Operating Manual

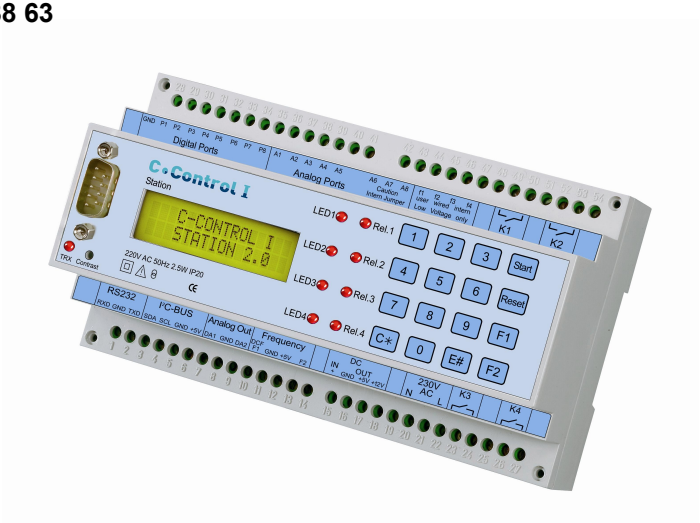
Version 01/06 BA006

CE

C-Control I
DIN Rail Mounting Sytem

Station 2.0

Item- Nr. 19 88 63



Please check at www.c-control-support.net for updates

This manual and safety instructions guide belongs to this product. It describes important facts concerning operation and handling. Keep this manual at a safe place for a later reference

In the case of any damages which are caused due to the failure to observe these operating instructions, the warranty will expire! We do not assume liability for resulting damages!
An exclamation mark inside a triangle indicates important instructions in the operating manual. Carefully read the whole operating manual before putting the device into operation.
The unauthorized conversion and/or modification of the unit is inadmissible because of safety and approval reasons.

Introduction

Dear customer,
Thank you very much for taking the excellent decision to purchase a C-Control product.
C-Control - This name stands for outstanding high-quality products in the field of Automation, measuring, and controlling The products are characterized by expert competence, extraordinary efficiency and permanent innovation. The products of the C-Control family offer optimum solutions even for the most demanding applications for ambitious hobby electricians as well as for professional users. We offer the perfect technology and the reliable quality of our C-Control products at a cost-performance ratio that is almost unbeatable.
The C-Control products have been designed using state-of-the-art technology. The products meet the requirements of the current European and national guidelines. Conformity has been proven and the relevant statements and documents have been deposited at the manufacturer.
We kindly request the user to follow the operating instructions to preserve this condition and to ensure safe operation!

Feel free to contact our customer support if you have any questions

Prior to contact our customer services we kindly ask you to carefully read the documents coming along with the C-Control Products and check the online product support and help guide at:

http://www.c-control-support.net

Deutschland: ***Tel. 0180/5 31 21 16 oder 09604/40 88 47***
Fax 09604/40 88 48
e-mail: tkb@conrad.de
Mo. - Fr. 8.00 bis 18.00 Uhr

Österreich: ***Tel. 0 72 42/20 30 60 · Fax 0 72 42/20 30 66***
e-mail: support@conrad.at
Mo. - Do. 8.00 bis 17.00 Uhr,
Fr. 8.00 bis 14.00 Uhr

Schweiz: ***Tel. 0848/80 12 88 · Fax 0848/80 12 89***
e-mail: support@conrad.ch
Mo. - Fr. 8.00 bis 12.00 Uhr,
13.00 bis 17.00 Uhr

Prescribed Use

The DIN Rail mounted C-Control 1 Station 2.0 is your first choice of moving a standard hardware environment to a compact system. The Station contains all components needed for standard applications and is ready to use. Programming the C-Control Computer Station 2.0 has exclusively be done by using the dedicated Development Environment. To ensure protection against electric shock the Station 2.0 must be operated in a switch cabinet with covered terminals if any terminal of the the Station 2.0 is connected to a voltage more than 24V.
The C-Control BASIC Computer Unit Station 2.0 is designed as a programmable control unit, interfacing other electric and electronic devices. The C-Control Computer may be integrated into any technical systems as far as they do not support medical or health and life saving purposes.
Programming the C-Control Computer has exclusively be done by using the dedicated Development Environment. All C-Control Products must be operated in closed and dry environments only. The products are not suitable for operation in industrial applications.
Any use other than described above causes damages this product. Moreover, this involves dangers such as shortcircuit, fire, electric shock etc. Always observe the safety instructions!

Sample programs for the Station 2.0 are located at the installation disk and can also be downloaded from the internet.
Please check for recent updates and complete product series here: http://www.c-control-support.net

Station 2.0 delivery

This items are included :
Station 2.0
Seriel Interface Cable
Installation- Disk
Operating Manual

Maintenance

For maintenance the product has to be disconnected from all components and must be removed from a switch cabinet. The Station 2.0 then can be cleaned with a soft and moistly fluffless cloth. Never use agressive cleaning agents, because this may lead to damages of the product.

Disposal

If the pruduct is not operational any more and if no repair is possible you must dispose it in compliance with guidelines and national regulations.

Safety Instructions

In the case of any damages which are caused due to the failure to observe these operating instructions, the warranty will expire! We do not assume liability for resulting damages! An exclamation mark inside a triangle indicates important instructions in the operating manual. Carefully read the whole operating manual before putting the device into operation. The unauthorized conversion and/or modification of the unit is inadmissible because of safety and approval reasons.

Electric devices must not be left unattended if children are present. Childen may try to insert objects into electric supplies resulting in hazardous electric shock. This product is not a toy and must be kept away from children.

C-Control Products are not suitable for children below the age of 14
This Products must not be exposed to high temperatures, vibrations, magnetic fileds or moisture

Disconnect C-Control Station 2.0 from mains voltage and other components

- before cleaning
- when leaving the products unattended
- during thunderstorms
- before connecting anything to the terminals or change system configurations

Short circuits at the the supplied voltage may cause fire !!

The maximum ratings defined in the product specifications must never be exceeded. This products never must be operated in environments with flammable,explosive or acid atmosphere. Moving the C-Control Products from warm to colder rooms will cause condensation. Prior to operation the condensed water must be waited to evaporate.

If the C-Control Products are operated in field applications the hazard of lightning strokes has to be considered. The products never must be operated in hazardous environment. The warranty does not cover damages caused by lightning strokes.

Electrostatic discharge to C-Control Products and connected devices may cause program malfunction or even permanent damage to this components. Discharge your body before touching system components.

Any kind of service and repair must be done by specialists who are aware of related hazards and regulations.
Keep the Packing material at a safe place and away from children.

Important Advice

Downloading the user program to the C-Control Station 2.0 withe the Station 2.0 connected to the mains voltage, it has to be mounted to the DIN Rail. Touching the mains voltage can cause immediate death. The mains voltage terminals at the Station 2.0 have to be covered and protected against unintentional touching therefore. When connecting the serial interface cable to the Station 2.0 the mains voltage has to be disconnected. Desktop operation of the Station 2.0 with connected mains voltage is posssible but prohibited due to the regulations of protection agains hazardous voltages.

This Product was carefully tested at the manufacturer. The test program may be still resident in the program memory. Running this program may result in unexpected level changes on ports or may result in error messages if a LCD is connected. Error messages without proper test environment connected to the units are without any importance
Do not connect any external components to the C-Control Station (except for program download) prior to have a program loaded, matching the connected hardware environment. The resident test program may damage connected components or the Station itself

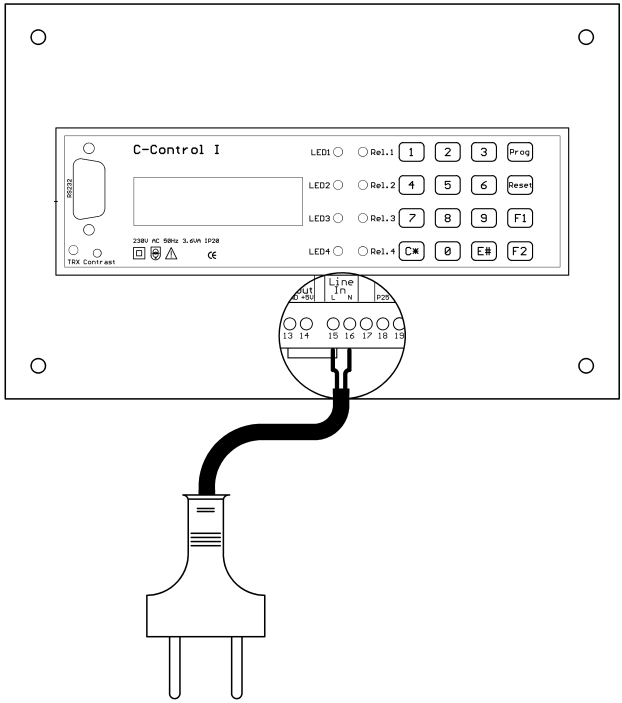
The Station 2.0 has the EEPROM boot option (program download from a external EEPRM) activated as default. Any connected EEPROM which don't contain a valid program file may cause unexpected malfunctions of the unit. This option also causes some action on ports 9 and 10 when entering the download mode. Connected devices may be affected by this. For detais please see the Harware Manual or the BASIC++ Programmer's Manual included in the IDE

The provided program samples dedicated to the Station 2.0 are designed for a quick functional check of the Station 2.0. The Station circuit corresponds mostly to a Unit M 2.0 and the Application Board. Therefore the samples provided to the Unit M 2.0 are applicable to the Station also, as far as no special bus modules are used. The Station 2.0 is delivered with operation system version 2.06 or above. The operating system may be updated to gain more performance and new features.

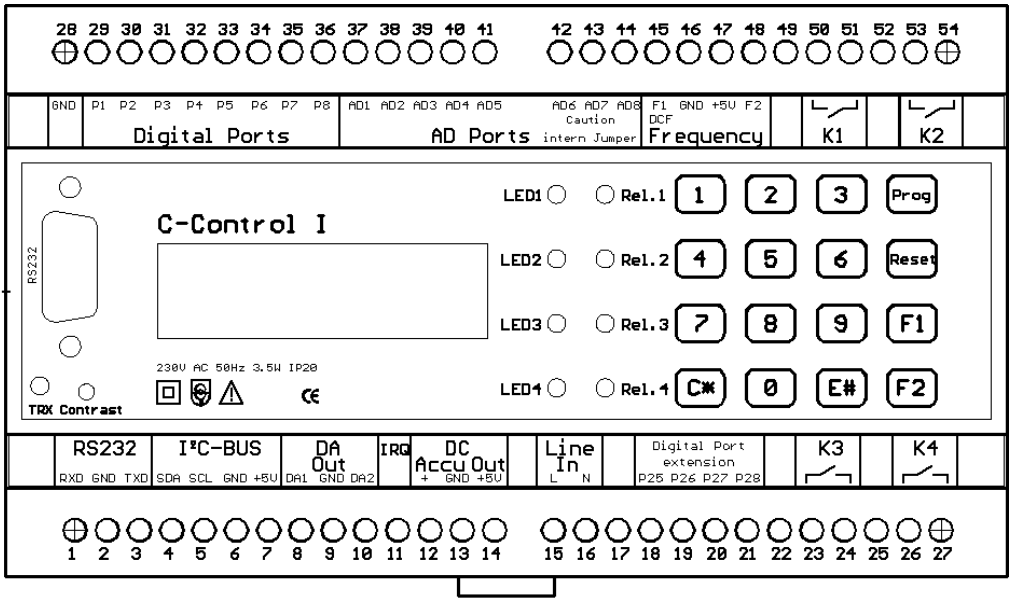
Details concerning programming the Station are available at the manual for the Unit M 2.0. Program samples can be found on the installation disk delivered with the Station amd are also available at the C-Control internet pages.

Please check regularly for updates here: http://www.c-control-support.net

Cover terminals leading mains voltage!



Front Panel



RS232 Connector (Sub- D Jack)

The C-Control Computers require a Development Environment running on a PC. It features the program downloader. The compiled BASIC program is transmitted to the C-Control Computer via the RS 232 serial interface. To match the different voltage levels of the C-Control Unit and the RS232 interface, a special converter is required. Your C-Control Station 2.0 contains this converter already.
Connect the cable only for downloading your program. After the download has finished you have to disconnect the cable. The TRX LED is located at the front panel and shows activity at he RS232 interface lines.

LED TRX

The red TRX LED located below the serial interface connector lights up if data is transmitted or received. The brightness depends on the duty cycle of data transmission and breaks between single bytes transmitted or received and may be very low in some cases. The alternate function of this LED is to show the logic level at the FREQ1 input. In this case the signal of a connected DCF77 receiver can be monitored. Jumper JP4 inside the cabinet determines if primary or secondary function is active.

Display

The LC-Display has 2x16 characters and is connected to byteport 2 (port 9 to 16). It shares port 9 and port 10 with the I²C®- Bus SDA u. SCL lines at terminal 4 and 5 . For proper operation of the I²C- Bus the LCD has to be initialised by your program even you do not use the LCD. The LCD offers a switchable back light. Port 16 switches this back light (light is on when the port output is low). Beside this the LCD offers the feature

of adjustable contrast. At the left side and below the LCD the contrast regulator is accessible. Use a small screw driver and turn the regulator clockwise to gain more contrast.

Keyboard

A numeric 10 buttons keyboard with additinal Enter, Clear and two control keys offer convenient working during program development and later when your application is running. The keyboard (except the keys RESET and PROG) are connected to a chain of resistors. This chain supplies its voltage to ADC8 for decoding the keys. The keyboard can be disconnected from ADC8 if this is required by your application. Please see chapter „ Internal Jumper“ for more details. The keyboard decoder routines are provided together with program samples for the Station 2.0.

RESET and PROG

Other than the Application Board or the Unit M 2.0 the Station has no START button. The Station is always in Autostart mode. To enter the download mode you have to hold PROG down and press RESET a short time. After this you can release the PROG key and the Station is ready for download now. After download the program starts automatically..

LED1 to LED4

The Station offers 4 ports (accessible at terminal 18 to 21) which are internal connected to 4 LEDs located at the front panel. The port driver is a PCF8574 external port and is handled as byteport 4 by the operating system. The PCF 8574 is located fixed at I²C-bus address 1. This four LEDs are connected to bitports 25 to 28. This bitports are treated as standard bitports (1 to 16) except the do not support port toggle and pulse function. Please see the Programmer's manual for details

LED´s for Rel.1 to Rel.4

They show relay Rel.1 to Rel.4 switch status. The LED ligts up if the relay is switched on. The relays are connected to the remaining 4 ports (bitport 29 to 32) of the PCF8574.

Screw Terminals

Important Advice for connecting external circuits to ports

Outputs – HI level:
The total output current of all ports has to be limited to less than 20mA if the Unit M 2.0 is supplied with 12V operating voltage (at the dedicated 12V terminal)
The total output current of all ports has to be limited to less than 20mA if the Unit M 2.0 is supplied with 5V operating voltage (at the dedicated 5V terminal)
If external voltages >5V are applied to output the ports, a current into the output ports occures. This is permitted only if the current is limited to less than 1mA by a resistor.

Outputs - LO level:A LO level output can be considered to be a short from the voltage source to GND. The current flow to GND must be limited to less than 10mA (e.g. by a resistor).

Inputs:
If external voltages >5V are applied to the input ports, a current into the input ports occures. This is permitted only if the current is limited to less than 1mA (e.g. by a resistor).

Disregarding this rules will immediatele result in permanent damage of ports or the C-Control Unit itself and connected devices

Serial Interface

Terminal	RS232 serial interface
1	RXD- Signal
2	GND
3	TXD- Signal

The Terminals 1 to 3 are are internally connected to the Sub D-jack of the serial interface because it is some times more comfortable to have a fixed interface connection to other devices instead of a interface cable with plug.

I²C-Bus

Terminal	I²C-Bus
4	SDA- Signal
5	SCL- Signal
6	GND
7	+5V

The I²C-Bus shares the ports 9 and 10 with the LCD interface but don't cause any troubles when operated at the same time. I²C- Bus compatible components must be connected to this ports, otherwise LCD malfunction may occure. For proper I²C- Bus operation, the LCD must be initialized by the user prior tu use the I²C- Bus interface.

DA Ports

Terminal	DA Digital/Analog Outputs
8	DA1
9	GND
10	DA2

Two D/A converter are connected to terminal 8 and 10. The two 8 bit D/A converter are PWM (Pulse Width Modulated) converters. The output pulse consists of 256 seperate sections swiched to logic lo or hi related to value of the D/A conversion output. If a conversion output of 128 is required, 128 sections are set to hi and the remaining 127 sections are hold lo. This waveform is repeated at a rate of 1930Hz, each single section is of 2us width. Details for operation you will find in the programmer's manual. Program samples for operation are provided on the installation disk..

IRQ Input

Terminal	IRQ / Interupt
11	IRQ

The IRQ port is alwas input and serves the immediate reaction on an external request i.e the current operation is interrupted an the external event is serviced by a appropriate Interrupt Routine. The IRQ input is negative edge triggered. Details for operation you will find in the programmer's manual.

DC Power Supply

Terminal	DC / Input Output Lines
12	+12V IN
13	GND
14	+5V Out

The Station 2.0 may be operated with 12V to 15V DC without any restrictions. Voltages lower than 12V DC may work, but reliable relay switching can not be assured.
Caution: Voltages more than 15V will immediate cause permanent damages to the Station 2.0.
It is posssible to monitor the voltage supplied to this terminals (e.g. monitoring of charge/discharge status if a recharchable battery is connected). AD7 is therefore connected to terminal 12 if the inside jumper JP3 is plugged to select this option. In this case the voltage is connected to AD7 with a 1:3 prescaler. Therefore the AD7 will show a voltage of 4V when the terminal voltage is 12V.
Terminal 14 provides the internal regulated 5V DC voltage an may be used to supply external circuits with a maximum load current of 50mA.
Caution: Exceeding this max. load current may result in immediate and permanent damage to the Station 2.0 No external voltages must aplied at this terminal.

Mains Voltage Supply

Terminal	Line IN / Mains Voltage Supply 230VAC
15	L / live wire
16	N / neutral wire

Connect the mains voltage to this terminals. Please see safty instructions prior to use

Digital Port Extension

Terminal	Digital-Port-Extension	LED- Anzeige
18	P25	LED1
19	P26	LED2
20	P27	LED3
21	P28	LED4

The Station offers 4 ports accessible at this terminals. They are internally connected to 4 LEDs located at the front panel. The port driver is a PCF8574 external port and is handled as byteport 4 by the operating system. The PCF 8574 is located fixed at I²C-bus address 1. This four LEDs are connected to bitports 25 to 28. This bitports are treated as standard bitports (1 to 16) except the do not support port toggle and pulse function. Please see the Programmer's manual for details

Relay K3 / K4

Terminal	K3 Relay	Port
23	K3 Relay contact NO 8A	
24	K3 Relay contact NO 8A	P31
26	K4 Relay contact NO 16A	
27	K4 Relay contact NO 16A	P32

The relays are connected to the remaining 4 ports (bitport 29 to 32) of the PCF8574. K3 and K4 is switched by the bitports 31 and 32. The corresponding LEDs REL3 and REL4 show the K3/K4 switching status.

Digital I/O Ports

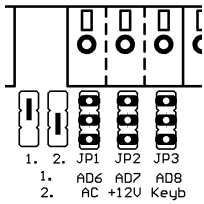
Terminal	Digital Ports
28	GND
29	P1
30	P2
31	P3
32	P4
33	P5
34	P6
35	P7
36	P8

The C-Control Station 2.0 provides one standard byteports (8 bitports, P1 to P8). Each bitport can be used as input or output port. This byteport is provided with software switchable pull up resistors (30k). More details you will find in the programmers‘ manual.

Caution: Please read the safety instructions for connecting external circuits to ports

AD-Ports

Klemme	AD Ports
37	AD1
38	AD2
39	AD3
40	AD4
41	AD5
42 / AC-Sense	AD6 selectable with jumper JP1
43 / +12V-Sense	AD7 selectable with jumper JP2
44 / Keyboard	AD8 selectable with jumper JP3



All kind of sensors may be connected to the A/D-ports, if they match the maximum A/D input voltage. The A/D converters have 8 bit resolution i.e one digit corresponds to 19.6mV. Protect the A/D-ports with a 10k serial resistor if the input voltage applied to the ports can exeed voltages above 5V. This resistor will not affect the conversion accuracy and provides a over voltage protection up to 12V. The internal reference voltage is set to 5V and is a precision type reference. The internal jumpers connect the AD6 to AD8 to inernal voltage sources if requested.
It is posssible to monitor the voltage applied to 12DC Input terminal terminals (e.g. monitoring of charge/discharge status if a recharchable battery is connected). AD7 is therefore connected to terminal 12 if the inside jumper JP3 is plugged to select this option. In this case the voltage is connected to AD7 with a 1:3 prescaler. Therefore the AD7 will show a voltage of 4V when the terminal voltage is 12V. You also may monitor the 230V power supply DC output voltage. This option can be selected with jumper JP1, the of AD6 prescaler is set to 1:4 in this case.

Caution: Please read the safety instructions for connecting external circuits to ports

FREQ Ports

Klemme	Frequency
45	F1 DCF- Signal Input FREQ1
46	GND
47	+5V
48	F2 Signal Input FREQ2

This ports are always and exclusivly inputs. The primary operation is frequency counting in the range from 0 to 32kHz. FREQ 1 supports the feature to synchronize the system clock if a DCF77 receiver module is connected to this port. The synchronization is done automatically in the background, i.e. no user action is required. The receiver module must provide a open collector output to switch this port lo. Use shielded cables to connect the receiver module to the unit.

Caution: Please read the safety instructions for connecting external circuits to ports

Relay K1/K2

Klemme	K1 Relais	Port
50	K1 Relay contact NO 8A	
51	K1 Relay contact NO 8A	P29
50	K2 Relay contact NO 16A	
51	K2 Relay contact NO 16A	P30

The relays are connected to the remaining 4 ports (bitport 29 to 32) of the PCF8574. K1 and K2 is switched by the bitports 29 and 30. The corresponding LEDs REL1 and REL2 show the K1/K2 switching status

Mounting / Installation Advice

Before mounting or installation please carefully check if the jumper settings correspond to your desired operation mode and the cabinet is screwed. Mounting has to be carried out considering safty instructions and and general national regulations.
During operation the Station 2.0 must be mounted on a DIN Rail e.g. in an electric switch cabinet as found in your household. The Station is simply snaped onto the Rail without any tools nedded.
The terminals may be closed at delivery. Open them prior to use. Connect the wires of your external components to the screw terminals now. In regular operation the Station 2.0 is supplied with 230V connected to the terminals 15 and 16. A recharchable battery may be conncted to the DC12V Input for backup purposes on mains voltage drops or shut downs. Please see the AD-Ports section of this dokument for the description of voltage monitoring.
Advice: On minimum load conditions the internal operating voltage can exceed values of 20V and above. AD readings of voltages in this range can be considered as normal.
.
Disregarding the maximum load specifications of ports and the regulated 5V DC voltage output may cause malfunctions and lead to immediate and permanent damage of the Station 2.0
Touching the 230 V mains voltage can cause immediate death. The mains voltage terminals at the Station 2.0 have to be covered and protected against unintentional touching.
Any kind of electrical installation involving 230 Volts mains voltage may be done by qualified field persolnnel only.

Operation

Important Advice:
This Product was carefully tested at the manufacturer. The test program may be still resident in the program memory. Running this program may result in unexpected level changes on ports or may result in error messages if a LCD is connected. Error messages without proper test environment connected to the units are without any importance
Do not connect any external components to the C-Control Station (except for program download) prior to have a program loaded, matching the connected hardware environment. The resident test program may damage connected components or the unit itself.

Internal Jumper

The jumper setting at delivery is as follows:
Port AD6 Jumper set to AC-Sense (measurement 230V power supply DC output voltage, 1:4 prescaler)
Port AD7 Jumper set to +12VIN (measurement of external supplied 12 V DC voltage 1:3 prescalerPort AD8 Jumper set to Keyboard (Keaboard decoding)

If you want to change the setting you have to unscrew the cabinet. This is not permitted if a 230V power supply is already connected or if the Station is mounted in a electrical switch cabinet.

Before opening the Station 2.0

- disconnect the mains voltage and other voltage sources
- disconnect all components
- secure all voltage sources against unintentional switching
- trennen Sie alle angeschlossenen Verbindungen
- Remove the Station 2.0 from the DIN Rail by pulling the black rest lever

Place the Station upon a table and unscrew the cabinet. Lift the upper cabinet part slowly and put it aside. Set the jumpers according to your application requirement. Close the cabinet, take care not to jam the flat cable inside. Screw the cabinet again.

Power Supply

The power supply is either provided by 230 Volts AC or 12V DC. A 5V/50mA DC output is available for external connected circuits and devices. For details please see chaper „Screw Terminals“

Download

The C-Control Computer needs a connection to a PC for downloading the user program.Together with the Station 2.0 a dedicated interface cable was supplied. Connect this cable to the PC serial interface.
Apply the supply voltage now and start the BASIC++ IDE for a download of your program. If no error is encountered during compilation, the program downloaded can be started. The C-Control Unit is ready for download if it is in the DOWNLOAD -MODE. Other than the Application Board or the Unit M 2.0 the Station has no START button. The Station is always in Autostart mode. To enter the download mode you have to hold PROG down and press RESET a short time. After this you can release the PROG key and the Station is ready for download now.
For details concerning the download with the IDE please refer to the programmer‘s manual. Depending on the program size the download lasts betwen 1s for short programs and up to a minute for large programs.
The TRX LED located at the front panel shows activity at the interface lines, the download window on your PC shows the progress. After download the connection to the PC either may stay (e.g. for program outputs to a terminal program) or can be removed if desired.
After download of the user program to the C-Control Unit, the program is permanently (until a new program download) stored at the unit’s Flash memory.

After download the program starts automatically. Different than the Unit M 2.0 the Station is in always in the Autostart Mode i.e your program can be hold only by entering the Download Mode. Pushing the RESET button will just cause a reset with a following restart of your program

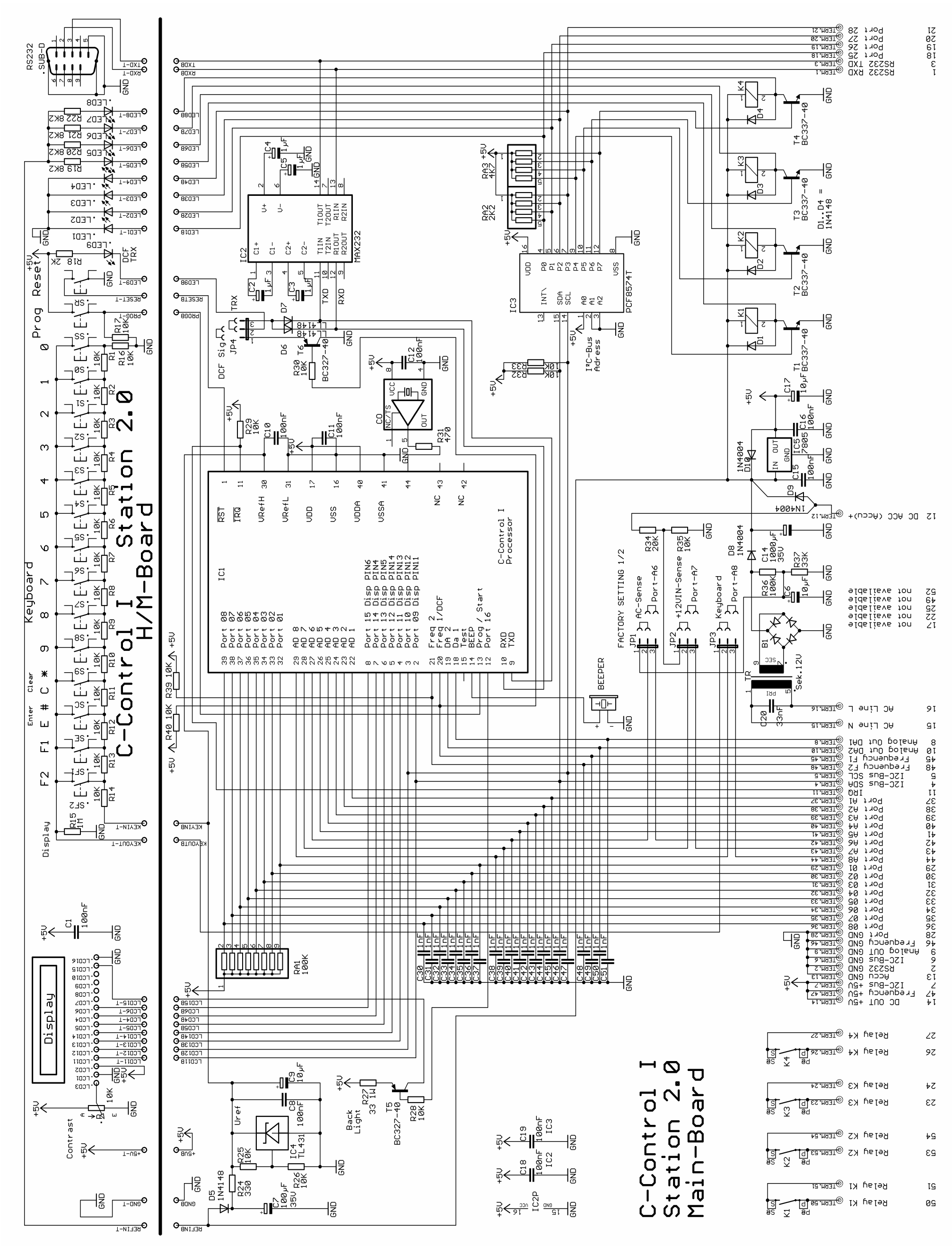
EEPROM Boot Option

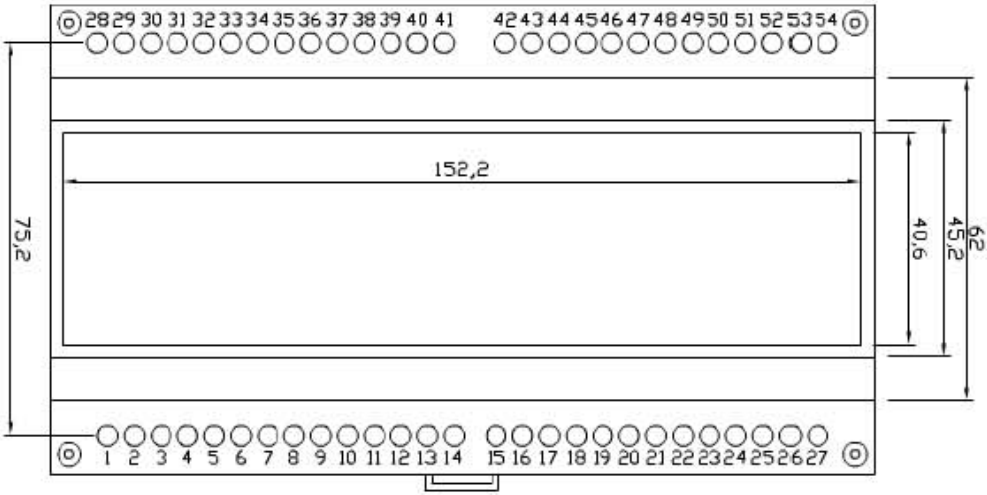
The Operating System Versions above 2.05 offer the option to load a user program from a EEPROM e.g. in form of a „Chip-Card“. This is very comfortable if the user program has to be updated in the field without a PC available or if qualified personnel for a manual program download is not present. The EEPROM Boot Option is set als default but can be switched off. The procedure is similar to a usual downlaod. RESET with pressed PROG key (see above „DOWNLOAD“) causes the Station to enter the Download Mode and the Operarting System tries to identify a EEPROM containing a valid program file. If no EEPROM is connected or the loaded file is not valid, the usual procedure (download from serial interface) is applyable. If a EEPROM containing a valid program file is connected then the program is copied into the FLASH Memory.
A program file on EEPROM is defined to have the first byte in memory loaded with the value $55. The memory beyond the program bytes can be used as data memory. The boot option is set on/off with a dedicated small BASIC program. The boot file located on EEPROM is created with a special program running on a C-Control Unit. Details you will find in the Programmers's Manual

Caution:
EEPROMs used as standard data memory must not have a value $55 loaded to the first byte in memory, if the EEPROM boot option is active. The boot option supports EEPROMs manufactured by MICROCHIP only.

Technical Data

Operating Voltage AC:	230V ± 10% / 3.6VA
Operating Voltage DC:	12…15V
Current Consumption DC:	60 to 210 mA
Max. output current +5VOut:	50 mA
Internal used C-Control I ports:	Port 9 - 16, (AD8, AD7, AD6)
User variables	140 Byte RAM (with BASIC++)
User program memory	10 kByte FLASH
Operating system	6 kB FLASH
Bus clock	8 MHz
A/D-ports	8 x 8 Bit A/D converter, 0.....5V
Reference voltage Uref	5V
Digital ports:	8, I/O ports
Digital port output level 0.2mA load:	Uout LOW 0,1…0,3V Uout High 4,7…4,9V
Digital port input level:	Uout LOW 0V…1V Uout HIGH 3,5…5V
Maximum port output load current:	sink (in) max. 10mA, source (out) max. 10 mA
D/A-Ports:	2 x 8 Bit, 1930 Hz PWM
Frequency inputs F1, F2	0…32 kHz
Serial Interface	8N1, 9600 Baud, no Handshake
Environment requirements:	Temp. 5...40 °C, rel. Hum. 20…60%
max. switching capability K1, K3:	250VAC 8A
max. switching capability K2, K4:	250VAC 16A
min. switching capability K1, K2, K3, K4	5VDC / 100mA
Cable cross section	single wire, not flexible max. 4,0mm² Flexibel wire max. 2,5mm²
Mounting:	On DIN-Rail corresponding DIN 50 022, 35mm Terminals must be covered


C-Control I Station 2.0 H/M-Board
C-Control I Station 2.0 Main-Board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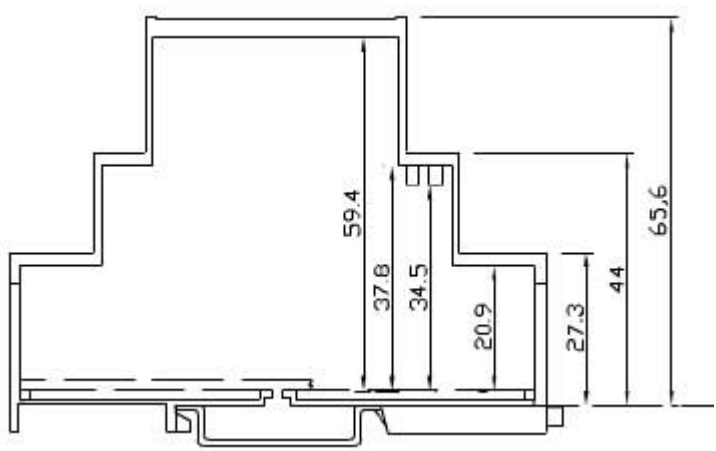
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27.3
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*)

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GB

Imprint

These operating instructions are created for Conrad Electronic GmbH,
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Impressum

Diese Bedienungsanleitung wurde erstellt für Conrad Electronic GmbH,
Klaus-Conrad-Str. 1, 92240 Hirschau/ Germany.