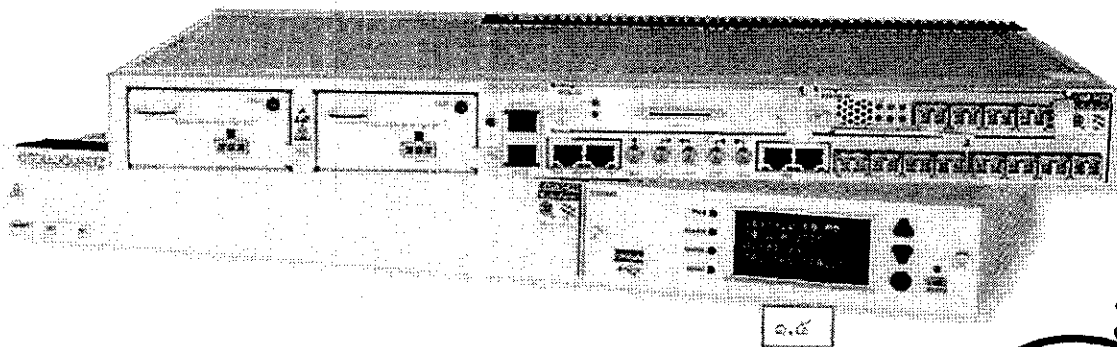


OSA 5422

PTP grandmaster, NTP server, GNSS receiver

Reliable and accurate delivery of synchronization is essential to meet the stringent requirements of mission-critical applications in multiple market areas such as mobile backhaul, power utilities and broadcasting. Network operators need a robust, scalable solution to provide assured phase, frequency and time-of-day synchronization. However, achieving this in a cost-effective way is a challenge.

Our OSA 5422 is a versatile and accurate synchronization device that can meet the stringent frequency and phase synchronization demands of new applications, such as 5G, while supporting legacy networks using IRIG, BITS or NTP. With a compact and flexible design optimized for deployment at the network edge, it ensures that cost-effective and accurate synchronization is no longer a challenge. Our OSA 5422 offers unique flexibility. It can be used as an IEEE 1588v2 PTP grandmaster clock. With its NTP server and GNSS receiver capabilities including multiple synchronization fan-out options, our OSA 5422 is also ideal for deployment in legacy synchronization architectures. To meet all installation demands, two ordering options are available: one with all connectors at the front and one with connectors at the rear side and a display at the front. All these features make our OSA 5422 ideal for the delivery of accurate and reliable synchronization for new and legacy solutions at the network edge.



Your benefits

Leading edge GNSS receiver

Enables ePRTC/PRTC-A/-B and grandmaster clock functionality for frequency, phase and time-of-day delivery using multiple constellations and multi-band option

Unique flexibility

Can be used as PTP grandmaster clock, APTS, boundary clock and slave clock as well as NTP server and SSU/TSG

Extended holdover performance

High-end quartz and rubidium oscillator options

High-availability design

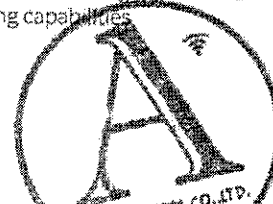
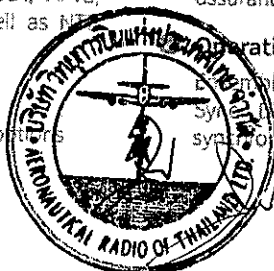
Automatic clock selection, self-calibrating delay asymmetry compensation, power supply redundancy and DoS protection

Syncjack™ technology

Built-in synchronization accuracy monitoring and assurance functionality

Operational simplicity

Simple Controller, including Ensemble Sync Director, for superior management and synchronization monitoring capabilities



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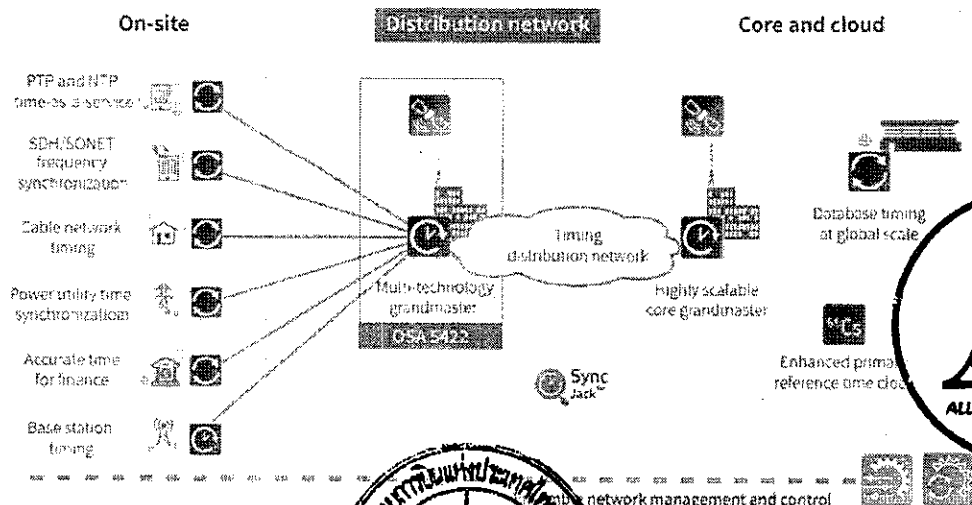
High-level specifications

OSA 5420 Series • High-quality OCXO, DOCCO and rubidium • Up to two expansion line cards • Multiple 1G/10G ports • Up to 1024 unicast slaves @128pps • Hot-swappable redundant PSU	Operation modes • ePRTC, PRTC A and PRTC B • PTP GM, BC type D, slave, probe • NTP server • SSU up to 32 x E1/T1 outputs • GNSS receiver fan-out - up to 32x clock/PPS/PPS+ToD	Built-in GNSS receiver • Embedded L1 multi-constellation receiver (GPS/GALILEO/BEIDOU/GLONASS) • Optional multi-band, multi-constellation for enhanced accuracy • Jamming, spoofing detection
IEEE 1588 2008 PTP profiles • L2 (Ethernet) and L3 (IP) default profiles • Telecom profiles • Enterprise hybrid profile • Power and utility profiles	NTP server • High capacity server • Hardware timestamping • NTP/PTP/Sync-E/SSU supported simultaneously • PTP to NTP conversion • NTP authentication	Expansion cards (Up to 2) • 16x E1/T1/2.048MHz outputs (120/100/75ohm) • 16x PPS outputs (50ohm) • 16x clock (10/5MHz 50ohm) • 16x PPS+ToD outputs (RJ-45) • 4x 1GbE (Fiber) • 10x Time code IRIG

Applications in your network

Synchronization and time-as-a-service applications with the highest availability

- Timing distribution at the edge of mobile backhaul and fronthaul networks for frequency and phase synchronization
- Cable networks (DOCSIS 3.1) synchronization
- Synchronization delivery within buildings for indoor small cell radio base stations
- Synchronization of legacy network architectures based on NTP and SSU
- Time as a service into data center, financial, health and media networks
- Modernized power utility networks



For more information, please visit our website at www.oscilloquartz.com

OS-5420 Series Optical Network Timing

Product name: OSA 5420 Series Optical Network Timing

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Product variants

	OSA 5422 quartz	OSA 5422 quartz HQ+	OSA 5422 quartz HQ++	OSA 5422 rubidium
Clock	OCCO	High-quality OCCO	DOCCO	Rubidium
Expansion line cards	2	2	2	2
Multi-band GNSS	Option	Option	Option	Option
PSU	Hot swappable redundant PSU (AC/DC)	Hot swappable redundant PSU (AC/DC)	Hot swappable redundant PSU (AC/DC)	Hot swappable redundant PSU (AC/DC)

Main applications

- ePRTC, PRTC-A and PRTC-B
- 1588v2 PTP grandmaster clock (up to 1024 PTP unicast clients at 128pps)
- 1588v2 PTP boundary clock (up to 1024 PTP unicast clients at 128pps)
- G.8273.2 boundary clock type D
- 1588v2 APTS clock
- 1588v2 PTP slave clock
- Fan-out of multiple physical synchronization output interfaces
- Synchronization supply unit (SSU)
- NTP server
- Synchronization protocol and physical signal conversion
- Sync probe – Syncjack™ monitoring and assurance

PTP features

- PTP profiles support:
 - ITU-T G.8265.1 frequency delivery profile (IP unicast over IPv4/IPv6)
 - ITU-T G.8275.1 time/phase delivery profile (Full timing support – Ethernet multicast)
 - ITU-T G.8275.2 time/phase delivery profile (APTS)
 - PTP enterprise profile (Mixed multicast and unicast over IPv4/IPv6)
 - IEEE 1588 2008 PTP default profile over IPv4/IPv6 multicast
 - IEEE 1588 2008 PTP default profile over Ethernet multicast (Annex F)
 - PTP power and utility profiles IEC/IEEE 61850-9-3, IEEE C37.238-2011, IEEE C37.238-2017
- Up to 16 master/BC IP addresses
- Up to 16 VLANs (IEEE 802.1Q customer-tagged) and stacked VLANs
- Support for multiple profiles simultaneously
- Support PTP (TAI) and arbitrary (ARB) timescales
- Support master and slave on any port simultaneously
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)
- ICMP/DSCP/TOS
- Configurable static routes and default gateway

- Enhanced PTP GM/BC/Slave statistics, performance monitoring (15min and 24h), threshold crossing alarm (TCA) and SNMP traps
- In-house best-in-class clock recovery algorithms
- DoS protection using hardware access control list (ACL) and traffic rate limiting

NTP features

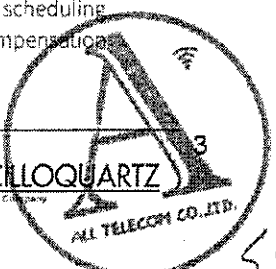
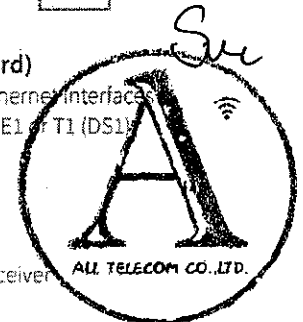
- Stratum 1 NTP server when locked to GNSS
- NTP v1, v2, v3, v4 and SNTP over IPv4/IPv6
- NTP unicast/multicast/broadcast
- Symmetric key and Autokey authentication
- TIME & DAYTIME protocols
- NTP peering
- Hardware timestamping
- Accuracy 0 - 50nsec from UTC
- Up to 16 NTP server IP addresses
- Support PTP and NTP on same Ethernet port
- PTP to NTP translation
- Up to three stacked VLANs per flow (Q-in-Q service provider tagged)
- Enhanced NTP statistics and client lists
- Up to 8000 transactions per second
- PTP backup in case of GNSS outage

Synchronization interfaces (onboard)

- Synchronous Ethernet (SyncE) over Ethernet interfaces
- 2x BITS-in and 2x BITS-out (2.048MHz, E1 or T1 (DS1) including SSM)
- 2x PPS in/out
- 2x time-of-day (ToD) + PPS in/out
- 2x CLK 10MHz in/out
- Antenna input for embedded GNSS receiver

Ethernet ports

- Hardware-based timestamping (PTP & NTP)
- 2x 100/1000BaseT copper ports
- One copper port is PoE driver (802.3af class 2, 6.49W max)
- 1GbE (SFP) or 10GbE (SFP+), user configurable
- Optional 8x 1GbE (SFP) using expansion card
- All copper ports support SM/MM colored/non-colored SFP
- Low hardware-based policing and scheduling
- Configurable link asymmetry delay compensation



Synchronous Ethernet (SyncE)

- Supported by all Ethernet interfaces in fiber and copper modes
- Compliant to ITU-T G.8261/G.8262/G.8264
- Ethernet synchronization message channel (ESMC)
- Sync-E for time holdover during GNSS outage

BITS

- 2x BITS input over shielded RJ-45
- User-configurable: E1, T1 (DS1), 2.048MHz
- G.823 / G.824 sync interface compliant
- Synchronization status message (SSM)
- BITS input for time holdover during GNSS outage
- Output squelch option
- EEC/SEC/SSU filtering options

PPS in/out

- 2x PPS input/output (user configurable)
- User configurable input and output delay compensation
- SMA-F connector (50ohm)
- Output squelch option

Time-of-day (ToD) output

- G 8271 compliant
- ToD format - NMEA 0183 (\$GPZDA sentence) and CCSA
- RS422 over shielded RJ-45
- Output squelch option

GNSS Receiver

Single-band receiver

- Multi-constellation GNSS L1 72 channels receiver
- GPS (L1C), GLONASS (L1OF), BEIDOU (B1I), GALILEO, Beidou (B1I), QZSS (L1C/A), SBAS (L1C/A), WAAS, EGNOS, MSAS, GAGAN)
- Three concurrent GNSS constellations

Multi-band GNSS receiver option

- Provide enhanced accuracy for ePRTC and PRTC-B
- Multi-band, Multi-constellation 184-channel GNSS receiver
- GPS (L1C/A L2C), Galileo (E1B/C E5b), GLONASS (L1OF, L2OF), Beidou (B1I, B2I), QZSS (L1C/A L2C), SBAS (L1C/A), WAAS, EGNOS, MSAS, GAGAN)
- Four concurrent GNSS constellations
- Jamming and spoofing detection

Common GNSS receiver features

- Skyview and GNSS satellites status
- Configurable SNR, elevation and PDOP masks
- User-configurable antenna cable delay compensation
- Support fixed positioning - single satellite mode
- Voltage to antenna +5VDC
- Antenna connector SMA-F (50ohm)

CLK in/out

- 2 x CLK 10MHz input/ output (user configurable)
- SMA-F connector (50ohm)
- Output squelch option

LCD display module

- Optional OLED display (reverse mounting)
- Press buttons
- Status LED's
- USB and Serial connectors

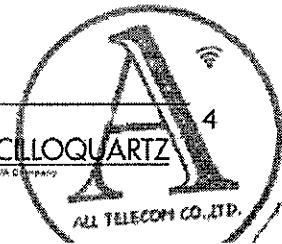
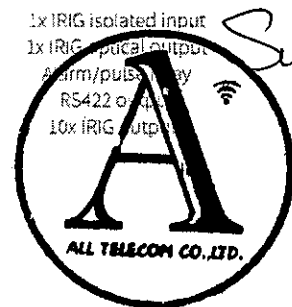
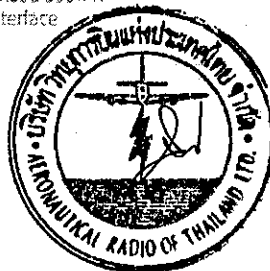
Output expansion line cards

- Up to two expansion cards
- Hot insertion/ extraction support
- Overvoltage/ current protection
- Two expansion cards share a single mountable patch panel with 16x RJ-48 / RJ-45 and 16x BNC connector options

Line cards	16x BITS	16x CLK / PPS	16x PPS+ToD	4x 1G	IRIG
------------	----------	---------------	-------------	-------	------



Capabilities 16x BITS outputs over high density connector (VHDCI) - supporting 2.048MHz, E1 or T1 (DS1). Per output configurable signals type (E1, 2.048MHz)	16x clock 10MHz or 5MHz outputs over unbalanced 50ohm interface or 16x PPS outputs over unbalanced 50ohm interface	16x PPS+ToD outputs over balanced Interface	4x 100/1000bit/s Ethernet ports (PTP / NTP / Sync-E) Sync-E and PTP monitoring and assurance using Syncjack™	1x IRIG isolated input 1x IRIG optical output Alarm/pulse delay RS422 output 10x IRIG outputs
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Holdover performance

	Clock	Aging / day (after 30 days)	Temperature stability
Quartz CSM	OCXO Stratum 3 / G.812 Type III	$\pm 5 \times 10^{-10}$	$\pm 50 \times 10^{-12}$
Quartz HQ+ CSM	High quality OCXO G.812 Type I	$\pm 2 \times 10^{-10} / \pm 1 \times 10^{-10}^*$	$\pm 2 \times 10^{-10}$
Quartz HQ++ CSM	DOCXO Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-11} / \pm 1 \times 10^{-11}^*$	$\pm 1 \times 10^{-11}$
Rubidium CSM	Rubidium Stratum 2 / G.812 Type II	$\pm 5 \times 10^{-12}$	$\pm 2 \times 10^{-12} / \pm 2 \times 10^{-11}^{**}$

* Note: Effective daily aging after device has been powered for one month and locked to GPS for three days, for the following three days

** Note: effective temperature stability after compensation

	200nsec	400nsec	1.1usec	1.5usec	5usec	10usec	16ppb
Quartz	1 hours	2 hours	4 hours	5 hours	8 hours	14 hours	1 month
Quartz HQ+	4 hours	8 hours	14.5 hours	16.5 hours	1.5 days	2 days	0.5 years
Quartz HQ++	10 hours	17 hours	1.5 days	2.2 days	4.4 days	6.6 days	>1.5 years
Rubidium	1 day	18 days	3.5 days	4 days	8 days	12 days	>5 years

Note: The above are typical values (1 sigma confident) assuming controlled temperature environment, after the device has been powered for one month and locked to GPS for 72 hours. Due to the excellent temperature stability of the HQ++, the HQ++ holdover will outperform the Rubidium holdover when significant temperature variations are presented.

Sync signal conversion

From/To	SyncE Tx	BITS OUT	CLK OUT (10MHz)	PTP	NTP	PPS OUT	ToD
GPS/GNSS	✓	✓	✓	✓	✓	✓	✓
SyncE Rx	✓	✓	✓	✓	n/a	freq.	n/a
BITS IN	✓	✓	✓	✓	n/a	freq.	n/a
CLK IN (10MHz)	✓	✓	✓	✓	n/a	freq.	n/a
PPS IN	✓	✓	✓	✓	✓	✓	✓
PTP	✓	✓	✓	✓	✓	✓	✓

GM/PRTC frequency and time accuracy

- While locked to GNSS:
- Phase and time
 - Single band GNSS, PRTC-A: ± 100 nsec from UTC
 - Multi band GNSS, PRTC-B: ± 40 nsec from UTC
 - ePRTC (with ePRC input): ± 30 nsec from UTC
- Frequency - exceed PRC / G.811 frequency accuracy

Syncjack™ monitoring and assurance tools

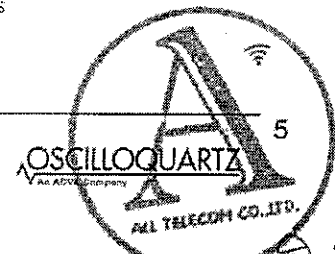
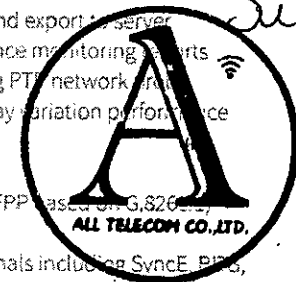
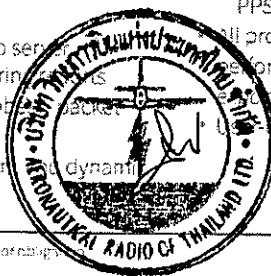
- Clock accuracy for up to two clock probes - computing TE, TIE and MTIE of physical clocks
 - Calculation of maximum, constant and dynamic TE, TIE and MTIE between physical source and reference signals
 - Programmable source and reference signals including SyncE, BITS, PPS, GNSS and 10MHz
 - MTIE mask and time error threshold alarms based on SNMP traps
 - TE/TIE raw data collection and export to server
 - Daily MTIE and TE performance monitoring reports
- Clock analysis for up to four PTP clock probes
 - Packet delay and packet delay variation performance statistics
 - Delay asymmetry
 - Network usability statistics (FPP based on G.826.2)
 - Packet loss statistics
 - Programmable reference signals including SyncE, PPS, PPS, GNSS and 10MHz
 - All probes include enhanced sync assurance statistics, performance monitoring (15min & 24h), including data packet, threshold crossing alarm (TCA) and SNMP traps
 - Configurable MTIE masks

TE, TIE and MTIE between physical reference signal and timestamps within the PTP packets

- Support for active and passive probe mode
- Programmable reference signals including SyncE, BITS, PPS, GNSS and 10MHz
- MTIE mask and Time Error threshold alarms based on SNMP traps
- TE/TIE raw data collection and export to server
- Daily MTIE and TE performance monitoring reports
- PTP network analysis including PTP network
 - Packet delay and packet delay variation performance statistics
 - Delay asymmetry
 - Network usability statistics (FPP based on G.826.2)
 - Packet loss statistics
 - Programmable reference signals including SyncE, PPS, PPS, GNSS and 10MHz

All probes include enhanced sync assurance statistics, performance monitoring (15min & 24h), including data packet, threshold crossing alarm (TCA) and SNMP traps

Configurable MTIE masks



Low-touch provisioning

- Text-based configuration files
- FTP/SFTP/SCP for configuration file copy
- Remote software upgrade

Management and security**Local management**

- Serial port (RS232 over RJ45) for CLI

Remote management

- Local LAN port (10/100BaseT over RJ45) using CLI, SNMP and Web GUI interfaces
- Support for IPv4 and IPv6
- Barrier free GUI
- Maintains in-band VLAN and MAC-based management tunnels
- Static routes & configuration of default gateways
- Fully interoperable with ADVA FSP 150 and ADVA FSP 3000 products
- Supported by Ensemble Controller, including Ensemble Sync Director and GNSS assurance

Management protocols

- Telnet, SSH (v1/v2)
- HTTP/HTTPS
- SNMP (v1/v2c/v3)

Secure administration

- Configuration database backup and restore
- System software download via FTP, HTTPS, SFTP or SCP (dual flash banks)
- Remote authentication via RADIUS/TACACS+
- SNMPv3 with authentication and encryption
- Access control list (ACL)
- ICMP filtering and rate limiting

IP networking

- DHCP
- ARP cache access control
- RIPv2 and static routes
- IPv6 NDP address resolution
- RIPv6 for IPv6
- ICMP

System logging

- Syslog, alarm log, audit log and security log
- Configurable system timing source – local / NTP / PTP / PRTC (GNSS)
- User configurable time zone & daylight saving time

Standards compliance

- ITU-T G.8261, G.8262, G.8264, G.703, G.781, G.812
- ITU-T G.8272, G.8273.2
- ITU-T G.8265.1, G.8275.1, G.8275.2
- IEEE 1588v2 (PTP), 802.1Q (VLAN), 802.1ad, 802.1p (Priority)
- RFC 2863 (IF-MIB), RFC 2865 (RADIUS), RFC 2819 (RMON)
- RFC 1059 (NTPv1), RFC 1119 (NTPv2), RFC 1305 (NTPv3), RFC 5905 (NTPv4), RFC 4330 (ISNTPv4)

Regulatory compliance

- CE compliance
- RoHS compliance
- Power: ETSI 300 132-2, BTNR2511, ETS 300-019, ETS 300-019-2-[1,2,3], ANSI C84.1-1989
- Safety: EN 60950-1, 21CFR1040.10, EN 60825
- EMI: EN 55022 2010 Class A, EN 61000-3-2-2006, EN 61000-3-3 2008, EN 300 386 v1.6.1 2012, FCC 47FR Part 15 2014 Class A, ICES-002 2012 Class A

Power supply

- Hot-swappable, modular AC-PSU: 100 to 240VAC (47 to 63Hz) with over-voltage and over-current protection
- Hot-swappable, modular DC-PSU: -48 to -60VDC (tolerate -36 to -72VDC) with over-voltage and over-current protection
- Power consumption (without LC or SFP; Vin=48V):
 - OSA 5422 Quartz: 20W (typical), 22W (max.)
 - OSA 5422 Quartz HQ+: 25W (typical), 35W (max.)
 - OSA 5422 Quartz HQ++: 25W (typical), 35W (max.)
 - OSA 5422 Rubidium: 28W (typical), 41W (max.)

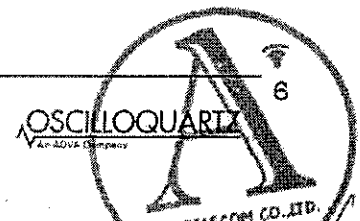
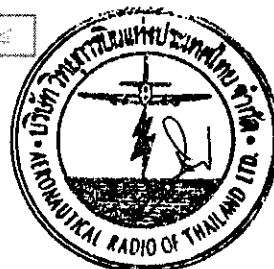
Environmental

- Dimensions: 443mm x 44mm x 250mm / 17.44" x 1.73" x 9.84" (W x H x D), ETSI-complaint
- Weight: 4.15 - 5.21Kg
- Operating temperature (ambient):
 - Quartz, Quartz HQ+, Quartz HQ++: AC: -40 to +50°C / DC: -40 to +65°C (hardened environment)
 - Rubidium: -40 to +45°C
- Storage temperature: -40 to +70°C (IGR-63-CORE)
- Humidity: 5 to 100% (with condensation)

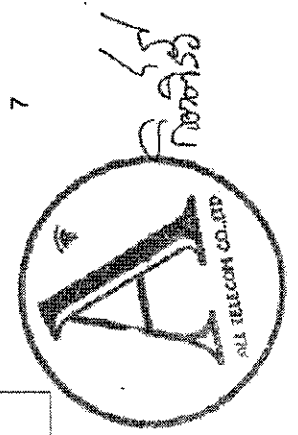
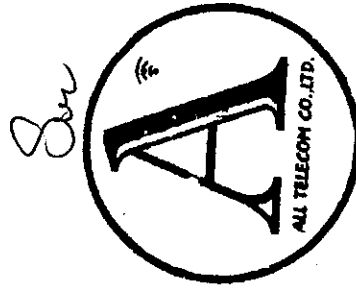
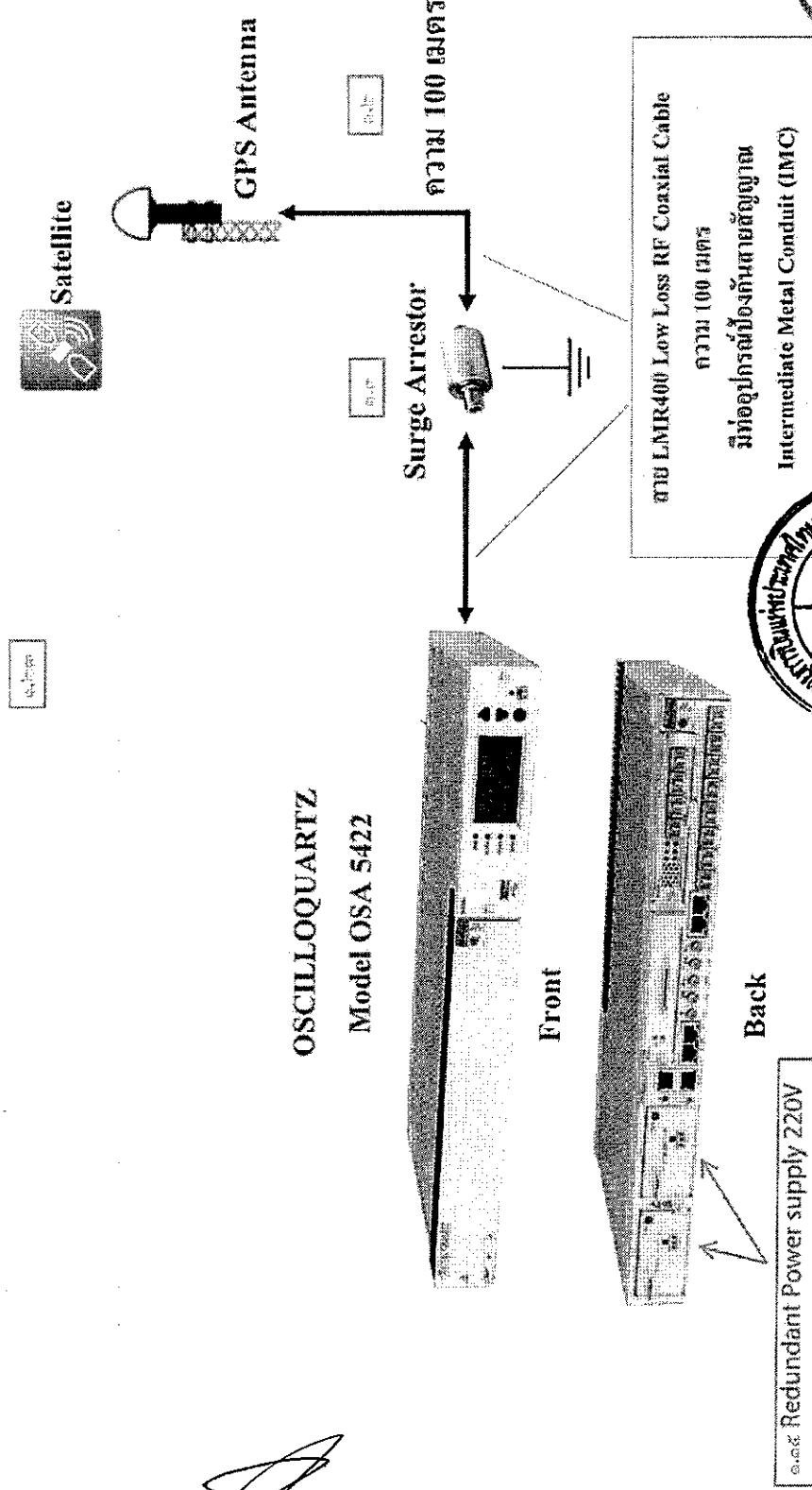
Optional accessories

- Single and multi-band GNSS (GPS/ GLONASS/BEIDOU/ GALILEO/SBAS/QZSS) antenna kits 10 / 20 / 60 / 120 / 150m (32.8ft / 65.6ft / 196.85ft / 393.7ft / 492.1ft), including indoor and outdoor cables, roof antenna, lightning protector and mounting kit
- 1:2 / 1:4 / 1:8 GNSS (GPS/ GLONASS/BEIDOU/ GALILEO) splitters
- GNSS window antenna
- Cables and adapters accessory kit
- Patch panels for BITS / CLK / PPS / PPS+ToD / IRIG

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NTP SERVER DIAGRAM





For more information regarding the CLI command structure, see the *OSA 5422 Command Line Interface Reference Guide*.

2.2.0

Simple Network Management Protocol (SNMP)

SNMP commands can be used to configure and monitor the OSA 5422. The OSA 5422 SNMP MIB provides a system for remote configuration and management of OSA 5422 functions.



For more information regarding the SNMP command structure, see the *OSA 5422 SNMP Reference Manual*.

Management Features

These management features are described in this section:

User Management and Security	21
Provisioning	23
Operations Provisioning	24
Alarm Generation and Monitoring	26

User Management and Security

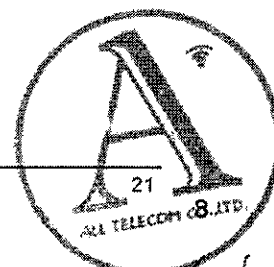
Security features include:

- User access security levels
- Secure Sockets Layer (SSL)
- Support for security of Secure Hypertext Transfer Protocol (HTTPS)
- Secure Shell (SSH) management protocols
- RADIUS support
- SNMP support
- Post login security banner
- Access Control List (ACL) management.

2.2.0

Web access to the onboard Element Manager is through:

- HTTP
- or-
- HTTPS



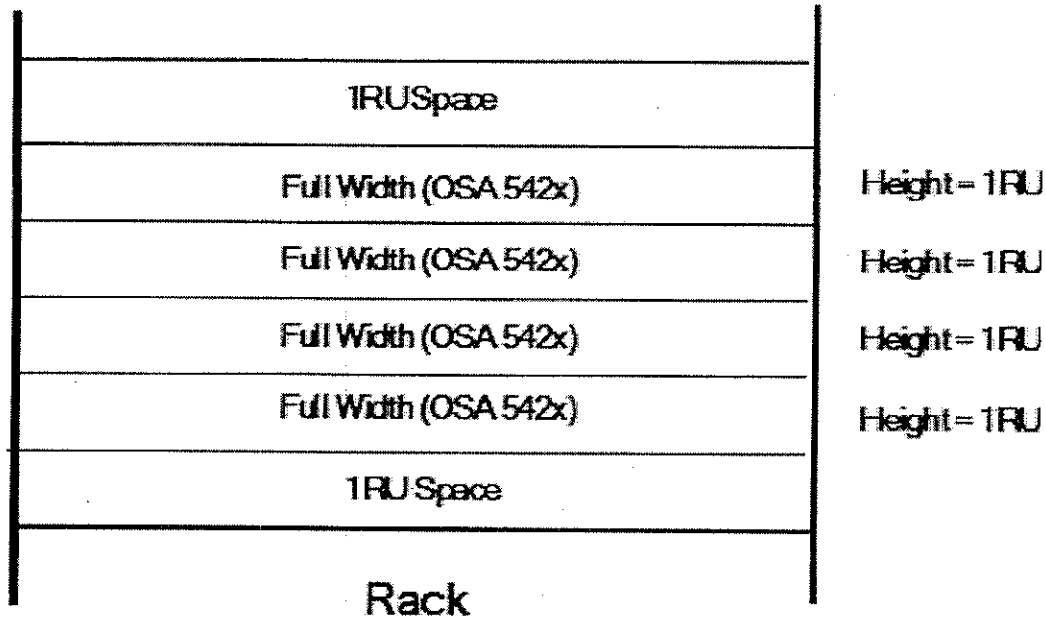
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Figure 19: Install OSA 542x (Full-width Units) in Standard Rack in C-Temp Environment



OSA 542x Mounting Kit

A single rack mounting kit (part number 1013902002) is provided for mounting the OSA 542x.

Mounting Options

The chassis can be rack mounted or placed as a standalone unit. Use one of these procedures to mount the OSA 542x:

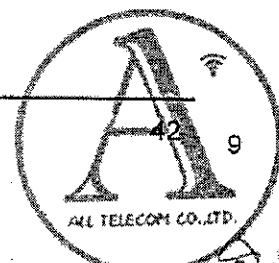
- Installing an OSA 542x Rack Mounted Chassis
- Installing a Standalone Chassis



Installing an OSA 542x Rack Mounted Chassis

The chassis is rack mounted using a mounting bracket pair (part number 1013902002). The rack mounting brackets provided in the Mounting Kit enable the chassis to be inserted into 19" ETSI or 23" standard size racks.

The mounting brackets are mounted on the OSA 542x on the outside of the Left Hand (LH) and Right Hand (RH) side panels. The mounting brackets are either mounted so that the chassis is flush with the rack, or recessed in the rack to allow doors to be used. The steps for fitting the appropriate mounting brackets are explained in the task below.





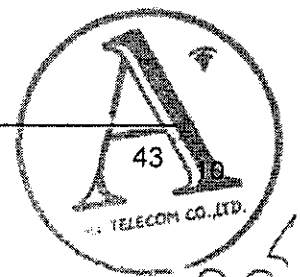
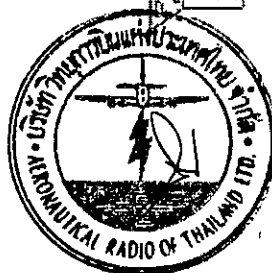
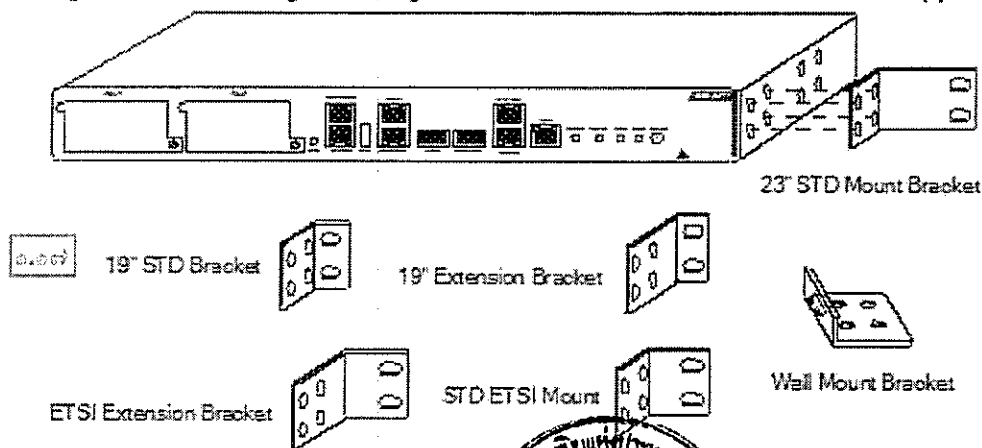
(1) **MECHANICAL LOADING.** When mounting the equipment in a rack ensure that a hazardous condition is not created by uneven mechanical loading.

(2) Ensure that reliable grounding of the rack mounted equipment is maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit.

To install a rack-mounted chassis:

1. Take the chassis out of its packaging and put it on an anti-static surface. If necessary, use canned compressed air to blow off any dust particles.
2. Select the correct mounting bracket type from the Rack Mounting Kit.
3. Place one mounting bracket on one side of the OSA 542x in the correct position, so that the four screw holes on the chassis side panel and the mounting bracket are lined up (one bracket for each side). The mounting bracket can be used in the middle or the front of the side panels. See Figure 20.
4. Align the shelf to the assigned frame location and insert two counter-sunk M4 Pozihead Screws through the mounting holes (as supplied in the Rack Mounting Kit) and tighten with a No.2 Pozi or Phillips screwdriver. See Figure 21.
5. Repeat Steps 3 and 4 for the opposite side of the chassis.
6. Insert the chassis into the rack and secure each mounting bracket to the rack using M5 (or M6) Pozihead Screws.
7. Install patch panel(s) and patch panel connector module(s) as required using M5 (or M6) Pozihead Screws.

Figure 20: Installing Mounting Brackets for OSA 5422 Rack Mounted Applications



Slim Line protector, GDT technology

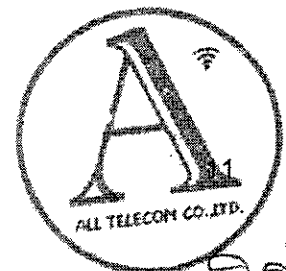
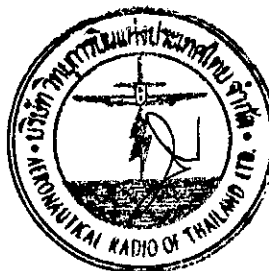
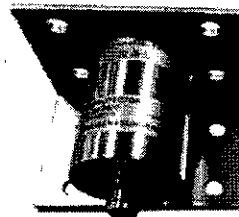
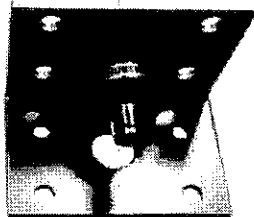
This is a slim line EMC protector of gas discharge technology specially designed for filtering and protecting GNSS receivers systems against electromagnetic perturbations and high voltage transient.



Impedance	50 Ω
Frequency range	0 - 2000 MHz
Insertion loss	≤ 0.2 dB
Return loss	≥ 20 dB
DC supply voltage	≤ 6 V
Surge current handling capability	10 single / 5 multiple kA (test pulse 8/20 μ s)
Residual pulse energy	350 μ J typically (test pulse 4 kV 1.2/50 μ s / 2 kA 8/20 μ s)
Connector (unprotected side)	TNC jack (female)
Connector (protected side)	TNC jack (female)
Weight	50 g
Operating temperature	-40 °C to +85 °C
Waterproof degree	IP65
Compliance	IEC 61643-21
Mounting	ML-4 ($\varnothing 12.9$ mm) or Aluminium mounting bracket (included)

Accessories

Mounting bracket is included together with each EMP. This bracket is made of Aluminium for allowing grounding the EMP.

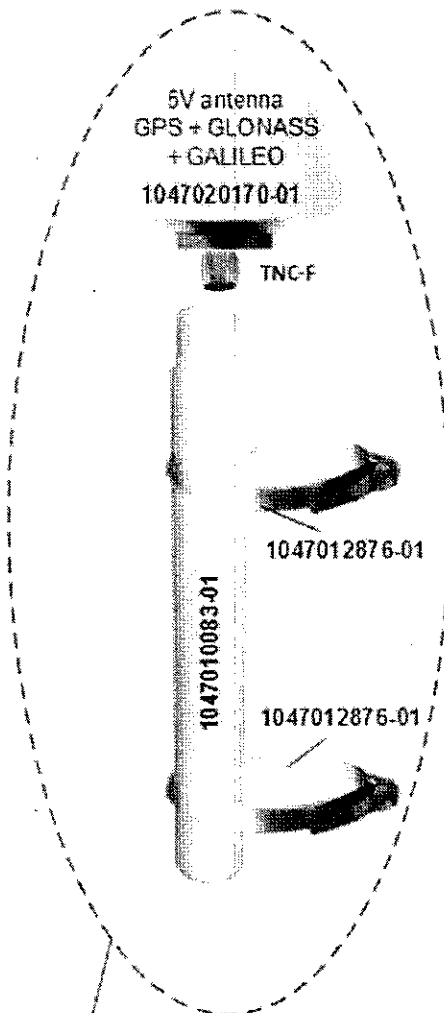


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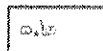
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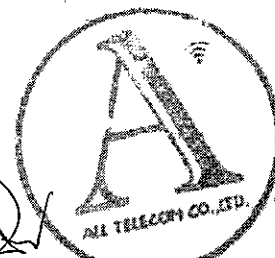
28dB antenna kit
BC47020101-01



40dB Cone antenna

This is a multi-constellation GNSS receiver antenna specially designed for roof installation in tough environments. It has a TNC connector, which is located inside the threaded socket, allowing the antenna cable to be routed inside the mounting pole and protects the cable and connection.

This antenna is an active high gain and high rejection GPS L1, Galileo E1, GLONASS G1 bands antenna having 40dB preamplifier with 5V DC power, supplied directly from the receiver. It includes internal filtering which improves immunity to other RF signals for reliable performance in hostile RF jamming environments.



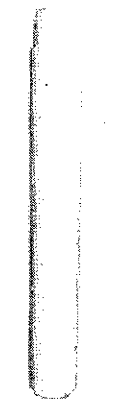


PERFORMANCE	
Input Voltage	+2.8 to +6.0 Vdc
Power consumption	< 25 mA (typical)
Impedance	50 Ω
Noise	<2.0 dB (typical)
Gain	GNSS: 40 dBi $\pm$ 4 dB
Frequency	1559 MHz – 1610 MHz (GPS – GALILEO – GLONASS)
Out-of-band rejection	F ₀ = 1586 MHz F ₀ $\pm$ 50 MHz: $\geq$ 60dBc F ₀ $\pm$ 60 MHz: $\geq$ 70dBc
VSWR	$\leq$ 2.0 : 1
Polarization	RHCP
ENVIRONMENTAL	
Operating temperature	-40° C to +85° C
Storing temperature	-
PHYSICAL	
Dimensions (H x $\varnothing$)	60 x 44 mm
Weight	50 gr
Connector	TNC female
Mounting	3/4" pipe thread adaptor provided

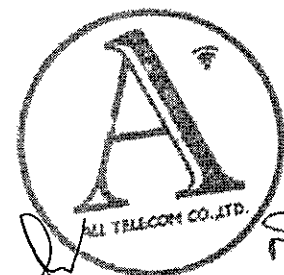
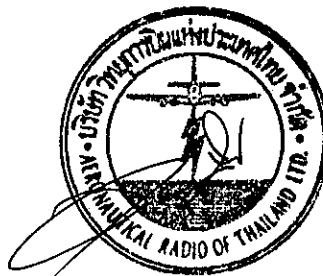
Mounting accessories

Antenna mast

Antenna mast (H x $\varnothing$)	250mm x 30mm (9.84" x 1.18")
Strap-clamp circumference	min. 250mm (8.0") max. 114mm (4.5")



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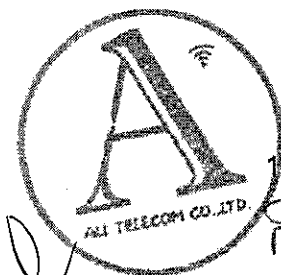
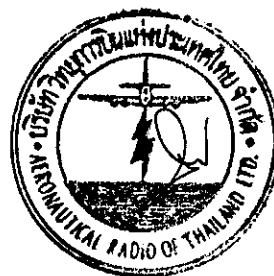
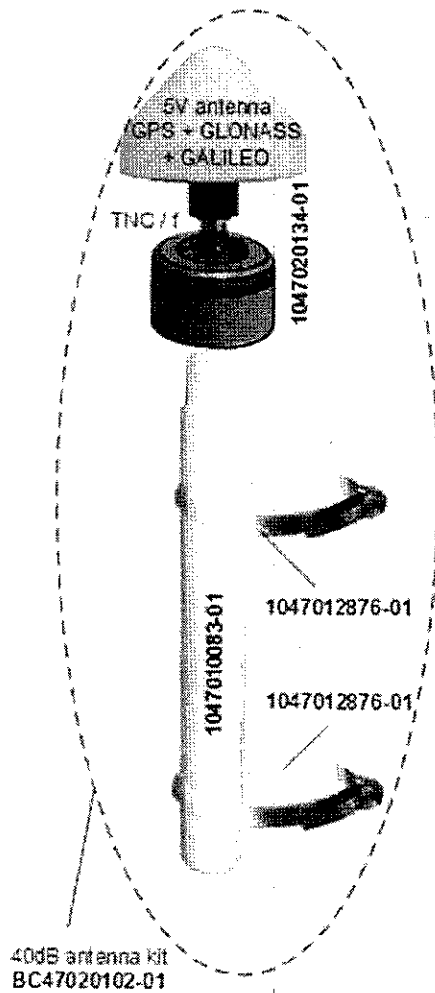
Hose clamp



2x hose clamps are proposed to fasten the antenna mast

Bundle

Order the following bundle for receiving the antenna together with the mounting accessories.



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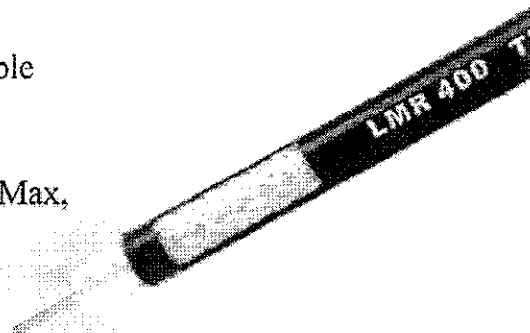


LMR®-400

Flexible Low Loss Communications Coax

Ideal for...

- Drop-in replacement for RG-8/9913 Air-Dielectric type Cable
- Jumper Assemblies in Wireless Communications Systems
- Short Antenna Feeder runs
- Any application (e.g. WLL, GPS, LMR, WLAN, WISP, WiMax, SCADA, Mobile Antennas) requiring an easily routed, low loss RF cable
- **NEW!** Times Protect® LP-18-400 protector-series



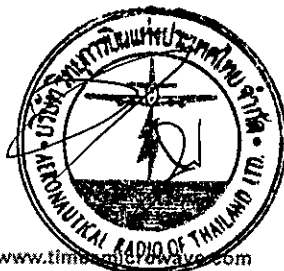
Part Description				
Part Number	Application	Jacket Color	Color	Stock Code
LMR-400	Outdoor	PE	Black	54001
LMR-400-DB	Outdoor/Watertight	PE	Black	54091
LMR-400-FR	Indoor/Outdoor Riser CMR	FRPE	Black	54030
LMR-400-FR-PVC	Indoor/Outdoor Riser CMR	FRPVC	Black	54073
LMR-400-PVC	General Purpose	PVC	Black	54218
LMR-400-PVC-W	General Purpose	PVC	White	54204

Construction Specifications			
Description	Material	In.	(mm)
Inner Conductor	Solid BCCA1	0.108	(2.74)
Dielectric	Foam PE	0.285	(7.24)
Outer Conductor	Aluminum Tape	0.291	(7.39)
Overall Braid	Tinned Copper	0.320	(8.13)
Jacket	(see table)	0.405	(10.29)

Environmental Specifications			
Performance Property	°F	°C	
Installation Temperature Range	-40/+185	-40/+85	
Storage Temperature Range	-94/+185	-70/+85	
Operating Temperature Range	-40/+185	-40/+85	

Mechanical Specifications			
Performance Property	Units	US	(metric)
Bend Radius: installation	in. (mm)	1.00	(25.4)
Bend Radius: repeated	in. (mm)	4.0	(101.6)
Bending Moment	ft-lb (N-m)	0.5	(0.68)
Weight	lb/ft (kg/m)	0.068	(0.10)
Tensile Strength	lb (kg)	160	(72.6)
Flat Plate Crush	lb/in. (kg/mm)	40	(0.71)

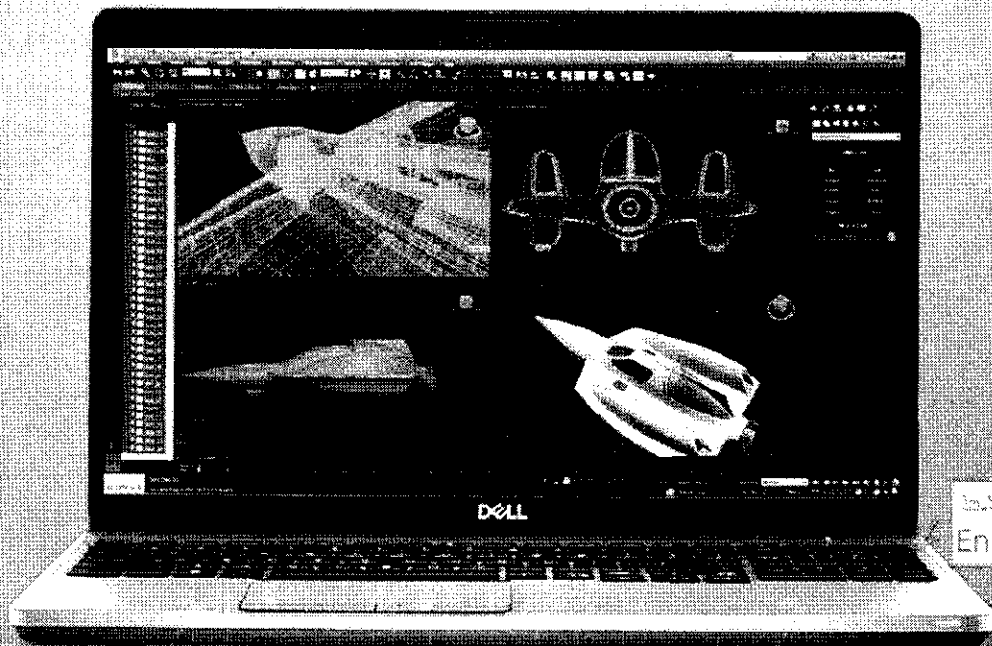
Electrical Specifications			
Performance Property	Units	US	(metric)
Velocity of Propagation	%	84	
Dielectric Constant	NA	1.38	
Time Delay	nS/ft (nS/m)	1.20	(3.92)
Impedance	ohms	50	
Capacitance	pF/ft (pF/m)	23.9	(78.4)
Inductance	uH/ft (uH/m)	0.060	(0.20)
Shielding Effectiveness	dB	>90	
DC Resistance			
Inner Conductor	ohms/1000ft (/km)	1.39	(4.6)
Outer Conductor	ohms/1000ft (/km)	1.65	(5.4)
Voltage Withstand	Volts DC	2500	
Jacket Spark	Volts RMS	8000	
Peak Power	kW	16	



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Handwritten notes and signatures, including 'D1' and '10/1/97'.

Powerful and affordable



ภาษาไทย Thai/
English



INTELLIGENT PERFORMANCE

Maximize your workstation performance with Dell Optimizer for Precision software and featured components, including an Intel® Core™ (up to 8-core on i9) or Xeon® processor, up to 64GB DDR4 memory (ECC optional) and NVIDIA Quadro™ professional graphics (4GB).



SMALL, BUT POWERFUL

This new mobile workstation is available in two colors, including a beautiful aluminum Titan Gray, and comes in at 4.35lbs. The 350 is great for 2D and 3D CAD, as well as heavy Excel file users who need mobility. Also, Thunderbolt keeps you connected to all the accessories you need and keeps pace with your speed.



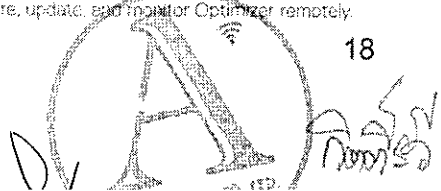
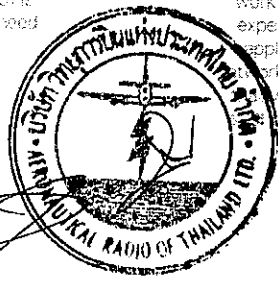
EXCEPTIONAL MOBILITY

Get an extremely long battery life with an optional ExoreesCharge battery, and up to 4TB (2x2TB) of storage for projects on the go.



PEACE OF MIND

Dell Optimizer for Precision is AI-based software that learns how you work and adapts to your style to create a smarter, more personal experience. The result? Improved system responsiveness, better application performance, smarter use of battery power, reliable network connectivity and optimized storage. All from a single console you manage from WorkspaceOne or Dell SCCM—allowing IT to deploy, configure, update, and monitor Optimizer remotely.



Recommended Accessories

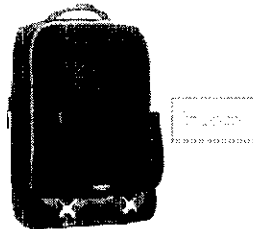
PROVIDING 50%

ON-THE-GO



DELL USB-C MOBILE ADAPTER C8300

Connect your Precision to almost any device with this convenient USB-C compact adapter and collaborate from any location.



DELL TIMBUK2 AUTHORITY BACKPACK 15-18"

Designed by professional for Dell, the Timbuk2 Authority Backpack is built to carry all protect everything you need for the workday. The internal organizer provides ample space for laptop accessories and any extra items you need to carry.



JABRA EVOLVE 75

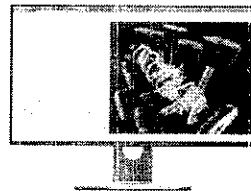
With the ambient noise cancellation feature of this wireless headset you can hear every word clearly on your next call.

AT THE DESK



DELL THUNDERBOLT DOCK W1587B

Work at full speed with Precision 7000 series Thunderbolt Dock. The dock supports your Precision 7000 series laptop, multiple 4K displays and connects to your peripherals via a single cable.



DELL ULTRASHARP 32 4K MONITOR U3218Q

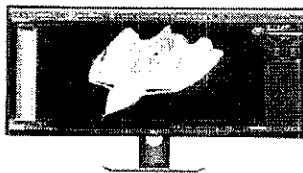
The world's first 32" 4K monitor for work. Immerse yourself in a powerful HDR content playground for training, design and creative work. Fully adjustable stand.



DELL PREMIER WIRELESS KEYBOARD AND MOUSE KM717

Enhance productivity and enjoy its elegant design that will fit into virtually any work space. For increased productivity you can simultaneously pair up to two compatible devices with Bluetooth LE.

CREATORS AND ENGINEERS



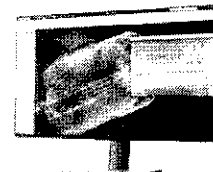
DELL ULTRASHARP 32 CURVED MONITOR U3218Q

Engage, experience, create. Immerse yourself in the world's first 32" 4K curved monitor with an ultra-thin bezel.



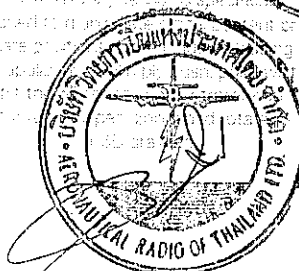
30C0RNXEN SPACEMOUSE WIRELESS

30C0RNXEN SPACEMOUSE WIRELESS is a wireless, ergonomic, precision pointing device that provides a natural, intuitive way to interact with your computer. It features a built-in trackball and a scroll wheel for precise navigation. The device is designed for long-term use and is compatible with Windows, Mac, and Linux operating systems.



DELL ULTRASHARP 32 4K MONITOR U3218Q

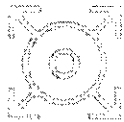
Your images show the way they were meant to. With the world's first 32" 4K Ultra HD monitor with VESA certified Deep HDR™ HDR content support.



Built for business

Dell Technologies Unified Workspace

Dell Technologies Unified Workspace is the most comprehensive solution to deploy, secure, manage and support virtually all devices from the cloud. We designed this revolutionary solution with intelligence and automation providing you with visibility across the entire endpoint environment. We help you save time, improve user experience, optimize resources and strengthen security.



DEPLOY

Our modern deployment solution, ProDeploy in the Unified Workspace allows you to revolutionize the way deployment gets done. By spending just one hour for set up, IT can then hand deployment to Dell and have preconfigured systems shipped directly to the end users—wherever they are.



SECURE

Dell Endpoint Security for the Unified Workspace helps you manage growing cyber risks while embracing workforce transformation. With Dell SafeGuard and Response powered by Secureworks, you gain actionable insight to help you quickly and efficiently prevent, detect and respond to cyber-attacks - keeping your environment free from harm.

The 3551 adds additional security features such as: Intel® Platform Trust Technology, Trusted Platform Module (TPM) 2.0, Chassis lock slot support; Support for Computrace and SmartCard Reader; Fingerprint reader or FIPS Fingerprint reader (Check regional availability).



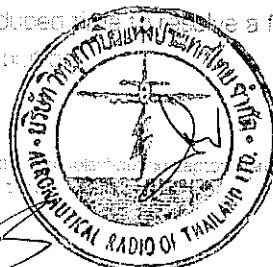
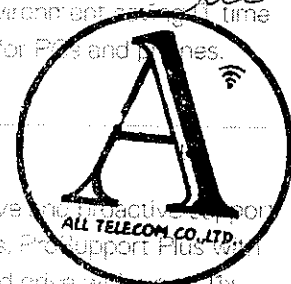
MANAGE

We integrated our hardware management solution, Dell Client Command Suite with VMware Workspace ONE, allowing you to take advantage of unified endpoint management (UEM) and manage the firmware, operating system and applications for all devices from the Workspace ONE console. UEM simplifies the management of the entire environment saving time from having to work between separate consoles for PCs and phones.



SUPPORT

ProSupport Plus continues to be the only predictive and proactive support in the market. When compared to key competitors, ProSupport Plus with Support Assist reduced the time to fix a failed hard drive with up to 11x faster time to resolve.

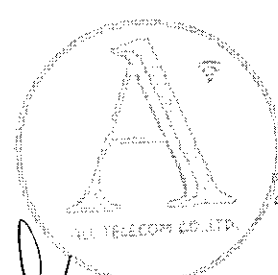


Business and Financial Technology, your best choice. Dell Client Command Suite and ProSupport Plus are the most comprehensive solutions for your business. Dell Client Command Suite and ProSupport Plus are the most comprehensive solutions for your business.

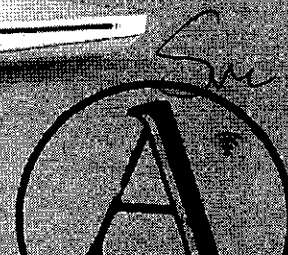
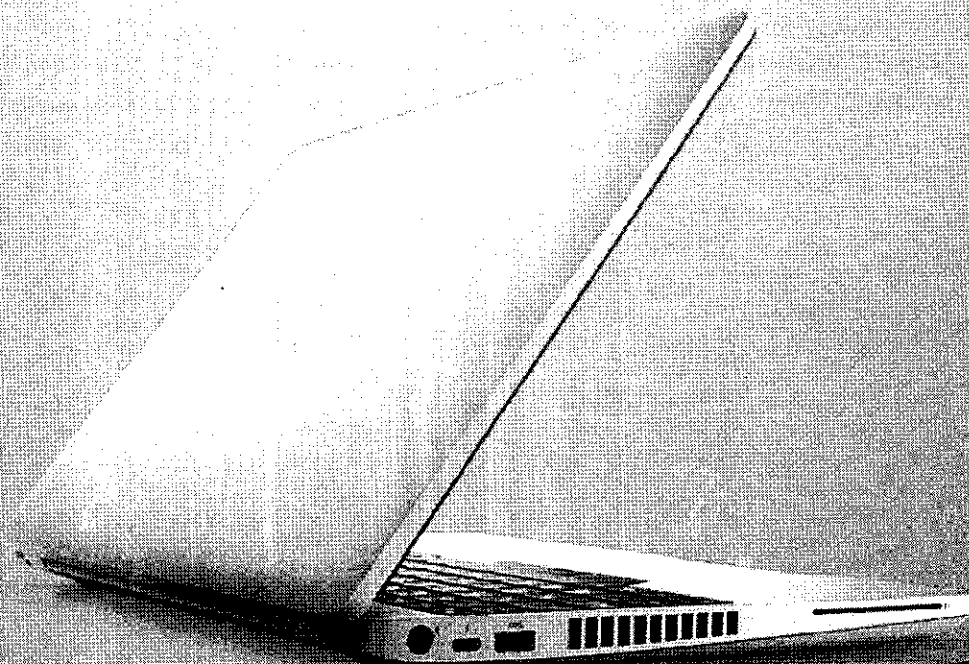
Features & Technical Specifications

PRECISION 3551

Feature	Dell Precision 3551 Technical Specifications	Feature	Dell Precision 3551 Technical Specifications
Processor ¹	Intel® Xeon® V-4055N, 6 Core, 12M Cache, 2.80 GHz up to 3.10 GHz Turbo, 35W (40W) Intel® Core™ Processor (3rd Gen), 6 Core, 10M Cache, 2.40 GHz up to 3.5 GHz Turbo, 35W (45W) Intel® Core™ Processor (4th Gen), 6 Core, 12M Cache, 2.40 GHz up to 3.5 GHz Turbo, 35W (45W) Intel® Core™ Processor (10th Gen), 6 Core, 12M Cache, 2.40 GHz up to 3.5 GHz Turbo, 35W (45W) Intel® Core™ Processor (7th Gen), 6 Core, 12M Cache, 2.40 GHz up to 3.5 GHz Turbo, 35W (45W) Intel® Core™ Processor (5th Gen), 4 Core, 10M Cache, 2.40 GHz up to 3.5 GHz Turbo, 35W (45W) Intel® Core™ Processor (5th Gen), 4 Core, 10M Cache, 2.40 GHz up to 3.5 GHz Turbo, 35W (45W)	I/O Ports and Connectors	1 Thunderbolt Type-C 3 USB 3.2 Gen 1 (1x power enabled) 1 HDMI 2.0 1 RJ-45 1 Headset jack 1 micro SD card reader 1 Smart Card reader (optional) 1 Fingerprint reader on power button (optional)
Operating System ²	Microsoft® Windows 10 Pro (64-bit) Microsoft® Windows 10 Pro for Workstations (64-bit) Microsoft® Windows 10 Home (64-bit) Ubuntu 18.04 Red Hat 8.0	Security ³	Software Security SafeGuard and Response , powered by VMware Carbon Black and Secureworks, provides modern security to prevent, detect and remediate advanced malware and cyber attacks. Suite of technologies includes the following: Next Generation Antivirus (NGAV), Endpoint Detection and Response (EDR), Threat Detection and Response (TDR), Managed Endpoint Detection and Response, Incident Management, Retainer, Emergency Incident Response SafeData protects information on device and in the cloud Hardware Security SafeBIOS protects from threats that attack below-the-OS. Includes Dell On-Host BIOS verification, BIOS Resilience, BIOS Recovery, and additional BIOS Controls. SafeID secures end user credentials with a dedicated security chip. Additional features include the following: Trusted Platform Module (TPM) 2.0, self-encrypting storage drives (Opti. RFS), Smart card keyboard (RFS), Physical Security Options: Chassis lock pin support, Chassis Intrusion Switch, Lockable Cable Covers, Supply chain tamper alerts (Check regional availability)
Memory ⁴	2 DIMM slots up to 64GB DDR4-2933MHz (optional ECC)	Dimensions	Width 14.14/358.0mm x Depth 8.37/213.5mm x Height 60.7/154.9mm
Graphics ⁵	Integrated Intel® HD 630 Graphics NVIDIA Quadro P520 or RTX 2080	Battery	5 Cells, 51 Whr ExpressCharge™ Capable Battery 4 Cells, 68 Whr ExpressCharge™ Capable Battery 4 Cells, 68 Whr Long Life Battery (includes 2 year limited hardware warranty) 6 Cells, 87 Whr ExpressCharge™ Capable Battery
Display Options	15.6" FHD, 100% sRGB, Anti-Glare, Non-touch 45% Adobe RGB color gamut 15.6" FHD WVA, 1920 x 1080, Anti-Glare, Non-touch, 45% Adobe RGB color gamut 15.6" FHD WVA, 1920 x 1080, Anti-Glare, Non-touch, 100% sRGB color gamut w/ Premium Color 15.6" FHD WVA, 1920 x 1080, Anti-Glare, Touch, 45% Adobe RGB color gamut	Weight ⁶	Starting at 4.7 lbs, 1.85kg
Storage Options ⁷	2 slots for 2.5" HDD and 1 x 2.5" SATA / PCIe 2.5" HDD: 500GB, 7200RPM, 12GB 7200RPM SATA 6GB/s, 1TB 7200RPM, 2TB 7200RPM M.2 SATA 2280, 512GB M.2 PCIe, PCIe-to-SATA adapter (2x 512GB, 1TB, 2TB, 4TB, 8TB) 512GB, 1TB, 2TB, 4TB, 8TB 512GB 2TB M.2 PCIe (max 60,000 IOPS) 10 Key Keyboard, Single pointing 10 Key + numeric Dual pointing Backlit, 10 Key Keyboard, Single pointing	Power Adapter	60W 4-pin barrel AC Adapter 60W 4-pin barrel AC Adapter, USB Type-C
Input	10 Key Keyboard, Single pointing 10 Key + numeric Dual pointing Backlit, 10 Key Keyboard, Single pointing	Regulatory and Environmental Compliance ⁸	Energy Star, EPEAT Certified
Communication Options	Integrated Intel® I219-LM 10/100/1000 Gigabit Ethernet Controller Wireless LAN & Bluetooth Intel® Wireless AX201 2x2, Max 160MHz + Bluetooth 5.1 Intel® Wireless AX201 2x2, Max 160MHz + Bluetooth Quad-band LTE Cat 4B 300Mbps Dual Band 2x2 Wireless Adaptor + Bluetooth 4.0 Wireless Wi-Fi Intel® AX 1650 LTE-A Wireless	TAM Configurations available	Check regional availability
Multimedia	Dual integrated high quality speakers and dual integrated noise-reducing microphone Max Audio Playback Modes HD Video 4K camera		



Our Best Work Performance Mobile Workstation



Some options available only in select regions. ISV certification applies to select configurations.

1 Intel Turbo Boost mode only available on Xeon, Core i7 and Core i5 processors. Intel Integrated HD graphics only available with select processors.

2 A 64-bit operating system is required to support 4GB or more of system memory.

3 System memory may be used to support graphics, depending on system memory size and other factors.

4 Hard Drive capacity varies with preloaded material and will be less.

5 Computrace is not a Dell offer. Certain conditions apply. For full details, see terms and conditions at: www.absolute.com/en/about/legal/agreements.

6 Weights vary depending on configuration and manufacturing variability.

7 See epeat.net for specific registration rating/status by country. For a complete listing of declarations & certifications, see Dell's regulatory & compliance homepage at dell.com/regulatory_compliance. Availability and terms of Dell Services vary by region. For more information, visit Dell.com/servicecontracts/global.

Warranty available by visiting Dell USA LP, Attn: Warranties, One Dell Way, Round Rock, TX 78682 or see www.dell.com/warranty. Onsite Service after Remote Diagnosis. Remote

Diagnosis is determination by online/phone technician of cause of issue; may involve customer access to inside of system and multiple or extended sessions. If issue is covered by Limited Hardware Warranty (www.dell.com/warranty) and not resolved remotely, technician and/or part will be dispatched, usually within 1 business day following completion of Remote Diagnosis. Availability varies. Other conditions apply.

Dell, EMC, and other trademarks are trademarks of Dell Inc. or its subsidiaries. Other trademarks are the trademarks of their respective owners. Intel and the Intel logo are trademarks of Intel Corporation in the U.S. and/or other countries. Microsoft and Windows are trademarks of Microsoft Corporation in the U.S. and/or other countries.

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DataTraveler 100 G3 USB Flash Drive with Sliding Cap

Kingston's DataTraveler® 100 G3 (DT100G3) USB Flash drive is compliant with USB 3.0 specifications¹ to take advantage of technology in newer notebooks, desktop PCs and digital devices. DT100G3 makes it easier than ever to store and transfer documents, presentations, music, video and more.

DT100G3 features a sleek, cost-effective design to make adding to the USB 3.0 experience a minimal investment. Available in capacities from 16GB–256GB², DT100G3 is backward compatible with USB 2.0 and has a five-year warranty.

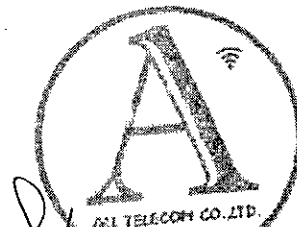
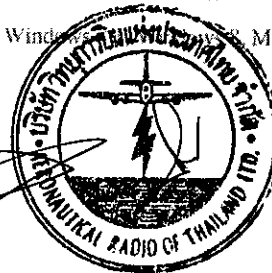


Specifications

Capacities ¹	32GB, 64GB, 128GB, 256GB
Speed	32GB, 64GB: 100MB/s read 128GB, 256GB: 130MB/s read
Dimensions	60mm x 21.2mm x 10mm
Operating Temperatures	0°C to 60°C
Storage Temperatures	-20°C to 85°C
Warranty	5-year warranty with free technical support
Compatible with	Windows® 10, Windows® 8.1, Windows® 7, Mac OS (v. 10.10.x+), Linux (v. 2.6.x+), Chrome™ OS



00000000





Dell Corporation (Thailand) Co., Ltd.
22nd Floor, Empire Tower 195 south Sathorn Road,
Yannawa, Sathorn, Bangkok 10120 Thailand
Tel: (66 2) 670 7000

Letter of Appointment

Date: August 25, 2020

To: Aeronautical Radio of Thailand Ltd.

Tender No.: KorPor.BorTor e-b 168 / 2563 issue dated on August 17, 2020

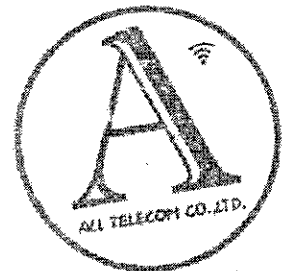
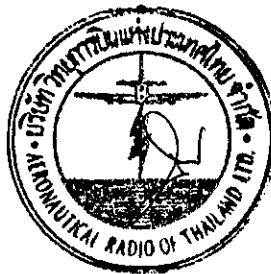
Project: Bid Purchase and Installation NTP Server System NETWORK TIME PROTOCOL (NTP)
with Training amount 1 System

We, Dell Corporation (Thailand) Co., Ltd., office at 22nd Floor, Empire Tower 195 south Sathorn Road, Yannawa, Sathorn, Bangkok 10120 Thailand, the representative of Dell Notebook & Accessories, hereby appoint ALL Telecom Co., Ltd., headquarters office at 46 Soi Phetkasem 24, Phetkasem Road, Pakkhong-Phasricharoen, Phasricharoen, Bangkok 10160 Thailand, as our to supply our Dell Notebook & Accessories model PRECISION 3551 Brand Dell to Aeronautical Radio of Thailand Ltd. in response to the invitation letter number KorPor.BorTor e-b 168 / 2563 issue dated on August 17, 2020 the tender for "Bid Purchase and Installation NTP Server System NETWORK TIME PROTOCOL (NTP) with Training amount 1 System"

We commit to provide full support to Aeronautical Radio of Thailand Ltd. through our authorized distributor until completion of the project and will provide support for the equipment, material and/or software. Our support will cover delivery of equipment and/or software and/or system, installation, warranty, maintenance and repair.

Sincerely yours,

Kamonlak Hongveanchan
Sales Project



Manufacturer's Authorization

Date: 27 August, 2020

To: Aeronautical Radio of Thailand Ltd.

Tender No.: KorPor.BorTor e-b 168 / 2563 issue dated on August 18, 2020

Project: Bid Purchase and Installation NTP Server System NETWEEK TIME PROTOCOL (NTP) with Training amount 1 System

To Whom It May Concern

We, Oscilloquartz SA office at Avenue des Pâquiers 1 CH-2072 Saint-Blaise Switzerland, the representative of NTP Server Brand OSCILLOQUARTZ model OSA-5422, hereby appoint ALL Telecom Co., Ltd., headquarters office at 46 Soi Phetkasem 24, Phetkasem Road, Pakkhong-Phasricharoen, Phasricharoen, Bangkok 10160 Thailand, as our to supply our Bid Purchase and Installation NTP Server System NETWEEK TIME PROTOCOL (NTP) with Training, model OSA-5422 Brand OSCILLOQUARTZ made in Switzerland / Germany to Aeronautical Radio of Thailand Ltd. in response to the invitation letter number KorPor.BorTor e-b 168 / 2563 issue dated on August 18, 2020 the tender for " Bid Purchase and Installation NTP Server System NETWEEK TIME PROTOCOL (NTP) with Training"

We commit to provide full support to Aeronautical Radio of Thailand Ltd. through our authorized distributor until completion of the project and will provide support for the equipment, material and/or software. Our support will cover delivery of equipment and/or software and/or system, installation, warranty, maintenance and repair.

All products supplied by OSCILLOQUARTZ are brand new (i.e., those system and/or equipment and/or software have never been used in any other installation and have never been re-conditioned for any purpose).

We further state that the proposed products are currently in production line and we have no plan to discontinue them within 2 years after final Acceptance Test date or in the near future.

Oscilloquartz SA



Jean-François DUBUIS
VP Sales Operations & Partner Planning OSA

Tang Huey Eri
Finance & Commercial Mgt

Oscilloquartz SA
Avenue des Pâquiers 1
CH-2072 Saint-Blaise
Switzerland
Phone: +41 32 722 55 55
Fax: +41 32 722 55 56
www.oscilloquartz.com

VAT No.: CHE-101.815.583
Commercial Register: CHE-101.815.583

Deutsche Bank AG, Frankfurt a.M. Zurich Branch
Customer Service
Urbanstrasse 9
P.O. Box 3604
8021 Zurich

Standard Settlement Instruction
Swift Code: DEUTCH33XXX
Local Clearing: 67801
Swift Code for USD: BKTRUS33
Swift Code for CHF: DEUTCH33
Swift Code for all other currencies

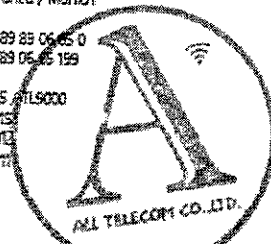
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IBAN CH1487801001000354000

Account EUR:
0900354001 /
IBAN CH1487801001000354001

Account USD:
0900354002 /
IBAN CH1487801001000354002

Headquarters:
ADVA Optical Networking SE
Campus Martinsried
Fraunhoferstrasse 9 a
82552 Martinsried / Munich
Germany
Phone: +49 89 89 06 05 0
Fax: +49 89 89 06 05 159

ISO 9001:2015
ISO 14001:2015
ISO 22301:2017
ISO 50001:2017



05/08/20

Confirmation Letter

Date: 27 August, 2020

To: Aeronautical Radio of Thailand Ltd.

Tender No.: KorPor.BorTor e-b 168 / 2563 issue dated on August 18, 2020

Project: Bid Purchase and Installation NTP Server System NETWORK TIME PROTOCOL (NTP)
with Training amount 1 System

To Whom It May Concern

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Technical Specifications

- ๑.๔ OSA-5422 Built-in monitor display can show time, date, month, year and status receiver signal from satellite.
- ๑.๘ Shall be have Synchronization NTP accuracy in comparison UTC, NTP will be slower or faster UTC during 0 to 50 nanoseconds.
- ๑.๑๐ Shall be management by Command line, Web Browser and SNMP.
- ๑.๑๓ Shall be support coding to secure data type MD5.

Oscilloquartz SA

Jean-François DUBUIS
VP Sales Operations & Partner Planning OSA

Tang Huey Erl
Finance & Commercial Mgt

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Deutsche Bank AG, Frankfurt a.M. Zurich Branch
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8021 Zurich

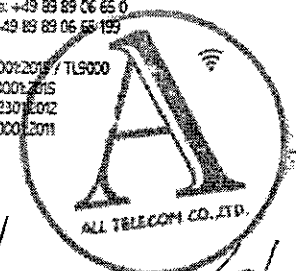
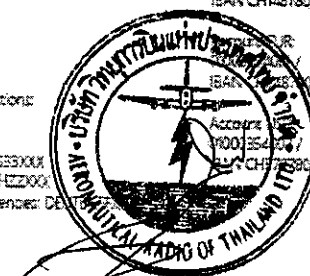
Standard Settlement Instructions
Swift Code: DEUTCH33XXX
Local Clearing: 87801
Swift Code for USD: BKTRUS33XXX
Swift Code for CHF: DEUTCH33XXX
Swift Code for all other currencies: DEUTCH33XXX

Account CHF:
01000354000 /
IBAN CH1457801001000354000

Account EUR:
1001354000 /
IBAN CH1457801001000354000

Headquarters:
ADVA Optical Networking SE
Campus Marbraried
Fraunhoferstrasse 9 a
82152 Martinsried / Munich
Germany
Phone: +49 89 89 06 65 0
Fax: +49 89 89 06 68 199

ISO 9001:2015 / TL9000
ISO 14001:2015
ISO 22301:2012
ISO 50001:2011



๐๗๗๗

Record of Supply

Date: 27 August, 2020

To: Aeronautical Radio of Thailand Ltd.

Tender No.: KorPor.BorTor e-b 168 / 2563 issue dated on August 18, 2020

Project: Bid Purchase and Installation NTP Server System NETWORK TIME PROTOCOL (NTP)
with Training amount 1 System

To Whom It May Concern

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Type of Equipment	Customer	Country	Date of Supply	Q'ty	Type of Service
1) OSA-5420/ OSA-5422	1. AeroThai	Thailand	July 2020	13	State Enterprise
2) OSA-5420/ OSA-5422	2. CAT Telecom	Thailand	February 2020	11	Telecom Operator
3) OSA-5420/ OSA-5422	3. TRUE	Thailand	May 2019	4	Telecom Operator

Oscilloquartz SA

Jean-François DUBUIS
VP Sales Operations & Partner Planning OSA

Tang Huey Erl
Finance & Commercial Mgt

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Customer Service
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P.O. Box 3604
8021 Zurich

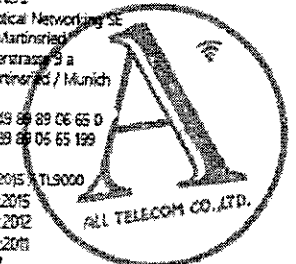
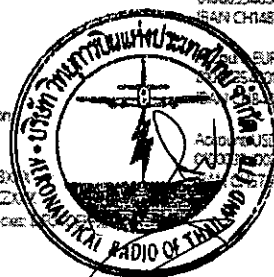
Standard Settlement Instruction
Swift Code: DEUTCH22XXX
Local Clearing: 87801
Swift Code for USD: BRTUS33XXX
Swift Code for CHF: DEUTCH22XXX
Swift Code for all other currencies:

Account CHF:
01000354000 /
IBAN CH1487801001000354000

Account EUR:
01000354000 /
IBAN DE44 2512 0510 0007 0003 540001
Account USD:
01000354000 /
IBAN US33 2512 0510 0007 0003 540002

Headquarters
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82152 Martinsried / Munich
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Phone: +49 89 89 06 65 0
Fax: +49 89 89 06 65 199

ISO 9001:2015 7119000
ISO 14001:2015
ISO 22301:2012
ISO 20001:2011





บริษัท ออลส์เทลคอม จำกัด ALL TELECOM CO.,LTD.

46 ถนนเพชรเกษม 24 แขวงปากคลองภาษีเจริญ เขตภาษีเจริญ กรุงเทพฯ 10160

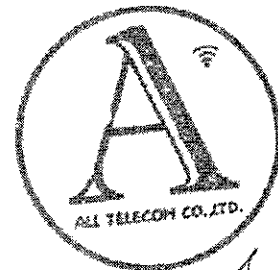
โทร : 02-868-5615, 02-408-8612, 094-424-5461 แฟกซ์ : 02-457-2371

หน่วยงาน Service and Support

บริษัท ออลส์เทลคอม จำกัด อยู่เลขที่ 46 ซ.เพชรเกษม 24 ถนนเพชรเกษม แขวงปากคลองภาษีเจริญ
เขตภาษีเจริญ กรุงเทพฯ 10160 โทรศัพท์ 02-868-5615

เงื่อนไขการให้บริการ

1. การรับประกัน 1 ปี
2. การส่งของและตรวจรับ
3. การซ่อมแซมแก้ไข
4. การสำรองอะไหล่
5. การนำอุปกรณ์มาทดแทนการใช้งาน
6. การ Upgrade new software
7. การฝึกอบรม
8. ติดต่อ คิวเมตส์ รังสิยาธิโนนธ์ 094-424-5461, 094-414-2924



อรรถกวี