Bandwidth used on OTN
Between 1 Mbps and 12 Mbps per channel in 1 Mbps increments.

Output signal level ≥1Vp in 75 Ohm

Signal-to-noise ratio > 60dB (weighted)

Differential gain < 5%

Differential phase < 2.5°

Insertion gain variation +/- 0.2dB

Amplitude vs. frequency characteristics
Bandwidth 5.5MHz (typical)

Chrominance-to-luminance gain inequality < 7%

Chrominance-to-luminance delay inequality < +/- 70ns

Specifications low speed data
The low speed data ports on the N2021(R) are compatible with the RSXMM, S30826-Q70-X, RS232 (FB-52365-A), RS232MM (FB-52441-A) and RS422 (FB-52384-A) interface cards. With respect to point-to-point connections, they are also compatible with the RS422MD4 (FB-52384-F0A) and RS422MM6 (FB-52384-EOA) interface cards.

Note: not compatible with the RS485 card (BE2-FB052429A)

Compatibility
RS232 EIA/TIA-232-E and CCITT V.28
RS422 and CCITT V.11
RS485 EIA, RS485

Number of ports
4 ports point-to-point / multidrop

Data rate
0 up to 100 kbps (RS232)
0 up to 600 kbps (RS422) selectable per channel

Performance certification available for IEC 60870-5-101

Transmission
Async./Sync.

Full duplex

Connectors
DB-9

Status information
Receive data
Transmit data
RTS status
RS mode (RS232/422 or -485)

On-board indications per circuit
Receive data
Transmit data
RS mode (RS232/422 or -485)

Specifications I/O contacts
Input contacts
2 inputs: connection for 2 voltage free contacts. An open contact represents a logical 'high' state.

Output contacts
2 outputs: change-over contact Relay is activated by a logical 'low' state.

Low speed data interfaces
The 4 low speed data ports on the N2021(R) support RS232 or RS422 applications. These ports can be configured in point-to-point and multidrop connections. For each low speed data port one can select the type of electrical interface to be used, RS232, RS422 or RS485.

Note: this service is compatible with RSXMM, but not with the RS485 interface card.

Operation
Incoming data signals are sampled at 6.67 times the rate of the incoming data signal. These samples are inserted into the OTN frame and transmitted through the network.

Hence, the transmission speed selected on a channel is the maximum speed possible, but any lower speed can also be transmitted. In the receiving node, these bits are stripped from the OTN frame, reassembled to the original signal and forwarded to the connected equipment. In a point-to-point configuration, a circuit transmits information using the bits (bandwidth) in the OTN frame on which it receives information. In other words, the full duplex operation uses a minimum of bandwidth.

In a multidrop configuration, the received information is also copied and transmitted on the ring towards the next port of the multidrop network; the slave devices transmit data towards the master in a separate channel. Hence, a multidrop network uses two times the bandwidth of a point-to-point link with the same bit rate.

I/O contacts
The N2021(R) node provides connectivity for 4 I/O contacts: 2 input and 2 output contacts. It is possible to create a connection between one or more input contacts and one or more output contacts (or RSXMM ports) allowing for the transport of the contacts’ digital status over OTN.

The input contacts are voltage free contacts, sensed by a solid state relay. An open contact will be converted in a logical high state (inactive or idle state). The output contacts are built using an independent change-over contact on a relay that is activated by a logical zero. Maximum current through such a contact is 1A DC, while the maximum voltage is 60VDC.

The current status of the contacts can be visualized by the OTN Management System.

Ordering information
N2021: S30826-B28-Xabc
N2021R: S30826-B26-Xabc

Introduction
The Open Transport Network (OTN) is a private communication system providing an extension over fiber for voice, data, LAN and video communications. The system is based on “nodes”, which are interconnected to two point-to-point fiber optic links creating two counter rotating rings.

This topology, in combination with the system’s built-in fault recovery features, ensures extremely high system reliability.

Description
The N2021(R) node consists of a 1HU high, 19" rack mountable chassis in which OTN-600-based common logic is combined with on-board interfaces for Ethernet, MPEG, voice, low speed data and I/O contacts.

OTN common logic
The OTN-600 based common logic is the N2021(R) node’s central control block, holding the connections and configuration settings - programmed by the network operator via the OTN Management System (OMS) - and realizing the following functions:

- Controlling the node and interface ports: The core tests and manages the node and the interface ports. An alphanumeric display on the front panel of the node shows the actual ring and node status, facilitating fast troubleshooting.
  - Managing and interfacing the optical ring: The OTN-ring is managed distributed by all BORAs connected to it. Upon startup, the BORA selects a ring master, initializes and closes the ring, and loops back if required due to broken fibers or removed nodes. No single point of failure exists.
  - Controlling the data exchange between interface ports and optical ring: The core determines which data is exchanged between interface ports and the ring, this way making sure no interface port will disturb data from other interface ports.

The N2021(R) node has two slots for SFP optical modules. These SFP modules use LC optical connectors. Different SFP modules are available for IEC 60870-5-101 performance certification (depending on network size) in case of cable break or equipment failure.

Bit Error Rate better than 10^-9

For 600 Mbps OTN networks (OTN-600)

OTN N2021 AND OTN N2021R NODE

FEATURES
- Compact design
- Standard 19" rack mountable Alu chassis
- Very high system reliability
- Multi-service: Ethernet, Video, Voice, low speed data and I/O contacts
- Range of optical transceivers to match various distance requirements
- Extremely fast reconfiguration time of max. 100 ms (depending on network size)

OTN Systems NV
Printed in Belgium
Ref. No.: AB-S403-E-3
Issued February, 2011
Specifications subject to change as design/structural works are implemented.

www.otnsystems.com - www.otn.be
for different distances are available, both for multi-mode and single-mode fiber based networks.

**Ethernet interface**

The N2021(R) node features 5 Ethernet ports (four 10/100 Mbps and one 10/100/1000 Mbps) that are fully compliant with the IEEE 802.3 standard and allow to create fully transparent Ethernet networks through OTN.

The bandwidth through the OTN is selectable from 1 Mbps up to 144 Mbps via the OMS. The Ethernet ports on the N2021(R) node can be used in point-to-point and multipoint configurations.

• Point-to-point connections can be set up between two N2021(R) nodes connected via OTN or between an N2021(R) node and an ET100AE interface card, implying by both nodes shall be using the same bandwidth on the OTN ring. The complete transmission path can operate in full duplex mode.

• In order to realize a multipoint configuration (network), a connection should be defined between the Ethernet ports of three or more N2021(R) nodes and/or ET100AE cards. Multipoint connections between the N2021(R) and ET100AE cards installed in different OTN nodes of the same Ethernet subnetwork use the same bandwidth.

The interface between Ethernet ports on the N2021(R) and the connected device operates in half or full duplex mode. A port offers a bandwidth of 100 Mbps or 10 Mbps (selectable via the OTN Management System (OMS) or via auto-negotiation) to the connected devices. However, the bandwidth used through the OTN network is allocated by the OTN management system, and is selectable stepwise with a maximum of 144 Mbps. This way, the bandwidth network allows to safely load the bandwidth up to 100 Mbps (resp. 10 Mbps) Ethernet networks which are not fully loaded.

The bandwidth setting applies to the entire Ethernet subnetwork, and can be changed via the OTN network management system at all times. Consequently, the maximum number of 100 Mbps subnetworks which can be configured in an OTN network depends on the bandwidth of the OTN network.

The IEEE 802.3 implementation on the N2021(R) node acts as a 5-port store and forward device and uses a sophisticated buffering mechanism guaranteeing maximum performance and transparency. The N2021(R) node allows each Ethernet port to be allocated to a different port of the OTN backbone bandwidth. In this way up to 5 separated Ethernet segments can be configured on a single N2021(R) node (S-LAN).

OTN allows creating Ethernet networks covering more than one hundred kilometers without affecting network performance. This unique feature of OTN makes it very useful in stretched networks.

**Voice interface**

The N2021(R) node is equipped with an 2LVOI-T and an 2W/4W-E&M port allowing to set up analog 2- or 4-wire voice connections, while maintaining full feature transparency.

The 2W/4W port is used for interfacing with analog telephones and is typically applied in combination with a PBX. It is equipped with analog ports and E&M signaling. Besides connections between telephones and PBXs, the 2LVOI-T port also supports direct connections between telephones, for hot line applications without a PBX.

• The 2W/4W port establishes 2- or 4-wire links with separate E&M signaling on -48V, to connect equipment with analog interfaces to the OTN such as modems, emergency telephones, PA systems, SCADA (Supervisory Control and Data Acquisition), radio equipment end, of course, PBXs. The voice port on the port consists of a voice port and a signaling port. The voice port handles balanced analog signals with frequencies in the range of 300 to 3400 Hz. The 2LVOI-T port offers fully transparent E&M signaling capabilities at -48V.

**Video interface**

The MPEG port on the N2021(R) node can be used to transport MCPC carriers in OTN video signals within an 2W/4W-E&M port. Analog CVBS video signals are digitized and compressed, transmitted to another node and decompressed and converted to an analog PAL or NTSC signal. The same port can be used as input or output. Depending on the application, the user may opt for either a low latency or a low bandwidth mode.

Both in point-to-point and multipoint configurations, the MPEG video ports provide switched connections between inputs and outputs. Bandwidth switching video signals are allocated by the OMS (OTN Management System). The bandwidth per video connection can be configured from 1 Mbps to 12 Mbps, depending on the resolution and field rate required; 2 Mbps is adequate for most applications.

A video management system, which can either be the OTN VENUS software or an existing Video or Traffic Management System (VMS), controls the actual switching of the video channels. The VMS translates commands from the VMS into OTN switching commands.

**Specifications**

**Specifications N2021(R) node**

- **Dimensions**: 460mm (19’’), Height: 44mm (1.73’’), N2021R: 59mm
- **Depth**: 318mm
- **Weight**: Node: Module Number Weight N2021 empty (S30826-268-K) 2.0 kg
- **Power Supply**: 4x10/100 Mbps, 1x10/1000 Mbps (selectable via the OMS or through auto-negotiation)
- **Temperature range**: OTN: Between 1 and 144 Mbps, stepwise selectable via the OMS
- **Ambient temperature**: -20°C to +70°C (-4°F to +158°F)
- **Relative humidity**: 5% - 95% non-condensing
- **Altitude**: Up to 5 independent Ethernet segments per N2021(R) node (S-LAN)
- **Line data rate**: 96 kbps per circuit
- **Data in output buffer**: 1200 0 digital telephone
- **Input buffer**: 440 g
- **Data rate**: 589.824 Mbps
- **Data power consumption**: 32W

**General information**

**Power supply**

- 24 VDC (+20%)
- 2-Wire connections for external 24V/DC power supplies for redundancy

**Power supply**: 32W

**Status information**

The following status information is available from the node:

- **Node type**
- **Ambient and node temperature**

**Specifications N2021(R) core**

- Compatibility: With OTN-600 based networks. In an N2021(R) node network, at least one N22 or N215 node is installed for connection with the OMS

**System data rate**: 589.824 Mbps

**Video interface**

- **Video compression**: MPEG-2 MP@ML
- **Video standard**: ITU-T G.712
- **Compression ratio**: 1200:1
- **Latency**: <300 ms
- **Compatibility**: ITU-T H.264

**Specifications Video Interface**

**Specifications video interface**

- **Video standard**: ITU-T G.712
- **Compression ratio**: MPEG-2 MP@ML
- **Compatibility**: ITU-T H.264

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