Defence Communications Systems

DIGITAL SWITCHES AND MULTIPLEXERS FAMILY

The CD/MT family of digital switches and multiplexers includes a complete range of products designed to provide access and advanced switching and multiplexing services to support military networks in both tactical and strategic environments.

Services offered range from military enhanced telephony services to data services, circuit and packet based, suitable to support modern multimedia Command & Control applications.

The access, switching and networking functions provided by the CD/MT Series equipment are suitable for deployable networks, especially in terms of network services (flood search, resilience to errors and to propagation delays, adaptability to narrow-band bearers) and user services (priority, pre-emption, secure connections).

The same functions can also be used in strategic networks, whose geographic coverage can range from the regional level to the national level.

MAIN FEATURES

- Switching capacity (non-blocking): 2048 channels (time slots)
- Large variety of network interfaces: EUROCOM D/1 86, EUROCOM D/1 EES, STANAG 4206, STANAG 5040, ISDN, ITU-T E1, series V, ETSI/ITU-T ISDN
- Large variety of user and access interfaces: digital 2/4 wires EUROCOM, analogue 2/6 wires, ITU-T V. and X. Series for data, LAN Ethernet, CNR access systems
- Enhanced military services: user mobility, priority, preemption, flood-search routing, multi-slot operations, SW selectable voice coding techniques, security
- INFOSEC certified (ITSEC E2)
- Multiplexes and with crypto devices for bulk or end to-end encryption
- Local control or remote control via integrated Network Management System (NMS)
- Compliant to MIL-STD for operation in hostile climatic and environmental conditions.

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CD/MT SERIES

CD/MT Series equipment are designed to comply with EUROCOM D1/EES and STANAG standards, and are interoperable with other networks and systems compliant with ITU-T and ISDN standards, as well as with single channel radios, wireless systems and data networks. CD/MT Series equipment, in their different versions, are constantly upgraded in technology and performance and are deployed by several MoDs around the world. They represent the success of Selex ES in the field of modern, integrated military telecommunications systems.

NETWORK INTERFACES

- Multi-channel ports with variable bit rate, and BER resilient characteristics
- Multi-channel ports with variable bit rate and variable channel sampling rate for satellite transmission
- Analogue interfaces for PABXs and public or private networks
- Gateways: EUROCOM D/1, EES, STANAG 4206, STANAG 5040
- PCM gateway with ITU-T G.703/G.704 interface and R2, QSIG, DSS1, CAS A1 signalling protocols.

USER INTERFACES

- Digital telephones EUROCOM D/1 compliant with proprietary extensions
- ISDN telephones and terminal adapters
- LB, CB and ACB analogue telephones (DP or DTMF), data modems, facsimile equipment
- Vocal coding CVSDM, PCM, ADPCM
- Asynchronous and synchronous circuit data terminals
- LAN (Ethernet)
- Analogue and digital Combat Net Radios with narrowband LPC, MELP and CELP vocal transcoding.

ROUTING

CD Digital Switches implement a powerful and flexible routing algorithm based on an adaptive flood search method, to support frequent changes in network topology. When applied to tactical networks, flooding can be extended to the entire system, to allow full exploitation of the available transmission bearers and network throughput. When applied to fixed networks, flooding can be restricted to user zones, areas or user communities avoiding signalling congestion and minimising circuit set-up times. The routing function supports standard user services and military features, such as priority, pre-emption and security mechanisms.

TIMING

CD Digital Switches can each operate with an independent clock, either internal or an external high-precision timing source, with buffering facilities on trunk ports. In synchronous networks they can derive the timing source from a designated (master) switch through any network link.

Other timing sources (secondary sources) can be used at the same time to guarantee network synchronisation in the event of unavailability of the primary source. An ad-hoc algorithm guarantees the selection and distribution of timing signal from primary and secondary sources to every node in the network.

USER SERVICES

CD Digital Switches provide a complete set of user services, including:
- Precedence, pre-emption, secure routing
- Abbreviated and compressed dialling
- Digital and analogue conference, add-on conference, secure or non-secure broadcast, dynamic or planned, secure or non-secure
- Call hold and call forward
- Automatic call transfer, secretary and follow me functions
- Camp on busy
- Closed user group
- Switched hot line
- Sole user circuits with automatic restoration in case of failure
- Call barring
- Operator function
- Call tracing
- User affiliation/deaffiliation
- Call offer and intrusion
- Calling line ID presentation.

NUMBERING PLANS

CD Digital Switches can support many different numbering plans to fulfil specific applications; standard (STANAG 4214 Ed. 1 and Ed. 2, STANAG 5046, ITU-T E.164) or custom solutions can be applied.

Numbers can be deducible and associated to subscriber's rank. Numbering can be further extended to connect and integrate systems such as CNR networks and wireless systems to provide homogeneous access schemes. The affiliation mechanism allows full number portability throughout the network.

SECURITY

CD Digital Switches can operate in connection with EUROCOM or ITU-T compatible bulk and end-to-end encryption devices; they further provide efficient protection mechanisms against unauthorised access.

EQUIPMENT VERSIONS

The CD/MT family includes tactical and strategic digital switches of different sizes. Tactical equipment is housed in rugged, splash proof cases, suitable for outdoor use. Tactical equipment, which is designed to be installed in shelters, on-board wheeled or tracked vehicles or in field tents, has external (MIL) connectors mounted on the front panel to make repeated patching more reliable.

Strategic equipment, designed mainly for fixed installations, has external (ISO) connectors mounted on the rear panel and can be equipped with an additional expansion box to house a larger number of interface cards, up to the maximum switching capacity.

TACTICAL NETWORKS APPLICATIONS

CD Digital Switches and MT multiplexers can operate in tactical scenarios on-board mobile stations or platforms. The bit rate of transit ports is configurable from 64 kbps up to 2 Mbps depending on the bearer used (LOS radio links, satellite links, FOC links, CNR VHF systems) and on the transport technology (TDM circuit switched or ATM). CD Digital Switches can be configured as access nodes as well as transit nodes allowing homogeneous networks to be set up.

The main features are:
- Support of meshed networks with variable topology depending on tactical scenarios and mission profiles
- Access of analogue or digital users at Command Post level
- Access to radio networks (CNR, TETRATAC) supporting communications with subordinate units
- Access to Command and Control network LAN segments (Ethernet)
- STANAG/EUROCOM gateways for multinational operations or towards national or NATO military infrastructure networks.

Among the distinguishing features of CD Digital Switches for tactical use are:
- Flood search routing across all available transmission resources
- Support of numbering plans including extensibility to mobile users, short numbering for users groups, user mobility (affiliation service)
- Integration with numbering plans of connected strategic networks and PSTNs
- Automatic recovery of synchronism in case of failure of the selected timing source.

CNRA, COMBAT NETWORK RADIO ACCESS APPLICATIONS

In a typical CNRA system, a CNR radio (HF or VHF) is connected to a CD Digital Switch, performing the radio base station (RBS) function. More than one RBS can be clustered to build up a Radio Access Point (RAP).

The following services are provided:
- Adaptation to narrowband vocoders (LPC, MELP, CELP) for digital voice connections
- Automatic affiliation (if supported by the radio equipment)

- Voice/data selective call from radio net member to landline subscriber and vice-versa
- Voice/data selective call and conference call between radio net members, and members of other CNR networks, through CNRA.

STRATEGIC NETWORKS

In wide area networks, CD Digital Switches can be configured as access and transit switching nodes. The transit network may exploit other transport techniques such as ATM, PDH, SDH or be realised over leased lines. Access centres capable of accommodating hundreds of users can be created by means of multi-box switches with connecting local MT multiplexers.

CD Digital Switches are typically connected together, to MT equipment and to the transport level by means of 2 Mbps links on copper, fibre optics, microwave or satellite bearers. The main functions of CD Digital Switches for strategic use are:
- Access and switching support for geographic networks at regional or national level
- Routing and cross-connection of HF/VHF/UHF traffic and control channels for air and naval traffic control
- Access to LANs (Ethernet) supporting modern multimedia Command and Control applications
- Support of wide area networks shared between different user communities (e.g. Army, Navy, Air Force)
- Access to wireless systems (e.g. CNR, TETRA, GSM)
- Gateway to national or NATO strategic networks or to other public or private networks.

The distinguishing features of CD Digital Switches for strategic use are:
- Flood-search routing restricted to geographical areas or user communities
- Integration with numbering plans of tactical networks and full service sharing.

SATELLITE ACCESS APPLICATIONS

CD Digital Switches can be connected to satellite modems, allowing the establishment of PAMA or DAMA links, the latter using proprietary protocols.

The following services are provided:
- Accommodation of up to 64 channels with selectable sampling rate (4, 8, 16, 32 kbps) on one single link
- Voice compression and echo cancellation
- FEC and rate optimisation techniques for data transmission.

TECHNICAL SPECIFICATIONS

Switching capacity
- Up to 2048 equivalent channels (time slots).

Network configurability
- Multi-channel interfaces (loop/trunk/gateway):
  - Up to 16 ports (up to 64 time slots each)
- Up to 5 multi-channel interfaces on the Small Tactical version.

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User configurability
- Easy configuration for all user categories, 5 or 10 channels per card
- Up to 64 integrated users on tactical and strategic versions
- Up to 128 integrated users through multi-box expansion modules on strategic version
- Up to 40 integrated users (depending on their types) on Small Tactical version
- Additional expansion up to 2000 user lines through MTSeries multiplexes
- Network and access interfaces
- EUROCOM (loop/trunk group) up to 2 Mbps, Gateway D1/EES, "C"
- Interconnection point, up to 2 Mbps, STANAG 4206 Gateway (through on-line SW configuration)
- STANAG 5040 Gateway
- Interoperability with ITU-T R2 and CAS (ETSI 300.103), QSIG 931, EURO-ISDN/DSS-1, STANAG 4578 1st Edition (through on-line SW configuration).

Numbering plans
- Deducible plans supported
- Compliant with
- STANAG 4214 Ed. 1
- STANAG 4214 Ed. 2
- STANAG 5046
- ITU-T E.164
- Customised proprietary.

USER INTERFACES

Digital interfaces
- EUROCOMD/1 "K" interface with or without user power feeding.

Analogue interfaces
- 2-wire LB, CB and ACB with DP or DTMF signalling and CVSDM, PCM or ADPCM vocal coding
- 6-wire with E&M signalling
- 2-wire with signalling ACB (CO)
- DP/DTMF signalling in both directions, incoming, outgoing and direct (DID/DOD).

Circuit switched data
- Serial interfaces: ITU-T V.28, V.10, V.11, V.35, V.36 and MIL-188
- Ethernet 10/100 Base-T (bridge)
- FEC: according to EUROCOMD/1, classes 1 to 4 with proprietary extensions
- Asynchronous mode
  - With FEC: up to 38.4 kbps
  - Without FEC: up to 115200 bps
- Synchronous mode
  - With FEC: up to 38.4 kbps
  - Without FEC: up to 256 kbps.

Radio interfaces
- Analogue E&M and Digital MIL-STD 188-114 (each port individually configurable) to interface CNR systems.

Security
- Bulk encryption device synchronisation through EUROCOM circuits, dedicated criterion or in-band signalling (G.703/G.704)
- ITSEC E2 Certification for data protection against unauthorised access.

Timing options
- Channel sampling rate: 4, 8, 16 or 32 kbps selectable per single interface
- Internal timing source: clock stability $\pm3\times10^{-6}$ per year (optionally $\pm2\times10^{-8}$ per year)
- High stability external source
- Received source locked to an incoming link clock signal.

Management
- Auto-diagnostic
  - Power-on self-test
  - On-line BITE
  - General Alarm
- Local Control
  - V.10/V.24 asynchronous serial line, ASCII protocol
- Remote Control
  - In-band dedicated channel.

Power supply
- AC/DC with no break automatic changeover
- Mains
  - Voltage: 110/220 Vac nom., 50/60 Hz
- Consumption
  - 140 W (CD115E, CD141), typical
  - 70 W (CD145), typical
- Battery
  - Voltage: 24/48 Vdc nom.
- Consumption
  - 110 W (CD115E, CD141), typical
  - 55 W (CD145), typical.

Physical
- CD115E, CD141
  - Size: 278 x 448 x 390 mm (H x W x D)
  - Weight: 40 kg max
- CD145
  - Size: 189 x 448 x 390 mm (H x W x D)
  - Weight: 20 kg max.

Environmental
- According to MIL-STD-810
- Temperature: – 40°C @ +55°C operating
- Humidity: 95% non condensing.

EMI/EMC
- According to MIL-STD 461/2.

Installation
- 19" racks
- Fixed, shelter, platform systems, field use.