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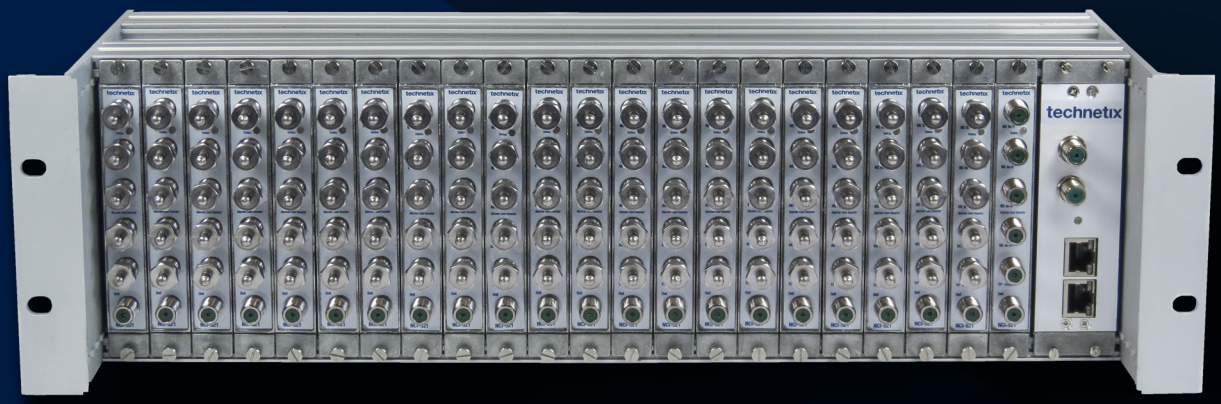

1.2 GHz Narrowcast insertion solution

Product overview

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In the headend environment, isolation issues must be addressed without compromising power consumption, heat dissipation or valuable rack space.

The demand for high speed Internet and digital television means that headends are frequently modified, extended and upgraded to offer higher bandwidth to cable end-users. This is achieved with a range of new technologies or approaches, such as increasing the frequency spectrum, implementing higher modulation schemes, reducing node size (i.e. node splitting) or migrating to DOCSIS 3.1 and CCAP standards.

New cable industry standards

DOCSIS 3.1 offers increased capacity by using channel bonding, but channel bonding reduces the carrier levels, increasing the probable need for active combining.

CCAP, the CableLabs standard, was designed as a cost-effective means of migrating conventional MPEG-based video delivery to IP video transport. It migrates data and video delivery to one integrated distribution path.

Evolving the headend

To cope with the revised standard, more combining and dividing of signals becomes necessary. However, introducing a greater number of smaller nodes into a network necessitates additional headend equipment such as optical downstream transmitters and upstream receivers.

Operators will migrate to CCAP gradually, replacing their existing substantial investment in cable modem termination systems (CMTS) and Edge QAMs (EQAM) over a period of time. The CCAP standard offers combined CMTS and EQAM functionality in one hardware solution. When all signals are provided by a CCAP platform, there is theoretically no need for a combining system. However, in reality, a network migration is never completed all at once – migration takes place over a number of years and network diagnostic systems are still needed.

How important is isolation in a combining system?

High QAM modulation schemes need high isolation for signal combining, the CCAP standard dictates 70 dB isolation between ports on a CCAP device. Existing passive headend combining systems built with splitters and directional couplers are not capable of meeting CCAP isolation requirements. Furthermore, isolation issues must be addressed without compromising power consumption, heat dissipation or rack space in the headend environment. Active combining is the best solution to provide a future-proof system which can handle DOCSIS 3.0, DOCSIS 3.1 and CCAP.

Technetix would like to offer customers a 4K QAM quality signal in the future, which will require a minimum of 41.5 dB CNR. Some CNR will be lost at each amplifier (approx. 0.5 dB in MER) and some system tolerances should be allowed for. A starting CNR of 46-48 dB at the optical nodes is recommended (depending on the network configuration).

What is the CNR of an analog optical link?

CNR is 50 dB (approx.) when there is a good link. In a full passive combining solution, a maximum isolation of 50 dB is a possibility due to leakage paths and return loss issues. In an active solution like the NCI system, it is feasible to have an isolation of 60 dB or more, resulting in a CNR of 60 dB.

It is shown that isolation in the headend combining solution can result in an improved starting CNR in the access network which is 3 dB better. An analog optical link is dominant when there is an active combining solution. In a passive solution the combining system is equal to the optical link and results in a 3 dB lower value.

How the total link is calculated:

Passive combining solution CNR
+ Optical link CNR
= CNR rate at start of access network

50 dB CNR + 50 dB CNR = 46.99 dB CNR

NCI combining solution CNR
+ Optical link CNR
= CNR rate at start of access network

60 dB CNR + 50 dB CNR = 49.59 dB CNR

The NCI solution

The compact, CCAP compliant narrowcast inserter (NCI) solution from Technetix is the smart choice for dynamic operators seeking to overcome these challenges. Available up to 1.2 GHz, the system provides a flexible, scalable and remotely manageable solution to support changing network requirements over time.

Next-generation, CCAP compliant RF combining

The NCI solution complies with the CCAP isolation requirement of greater than 70 dB. The system consists of up to 22 narrowcast inserters (the NCI-521-12), a central controller (the NCC-x222G) and a 22-way broadcast splitter at the rear of rack. It has been designed to deliver maximum flexibility for minimum rack space, along with low power consumption and high isolation.

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The NCI narrowcast inserters are hot swappable plug-in modules. No connections have to be made from the back, as everything is accessible from the front. Each input port on the narrowcast inserter has gain control from 0 dB to 30 dB in 0.5 dB increments and slope control from 0 dB to 10 dB in 0.5 dB increments, with the combined output level also adjustable.

The central controller in the rack controls all 22 modules locally or remotely via a web browser. Setting slope and gain electronically means there is no signal disruption while changes are being made. The advantage is that work can be carried out from a remote location at any time of the day, cutting out the need for night-shift work. For integration into a network management system, an Ethernet data port with an SNMP interface is available as standard.

The NCI solution consists of the following modules:

The **NCI-521-12** is compact, flexible and offers greater than 70 dB isolation between ports. The unit is used to combine up to four narrowcast services with one broadcast service. Up to 22 narrowcast modules can slot into a standard 19″ 3 RU rack along with the NCC-x222G narrowcast controller required to control the NCI-521-12 modules. The system's convenient design saves space in the headend.

NCI-521-12

Every narrowcast input has a centrally operated, 30 dB electronic adjustable attenuator and 10 dB equalizer. Both the broadcast input and output have an adjustable attenuator. Adjustments are made in microseconds, minimizing the risk of service interruptions.

RF connections are made with "F" connectors and the use of high quality ferrite ensures very low passive intermodulation, meaning the NCI-521-12 is fully prepared for DOCSIS 3.1 and channel bonding applications. Narrowcast input 4 has a separate switch and can be used as a redundant input for future CCAP applications.

All settings are stored in non-volatile memory inside the unit, in the event of a power failure settings are restored automatically. Changes in level and slope are completed in microseconds, avoiding potential service disruptions during the process. This significantly reduces labor costs overall.

NCI-x222G

The **NCC-x222G** is a controller combined with a broadcast amplifier and splitter. The unit monitors the RF level of the broadcast signal and the alarm from the Technetix RPS-UNI power supply, it controls up to twenty-two NCI-521-12 narrowcast inserters. Settings and controls can be operated via the built-in web browser. All functions and alarms can be operated remotely via SNMP and SNMP traps are generated. The ability to control the device remotely reduces the need for technicians to travel to remote locations, which is better for the environment and cuts costs for the operator.

A 20 dB broadcast test point is located on the front panel along with a single broadcast RF input. The NCC-x222G is fully prepared for DOCSIS 3.x and channel bonding applications.

MRO-100G/BP

The controller software is built-into the NCC-x222G and automatically detects system modules, offering easy online access to all settings from the operator's preferred location. When the RPS-UNI redundant power supply is connected, monitoring is achieved via the NCC-x222G and results are displayed on the web interface. SNMP and network settings are selected via a menu screen, and NCC-x222G and NCI-521-12 settings are adjusted via the web interface.

For ease of operation, each node can be assigned a name which appears on screen when the associated unit is selected.

The web interface has a built-in calculator to gauge the CSO and CTB values of the unit, signalling the amplifiers' load to the technician. When an amplifier is overloaded, a fault alarm indication is generated.
A more complex system calculator can be downloaded as an Excel file from the controller to also calculate the carrier-to-noise ratio and the isolation between ports at all settings.

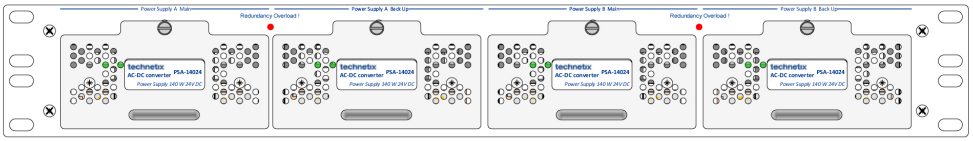
The **MRO-100G/BP** is a 3 RU height, 19-inch mounting rack for the Technetix NCI solution, housing a single NCC-x222G controller and up to 22 narrowcast inserters (NCI-521-12s).

The rack contains a back panel with a 22-way broadcast splitter. All powering, addressing and control signals are integrated; no connections have to be made from the back. The broadcast feed is automatically terminated when a module is removed, allowing the narrowcast inserters to be hot-swapped.

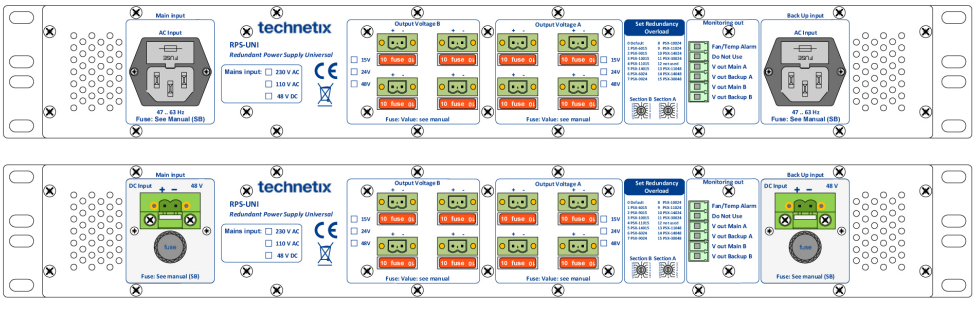
The **RPS-UNI** is a universal fully-redundant power supply featuring four slots for hot-swappable power supply modules. With its 1.5 RU housing, the RPS-UNI uses minimal rack space and can be placed in a standard 19-inch cabinet.

Redundancy overload protection is built-in and realized via load sharing. If redundancy is jeopardized an alarm is emitted via the NCC-x222G. Monitoring of the temperature, fans and output voltages is also possible.

The PSA-30024 plug-in power supply for the RPS-UNI provides 300 W, which is enough power to feed four NCI racks. The system achieves redundancy with the use of two plug-ins. Up to four PSA-30024 power supplies can be placed in the 1.5 RU 19″ housing to redundantly feed up to eight full racks.



RPS-UNI



RPS-UNI back panel with connections

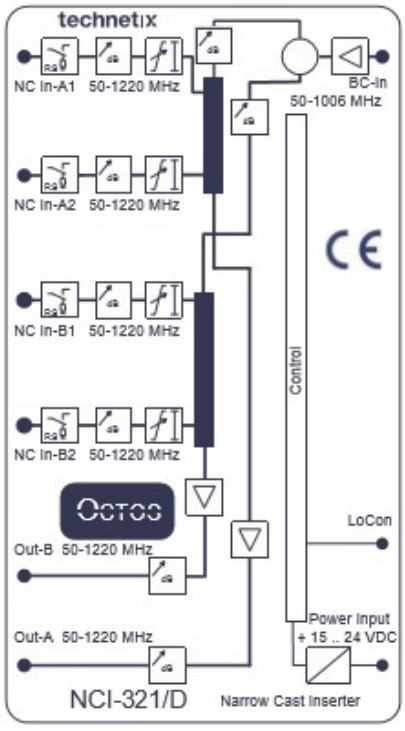
NCI-321/D

Many MSOs are migrating to CCAP in a staged approach taking it one signal source at a time with less services to combine in the headend.

Technetix' NCI solution grows with the changing requirements and has added a new module to its NCI portfolio. The NCI platform is a 19″ 3RU active signal combining solution and operates in the 19″ chassis which has an integrated 22-way broadcast splitter. The broadcast signal is inserted through the narrowcast controller NCC-2222. The controller also acts as an RF amplifier covering the splitter loss from the 22-way split on the back plane.

The NCI-321/D is a 1.2 GHz double 2-way narrowcast inserter, it is next generation CCAP equipment. When compared to its predecessor, (NCI-521-12), the new NCI-321/D module has only two narrowcast inputs per section but also has two sections meaning there are two outputs. When slowly migrating services to CCAP, MSOs require less narrowcast input ports. This double-density unit grows with the network, doubling the density in headends. With a fully populated NCI rack, which comes with twenty-three slots (one of which is dedicated to the system controller), one can now actively feed 44 optical transmitters.

All controls shown in the block diagram are accessed through a a web interface. Attenuator and equalizer plug-ins are no longer needed when changes can be made at the click of a button without causing disruption to services.



NCI-321/D module block diagram

NCI-321/D

Operators migrating to CCAP must consider the NCI solution. The system can replace legacy vendor equipment in the headend while offering scalability to meet future needs – providing a stepped approach to capital expenditure over time.

Features and benefits of the NCI solution

Total cost of ownership is reduced with the following features and benefits:

1. Easy installation saves time and costs.
2. System scalability enables operators to upgrade equipment and services in a gradual, controlled way.
3. High isolation between ports enables the solution to be CCAP compliant.
4. Compact high-density design optimizes space in headends and hub sites.
5. Local or remote system access simplifies network management.
6. Software remote control saves travel time and reduces the technician's carbon footprint.
7. Real-time adjustments eliminate the need for night-shift work and prevents service disruptions.
8. Built-in monitoring generates alarms (SNMP traps).
9. Integrated controller software offers convenient control of up to 22 x NCI-521-12s or NCI-321/D for 44 outputs.
10. Modular system design renders the solution headend / field upgradable to 1.2 GHz.
11. The use of high-quality ferrite ensures very low passive intermodulation, preparing the solution for DOCSIS 3.x and channel bonding applications.

The NCI solution was developed by experts in the field to help operators address isolation challenges in the headend while meeting the growing demand for high capacity applications. The NCI can be customized to meet the needs of MSOs of all sizes.

System compliances include the FCC, USA and Cenelec EN European standards.

Full detailed specification sheets are available.