

C02*DSP* / C03*DSP* / C04*DSP* RDS Encoder



User Manual

2009, June

Table of contents

- 1. Introduction.....4**
- 2. Precautions5**
- 3. Supplied parts6**
- 4. Manufacturer6**
- 5. Installation & Initial Setup7**
 - How to connect the signal cables (point of summation)..... 8
 - How to turn on the device 9
 - Phase balancing instruction 10
 - How to update the firmware 11
- 6. Control elements and connectors12**
- 7. Operation.....14**
 - Operation of C03_{DSP} and C04_{DSP} 14
 - C02_{DSP} Operation via menu 14
 - Status screen – display of the operating parameter..... 14
 - Main menu 15
 - RDS parameter 15
 - Data set memories 15
 - RDS signal level 15
 - Signal phase delay configuration 15
 - MPX input selection 15
 - RDS generation on / off 16
 - ARI, DK / TA, and BK configuration..... 16
 - Reference table setups..... 16
 - Interface configuration..... 17
 - Configuring the serial RS-232 interfaces 17
 - Configuring the TCP/IP network interface..... 18
 - Basic settings 19
 - Configuration of the serial RS-232 interface timeout..... 19
 - Select unit for the level display 19
 - Configuring the system- and error message generation 19
 - Select language 19
 - Self tests and diagnostic 20
 - Check unit functions 20
 - Display- and input/output test 20
 - System clock time..... 20
 - Opto-isolated inputs state 20
 - Relay state..... 20
 - System error messages..... 20

Unit configuration.....	21
Unit functions without menu access	21
Cold start default values	22
8. Interfaces	23
Serial RS-232 interfaces.....	23
IP network interface	24
BNC connectors	25
Symmetrical outputs	27
Jumper for symmetric RDS outputs and MPX bypass setting	27
9. Interface functions / protocols.....	28
UECP protocol V6.0	28
Link protocol	31
ZIDEM.....	31
SNMP - Simple Network Management Protocol.....	32
Transparent mode.....	38
ODA - Open Data Applications.....	42
10. Programmable device functions	44
Relay functions	44
Opto-isolated inputs functions.....	45
11. Maintenance & Servicing	46
12. Troubleshooting	47
13. Specifications.....	48

1. Introduction

The RDS encoder C02_{DSP}, C03_{DSP}, and C04_{DSP} are integrated in 19", 1 RU housings. These RDS encoders are used to transmit RDS data via radio broadcast transmitters. The units are designed for continuous use in unmanned broadcast facilities.

C02_{DSP}, C03_{DSP}, and C04_{DSP} have the same basic function, but vary in several features. The basic functions of the units are explained under the designation C0x_{DSP} or "device". The deviating features are explained under the corresponding unit designator C02_{DSP}, C03_{DSP}, and C04_{DSP}.

Important

Please read this instruction manual carefully before attempting to operate the device. Save this instruction manual carefully – it contains important safety and operating instructions for the unit.

Explicit definitions

Warning	Describes precautions necessary to prevent injury, loss of life, fire or an electrical shock
Caution	Describes precautions necessary to protect the equipment

Further notices:

The figures and graphics in this manual may deviate from the actual appearance.

Errors and omissions excepted.

Configurations, functions, and specifications may change for further development without notice.

2. Precautions

- Dangerous high voltage is present inside the housing. Even after disconnecting the mains supply, dangerous high voltage may be present for a certain time.
- The housing should never be opened by the user.
- To avoid the risk of electrical shock hazards: Check the front panel / housing for damage and the supply cord for abrasion / damage.
- Use a grounded three-wire power supply cord and -plug only, which complies with the national regulations. If necessary, another than the supplied supply cord has to be used, which complies with the regulations of the country where the unit is operated.
- The unit must be plugged into a grounded power socket only - Shock hazards may exist if the unit is not properly grounded.
- The grounding wire/contact must not be removed.
- Make sure that the mains power socket is next to the unit and readily accessible to the user.
- Do not operate the unit in a dusty environment or in direct sunlight exposure.
- Ensure sufficient heat dissipation during operation.
- The surface of the unit can heat up during operation – do not touch.
- Devices which are connected to the unit could be damaged by the unit or damage the unit itself, if the output levels exceed the limits.
- Never expose the unit to rain, snow, or liquids. Do not touch the unit with wet hands.
- Do not use corrosive detergents on the unit.
- Do not operate the unit in the presence of flammable gases. Explosion can result.

3. Supplied parts

	C02 _{DSP}	C03 _{DSP}	C04 _{DSP}
1 x power supply cord	X	X	X
3 x BNC cable	X		X
1 x BNC cable		X	
1 x RJ45 patch cable *	X		
1 x CD-ROM with PC software for remote operation	X	X	X
1 x serial RS-232 crossover cable (D-Sub 9 pole)	X	X	X
1 x instruction manual	X	X	X
1 x 25 pole D-Sub connector (male)	X		X
1 x 25 pole D-Sub connector (female)	X		X
2 x housing for 25 pole D-Sub connector	X		X

* (for units with TCP/IP-module only)

Note: The scope of delivery may deviate in special cases.

4. Manufacturer

2wcom GmbH • Lise-Meitner-Str. 4 • 24941 Flensburg • Germany
Phone (+49) 461-662830-0 • Fax (+49) 461-662830-11
contact@2wcom.com • www.2wcom.com

© 2009 • 2wcom and the 2wcom logo are registered trademarks of 2wcom in Germany and/or other countries.

5. Installation & Initial Setup

This section informs you about how to install and connect the CO_xDSP correctly.

Best setup location

The CO_xDSP unit should be installed into a rugged 19" rack. Avoid direct sunlight, proximity to radiators and air conditioning, dust, water, and chemicals. Provide good heat dissipation to the unit. Before installation, keep in mind to choose a good position, which provides a clear view onto the front panel indicators.

Power supply

Present devices are designed for operation with 100 to 240 V AC, 50 to 60 Hz. Older devices are designed for 230V AC / 50Hz or 115V AC / 60Hz, depending on version. Check if the specific device marking near the IEC mains connector fits to the domestic mains voltage and frequency, before connecting to mains supply!

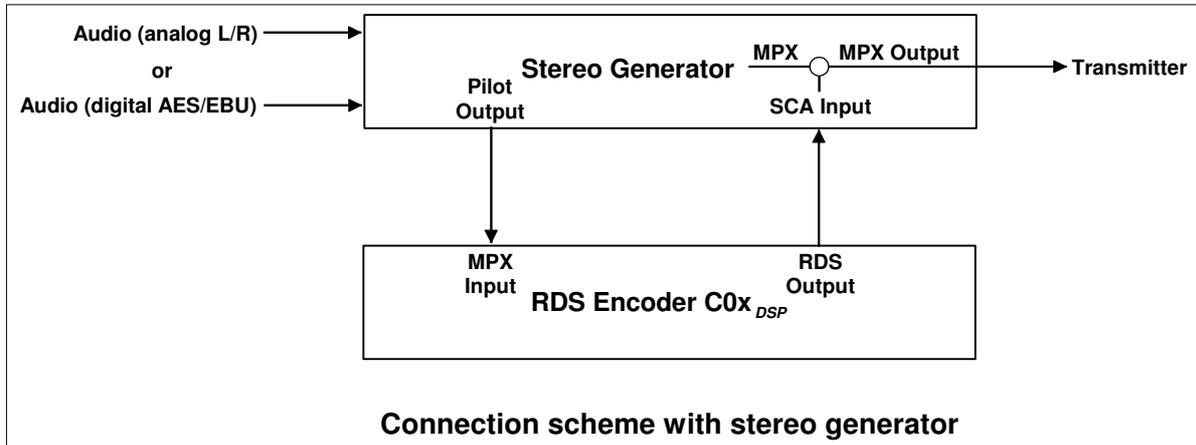
No power switch is available; separation from mains voltage can be achieved by disconnecting the power plug only. Keep the supply plug accessible to the user.

Warning: Disconnect power plug prior to opening the housing. Repair of the equipment has to be carried out only by authorized and qualified personnel.

How to connect the signal cables (point of summation)

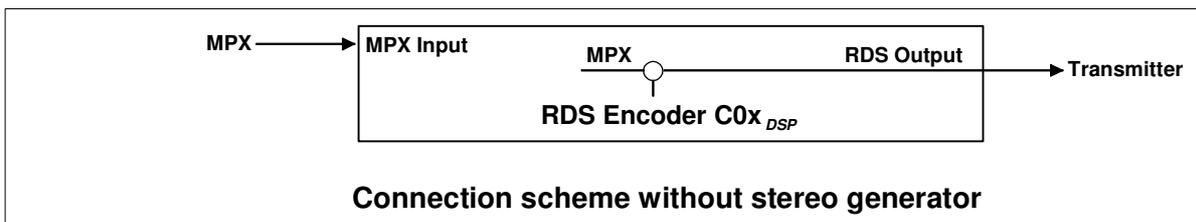
A suitable point of summation is necessary to add the generated RDS signal to the stereo or mono MPX signal. Additionally the RDS signal should be synchronized to a 19 kHz pilot tone to achieve a signal according to the specifications. The cabling depends on these requirements.

Installation variant 1: Installation scheme with stereo generator (e.g. our S02)



Point of summation for adding the RDS signal to the MPX signal: Usually the additional signal (SCA) input of a stereo generator (e.g. 2wcom S02) is used to add the signals inside the stereo generator (see Fig. "Connection scheme with stereo generator"). Therefore the auxiliary pilot output of the stereo generator has to be connected to the/an MPX input (MPX Input 1/2) of the C0x_DSP for synchronization and the RDS output (RDS Output 1/2) of the C0x_DSP to the additional signal (SCA) input of the stereo generator. The MPX-Bypass in the C0x_DSP has to be switched off. In order to do so, please use the supplied software "Arcos Config" and check the tab [General] to see if the checkbox [MPX Bypass] is deactivated; if not, deactivate it and click on the button [Send] to send the changes to the C0x_DSP. If there is no auxiliary pilot tone, it is possible to synchronize the RDS signal to the pilot carrier of the MPX-signal.

Installation variant 2: Installation scheme without stereo generator:



If there is no stereo generator, the point of summation integrated in the C0x_DSP can be used. Therefore the MPX source must be connected to the/an MPX input of the C0x_DSP and the MPX bypass in the C0x_DSP must be switched on. In order to do so, please use the supplied software "Arcos Config" and check the tab [General] to see if the checkbox [MPX Bypass] is activated; if not, activate it and click on the button [Send] to send the changes to the C0x_DSP. The synchronization of the pilot tone works automatically.

No synchronization is required if a transmission system without pilot tone is being used. A crystal oscillator then generates the 57 kHz carrier and the red 'Pilot' LED turns on.

How to turn on the device

Before connecting the C0x_{DSP} to the main supply, verify that the supplied C0x_{DSP} is specified to work with the available mains voltage and frequency. Then connect an appropriate supply cable to the mains socket. The device then turns on and initiates a warm start. The settings of the unit are stored in non-volatile memory and are read out to generate the RDS signal.

A cold start can be carried out by using the provided "Arcos Config" program (C0x_{DSP} setup software for PC) or by means of the reset button on the front side of the encoder (see page 11). After a cold start, the encoder will be loaded with default values.

When you receive the encoder, it is set to default values e.g., for phase delay and signal level. These values are non-volatile stored in an EEPROM and are loaded after every cold- and warm start. Therefore the encoder is operational at any time.

The configuration of the serial RS-232 interfaces on delivery of the unit can be set to standard settings or can be set to customized settings. Details of the possible configurations can be found on page 24.

Application in Europe:

A stereo transmission system with a 19 kHz pilot tone is used. After the installation in the system, a phase adjustment of the 57 kHz pilot signal should be carried out and the level needs to be checked.

Application outside Europe:

A considerably higher level is used compared to Europe. If no pilot tone is used (mono operation) phase adjustment is not necessary. Please pay attention for a correct impedance matching to the transmitter.

Phase balancing instruction

After the installation of the RDS encoder in systems with pilot signal it is a good practice to perform a check / balancing of the phase delay between the pilot signal (19 kHz) and the RDS signal (57 kHz). This ensures to have the lowest possible FM deviation for RDS.

This balancing is necessary for the compensation of a possible phase delay in the transmitter system. In systems without pilot signal (monophonic), this phase balancing is not necessary.

Note that other signals like the program modulation (speech/music) need to be turned off during the measurement. To perform the check you need an oscilloscope. Where to connect the oscilloscope depends on the installation variant as described on page 8.

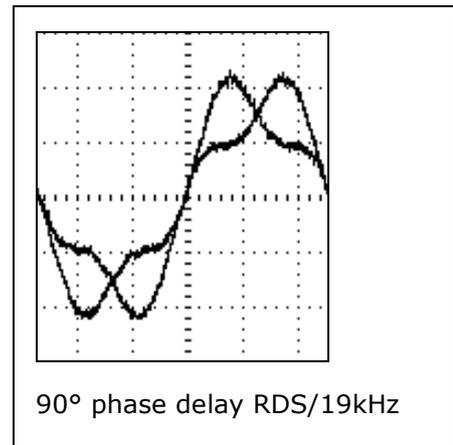
Measurement:

Installation variant 1: Connect the oscilloscope to the MPX output of the stereo generator.

Installation variant 2: Connect the oscilloscope to the RDS output of the $C0x_{DSP}$ RDS encoder or to the output of the last part in the chain before the transmitter.

If you do not measure a symmetric signal like in Fig. "90° phase delay RDS/19 kHz" you can adjust the phase setting of the encoder via „Arcos Config" by data connection ($C0x_{DSP}$) or directly via the LCD menu ($C02_{DSP}$) to achieve a symmetric signal with two peaks of the same amplitude.

Note: Waveform readability depends on RDS/Pilot signal voltage ratio.



Carrying out of a cold- and warm start

A cold- and a warm-start can be carried out by the Arcos Config software, included in the delivery or just by using the pinhole reset button. The pinhole reset button can be found on the front side of the encoder behind a little opening to the right of the LED's (use a bent paperclip or similar for actuation).

Warm start by means of the reset button

The button has to be pressed with a suitable object such as a bent paper clip at least until all LED's on the front panel of the C0x_{DSP} are turned off. If the button is released at that moment, the encoder carries out a warm start (all data remains).

Cold start by means of the reset button

The button has to be pressed at least until all LEDs on the front panel of the C0x_{DSP} are turned off. If the reset button is pressed two to three seconds longer, all LED's on the front panel are turned on and the encoder is carrying out a cold start. The encoder is operational a few seconds afterwards.

How to update the firmware

All necessary data for the firmware update will be provided as a self-extracting executable file. The file name includes the current version of the firmware (e.g., the C04DSP_V1_16.exe includes the V1.16 firmware version for the C0x_{DSP}). At present, the same firmware packages are used for the C02_{DSP}, the C03_{DSP} and the C04_{DSP}. Therefore a C04_{DSP}-image can be loaded into a C02_{DSP} and a C03_{DSP}.

For a firmware update, copy the firmware file (e.g., C04DSP_V1_16.exe) into any directory and start the file. The individual images are being unpacked automatically and the flash tool will start. The flash tool loads all necessary images automatically.

Firmware updates can be carried out through the front interface (RS-232) of the C0x_{DSP} only. Connect the encoder through the delivered serial cross-link cable to your computer and select the appropriate PC interface in the flash tool. The baud rate is automatically adjusted to correspond with the baud rate of the front interface. If the C0x_{DSP} has the option "LINK", it is necessary to ensure that the front interface is set to UECP mode.

After starting the update process, three images are being loaded into the C0x_{DSP} encoder. When the update is completed, the unit is carrying out a restart.

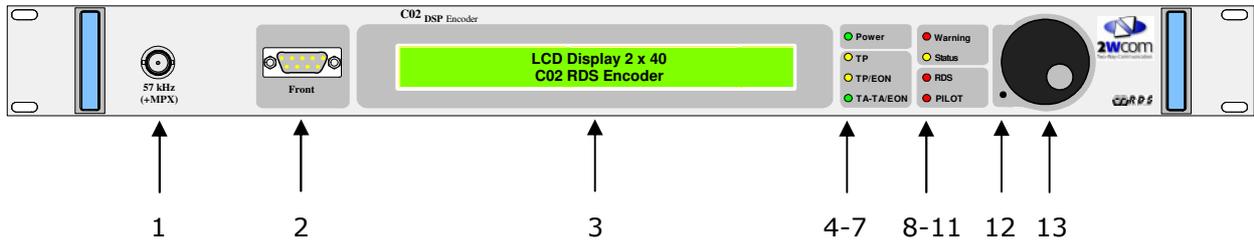
The unit carries out a warm start by default. The unit carries out a cold start instead if at least one of the following properties has been changed by the update: version of the firmware, date of the firmware, storage structure of the RDS specific data.

If an error occurs during the firmware update process, it is usually possible to simply restart the process.

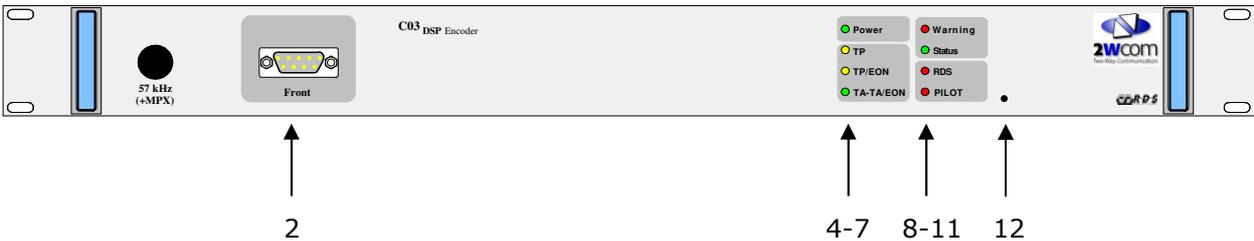
The image file of the firmware is usually not included on the enclosed CD. In case of a necessary update, it is a pleasure for us to send you the image file together with the appropriate update tools.

6. Control elements and connectors

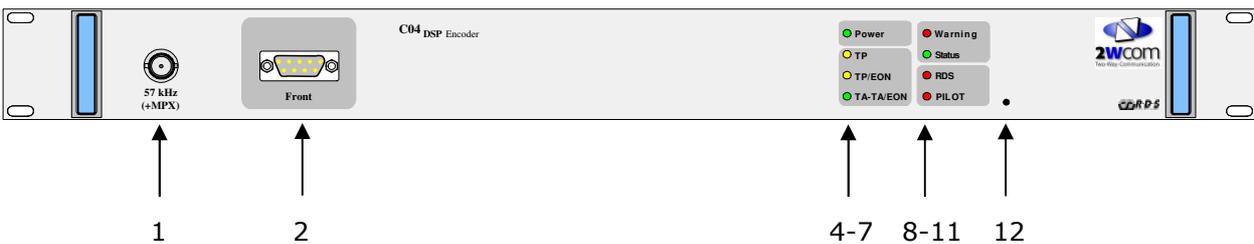
Front panel C02_{DSP}



Front panel C03_{DSP}



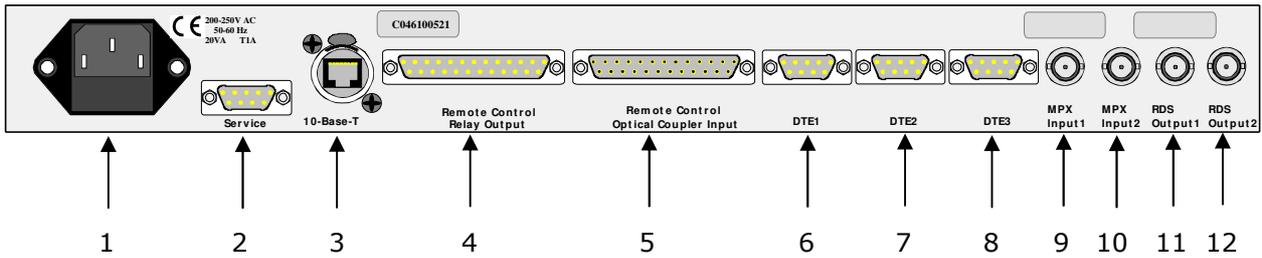
Front panel C04_{DSP}



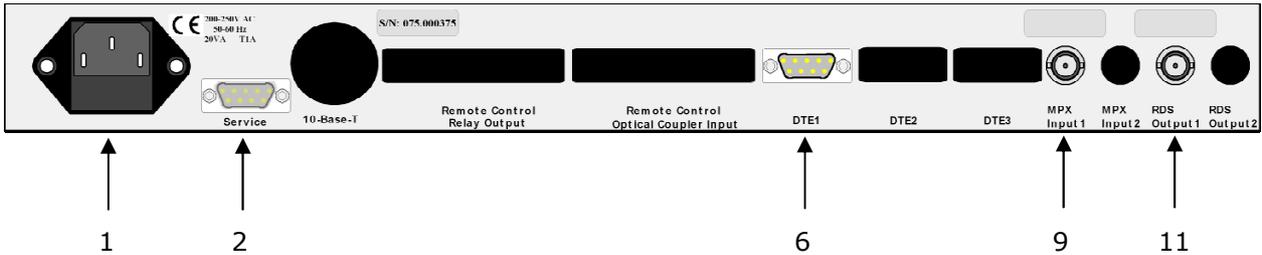
1	[57 kHz (+MPX)]	BNC; RDS monitoring output
2	[RS-232]	D-Sub 9 pole male; serial RS-232 interface
3	Digital display	Illuminated LCD display, 2 x 40 characters
4	[Power]	LED indicator (green); active if mains supply is ok
5	[TP]	LED indicator (yellow); active if TP (Traffic program) is activated
6	[TP/EON]	LED indicator (yellow); indicates if TP/EON is activated (referenced traffic program). The LED is active if the main PSN TP=0 and TA=1 and exactly one EON switches TP=1.
7	[TA - TA/EON]	LED indicator (green); active if the main PSN currently transmits a traffic announcement (main PSN TP=1 and TA=1) or an EON PSN with TP=1 switches TA=1.
8	[Warning]	LED indicator (red); active if a device warning message occurs.
9	[Status]	LED indicator (C02 _{DSP} : yellow / C03 _{DSP} & C04 _{DSP} : green); Active if ARI (option) is activated.
10	[RDS]	LED indicator (red); active if no RDS signal is generated
11	[Pilot]	LED indicator (red); active if no or weak pilot input signal is detected.
12	Reset button (behind hole)	Push button behind the hole in the front panel. Can be activated with a bent paperclip or similar.
13	[Jogwheel]	Navigate (rotate) and activate (push) inside the displayed menu structure

Note: Figures may deviate from supplied unit

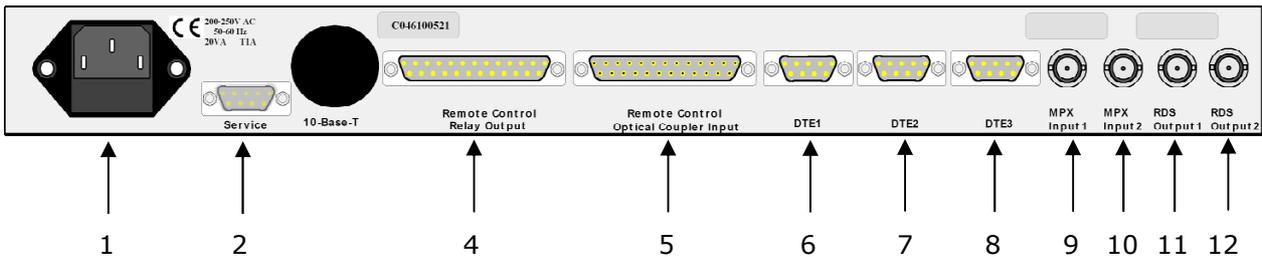
Rear panel C02_{DSP} (and C04_{DSP} with TCP/IP module)



Rear panel C03_{DSP}



Rear panel C04_{DSP}



- | | | |
|-------|--|---|
| 1 | Power supply connector | Standardized supply connector with integrated fuse holder.
Fuse rating depends on mains supply voltage:
100-120 V: T1.6 A (time lag); 5x20 mm; IEC; 250 V
220-240 V: T1.0 A (time lag); 5x20 mm; IEC; 250 V |
| 2 | [Service] | D-Sub 9 pole male connector; This interface is for servicing purposes only. No configuration or communication to the C0x _{DSP} possible. (Dummy connector if no TCP/IP module installed) |
| 3 | [10/100-Base-T] | RJ-45 jack for a 10/100MBit IP connection to an IP-network. Can be used to configure and operate the unit via remote control. IP-parameters of the unit are setup via front panel (C02 _{DSP}) or Arcos Config (C0x _{DSP}). Users of a C02/C03/C04 _{DSP} with TCP/IP interface please also see page 18 for details. |
| 4 | [Remote Control Relay Output] | D-Sub 25 pole male connector; provides access to the internal relay contacts. It is possible to assign functions to individual relays by using supplied software tools. |
| 5 | [Remote Control Optical Coupler Input] | D-Sub 25 pole female connector; provides access to the internal non-floating opto-isolated inputs. It is possible to assign functions depending on the state of the opto-isolated inputs. |
| 6,7,8 | [DTE1], [DTE2], [DTE3] | D-Sub 9 pole male connector; serial RS-232 interface |
| 9 | [MPX Input 1] | BNC connector; Input for feeding in a pilot or MPX signal |
| 10 | [MPX Input 2] | see 9 |
| 11 | [RDS Output 1] | BNC connector; Output for generated RDS signal |
| 12 | [RDS Output 2] | see 11 |

Note: Figures may deviate from supplied unit.

7. Operation

Operation of C03_{DSP} and C04_{DSP}

The units do not have operation elements and no LCD display. They are operated via the supplied PC software "Arcos Config" and/or UECP MEC commands by remote control (standard UECP commands can be found in the UECP Specification SPB 490 V.6.0). The C02_{DSP} offers this function additionally.

C02_{DSP} Operation via menu

The C02_{DSP} has an easy to handle menu structure. The [Jogwheel] can be rotated left and right to highlight displayed menu buttons. A highlighted menu button is indicated by a "█" cursor symbol left to the soft button. To navigate into the highlighted menu button, the [Jogwheel] has to be pushed once. This works on every soft button that contains a submenu. To navigate to the previous menu, the "Back" menu button has to be highlighted and selected (rotate and push the [Jogwheel]). To change settings or values, the part to be changed has to be highlighted and selected. The configurable part is indicated by the symbols "▶" and "◀" and can be adjusted by rotating the [Jogwheel]. To confirm the configuration, the [Jogwheel] has to be pushed once. Afterwards the [Jogwheel] can be used for navigation as before.

For a better overview during navigation through the menu, every listed entry below shows the corresponding menu path.

Status screen – display of the operating parameter

After turn on the LCD shows a status screen which shows an overview of the current operating parameter.

Press	DSx	PS=Name	TP=1	TA=0
Enter	PIhex	RDS=xxxmVpp	MPX Input=	1

The status screen shows seven status settings.

- DSx: Indication of active dataset
- PIhex: PI code as hex value
- PS=Name: PS station name that is shown on RDS radios
- RDS=xxxmVpp: adjusted RDS signal level in mVpp
- TP=: Indication of TP bit status (traffic program)
- TA=: Indication of TA bit status (traffic announcement)

- MPX Input=: Indication of selected MPX input for synchronization.

Main menu

Most of the settings are available via the menu structure of the unit. Additional settings are available via "Arcos Config" PC software. The contained entries of the menu are described below. The listed order follows the menu structure of the unit.

The main menu has the following structure:

C02		Coder	Interface	
Vx.xx		Setup	Diagnostic	Back

The leftmost part shows the version of the firmware.

RDS parameter

Main menu>Menu [Coder]

This menu shows submenus for configuring most of the available parameter for the RDS encoding.

Coder		DS	Level	Phase	MPX Inp.
		RDS	VRF	Calibr.	Back

Data set memories

Main menu>Menu [Coder]>[DS]

This menu shows a selection for choosing the active data set. The corresponding PS (station name) of each dataset is shown additionally. The unit has eight data set memories. Each data set contains most of the configurations, which setup the RDS encoding. The data set memories are setup according to the RDS UECP specification V6.0.

RDS signal level

Main menu>Menu [Coder]>[Level]

This menu can be used to show and setup the RDS and the ARI generator level. Additionally the menu shows the sum of both levels.

Signal phase delay configuration

Main menu>Menu [Coder]>[Phase]

This menu can be used to show and setup the phase delay between the RDS signal (57 kHz) and the pilot signal (19 kHz). Additionally the menu shows the fixed phase delay of 90° ([VRF]) between the RDS and the ARI signal.

MPX input selection

Main menu>Menu [Coder]>[MPX Inp.]

This menu can be used to select the MPX input, which should be used for the synchronization to a pilot signal.* The setting does not get lost by a cold start.

* \geq HW rev. 2.00, not C03_{DSP}

RDS generation on / off

Main menu>Menu [Coder]>[RDS]

This menu can be used to turn the RDS signal encoding [On] or [Off]. Additionally [Mode] offers to select between [normal] and [binary] encoding mode. The [binary] mode can be used for testing. Note that this mode cannot be used to encode a valid RDS signal.

ARI, DK / TA, and BK configuration

Main menu>Menu [Coder]>[VRF]

(Optional) This menu can be used to turn the [VRF] (ARI) encoding [On] or [Off]. [DK/TA] can be used to turn the traffic announcement indication (ARI) [On] or [Off]. Additionally [BK] can be used to setup the traffic area identification signal for ARI (0, A...F).

Coder		VRF	DK/TA	BK	
VRF		Off	Off	0	Back

Reference table setups

Main menu>Menu [Coder]>[Calibr.]

This menu can be used to assign an individual reference table for [MPX Input1] and [MPX Input2]*. The unit has six reference tables. These tables contain level and phase settings for a quick adaptation to different transmitters and synchronization sources.

* [MPX Input 2] only HW rev. \geq 2.00, not C03_{DSP}

Interface configuration

Main menu>Menu [Interface]

This menu contains submenus for the configuration of the interfaces. These are: the serial front interface [Front], the serial rear interfaces [DTE1], [DTE2], [DTE3] and the [TCP/IP] interface (10/100-Base-T).

Interface	Front	DTE1	DTE2	DTE3	
	TCP/IP				Back

Configuring the serial RS-232 interfaces

Main menu>Menu [Interface]>Submenu [Front] and [DTE1] – [DTE3]

The submenu [Front] can be used to configure the serial interface on the front panel. The submenus [DTE1], [DTE2], and [DTE3] configure the serial interfaces on the rear panel. All interfaces offer the same settings. It is possible to setup the baud rate, the interface protocol (UECP or LINK*), and the response type for data acknowledge. The RS-232 bit and parity settings cannot be changed and are fixed on: 8 data bits, 1 stop bit, and no parity (8/N/1). The configuration of the timeout setting can be found on page 19.

Interface	Baud	Prot	Response	
xxx	xxx	xxx	xxx	Back

*Requires option LINK

Setup the interface speed [Baud]

This entry can be used to setup the serial RS-232 interface speed. The available speed rates can be seen from the table to the right:

1200	Baud
2400	Baud
4800	Baud
9600	Baud
19200	Baud
38400	Baud

Setup the interface protocol [Prot]

All C0x_{DSP} encoder support the UECP protocol V6.0. C02/C04_{DSP} support the Link protocol as an option. If this option is installed, it is possible to select [UECP] or [Link] as protocol.

Setup of the acknowledge modes [Response]

This entry can be used to setup the operation mode of the serial RS-232 interfaces. Acknowledge modes can and should be activated in the C0x_{DSP} encoder and the control PC software to make the UECP data communication more robust to avoid data errors. The following modes are available:

[None]	Unit does not send any acknowledge responses.
[Request]	Unit sends an acknowledge response only on request of the control software.
[Spontan]	Unit sends an acknowledge response for every received UECP frame.

Configuring the TCP/IP network interface

Main menu>Menu [Interface]>Submenu [TCP/IP]

This menu can be used to configure the internal 10 / 100 MBit TCP/IP interface. The IP-addresses are stored in the internal EEPROM.

Interface	IP Address	=255.255.255.255
TCP/IP	Netmask	=255.255.255.255

The following parameters are displayed and can be configured:

[IP-Address]	Individual address, which is necessary to identify a hardware device in an IP network like the internet or intranet.
[Netmask]	Bit mask, which separates an IP address into a network part and a host part.
[Gateway]	Address of the intranet computer that acts as a gateway to the internet.
[SNMP IP 1]	Address of the system that receives the SNMP events/traps of the CO _x DSP.
[SNMP IP 2]	Address of the system that additionally receives the SNMP events/traps of the CO _x DSP. Deactivation: This additional function can be deactivated by setting the IP address to 0.0.0.0
[SNTP IP]	Address of the NTP Time Server that is used to synchronize the system time after a system restart or hourly if accessible*. Via SNMP it is possible to setup an individual synchronization interval. * Requires option SNMP
[Port]	Port address that is used for the TCP/IP data communication. Note: Configurable on units with firmware V1.49 (or higher) with TCP/IP module firmware V1.36. Not configurable on units with older firmware versions (then fixed on 6666).

The necessary TCP/IP interface settings above do depend on the individual network and should be assigned by a responsible network administrator.

The settings can be changed as follows:

Use the [Jogwheel] to highlight an address type. To do this, rotate the [Jogwheel] left and push it one time for editing. The address part to be edited is then marked by the symbols "▣" and "◀". Rotate the [Jogwheel] to edit the first part of the address. Push the [Jogwheel] one time and edit the second part of the address as described before. Continue until the last of the four parts of the address is edited. After the last edited part has been confirmed by a push on the [Jogwheel] it is possible to navigate in the TCP/IP menu again. The settings are activated by leaving the TCP/IP menu!

C03/C04_{DSP} and C02_{DSP}: It is possible to configure the TCP/IP interface settings of the unit via Arcos Config (Tree Menu: Encoder symbol selected- Tab: Hardware Setup > TCP-IP settings) with an active RS-232 or IP connection to the unit. There it is possible to enter and send or readout the following IP-settings: IP Address, (UECP Port, Subnet Mask, and Gateway. The settings are immediately activated by an automatic warm start of the device!

* Requires option SNMP

Basic settings

Main menu>Menu [Setup]

This menu shows submenus for the configuration of basic settings of the unit.

Setup		Timeout		Units	
		Messages		Language	Back

Configuration of the serial RS-232 interface timeout

Main menu>Menu [Setup]>[Timeout]

The submenu [Timeout] can be used to set a timeout for each serial RS-232 interface. If a communication pause exceeds the configurable delay time, the LED [Warning] is activated and a warning action is initiated. Possible delay times are between 1' and 254' (minutes). Additionally this function can be turned [Off] individually. A warning action has to be configured by the user. Possible are: Assigning the function "timeout" to a relay or enable an SNMP event/trap (requires option SNMP).

Setup		DTE1	DTE2	DTE3	Front	
Timeout		Off	Off	Off	Off	Back

Select unit for the level display

Main menu>Menu [Setup]>[Units]

This submenu can be used to choose the unit for various level displays. Possible are [mVpp] and [kHz] (corresponding signal deviation).

Configuring the system- and error message generation

Main menu>Menu [Setup]>[Messages]

The generation of error messages can be prevented. To do this, the parameter [Error] must be set to [Off]. The menu entry [System] has no function.

Select language

Main menu>Menu [Setup]>[Language]

This submenu can be used to select the language setting of the unit. Possible settings are [English] and [Deutsch].

Self tests and diagnostic

Main menu>Menu [Diagnostic]

Diagnostic	Hardware	Messages	
	Configuration		Back

Check unit functions

Main menu>Menu [Diagnostic]>[Hardware]

This submenu shows device functions, which can be checked for basic functionality. These include the LEDs, the opto-isolated inputs, the relay, and the real-time clock.

Diagnostic	I/O Test	Clock	
	Remote In	Relay	Back

Display- and input/output test

Main menu>Menu [Diagnostic]>[Hardware]>[I/O Test]

This mode activates the LEDs cyclically (but power LED is activated continuously). Additionally the opto-isolated inputs are coupled to the relay (e.g. the opto input 3 activates the relay 3).

System clock time

Main menu>Menu [Diagnostic]>[Hardware]>[Clock]

Displays the present time of the internal clock without any offset. The internal clock can be synchronized to an NTP time server via TCP/IP (SNTP) if available (hourly / at device restart)*. Via SNMP (snmpUpdateInterval) it is also possible to set an individual synchronization interval time.

* Function only available with option SNMP.

Opto-isolated inputs state

Main menu>Menu [Diagnostic]>[Hardware]>[Remote In]

Displays the present state of the opto-isolated inputs 1 - 9, A - C. The value [0] means the input is not actuated and the value [1] means the input is actuated (pulled to ground).

Relay state

Main menu>Menu [Diagnostic]>[Hardware]>[Relay]

Displays the present state of the relay 1 - 11 (hex 1 to B). The value [0] means the relay is not actuated and the value [1] means the relay is actuated.

System error messages

Main menu>Menu [Diagnostic]>Menu [Messages]

This submenu can be used to show the system related [Error] messages and to [clear messages] from the unit memory. The entry [System] has no function.

Diagnostic	System	Error	
Messages	Clear messages		Back

Unit configuration

Main menu>Menu [Diagnostic]>Menu [Configuration]

This submenu shows the customer specific setting (customer name) and, if available, the options ARI, Link, SPS and TR.

Diagnostic Customer: Name
CoderConfig Opt.: ARI Link SPS TR Back

Unit functions without menu access

Not all of the C02_{DSP} functions are available via menu / jogwheel. These functions can be accessed via the Arcos Config control software and / or MEC commands.

Cold start default values

The COX_{DSP} has a default data set, the DSIB. The data of the DSIB is non-volatile stored in an EEPROM and being maintained after a cold start or in the case of a battery change. The DSIB can be overwritten by the user with the customized UECP command 2D,04,52,53,10,DS or in the Link protocol by the command 'copy' with the data included in this data set. When carrying out a cold start the encoder loads all data sets with the data from the DSIB.

Because a cold start erases contents like AF lists and radio texts, an error message is generated in the error menu. If configured with the Arcos Config software, a relay or a LED is actuated additionally. The cold start error can be reset by the LCD menu entry "[Diagnostic]>[Messages]>[Clear Messages]" or by UECP command if the option SNMP is available.

On delivery of the encoder the DSIB has the following values:

PI	0xFFFF	MS	1 (music)
PS	" RDS PS "	PTY	0 (undefined)
DI	1 (stereo)	PTYN	"RDS PTYN"
TA	Off	PIN	0x0000
TP	On	Linkage	0x0000

All other RDS specific data are not stored in an EEPROM and are loaded on a cold start with the default values:

AF	List with length 0 (E0 CD)
GS	0A
PSN List	17,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16

Signal parameters:

The parameter which affect the output signal are non-volatile stored in an EEPROM and do not get lost by a cold start. On delivery of the device the following values are usually set:

Reference Table	1
RDS Pilot Phase	0°
RDS Level	219 mVpp
VRF Level	382mVpp
RDS	True (RDS on)
BK (ARI area identification signal)	0
VRF	False
VRF Phase	True
DK (ARI traffic announcement indication)	False

8. Interfaces

The RDS encoder C02_{DSP} / C03_{DSP} and C04_{DSP} are equipped with several interfaces for the input and output of signals. All units support the UECP protocol V6.0. C02_{DSP} and C04_{DSP} optionally support the Link protocol (according to ARD-Pflichtenheft).

Serial RS-232 interfaces

Note: To connect a computer to a serial interface of the C0x_{DSP} it is necessary to use a serial cross-link cable!

Front serial interface [RS-232]

The front panel provides an RS-232 interface as a 9 pole male D-Sub connector. This interface is used for the serial connection to a computer with installed C0x_{DSP} configuration software (e.g. Arcos Config). The interface uses the UECP protocol.

Rear panel serial interfaces [DTE1], [DTE2]*, [DTE3]*

The rear panel provides three RS-232 interfaces as 9 pole male D-Sub connectors.

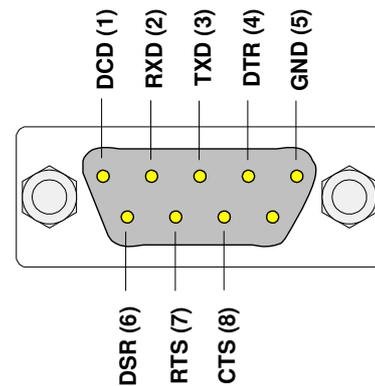
* Not applicable for C03_{DSP}.

[Service] interface

This interface is only for servicing purposes. No data or setup communication possible.

Pin assignment of the serial interfaces

The figure "RS232 interface pin assignment" shows the pin assignment of the serial RS-232 interfaces. The interfaces do provide all handshake signals.



RS232 interface pin assignment

Configuration of the serial interfaces

When configuring the serial interfaces it has to be distinguished between a warm start and a cold start. Furthermore there are customized settings, which influence the behavior of the serial interfaces. The following tables describe the possible combinations. If there is no entry under warm start, the setting before carrying out the warm start will remain for the interface.

Default settings of the RS-232 interfaces (depends on options/customer).

C02_{DSP}/C04_{DSP}:

Standard configuration with UECP protocol:

interface	cold start	warm start
DTE1	9600 Baud UECP (EBU)	
DTE2	9600 Baud UECP (EBU)	
DTE3	9600 Baud UECP (EBU)	
FRONT	9600 Baud UECP (EBU)	

Configuration with UECP and Link protocol:

interface	cold start	warm start
DTE1	9600 Baud Link	
DTE2	9600 Baud Link	
DTE3	9600 Baud UECP (EBU)	
FRONT	2400 Baud UECP (EBU)	

Customized configuration ORF:

interface	cold start	warm start
DTE1	9600 Baud Link	
DTE2	9600 Baud Link	
DTE3	9600 Baud UECP (EBU)	
FRONT	9600 Baud UECP (EBU)	9600 Baud UECP (EBU)

Customized configuration Media Broadcast:

interface	cold start	warm start
DTE1	2400 Baud UECP (EBU)	
DTE2	9600 Baud UECP (EBU)	
DTE3	9600 Baud UECP (EBU)	9600 Baud UECP (EBU)
FRONT	9600 Baud UECP (EBU)	

C03_{DSP}:

Default configuration with UECP protocol:

interface	cold start	warm start
DTE1	9600 Baud UECP (EBU)	
FRONT	9600 Baud UECP (EBU)	

IP network interface

The C02_{DSP} (standard), the C04_{DSP} (optional) as well as special versions with TCP/IP module have a 10/100 MBit full duplex TCP/IP interface* [10/100-Base-T]. Use a shielded RJ-45 patch cable to connect the unit to the network.

* Not applicable for units without TCP/IP module.

BNC connectors

Front panel:

C02_{DSP} and C04_{DSP} are equipped with a BNC connector* on the front panel. This connector [57 kHz + MPX] provides an RDS monitoring output. This output provides the RDS signal if just the pilot signal is provided to the unit. Alternatively the output provides the MPX + RDS signal if the MPX signal is provided to the unit.

* Not applicable for C03_{DSP}

Rear panel of C02 / C04_{DSP} :

[MPX-Input1] and [MPX-Input2]

At this input it is possible to feed in either:

- a pilot signal (square wave signal with TTL level or a sine signal)
- an MPX signal including the pilot, but without the 57 kHz signal (RDS).

It is possible to switch between the input to be used by menu (only C02_{DSP}) or by manufacturer specified commands (see page 30).

Note:

When using the MPX-bypass and in case of AC power loss the signal from the active MPX input is switched to the RDS outputs! (Older hardware versions allow only a bypass from MPX input 1 to the RDS outputs.)

[RDS Output1] + [RDS Output2]

The RDS outputs 1+2 are the 57 kHz (+MPX) operational outputs. These outputs provide either just the generated RDS signal (bypass/summation off) as recommended for summation inside a stereo generator or the combination of a fed in MPX signal and the RDS/ARI signal (bypass/summation on) for the modulation of a transmitter.

Rear panel C03_{DSP} :

[MPX-Input1]

At the MPX-Input1 it is possible to feed in either: A pilot signal (square-wave signal with TTL-level or sine signal) or an MPX-Signal including the pilot, but without the 57 kHz signal (RDS)

Note:

When using the MPX-bypass and in case of AC mains power failure, the signal from the MPX input 1 is switched to the RDS output 1!

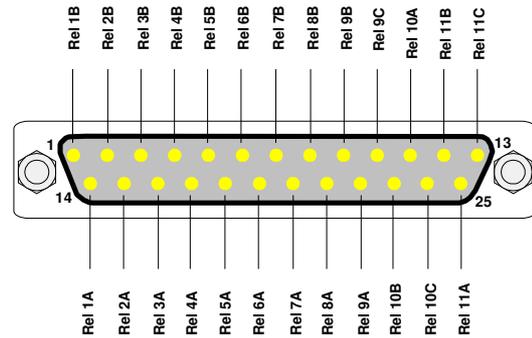
[RDS Output1]

The RDS output 1 is the 57 kHz (+MPX) operational output. This output provides just the generated RDS signal (bypass/summation off) as recommended for summation inside a stereo generator or the combination of a fed in MPX signal and the RDS signal (bypass/summation on) for the modulation of a transmitter.

Relay / Opto-isolated inputs connectors

[Relay Output]*

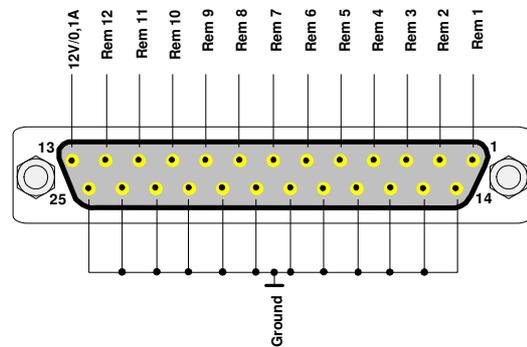
C02_{DSP} and C04_{DSP} are equipped with 8 floating SPST (single pole single throw) relay contacts (A & B) which are normally open and three SPDT (single pole double throw) relay contacts which switch the contact A between contact B and contact C (connected to A if relay is not actuated). It is possible to assign functions to the individual relay; please see section "relay functions" on page 44 for details).



D-Sub 25 pole male connector
(rear panel view)

[Optical Coupler Input]*

C02_{DSP} and C04_{DSP} are equipped with 12 non-floating opto-isolated inputs. It is possible to assign functions to the individual opto-isolated input. See section "opto-isolated input functions" on page 45 for details.



D-Sub 25 pole female connector
(rear panel view)

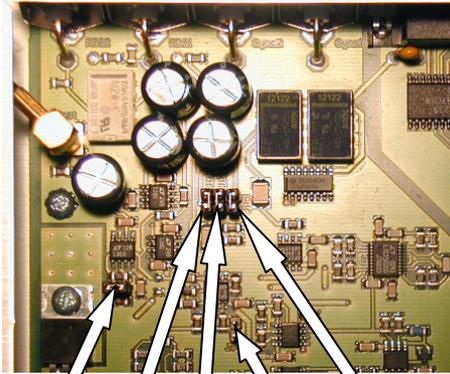
* Not applicable for C03_{DSP}

Symmetrical outputs

C02_{DSP}, C03_{DSP} and C04_{DSP} are delivered with asymmetrical outputs by default. It is possible to configure the RDS outputs to work symmetrical. This can be done with jumper settings on the main board. Please note that symmetric connectors have to be installed for this operation.

Jumper for symmetric RDS outputs and MPX bypass setting

The main board inside the unit has jumper connectors, which set the RDS output mode to symmetrical or asymmetrical. Additionally the MPX bypass availability can be activated or deactivated. The following combinations are possible:



JP7 JP3 JP1 JP 4 JP5

JP4 open	Rear RDS outputs work asymmetrical
JP4 closed	Rear RDS outputs work symmetrical
JP7 open	Front RDS monitor output works symmetrical
JP7 closed	Front RDS monitor output works asymmetrical
JP1/JP3/JP5 open	MPX-Bypass not available
JP1/JP3/JP5 closed	MPX-Bypass available (only for asymmetrical use!)

Warning: Disconnect the supply cable from mains before you are going to open the unit.

Caution: Take actions against an electrostatic discharge (ESD) before you are going to open the unit.

Note: The RDS monitoring output on the front panel provides the correct level only if configured to the same mode as the rear RDS outputs (symmetrical or asymmetrical).

9. Interface functions / protocols

UECP protocol V6.0

General:

8 datasets (DSN) are available.

The C03_{DSP} has no playback memory. Therefore all data being changed or fed into the active dataset are transmitted promptly.

1024 site addresses and 64 encoder addresses are adjustable.

Implementing individual commands:

MEC 0A (Radio Text)

Eight radio texts per data set are allowed.

MEC 13 (alternative frequencies)

MEL ≤ 29 (dec0). (Start-Location + 0xEn + 25 Frequencies + Terminator)

The Start-Location is allowed to accept 0x0000 or 0xffff values only.

0x0000 deletes the existing lists

0xffff adds the list to the existing

The Terminator is necessary in principle

An AF-list with the length 1 (terminator only) deletes the existing AF-lists

Only 70 AF-lists per data set are allowed

MEC 2D (manufacturer's specific command)

MEL ≥ 3 (message element data length - value needs to be adjusted if message length can vary - e.g. at transparent mode.)

The Manufacturer Designation is „RS“ (hex 52 53, dec. 82 83)

MEC 30 (TMC)

If the Buffer Configuration = 11 (bin) is being used, the data are transmitted at the mentioned frequency in the bits 4..1.

The frequency that is indicated in the bits 4..1 can be 0 (endless transmission).

Data with finite transmission are being sent contiguously. Data with set Flag "Extremely Urgent" are being sent immediately and continuously.

MEC 3C (baud rate)

The maximum baud rate is 38400

The minimum baud rate is 1200

MEC 17/0A (RT)

Instead of the data byte, which among other things includes the buffer configuration in the SET command, the buffer number is transmitted in the request command.

MEC 17/13 (AF)

The start location is used as a list index (buffer number). If the requested AF list is empty, the returned list contains only the terminator.

MEC 17/23 (site address)

The individual addresses are being sent in each case as separate UECP-frames. A list with the address 0x000 is send as a final list (a common address, valid for any encoder). This selection of readout was made because not all addresses may fit into a UECP-Frame.

MEC 17/27 (encoder address)

The last address in the list is always 0x00, which is defined for all encoders. If no further address is existent, the 0x00 address is returned only.

MEC 31 (EPP transmitter information)

The last data byte is ignored but has to be sent.

Manufacturer Specified Commands of the C0x_{DSP}

Function	UECP-command
Save DSIB (Default Dataset)	2D,04,52,53,10,DS (DS=0, 1..8)
MPX Bypass ON	2D,04,52,53,01,01
MPX Bypass OFF	2D,04,52,53,01,00
Activate MPX Input 1	2D,04,52,53,02,01
Activate MPX Input 2 (not C03 _{DSP})	2D,04,52,53,02,02 Note: Please use these manufacturer specified commands to select the activated MPX input. The UECP MEC command "1D" just selects the reference table.
Warm start	2D,03,52,53,FE
Cold start	2D,03,52,53,FF
Cold start without reset of the TCP/IP network module (NetPC)	2D,03,52,53,FD
Erase cold start warning (Function requires the option SNMP)	2D,04,52,53,85,04
Switch interface protocol to Link* or UECP (*Link only if option "Link" is installed)	2D,05,52,53,port,protocol port: 01=DTE1;02=DTE2;03=DTE3; 04=Front protocol: 00=UECP; 01=LINK
Check interface protocol setting (see port details above)	2D,04,52,53,port Response: 2D,05,52,53,06,port,protocol port: 01=DTE1;02=DTE2;03=DTE3; 04=Front protocol: 00=UECP; 01=LINK
Assign a reference table to an MPX input.	2D,05,52,53,09,MPXinput,ref.table MPX input: 01=input 1; 02=input 2 ref.table: 01 to 06 = reference table 1 to 6
Readout reference table to MPX input assignment.	2D,03,52,53,0A Response: 2D,05,52,53,0A,ref.table for input1,ref.table for input 2 ref.table for input 1/2: 01 to 06 = reference table 1 to 6
Set SNTP* address	2D,07,52,53,CD,xx,xx,xx,xx xx=IP address
Readout SNTP* address	2D,03,52,53,CC Response: 2D,07,52,53,CC,xx,xx,xx,xx
* Requires option SNMP	
Set TCP/IP port	2D,05,52,53,CF,portH,portL e.g. for 6666 (hex1A0A): portH=1A portL=0A
Readout TCP/IP port	2D,03,52,53,CE Response: 2D,06,52,53,CE,02,portH,portL

Note: Commands do not send a response if not otherwise stated.

Link protocol

A manufacturer specific command can be used to set the protocol (UECP or Link*) of the serial interfaces [DTE1] to [DTE3] and [Front] of the C02/C04_{DSP}. The C03_{DSP} only supports the UECP protocol.

* Requires option LINK

Implementation of individual commands:

EON AF method B:

The available C02/C04_{DSP} version does not support the input of AM frequencies, neither in the UECP nor in the Link protocol.

Linkage:

The group 14A, AC12 of the linkage is send if LN (Bit 0..12) is set. The LA und EG Bit do not influence the transmission of AC12. In order to set LA, EG or LN in the Main PSN only, the PI in the EON command is allowed to be the PI in the Tuned Network; all other EON commands with PI of the tuned Network are not being carried out.

Copy:

The command copy (short information character c) copies PI, PIN, PS, TA, TP, MS, DI, PTY, PTYN and the Linkage Information of the given data set into the start up data set (DSIB). The data of the DSIB are non-volatile stored in the EEPROM. The data can be used for initialization of the data sets after a cold start of the C02/C04_{DSP}.

Priority status:

Selection of the interface: 00 operates all ports, 01 operates the front interface, 02 operates all interfaces on the rear side (DTE1, DTE2 and DTE3), 2A operates interface DTE1, 2B operates DTE2 and 2C DTE3. The function of the inputs can be programmed variably. As this results in a possible overriding of the set priority status, no priority status can be set for the switching inputs. The priority status can only be set through the front interface. The front interface cannot be locked.

Alarm functions

The alarm function according to the ARD performance specification V3.3 is not implemented in the C04_{DSP} *since* there is no possibility for adjusting the functionality on the front panel of the C04_{DSP}.

Non-implemented commands:

FFG

The commands with the short information character Hz, 4z and Kz are not implemented. Therefore groups 1B, 4A, and 4B cannot be filled with any data.

ZIDEM

The function ZIDEM* (IH, Inhouse data monitoring), that the C0x encoder optionally supports, is configured and operated solely via the Arcos Config PC software \geq V2.00.

* Requires option ZIDEM

SNMP - Simple Network Management Protocol

The encoder optionally supports SNMP*. SNMP can be used to read out several parameters and to setup some parameters via the IP network. In case of a coder warning, the encoder can generate specific SNMP events or SNMP traps.

Notes: An SNMP network access is only possible if the community strings of the device are configured (see p.37). It is also necessary that the accessing SNMP manager tool is set to the same community strings that are used in the device.

We recommend using only the SNMP events. Please use your SNMP management tool to disable/enable the traps/events.

* Option SNMP required

Parameters that can be accessed via SNMP:

Parameter	Readable via SNMP	Configurable via SNMP
IP address	yes	
Netmask	yes	
Gateway IP	yes	
SNMP IP 1	yes	
SNMP IP 2	yes	
SNTP IP	yes	
SNTP Update Interval	yes	yes*
SNMP Event Priority	yes	yes
SNMP Event Enable	yes	yes
SNMP Trap Priority	yes	yes
SNMP Trap Enable	yes	yes
SNMP sysContact (mib-2/system)	yes	yes
SNMP sysName (mib-2/system)	yes	yes
SNMP sysLocation (mib-2/system)	yes	yes

* Note: Reset (warm start) the device for the changes to take effect.

Sending of SNMP events or traps:

In case of a device re-start, all activated SNMP events / traps are sent as status information. The encoder is able to control predefined processes. In case of a warning, a warning specific SNMP event or SNMP trap is being generated as a warning message. This SNMP event or trap will then be transmitted via the IP connection to a specified SNMP management system. This system, equipped with an SNMP-Management-Tool and a specific 2wcom C0x MIB file for processing the SNMP events or traps, is being able to monitor multiple encoders.

The configuration of warning conditions, as well as reading and deleting existing warning-messages will be carried out via UECP-commands.

Additionally it is possible to enable or disable specific SNMP events / traps via SNMP and to assign different priorities to the SNMP events / traps via SNMP.

Note: For sending SNMP events / traps, it is necessary to ensure that the required events / traps are enabled via UECP MEC command and also via the SNMP function (EventEnable / trapEnable).

Possible SNMP events:

SNMP Event	Triggering event
coldStart	Cold start
warmStart	Warm start
dspEvent	>90 ms DSP inactivity
rdsEvent	RDS signal off / returned
pilotEvent	Pilot signal off / returned
uecpTimeoutEvent	Configured interface port timeout exceeded (UECP + LINK). The affected port (DTE1, DTE2, DTE3, Front) is given in the SNMP event.
odaTimeoutEvent	Configured ODA data feed timeout exceeded

Possible SNMP traps:

SNMP trap	Triggering event
coldStart	Cold start
warmStart	Warm start
dspFailure	>90 ms DSP inactivity
noRDS	RDS signal off
rdsOK	RDS signal returned
noPilotOn	Missing pilot signal
noPilotOff	Pilot signal returned
uecpTimeout	Configured interface port timeout exceeded (UECP + LINK). The affected port (DTE1, DTE2, DTE3, Front) is given in the trap (trap binding).
odaTimeout	Configured ODA data feed timeout exceeded

Transfer of warnings:

Warnings and commands for configuring the warning behavior of the C0x_{DSP} are being transmitted via UECP MEC-commands.

MEC – commands:

Reading a single warning:

MEC 0x85

MEC	0x2D
MEL	0x05
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0x85
Command2	0x03
Warning No.	0x00-0xFF

Response:

2D,0A,52,53,85,03,xx,Year,Month,Day,Hour,Minute

xx=Warning number, see table on p. 35

or

2D,05,52,53,85,03,00

(if specified warning does not exist)

Deleting the list of occurred errors:

MEC 0x85

MEC	0x2D
MEL	0x04
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0x85
Command2	0x04

Configuration of the warning behaviour:

It can be configured to send or not to send an SNMP event/trap if a warning condition occurs.

The warning configuration is being stored in the EEPROM of the encoder.

Upon delivery, a standard configuration is already being stored in the EEPROM.

Reading warning configuration

(which errors are triggering warnings):

MEC 0x85

MEC	0x2D
MEL	0x04
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0x85
Command2	0x01

Set warning configuration

(which errors are triggering warnings):

MEC 0x85

MEC	0x2D
MEL	0x06
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0x85
Command2	0x02
Warning byte 1	0x00-0xFF
Warning byte 2	0x00-0xFF

Warning bits are related to the two warning bytes as follows:
 (Bits are read from right to left, i.e. "coldStart" is the first bit from the right of the second warning byte.)

SNMP Event	SNMP Trap	Bit
coldStart	coldStart	= 0
warmStart	warmStart	= 1
dspEvent	dspFailure	= 2
rdsEvent	noRDS & rdsOK	= 3
pilotEvent	noPilotOn & noPilotOff	= 4
uecpTimeoutEvent (DTE1)	uecpTimeoutDTE1	= 5
uecpTimeoutEvent (DTE2)	uecpTimeoutDTE2	= 6
uecpTimeoutEvent (DTE3)	uecpTimeoutDTE3	= 7
uecpTimeoutEvent (FRONT)	uecpTimeoutFront	= 8
Reserved	Reserved	= 9
odaTimeoutEvent	odaTimeout	=10
Reserved	Reserved	=11-15

Example: To enable all available SNMP events / traps, you can send the following MEC command to the device: 2D,06,52,53,85,02,**05,FF**

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Binary	0	0	0	0	0	1	0	1	1	1	1	1	1	1	1	1
Hex	05								FF							

Please note that these settings can also be performed via Arcos Config. The warning settings that can be accessed via SNMP are independent from the settings above.

Storing warning messages:

The last 256 warning messages are stored in the battery buffered RAM of the RDS encoder. A cold start of the encoder will erase all warning-messages.

Stored warning-messages can either be readout with MEC-commands or on the display of the encoder. Menu path: [Diagnostic]>[Messages]>[Error]

User interface:

There are three ways for the user to readout warning-messages.

- Displaying SNMP events / traps directly by using an PC SNMP-Manager-Tool
- On the display of the encoder (Error-messages are stored and are displayed as text messages)

```
0:23.10.2003 11:50->Warmstart
1:23.10.2003 11:55->UECP_Timeout DTE1
```

- By using Arcos Config (Menu>Help>UECP Terminal...) as well as the UECP Log (error-messages are displayed one by one in 6 byte blocks (timestamp + warning). Each bit of both warning bytes represents an error-message). In case the requested warning currently does not exist, a "0" is sent back instead of an error-message.

Configuration of the SNMP IP address:

The SNMP IP address represents the IP of the receiving PC that runs the SNMP-Manager-Tool.

Reading the SNMP IP address:
MEC 0xC8

MEC	0x2D
MEL	0x03
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0xC8

Setting the SNMP IP address:
MEC 0xC9

MEC	0x2D
MEL	0x07
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0xC9
IP part 1	0x00-0xFF
IP part 2	0x00-0xFF
IP part 3	0x00-0xFF
IP part 4	0x00-0xFF

Reading the second SNMP IP address:
MEC 0xCA

MEC	0x2D
MEL	0x03
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0xCA

Setting the second SNMP IP address:
MEC 0xCB

MEC	0x2D
MEL	0x07
Man.MEC1	0x52
Man.MEC2	0x53
Command1	0xCB
IP part 1	0x00-0xFF
IP part 2	0x00-0xFF
IP part 3	0x00-0xFF
IP part 4	0x00-0xFF

Configure the SNMP Community Strings

The SNMP Community Strings are "Passwords" for the network access to the SNMP functions of the device. The device supports two "Read Community" strings for read-only access, as well as two "Write Community" strings for full access. If the device is still in factory condition, these need to be configured to the desired community strings, as used in your SNMP management tool.

For security reasons, the configuration of the SNMP community strings is only possible via a terminal program with a serial RS-232 connection to the "Service" interface of the device (9600 baud, 8N1).

Display the configuration:	Enter the command "snmp info" in the terminal program to see the present configuration of the community strings. The factory settings are "public" (Read) and "private" (Write).
Change the configuration:	Use the following command in the terminal program for configuration: Syntax: set community string [<i>user</i>]= <i>string</i> <i>user</i> = R1 (1. Read Community) R2 (2. Read Community) W1 (1. Write Community) W2 (2. Write Community) <i>string</i> = The desired community string (alphabetic characters, numbers, no special characters). Example: „set community string[R1]=public“

Transparent mode

The RDS encoder optionally supports the transparent mode for the transmission of raw groups (Hex-data framed in UECP-commands) in the RDS-data stream.

The transparent mode can be activated instead of the standard encoder operation. While the transparent mode is active, the normal encoder operation will be deactivated. Raw data will be forwarded to the encoder and transmitted unchanged (transparently) along with the RDS-data stream. So it is e.g. possible to send formerly recorded RDS-data in the exact same sequence again.

Possible modes (circular buffer and simple mode)

There are two modes in the transparent mode, one is the simple mode and the next is the circular buffer mode.

Simple mode:

In this mode, the received data will be transmitted once and will not be available later on anymore. Thus, data needs to be supplied constantly. In case there are no more group data available in the memory to be sent, there is a standard group sequence available for transmission, preventing RDS-data stream interruptions.

Circular buffer:

When circular buffer mode is used, the data only needs to be received once and will then be transmitted repeatedly. Note that the data have to be within the encoder already before this mode is activated. After the last group is sent out, the encoder will then start with the first group again. While the circular buffer mode is active, data must not be added! If data is added nonetheless, the circular buffer mode is halted, old buffer data will be deleted and replaced by the new data. After this the circular buffer mode has to be reactivated again. While the circular buffer mode is inactive, the standard group sequence will be transmitted repeatedly.

Burst transmission:

It is possible to transmit group data-bursts in both modes. With a special MEC-command it is possible to send group data to the encoder to be sent out immediately. Up to 20 group data blocks can be stored in the encoder for burst transmission. As long as there are burst group data available, it will be sent out and the standard group data transmission is suspended until all burst group data are being sent.

Memory for group data:

For the application of the transparent mode three different memory areas are available: the main memory, burst-memory, and the reserve memory.

Main memory:

Main memory is used to store group data which are transferred using the manufacturer specified "D1" MEC-command. A total of 1000 group data blocks can be stored. These group data blocks will be transmitted when the encoder is running in standard transparent mode, i.e. if no burst-group data do exist and the circular buffer mode is not halted. The main memory can be used in the simple mode as well as in the circular buffer mode.

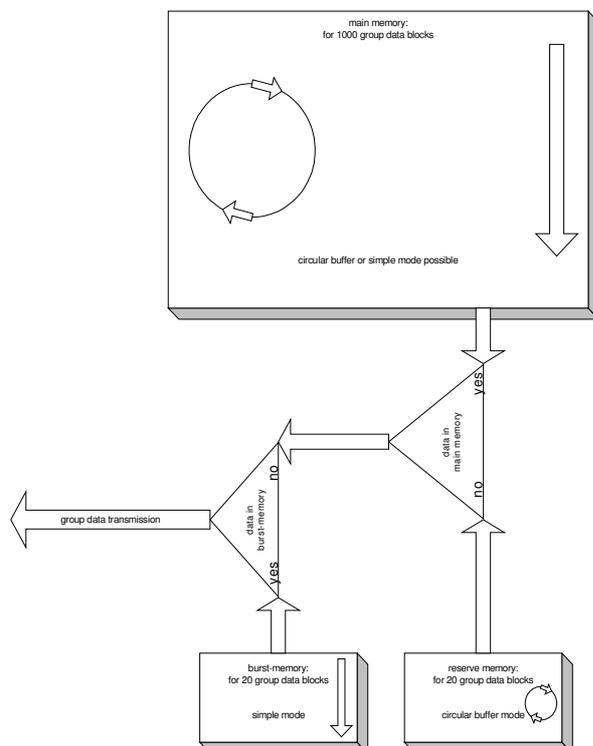
Burst memory:

Burst-memory is used to store group data which are to be transmitted immediately. If there are any group data in the burst-memory, these data will be transmitted first in front of other group data from different memory areas. Up to 20 group data blocks can be stored in the burst-memory and it only works in the simple mode, i.e. data from burst-memory will only be sent once.

Reserve memory:

The reserve memory contains 20 groups of standard sequences and is operating in the circular buffer mode while transmitting the data repeatedly. The encoder is in the transparent mode and there are no additional group data available in the main-memory and burst-memory. Now the reserve memory is being used to transmit these stored group sequences of data instead.

The following figure illustrates the flow of data processing in the transparent mode:



MEC commands:

To activate the transparent mode, the manufacturer specific MEC-command "D0" is used.

MEC	0x2D
MEL	0x04
Man.MEC1	0x52
Man.MEC2	0x53
Command	0xD0
Transparent mode	0x00 - 0x02

There are three possible settings:

- terminate transparent mode = 0
- start transparent mode (in simple mode) = 1
- start transparent mode (in circular buffer mode) = 2

The encoder will return to standard operation, when the transparent mode is terminated.

Transmission of standard group data:

MEC	0x2D
MEL	0x0C - 0xF4
Man.MEC1	0x52
Man.MEC2	0x53
Command	0xD1
Group quantity	0x01 - 0x1E
First group data part	0x00 - 0xFF
...	...
Last group data part	0x00 - 0xFF

To transmit group data to the encoder, the manufacturer specific MEC-command "D1" is used. With this MEC-command 1 to 30 group data blocks can be transmitted. Each group data block consists out of 8 bytes.

The MEL and the Group Quantity needs to be adjusted depending on the message element length and the quantity of groups.

Examples:

2D,**0C**,52,53,D1,**01**,E1,13,E5,5D,18,00,E2,11
(transmission of one group)

2D,**14**,52,53,D1,**02**,E1,13,E5,5D,18,00,E2,11,E2,14,E6,5E,19,01,E3,12
(transmission of two groups)

The encoder will respond to the transmitted group data either with an ACK or with NACK. If there is sufficient space for the group data, an ACK is sent. Otherwise the encoder responds with a NACK.

Transmission of burst group data:

MEC	0x2D
MEL	0x0C - 0xF4
Man.MEC1	0x52
Man.MEC2	0x53
Command	0xD2
Group quantity	0x01 - 0xF4
First group data part	0x00 - 0xFF
...	...
Last group data part	0x00 - 0xFF

To transmit burst-group data to the encoder, the manufacturer specific MEC-command "D2" is used. For further explanation on burst-group data see section "Burst transmission" on page 38.

Transmission of reserve group data:

To transmit reserve-group data to the encoder, the manufacturer specific MEC-command "D3" is used. The MEL and the Group Quantity needs to be adjusted depending on the message element length and the quantity of groups. For further explanation on reserve-group data see section "Reserve memory" on page 39.

MEC	0x2D
MEL	0x0C - 0xF4
Man.MEC1	0x52
Man.MEC2	0x53
Command	0xD3
Group quantity	0x01 - 0xF4
First part of group data	0x00 - 0xFF
...	...
Last part of group data	0x00 - 0xFF

Examples:

Simple mode: In order to send data to the encoder and to have it transmitted just once, simple mode is used. The following is possible:

Simple transparent mode can be activated or the data to be transmitted can be sent to the encoder.

If the data were sent first and the simple mode was activated thereafter, the encoder begins to transmit the group data right away.

If simple transparent mode was activated first and data for transmission were sent later, the encoder will send reserve data for a transition period. If there are no reserve data available yet, fixed implemented standard group data will be transmitted instead.

As soon as group data are being forwarded to the encoder, they will be transmitted. In case all group data have been transmitted and no more group data are being forwarded to the encoder, reserve data will be transmitted again.

Burst-group data can be transmitted anytime independent from the availability of group data or reserve group data. Burst-group data send to the encoder will always be transmitted immediately.

Circle buffer mode:

In order to send data to the encoder once and then have it transmitted repeatedly, circular buffer mode is used. The following is possible:

In the circular buffer mode, group data have to be sent to the encoder prior use.

After group data have been sent, the circular buffer transparent mode will be activated. Group data will be periodically and repeatedly transmitted until this mode is terminated.

If new group data are being sent to the encoder while the transparent mode is active, old group data will be deleted and the circular buffer transparent mode will be halted. Now, new group data can be sent until the circular buffer mode is activated again. While inactive, reserve group data will be transmitted.

Burst-group data can be transmitted independent of the availability of group data or reserve group data, active or inactive circular buffer transparent mode at any time. Burst-group data being sent to the encoder will be transmitted always immediately.

ODA - Open Data Applications

In order to use RDS for non-specific applications, open data applications can be used (if option ODA is installed). By means of open data application-groups, any data can be sent to an application. For this application, the integrated free format buffer will be used. Data will be sent to the encoder by means of UECP-commands and stored with all the necessary additional information in the corresponding sending-queues. Data stored in these sending-queues will be transmitted via their corresponding ODA groups later on. To preserve the flexibility of ODA applications, commitment of at present transmitted ODA applications takes place "On Air". RDS-Receiver will receive the necessary additional information via the 3A group.

Procedure:

An 0xFFFF AID (Application Identification) number is assigned to each application. By an AID, an application is addressed. Subsequently the AID is then assigned to a group wherein the actual transmission of the data takes place. The 3A group will inform a receiver, which AID is addressing which group. Once the process of assigning an application to an AID, assigning an AID to a group and informing the receiver is finished, data can be transmitted via this group. A receiver can now assign data to a specific application and forward it.

To accommodate a wide spectrum of applications, a new group sequence mechanism has been implemented. One option is to transmit ODA-group data in burst-mode, another option is to use the special "Spinning Wheel"-mode.

In addition to that, data sent to the encoder can be assigned to a certain priority and the encoder will transmit the data based on the order of priority.

Dispatch modes:

Transmission of data that has been sent to the encoder can be achieved as follows:

Standard group sequence:

The standard group sequence can be used. The data will then be sent according to the group sequence order.

Burst:

In the burst-mode data can be transmitted similar to 14B and 15B groups as bursts. That is, independent from the standard group sequence, group data of the same group will be transmitted consecutively. It can be configured how often a group will be transmitted consecutively and how many other groups have to be transmitted between two burst-data transmissions of the same group.

Spinning wheel:

The Spinning Wheel mode allows data to be transmitted to a specific application at specific times. It is possible to divide a minute into periods where data can be sent and where data may not be sent, in an alternating scheme. Period lengths can be individually defined for each application. It is also possible to define an offset between the beginning of a minute and the first period.

Priorities:

- Groups 1A and 4A, as well as paging-groups do have a higher priority in general.
- ODA groups can be used with "normal", "extremely urgent", and "immediately" priorities, by adding a priority flag when sending the group data to the encoder.

Normal mode: sent group data will be positioned at the end of the sending-queue of the corresponding Free Format Buffer

Very urgent mode: Sent group data will be positioned at the beginning of the sending-queue and will be transmitted as soon as the corresponding ODA group is being sent.

Immediately mode: The specified group sequence will be neglected, so the group will be transmitted immediately. Note that groups 1A, 4A and other privileged groups still have higher priority.

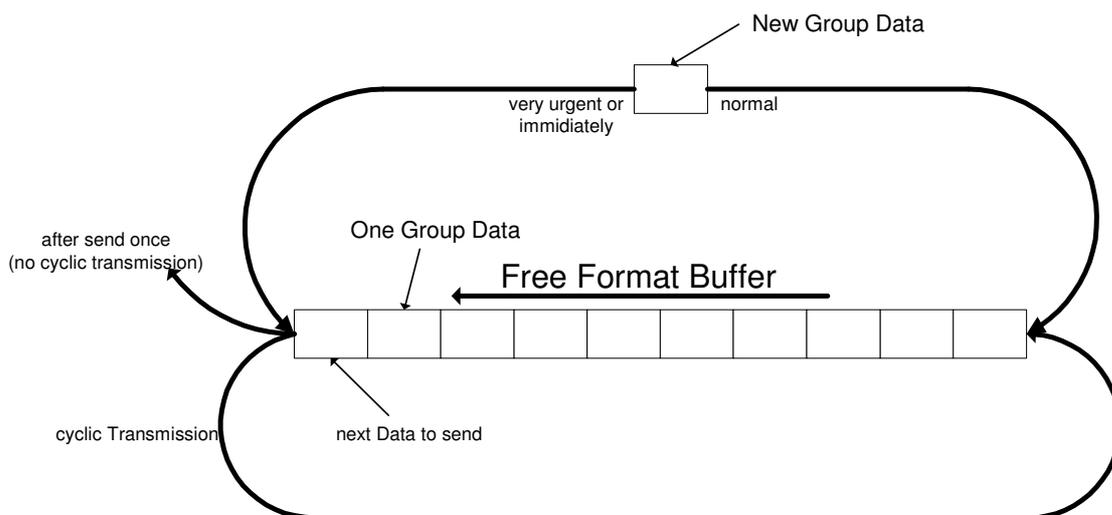
- A special priority list can be made for ODA groups (including groups 14B and 15B). This priority list will be used whenever data with the status "Immediately" are existent.
- If ODA is used, no FFG (Free Format Groups) are transmitted.

Sending and processing ODA data:

When sending ODA data to the encoder the following additional information is sent, in order to specify how the data has to be processed:

- Priority-mode (normal, very urgent, immediately)
- Buffer-mode (cyclic or single transmission)
- Send-mode (normal, burst or "Spinning Wheel")

Depending on the mode, forwarded data will be processed and transmitted differently. The following figure illustrates how the forwarded data are being processed in the encoder:



10. Programmable device functions

The RDS encoder C02_{DSP} and C04_{DSP} have several functions, which can be programmed by the user. The following functions are available.

Relay functions

Caution: The relay contacts have a nominal rating of 0.5 A at 125 V AC / 60 V DC. The absolute maximum current rating is 1 A !

The relay contacts¹ are accessible at the [Relay Output] connector on the rear panel of the unit. The relay 1...8 are floating SPST (single pole single throw) relay contacts (A & B) which are normally open. The relay 9...11 have SPDT (single pole double throw) relay contacts which switch the contact A between contact B and contact C (contact A and C are connected if relay is not actuated). It is possible to assign functions to the individual relay.

Note: The function of relay 11 is fixed on mains supply loss / RDS loss and cannot be changed.

The relay functions can be programmed with the software Arcos Config, which is part of the supplied CD-ROM. The following relay functions are possible.

Function	Parameter	Relay is actuated if...
No function	-	No function means no activation at all.
TA	1=TA, 0=/TA	TA is active / inactive.
TP	1=TP, 0=/TP	TP is active / inactive.
MS	1=MS, 0=/MS	MS switch is set to Music / Speech.
PTY	0..31	Corresponding PTY is activated.
CT	1=CT, 0=/CT	CT is active / inactive.
RDS	1=RDS, 0=/RDS	RDS active / inactive.
VRF	1=VRF, 0=/VRF	VRF (ARI) is active / inactive.
Ref. Input Select	1..6	Corresponding reference setting table is active.
Data Set	1..8	Corresponding dataset is active.
Timeout	0..5 (0=all ports)	UECP timeout on interface occurred.
Pilot	1=Pilot, 0=/Pilot	Pilot signal is active / is missing.
EON-TA	1=EON-TA, 0=/EON-TA	EON TA is active / inactive.
Cold start	1=Coldstart, 0=/Coldstart	A cold start has been executed.
DSP Error	1=Error, 0=/Error	DSP is inactive >90ms.
Zidem ²	30-61 (=Channel 0-31)	Zidem Channel Monitoring detected no error (1)/ detected an error (0).

The programming requires a function and a parameter, which is specific to the function. This parameter sets the actual action.

Example:

On the function "Data Set" the parameter selects which dataset has to be active for a relay actuation.

¹ Connector / Function not applicable for C03_{DSP}

² Option "Zidem" required

Opto-isolated inputs functions

Caution: Apply only ground (0 Volt) to switch the inputs. Never apply a positive or negative voltage!

The RDS encoder C02_{DSP} and C04_{DSP} have 12 non-floating opto-isolated inputs on the rear panel. These inputs are provided on a 25 pole female D-Sub connector. The opto-isolated inputs are internally supplied on the internal pin and can be activated by simply pulling the corresponding pin at the connector to ground. All opto-isolated inputs are programmable by the user.

The opto-isolated input functions can be programmed with the software with the software "Arcos Config", which are part of the supplied CD-ROM. The following functions are possible:

Function	Parameter	An actuation causes the action:
no function	-	no function
TA	1=TA, 0=/TA	TA function is activated / deactivated
TP	1=TP, 0=/TP	TP function is activated / deactivated
MS	1=MS, 0=/MS	MS switch is set to Music / Speech
PTY	0..31	Corresponding PTY is activated
CT	1=CT, 0=/CT	CT function is activated / deactivated
RDS	1=RDS, 0=/RDS	RDS function is activated / deactivated
VRF	1=VRF, 0=/VRF	VRF (ARI) function is activated / deactivated
Ref. Input Select	1..6	Corresponding reference table is activated
Data Set	1..8	Corresponding dataset is activated
EON TA	1=EON TA, 0=/EON TA	EON TA function is activated / deactivated
Pilot Select	1=MPX Input1 2=MPX Input2	Corresponding MPX input is selected
SNMP Reset	1=Reset	Warnings are erased
Warm start	1	Warm start is initiated
Cold start	1	Cold start
TA Toggle	0	If opto-isolated input is actuated: TA is activated If opto-isolated input is not actuated: TA is deactivated

Example:

If the parameter 1 is set to the function "TA" an actuation of the corresponding opto-isolated input sets the TA bit in the active dataset to 1 (active). If the parameter 0 is set instead, an actuation of the corresponding opto-isolated input sets the TA bit in the active dataset to 0 (inactive).

* Connector / Function not applicable for C03_{DSP}

11. Maintenance & Servicing

Maintenance note

No special maintenance is necessary on the device. Dust can be removed by a dry duster. For cleaning use neutral, non-corrosive detergents only.

Servicing note

According to the fact that the modules of the device have a high complexity, a usual repair is not possible.

The 2wcom GmbH is equipped with special measurement and repair kits. Therefore a repair by the user is not intended.

Calibration note

Due to the construction of the device, no regularly calibration is necessary.

12. Troubleshooting

The following chart is designed to help you to correct minor problems with the use of the unit prior to contact our service (failure report by email or fax). Also make sure to read the entire manual carefully, as this often helps in understanding and fixing problems.

Problem	Possible cause	Solution	Ref.
Power does not come on	<ul style="list-style-type: none"> • Power cable is improperly connected • Mains supply failure • Blown fuses 	<ul style="list-style-type: none"> • Check supply cord • Check mains supply • Replace the fuses by the same type (accessible at mains connect. of the unit) 	
Device does not work	<ul style="list-style-type: none"> • System halted 	<ul style="list-style-type: none"> • Disconnect and reconnect the device from/to mains supply 	
No RDS signal at the output(s)	<ul style="list-style-type: none"> • RDS function deactivated 	<ul style="list-style-type: none"> • Activate RDS function 	Page 16
RDS signal distorted	<ul style="list-style-type: none"> • Improper signal cable • Signal cable defect 	<ul style="list-style-type: none"> • Use proper, screened cable only • Use faultless signal cable 	
Level values are displayed in kHz instead of mVpp (or vice versa)	<ul style="list-style-type: none"> • Level unit is set to alternative unit 	<ul style="list-style-type: none"> • Change unit for level display as desired. (mVpp or kHz) 	Page 19
Device does not communicate via RS232C to connected units	<ul style="list-style-type: none"> • Data cable not properly connected • Wrong cable type • Wrong COM port of the PC selected 	<ul style="list-style-type: none"> • Check connections • Use correct cable type (crossover / null modem cable) • Select the correct COM port in the PC software 	Page 17
TCP/IP communication does not work	<ul style="list-style-type: none"> • TCP/IP settings (IP-address, Port, Netmask, Gateway) wrong • Network does not work at all. • Computer Network settings not correct • Firewall / Protection software configuration on computer not correct 	<ul style="list-style-type: none"> • Check TCP/IP settings • Check network • Check settings • Check configuration 	Page 18
SNMP Get requests are not working	<ul style="list-style-type: none"> • SNMP community strings of the device and the SNMP management tool are not aligned. 	<ul style="list-style-type: none"> • Check / Align the SNMP community strings 	Page 37
Relay output is not actuated as desired	<ul style="list-style-type: none"> • Relay output is not actuated as desired 	<ul style="list-style-type: none"> • Check / Change programming of the relay functions 	Page 44
Opto-isolated input does not activate the desired function	<ul style="list-style-type: none"> • Missing / Wrong programming of the opto-isolated input function 	<ul style="list-style-type: none"> • Check / Change programming of the opto-isolated input functions 	Page 45

13. Specifications

RDS/RBDS C02 and C04 DSP Encoder – Technical Details

RDS signal	according to CENELEC EN 50067 and ARD standard specification 5/3.8 (Leitungsprotokoll) (optional) and UECP V 6.01 protocol	Interfaces	
Coding	differential and biphasic double-sideband amplitude modulation (DSSC) with suppressed carrier	Remote control input Connector	12 opto isolated inputs 25 pole sub-D female 14 programmable functions available
Modulation		Remote control output (Messages)	11 floating relay contacts (for DC: max.24 V, 1 A, 10 W), 25 pole sub-D male 15 programmable functions available
Centre frequency	57 kHz ± 6 Hz	Data interfaces	Input/output of RDS data and setup function
Bandwidth	± 2.4 kHz	Connector	4 serial interfaces, RS-232C (1 front, 3 rear) 9 pole sub-D male
RDS Level & Phase		Transmission rate	1200 to 38400 baud, asynchronous
RDS Level	0...8191 mVpp	Data format	UECP, Universal Encoder Communication Protocol (EBU SPB 490)
RDS Pilot	adjustable in steps of < 2°, range 0...360°	TCP/IP data interface (for model C04 optional available)	Input/output of UECP data and setup functions
Linear distortion	< 0.5 dB between upper and lower sidebands	Connector	Neutrik Ethercon / RJ 45 (rear)
Signal generation		Type	full duplex 10/100 BASE-T
RDS amplifier		Data format	TCP, UDP, SNMP, SMTP, HTTP, Telnet, FTP
Max. output level	16 Vpp	Front panel	BNC test output
Level variation	< 0.5 dB	LEDs	serial interface, RS-232C Power, TRTP/EON, TA-TA/EON, Warning, Status, RDS, Pilot
Synchronisation		(for model C04 not available): LCDisplay Jog wheel	2 x 40 characters impulse, ENTER button
External	to auxiliary pilot of stereo generator or to pilot of MPX signal, frequency 19 kHz ± 2 Hz	RDS Features	PS, PI, TR, TA, PTY, PTYN, MS, DI, RT, CT, AF 64 lists, EON, EWS, ODA, TMC, TDC, IH, RP, PIN, SL, LINKAGE, EPP, ECC, FFG, SPS, ODA, 8 data sets 16 program service numbers optional: Transparent RDS mode: recorded data stream can be played again (advantage for test- and measurement purposes)
Internal	automatic switchover to internal crystal oscillator if external pilot fails, frequency 19 kHz ± 2 Hz	General Data	Power consumption
Inputs		Case dimensions	19 VA
Sync/MPX summation	for 19 kHz pilot/FM stereo MPX signal	Weight	19", 1 HU, depth: 310 mm
Connector	BNC unbalanced	Housing	width: 424 mm
Max. input level	9 Vpp	Rated temp. range	front panel: 484 mm
Pilot level	TTL (square wave) or 0.4 Vpp to 1 Vpp (sine wave)	Operating temp. range	3.5 kg
Input impedance	10 kΩ	Storage temp. range	aluminium chromated
Outputs		Power supply	+5 °C...+45 °C 0 °C...+50 °C -40 °C...+70 °C internal, 100 V...230 V (±10%), 50 Hz...60 Hz
57 kHz (+MPX) main output			
Connector	BNC or Lemos		
Type	unbalanced / balanced		
Max. load	300 Ω // 5000 pF		
MPX summation	link-selected, AC-coupled		
Gain	0 dB		
Level variation	< 0.5 dB		
Frequency response flatness	< 0.5 dB (40 Hz...53 kHz)		
57 kHz (+MPX) test output	rating same as main output		
Connector	BNC unbalanced		

Version: 21.10.2008
These data are subject to modifications and amendments.
Errors excepted.

www.2wcom.com • contact@2wcom.com • Schleswiger Straße 85 • 24941 Flensburg • Germany • Fon (+49) 461 - 9 78 92 - 0 • Fax (+49) 461 - 9 78 92 - 11