packets and integration with TETRA (Terrestrial Trunked Radio).

Option – Electronic ID key

Arxlight™ 96410 have optional electronic authentication by 1-wire iButton reader with local and/or central access rights control, that protect equipment from unauthorised users and allow optional Line insulation according to TSG Standard when there is authorised user of Arxlight™ 96410, if needed. It is also possible to define allowed calls without approved ID keys, for example emergency calls and specific internal numbers.

Only key tags that have been logged in and been assigned with user rights in local and/or central rights management database can activate full usage of Arxlight™ 96410 with per user defined rights.

1-wire interface use 1 electrical data signal (and ground), meaning that there is no transmission of RF signal for exchange of encrypted identification. iButton reader is magnetic and holds key tag in place until it is removed by user. Time window can also be used to keep equipment activated for a preprogramed time without keys if user needs to move from equipment but still have equipment in sight.

User key tag is a 16 mm diameter stainless steel package with high radiant and EMP resilient electronics, including bidirectional SHA-256 authentication and 10 Kb OTP (One-Time Password) memory.

One significant benefit with electronic ID key tag is the possibility to automatic dispatching of calls and messages to specific persons. Central rights management database will know where you are when you connect your personal Electronic ID key to Arxlight™ 96410.

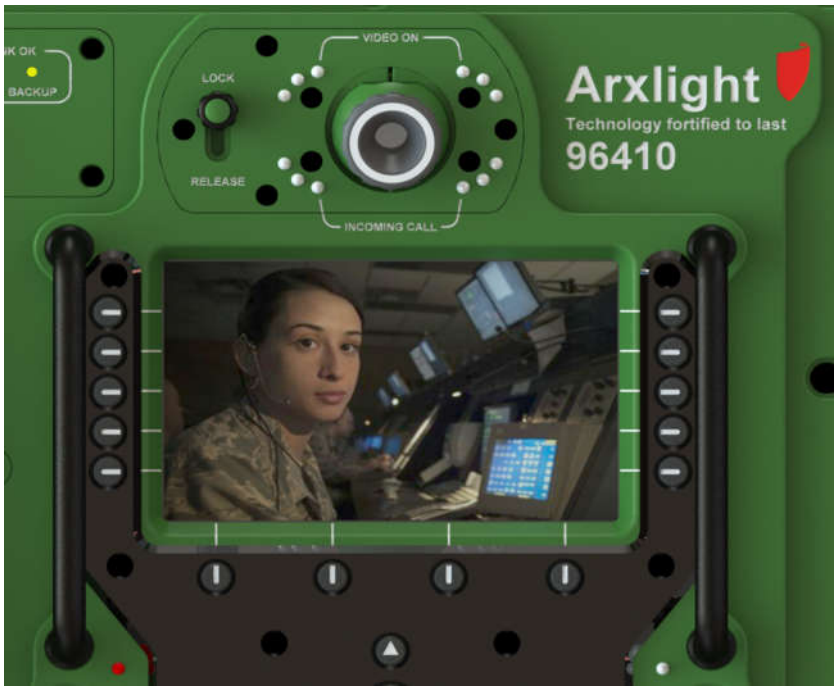
Option - Video improves communication awareness

Arxlight™ 96415 adds Cisco 8845 video functionality with 720p HD quality. This feature can be either chosen initially or upgraded later when video is needed in basic Arxlight™ 96410 chassis.

Video improves communication awareness since both sides can recognise each other. Callers are also able to participate in video conferencing with picture and viewing of video content.

HD Video camera can be tilted and locked to chosen direction. For dimmed light environment, optional IR illuminator can be chosen with light dimmer control from zero to bright light level.

Used network bandwidth for video calls can be configured in Cisco 8800 by “Applications”, Select Settings > Video > Bandwidth. Video calls uses minimum 0,25 up to 2 Mb/s for HD compared to 0,1 Mb/s for voice only call.



A mechanical shutter is included in video camera lens, that effectively closes the camera lens when video is not used, securing unauthorized video viewing. VIDEO ON status shows open shutter.

Option - Dimmed light environment and NVIS support

Dimmed light environment may be critical for some applications, where light from status LED or IR illuminator could give detectable tails to your location in field environment. Operation centres may also require dimmed light, while daylight users may demand brighter light.

Screen brightness adjustment for Cisco VGA (800x480) widescreen is included in all basic chassis by Cisco:s "Application" button and selection of "Settings > Brightness" in Cisco:s menu.

For optional status panels and optional HD camera IR illuminator, a light dimmer control can be set with a mechanical lever and reliable friction lock, to ensure that the illumination intensity is adjusted to a level suitable for the operational environment, from absolute zero light to bright light in 16 steps.

Current version does not control light on Cisco:s VGA (800x480) widescreen or light in Cisco:s dial panel, but this feature may become available by future upgrades.

Optional NVIS (Night Vision Imaging System) filter can be added, that regulate radiated IR spectrum from both Cisco VGA display and status light for minimum distance detection in darkness and prevention of glare out or interference with users own NVIS equipment. Keypad and control buttons have distinct raised structure that allow user to feel buttons position for safe operation in absolute darkness.

Option - EMP protection and EMI shielding

Arxlight™ 96410 offers a variety of modular EMP filters for electrical interface that are designed to extend common MIL-STD-461G to reach effective EMP protection levels according to MIL-STD-464C, MIL-STD-2169 and MIL-STD-188/125-2. Optional choices for electrical EMP filters are:

- Ethernet 10/100/1000 Gbps interface including PoE.
- POTS interface for xDSL uplink.
- Local power interface for DC and AC power supply.

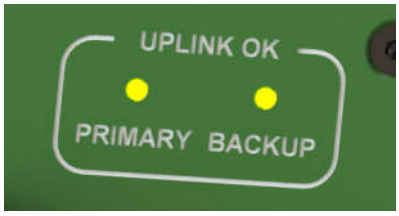
All optional electrical EMP filters for uplink cables are designed to handle direct surge up to 10 kA with very fast rise time below 1 ns without damage on internal electronics.

EMP protection levels are increased above common MIL-STD to confidential levels by the implementation of optical communication interfaces. These are designed to protect internal electronics against recently developed weaponised military grade EMP.

Arxlight™ 96410 chassis and optional EMP filters are designed to meet high level of EMI shielding including relevant parts of MIL-STD-461G with for example conducted emissions (CE101 and CE102), conducted susceptibility (CS114, CS115 and CS116) and radiated emissions (CE102).

Option - Redundant uplink interfaces

Arxlight™ 96410 offer a wide range of optional redundant uplink modules for mission critical communication that can be combined with or replace Ethernet 10/100/1000 Gbps interface to connect commonly available cable infrastructure, like for example:



- **Fibre optical interface** for most commonly available choices of fiber cable and optical transmission, through use of standard SFP modules with options for a wide range of choices between 2 - 100 km optical uplink.

- **POTS copper wire** over G.SHDSL interface for up to 9 km reach on most commonly available legacy phone wires.

A wide choice of options for redundant uplink interfaces is offered, following commonly available Telco standards for PoE, optical and xDSL equipment, to accommodate smooth integration with existing communication infrastructure.

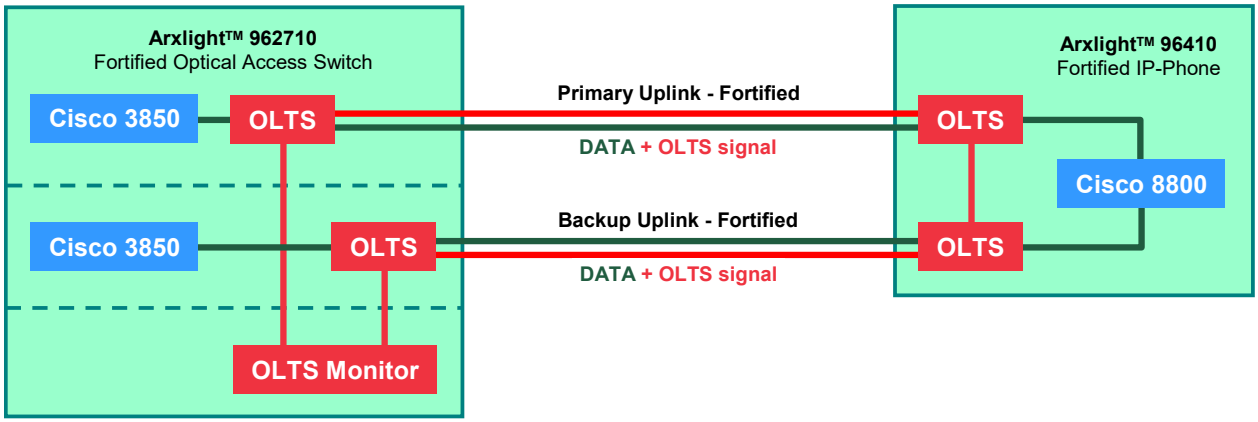
EMP protected centralised power feed to remote locations is possible by choice of optional Arxlight™ 962500 fortified PoE (Power over Ethernet) Switch for up to 90 meter over Kat.5-6 cable, or Arxlight™ 962600 fortified POTS Switch for up to 3.000 - 5.000 meter power feed over legacy standard telecom copper wire by choice of optional Arxlight™ RPS (Power over POTS).

Fiber optical uplinks include optional early warning and fast geolocation of unauthorised tampering on optical links for up to 80.000 meter by combined choice of Arxlight™ 962700 fortified Optical Access Switch with option Arxlight™ OLTS (Optical Link Tamper Surveillance).

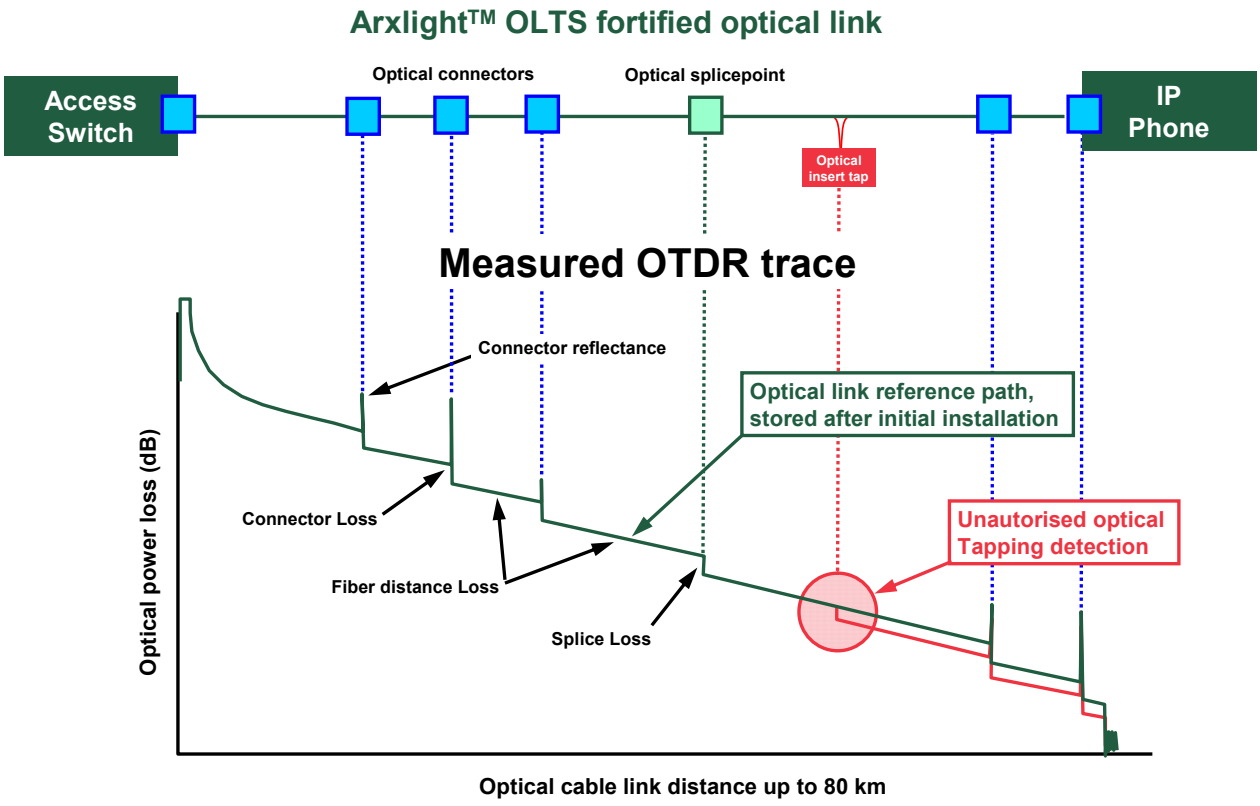
Centralised remote monitoring of local power and battery status, temperature and "off line" restart is also available by choice of optional OMC (Optical Monitor Channel).

Option - OLTS (Optical Link Tamper Surveillance)

Fiber optical uplinks have optional choice of OLTS (Optical Link Tamper Surveillance) that fortifies up to 80.000 meter of optical cable link to Arxlight™ 96410, with early warning and fast geolocation of unauthorised tampering or tapping of optical link, by combined choice of Arxlight™ 962700 fortified Optical Access Switch with option Arxlight™ OLTS.



Arxlight™ OLTS continuously monitors changes in optical link attenuation with high precision. Any minor deviation in signal level triggers an OTDR (Optical Time Domain Reflection) trace measurement. The data is compared to reference trace stored per optical link at initial installation. Any change in optical link OTDR trace is logged with timestamp and distance from Access Switch with a precision of +/-20 meter over up to 80.000 meter. Changes above pre-programmed threshold that indicates possible optical signal tapping will trigger alarm message within 15-20 seconds of automated analyse:



Option - OMC (Optical Monitor Channel)

Arxlight™ OMC (Optical Monitor Channel) creates very robust "out of band" optical communication that is independent of payload communication for monitoring and control signals based on low bandwidth IPSec encrypted signalling over independent optical WDM channel.

OMC can be used for the following functions:

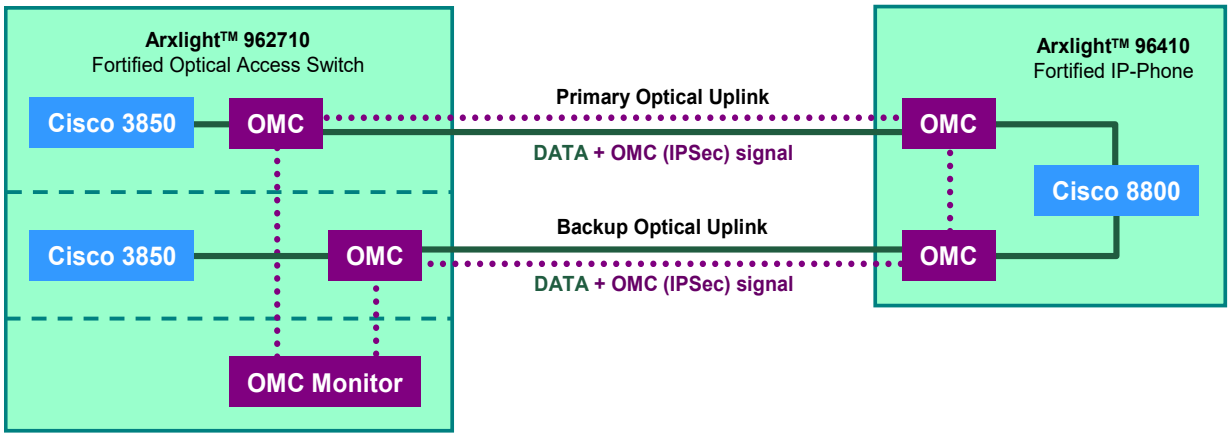
Remote monitoring of local working environment for Arxlight™ 96410, including for example:

- Power feed, with real time voltage and current from different sources.
- Power consumption for Cisco 8800 and optional Arxlight™ features.
- Working temperature at external chassis and air inside Arxlight™ 96410.
- Battery charging status including coulomb counting of remaining battery minutes.
- Battery change signal when local battery needs to be replaced.
- Link status for all external communication links.
- Local event log for advanced trouble shooting.

Remote control, including for example:

- Remote reboot of Cisco 8800 in case of error by toggling power on and off.
- Signal of incoming call to Arxlight™ 96410 in sleep mode that saves local battery time.
- Warning signal in case of detected tampering with optical links from OLTS.

Automated central management software for OMC can be programmed with threshold values that generate alarm signal to service centre if local conditions at remote Arxlight™ 96410 needs attention.



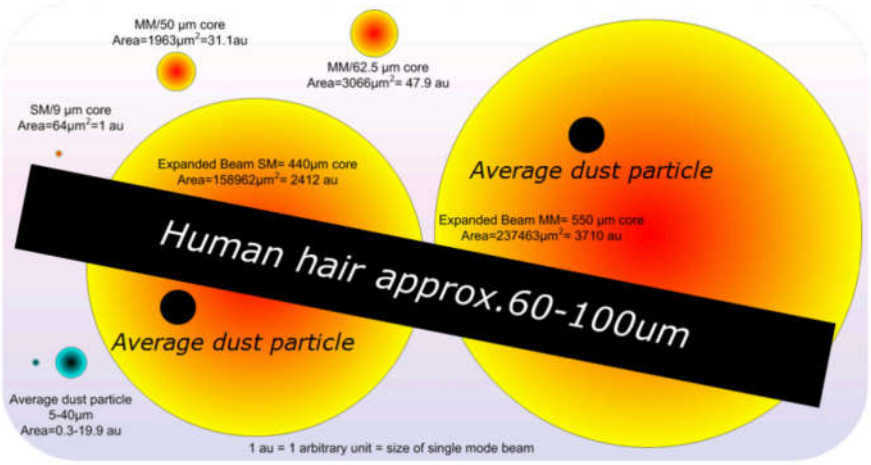
Option - Expanded Beam optical connectors

Optical links with standard SM (Single Mode) or MM (Multimode) connectors are vulnerable for dirt in field or semi field deployments, including installations in ground vehicles, naval ships and airplanes, since common standard optical connectors have transition area that is far less in size than common dust particles. This is visualised in the following picture (source www.belfuse.com):

Expanded Beam technology increases transition area in optical connectors by a factor of 2.400 - 3.700 times.

This makes optical links truly dependable, consistent and reliable in the harshest environments.

Pictures below shows real life field ability of Expanded Beam technology, that most certainly would cause permanent damage to any standard optical connector:

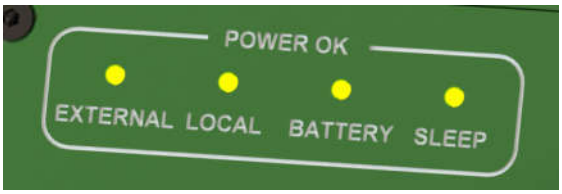





Arxlight™ 96410 uplink connector panels have optional choice of MIL-DTL-38999 Shell Size 11 and 13 that includes Expanded Beam optical insertion for SM (Single Mode) or MM (Multimode) optical uplink cables.


Option - Local power from most common DC or AC source

Arxlight™ 96410 offers a variety of modular power options, including standard PoE (Power over Ethernet) to support any commonly available local DC and/or AC power source, like for example:



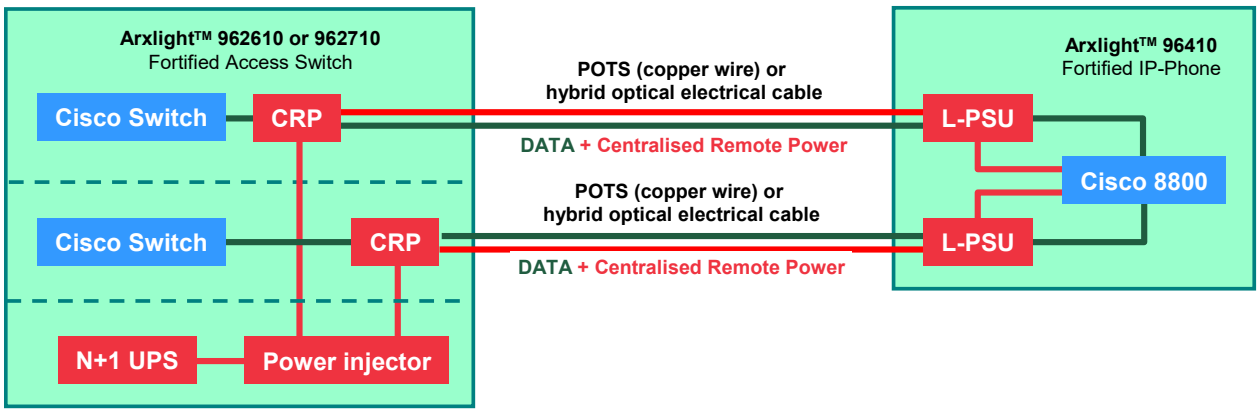
- **PoE upgrade to 60W** to cover optional uplink modules and local charging of batteries for backup power.
- **Cisco Power Module 4** with ODU AMC connector.
- **Low Voltage PSU** for 15 - 150VDC or 11 - 110VAC that cover most common local power source from for example solar cells and wind turbines to POTS copper line power. This module covers common ***MIL-STD 28VDC***.
- **High Voltage PSU** for 120 - 420VDC and 85 - 290 VAC that can be combined with auto changeover between low and high voltage PSU.
- **Cable adapters** are available for most common DC or AC sources.

All optional power modules are designed to cover MIL-STD-1275E, MIL-STD-704F and RTCA/DO-160C protection levels. Arxlight™ 96410 have 3 internal slots for power modules that can be combined to cover for example:

Function:	PSU Slot 1	PSU Slot 2	PSU Slot 3
PoE 60W + Local 15-420VDC and 11-290VAC	PoE 60W	LV-PSU	HV-PSU
POTS CRP + Local 15-420VDC and 11-290VAC		LV-PSU	HV-PSU
Redundant Hybrid Optical and Electrical Uplink	LV-PSU (A)	LV-PSU (B)	
2 x Hybrid Optical Electrical + Local 15-150VDC	LV-PSU (A)	LV-PSU (B)	LV-PSU (C)

Centralised power feed with UPS (Uninterruptible Power Supply) for remotely located Arxlight™ 96410 can be enabled by choice of Low voltage PSU, with very wide voltage range that enable power feed for up to 3.000 - 5.000 meter cable distance (depending on cable resistance).

Arxlight™ CRP (Centralised Remote Power) is optional with **Arxlight™ 962600** fortified POTS Switch and G.SHDSL option for centralised power feed to Arxlight™ 96410 through legacy copper wire, or **Arxlight™ 962700** fortified Optical Access Switch and choice of hybrid optical and electrical cable module.



Option - Battery backup for 3-12 months in sleep mode

Fiber based uplink configurations that are resilient to EMP threats with no central power feed over uplink copper cables are more dependent on local power source. Operations that need to ensure safe voice communication even in case of local power failure need local battery backup.

Arxlight™ 96410 offer optional internal battery backup with automated estimation of battery call time left in minutes based on energy consumption, temperature and calculated energy left in the batteries in scale of 1-99 minutes, 10-990 minutes or 100 - 9900 minutes. This gives the user ability to prioritize how remaining call time is best prioritised in case of power outage.

Arxlight™ 96410 has space for up to 16 x 18650 standard size battery positions, that can be populated with either Li-ION or NiHA batteries for the following functionality:

Battery parameter	Li-ION	NiHA
Active call time (hour)	9-18h	4-8h
Charged storage (months)	3	12
Battery capacity	93-186Wh	39-78Wh
Operational temperature	-20˚ to +60˚C	-20˚ to +60˚C
Charging temperature	+10˚ to +60˚C	(TBD)
Charged storage	20˚ to +25˚C	(TBD)
Life expectancy@21˚C	300 cycles	1.000 cycles

Arxlight™ TCM (Temperature Control Module option) extends operational and charging temperature to -30˚C to +60˚C.

Operational battery time can be extended to 3-12 thanks to Arxlight™ Sleep Mode that reduces power usage in between calls.

Sleep Mode uses **Arxlight™ 962700** fortified optical switch with Arxlight™ OMC (Optical Monitor Channel) to signal incoming calls and start up local battery power feed remotely from sleep mode.

Local battery activation from Sleep Mode is triggered by handset release, speaker button or ON switch. Cold start from Sleep Mode to voice call in and out is ca 1 minute with current Cisco software.

Battery can be charged when alternative power sources are available, such as solar panels, wind turbines or available POTS lines with Arxlight™ optional power module for 12 - 160VDC.

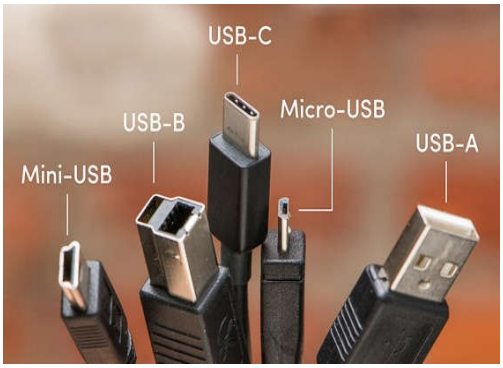
Option - USB Charger

Cisco 8851 and 8865 has included USB charger that is available on Arxlight™ 96410 front panel through ODU AMC connector for MIL-STD-810G compliance. Cisco 8800 USB charger standard output is 5VDC@0.5A = 2.5W and cable connector is USB-A.

Arxlight™ 96410 has two optional upgrades for USB:

USB 45W Output module that upgrades the USB connector with PD (Power Delivery) logic for dynamic device detection and advanced over charging protection. Two external ports are included to cover common standards:

- ***18W USB-A QC*** (Quick Charge) 3.0 for 6V@3A, 9V@2A and 12V@1.5A.
- ***45W USB-C PD*** (Power Delivery) for 5V@3A, 7V@2.5A, 9V@3A, 12V@3A and 15V@3A.

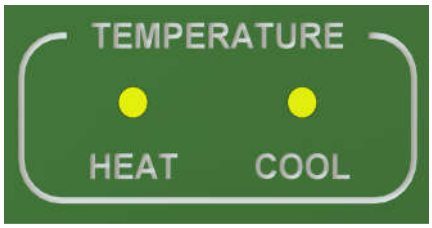


Adapters are included for USB-B, Mini-USB and Micro-USB to cover all commonly used USB connectors. Optional power modules and connected power feed at 60W are mandatory for usage of 45W output.

USB 60W Input module upgrades USB port to also receive energy through USB port for field operations, emergency power and charging of internal batteries, based on USB-PD 3.0 standard over USB-C connector that negotiates best available power profile.

Option - TCM (Temperature Control Module)

Arxlight™ 96410 standard operational temperature range determined by Cisco 8800 electronics to 0˚C to +40˚C, but can be extended to cover MIL-STD-810G Procedure II (Operational) temperature range by optional Arxlight™ TCM (Temperature Control Module) for low temperature of -30˚C (802.5), up to high temperature of +60˚C (501.5).



Arxlight™ TCM includes both cooling capacity of -20˚C and heating capacity of +30˚C divided in two optional modules to cover different optional choices of internal power consumption.

Optional anti-fog technology can also be chosen for display window and video camera lens, that uses a transparent thin-film electric heater and prevent water condensed fog on inside of glasses in sub-zero climate.

Power saving functions include inside humidity and temperature sensors with software that automatically turns glass heating on when fogging is imminent or is ongoing and turns off when glass heater is not needed.

Arxlight™ 96410 Configuration Guide

Arxlight™ 96410 is built on one standard and modular basic chassis where optional modules can be added and/or changed when needed in the future. This design strategy enables ability to adapt assets to new and changing demands and secures very high level of long term user satisfaction.

One standard basic chassis that can be adopted to future demands simplifies long term product management and spare part sourcing, securing superior TCO (Total Cost of Ownership) for decades ahead. Configuration marking example on chassis, identifying installed options:

Model #: 96416
Installed options:
H1, H2, 2xT1, 2xUFE11,
2xUF0-SM-1550-31, 2xUF-OLTS,
2xUF-OMC, P01, P3, P33, P4, P5,
P6, BC1, 2xBPL1

9641x - Cisco 8800 and basic chassis choices:

Product Number	Description
96412	Based on Cisco 8841 - Basic version
96414	Based on Cisco 8851 - With USB charger and Key Expansion Module port (2x)
96415	Based on Cisco 8845 - With HD video
96416	Based on Cisco 8865 - With HD video, USB charger and KEM (3x)
Option – L1	Simplified low profile chassis, no options and no EMP shielding.

Bluetooth and WiFi features are disabled for EMI and security reasons.

Option Hx - HD Video extensions and NVIS protection:

Option Number	Description
H1	IR illuminator for dimmed environment
H2	Light dimmer for optional signalling panels allowing 16 fixed levels from zero light to bright light in panels for POWER OK, UPLINK OK and BATTERY. Light level on graphical display is controlled by settings in Cisco 8800 PCB
H3	NVIS (Night Vision Imaging System) filters for display and status lights that regulate radiated IR spectrum for minimum distance detection in darkness.

Option Kx – PTT (Push-To-Talk) and KEM (Key Expansion Module):

Option Number	Description
K-PTT	PTT (Push-To-Talk) option
K1	Expansion of basic chassis with 1 x KEM for 96415 and 96417
K2	Expansion of basic chassis with 2 x KEM for 96415 and 96417
K3	Expansion of basic chassis with 3 x KEM for 96417

Option Sx – Security options for NATO TEMPEST and U.S. CNSS/TSG

Product Number	Description
ST-A	NATO TEMPEST certification for SDIP-27 Level A
ST-B	NATO TEMPEST certification for SDIP-27 Level B
ST-C	NATO TEMPEST certification for SDIP-27 Level C
(No option)	Keypad Face Plate Colour = BLACK
SB-R	Keypad Face Plate Colour = RED
SB-Y	Keypad Face Plate Colour = YELLOW
SO-H	ON-HOOK security option designed to fulfil CNSS/TSG-6 approval
SO-C	Permanent disconnection of speakerphone and audio-conferencing systems according to Intelligence Community Standard (ICS) 705 - “Technical Specifications SCIF Construction”.
SA	Secured assembly of Arxlight™ 96400 by TOP SECRET-cleared U.S. personnel for Category I and II countries according to Intelligence Community Standard (ICS) 705 - “Technical Specifications SCIF Construction”, including key lock for chassis, digital timestamped logging of chassis inside access and remote alarm for inside chassis access.
SID	ID-Key option based on 1-wire iButton reader with local and/or central access rights control. Key tag in stainless steel with high radiant and EMP resilient electronics, including bidirectional SHA-256 authentication and 10 Kb PTP (One-Time Password) memory.

Option Tx - TCM (Temperature Control Modules:

Option Number	Description
(No option)	Cisco 8800 standard temperature range is 0 to +40˚C, included in basic chassis with no options.
TA1	Standard temperature range can be extended to meet MIL-STD-810G with -30 to +60˚C temperature range by choice of optional heater and cooler based on one or two modules, depending on internal power consumption with chosen options.
TA2	Anti-fog technology for display window and video camera lens, that uses a transparent thin-film electric heater and prevent water condensed fog on inside of glasses in sub-zero climate, with humidity and temperature sensors that automatically turns heat on and off for energy saving.

Option Ux - Uplink modules:

Option Number	Description
(No option)	Basic chassis with no Uplink options includes Cisco 2-port Ethernet switch for connection to 10/100/1000BASE-T Ethernet network (IEE 802.3i/802.3u/802.3ab) through RJ-45 (IP-67 sealed) interface with single LAN connectivity for both the phone and a co-located PC, including IEEE PoE (Power over Ethernet) compatible with 802.3af and 802.3at.
Ux	Internally shielded filter box with 3 bays for 2 uplink modules and 1 power module, mandatory for housing of all optional choices of Uplink modules, and basic EMP protection package for local electrical connectors (Handset, Headset and USB).
UEx*	**Electrical EMP filter - Ethernet PoE** for LAN Uplink (1) and PC (1) connector. Can be configured with one uplink module (PC is disabled) or two uplink modules for both uplink and PC. This option can be combined with Arxlight™ 962510 fortified 10/100/1000 Mb/s PoE switch. Available connector interfaces (x and xx): 1 = RJ-45 IP-67 sealed 2 = ODU AMC Size 1, 8 pin GbE, IP-68 sealed 3 = MIL-DTL-38999/24WB35PN, Size 11, 13 pin
UCx*	**Electrical EMP filter - Including G.SHDSL modem with RJ-11** (IP-67 sealed) interface for up to 9 km reach over common POTS 1 pair copper wire. Bandwidth will adapt to length and copper condition between 0,1 to 4 Mb/s. This option can be combined with Arxlight 962610 fortified POTS switch with optional PoPOTS (Power over POTS) injector and option P3 - 14-160VDC PSU. Panel for "UPLINK OK" panel on front is included for link status indication. Available connector interfaces (x): 4 = RJ-11 5 = ODU AMC Size 1, 4-pin

Option Number	Description
UFx**	**Fiber Uplink module** with standard 1 Gb/s SFP bay internally with 3-port Ethernet Switch and 2xGE. Two optical modules can be combined for redundancy (PRIMARY and BACKUP). Panel for "UPLINK OK" panel on front is included for link status indication. Available connector interfaces (x and xx): 6 = LC duplex connector 7 = Hirose MF10S duplex IP-67 8 = MIL-DTL-38999 Shell Size - Insert arrangement 11-02 9 = ARINC 801 Size - Insert arrangement 11-02
UFEx**	**Fiber Uplink module with hybrid electrial and optical interface,** including Electrical EMP filter and standard 1 Gb/s SFP bay internally with 3-port Ethernet Switch and 2xGE. Two optical modules can be combined for redundancy (PRIMARY and BACKUP). Panel for "UPLINK OK" panel on front is included for link status indication. Available connector interfaces (x and xx): 10 = LEMO 11 = MIL-DTL-38999 Shell Size 13-13, 2xExpanded Beam + 2xAWG16 Power
UF-PC	Ethernet PC connection over fiber with standard 1 Gb/s SFP module for SM (Single Mode fiber) @ 1310 nm with 14 dB (ca 20 km) link budget and DDMI (error correction).
UF0-mm-nnnn.nn-dd	Fiber Uplink module includes one standard 1 Gb/s SFP module for SM (Single Mode fiber) @ 1310 nm with 14 dB (ca 20 km) link budget and DDMI (error correction). By adding UF0 option, following choices of SFP options is available to accommodate most common fiber optical choices: ***mm* =** SM (Single Mode fiber) or MM (Multi Mode fiber). ***nnnn* =** ITU CWDM spaced @ 20 nm (18 channels available). ***nnnn.nn* =** ITU DWDM C-Band spaced @ 0.8 nm (56 channels available). ***db* =** Link budget, 8dB (2 km), 14dB (20 km), 22dB (80 km) or 31 dB (120 km). ***BIDI* =** Bidirectional options on one single fiber is available on request. Ordering example: UF0-SM-1529.55-22 = Change to SM 1529.22 nm 22 dB SFP.
UF-OLTS1	All optical uplink modules can be combined with optional Arxlight™ OLTS (Optical Link Tamper Surveillance) for early warning and fast geolocation of unauthorised tampering on optical links for up to 80.000 meter by combined choice of Arxlight™ 962700 fortified Optical Access Switch with OLTS management module.
UF-OMC1	All optical uplink modules can be combined with optional Arxlight™ OMC (Optical Monitor Channel) that gives Centralised remote monitoring of local power and battery status, temperature and "off line" restart, by combined choice of combined choice of Arxlight™ 962700 fortified Optical Access Switch with OMC management module.

(*) UEx and UCx = Electrical EMP filters protect against electrical surges up to 10 kA with very fast rise time below 1nS without damage to internal electronics. Replacement of surge arrester and MOV components will how ever be needed after repeated exposure to multiple high energy surges.

(**) UFx = Optical interfaces includes EMP wave guides with very high attenuation for a wide frequency spectrum. Specification is confidential. Electrical uplink modules is mechanically compatible and may be replaced by optical interfaces in the future when higher protection level is reqested.

Option Px - Power modules:

Option Number	Description
(No option)	Basic chassis with no optional Power modules includes Cisco IEEE PoE (Power over Ethernet) power feed compatible with 802.3af and 802.3at that cover Cisco 8800 phone features (7-15W) and USB Charger up to 2.5W (only on model 96414 and 96416).
Px	Internally shielded filter box with 3 bays for 2 uplink modules and 1 power module, mandatory for housing of all optional choices of Power modules.
P0x	**Electrical EMP filter** for local power feed, specified to cover any AC or DC power source from 0 - 400V up to 5A. This module is mandatory and shared for choice of option P2 and/or P3 but can also be used for EMP protection of 96410 chassis when used with P0 power feed. Electrical EMP filters protect against electrical surges up to 10 kA with very fast rise time below 1nS without damage to internal electronics. Replacement of surge arrester and MOV components will how ever be needed after repeated exposure to multiple high energy surges. 3 stage MIL grade Common Mode and Differential Mode EMI filters is included. Available connector interfaces (x): 1 = ODU AMC Size 1 2 = MIL-DTL-38999 Shell Size 11 3 = MIL-DTL-38999 Shell Size 13
P1	**Cisco CP-PWR-CUBE-4** with ODU AMC connector for up to 44W power feed from 100-240VAC@0.8A and 48V@0.9A output. EMP filter is not included in this option, se optional choice of option P0 above.
P2	**Upgrade of Ethernet PoE to 60W** according to 802.3at standard for additional power capacity to chosen options.
P3	**Low voltage PSU** isolated for 3kVAC that accepts most common DC or AC input power feed of 15-150VDC or 11-290VDC@0.8A, covering 10-48W (depending on input voltage) with 85% or better efficiency. OVP (Over Voltage Protection) with fast response time shuts down or divert power feed to option P4 (if installed). Must be combined with P0. Choice of P0 and P1 is mandatory for compliance with MIL-STD-1275E, MIL-STD-704F and RTCA/DO-160C.
P4	**High voltage PSU** isolated for 3kVAC that accepts most common DC or AC input power feed of 120 - 420VDC or 85 - 290VAC up to 150W with 92% efficiency. OVP (Over Voltage Protection) with fast response time shuts down and isolate overvoltage spikes that might pass surge arrester and MOV from option P0.
P5	**USB 45W Output module** that upgrades the USB connector with PD (Power Delivery) logic that dynamically detects devices to deliver optimum power level for good battery life and performance, with advanced over charging protection. Two external ports is included to cover common standards: • ***18W USB-A QC*** (Quick Charge) 3.0 for 6V@3A, 9V@2A and 12V@1.5A. • ***45W USB-C PD*** (Power Delivery) for 5V@3A, 7V@2.5A, 9V@3A, 12V@3A and 15V@3A. **External adaptor cable** is used for USB standard connectors, to secure that Arxlight™ 96410 basic chassis compliance with for example MIL-STD-810G is not jeopardised. Adapters is included for USB-B, Mini-USB and Micro-USB to cover all commonly used USB connectors. Optional power modules (P2, 2xP3 or P4) and connected power feed at 60W is mandatory for usage of 45W USB output.

Option Number	Description
P6	**USB 60W Input module** upgrades USB port to also receive up to 60W of energy through USB port for field operations, emergency power and charging of internal batteries, based on USB-PD 3.0 standard over USB-C connector that negotiates best available power profile. **External adaptor cable** is used for USB standard connectors, to secure that Arxlight™ 96410 basic chassis compliance with for example MIL-STD-810G is not jeopardised. Adapters is included for USB-B, Mini-USB and Micro-USB to cover all commonly used USB connectors.

Option Bx - Battery modules:

Option Number	Description
BC1	**Battery charging control module**, including front panel with OFF-ON-AUTO control, charging mode IN-FLOAT-OUT, change battery indicator and automated estimation of call time left in minutes based on energy consumption and calculated energy left in the batteries in scale of 1-99 minutes, 10-990 minutes or 100 - 9900 minutes. Choice of minimum one optional BP is mandatory.
BPL1	**Battery Package Li-ION** with 93Wh capacity based on 8 x 18650 standard size batteries. Charged storage up to 12 months. Operational temperature -20˚ to +60˚C, charging temperature +10˚ to +60˚C, charged storage -20˚ to +25˚C and Life expectancy of 300 cycles @21˚C. Temperature range can be extended with T1 and T2 option. Two BPL can be combined, but not with BPN option.
BPN1	**Battery Package NiHA** with 39Wh capacity based on 8 x 18650 standard size batteries. Charged storage up to 12 months. Operational temperature -20˚ to +60˚C, charging temperature (TBD), Charged storage (TBD) and Life expectancy of 1.000 cycles @21˚C. Temperature range can be extended with T1 and T2 option. Two BPN can be combined, but not with BPL option.