



CR391 Manual

Revision 000

14 Mar 2017

Revision History

Version	Date	Person	Reason For Changes
001	2014-10-01	MTL	Match CR390 FW v1.46. Library functionality mode to document CR39x.Library.manual.doc
001a	2014-11-21	MTL	Correct configuration drawing
002	2014-12-2	MTL	FW Version 2.
005	2015-01-15	MTL	FW Version 5. Correct number of cards and buffer sizes.
009	2015-04-18	MTL	FW Version 9. Add updating
00B	2015-07-21	MTL	FW Version B.
00D	2015-08-26	MTL	FW Version D.
00G	2015-09-15	MTL	FW Version F. Serial reader
00I	2015-12-05	MTL	FW Version I. Remove Ethernet cable when doing factory reset
00K	2016-06-06	MTL	FW Version K.
00L	2016-07-12	MTL	FW Version L, Bootloader 1.12, I/O map to match Lib V01Z
00N	2016-11-22	MTL	FW Version N, Bootloader 1.13 (flash node 2 fast). CR355A requires own dB TG
00O	2017-03-14	MTL	FW Version O, Bootloader 1.14 (flash node 128 fast).

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1 SCOPE

This help file contains all information on the Softcon product CR391 card reader controller (hereafter referred to as the CRC). The document contains the following:

- General product specifications.
- Detail technical specifications.
- Installation instructions.
- Operators manual.
- Parts lists.
- PCB versions.
- FirmWare (FW) versions.

2 WARNINGS AND CAUTIONS

The controller poses no hazard to the user of such equipment if installed correctly. The controller is powered by 110 or 220/240 VAC and should therefore always be kept locked with the transformer plate screwed into place. Both fuses on the board are rated at 2 amps and should never be exceeded. All supply voltages, environmental specifications, as well as general specifications should be considered when installing the controller.

In installations where the equipment effects control, potential hazards may occur, depending on the item being controlled. Correct system design and implementation should eliminate such hazards, e.g. installing detection loops under barrier arms.

3 APPLICABLE DOCUMENTS

All information specific to the CR391 controller is included in this document.

Functionality of the controller is listed in the document CR39x.Library.manual.doc. The library manual lists all functions available in Softcon products and a functions table specifies the controllers that are enabled for each function.

The CR391 can be programmed using the CR374 or CR375 programmer (these also used as front-end interfaces for reader, display and key-pad). Throughout this document, these programmers are referred to as hand held programmers (HH). The HH booklet (SCS_CR39x.HH.booklet.pdf) describes the use of the HH. The functions table in the HH booklet (same as the functions table in the library manual) lists what controllers are enabled for each function.

The CR391 booklet (SCS_CR391.booklet.pdf) described the CR391 HW (connections and links).

The CR391 lid inserts (SCS_CR391.lid.pdf) are installed in the product lid, are included here as appendixes.

The PC SW manuals are available for information on the LAN systems.

All documents are available on WWW.softconserv.com

4 CR390 COMPATIBILITY

The CR391 is an updated CR390 controller, containing all CR390 functions with the following additions:

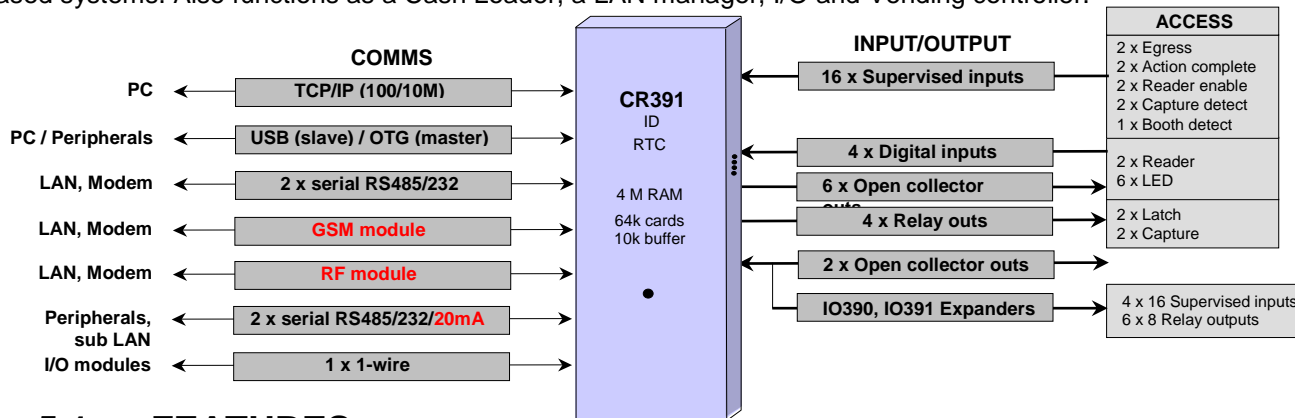
- 1 Single PCB with surface mount components.
- 2 USB (slave). Connects to PC for test and master / slave comms.
- 3 USB (master). Connects to peripherals and interfaces memory sticks.
- 4 TCP 100M.
- 5 2 serial ports for peripherals, e.g. readers, note reader, vending machine, fuel pump.
- 6 2 additional readers (4 total) via CR375.
- 7 Option RF module – comms with CR375 or to PC.
- 8 Optional GSM module – comms with PC via APN
- 9 LCD and keypad on the board.
- 10 1-wire I/O expansion connector.
- 11 Component level interface bus to interface with other hardware
- 12 8 General purpose input output ports (TTL)
- 13 Reader1 and Reader2 power can be disabled via software

- 14 Reader1 and Reader2 power can be selected via Software (12VDC or 5 VDC)
- 15 Reader1 and Reader2 power short circuit protection

The CR391 is manufactured in different configurations where certain components are omitted. The BareBones version does not contain TCP or USB features and is similar to the CR355 controller in I/O and communication functions.

5 GENERAL SPECIFICATION

An intelligent Access Controller of one or two entry points, via one or two Card Readers and/or Keypads (with Data/clock, Wiegand, Dallas Touch or serial interfaces) utilized in stand-alone mode or integrated into on-line PC based systems. Also functions as a Cash Loader, a LAN manager, I/O and Vending controller.



5.1 FEATURES

- Multiple Card Technologies: Interfaces to Wiegand, Magnetic Stripe, Dallas Touch, Proximity, Infra-Red, Serial (RS232 or RS485).
- Remote Transmitters and barcode readers.
- Optional additional wireless, connecting to one or two CR375 interfaces (reader/LCD/Programmer).
- Multiple Time Zones for Access, Readers, Keypads, Door Monitoring and aux inputs.
- Booth (mantrap) and interlock Logic, Card Capture and Audible Alarm.
- Supervised auxiliary inputs,
- Auxiliary outputs.
- Anti-Pass back, Anti-Time back (Pedestrians and vehicles).
- 65 000 local users (expandable to 128k).
- 65 000 Unique PIN Codes (1 to 5 digits).
- Programmable via Handheld Programmer (RS485 or RF), Terminal, PC (on-line system).
- AC or DC Power Source.
- 10000 LAN transaction buffer.

5.2 PERIPHERAL DEVICES

Readers: Wiegand, Magnetic Stripe, Dallas Touch, Proximity, Infra-Red, Remote Transmitters and Bar-Code.

Keypads: Via CR374/5.

Terminal: For testing: VT100, ASCII, Main port RS232 full duplex, 19200 Baud, 1 Start, 1 Stop, no parity.

5.3 INPUT / OUTPUT CAPABILITY

- 2 Card readers: Data/clock, Wiegand, Dallas Touch or serial (RS232,RS485) interface.
- 3 Status LED's.
- 2 Keypads (Via CR374/5). RS485 or wireless.
- 2 LCD displays (Via CR374/5). RS485 or wireless.
- 16 supervised inputs (short circuit, closed, open, open circuit), 5VDC maximum.
- Input expansion to 80 inputs.
- Special function inputs:
 - 2 Action-complete
 - 2 APB follow
 - APB reset (enable both readers if either), or enable all.
 - Booth occupied, Booth Continue, 2 Booth call, Booth door continue
 - 2 Card Capture
 - Card count reset
 - 2 Egress (push button)
 - 2 Latch monitor
 - 2 Random search 0%, 2 Random search 100%

- 2 Reader enable
- 2 Tamper
- Relay outputs (30 VDC / 250 VAC, 3 Amp potential free relays), 2 NO, 2 NC.
- 8 Open collector outputs (Darlington, 500 mA / 12 VDC). 6 used for reader LEDs if connected locally.
- Outputs expansion to 80 outputs.
- Special function outputs:
 - Booth/interlock busy
 - 2 Buzzer
 - 2 Capture
 - 60 Card count full
 - LAN on-line
 - 2 Latch
 - 4 Diagnostic LEDs, 6 reader LEDs
 - 2 Random search
 - 2 Reader enable (virtual)
- Serial comms: RS232 (TX, RX, RTS), 20mA, Lonworks, RS485 (Data, /Data, RTS, /RTS transzorb protect).
- TCP, USB (slave) and optional GSM and RF modules.
- 1-wire I/O expansion.
- 2 Peripheral serial communication: RS232 (TX, RX), RS485 (Data, /Data) or 20mA.
- USB (master) peripheral communication and memory stick interface.

5.4 CABLE TYPE AND LENGTH

Reader to CR391:	8-core multi-strand Mylar, 0.2 mm, with screen.	50 m maximum.
CR374/5 to CR391:	2 pair twisted multi-strand Mylar, 0.2 mm, with screen.	2 000m max total length.
Terminal to CR391:	3-core multi-strand Mylar, 0.2 mm, with screen.	20 m maximum.
CR391 to 1-wire modules:	2 Pair twisted multi-strand Mylar, 0.2mm ² with screen.	20m total length.
CR391 to IO 390/1 modules:	8 core multi-strand Mylar, 0.2mm ² .	50cm.
LAN cable:	2 pair twisted multi-strand Mylar, 0.2 mm, with screen.	2 000m max total length.
RF module:	433MHz or 868 to 915MHz.	20-30m indoor 300m line of site 1km directional antennae

5.5 HOUSING AND DIMENSIONS

White powder-coated steel enclosure with lock.

255mm (H) x 300mm (W) x 115mm (D), or 315mm (H) x 300mm (W) x 90mm (D) with integrated UPS.

5.6 ENVIRONMENTAL CONDITIONS

Storage Temperature: -20 to 65 degrees C (-46 to 150 degrees F).

Operational Temperature: 0 to 40 degrees C.

Humidity: 80 % non-condensing.

5.7 POWER SUPPLY

90-240 VAC +/- 10% 35 Watt total power consumption.

Data setup parameters and clock are battery backed-up for 10 years (with power off).

12 VAC and 15 VDC (1.5 A - not regulated available for latches).

5 VDC (regulated) or 15 VDC (not regulated) at 500mA, available for readers.

Integrated UPS option with 7 AH battery, mains monitor.

6 GENERAL INFORMATION

6.1 INTRODUCTION

The card reader controller (CRC) is single 32bit microprocessor-based equipment designed to execute control of one or two doors, barriers, turnstiles etc. Control of these doors could be via card readers (MAG, prox, touch, infra-red, barcode or Wiegand), PIN-pads or push buttons (egress). The controller can be used as a stand-alone unit or in an “on-line” PC based LAN system.

The controller has 16 (expandable to 80) supervised inputs that can be used to monitor potential free contacts (in PC based option), or be set as special function access related inputs.

12 outputs (expandable to 80) are 4 relay and 8 open collector outputs are configured as special function access related outputs or as auxiliary outputs controlled on time and/or by the PC.

The set-up is set and can be viewed with a hand programmer that is plugged in to the controller. In on-line systems, the PC can change the set-up.

A bootloader firmware upgrade function is also available as standard where new firmware can be downloaded to the controller via the Ethernet or RS485 connection.

An integrated UPS option of the CR391 is available.

The controller can be set to function in modes as described below. The **CR355** and **CR355A** mode differ only in time groups. **CR355** has 15 Access time groups, 15 input time groups, 15 output groups and a time group for each reader and PIN required and each door open time group. **CR355A** has 60 time groups (8 time zones per 15 groups) with selection of any time group for any of the functions – Access, reader, PIN, latch, input and output. Note that for CR355A, db2 is limited to 32000 cards. **PC translator type** is set as CR355 or CR355A respectively. CR355A must have db setting of each Tg.

The controller can be set to function as a **CR351/2/4** controller (previous Softcon access controller), with dedicated special function inputs and outputs, 4 auxiliary inputs and 1 auxiliary output. CR372 and CR374 cannot be connected in this mode. The CR374/5 is used only as a hand programmer.

The CR391 can be used as a **vending controller** and a **cash loader** (may require different FW load). The cash mode only functions on-line with the PC. In these modes, the CR374/5 is used as a display.

The controller can perform a variety of functions (details are given in the library manual):

- Access control
- Cash Loader
- Input / Output controller
- LAN manager
- Vending controller

6.2 CONTROLLER

6.2.1 Design and construction

Materials. Housing is a white powder coated metal enclosure. CR391 consists of 2 PCB, PCBs are 1.6mm fiberglass. The “uP” PCB mounts on to the “Base”PCB.

Radiation. Radiation falls within the EU and UL requirements and causes no detrimental effect to the surroundings (requires correct earthing). See protection.

Identification, markings. Each PCB has a recorded unique serial number in permanent ink and has a PCB version number in white paint – B70x (for the uP PCB) and B71x for the base PCB, where x is a version number (0 to 9 or A to Z).

Interchange ability. PCBs are interchangeable.

6.2.2 Protection

Power supply protection is limited to a mains line filter (Varistor, inductor and capacitor network), with a

transzorb on the secondary winding. The LAN lines are protected with transzorb. The reader data is opto-coupled. Additional protection must be provided externally where required.

Reader supplies (pin 1 and 4 on the reader connector) that are short-circuit result in the PCBs fuse blowing, opening MAG latches.

All reader inputs have serial 100 ohm protection resistors. MAG and Wiegand Reader inputs are protected via tranzorbs.

Inputs have tranzorb and an RC network for noise.

6.2.3 Power supplies

The controller requires a “clean” power supply. Two version of CRC are manufactured, a 110VAC and a 220VAC version (transformers wired differently). The specification calls for 110 or 220 volt AC with a tolerance of plus minus 10%. In installations where the power supply fluctuates regularly or dips below 100 or 200 volts AC an external UPS should be installed.

Connecting the CRC to the same remote mains power supply as a motor and control operating a boom or a roller shutter door, could cause problems because of the excessive mains variations as the motor switched “on” and “off”. Mains UPS or DC UPS (nominally 12VDC to 20VDC) can be utilized. The CRC is available with an integrated UPS option.

A “clean power supply” is generally available in buildings for computers. The CRC should be connected to that supply.

Signal ground must be isolated from earth, i.e. no links between ground and earth (the housing is earthed). Supplying DC to a CRC via long cables should be avoided and additional capacitance is generally required at the CRC when supplying DC.

The CRC generates a supply for loads (latches) and is a maximum supply of 14,2 VDC or 13,5 VAC (true RMS) at 2A.

These voltages assume that the primary winding connections of the transformer matches the supply, i.e. 110V or 220V. The 14,2 VDC is not regulated and is the 13,5VAC that has been rectified and smoothed. External supplies should be used if the requirements exceed these values. The relay contacts are rated at 3A 30VDC and 3A 250VAC.

The external 110/220VAC supply is fed though a line filter (reducing noise from and to the mains supply) to the transformer installed in the CRC housing. UPS mains supply is mounted externally or contained in the housing (UPS option).

Installations requiring DC main supplies, or latch/reader supplies not generated by the CRC must be installed externally. External DC supplies could be mounted in a matching CRC housing. DC supplies must be mounted in close proximity to the CRC, alternatively, suitable cables and voltages must be used.

When using mains supply (110/220VAC), the supply is connected to the “kettle” socket on the enclosure, with earth tied to the centre terminal and live and neutral to the outer terminals. When using mains UPS, it is connected to the same terminals.

6.2.4 External battery backup unit

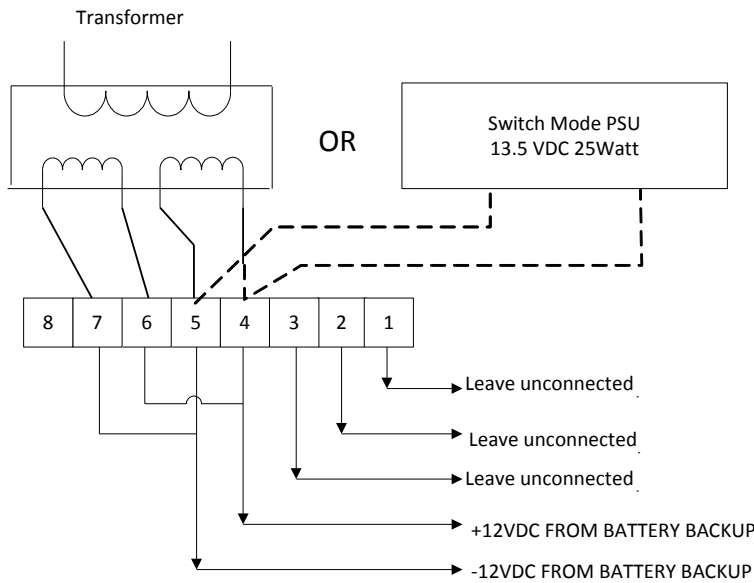
Disconnect live and neutral cables from the “mains” connector.

Disconnect the secondary from the transformer to the PCB (terminals 4, 5, 6 and 7).

Link terminals 4 and 6. Connect 12 volt + from battery backup unit to linked terminals 4 and 6.

Link terminals 5 and 7. Connect 12 volt - from battery backup unit to linked terminals 5 and 7.

Note that earth must remain connected via the mains connector or be connected to the earth terminal block provided in the housing.



6.2.5 Integrated UPS

A version of the CR391 controller has an integrated uninterruptible supply (UPS), with a 7 AH battery. This powers the CRC, readers and latches (only DC latches). The period that the CRC can be powered depends on the power consumption of the readers and latches and how often the latches are energized. The controller draws 800mA, proximity readers typically require 100mA each, and if the latch is not energized, the controller and readers can be sustained for 5 hours. Mains monitor relay on charger.

6.2.6 Communication

For functionality and set-up details on the following see the library. Generally selected port in brackets below.

Peripherals (see peripherals below for connection details) :

- Cash loader:** The PCB is linked for TTL when installed in cash loaders.
- HH:** RS485 communication with HH programmer, (Com A).
- Readers:** Data/clock, Wiegand dual line, single line Dallas (touch) or wireless via RD modules.
- RF modules:** Link wireless to one or two CR375 front end controllers, each linking a reader, LCD (or programmer) to the controller.
- USB (device/slave):** This comms is used for test mode (terminal mode) or for PC / Master comms.
- USB (host/master):** To connect USB peripherals (printers, modems) or devices such as memory sticks.
- Vending and Fuel:** 20mA. (Com D)
Only TCP comms to the PC is possible.

PC comms (see PC comms below for connection details):

- Serial to PC:** RS232 (in terminal test mode, in modem app or in PC mode. (Com C).
- Basic serial slave:** RS232/485 Basic ASCII-HEX, space separated, CR terminated strings. (Com C/B).
- LAN Master:** CR391 can be LAN master (and a LAN slave) to 128 slaves – polling the slaves and passing data to the PC (slave to PC). RS485. (Com B).
- LAN Slave:** RS485 polled. Controller with matching node address receive/send data. (Com B)
- TCP-IP:** 10/100Mb/s baud, half duplex TCP connection to PC, with IP, Subnet Mask, Gateway, Port and MAC addresses settable via HH.

6.2.7 Memory

On-board memory is fixed at 4M byte SRAM and 524k byte EEPROM in the uP. RAM allows for up to 64k card database and up to 7000 transaction buffer (depending on dB options). Set-up parameters are kept in

Electrically Erasable (EE) or Battery Backup (BB) memory and the card database is kept in BB. On power-up the BB memory is checked for a specific pattern and if incorrect the set-up is loaded with defaults, mostly from settings in EPROM as listed in the default set-up below (see HH set-up / default memory).

6.2.8 FW versions

The CRC program (referred to as FirmWare - FW) resides in the Electrically Erasable Programmable Read Only Memory (EEPROM) device in the uPs. The FW version of the two uP are synchronized to be the same and is printed on a sticker on the uP PCB.

The version format is Vccc.Illx:

- ccc - Controller specific version (HW drivers, I/O ports, etc.).
- Ill - Library version. All functions and settings (common to Softcon products). Note that certain functions may not be linked in certain ccc versions. See the function table appendix.
- x - For French, a 'F' after the version indicates that displays are in French. Other languages are available on request.

6.2.9 Reset

The controller has built-in power and time-out watchdog reset circuitry. When the 5V supply drops below 4.8V, the RAM closes to a battery backup state and the microprocessor resets. The time-out watchdog resets the microprocessor if the SW does not perform the time-out clear every second – this reset occurs when the green tick LED flashes on the PCB. These functions are done automatically.

Resetting the CRC is by powering up the controller.

A memory of the EERAM and SRAM reset (factory reset) can be forced by short circuiting the reset pin on the uP PCB (masked as RESET, E4 or E12 on PBC version <802.2) till Rd1 and Rd2 LEDs light up and removed when Rd1 LED off (wait a fraction of a second), Rd2 on.

When the CRC powers-up with the reset link in, the first reset defaults Serial C to Test. The following occurs:

- The CR391 goes in to firmware update mode
- If no update command was received after 7 seconds the CR391 will go in to “run” mode

Reset options are available via the HH – see the HH booklet.

It is suggested that in TCP connected controllers, the Ethernet cable be removed before the factory reset is done and only replaced when the correct IP setting have been entered. This eliminates possible problems with certain smart routers that block the port when detecting the default IP address 192.168.100.001.

6.2.10 Micro processors

The uP PCB contains a single 32bit processor (Pic32 795 512L) with IO port expanders.

6.2.11 Durability and reliability

Ruggedization is limited to static use, i.e. not mobile. The mean time between failures is greater than 10 000 hours at 24 hour per day operation within the specified environmental and supply conditions.

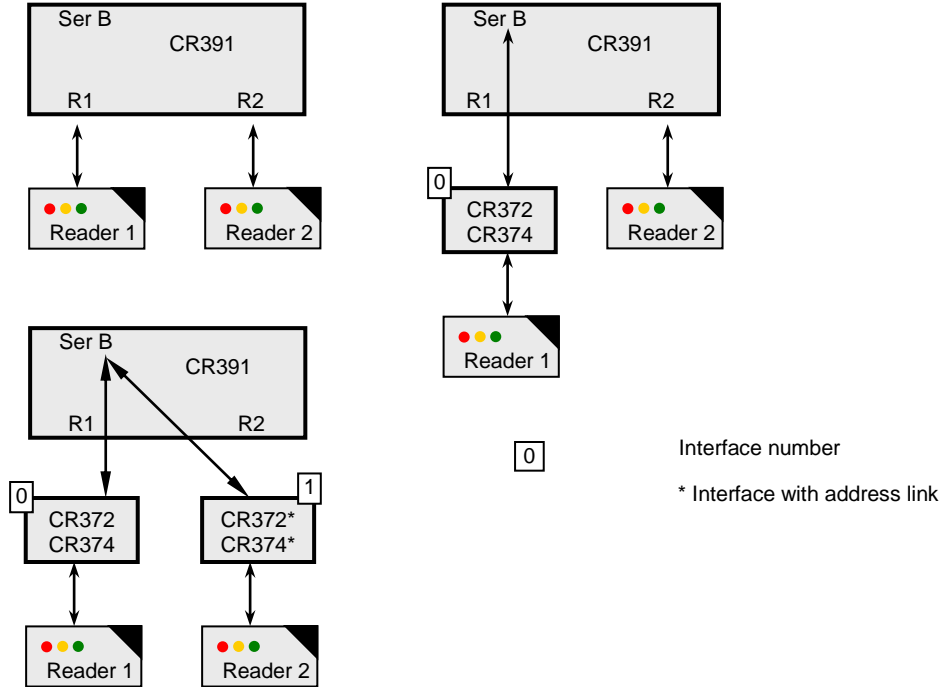
6.2.12 Acceptance test procedure

During production, CRC is subjected to a variety of tests and checks. A built in test (BITE) is used to test all HW functions of PCB and once installed in housing, functional tests are performed.

6.3 CONFIGURATION

The CRC is installed in as stand-alone unit or as part of a LAN system and is configured to control one door (with a reader in and reader out) or as a two door controller (reader in, free or egress exit). A bi-directional turnstile or booth (mantrap) is set as a two door controller.

Readers are connected directly to the PCB or via CR372 or CR374/5 front end modules connected serial port A in RS485 mode.



6.4 FUNCTIONALITY

All functionality available in Softcon products are described in the library manual (SCS_CR39x.Library.manual.PDF). This manual contains a table of functions, indicating which controllers are enabled for each function.

6.5 DATABASE

The CRC uses a local battery backed up database of card holders which indicates if the card is enabled for each reader, the time group allocated to the card, if the card is a pass back card and a capture card. Database options available are listed below. When the dB type is changed, all data is lost.

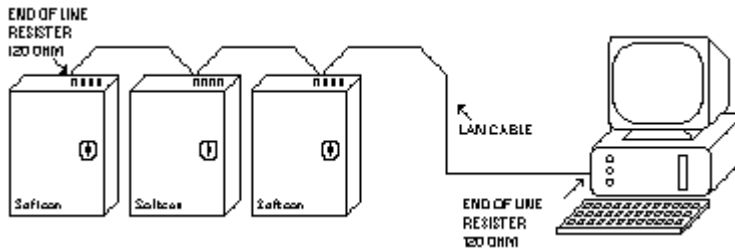
In LAN systems, the PC updates the database and the local data is overwritten. No upload to the PC function is available. A batch load function is available for the hand programmer. See library for more detail.

Type	Cards	PIN	Number	BCD	LAN	TG*	CR355A*
02	130000	No	No	No	10000	No	No
02	130000	No	No	No	10000	No	Yes
02	130000	No	No	No	10000	Yes	Yes
10	130000	No	Yes	Yes	10000	Yes	Yes
10	130000	Yes	Yes	Yes	10000	Yes	Yes
10	130000	No	Yes	Yes	10000	Yes	Yes
10	130000	Yes	Yes	Yes	10000	Yes	Yes

TG* indicates separate card access time groups per reader, e.g. reader 1 24 hours, reader 2 day only. CR355A* selection.

7 PC COMMUNICATION

7.1 LAN SLAVE



When installed as a slave to LAN system, the required serial port (generally serial B) of the CR391 must be set be serial – slave. The serial port must be linked to RS 485 (E23 2-3 for serial B). See library for the required set-up.

The running of the LAN cable must be such so as to avoid electrical interference. RS 485 Connections for port B are:

Cable Colour	CRC	Mux D25
Yellow & Green	10	25
Red	11	10
Blue	12	1
		Connect 13 to 16

Each segment of the LAN must be earthed only at the controller furthest from the PC.

The ground of the CRCs are tied together to bring the potential to the same level. This is to prevent the transzorb protection devices on the controllers (between signal and ground) from “firing” due to potential differences.

LAN cable stubs must be avoided, i.e. no T-joints must be made and the cable should be looped through each controller, i.e. only two ends to the cable. The two furthest ends of the cable must be terminated with the characteristic impedance of the cable, generally 120 ohm resistors between data and data not. Note that any unit can physically reside anywhere on the LAN, the PC mux does not need to be installed in the centre of the LAN or at the end.

For test purposes, a slave CRC can be set to act as multiple controllers with a range of addresses – see library.

7.2 LAN MASTER

When installed as a master to LAN system, the required serial port (generally serial B) of the CR391 must be set be serial – master. The serial port must be linked to RS 485 (E23 2-3 for serial B) and pull-up and down resistor must be linked on data, /data (link E26 1-2, 3-4 for serial B). The number of slaves is set in the EERAM (sent from the PC). If the controller also functions a controller (slave), the Node must be set to the appropriate node address (see hand programmer below).

See library manual for setting and status check.

7.3 TCP NETWORK

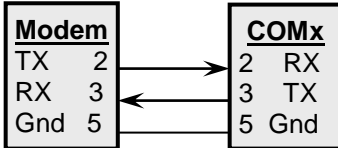
When installed to the PC via a TCP connection (connected to uP1), comms is 10M, half duplex. See library manual for details.

When connected directly to a PC, a crossover cable must be used. A straight cable (1 to 1) is used when connected via multiplexers/routers. See connections for pin outs. The two red LEDs on the uP PCB indicate the status of the TCP comms, with off indicating that comms is established.

7.4 MODEMS

Via the HH, the comms mode is set to type modem. Baud and the bits type are set.

The controller ignores HW handshake (CTS / RTS) and does not generate Data Terminal Ready (DTR). Modem setting thus requires that DTR be ignored. Certain modems do not have such a setting, or does not function correctly. Such modems must be wired as a null modem as indicated below, else a connect command is not received.

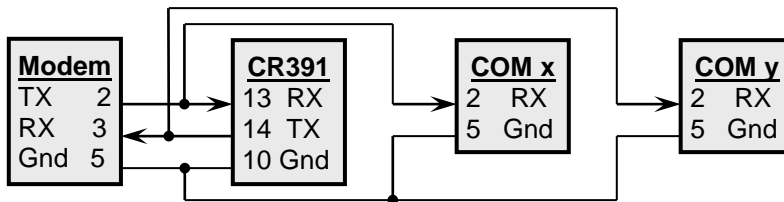


CONTROLLER TERMINAL	MODEM PIN (9 WAY F)	MODEM PIN (25 WAY F)	NAME	MODEM DESCRIPTION
14 TX	3	2	RD	In: Receive data
13 RX	2	3	TD	Out: Transmit data
	7	4	RTS	In: Request to send
	8	5	CTS	Out: Clear to send
	6	6	DSR	Out: Data ready state
10 GND	5	7	SG	Signal ground
	1	8	DCD	Out: Data carrier detect
	4	20	DTR	In: Data terminal ready
	9	22	RI	Out: Ring indicator

For a null modem: Interconnect DTR, DCD and DSR.
Interconnect RTS and CTS.

See library manual for functionality detail.

To monitor communication between controller and modem, connect as follows to the PC:



7.5 GSM MODEMS – CALLER ID READERS

A GSM modem can be connected to a serial RS232 port B configured as serial type 11. The serial port baud, number of bits and parity must be set to match that of the modem.

The caller ID is used as an access card - See library manual for details.

8 PERIPHERALS

A variety of readers, displays, door monitors and input devices can be tied to the CRC. These are listed below:

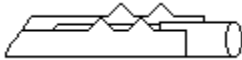
8.1 CARD READER

Two card readers can be connected to the CRC.

Card readers should always be mounted within 50 meters of the controller utilizing an 8 core 0.2mm² mylar screened cable. Serial readers generally use a 2 pair screened cable. The screen must always be connected to mains earth terminal block in the controller. Always ensure that all metal-based equipment that the reader is mounted on (gooseneck, turnstile etc.) is well earthed to mains earth. Ideally the reader should be mounted ± 1.2m above ground level. When using swipe readers ensure sufficient space to accommodate the swipe action from insert through to follow through is provided for. Special care must be taken when mounting proximity or hand-free readers. Problems are encountered with readers influencing one another. When mounting Prox reader on metal, the read distance decreases (typically by half). Mounting the readers on non-metal spacers e.g. wooden or plastic base plates of 1cm or more, resolves this problem. Detailed mounting instructions are available from the manufacturers of the readers.

Reader connections are by means of 9 pin molex plugs (these are supplied with the controllers). The reader connectors are marked on the CRC PCB as P9 (reader 1) and P10 (reader 2). Cables must never be soldered to the reader or CRC connector pins, use the crimp pins supplied.

It is essential to use the correct crimp tool at the correct pressure for crimping the lugs to the reader cable. Note that the end section of the lug is crimped on to the cable sheath, while the front end is crimped on to bare strands of the cable. The strands must be twisted together before crimping to form a “single” wire, i.e. do not crimp loose separate strands. The crimped lugs, when pushed in to the lug casing, must clip in and not slide out when the cable is pulled gently.



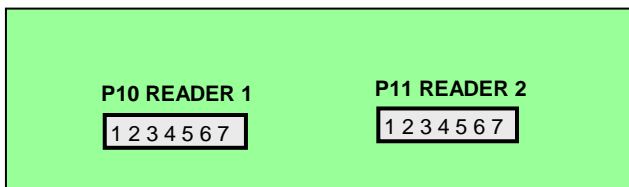
Ample cable slack should be left at both sides of the cable, facilitating the removal of the reader from its mounting position while it remains connected, and allowing the two reader connections to be exchanged at the CRC end. Excess slack should not be coiled up inside the housing. Use the appropriate CRC housing knockout for the cable entry - see installation.

Before switching on the controller, make sure of the power requirements of the readers installed. The CR391 will by default set the power to the Readers to 5Volt DC. Power control is electronically provided via the handheld programmer. The installer have a selection of:

- 5 VDC
- 12VDC

Both selections are short circuit protected.

Reader connections are as follows (with colors suggested):



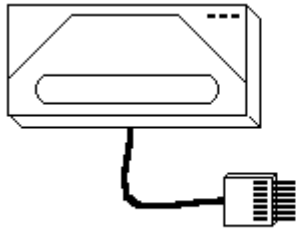
1	Red	+VCC	5V or 12V
2	Yellow	Low Data	“0” (data, touch)
3	Green	High Data	“1” (clock)
4	Black	Ground	
5	Brown	Pass LED	Green
6	Blue	Ready LED	Yellow
7	Purple	Fail LED	Red

Serial readers can be connected to unused serial ports – **THIS OPTION HAS NOT BEEN ACTIVATED FOR CR391.**

It is good practice to use an unused core as an additional ground, i.e. double up on the ground line with two cores, especially on long cable runs.

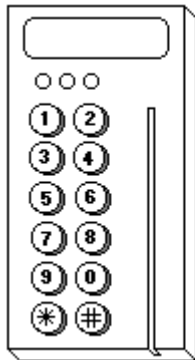
Reader names, activities and the date-time can be displayed on LCDs. See LCDs.

8.1.1 Infra red reader (moulded)



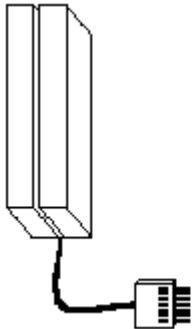
1	Brown	+ 12 VDC
2	Red	Low Data
3	Orange	High Data
4	Yellow	Ground
5	Green	Orange LED
6	Blue	Green LED
7	Purple	Red LED

8.1.2 Infra red (Softcon)



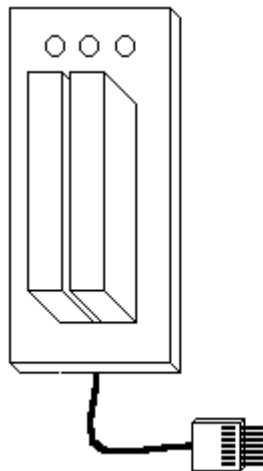
1	+ 12V
2	Low data
3	High data
4	Ground
5	Orange LED
6	Green LED
7	Red LED

8.1.3 MAG reader without LED's and back plates



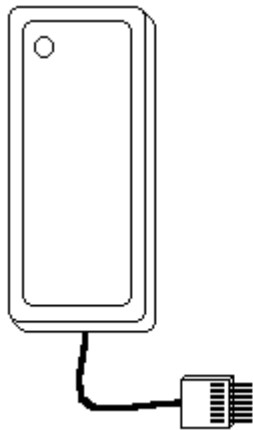
1	Red	+ 5 VDC
2	Blue	Low data
3	Green	High data
4	Black	Ground
5	Yellow	Not used

8.1.4 MAG reader (Softcon) with back plate and LED's



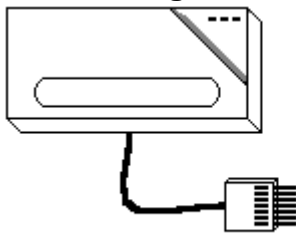
1	Red	+ 5 VDC
2	Blue	Low data
3	Green	High data
4	Black	Ground
5	Blue	Orange LED
6	Green	Green LED
7	Purple	Red LED

8.1.5 Proximity reader (Motorola)



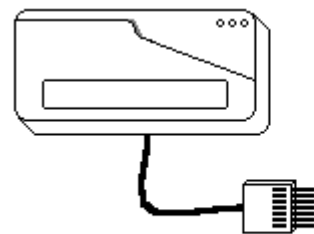
1	Red	+ 5V TO 12V
2	Green	Low Data
3	White	High data
4	Black	Ground
5		
6	Orange	Green LED out
7	Brown	Red LED out

8.1.6 Wiegand reader (Compuguard)



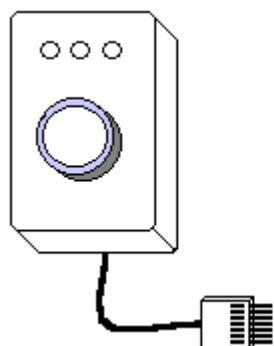
1	White + Grey	+ 5 volt DC
2	Green	Low Data
3	Red	High Data
4	Black	Ground
5	Blue	Yellow LED
6	Purple	Green LED
7	Brown	Red LED

8.1.7 Wiegand reader (Docuco)



1	Brown	+ 5 volt
2	Red	Low data
3	Orange	High data
4	Yellow	Ground
5	Green	Orange LED
6	Blue	Green LED
7	Purple	Red LED

8.1.8 Dallas touch housed with LED's (Softcon)



1	Orange	+ 5 volts
2	Grey	Data
3	Grey	Data
4	Black	Ground
5	Green	Yellow LED
6	Blue	Green LED
7	Purple	Red LED

Static problems have been encountered when using touch readers. Earthing of the metal base plates and addition of surge arrestors resolve the problem. Requires special link fields and removal of resistor (see link fields in the booklet).

Touch readers require specifically manufactures CR391 controllers. Contact Softcon.

8.1.9 GSC reader

1	Red	+12VDC
2	Blue	Data
3	Green	'Clock
4	Black	Ground
	Yellow	Select

8.1.10 HID prox point, Prox point + reader

1	Red	+5 to 15VDC
2	Green	'0'
3	White	'1'
4	Black	Ground

8.1.11 IMPRO prox 44 bit reader

1	Red	+12VDC
2	White	'0'
3	Green	'1'
4	Black	Ground

8.1.12 Barcode serial reader MT-412R

	Green	D9-2	TX
9	Black	D9-3	RX
1	Brown/Rim	D9-5/Rim	Gnd
4	White/Inner	D9-9/Inner	+5V

Reader serial links function at RS232 or RS485.
Reader must be set to 2400 baud, 8 bit, no parity.

Set reader power links E4 and E9 to 5V

8.1.13 Biometric fingerprint reader (Bioscrypt)

Pin #	Signal Description	Prior Cable (Gray Jacket)	Current Cable (Blue Jacket)
1	Wiegand Out Data 0	Red/Black	Green
2	Wiegand In Data 0	Green/Black	Green/White
3	Wiegand Out Data 1	Orange	White
4	Wiegand In Data 1	Orange/Black	White/Black
5	Line Trigger	Green	Gray
6	Wiegand GND	Red	Black/White
7	RS-485 (-)	Blue/Black	Blue/Black
8	RS-485 (+)	White	Blue
9	RS-232 TX	Black/White	Violet
10	RS-232 Rx	Red/White	Violet/White
11	Power GND	Black	Black
12	Signal GND	Green/White	Black/Red
13	Power Input 9-24VDC (V-Prox, V-Pass FX)	Blue/White	Red
14	Reserved	Blue	Red/White
15	Safety GND	White/Black	Green/Yellow



Networking Bioscrypt Readers



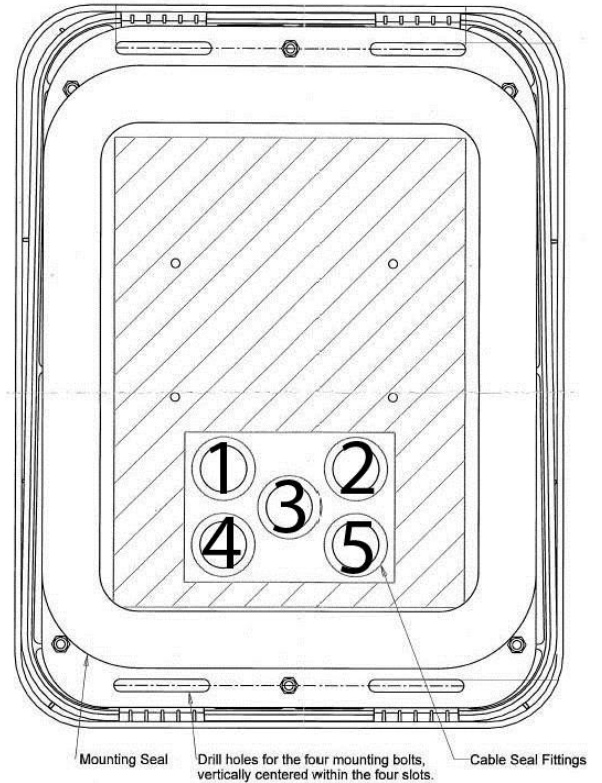
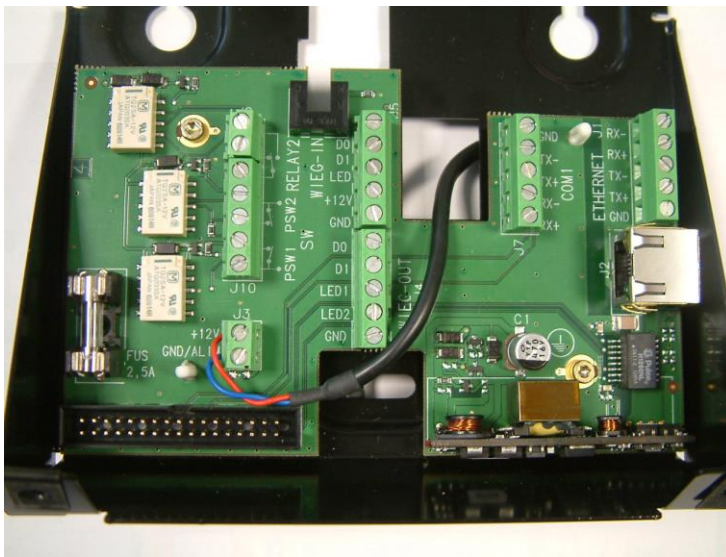
8.1.14 Biometric fingerprint reader (Sagem)



The required cables for the Sagem finger print readers are twin flex for power, cat5e for the network, and 4 core 0.2mm² mylar screen for the Wiegand. The OMA units **cannot be opened** as this will void the warranty. The connections can be made on the pig tail at the back of the unit. All other units can be opened in order to make the connections. The connections are:

OMA500:

Cable Number	Type
1	Tamper Switch
2	RS422/485
3	Power Supply
4	Ethernet
5	Wiegand



MA500/OMA: Power Supply(Connector J3)

Pin	Type	MA	OMA
1	+12V	+12V Power Suply	Red
2	GND	Ground	Black

Wiegand/dataclock Output (Connector J4)

Pin	Type	In/Out	MA	OMA
1	D0	Out	Wiegand D0	Green
2	D1	Out	Wiegand D1	White
3	LED1	In	LED1 (Option)	Brown
4	LED2	In	LED2 (Option)	
5	GND		Ground	Black

Wiegand/Dataclock Input (Connector J5)

Pin	Type	In/Out	MA	OMA
1	D0	In	Wiegand D0	Blue
2	D1	In	Wiegand D1	Yellow
3	LED	Out	LED Out (Option)	Orange
4	+12V	Out	12V Output	Red
5	GND		Ground	Purple

When connected directly to a PC via the TCP/IP connection, a crossover cable must be used. A straight cable (1 to 1) is used when connected via multiplexers/routers. See connections for pin outs.

MA100:

1	2	3	4	5	6	7	8	9	10	11	12	13	14	USB	15	16
Pin	Type	In/Out	Description													
1	D1	Out	Wiegand/Dataclock													
2	D0	Out	Wiegand/Dataclock													
3	LED1	In	Wiegand LED1													
4	LED2	In	Wiegand LED2													
5	GND		Ground for Wiegand													
6	Relay		Relay Contact 1													
7	Relay		Relay Contact 2													
8	Tamper		Tamper Switch Contact 1													
9	Tamper		Tamper Switch Contact 2													
10	GND		Ethernet Ground													
11	RX-		Receive Negative Ethernet													
12	RX+		Receive Positive Ethernet													
13	TX-		Transmit Negative Ethernet													
14	TX+		Transmit Positive Ethernet													
15	+12V		+12V Power Supply													
16	GND		Ground Power Supply													

8.1.15 Motorized / Insert reader

The CRC can interface to motorized or insert MAG MAGTEK reader via a serial port.

Serial type 12, reader type 64 (Insert) or 74 (motorized).

These are often used when card capture is required (certain readers cannot capture).

CR391	MagTek	Color	Description
P3(1)-1	Jack center	Red	12VDC
P3(1)-4	Jack shell	Black	GND
P10(12)-5	4	Yellow	CR391 RX
P10(12)6	1	Green	CR391 TX
P10(12)-2	7	Brown	GND
	5	Solder to 6	RTS
	6	Solder to 5	CTS

Serial pins above are when using serial port C (type 12, 9k6, 8 bit, even parity).

PCB version before V2 are given in (brackets).

Typical settings are: db type10, Client code 2, Site code 9.

Card type 64 or 74, Nr location 6-16, Facility location 2-5, Alt number 2-21

8.2 PIN-PADS

One or two PIN-pad readers can be tied to the CRC and function independently or in conjunction with the card readers. Softcon CR374/5(s) are connected to reader 1 serial port (RS485 mode) to PIN Pad(s). See library manual for functionality detail.

8.3 LCD

One or two LCD displays can be tied to the CRC and function in conjunction with the card readers. See library manual for functionality detail.

8.4 ACTION COMPLETE

One or two action complete detectors can be tied to the CRC. See library manual for functionality detail.

8.5 EGRESS (PUSH BUTTON)



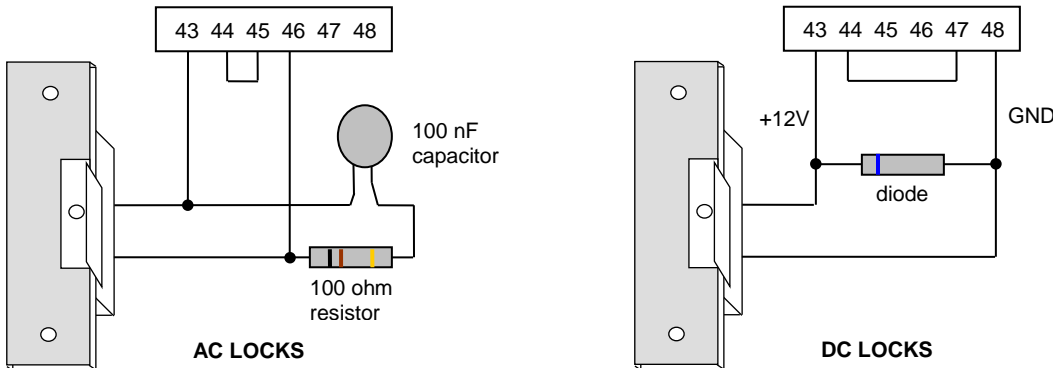
One or two push buttons can be tied to the CRC, which request the opening of the latch. See library manual for functionality detail.

8.6 LATCH

One or two control points can be tied to the CRC. See library manual for functionality detail.

The resistor/capacitor for AC and diodes for DC components reduce the “flash-over” of the relay contacts. The fly-back components should be installed at the load, i.e. at the lock or roller door/boom logic board. Fly-back relays must also be installed on inter-posing or other inductive loads being switched.

When switching DC loads, the ideal is to run the negative line (ground) to the load and switch the positive line (+12v) through the relay.



Unregulated 12VAC (terminals 53 and 54) and 12VDC (55 or 58 + and 56 or 57 ground) are available for feeding through the latch relays (see power supplies below). The latch supplies are derived from a separate winding of the 12V transformer installed within the CRC housing (the other winding generates the supply for the PCB). The 12 VAC is rectified and smoothed for the 12 VDC supply. AC supply to the primary winding of the transformer is set at 110 or 220V. Total current drawn by the latches should ideally not exceed 1A. Fuse F1 on the CRC has a 2A fuse (F1) installed in-line with the AC supply from the transformer.

8.7 BOOTH / MANTRAP / INTERLOCK

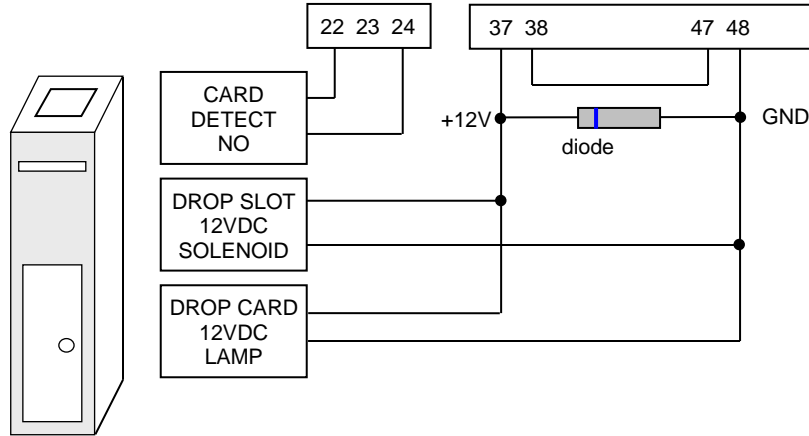
Booth is *Softcon's* term for "air-lock", "inter-lock" or mantrap, i.e. if a pair of doors is set for booth then they are inter-locked, only one may be opened at any time.

See library manual for functionality detail.

8.8 CARD CAPTURE BIN

A card capture unit is an enclosure in to which visitors must insert their cards before exit is permitted from the premises. See library manual for functionality detail.

The card capture bin is installed at the reader, with the card insert point into the bin in close proximity to the reader. The drop card sensor is a potential free normally open contact (micro switch or optical), grounding the input when the card is sensed.



The connections are as given above. Flash back diodes (1N4002 or better) must be installed at the relay contacts and coils in the card capture unit (see “Latch connections” above). The output can be moved to any of the outputs (typically output 4 is used as shown) – see output type. The Output can be changed NO/NC via the set-up menu.

8.9 TERMINAL / TEST

A VT100 compatible terminal, with serial RS232 communications (such as Windows Hyper Terminal), can be tied to the CRC in the test mode and in BITE mode. See Library for settings and functions.

If powered up with the reset link in (see reset above), the first reset defaults serial B to test.

Generally the baud rate of the terminal is required as 9600, 8 data bits, 1 stop and no parity. HW handshaking is not required, but X-on/off is used. The rate is set via hand programmer.

RS 232 connections for the terminal are:

	Function	Cable Colour	Terminal D25	Terminal D9
10	Ground	Green	7	5
13	RX data	Blue	2	2
14	TX data	Red	3	3
earth	Screen	Screen	None	None

For test purposes, a slave CRC can be set to act as multiple controllers with a range of addresses – see Node/Event simulate in SCS_CR391.booklet.doc

9 TRANSPORT AND STORAGE

Limited protection is provided against mechanical damage, but the CRC is transportable if not manhandled. Protection against electrical damage, as well as against effects of static electricity is sufficient.

10 UNPACKING

All controllers are generally delivered mounted within steel enclosures and are wrapped in plastic. The terminals, PCs and printer are delivered in polystyrene protection.

The serial number of the units and the version of software provided (where applicable) is written on to the plastic wrapping. A small plastic packet containing diodes, resistors, capacitors, molex plugs and pins are supplied inside the CR enclosure. The keys to the CR enclosure lock are strapped onto the locking lever within the CRC enclosure.

11 INITIAL INSPECTION

A visual inspection of all units is done before and after unpacking. Defects must be reported immediately, and no defective units should be installed.

12 ASSEMBLY

All **Softcon** manufactured units are workshop assembled, fully tested.

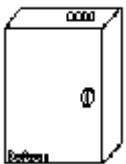
13 INSTALLATION

GOLDEN RULES TO SUCCESSFUL INSTALLATIONS ARE:

- READ THE MANUAL
- AVOID ELECTRICALLY “NOISY” ENVIRONMENTS.
- KEEP CABLE LENGTHS AS SHORT AS POSSIBLE.
- USE SCREENED CABLES.
- EARTH CONTROLLERS, CABLES SCREENS and METAL ON TO WHICH READERS ARE MOUNTED.
- USE “CLEAN” AND STABLE MAINS SUPPLY.
- SUPPRESS “FLY-BACK” AT INDUCTIVE LOADS.
- SWITCH THE SUPPLY TO LOADS (not the ground return).
- USE COMMON SENSE.

The installation of the controller and peripherals are described for each item below.

14 MOUNTING



The CRC enclosure has four 5mm holes in the back plate of the enclosure for easy mounting. Ideally the CRC is mounted at a height of 1.5m to the bottom of the housing and central to the card readers connected to it. When selecting the physical position to mount the controller, take care to avoid mounting the controller within close proximity to equipment generating electromagnetic fields (EMF). Typical EMF or noise generators are: radio transmitters, lift shafts, electric motor, electric solenoids, transformers, distribution boxes etc. Mount the CRC so that the diagnostic light emitting diodes, (LED's) are easily visible. Utilise the 20mm knockouts on the side of the enclosure for cable entries. Power to the controller is normally via 110 / 220 VAC supply. This supply should be connected onto the 3 way terminal plug or block. If a battery back up unit is being used refer to the Battery Backup.

An optional housing is the controller PCB, transformer, line filter and regulator mounted on a metal plate of 18 x 27 cm. Three 5 mm mounting holes are provided on the plate.

Mounting of each item is described below.

15 CABLING

Cables should not be run in close proximity to other cables or across equipment generating noise. Where cables have to run close to or along noise generators, it is imperative to physically separate the cables from the noisy equipment and cables. A 10cm separation reduces the noise factor tremendously.

Maximum cable lengths and cable types are listed below.

Reader, LCD/keypad and PIN-pad cables must be screened cables, with the screen being tied to earth at the CRC. The LAN cable must be screened and tied to earth at one point only, preferably at the master controller (PC).

Note that the LAN screen must be continuous, i.e. looped through at each controller.

Cables must not lie over the PCB, this prevents noise from being induced in to the electronic circuitry. Routing cables through the housing knockout that is closest to the appropriate connector on the PCB ensures minimum cables within the housing. Use the following knockouts (1 on the top, the mains connector):

- Mains
- comms (LAN, terminal or printer)
- LCD / PIN
- Readers, push button, action complete, aux inputs
- Latch, aux output

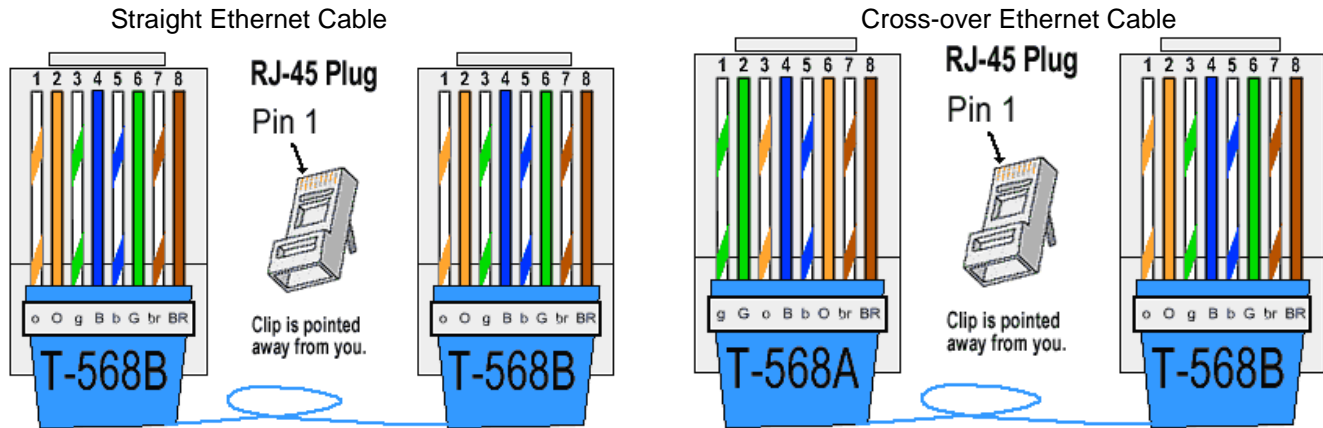
Using the suggested cable colors simplifies maintenance.

Location	Cable	Max m
Card reader to CRC	8 Core, m/s 0,2mm mylar screened	50
CR372/4 to CRC	2 Pr twisted m/s 0,2mm mylar screen	2000
CRC to terminal	3 Core, m/s 0,2mm mylar screened	10
CRC to LAN controller	2 Pr twisted m/s 0,2mm mylar screen	2000
CRC to PC MUX	2 Pr twisted m/s 0,2mm mylar screen	2000
CRC to latch	2 Core, m/s	50
CRC to action complete	2 Core, m/s	50
CRC to push button	2 Core, m/s	50
CRC to card capture	4 Core, m/s	50

The maximum lengths tabled above could be exceeded in certain instances, and depends on cable resistance, electrical noise, etc., this can only be ascertained when installed.

16 CONNECTIONS

See SCS_391.booklet.pdf and SCS_CR391.lid.pdf in the appendix.



Ethernet Pin Out

Pin	Type
1	TX+
2	TX-
3	RX+
4	
5	
6	RX-
7	
8	

17 JUMPERS AND DIP SWITCHES

See SCS_391.booklet.pdf and SCS_CR391.lid.pdf in the appendix.

18 STARTING UP

The power is simply switched on.

19 PRE-START CHECKS

Before starting up, all wiring must be checked. Note that faulty wiring could permanently damage the equipment. Ensure that the power-supply selection to the readers (12V or 5V) is set according to the readers used (links E2 and E3).

In LAN installations, all node addresses on the CRCs must be pre-set to the appropriate address. No two units on LAN may have the same address. CRC addresses start at 01 and run consecutively. In LAN mode, the comms option must be set to 0 (LAN) and serial port must be set appropriately (set via hand programmer), see LAN SLAVE above.

The front module setting (via hand programmer) must be set to match the installation. Should a front module be set and the module is not present, the speed of the reader function slows down.

The connection information provided within the lids of the controllers indicates the node address and terminal information.

Link field uE8 must be removed if the HH is not connected. The battery link uE1 must be installed.

The mode the CRC function must be set with the hand programmer in stand-alone applications – updated from the PC: CR351 / CR355 (standard EPROM), Cash-loader (special EPROM) or Vending (special EPROM) controller.

20 PROGRAMMING

All set-ups are kept in the CRC battery backed-up or Electrically Erasable memory. Set-up is by using the hand programmer or by sending set-up information via the LAN.

20.1 HAND PROGRAMMER

A Softcon CR374 / CR375 with LCD/keypad can be connected to the CRC as a programmer (link uE8 in), facilitating the setting or altering of configuration parameters and card codes/statuses. LCD/keypads can also be used to request and indicate certain information. See SCS_390.booklet.pdf, attached here as an appendix.

20.2 LAN PROGRAMMING

Programming via the LAN overwrites the set-up in the CRC. See the appropriate PC SW manual or the LAN master controller.

21 UPDATING

The controller FW can be updated with PC based programmers or via Ethernet (UDP) or RS485 LAN connections. Updating via the LAN requires a CR391 master LAN controller installed with the boot-loader application. This application is transparent to the other CR391 functions and applications.

The manual SCS_CR391.FWupdate.manual for details.

22 IN OPERATION

In the terminal test mode, the CRC transmits test data to/from the terminal. This mode is set with comms mode 1 (via hand programmer). Comms mode 0 is LAN mode, 2 is modem, 3 is directly to PC COM port, 4 is when hand programmer is connected to the comms port.

The terminal test mode operation is self-explanatory and functions are added as required. This is an advanced function – see terminal / test mode above.

23 CLOSING DOWN

Should it be required to switch off a CRC, the power switch (if installed) within the unit is simply turned off, or the power cable is pulled out of the socket.

Note that when controllers are powered-down the outputs are not active, resulting in non-control (e.g. doors may be locked or unlocked permanently, depending on the lock type used. The latch relay contact is open when the controller is powered off.

24 MAINTENANCE

24.1 USER

Error detection is limited to the observation that the controller is not functioning “normally”, i.e. one of the following is not correct:

24.1.1 Functional indicators

Four LEDs (green, red and two yellow) are mounted on the edge of the PCB and are visible outside the housing. Four surface mount LEDs on the uP PCB, a red and green pair connected to the 8722 uP and a pair connected to the 4550 uP.

The “RUNNING” green edge LED on the controller housings flashes approximately every second, indicates that the unit is functional. An off or steady-on LED indicates an error. This LED is duplicated inverse on the uP PCB (8722 green).

The “COMMS” red edge LED on the enclosure indicates the status of the serial communications. In LAN installations, a steady-on LED indicates that comms is correct, while a flashing or off LED indicates that

COMMS is intermittent or "DOWN". In the terminal mode, the LED flashes every second, when the time on display is updated. The LED flashes whenever data is received or transmitted (from / to the terminal). This LED is duplicated inverse on the uP PCB (8722 red).

The "ENTRY" yellow edge LEDs flash whenever valid data is received from a reader. The "ENTRY" LED remains on for a misread or wrong card type and goes off when a correct card is read. When communication between the main processor on the CRC and the on-board R1 and R2 processors fail, the corresponding R1 or R2 entry LED flashes with run LED. The CRC resets when the communication fails for more than 3 seconds.

The 4550 uP LEDs indicate green flashing for uP is running and the red LED for TCP comms (off if it has comms).

24.1.2 Card reader

The "Ready" (YELLOW) LED flashed when the door is closed. Access denied is indicated with a red LED. Access granted is indicated with a GREEN LED. Misreads, wrong card type or facility error (card not belonging to the site) results in the red and yellow LEDs being on.

Entry of a code (swiping of a card, selection of a PIN-pad key) results in an indication of the entry LED on the reader LED on the CRC housing. A legal code entered at the reader results in the door latch being opened.

Multiple illegal code entry attempts results in the reader being disabled (all LED's of the reader off). The number of attempts and the period, for which the reader is disabled, is pre-configured. The disabled reader is re-enabled when the door is opened legally, i.e. via push button control, when a legal code is entered via the other reader.

When the reader is disabled on input or by the PC, the RED LED is on. The green LED is on while the door is open.

24.1.3 Door control

Door control errors are detected by the user if any of the following do not occur:

- On entry of a legal code, the door latch is opened until the door is opened, or until a pre-set time-out has expired (door not opened). See action complete.
- Doors opened too long (pre-set time-out) or doors opened illegally (i.e. not opened by the CRC after a legal code is entered or a push button is selected), result in the error buzzer being sounded (if set).
- Selection of a push button results in the door latch being opened.

REPAIR

Repair actions taken by the operator are limited to ensuring that the power to the CRC is switched on, and the door is closed. The re-enabling of a reader disabled after multiple illegal codes were entered is by opening the door legally (via other reader or via push button).

24.2 INSTALLER

If reader errors occur, swap the readers by swapping P9 and P10. The power need not be switched off (ensure that both readers require the same voltage supply). If the error stays with the reader, replace the PCB, else replace the faulty reader after checking the cabling.

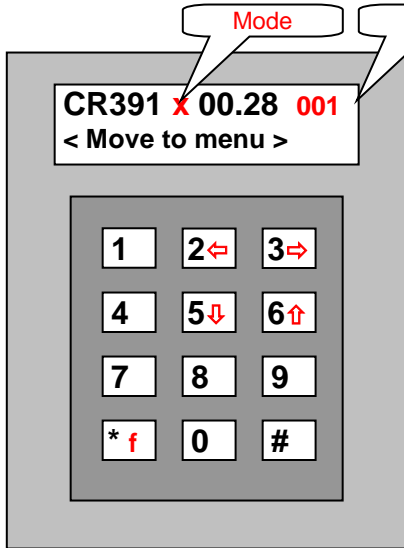
24.3 WORKSHOP

The mean time to repair is 20 minutes or less and is aided with a BITE option. A PCB repair schedule is listed as an appendix.

A debug / test mode can be set via the hand programmer, with data displayed on a serial RS232 terminal connected. See terminal / test mode above.

APPENDIXES

25 SOFTCON CR374/5 HAND HELD TERMINAL



The CR374 or CR375 hand held terminal provides the means to program the CR391 and also provides display (date time, access status and data from the PC, typically card holders name), keypad (used for PIN codes) and reader for access control. See the document SCS_CR391.booklet.doc.

Communication is RS485 (standard) or RF (wireless). The RF option requires the installation of RF modules on the CRC PCB and the CR375 PCB). See the document SCS_CR391_RFpolygon.manual.doc.

26 FW REVISION HISTORY

V0.00	2012-01-01		Proto-type.
V001	2014-10-01	Alter	New common library update
V002	2014-12-02	Alter	Memory map (set-up data changing)
V003	2014-12-05	Alter	uP memory MAP kernal to 2k boundary (parameters were being changed)
V004	2015-01-08	Correct	uP memory MAP error in 003
V005	2015-01-15	Correct	Batt RAM error
V006	2015-01-26	Correct	PMA address - error in SerC
V007	2015-02-12	Correct	PCB version 1.5
		Alter	Default dB size to 64/32,000
V008	2015-02-25	Add	I/O vend
		Alter	Vend after set-up, default reader enabled
V009	2015-04-20	Correct	Serial boot-loader
V00A	2015-05-04	Alter	New boot-loader (double MAC problem)
V00B	2015-06-08	Alter	Speed up card read (no A2D or Reset-link while card)
V00C	2015-08-05	Alter	Increase SRAM start wait state (memory bad reads)
V00D	2015-08-20	Alter	Tick interrupt to library
		Add	GSM modem
		Correct	Extra RAM wait-state, corrects dB errors
V00E	2015-08-28	Correct	Output 5,6 was mapped to 3,4. Now 5,6 to extender plug - buzzer on 5,6 caused error on capture 3,4
V00F	2015-09-07	Alter	Initialize readers last (RD supply on PCB<2.2 intermittant)
V00G	2015-09-15	Alter	130,000 cards
V00H	2015-10-13	Alter	Output expander RCK now pin 9 (was 10)
V00I	2015-11-15	Alter	Delay on power-up for POWER_PRESENT on PCB<2.0
V00J	2016-03-03	Alter	Disable Reset pins
V00K	2016-06-06	Alter	Re-enable Reset pins
V00L	2016-07-11	Alter	Bootloader 1.12 (correct LAN update, events from other CRC while update)
		Alter	I/O mapping to match LIB V01Z
V00M	2016-10-13	Alter	Bite to show cards, node
V00N	2016-11-03	Alter	Bootloader 1.13 (flash fast if node 2) Flash run LED fast is node 2
V00O	2017-03-14	Alter	Bootloader 1.14 (flash fast if node 128) Flash run LED fast is node 128

27 PCB REVISION HISTORY

uP PCB

B710.	2010-06-01.	CR 391 Prototype 1
B711.	2010-09-01.	CR 391 Prototype 2
B712.	2011-04-20.	CR 391 Prototype 3
B713.	2011-09-15.	Release 1
801.3.	2013-10-15.	Release 2
801.4.	2014-05-10.	Release 3 – Corrected GND to earth. Has input 16 to GND error (corrected by removing via).
802.2.	2015-07-21.	CE certified
802.3.	2016-12-01.	Correct RS232 IC ttl/232

28 CR391 INSTALLATION CHECKLIST



SOFTWARE CONTROL SERVICES (PTY) LTD
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 Email : softcon@softconserv.com
 www.softconserv.com

CR391 INSTALLATION CHECKLIST

Site	<input type="text"/>	Client	<input type="text"/>
Installer	<input type="text"/>	Person	<input type="text"/>
Checked	<input type="text"/>	Signature	<input type="text"/>

1 HARDWARE.

1.1 CABLE TYPES (used in sections below)

1	2 core mylar	2	3 core mylar	3	4 core mylar
4	2 core, 0.2mm mylar screened	5	4 core, 0.2mm mylar screened	6	8 core, 0.2mm mylar screened
7	16 core, 0.2mm mylar screened	8	20 core, 0.2mm mylar screened	9	24 core, 0.2mm mylar screened
10	2 twist pair, 0.2mm mylar screened	11	4 twist pair, 0.2mm mylar screened	12	8 twist pair, 0.2mm mylar screened

1.2 CONTROLLER

ID	<input type="text"/> Number	<input type="text"/> Name	<input type="text"/> Node
	<input type="text"/> Location		
Devices	<input type="text"/> EPROM	<input type="text"/> PAL	
Links (to 1 or 3)	<input type="checkbox"/> E1(Rd1)	<input type="checkbox"/> E2(R1v)	<input type="checkbox"/> E3(R2v) <input type="checkbox"/> E4(Rd2) <input type="checkbox"/> E5(Rd1) <input type="checkbox"/> E6(Rx) <input type="checkbox"/> E7(Rd2)
Mounting	<input type="checkbox"/> Away from noisy devices (lifts, DB's, Motors, etc.).		<input type="checkbox"/> Housing to earth.
	<input type="checkbox"/> On safe side.	<input type="checkbox"/> Fixed to wall.	<input type="checkbox"/> LED's visible.
<i>Outside units</i>	<input type="checkbox"/> <i>Weather proof.</i>	<input type="checkbox"/> <i>Cooled or aired.</i>	<input type="checkbox"/> <i>Light color or in shade.</i>
Power supply	<input type="checkbox"/> 220VAC.	<input type="checkbox"/> <i>Ah UPS.</i>	<input type="checkbox"/> Via line filter.
General	<input type="checkbox"/> Cable lugs.	<input type="checkbox"/> Reader connectors correctly crimped.	
	<input type="checkbox"/> No wiring over PCB.	<input type="checkbox"/> No additional devices in housing (relays, bridge rectifiers, etc.).	
	<input type="checkbox"/> <i>Lightning protection.</i>	<input type="checkbox"/> <i>Physical separation of "clean" and "field" sides.</i>	

1.3 READERS, LCD and PIN

Qty, types	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Mounting	<input type="checkbox"/> Correct screws, straight.	<input type="checkbox"/> Smaller than frame.	<input type="checkbox"/> Weather protected.	
	<input type="checkbox"/> Metal earthed.	<input type="checkbox"/> Prox readers not back to back.		
LED's	<input type="checkbox"/> Amber (power), Green (access granted), Red (access denied).			
	<input type="checkbox"/> Other.	<input type="text"/>		
Cable Readers	<input type="checkbox"/> Type.	<input type="checkbox"/> Concealed at secure side.	<input type="checkbox"/> Screen to controller earth.	
	<input type="text"/> m length.	<input type="checkbox"/> Knockout 4 with gland.		
<i>Cable LCD</i>	<input type="checkbox"/> Type.	<input type="checkbox"/> <i>Concealed at secure side.</i>	<input type="checkbox"/> <i>Screen to controller, LCD earth.</i>	
	<input type="text"/> m length.	<input type="checkbox"/> <i>Knockout 3 with gland.</i>		
<i>Cable PIN</i>	<input type="checkbox"/> Type.	<input type="checkbox"/> <i>Concealed at secure side.</i>	<input type="checkbox"/> <i>Screen to controller, PIN earth.</i>	
	<input type="text"/> m length.	<input type="checkbox"/> <i>Knockout 3 with gland.</i>		

1.4 CONTROLLED DEVICE (DOOR, TURNSTILE, BOOTH, BOOM, ETC)

Fly back diodes	<input type="checkbox"/> Fitted correctly at load – including at load relays			
Latch	<input type="checkbox"/> Mounted correctly, secure side.	<input type="checkbox"/> Cable type	<input type="checkbox"/> knockout 5 with gland	<input type="checkbox"/> concealed, secure side.
<i>Door sensor</i>	<input type="checkbox"/> <i>Mounted correctly, secure side.</i>	<input type="checkbox"/> <i>Cable type</i>	<input type="checkbox"/> <i>knockout 4 with gland</i>	<input type="checkbox"/> <i>concealed, secure side.</i>
<i>Push button</i>	<input type="checkbox"/> <i>Mounted correctly, secure side.</i>	<input type="checkbox"/> <i>Cable type</i>	<input type="checkbox"/> <i>knockout 4 with gland</i>	<input type="checkbox"/> <i>concealed, secure side.</i>
<i>Break glass</i>	<input type="checkbox"/> <i>In series with latch.</i>	<input type="checkbox"/> <i>Cable type</i>	<input type="checkbox"/> <i>knockout 5 with gland</i>	<input type="checkbox"/> <i>concealed, secure side.</i>
<i>Aux inputs</i>	<input type="checkbox"/> <i>Numbered cables.</i>	<input type="checkbox"/> <i>Cable type</i>	<input type="checkbox"/> <i>knockout 4 with gland.</i>	
<i>Aux outputs</i>	<input type="checkbox"/> <i>Numbered cables.</i>	<input type="checkbox"/> <i>Cable type</i>	<input type="checkbox"/> <i>knockout 5 with gland.</i>	

1.5 LAN

Cable	<input type="checkbox"/> Type.	<input type="checkbox"/> Screen to cr earth.	<input type="checkbox"/> Screen thru.
	<input type="checkbox"/> No T's.	<input type="checkbox"/> Data/data R/B, Gnd Y&G.	
Position	<input type="checkbox"/> Mux.	<input type="text"/> Previous CR <input type="text"/> m	<input type="text"/> Next CR <input type="text"/> m <input type="checkbox"/> Knockout 2 with gland.
End of Line	<input type="checkbox"/> Ohms resistor.		

1.6 CONTROLLED DEVICE (DOOR, TURNSTILE, BOOTH, BOOM, ETC)

Fly back diodes Fitted correctly at load – including at load relays

Latch Mounted correctly, secure side. Cable type knockout 5 with gland concealed, secure side.

Door sensor *Mounted correctly, secure side.* *Cable type* *knockout 4 with gland* *concealed, secure side.*

Push button *Mounted correctly, secure side.* *Cable type* *knockout 4 with gland* *concealed, secure side.*

Break glass *In series with latch.* *Cable type* *knockout 5 with gland* *concealed, secure side.*

Aux inputs *Numbered cables.* *Cable type* *knockout 4 with gland.*

Aux outputs *Numbered cables.* *Cable type* *knockout 5 with gland.*

1.7 LAN

Cable Type. No T's. Screen to controller earth. Data/Data R/B, Gnd Y&G.

Total length m Mux 1. m Mux 2. m Mux 3. m Mux 4. Knockout 2 with gland.

End of Line Both ends (data /data). Ohms resistor.

Mux connector Back shell. Screwed to connector.

2 PC and SOFTWARE.

2.1 PC

CPU Pentium type. MHz. Mbytes RAM (64M or more).

Mbytes Hdisk free. CD drive. Stiffy drive.

Operating system Type. Edition / service pack. Functions disabled.

Network *Type.* *PCs.* *On-line.*

Power saving BIOS disabled.

2.2 SOFTWARE

General Version. Auto boot on power-up. Back-up.

Set-up Simulator. Password. No illegal characters.

Training Installer. Administrator. Operator.

29 INSTALLATION CHECKLIST



SOFTWARE CONTROL SERVICES (PTY) LTD

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INSTALLATION CHECKLIST

Date

Items in italics (blue) are site dependent. Softcon will only support sites that have completed this checklist, with all items checked or filled in. SW keys are only provided when the checklist, site installation lists have been received and accounts are not overdue.

Site	<input type="text"/>	Client	<input type="text"/>
Installer	<input type="text"/>	Person	<input type="text"/>
Checked	<input type="text"/>	Signature	<input type="text"/>

1 DOCUMENTATION.

Drawing/table Indicating controller location on LAN, node address and MUX.

2 HARDWARE.

2.1 CABLE TYPES (used in sections below)

1	2 core mylar	2	3 core mylar	3	4 core mylar
4	2 core, 0.2mm mylar screened	5	4 core, 0.2mm mylar screened	6	8 core, 0.2mm mylar screened
7	16 core, 0.2mm mylar screened	8	20 core, 0.2mm mylar screened	9	24 core, 0.2mm mylar screened
10	2 twist pair, 0.2mm mylar screened	11	4 twist pair, 0.2mm mylar screened	12	8 twist pair, 0.2mm mylar screened

2.2 CONTROLLERS

Qty, types, EPROM

Mounting Away from noisy devices (lifts, DB's, Motors, etc.). Housing to earth.
 On safe side. Fixed to wall. LED's visible.

Outside units *Weather proof.* *Cooled or aired.* *Light color or in shade.*

Power supply 220VAC. *Ah UPS.* *Via line filter.*

General Cable lugs. Reader connectors correctly crimped.
 No wiring over PCB. No additional devices in housing (relays, bridge rectifiers, etc.).
 Lightning protection. *Physical separation of "clean" and "field" sides.*

2.3 READERS, LCD and PIN

Qty, types

Mounting Correct screws, straight. Smaller than frame. Weather protected.
 Metal earthed. Prox readers not back to back.

LED's Amber (power), Green (access granted), Red (access denied).
 Other.

Cable Readers Type. Concealed at secure side. Screen to controller earth.
 m maximum length. Knockout 4 with gland.

Cable LCD *Type.* *Concealed at secure side.* *Screen to controller, LCD earth.*
 m maximum length. *Knockout 3 with gland.*

Cable PIN *Type.* *Concealed at secure side.* *Screen to controller, PIN earth.*
 m maximum length. *Knockout 3 with gland.*

2.4 CONTROLLED DEVICE (DOOR, TURNSTILE, BOOTH, BOOM, ETC)

Fly back diodes Fitted correctly at load – including at load relays

Latch Mounted correctly, secure side. Cable type knockout 5 with gland concealed, secure side.

Door sensor *Mounted correctly, secure side.* *Cable type* *knockout 4 with gland* *concealed, secure side.*

Push button *Mounted correctly, secure side.* *Cable type* *knockout 4 with gland* *concealed, secure side.*

Break glass *In series with latch.* *Cable type* *knockout 5 with gland* *concealed, secure side.*

Aux inputs *Numbered cables.* *Cable type* *knockout 4 with gland.*

Aux outputs *Numbered cables.* *Cable type* *knockout 5 with gland.*

2.5 LAN

Cable Type. No T's. Screen to controller earth. Data/Data R/B, Gnd Y&G.

Total length m Mux 1. m Mux 2 m Mux 3. m Mux 4. Knockout 2 with gland.

End of Line Both ends (data /data). Ohms resistor.

Mux connector Back shell. Screwed to connector.

3 PC and SOFTWARE.

3.1 PC

CPU Pentium type. MHz. Mbytes RAM (64M or more).

Mbytes Hdisk free. CD drive. Stiffy drive.

Operating system Type. Edition / service pack. Functions disabled.

Network *Type.* *PCs.* *On-line.*

Power saving BIOS disabled.

3.2 SOFTWARE

General Version. Auto boot on power-up. Back-up.

Set-up Simulator. Password. No illegal characters.

Training Installer. Administrator. Operator.

30 REPAIR GUIDE

To be added.

31 TROUBLESHOOTING

In the list below, correct each step before proceeding to the next.

31.1 NO POWER

Check that the controller is switched on.

Check the Mains power.

Between Live and Neutral you should measure 230VAC.

Between Live and Earth you should measure 230vAC. If not, faulty earth supply.

Between Neutral and Earth you should measure 0VAC.

Check the Mains power on the primary winding of the Transformer (220VAC).

Check the power on the secondary winding of the transformer (12VAC and 9VAC) and on the input power on the integrated uninterrupted supply. If not, faulty transformer.

Check the fuse for the integrated uninterrupted power supply as well as the fuses on the controller.

Replace fuse with correct rating. (2 amp).

Check the power on the power connector. See pin layout for P9 in the CR391 pamphlet.

Check the voltage between pin 2 and pin 3 for 12VDC (if not, faulty fuse or PCB) and between pin 2 and pin 1 for 5VDC (if not, faulty regulator mounted on housing).

Note that earth must remain connected via the mains connector or be connected to the earth terminal block provided in the housing.

31.2 CONTROLLER DOES NOT COME ON-LINE

Connection to RS485

With HH programmer, check controller serial port B settings:

Serial type LAN master or LAN slave.

Baud rate 9k6, 9 bit.

LAN Comms type to top (if LAN slave).

Check the RS485 cable and connections. See RS485 connections diagram in the CR391 manual.

Test for a short circuit between earth and ground.

When installing as a slave to LAN (RS485) there must not be a short circuit between earth and ground.

Check for the end of line resistors.

A 120 ohm resistor must be installed between D0 and D1 on both ends of the cable.

Check cable for continuity resistance with the end of line resistors connected and all controllers are removed from the LAN. The continuity resistance must test between 60 ohm and 90 ohm.

Checked link E6 for the B-D/D pull up/down resistors. Links must be installed when the CR391 is the master controller in the slave to LAN system. Pin 1-2 and 3-4 must be linked.

Connection to TCP

With HH programmer, check the controller setup:

Master PC-LAN.

TCP/IP Comms to top.

Net IP address and Sub Net Mask address.

Net Gateway and the PORT setting.

On the PC, check the setup in the SoftWin software.

Comms interface setup to TCP/IP.

IP address (no leading zeros).

Check the UTP cable connections.

Cross over cable is used when the controller is installed directly to the PC.

Strait cable is used when the controller is installed on a network switcher.

Check that you can ping the COM's interface from the PC.

Check that the Anti Virus software does not block the PORT number.

Check that the Network Switchers does not block the PORT number.

31.3 READERS DO NOT READ CARDS

Check that the readers are mounted according to the manufacturers mounting instructions.
Check that the cabling is properly crimped and installed at the controller.
Check that the wiring is installed correctly according to the manufacturers specifications and that the wiring matches the controller connections. See reader connections in the installation manual.
Check that the reader cable is earthed correctly.

Check links E2 (for reader 1) and E3 (for reader 2) for power required for readers.
Readers requiring other voltages, must be powered from an external power supply.

With HH programmer, check the following setting:
Reader bit type. Card types are tabled in the Library Manual.
Data Base type to match card type (random number must be type 10).
Check that the card is enabled for both readers and that the time group is active
For random database, the card number must be entered.

With the HH programmer, correct card number is displayed when the card is badge at reader 1.
Select "Card enter at Reader 1" on the HH to display the card number.

In the event that one of the readers is not displaying the card number, swap the reader cables around on the connector and re-test. In the event that the fault appears on the same reader port, the reader port is faulty. In the event that the fault moves with the reader, the reader or the cable is faulty.

31.4 OUTPUT RELAYS DO NOT LATCH

With the HH programmer, check output port setup.
Check that the wiring to the output is wired correctly.
Check the setup for the latch type is correct. (0= NO and 1=NC).
Check that the feedback diode is installed.
Check voltage on the user power supply or external power supply.
Check the output connector pins. If set for NC, you must measure a short circuit across the pins.

31.5 INPUTS DO NOT TRIGGER

With the HH programmer, check input port setup.
Check that the wiring to the input is wired correctly.
Check that the setup for the input is setup correctly.
Check the push button for egress is working correct.

31.6 CAPTURE BIN NOT CAPTURING CARDS

Check that the wiring is wired correctly. See wiring diagram in the installation manual.
Check that the Card is setup as a Capture Card.
Check that the reader that must capture the card is setup as the capture reader (Reader1 or Reader2).
Check that the Input is selected as capture1 or capture2. Input6=capture2 and reader2=capture2).
Check the DC voltage on the solenoid that opens the door for the capture card.
Voltage is 12VDC.
Check the Flash back diode is installed the correct way around.
At the PC, in SoftWin, check that the capture group is setup correctly.

31.7 CARD BATCH LOAD DOES NOT LOAD

With the HH programmer, check that the card database is setup for running card numbers. (02=sequential numbers)
If the card data base is setup for random card numbers, (10-random card numbers) a batch load cannot be done.
Make sure that you are in the second Menu where you select the cards that must be batch loaded.

32 ABRIVIATIONS AND TERMS

AC	Action complete (door status monitor).
Ah	Amp hour.
AMP	Measurement of electrical current.
APB	Anti-pass back (card cannot re-enter an area without exit).
ASCII	Data that can be displayed as text.
ATB	Anti-time back (card cannot be used at a the same reader for a set time-out).
Barrier	Vehicle boom.
Baud	Rate of bits per second of serial data on a communication line.
Bit	One bit of data, a logical zero or one.
Booth	A two door cubicle (mantrap), allowing access of only one person.
Byte	A character of data (8 bits).
CR351	Softcon 2 reader controller (Data/clock).
CR354	Softcon 2 reader controller (Wiegand).
CRC	Softcon CR351 or CR354 card reader controller.
Darlington	Type of integrated circuit (electronic component) for driving outputs.
DC	Direct current.
DB	Data base of card information.
DIP	Dual-in-line plug switches (on the PCB for address selection).
EC	European commission (standards for electrical emission and susceptibility, etc).
EPROM	Erasable Programmable Read Only Memory (component containing the program).
FW	Firmware (PCB program, in EPROM).
IC	Integrated circuit (electronic component).
LAN	Local Area Network (communication network linking a CRCs to the PC).
LED	Light emitting diode.
LSB	Least significant bit of a byte.
MAG	Magnetic tripe reader / card.
Mantrap	A two door cubicle (booth), allowing access of only one person.
MSB	Least significant bit of a byte.
NC	Normally closed.
NO	Normally open.
Node	LAN unit.
On-line	Connected to a PC.
Open collector	Type of integrated circuit (electronic component) for driving outputs.
PAL	Programmable Array Logic (an electronic component).
PC	Personal Computer (IBM compatible).
PCB	Printed Circuit Board.
PIN	Personal Identification Number.
RAM	Random Access Memory (parameters and card set-up).
ROM	Read Only Memory (FW).
SW	Software - PC program.
TTL	Transistor, Transistor Logic (digital IC).
UL	Underwriters Lab (standards for electrical emission and susceptibility, etc).
UPS	Un-Interruptible Power Supply.
VAC	Volt AC.
VDC	Volt DC.