IDM 8000

CCR

User Manual

UM-5033, Rev. 2.1, 2023/08/30

ADB SAFEGATE

A.0 Disclaimer / Standard Warranty

CE certification

The equipment listed as CE certified means that the product complies with the essential requirements concerning safety and hygiene. The European directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

ETL certification

The equipment listed as ETL certified means that the product complies with the essential requirements concerning safety and C22.2 No.180:13 (R2018) regulations. The CSA directives that have been taken into consideration in the design are available on written request to ADB SAFEGATE.

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Products manufactured by ADB SAFEGATE are guaranteed against mechanical, electrical, and physical defects (excluding lamps) which may occur during proper and normal use for a period of two years from the date of ex-works delivery, and are guaranteed to be merchantable and fit for the ordinary purposes for which such products are made.

Note

See your applicable sales agreement for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

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ADB SAFEGATE LED products (with the exception of obstruction lighting) are warranted against electrical defects in design or manufacture of the LED or LED specific circuitry for a period of 4 years from date of installation, per FAA EB67 (applicable edition). These FAA certified constant current (series) powered LED products must be installed, interfaced and powered with and through products certified under the FAA Airfield Lighting Equipment Program (ALECP) to be included in this 4 (four) year warranty. This includes, but is not limited to, interface with products such as Base Cans, Isolation Transformers, Connectors, Wiring, and Constant Current Regulators.

Note

See your sales order contract for a complete warranty description.

Replaced or repaired equipment under warranty falls into the warranty of the original delivery. No new warranty period is started for these replaced or repaired products.

Liability

WARNING

Use of the equipment in ways other than described in the catalog leaflet and the manual may result in personal injury, death, or property and equipment damage. Use this equipment only as described in the manual.

ADB SAFEGATE cannot be held responsible for injuries or damages resulting from non-standard, unintended uses of its equipment. The equipment is designed and intended only for the purpose described in the manual. Uses not described in the manual are considered unintended uses and may result in serious personal injury, death or property damage.

Unintended uses, includes the following actions:

- Making changes to equipment that have not been recommended or described in this manual or using parts that are not genuine ADB SAFEGATE replacement parts or accessories.
- Failing to make sure that auxiliary equipment complies with approval agency requirements, local codes, and all applicable safety standards if not in contradiction with the general rules.
- Using materials or auxiliary equipment that are inappropriate or incompatible with your ADB SAFEGATE equipment.
- Allowing unskilled personnel to perform any task on or with the equipment.

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1.0 Safety

Introduction to Safety

This section contains general safety instructions for installing and using ADB SAFEGATE equipment. Some safety instructions may not apply to the equipment in this manual. Task- and equipment-specific warnings are included in other sections of this manual where appropriate.

1.1 Safety Messages

HAZARD Icons used in the manual

For all HAZARD symbols in use, see the Safety section. All symbols must comply with ISO and ANSI standards.

Carefully read and observe all safety instructions in this manual, which alert you to safety hazards and conditions that may result in personal injury, death or property and equipment damage and are accompanied by the symbol shown below.

WARNING
Failure to observe a warning may result in personal injury, death or equipment damage.

DANGER - Risk of electrical shock or ARC FLASH
Disconnect equipment from line voltage. Failure to observe this warning may result in personal injury, death, or equipment damage. ARC Flash may cause blindness, severe burns or death.

WARNING - Wear personal protective equipment
Failure to observe may result in serious injury.

WARNING - Do not touch
Failure to observe this warning may result in personal injury, death, or equipment damage.

CAUTION
Failure to observe a caution may result in equipment damage.

ELECTROSTATIC SENSITIVE DEVICES
This equipment may contain electrostatic devices.

Qualified Personnel

Important Information
The term **qualified personnel** is defined here as individuals who thoroughly understand the equipment and its safe operation, maintenance and repair. Qualified personnel are physically capable of performing the required tasks, familiar with all relevant safety rules and regulations and have been trained to safely install, operate, maintain and repair the equipment. It is the responsibility of the company operating this equipment to ensure that its personnel meet these requirements.
Always use required personal protective equipment (PPE) and follow safe electrical work practice.

1.1.1 Introduction to Safety

CAUTION

Unsafe Equipment Use
This equipment may contain electrostatic devices, hazardous voltages and sharp edges on components

- Read installation instructions in their entirety before starting installation.
- Become familiar with the general safety instructions in this section of the manual before installing, operating, maintaining or repairing this equipment.
- Read and carefully follow the instructions throughout this manual for performing specific tasks and working with specific equipment.
- Make this manual available to personnel installing, operating, maintaining or repairing this equipment.
- Follow all applicable safety procedures required by your company, industry standards and government or other regulatory agencies.
- Install all electrical connections to local code.
- Use only electrical wire of sufficient gauge and insulation to handle the rated current demand. All wiring must meet local codes.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Protect components from damage, wear, and harsh environment conditions.
- Allow ample room for maintenance, panel accessibility, and cover removal.
- Protect equipment with safety devices as specified by applicable safety regulations
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning prior to returning power to the circuit.

Failure to follow this instruction can result in serious injury or equipment damage

Additional Reference Materials

Important Information

- IEC - International Standards and Conformity Assessment for all electrical, electronic and related technologies.
- IEC 60364 - Electrical Installations in Buildings.
- CSA - C22.2 No.180:13 (R2018) Series isolating transformers for airport lighting
- FAA Advisory: AC 150/5340-26 (current edition), Maintenance of Airport Visual Aid Facilities.
- Maintenance personnel must refer to the maintenance procedure described in the ICAO Airport Services Manual, Part 9.
- ANSI/NFPA 79, Electrical Standards for Metalworking Machine Tools.
- National and local electrical codes and standards.

1.1.2 Intended Use

CAUTION

Use this equipment as intended by the manufacturer
This equipment is designed to perform a specific function, do not use this equipment for other purposes

- Using this equipment in ways other than described in this manual may result in personal injury, death or property and equipment damage. Use this equipment only as described in this manual.

Failure to follow this instruction can result in serious injury or equipment damage

1.1.3 Material Handling Precautions: Storage

CAUTION

Improper Storage
Store this equipment properly

- If equipment is to be stored prior to installation, it must be protected from the weather and kept free of condensation and dust.

Failure to follow this instruction can result in equipment damage

1.1.4 Material Handling: Heavy Equipment

DANGER

Unstable load
Use caution when moving heavy equipment

- Use extreme care when moving heavy equipment.
- Verify that the moving equipment is rated to handle the weight.
- When removing equipment from a shipping pallet, carefully balance and secure it using a safety strap.

Failure to follow this instruction can result in death, serious injury, or equipment damage

1.1.5 Operation Safety

CAUTION

Improper Operation
Do Not Operate this equipment other than as specified by the manufacturer

- Only qualified personnel, physically capable of operating the equipment and with no impairments in their judgment or reaction times, should operate this equipment.
- Read all system component manuals before operating this equipment. A thorough understanding of system components and their operation will help you operate the system safely and efficiently.
- Before starting this equipment, check all safety interlocks, fire-detection systems, and protective devices such as panels and covers. Make sure all devices are fully functional. Do not operate the system if these devices are not working properly. Do not deactivate or bypass automatic safety interlocks or locked-out electrical disconnects or pneumatic valves.
- Protect equipment with safety devices as specified by applicable safety regulations.
- If safety devices must be removed for installation, install them immediately after the work is completed and check them for proper functioning.
- Route electrical wiring along a protected path. Make sure they will not be damaged by moving equipment.
- Never operate equipment with a known malfunction.
- Do not attempt to operate or service electrical equipment if standing water is present.
- Use this equipment only in the environments for which it is rated. Do not operate this equipment in humid, flammable, or explosive environments unless it has been rated for safe operation in these environments.
- Never touch exposed electrical connections on equipment while the power is ON.

Failure to follow these instructions can result in equipment damage

1.1.6 Maintenance Safety

DANGER

Electric Shock Hazard
This equipment may contain electrostatic devices

- Do not operate a system that contains malfunctioning components. If a component malfunctions, turn the system OFF immediately.
- Disconnect and lock out electrical power.
- Allow only qualified personnel to make repairs. Repair or replace the malfunctioning component according to instructions provided in its manual.
- 

Failure to follow these instructions can result in death or equipment damage

1.1.7 Material Handling Precautions, ESD

CAUTION

Electrostatic Sensitive Devices
This equipment may contain electrostatic devices

- Protect from electrostatic discharge.
- Electronic modules and components should be touched only when this is unavoidable e.g. soldering, replacement.
- Before touching any component of the cabinet you shall bring your body to the same potential as the cabinet by touching a conductive earthed part of the cabinet.
- Electronic modules or components must not be brought in contact with highly insulating materials such as plastic sheets, synthetic fiber clothing. They must be laid down on conductive surfaces.
- The tip of the soldering iron must be grounded.
- Electronic modules and components must be stored and transported in conductive packing.

Failure to follow this instruction can result in equipment damage

1.1.8 Arc Flash and Electric Shock Hazard

DANGER

Series Circuits have Hazardous Voltages
This equipment produces high voltages to maintain the specified current - Do NOT Disconnect while energized.

- Allow only qualified personnel to perform maintenance, troubleshooting, and repair tasks.
- Only persons who are properly trained and familiar with ADB SAFEGATE equipment are permitted to service this equipment.
- An open airfield current circuit is capable of generating >5000 Vac and may appear OFF to a meter.
- Never unplug a device from a constant current circuit while it is operating; Arc flash may result.
- Disconnect and lock out electrical power.
- Always use safety devices when working on this equipment.
- Follow the recommended maintenance procedures in the product manuals.
- Do not service or adjust any equipment unless another person trained in first aid and CPR is present.
- Connect all disconnected equipment ground cables and wires after servicing equipment. Ground all conductive equipment.
- Use only approved ADB SAFEGATE replacement parts. Using unapproved parts or making unapproved modifications to equipment may void agency approvals and create safety hazards.
- Check the interlock systems periodically to ensure their effectiveness.
- Do not attempt to service electrical equipment if standing water is present. Use caution when servicing electrical equipment in a high-humidity environment.
- Use tools with insulated handles when working with airfield electrical equipment.

Failure to follow these instructions can result in death or equipment damage

1.1.9 Touch Current

WARNING

Touch current exceeds 3,5mA a.c.

2.0 About this Manual

This document includes information with focus on safety, installation and maintenance procedures. Become familiar with the structure and content and carry out the actions completely and in the given sequence.

For more information, see www.adbsafegate.com.

Note

It is very important to read this document before any work is started.

3.0 Introduction

This manual includes installation, operation, maintenance and troubleshooting information for the IDM 8000 Constant Current Regulator (CCR).

3.1 General

3.1.1 IDM 8000

IDM 8000 is a microprocessor based CCR designed specifically for supplying airfield lighting serial circuits.

3.1.2 Airfield lighting serial circuit (AFL-circuit)

Serial circuit is normally used at airports for power transmission from the CCR to rather remote located and power consuming light fittings. Light fittings are connected via isolation transformers to a serial loop fed by the CCR. The output current of the CCR which defines the brilliancy of the light fittings is kept constant at each current step against supply, load and environmental changes. Current steps are provided in order to adjust the light output of the system to match with prevailing meteorological conditions.

Power of the circuits normally varies up to 30kVa which means the max output current being always 6.6A that high output voltages must be used with larger CCRs. Normally all components (e.g. isolation transformers, connectors etc.) connected to series circuits are designed for 5kV Rms – voltage.

In short the use of serial circuits and CCRs give the following benefits and disadvantages:

+ Provides equal brightness for all lamps due equal current in the serial loop.

+ Enables low cabling costs and transmission losses due rather low current level (6.6A).

- Because of high voltage used with larger CCRs extra precaution must be used when working with circuits. Regular maintenance is also needed to maintain proper isolation levels.

3.1.3 Airfield lighting power circuit (AFL-circuit) design guidelines

- Input power of the CCR is approx. 1.1 x rating of the CCR which should be considered when designing mains supply and supply cable sizes for the CCR.
- Mains supply Rsce, min=175 for all CCR sizes (according to IEC 61000-3-4)
- Output primary cable losses are approx. 160W / km (6.6A / 6mm2 Cu).
- Output secondary cable losses can be significant and should be calculated according the lengths, diameters and materials of the cables. Normally isolation transformer can tolerate up to 10% losses without reducing its output current.
- Isolation transformers efficiencies are normally 0.9 or better which should be taken in account together with the two above points when defining CCR rating for a circuit.

3.1.4 Specifications

IDM 8000 is designed and manufactured in accordance with following specifications:

ICAO:	Aerodrome design manual, Part 5
FAA:	AC 150/5345-10E
CENELEC:	Pr ENV 50231
IEC:	61822 Edition 1

IDM 8000 has also many unique new features not yet described in public specifications.

3.2 CCR Technical Data

3.2.1 Input Voltage (U 1) and Frequency (F1)

Input Voltage U1

Version	Value (Un +-10%)
3, 4, 5, 10, 15 or 20 kVA	230 V AC
5; 7,5; 10, 12,5; 15, 17,5; 20, 25 or 30 kVA	400 V AC

Input frequency F1

The input frequency F1 for all product versions is 50 / 60 Hz +-5 %.

3.2.2 Efficiency and Power Factor

- Efficiency: better than 0.9 at full load / Load PF=1 / U1<=Un
- Power factor: better than 0.9 at full load / load PF=1 / U1<=Un

3.2.3 Environmental

The CCR is designed for indoor use only, in an area with adequate ventilation for cooling the CCR.

- Temperature use: −20°C ...+50°C.
- Temperature for storage: −40°C ...+70°C
- Temperature for long-time storage: 15–30°C
- Humidity: Max. 95%
- Humidity for long-time storage: <60%
- Altitude: Max. 2000 m
- Degree of protection : IP 21

3.2.4 Output Current (I2)

All CCRs 6.6A rms. Accuracy ±1% under following conditions:

- Resistive load variation: 0–100%
- Max 30% open circuited isolation transformers of total load 50–100% of CCR rating
- Supply voltage: 0.90–1.10 Unom
- Environmental conditions within above given values

3.2.5 CCR Standard Sizes and Output Voltages

CCR Size kVA	Nominal output U2n/V rms	Max peak U2 u2p/V	Open circ ratio u2p/U2n	Dielectric test voltage U2 test/V
3	455	810	1.78	3600
4	606	1081	1.78	3967
5	757	1351	1.78	4333
7.5	1136	2027	1.78	5682
10	1515	2703	1.78	7576
12.5	1894	3378	1.78	9470
15	2272	4054	1.78	11364
17.5	2652	4729	1.78	13258

20	3030	5405	1.78	15152
25	3788	6756	1.78	18939
30	4545	8108	1.78	22727

3.2.6 Protective Functions

- Input voltage: Delay and 2 levels, warning and alarm with tripping
- Input frequency: Delay and 2 levels, warning and alarm with tripping.
- Temperature: Delay and 2 levels, warning and alarm with tripping.
- Open circuit: Delay and level with tripping. Incl. Capacitive current monitoring.
- Over current: 2 delays and levels with tripping.
- Earth fault: Selectable, tripping from level B if the maintenance switch is on.
- VA-drop: Selectable, tripping from level A

3.2.7 Monitoring Functions

- Lamp fault: ±1 lamp up to 10 lamp faults and ±2 lamps up to 30 lamps at all steps from 25% load to 100% load. Max 30% of total lamp power. Delay and 2 levels.
- Earth fault value: 1kohm – 50Mohm or 1kohm – 1Gohm, delay and 2 levels.
- VA-drop: delay and 2 levels.
- Cumulative operating time monitoring for lamp life.

3.2.8 Display Functions

All above protective and monitoring functions plus:

- Actual power display.
- Load power factor display.
- Consumed energy display with reset.
- Real time clock with time and date.
- Operating hours, all steps, total, cumulative hours and reset.
- 10 patch fault log with time and date labels.
- Info type displays e.g. CCR no, circuit name, control direction etc.

3.2.9 Remote Control Interfaces

- Parallel, selectable control voltage 24–60V DC, signal mode and coding.
- Serial, major field bus interface cards available. Duplicated, redundant interface possible.

3.3 CCR functional components

3.3.1 General

The CCR consists of three functional units each installed in its own compartment:

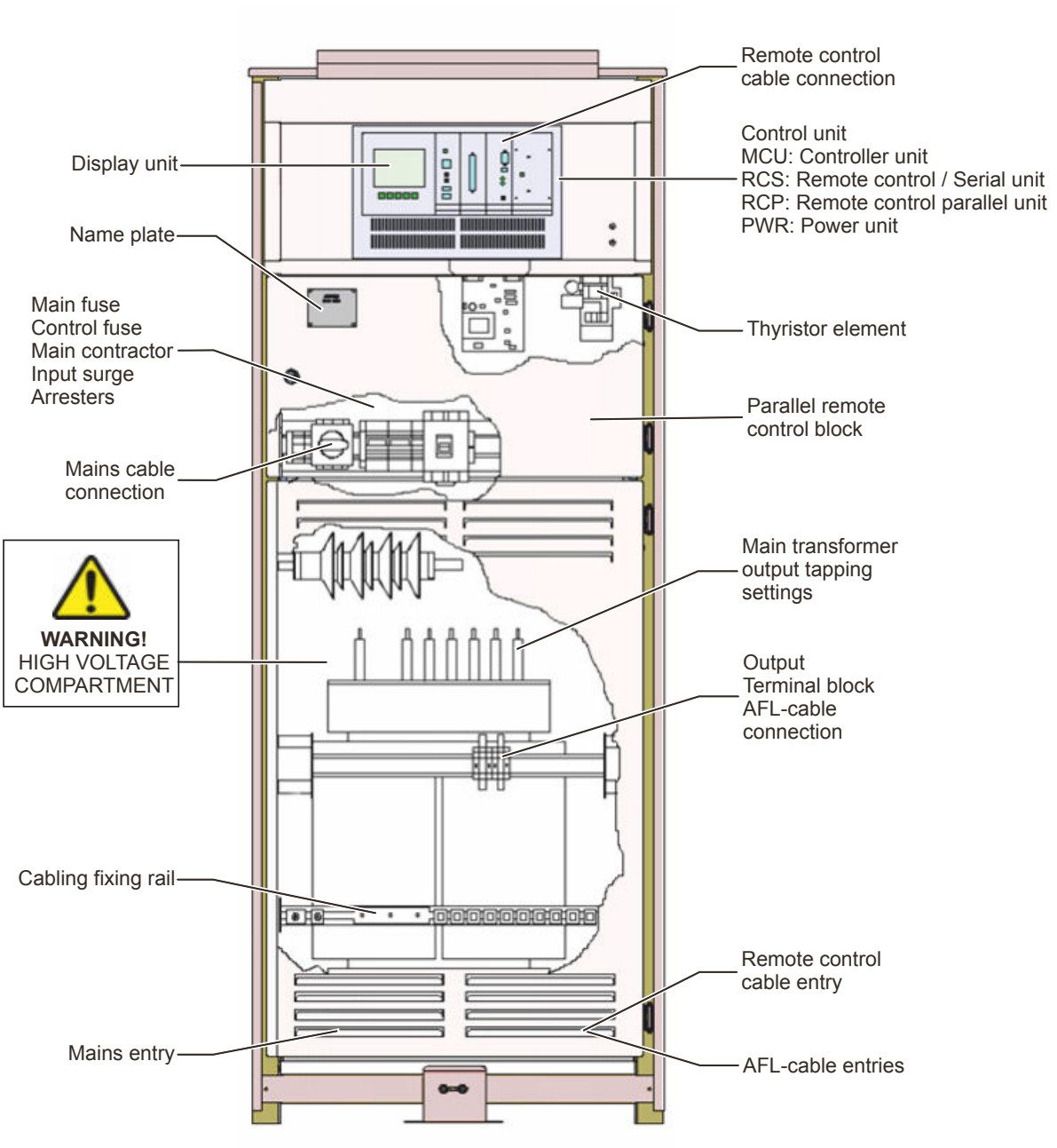
- Control unit installed in the control rack. All electronic units: E1 size plug-in cards.
- Power circuit located at the top compartment of the CCR.
- High voltage unit located at the lower compartment of the CCR.

Natural cooling is provided for all compartments (no fans are used). All cable entries are through the bottom plate of the CCR. All components are accessible from the front.

Rating / dimensions	H	W	D
Up to 17.5kVA	1705	495	650
From 20 kVA	1705	660	650
With hooks	1735		
With wheels	1835		
With hooks + wheels	1865		

Rating / dimensions	Net weight	Gross weight
3 kVA / 220 V	125	175
4 kVA / 220 V	135	185
5 kVA / 220 V or 400 V	145	195
7,5 kVA / 400 V	162	212
10 kVA / 220 V or 400 V	190	240
12,5 kVA / 400 V	200	250
15 kVA / 220 V or 400 V	200	250
17,5 kVA / 400 V	220	270
20 kVA / 220 V or 400 V	270	320
25 kVA / 400 V	295	345
30 kVA / 400 V	320	370

CCR 8000 mechanical design and location of main components



3.3.2 Power Circuit

The power circuit consists of components installed between the input terminals and the primary winding terminals of the main transformer:

Main switch	Mains supply cable is connected to its terminals. Works also as a safety switch.
Input surge arresters (option)	Protects the CCR from incoming voltage transients and is located next to the main switch.
Main fuse	Protects the CCR from overload caused by a possible component or regulator fault and is located next to the main switch.
Passive filter	Suppresses emissions, also limits current transients and works as a base load for the CCR in output short circuit use and is located at the bottom of the compartment.
Thyristor unit	Forms the desired primary Rms-voltages to produce correct output step currents (I2) by enabling only controlled parts of the sine waves to pass through in following way: • Thyristor starts to conduct when ignition pulses are given to its gate • Thyristor closes when ignition pulses are stopped and current passing through it goes to zero.

3.3.3 Main Transformer, Efficiency and Power Factor

The dry-type (not oil-cooled) main transformer defines the rating of the CCR. Because the transformer has load tapping on the output the rating of the transformer can be reduced in order to match with the connected load.

Optimal load matching provides following benefits:

- Minimizes maximum output voltage in case of open circuit or thyristor failure.
- Efficiency of the CCR is optimized since the input current which causes most of the CCRs power losses is decreased. Power losses generate heat which in turn causes aging of components i.e. load matching also improves the lifetime of the CCR.
- Power factor is optimized
- Harmonic content of the input and output of the CCR would be as small as possible
- Crest factor would be optimized: this may be a problem when connecting addressable light control and monitoring systems with the CCR.

Load matching is provided from 45% to 100% with 5% and 10% taps, see Load matching.

Note

If the supply voltage is higher than nominal during the tapping or lower supply voltages than 95% of nominal are expected, some additional reserve (+5...+10%) to the tapping might be necessary to operate the CCR on highest intensity.

3.3.4 High Voltage Circuit

The high voltage circuit consists of components connected between the output terminals and main transformer secondary winding terminals of the CCR and is assembled in a special high-voltage compartment. It consists of following components:

Output current measuring transformer	Measures the output current I2 and provides feedback information to the regulator function of the CCR. Secondary connected to control circuitry.
Output voltage measuring transformer	Measures the output voltage U2 of the CCR and provides information to various monitoring functions. The output voltage is always scaled to 25V with every CCR size.
Surge arresters	Protects the CCR from transients (e.g. lightning), coming from the AFL-circuit.
Earth fault module	The earth fault module measures isolation resistance of the AFL-circuit. It is connected to the circuit via high impedance / voltage resistor array and is completely isolated from the control electronics. With circuit selector function, earth fault is measured from all circuits simultaneously. **Note** Dielectric strength of the earth fault module is 11 kV. Surge arresters connected to the output of the CCR are recommended.
Direction changer or Circuit selector contactor block (optional)	The contactor block controls CCRs output circuits as follow: • With circuit selector selecting is made in a way to cause minimum flicker of lights. Reduced switching current is used when switching off circuits in order to avoid regulator overshoots. • With direction changer changeover is made current less in order to provide maximum lifespan for the contacts and also to avoid transients in the output circuit. **Note** With circuit selector all circuits are connected in series and short circuited. Circuits are not disconnected from the high voltage output. Selection of any combination of circuits is made within the circuit selector by removing the shorts. The circuit selector dielectric strength is 11 000V according to FAA: AC 150/5345-5A. Surge arresters connected to the output of the CCR are recommended.
Output terminals	Special output terminals are used to ease maintenance tasks: • Terminal taps, standards for all CCRs. • Series cut-out (SCO), option. One pair of connectors is provided for each circuit of the CCR. Each pair is labeled with a capital and small character, e.g. **A** for output and **a** for return of the loop. For more information, see Appendix M – Output Terminals.

3.3.5 Control Unit

MCU control unit

The control unit is E1 size custom designed electronic card containing powerful 16-bit microprocessor with application program, and its peripheral circuits.

- Regulator function adjusts the thyristor control output according the RMS actual current value (I2) provided by the Rms calculator (feedback) and set value defined by the user.
- Rms calculators define the actual output values by sampling the output waveforms and calculating effective (rms) values from the sample data.

The application program is stored on Flash-memory and can be therefore upgraded at site if desired. All set-parameters are stored in non-volatile EEPROM memory. Also, RAM memory is backed with battery for optimal performance in all operational situations.

Mother board

The mother board provides connections between the MCU and its peripherals like remote control unit, display unit and measuring channels. System hardware settings are made through dip-switch settings on motherboard. For more information, see Main Transformer, Efficiency and Power Factor.

Power unit

The plug-in E1 size power unit provides desired DC-voltages for the control electronics. Switch mode unit guarantees wide operating voltage range and good efficiency.

3.3.6 Serial Control Interface

Serial control interface is used with computer based control and monitoring systems using latest fieldbus technologies for CCR communication.

This interface is standard for all 8000 range CCRs and is designed under following criteria:

- To be compatible with most common fieldbus systems.
- Simple to interface: no data multiplexing, minimum “ripple” and round numbers (if possible no decimals) with data values.
- Possibility for redundant bus connection

The interface is realized with a credit card size communication card installed on E1 size plug in carrier card which again is installed in the RC-slot of the control rack. The fieldbus cable is connected directly to the connector on the communication card front plate.

General features

Each fieldbus interface (i.e. card) must have unique address on the bus.

- Fieldbuses using Daisy chain type of cabling (e.g. Profibus DP, cabling directly between CCRs) must be terminated at both ends of the physical cable link.
- Fieldbuses using Ethernet style cabling (e.g. Modbus TCP, separate cable for each CCR) do not need termination.
- Control and indication bit mode is continuous (i.e. static)
- Standard binary coding is used with control and indication step bits.
- With direction changer CCRs Lamp fault (LF) and power drop (VA) alarms and displays are for the current selected direction only. With circuit selector CCRs LF and VA alarms work only when all circuits are selected.
- The CCR monitors the fieldbus and in case the bus is not running it considers it to be offline (online when the bus is ok) and takes the failsafe setting until set to Off from the local control switch of the CCR or the bus returns to ok state.
- Heart beat-signal (Hb) confirms that real data connection exists with the host computer of the control systems and the CCR and is combined to online status monitoring of the CCR. (sometimes the fieldbus may be in ok state but has no connection to its host computer)
- With redundant duplicated system the card in slot RM_1 (right side) is the primary interface and the card in RM_2 the secondary interface. If the primary is online it controls the CCRs, if not the secondary controls and if both are offline the failsafe setting is taken.

Related software settings

- CCR type: normal / direction changer / circuit selector. Control and indication bits are enabled according the CCR type configuration.
- Failsafe setting defines how the CCR acts in case of bus failure.
- CCR size scales the size related measurement data (U2, P2).

Redundant duplicated configuration is defined by dip-switches on the MB.

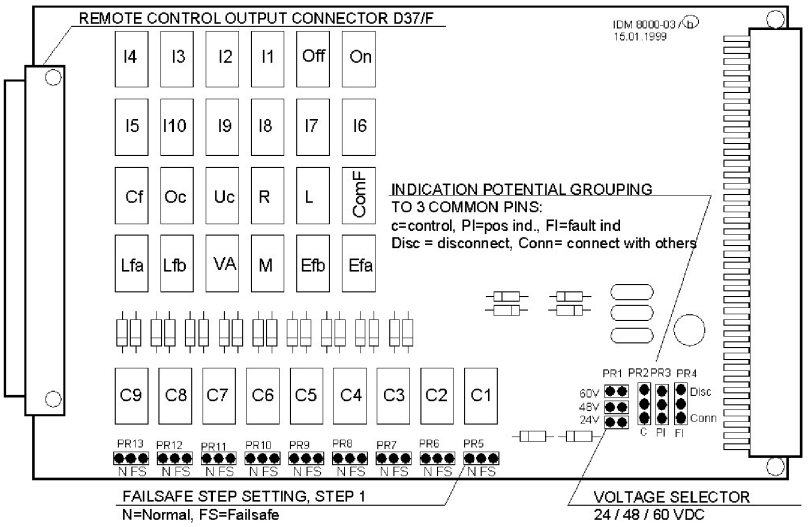
For more information, see Appendix C – Serial control interface signal list – Profibus DP or Appendix D – Serial control interface signal list – Modbus TCP.

3.3.7 Parallel control interface

Parallel control interface is used with traditional multi-wire control systems. The interface is designed to match with most control system types and allows configuring. This interface is standard for all 8000 range CCRs (normal/direction changer/ circuit selector).

Parallel interface unit is custom designed E1 size plug in card with D37 / F communication connector installed on the face of the card. The card is located in the RM-slot next to the power unit of the control rack.

Figure 1: Parallel control unit IDM 8000-03 layout and HW settings



Interface	Type	Data
Input / controls	Relay coil	Ucont = 0.8 – 1.6xUdcnom / R=3840 ohm
Output / indications	Relay contact	1A/30V DC, 0.3A/60V DC, 0.5A/125V AC
	PARALLEL REMOTE CONTROL HARDWARE SETTINGS	

Setting	Description	Factor setting	Allowed range
Control voltage	Control DC-voltage selection	60V	24 / 48 / 60V DC
Failsafe step One step (dec) Binary code(bin)	In case of control DC voltage or cable fault failsafe control status is taken. Control relays contacts are inverted with jumpers. Inverted control must be given by the control system	Off	Any step
Indication group C, PI, FI	Enables galvanic isolation between control, positive indications and fault indication groups		
Remote control	Dip switch SW1 settings on mother board. For more information, see Hardware system settings on page 44.		

PARALLEL REMOTE CONTROL HARDWARE SETTING STEPS		
Step	**Task**	**Remarks**
1	Turn the main switch off	
2	Remove RCP unit	
3	Set jumper switches to desired positions	
4	Insert RCP and turn the main switch on	

	**RELATED SOFTWARE SETTINGS**	
Setting	**Menu**	**Description**
Dec/bin	Remote control	Coding of control signals (dec=1 signal/step, bin=standard bcd code) (**1**=001; **2**=010; **3**=011; **4**=100; **5**=101; **6**=110; **7**=111)
Cont/imp	Remote control	Control signals mode: Cont=continuous, imp=impulse, off sgn needed
Type	System	Control/indication signals purpose depends on the Type selection. See HW-settings and parallel connection signal list.
ComF-m	Remote control	Defines if all fault signals are summed to Com-fault indication (SumF) or it contains only U1, f1 and T alarms (SysF).
Parallel control interface and indication signals: Appendix E – Parallel control interface signal list. Example connection in Appendix F – Parallel remote control example.		

4.0 User Interface

4.1 Control functions

4.1.1 Control functions with Operation switches

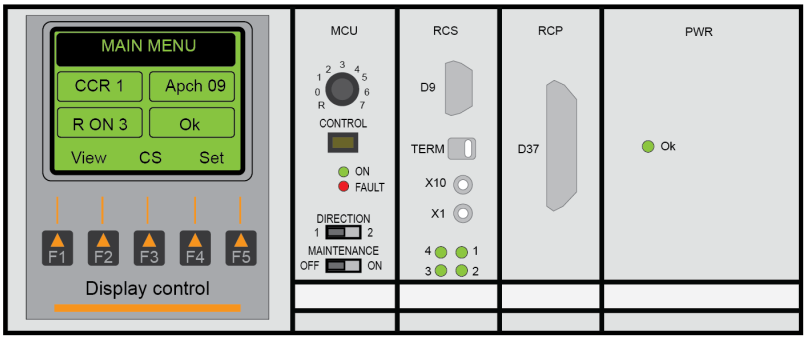
- Mains on/off control from the main switch located below the display unit on the power compartment door.
- Control mode and brilliancy step control from the control switch as follows:

Position	Mode	Function
R	Remote	CCR in remote mode
O	Local	CCR off
1–7	Local	Steps 1–7 on

• Direction changer control by using direction switch on the MCU-unit. Direction switch is enabled in the local control mode only

• Earth fault maintenance switch / Lamp fault B reset control by using maintenance switch on the MCU-unit. When set to on with earth fault tripping mode is activated on level B.

Figure 2: Control rack with display unit and control switches



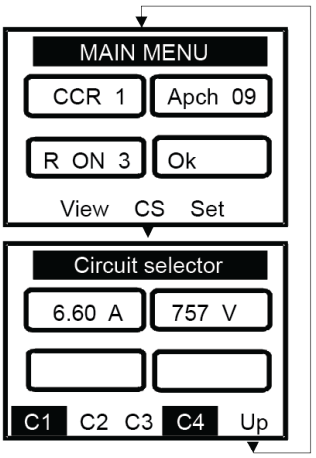
4.1.2 Circuit Selector Control via Display unit

To access control display select CS from the main menu.

Note

The CCR must have been defined to be circuit selector type.

Figure 3: Circuit selector control via display unit



Control is enabled only in local control mode; control status is displayed in both modes.

Pressing the soft menu button below the Circuit no., (e.g. C1) alternates the control status.

White text on dark background indicates that the circuit is selected and vice verse.

4.1.3 Led Indicators

- On led on the MCU (green)

Status	Meaning
Off	CCR is off
On	CCR is on (steps 1–7)

- Fault-led on the MCU (red)

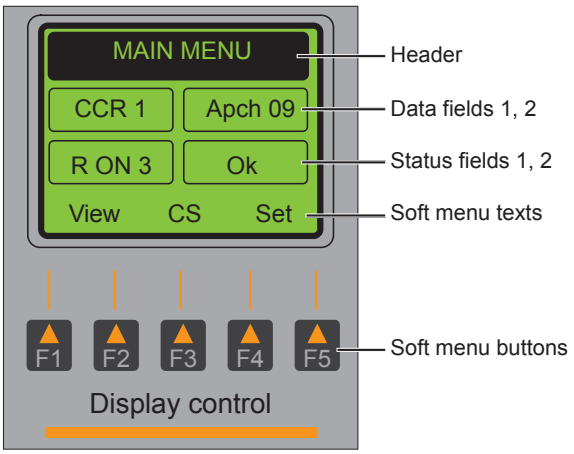
Status	Meaning
Off	CCR is ok
On	CPU stopped / CCR system fault
Blink	Fault: monitoring / protection operated / CCR offline (serial control only) Monitoring / protection

- On-led (green) on the power unit is on when the DC power module is powered.

4.2 Display Unit

The display unit consists of a graphical LCD-display and 5 soft menu buttons. Each display window consists of header, 2 function dependent data fields, 2 permanent status fields and 5 function dependent soft menu texts.

Figure 4: Display unit



Display component	Description	Remarks
Header	Describes the function of current display	
Data field 1 (left)	Data according the selected function	
Data field 2 (right)	Data according the selected function	

Status field 1 (left)	CCR control status	Permanent, not function dependent
	1. Control mode status	R = remote, B = profibus connection fault, r = remote control offline, N = remote/no card detected, L = local
	2. Control direction 1, 2	Only with direction changer
	3. Control step status	CCR. Off, On 1–7
Status field 2 (right)	CCR fault status text * = unacknowledged faults in the log	Permanent, not function dependent Ok, last fault
Soft menu texts	Describes the function of the soft menu button located below the text	
Soft menu buttons	Pressing the button will activate the function described by above menu text	Hold the button down for repeat when applicable

Following fault status texts are used in the status field 2 and in the fault log:

Fault status text	**Description**
Ok	CCR ok / no faults
Freq A-	Low frequency trip
Freq B-	Low frequency warning
Freq A+	High frequency trip
Freq B+	High frequency warning
U1 –A	Low input voltage trip
U1 –B	Low input voltage warning
U1 +A	High input voltage trip
U1 +B	High input voltage warning
Temp A1	High temperature trip
Temp B1	High temperature warning
Cur.fail	Current failure
VAdropA	VA-drop alarm, level A
VadropB	VA-drop alarm, level B
L fault A	Lamp fault alarm
L fault B	Lamp fault warning
E fault A	Earth fault alarm
E fault B	Earth fault warning
OpenCirc	Open circuit alarm, trip
CO OPEN	Series Cut Out switch open (Option)
OverCu A	Over current level A trip
OverCu B	Over current level B trip
FAST_I2	Fast repeated (5pcs) over current trip
SYS ERR	System error
NO CS	No circuits selected / circuit selector CCR
ERR	Incorrect value or function
LAMP AGE	Selected lamp life operation time reached

4.2.1 Display Interface Main Menu Structure

The main menu has three selections:

- **View** Viewing the values without affecting any set values.
- **Cs** Circuit selector control (only if the CCR is defined as a circuit selector CCR).
- **Set** CCR calibration and setting functions. Password protection of settings menu is selectable from the Sys settings. Factory setting for password protection is not in use (Off).

4.2.2 The set menu is divided into 3 sub menus:

- **Cal** Calibrating functions
- **Prot** Protective functions; monitoring functions which are able to trip the CCR
- **Set** Setting functions; other monitoring and system configuration functions

4.2.3 Commonly used symbols in all display menus:

- **More** Brings more equal level displays
- **Up** Brings you back to upper level display

4.3 View functions

Select View on the main menu to access the View-level displays :

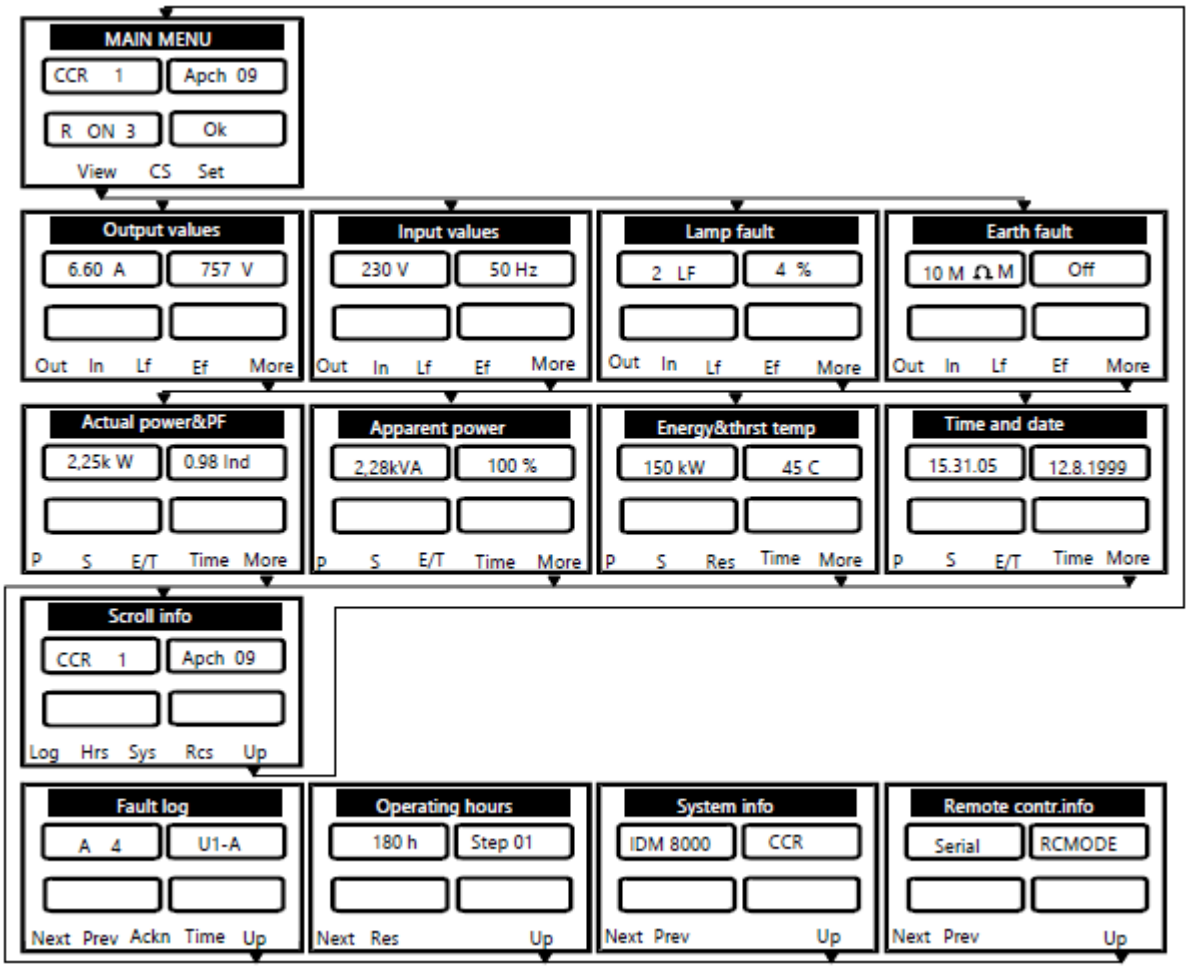


Figure 6 – View displays and menu tree

Header/function	Data 1	Data 2	Remarks
Output values	Output current RMS Resolution = 0.01A	Output voltage RMS Resolution = 1V	
Input values	Input voltage / V Resolution = 1V	Input frequency Resolution = 1Hz	
Lamp fault	Qty of lamp faults Resolution = 1 lamp Off when CCR off	% of total lamps, Resolution = 1% Lf when CCR off	For correct % display no of lamps must be set from system settings

Earth fault	Isolation resistance Variable resolution * Off when CCR local/off M=maintenance switch on and M-switch selected	Reserved	* Resolution **50M ohm range:** 1k: 0k-999k, 0.01M: 1.00M-9.99M, 0.1M: 10.0M-50.0M. **1G ohm range:** 1k: 0k-99k, 0.01M: 0.10M-99.99M 0.01G: 0.10G-1.00G
Actual power&PF	Load actual power Resolution = 0,01/0,1kW	Load power factor Resolution = 0.01	
Apparent power	Load apparent power Resolution = 0,01/0,1kVA "-" When CCR off	% of recorded full load value "---" If not calibrated	Full load values recorded during lamp fault calibration.
Energy&thrst Temp	Energy spent since last reset. Res to reset Resolution = 1kWh/1MWh	Thyristor element temperature Resolution = 1C	Max display 999 MWh
Time and date	Time hh.mm.ss	Date dd.mm.yyyy	
Scroll info	CCR no	Circuit, direction	Access to scroll info displays. Up to go back to main menu

View scroll info displays:

Header/function	**Data 1**	**Data 2**	**Remarks**
Fault log	A = acknowledged Fault number 1-10 1 = oldest fault	Fault text.	Next = Next fault Prev = Previous fault Ackn = Acknowledge Time = Fault occurrence time and date
Operating hours	Elapsed hours	Step no 01-07 – Total Cstep 01-07 – Ctotal (C = Cumulative)	Next = next hours Res = reset hours Cumulative hours, will not reset
System info	System data	Datatype	For more information, see *2.6.8* System settings.
	Run 7 / xx %.	Tap %	Max step, Load % of main trafo capacity
	xx,xx V.	DC +5V, +-12V	Internal DC voltages
	XXXX	DIP POS	*2.6.7 Hardware System settings* (2.6.7)
	LEDS	TEST	Led test function for MCU LEDs
Remote control info	Data	Datatype	For more information, see *2.6.9* Remote control settings.

4.4 Calibration functions

Select **Set** /**Cal** to access the calibration level displays:

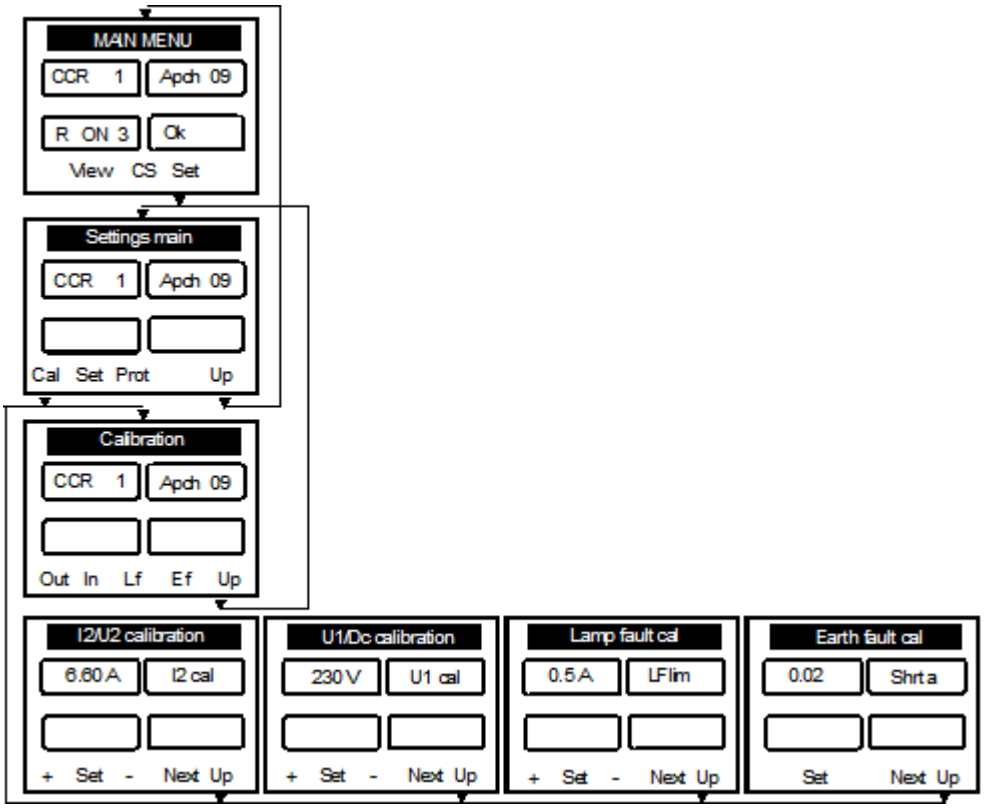
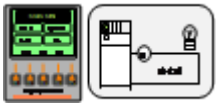


Figure 7 – Calibration displays and menu tree

If password protection is selected from system settings, you are asked for a password before entering the SETTINGS display. For more information, see selecting password protection in the section *2.6.8* System settings.

4.4.1 Output Current I2 and Voltage U2 Calibration

Header/function	Data 1	Data 2	Remarks
I2/U2 calibration	I2 / A U2 / V	I2 Cal U2 Cal	Next = U2 cal Next = I2 cal + - adjust
			

I2 calibration
1. Connect external calibrated RMS A-meter (10A, accuracy better than 1%) in series with the load circuit. Use at least 10% load of the CCR capacity.

	**Warning!** High voltage circuit – De-energize CCR before connecting!

Note *: For more information on easy meter connection, see* Series Cut Out (SCO) option in *Appendix M – Output Terminals. Clamp meter accuracy is normally not adequate for 1% accuracy. For periodic maintenance checks, clamp type meter is still recommended for safety reasons.*

1. Select the second highest current step (approx. 5A).

1. Go to I2/U2 calibration: select **Set**/**Cal**/**Out**.

1. Adjust the I2 reading on datafield 1 to equal with the external meter reading.

1. Make sure that the readings are equal then select **Set**.

	**Warning!** Make sure that there is max 10% deviation between the two readings. Selecting set with bigger difference between the readings may result to over current on the output circuit!

1. Check that both readings are equal, if necessary repeat steps 4-6.

***Note**: I2 calibration affects also to VA-drop function.*
Calibration with short circuit load (U2 = 0) is not allowed.
Calibration of more than ±10% from factory defaults is not allowed -> ERR indication in display.

U2 calibration

1. Connect external calibrated RMS V-meter (Min 30V, accuracy better than 1%) to the voltage transformer test outputs located on the right side of the power unit of the control rack.

1. Select the maximum current step (6.6A).

1. Go to I2/U2 calibration: select **Set**/**Cal**/**Out** and then **Next**.

1. Check the external meter reading and adjust the U2 reading on data 1 to be equal with the external meter reading and then select **Set** .

***Note**: Round up to next bigger value e.g. 20.12->20.2.*

1. Make sure that the both readings are equal and if necessary repeat step 4.

***Note**: U2 calibration affects also to VA-drop function*
Calibration of more than ±10% from factory defaults is not allowed -> ERR indication in display.

4.4.2 Input Voltage U1 Calibration

Header / function	Data 1	Data 2	Remarks
U1 calibration	U1 / V	U1 Cal	+ - adjust
			

U1 calibration

1. Connect external calibrated V-meter (appropriate scale, accuracy better than 1%) to the CCR mains input terminals (main switch).

	**Warning!** Line voltage circuit – use appropriate test probes!

1. Go to /U1 calibration: select **Set**/**Cal**/ **In**.

1. Adjust the U1 reading on data 1 to equal with the external meter reading.

1. Make sure that the readings are equal then select **Set**.

1. Check **View**/**In** that both readings are equal, if necessary repeat steps 3-5.

***Note**: Calibration for DC1 (+5V), DC2 (+12V) and DC3 (-12V) system voltages also provided in this display. Factory settings: not necessary to calibrate during commissioning.*

4.4.3 Lamp Fault and VA-Drop Calibration

Header / function	Data 1	Data 2	Remarks
Lamp fault cal	I2 / A (Fact set 2,80A)	Lflim	+ - adjust, Set, Next
	Measured LF voltage	Lfcal = 0	Run steps 1-7 and set, Next
	Qty of real lamp faults	Lfcal > 0	+ - adj. Run 1-7,Set
			

Lamp Fault and VA-drop calibration

1. Make sure that there are no lamp faults in the circuit. ***Note**: All isolation transformers must be of the same size and make in order to achieve the full accuracy of the lamp fault monitoring function.*

1. Go to lamp fault calibration, select **Set**/**Cal**/**Lf**.

1. If necessary adjust Lflim value (factory setting 2.80A for typical trafos) then select **Next**.

1. Start the CCR and control from Datafield 1 the measurement value to be below 0.8 on all steps. To adjust the value, change the Lflim value between 1.75A and 3.50A, re-check the measurement value. To calibrate, start the CCR with step 1, wait 30 seconds and select **Set**. ***Note**: For circuit selector CCRs ensure that all circuits are selected. Lamp fault monitoring function will only activate when all circuits are selected.*

1. Increase the brilliancy step, wait 30 s and select **Set**. Repeat this until step 7 is set. ***Note**: VA-drop full load values are automatically calibrated at the same time.*

Warning!
High voltage circuit - De-energize CCR before working with the load circuit!

1. Arrange desired amount of real lamp faults to the circuit. ***Note**: Use either level A amount of lamp faults or not less than 2 or more than 7 is required.*

Warning!
High voltage circuit – De-energize CCR before working with the load circuit!

1. Return to lamp fault cal. Use **Next** to go to Lfcal>0.

1. Adjust selected number of real lamp faults into the datafield 1 with +/- buttons.

1. Repeat steps 5 and 6.

1. Check from the View/Lamp fault display that correct number of lamp faults is displayed. If level A lamp faults was selected, check that alarm is given in local display.

1. Correct lamp faults to level B and run CCR to check that level B alarm is given.

1. Correct the lamp faults in the circuit and check that the lamp fault display is 0

1. If the CCR is with direction changer repeat steps 1-13 for the 2nd direction.

4.4.4 Earth Fault Calibration

Warning!
Extra precaution must be used when working with high-voltage circuits! Always de-energize the CCR before making connections.

50M ohm range			
Header/function	**Data 1**	**Data 2**	**Remarks**
Earth fault cal	Measuring value (V)	Open	Open load circuit, Next
	Measuring value (V)	Shrt a	Short terminal a, Set, Next
1G ohm range			
Header/function	**Data 1**	**Data 2**	**Remarks**
Earth fault cal	Measuring value (V)	Short	Short terminal a, Set, Next
	Measuring value (V)	A > 33M	Test resistor 33M to a, Set, Next
	Measuring value (V)	Open B	Open circuit, Set, Next
	Measuring value (V)	Open	Open circuit, Set, Next
			

Calibration 50M ohm range

1. Disconnect the load circuit with slide switches in the output terminals.

1. Turn the CCR operation switch to remote position. (EF monitoring on but the CCR off). ***Note**: Disconnect remote control cable to disable remote control, make sure that no failsafe setting is selected in order to avoid uncontrolled starting of the CCR.*

1. Go to Earth fault cal by selecting **Set**/**Cal**/**Ef**.

1. Wait 20s and then select **Set**/**Next**.

1. Turn the control switch to Off-position.

1. Short circuit the CCR output terminal a (Short a) to the ground by using test lead provided with the CCR. Output terminals have test sockets and also ground test socket is provided inside the right side of the CCR frame. ***Note**: By pressing the leftmost function key, the light turns on to the LCD panel.*

1. Turn the control switch to R-position, wait 2min and then select **Set**.

1. Turn the control switch to Off-position.

1. Disconnect the short circuit (a-gnd).

Calibration 1G ohm range

1. Disconnect the load circuit with slide switches in the output terminals.

1. Turn the control switch to Off-position.

1. Short circuit the CCR output terminal a (Short a) to the ground by using test lead provided with the CCR. Output terminals have test sockets and also ground and 33M test socket is provided inside the right side of the CCR frame. ***Note** : Disconnect remote control cable to disable remote control, make sure that no failsafe setting is selected in order to avoid uncontrolled starting of the CCR.If failsafe steps are used, remove the remote control card for calibration.*

1. Turn the CCR operation switch to remote position. (EF monitoring on but the CCR off).

1. Go to Earth fault cal by selecting **Set**/**Cal**/**Ef**.

1. Wait 2min until the measurement value has stabilised or the 'w' letter from the value has disappeared. The shorted value should be between 3.60V and 4.00V. Select **Set**/**Next**.

1. Move the test lead shorting the CCR output terminal a from ground to the 33M test socket.

1. Wait 2min until the measurement value has stabilised or the 'w' letter from the value has disappeared. The A > 33M value should be more than 3.00V. Select **Set**/**Next**.

1. Disconnect the test lead from the 33M test socket.

1. Wait 2min until the measurement value has stabilised or the 'w' letter from the value has disappeared. The OpenB value should be less than 1.00V. Select **Set**/**Next**.

1. Wait 2min until the measurement value has stabilised or the 'w' letter from the value has disappeared. The Open value should be less than 0.10V. Select **Set**/**Up**.

1. Turn the control switch to Off-position.

4.5 Protective Functions

Select Set/Prot to access the protection level displays:

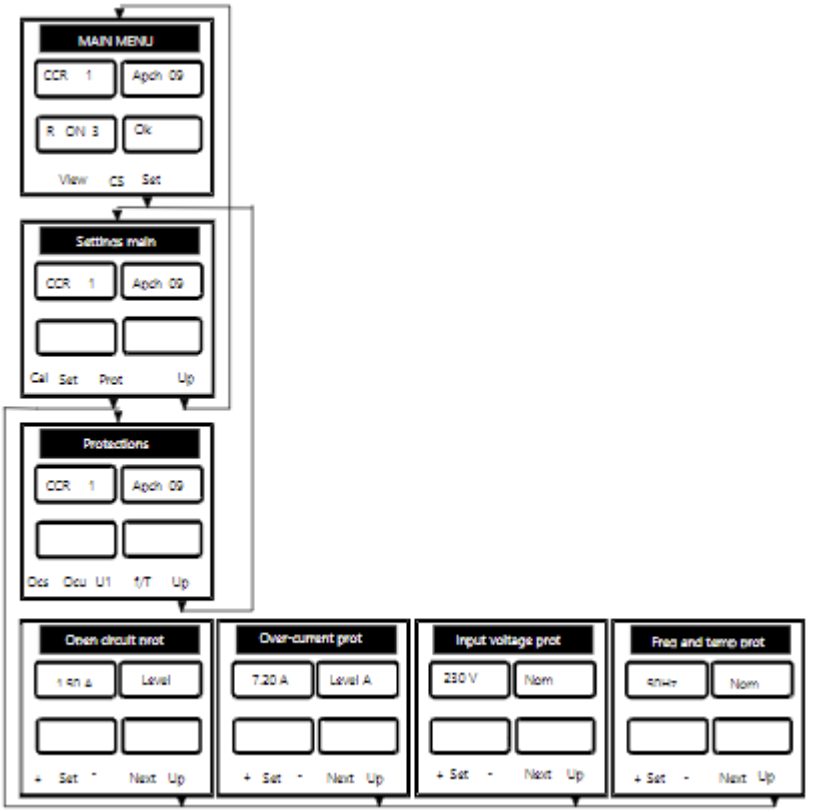


Figure 8 – Protective displays and menu tree

If password protection is selected from system settings, you are asked for a password before entering the SETTINGS display. For more information, see selecting password protection in *2.6.8* System settings.

General definitions used in protections setting displays

- ***Level A, B*** : threshold level, meeting the level causes operation of the protective function. Level A (alarm) normally causes shutdown of the CCR output hereafter called tripping and level B (warning) warning indication.
- ***Delay*** : Delay time after which the protection operates.
- ***Nom*** : Nominal value used for input voltage and frequency protections which are normally set with the dip-switch on the mother board and are critical for correct operation and lifespan of the CCR. Threshold levels A which trip the CCR are automatically set from these values and cannot be set directly.

Note *: Nominal values must correspond with the values of the mains input. Incorrect nominal value or calibration may cause incorrect operation of the protection.*

Reset mode
Defines in which way the operated protection can be reset i.e. the CCR can be started again: • **L** = Local reset, protection resets only by controlling the CCR off from the local operation switch of the CCR after which the CCR can be restarted. • **L+R** = Local+remote reset, protection is reset by controlling the CCR off either locally or via remote control. Maintenance personnel do not need to visit the CCR station for a CCR restart. • **A** = Automatic reset: protection resets automatically when the actual value returns within the acceptable limits (normally level A + hysteresis). No selection, used with U1, f and T protections.

4.5.1 Open Circuit Protection

This function protects the maintenance personnel in case of open circuit by tripping the CCR after a delay time if the output current stays below a predefined threshold level. The output current must exceed the threshold level to enable CCR normal operation. Local or Local+remote reset modes can be selected. The capacitive current monitor may be selected to monitor the power factor of the load. With an open circuit on long shielded cables, there may be enough capacitance in the cable to hold the output current above the open circuit threshold level. If the load power factor is highly capacitive, the capacitive output current monitor will switch off the CCR when selected and indicate an open circuit. Detection time for capacitive output current is one second.

Header / function	**Data 1**	**Data 2**	**Fact set**	**Allowed range**
Open circuit prot	Threshold level	Level	1.5A	0-6.60A in 0.05 steps
	Delay time	Delay	0,5s	0.1-10s in 0.1s steps
	Reset mode abbrev.	Reset m.	L	L / L+R
	Op. mode for capacitive current monitor	CAP MON	Off	Off / ON
				

Setting sequence
1. Go to open circuit protection display by selecting **Set** /**Prot** /**Ocs**.
1. If necessary adjust threshold level with **+** **-** buttons and select **Set**, then select **Next**.
1. If necessary adjust delay time as in step 2.
1. If necessary adjust the reset mode (L or L+R) with **+** **-** buttons.
1. If necessary select the capacitive current monitor operation.

Operational test	
Two ways can be used to test the operation of the protection:	
• Real test: Open the AFL-circuit and start the CCR. Make sure that the CCR trips in due time.	
	**Warning!** High voltage circuit! Adequate insulation and distances must be maintained during test.
• Simulated test: Adjust the threshold level above the actual output current level and check that the CCR trips in due time.	

4.5.2 Over Current Protection

This function protects the lamps in the AFL circuit and also the CCR from long term over current caused by possible regulation/component fault of the CCR. If the output current exceeds the threshold level for a predefined time period (delay time), the CCR trips. Two levels A (normally higher threshold and shorter delay) and B are provided. Local or local+remote reset modes can be selected.

Header / function	Data 1	Data 2	Fact set	Allowed range
Over current prot	Threshold level A	Level A	7.20A	3.30-7.75A in 0.05A steps
	Threshold level B	Level B	6.90A	3.30-7.75A in 0.05A steps
	Delay time A (s)	Delay A	1s	0.1-10s in 0.1s steps
	Delay time B (s)	Delay B	5s	0.1-10s in 0.1s steps
	Reset mode abbrev.	Reset m.	L	L / L+R

Setting sequence
1. Go to over current protection by selecting **Set**/**Prot**/**Ocu**.
1. If necessary adjust levels A, B with **+** **-** , select **Set** and then select **Next**.
1. If necessary adjust delay times A, B as in step 2.
1. If necessary adjust the reset mode (L or L+R) as in step 2.

Operational test
Adjust the threshold level below the actual output current value and make sure that the CCR trips in due time.

4.5.3 Over Current Protection, Fast Reset

The function protects the lamps in the AFL circuit and also the CCR for fast over currents, caused by load changes. If the output current exceeds 125% of nominal maximum intensity, the CCR will disable the output within 10ms for at least 40 ms, and restores operation to normal. If this fast reset repeats immediately within one second, after 5 fast resets the CCR will trip to protect the AFL circuit.

4.5.4 Input Voltage Protection

This function protects the lamps in the AFL circuit and also the CCR from possible regulation/component fault of the CCR caused by long term over/under input voltage.

If the input voltage is out of acceptable limits (L a + = +15% and L a - = -20%, deviation automatically set from the nominal value) for a predefined delay time the CCR trips. CCR starts automatically after the input voltage returns to acceptable limits.

Function	Limit type	Value	Trip value	Return value
Input voltage protection	Threshold level A + Threshold level A –	+15%	264 / 460 Vac	253 / 440 Vac
		-20%	184 / 320 Vac	196 / 340 Vac

***Note** : CCR can only start-up between ±15% of U1nom. After start-up it will operate between A- and A+ (-20%...+15%). If the CCR is not in operation (Off state), Input voltage alarm A is given from –15% level.*

B-levels are used as warning indication and can be set by the user. Reset mode is always A (resets automatically when actual value returns within acceptable limits).

Header / function	Data 1	Data 2	Fact set	Allowed range
Input voltage protection	Nominal value	Nom	Project *	HW setting w.dip switch
	Threshold level B +	L b, +	Project *	Lb- ... L a + in 1V steps **
	Threshold level B –	L b, -	Project *	La- ... - Lb + in 1V steps
	Delay time	Delay	1s	0.1-10s in 0.1s steps
* Factory settings vary according the nominal input voltage of the project. ** L a, + and L a, - automatically set from the nominal value.				

Setting sequence
1. Go to input voltage protection by selecting **Set** / **Prot** /**U1**.
1. Nominal value is displayed, select **Next**.
1. If necessary adjust levels Lb + and Lb – with **+** **-** , select **Set** and then select **Next**.
1. If necessary adjust delay time as in step 3.

Operational test
Change the U1 calibration in order to go beyond threshold limits (L a +/- or L b +/-) and make sure that the required function operates in due time.

4.5.5 Input Frequency and Temperature Protection

Frequency function protects the lamps in the AFL circuit and also the CCR from possible regulation/component fault of the CCR caused by long term input frequency fault.

If the input frequency is out of acceptable limits (F a, + and F a, -, automatically derived from nominal value) for a predefined delay time the CCR trips. CCR can start automatically when the input frequency returns within acceptable limits.

Function	Limit type	Fnom	Trip level	Return level
Input frequency protection	Threshold level A +	50/60Hz	Fnom +10% (55/66Hz)	Fnom + 7.5% (54/65Hz)
	Threshold level A –	50/60Hz	Fnom –10% (45/54Hz)	Fnom – 7.5% (46/55Hz)

B-levels are used as warning indication and can be set by the user. Temperature function protects the CCR from overheating caused by e.g. too high environmental temperature. If the thyristor cooling element temperature exceeds Level A value the CCR trips. Level B is used as warning and can be set by the user. Reset mode is always A (resets automatically when actual value returns within acceptable limits) for both protections.

Header / function	Data 1	Data 2	Fact set	Allowed range
Freq. and temp prot	Nominal value	Nom	Project*	HW setting w.dip switch *
	Threshold level B +	F b (+)	Project*	Nom - F a + in 1Hz steps**
	Threshold level B –	F b (-)	Project*	Nom - F a - in 1Hz steps
	Delay time	F delay	1s	0.1-10s in 0.1s steps
	Temp thresh. Level	T L	+ 80 C	0-95 C in 1 C steps
	BTemp delay time	T Delay	10s	0.1-10s in 0.1s steps
* Can be set from display but dipswitch settings overruns it at power up ** F a, + and F a, - automatically derived from nominal value				

Setting sequence
1. Go to freq/temp protection by selecting Set/Prot /F/T .
1. If necessary adjust freq nominal value with , + / - , select Set and then select Next.
1. If necessary adjust threshold levels F b, + and F b, - as in step 2.
1. If necessary adjust frequency protection delay time, as in step 2.
1. If necessary adjust temperature level T b, as in step 2.
1. If necessary adjust temperature protection delay time, as in step 2.

Operational test
Adjust the frequency nom value to be 10Hz out of real nominal value and make sure that the protection operates in due time. Warnings can be tested by adjusting the warning level.

4.6 Setting Functions

Select Set/Set to access the set-level displays:

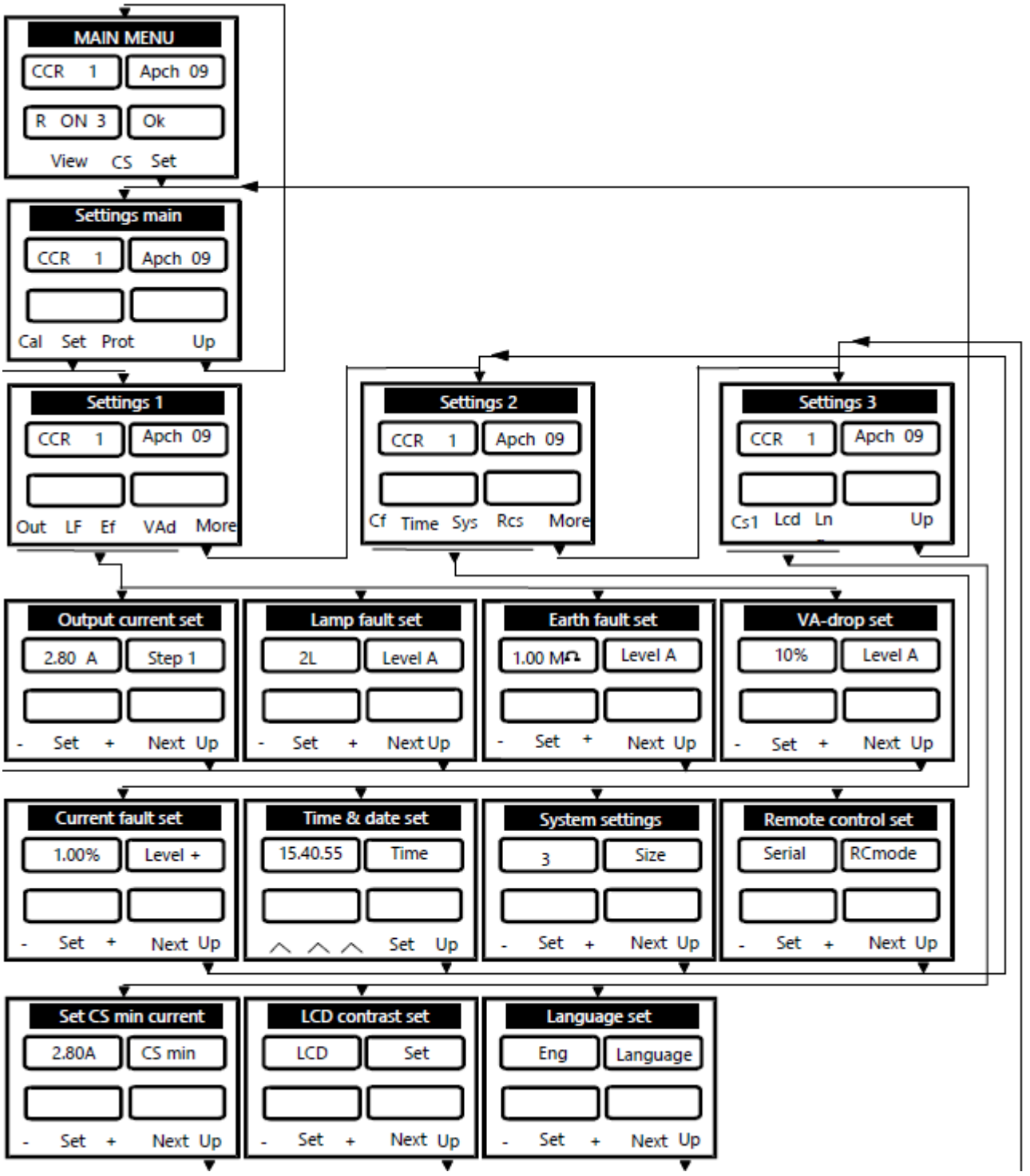


Figure 9 - Set displays and menu tree

If password protection is selected from system settings, you are asked for a password before entering the SETTINGS display. For more information, see selecting password protection in *2.6.8* System settings.

4.6.1 Output Current Step Setting

These settings define the output current levels of the CCR. If less than 7 steps are used it is recommended that the step no 7 is always the maximum current step of the CCR. This is because step no 7 is used for tapping info during commissioning (in local mode).

Header / function	Data 1	Data 2	Fact set	Allowed range
Output current set	Step 1 set level	Step 1	2.20A	1.00-6.60A in 0.05A steps
	Step 2 set level	Step 2	2.50A	1.00-6.60A in 0.05A steps
	Step 3 set level	Step 3	2.80A	1.00-6.60A in 0.05A steps
	Step 4 set level	Step 4	3.40A	1.00-6.60A in 0.05A steps
	Step 5 set level	Step 5	4.10A	1.00-6.60A in 0.05A steps
	Step 6 set level	Step 6	5.20A	1.00-6.60A in 0.05A steps
	Step 7 set level	Step 7	6.60A	1.00-6.60A in 0.05A steps
	I2	Conf CF ?		Accept current step values and recalculate current fault alarm levels.
				

Setting sequence

1. Go to output current settings by selecting Set/Set/Out.

1. If necessary adjust step 1 level with , + / - , select Set and then select Next.

1. Repeat step 2 until all 7 steps are set.

1. Select Set for Conf CF? - If you want to update the current fault monitoring values now. If you want to test the current fault monitoring skip this but remember to confirm it later.

4.6.2 Lamp Fault Setting

These settings define the amount of lamps faults that generates a lamp fault alarm after a predefined delay time. 2 levels A and B are provided.

Header / function	Data 1	Data 2	Fact set	Allowed range
Lamp fault set	No of lamp faults	Level A	2	1-99 lamps in 1 lamp steps
	No of lamp faults	Level B	1	1-99 lamps in 1 lamp steps
	Delay time	Delay	10s	1-99s in 1s steps
				

Setting sequence
1. Go to lamp fault setting by selecting **Set**/**Set**/**LF**.
1. If necessary adjust level A and B with **+** / **-** , select **Set** and then select **Next**.
1. If the CCR is with direction changer, choose the other direction and adjust levels A and B as in step 2. The levels for both directions are updated whenever direction is changed.
1. If necessary adjust delay time as in step 2.

Operational test
Adjust the alarm level below actual lamp fault level of the circuit or make more lamps faults than the alarm levels into the circuit and make sure that alarms are generated in due time.

4.6.3 Earth Fault Setting

When the isolation resistance of the AFL-circuit decreases below the earth fault levels (A and B) corresponding fault indication is generated. In case the earth fault maintenance switch function is enabled (i.e. selected on from the system settings) and the maintenance switch is on level B causes tripping of the CCR and is therefore a protective function.

Header/function	Data 1	Data 2	Fact set	Allowed range
Earth fault set	Isolation level	Level A	0,1M ohm	0.01-2.50Mohm in 0.01Mohm steps
	Isolation level	Level B	1M ohm	0.1-25Mohm in 0.1Mohm steps
	Delay time	Delay	10s	1-99s in 1s steps
				 

Setting sequence
1. Go to Earth fault setting by selecting **Set** / **Set** / **EF**.
1. If necessary adjust levels A and B with **+** / **-** , select **Set** and then select **Next**.
1. If necessary adjust delay time as in step 2.

Operational test
Adjust the alarm level higher than actual isolation level of the circuit or make an artificial earth fault in the circuit and make sure that alarms are generated in due time.

	**Warning!** De-energize the CCR before making the earth fault.

4.6.4 VA-Drop Setting

These settings define how big drop of the load in % (e.g. 2-point earth fault or ageing of lamps) generates VA-drop alarms. Threshold levels A and B are calculated for each brilliancy step according Levels A, B and recorded full load values set during lamp fault calibration function. Adjustable delay times are provided for both levels. Three operation modes Alarm/trip/Off are available.

Header / function	Data 1	Data 2	Fact set	Allowed range
VA-drop set	Selected mode	VA A/T/O	A	**A**larm / **T**rip / **O**ff *
	VA-drop %	Level A	20 %	1-100% in 1% steps
	VA-drop %	Level B	10%	1-100% in 1% steps
	Delay time	Delay A	30s	1-99s in 1s steps
	Delay time	Delay B	30s	1-99s in 1s steps
	Selected mode	Reset m.	L	L / L+R

- Alarm causes normal alarms. Trip de-energizes output on level A. Off disables VA-drop and lamp fault alarms (required when the CCR is used with addressable light control/monitoring system)

Setting sequence
1. Go to VA-drop setting by selecting Set/Set/VAd.
1. If necessary select operation mode with , + / - , select Set and then select Next.
1. If necessary adjust levels A and B as in step 2. These levels are used for both directions, if the CCR is with direction changer.
1. If necessary adjust delay times A and B as in step 2.
1. If necessary select trip / reset mode as in step 2.

Operational test
By-pass part of the circuit or temporarily reduce I2 output current level in order to reduce the apparent power actual value below the threshold levels and make sure that alarm is generated in due time. Actual VA % value against the full load value can be seen from the View/S menu. Full load value is calibrated during lamp fault calibration.

	Warning! De-energize the CCR before working with the AFL-circuit.

4.6.5 Current fault setting

These settings define the acceptable tolerance for the output current. Threshold values are calculated from the current step levels and current fault % levels. If the actual value stays outside (i.e. deviates) from the threshold values for a predefined delay time alarm is generated.

Header / function	Data 1	Data 2	Fact set	Allowed range
Current fault set	Deviation +	Level +	1 %	0.1-10% in 0.1% steps
	Deviation -	Level -	1.5%	0.1-10% in 0.1% steps
	Delay time	Delay	20s	1-20s in 1s steps
				

Setting sequence
1. Go to current fault setting by selecting **Set** / **Set** / **More** / **Cf**.
1. If necessary adjust level + and - with, **+** / **-** , select **Set** and then select **Next**.
1. If necessary adjust delay time as in step 2.

Operational test
Change the output current step setting (e.g. step 3) to be out of the current fault tolerance (e.g. +-0.2A) and do not update current fault limits (see paragraph output current step setting, update CF). Make sure that the alarm is generated in due time. Finally, set the output current level back to its original setting **.**

4.6.6 Time and date setting

Time and date settings are used as time labels in the fault log and also on the time and date display of the view menu. Years are presented with 2 last digits i.e. 2000 = 00.

Header / function	Data 1	Data 2	Fact set	Allowed range
Time&date set	hh.mm.ss	Time	Finish time	0-23 / 0-59 / 0-59
	dd.mm.yy	Date		1-31 / 1-12 / 0-99
				

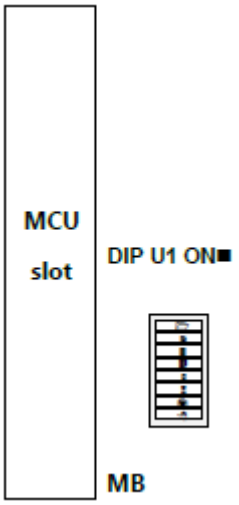
Setting sequence
1. Go to time and date set by selecting **Set**/**Set**/**More**/**Time**.
1. If necessary adjust time with arrows below each time component. Then Select **Set**.
1. If necessary adjust date as in step 2.

4.6.7 Hardware system settings

These are the basic settings of the CCR. The settings will be read from the 8-bit dip-switch located next to the MCU card connector on the mother board whenever the CCR is powered up.

Dec code 0 enables setting from display e.g. for protection testing purposes.

These factory settings enable the MCU card to automatically detect the basic settings of the CCR and need only to be changed/checked when modifying the CCR type or replacing a new mother board.

HW SETTINGS	Sw	Setting	DIP-switch positions / description / view-value				
	1 2	**U1 Nominal value (*)**	Sw1	Sw2		Setting	View value A
			0	0		Set from display (also F1)	0
			1	0		230V	1
			0	1		400V	2
	3	**F1 Nominal value (*)**	Sw3			Setting	View value B
			0			50Hz	0
			1			60Hz	1
	4 5 6	**CCR Type**	Sw4	Sw5	Sw6	Setting	View value C
			0	0	0	Set from display	0
			1	0	0	Normal CCR	1
			0	1	0	CCR with direction changer	2
			1	1	0	CCR with circuit selector CS 2	3
			0	0	1	CCR with circuit selector CS 3	4
			1	0	1	CCR with circuit selector CS 4	5
			0	1	1	CCR with circuit selector CS 5	6
			1	1	1	CCR with circuit selector CS 6	7
	7 8	**Remote control (**)**	Sw7	Sw8		Setting	View value D
			0	0		Parallel/serial, auto detection	0
			1	0		Serial	1
			0	1		Parallel, start in use	2
			1	1		Redundant serial	3

* Defines A-protection levels.
** No auto detection on redundant or start in use.
The settings are made with dip switch SW1 located on the motherboard (MB) on the right side of the MCU unit. Switch no 1 is on top and left switch position=off (0) / right pos=on (1).

SET SYSTEM HW SETTING		
Step	Task	Remarks
1	Turn IDM 8000 main switch off	
2	Remove MCU unit	
3	Set SW1 disp switches to desired positions	

4	Insert MCU and turn the main switch on	
VIEW SYSTEM HW SETTING		
Step	Task	Buttons
1	To open view/system select	View /More/More/Sys
2	Scroll displays until "DIP POS" is on Data field 2	Next

The settings can be viewed for checking from the display:

	SYSTEM HW SETTING DISPLAYS			
	See the column “view-value” in the “HW-settings” table to interpret the display values.			
Header / function	Data 1	Data 2	Factory setting	Allowed range
System information	DIP POS	ABCD where	Project	
		A = U1 Nominal value code		0-3
		B = F1 Nominal value code		0-1
		C = Type code		0-7
		D = Remote control code		0-3

4.6.8 System settings

General CCR settings are only enabled when the control switch is in Off-position.

***Note** : ERR indication is provided if settings are not accepted.*

- CCR size: is used for output voltage calibration and scaling size dependent measurement data for remote monitoring.
- CCR type: display only, normally set from HW-system settings. Can be set only if dip switch code enables setting from display.
- M-switch defines if the maintenance switch is used for earth fault maintenance or Lamp fault B reset (FAA-monitor reset) function or is not used at all.
- Monitor defines the indication operation mode. Realtime warnings and alarms are indicated only when the CCR is in operation and the measurement is active. Latching: alarms and warnings are indicated after the alarm has been activated even when the CCR has been in off state.
- Password defines if the settings can be altered with or without asked password. Password is required with setting ON. Factory setting is Off (No password needed). Factory setting of default password is 547.
- No of lamps is used in lamp fault % indication and is provided for 2 directions.
- Lamp rating; used only for information purposes, pre-set selections, provided for 2 directions.
- CCR number: CCRs control system position number. With 2 below information fields used as a name label of the CCR on the main menu display. If CCR number is set to “0”, the name label is not shown on the display. Instead the output current and voltage is viewed in MAIN MENU.
- Position text: circuit name selectable from:

Abbreviation	**Circuit / lighting system**
APCH	Approach lighting system
THR	Threshold lighting system
PAPI	Precision approach path indicator system

RWYE	Runway edge light system
RCL	Runway centre line light system
TDZ	Touchdown lighting system
TWYE	Taxiway edge lighting system
TCL	Taxiway centre line lighting system
SB	Stop-bar lighting system
RGL	Runway guard lights
SIGN	Guidance signs
	Not displayed

- CCR direction: CCR control (i.e. runway) direction (2 directions) or taxiway number.
- Lamp life: Set the time to be monitored for operational lamp life. When the total operation time of the CCR reaches Lamp life value, an alarm LAMP_AGE will be given to local indication. Also the ComF indication is given if selected as SumF-indication. For more information, see *2.6.9* Remote control settings. The indication is reset by resetting the operating hours counter from the View-Hrs menu. Also the indication is reset automatically if the lamp life parameter is increased is this menu.
- Service date: Used to memorize date of last CCR service / calibration.

Header / function	Data 1	Data 2	Fact set	Allowed range
System settings	CCR size CCR type Ef. Maint switch Indication type ON/OFF No of lamps Lamp rating EF Scale CCR number Circuit name CCR cntrl dir Hours for lamps CCR serv. Date	Size Type M-switch Monitor Password Lamps Lamp pwr EF Range CCR Text Dir Lamplife Lst serv	Project* Project* Project* Realtime OFF 10 45W 50M Project* Project* Project* Off Ftest date	0-30kVA from list Display only No / Efm / LF1 Realtime / Latching OFF / ON (fs pw: 547) 1-1000 in 1 lamp steps 45-300W from list 50M / 1G 0-99 APCH-SIGN, " " 01-36, 0 = not used " " Off,100,200...20 000 Set records current date
				

Setting sequence
1. Go to system settings by selecting Set/Set/More/Sys.
1. Browse the desired parameter with Next, adjust it with + / - and select Set to confirm.
1. If the CCR is with direction changer, select the other direction and set required parameters.

4.6.9 Remote control settings

These general remote control settings are only enabled when the control switch is in **Off**-position.

***Note** : ERR indication is provided if settings are not accepted.*

The CCR automatically detects if serial or parallel or no remote control card is connected and provides setting menus accordingly:

- Rcmode: Display only, serial (computerized) or parallel control card or no card detected.
- Bustype: Serial mode only. Displays which type of fieldbus card is detected (e.g. Profibus)
- Fieldb: Serial mode only, tells if 1 or 2 (redundant system) serial cards are detected
- Fails: Serial mode only. Failsafe mode i.e. what happens in case of bus failure:

Setting	Function
Cont	Continues with selected control status
Fs	Selects the failsafe step 0-7 (failsafe)
Fs off	Selects the failsafe step only if control status is Off, else continues with selected control stat.
ContHB	Continues with selected control status, Heart beat signal is used for bus failure detection.
Fs HB	Selects the failsafe step 0-7 (failsafe), Heart beat signal is used for bus failure detection.
Fs of HB	Selects the failsafe step only if control status is Off, else continues with selected control stat. Heart beat signal is used for bus failure detection.

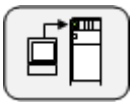
In case of direction changer CCR dir 1 is considered as failsafe direction and all circuits with circuit selector CCRs.

- F step: Serial mode only. Select a failsafe step if Fs or Fs off modes are selected
- Dec/bin: parallel mode only: coding of control signals.
- Cont/imp: parallel mode only: mode of control signals
- ComF-m: defines if all fault signals are summed to Com-fault indication (SumF) or it contains only U1, f1 and T alarms (SysF).

Displays with serial remote control card detected:

Header / function	Data 1	Data 2	Fact set	Allowed range
Remote control set	Serial/ none	Rcmode	* Project	Autodetect
	Bustype	Bustype	* Project	Autodetect
	No of serial cards	Fieldb	* Project	Autodetect
	Failsafe mode	Fails	Cont	Cont / Fs / Fs off / ContHB / FS HB / FsofHB
	Failsafe step	F step	00	0-7

Displays with parallel remote control card or no card detected:

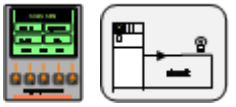
Header / function	Data 1	Data 2	Fact set	Allowed range
Remote control set	Serial/parallel cntrl	RCMODE		Auto detect: parallel / none
	Signal coding	Dec/Bin	Dec	Dec/bin
	Signal mode	Cont/imp	Cont	Cont / imp
	Com fault content	ComF-m	SysF	SysF / SumF
				 

Setting sequence
1. Set the control switch in **Off**-position.
1. Go to remote control settings by selecting Set /Set /More/Rcs.
1. Browse the desired parameter with Next, adjust it with , + / - and select Set to confirm.

4.6.10 Circuit selector minimum current setting

This setting defines the reduced output current of the CCR when disconnecting loads with the circuit selector. Optimal setting causes minimum flickering of lights without overshooting the output current when disconnecting loads with the circuit selector.

***Note** : Factory setting is minimum current with short circuit load. If more than one circuit is active, ERR indication is displayed.*

Header / function	Data 1	Data 2	Fact set	Allowed range
Set Cs min current	I2 / A	CS MIN	Short	Loads CS1-CS4 (only one) Set / Min
				

Setting sequence
1. Select the smallest of the circuit selector loads CS1-CS4. Use U2 View display to check which one is smallest (smallest U2 means smallest load).
1. Select Set/Set/More/CSI to go to circuit selector minimum current setting **.**
1. Select the desired current level with the local operation switch e.g. step 6.
1. Select Set to store the setting into memory and select Min to reset to a safe value.


4.6.11 LCD contrast setting

This setting defines the contrast of the LC-display which may need to be adjusted according the desired viewing angle and prevailing room temperature.

Header / function	**Data 1**	**Data 2**	**Fact set**	**Allowed range**
LCD contrast set	Contrast value	LCDSET	12	0-25 contrast range, 0=max
				

Setting sequence
1. Go to LCD contrast setting by selecting **Set**/**Set**/**More**/**More**/**Lcd**.
1. Adjust contrast value with , **+** / **-** and select **Set** to confirm.
1. If setting is not enough to make the contrast visible, see ../concepts/IDM-8000_troubleshooting.dita.

4.6.12 Language setting

Display language for the header and soft key texts can be selected between.

Standard English characters are used.

Header / function	Data 1	Data 2	Fact set	Allowed range
Language set	Eng	Language	eng	Eng / fin / swe / pol / spa / fra
				

Setting sequence
1. Go to language setting by selecting **Set**/**Set**/**More**/**More**/**Lng**.
1. Choose language with **+** / **-** ,and select **Set** to confirm.

5.0 Installation

5.1 General

This section deals with the installation of the CCR. Please refer to specific wiring diagrams and mechanic drawings for detailed information.

5.1.1 Transportation, Unpacking and Storage

Transportation

Make sure to do the following regarding transportation:

- Keep the CCR always in upright position during transportation and storage
- Protect the CCR from adverse weather conditions

Unpacking

Make sure to do the following upon receipt:

- Unpack and inspect the equipment immediately.
- Check the packing and equipment itself for damage.
- Notify the carrier of any damages.

Storage

Make sure to do the following regarding storage:

- Do not the store the equipment for a prolonged period in its packaging.
- Store the equipment in an environment that complies with th environmental conditions defined for its use in the Environmental section.
- Inspect the equipment regularly.

Do the following after a long storage period:

- Clean the equipment, if necessary.
- Remove the oxidation layer from the electrical contact before connection, if necessary.

NOTICE
For long term storage, it is recommended to keep the equipment in a dry (<60% humidity) and moderate temperature area (15–30°C ambient temperature).

5.1.2 Moving and Handling the CCR at Site

10 cm elevation of the bottom plate is provided to enable use of forklifts.

Keep the CCR always in upright position as it contains heavy components and fixing is designed for upright position only.

5.1.3 Installation Requirements

Note

- The CCR is designed for indoor use only, in an area with adequate ventilation for cooling the CCR.
- Make sure you use air conditioning to reduce the risk of equipment damage.
- Make sure that you install the CCR in a well-ventilated environment with sufficient clearances to walls and other objects. This way you ensure proper ventilation and smooth workflows in case of operation/maintenance tasks.
- The installation environment shall be rated at maximum Pollution Degree 2 and free of vibrations.
- The unit shall be installed on concrete floors or other non-combustible surface only.

The table below lists the heat dissipation values of the CCR:

Table 1: Heat dissipation for air conditioning calculation

Version	Value (W)
3 kVA	300 W
4 kVA	400 W
5 kVA	500 W
7.5 kVA	750 W
10 kVA	1000 W
12.5 kVA	1250 W
15 kVA	1400 W
17.5 kVA	1500 W
20 kVA	1600 W
25 kVA	2000 W
30 kVA	2400 W

5.2 Mechanical Installation

- All cable entries are through the bottom plate of the CCR.
- Leave 20cm clearance from wall and 50cm between CCR rows (back to back installation) for proper ventilation space.
- Reserve sufficient clearance in the front of the CCR for maintenance and operation purposes.

5.3 Electrical Installation

5.3.1 Mains Connection

- Connect the mains supply cable into the CCRs main switch terminals L, N (or L2), PE.
- Make sure that the cable size is sufficient for the CCR rating
- Make sure that a proper earth for the CCR is provided. Although the earth copper wire is provided with the supply, additional safety grounding of the CCR is recommended.
- Make sure that the fuse bank in the supplying low voltage switchboard is correct for the supply cable and the CCR rating. See table below

- Equipment according to IEC 61000-3-4, provided Rsce min = 175 as verified by the supply authority.
- It is recommended that the CCRs should be balanced evenly on the supply phases in order to provide as equal load for the 3 phases as possible, in all operational situations.
- OVC rating : OVC III
- Protective class of the equipment : Class I

	**NOTE!** The recommendations below should be considered as guidelines. Always follow national requirements for LV-boards and supply cables, which deviate from the values below.

CCR size	Supply	Main fuse in CCR	Recommended size of fuse or circuit breaker for supply power in LV-board	Recommended minimum cross section of supply copper wire from LV-board to CCR	Recommended minimum cross section of earth copper wire from LV-board to CCR
3 kVA	230 VAC	2 pole 20 A, c-curve	2 pole 25 A, c-curve	6 mm^2	6 mm^2
4 kVA	230 VAC	2 pole 25 A, c-curve	2 pole 35 A, c-curve	10 mm^2	10 mm^2
5 kVA	230 VAC	2 pole 40 A, c-curve	2 pole 50 A, c-curve	10 mm^2	10 mm^2
	400 VAC	2 pole 20 A, c-curve	2 pole 25 A, c-curve	6mm^2	6 mm^2
7.5 kVA	400 VAC	2 pole 25 A, c-curve	2 pole 35 A, c-curve	10 mm^2	10 mm^2
10 kVA	230 VAC	2 pole 63 A, c-curve	2 pole 50 A, c-curve	25 mm^2	16 mm^2
	400 VAC	2 pole 40 A, c-curve	2 pole 50 A, c-curve	10 mm^2	10 mm^2
12.5 kVA	400 VAC	2 pole 50 A, c-curve	2 pole 63 A, c-curve	16 mm^2	16 mm^2
15 kVA	230 VAC	2 pole 80 A, c-curve 2 pole	2 pole 100 A, c-curve	35 mm^2	25 mm^2
	400 VAC	50 A, c-curve	2 pole 63 A, c-curve	16 mm^2	16 mm^2
17.5 kVA	400 VAC	2 pole 63 A, c-curve	2 pole 80 A, c-curve	25 mm^2	16 mm^2
20 kVA	230 VAC	2 pole 100 A, c-curve	2 pole 125 A, c-curve	50 mm^2	25 mm^2
	400 VAC	2 pole 80 A, c-curve	2 pole 100 A, c-curve	35 mm^2	25 mm^2
25 kVA	400 VAC	2 pole 80 A, c-curve	2 pole 100 A, c-curve	35 mm^2	25 mm^2
30 kVA	400 VAC	2 pole 100 A, c-curve	2 pole 125 A, c-curve	50 mm^2	25 mm^2

Supply earthing systems and system voltage (V)

Supply earthing systems	**System voltage**
TN-S, TN-C, TN-CS, TT	≤230 V
TN-S, TT	≤400 V
TN-C	≤200 V
IT	≤230 V (TOV: 400 V)

Prospective short-circuit current (PSCC) and residual current device (RCD)

	IDMAN8000 (all power ratings)
Max. PSCC	6kA
Min. PSCC	1500A
RCD type	A,AC,F,B

5.3.2 AFL-Circuit Connection

- Connect each circuit to pair of terminals marked with capital and small characters (e.g. A, a)
- If more circuits than one is used the connectors are in alphabetical order i.e. circuit 1 = A, a, circuit 2 = B, b etc.
- If grounding is used connect the cable shields to the grounding terminals on the cable fixing rail of the high voltage compartment.

5.3.3 Serial Remote Control Connection

- Connect the bus cable with D9 connector directly on the face of the serial control card.

***Note** : Make sure that the connector is designed for that specific bustype (e.g. Profibus). For more information, see Appendix A – Serial communication interface – Profibus DP connection. If the connectors have termination switches, make sure their settings conform to bus configuration (normally first and last physical units are terminated. Remember that there are termination switches on the serial control cards too!). It is recommended to use the termination in the cable connector to be able to replace any unit without affecting the bus operation. Make sure that the node address setting conforms to the bus configuration.*

5.3.4 Parallel Remote Control Connection

- Connect the parallel control cable directly on the D37 connector located on the face of the card. For more information, see *Appendix E – Parallel control interface signal list*.
- Optionally IDM8000 can be delivered with terminal block-connections inside the low voltage compartment. The signal connection details are equal to the D37 connector.

***Note** : Before connecting, check that the remote control voltage setting conforms to the control voltage used.*

5.4 Load matching

Load matching is provided from 45% to 100% with 5% and 10% taps on the Main Transformer. Benefits of load matching is described in section *1.3.3 Main Transformer, Efficiency and Power Factor*.

Load matching is done by viewing the tap info in the LCD display, see figure 10, while running the CCR in local mode at step 7 with maximum load (for circuit selector CCRs all circuits must be switched on). The main transformer is then tapped to more accurately match the load. See table on next page for instructions.

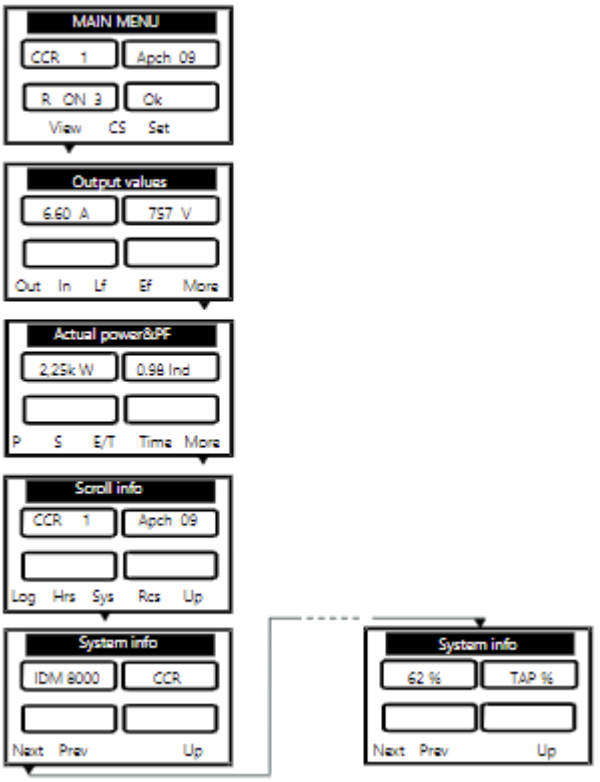


Figure 10 – Menu path to tap info

Header/ function	Data 1	Data 2	Remarks
System Info	Percentage of Load capacity being used	TAP %	Shows the percentage of main transformer capacity being used. For tap info the CCR must be set to step 7 with maximum circuit load.

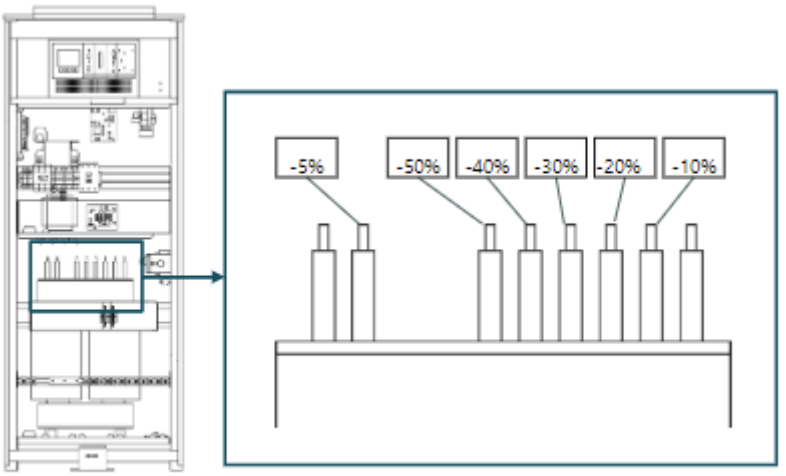


Figure 11 – Taps on the main transformer showing percentage decrease from full transformer rating.

Load Matching

1. Using local control, set the CCR to step 7. Make sure the CCR is experiencing the maximum load for the specific circuit – all fixtures should be ON. In the case of circuit selector CCRs, all circuits should be connected and ON.

1. Go to System Info: press **Next** until TAP % menu is reached.

1. Make a note of the Tap info value (%).

1. Turn the CCR OFF at main switch.

1. Open the CCR door and de-energize by setting the terminal outputs to either "Safety Mode" or "Maintenance mode" as described in *Appendix M – Output Terminals*.

Warning!
High voltage – De-energize CCR AT OUTPUT TERMINALS before PROCEEDING!

1. Using a size 10 wrench, unbolt the tap jumper lug and move it to the desired tap. Take special care to replace all washers and bolts in correct order!
2. ***Note*** **:** *The CCR should be tapped to a value +5…+10% higher than the Tap info value to compensate for variations in supply voltage.*
3. ***Example*** *: If the Tap info percentage value is 63%, a recommended tapping setting is 70%.*

1. Examine the main transformer and cabinet to ensure that no foreign objects such as tools or bolts are left inside before closing the CCR door.

	Warning! Make sure THERE ARE NO FOREIGN METAL OBJECTS LEFT INSIDE THE CCR CABINET BEFORE ENERGIZING!

1. Check the tap info again and make sure the output current is as expected while the CCR is set to step 7 with maximum load on the circuit(s).

5.5 Commissioning Procedure

The first start after shipping should be done according the following procedure:

CT no.	Task	Manual ref.	Ok
1.	Write down the CCR information		
	Write down the circuit information		
	Check that the CCR is off and the main switch is in 'Off' position		
	Open the CCR doors and set the output terminals in operating mode 'Safety'.	*Appendix M – Output Terminals*	
	Measure continuity of the circuit between output connectors A-a.		
2.	Check the supply cable and supply circuit breaker coming to the CCR. Measure the supply voltage.		
3.	Check that the system setting on the mother board are correct. Supply voltage DIP 1-2 Supply frequency DIP 3 CCR type DIP 4-6 Remote control mode DIP 7 Remote control ext.func. DIP 8 Mark the dip switch positions.	*2.6.7 Hardware system settings*	
	Check that remote control settings on remote control card are correct:		
	• Serial interface, front panel settings: Network address with rotary switches Termination setting (recommended OFF, connector terminated)	*1.3.6 Serial control interface*	
	• Parallel interface, jumpers on the remote card A3 (remove card): PR 1 Control voltage selection 24V / 48V / 60 V PR 2-4 Indication common grouping C, PI, FI C=Connected / D = Disconnected PR 5-13 Failsafe settings selection Normal / Failsafe	*1.3.7 Parallel control interface*	
	Turn the CCR on and check the green led in the PWR module.		
	Adjust the LCD contrast if necessary.	*2.6.11 LCD contrast setting*	
4a.	Clear operating time counters	*2.3 View functions*	
	System settings: Set the CCR size (***Note: If size = 0, calibrations and settings reset to factory defaults after power break***). Check the type of the CCR if set with motherboard switches. Set maintenance switch operation mode No / Efm / Lf1 Select password use. Set the circuit data, number of lamps and power of the transformers. Set the circuit id. If the CCR number is set to 0, main display shows output current and –voltage instead of circuit info. Set the lamp life monitoring parameter Set service date.	*2.6.8 System settings*	
	Check and set the time and date.	*2.6.6 Time and Date settings*	

4b.	Settings for the remote control		
	• Serial interface, Settings Rcs Check the identification of the card (Serial) Check the type of the card (Profibus) Check the number of identified cards (01 / 02) Set the failsafe mode Cont/ FS/ Fsoff/ ContHB/ FS HB/ Fsoff HB Set the failsafe step 00-07	*2.6.9 Remote control settings*	
	• Parallel interface, settings Rcs Check the identification of the card (Parallel) Set control coding Dec / Bin Set control mode Cont / Imp Set grouping mode for common fault SumF / SysF	*2.6.9 Remote control settings*	
5.	Start the CCR with local control. Check all current steps and adjust if needed.	*2.6.1 Output current step setting*	
6.	Switch the CCR off and connect the output terminals to operating mode "I2 cal". Use RMS ammeter with accuracy of 1% or better.	*1.3.4 High voltage circuit*	
	Check input voltage calibration.	*2.4.2 Input voltage U1 calibration*	
	Check output current calibration. Check output voltage calibration.	*2.4.1 Output current I2 and voltage U2 calibration*	
	Check the tapping info (System info) Adjust load matching if needed (tapping)	*3.4 Load matching*	
	If the CCR has a circuit selector installed, set the CS min current	*2.6.10 Circuit selector minimum current setting*	
7.	Run all intensity steps and check that the input voltage is sufficient.		
8..	Check and adjust/test (if desired) the supply voltage protection	*2.5.4 Input voltage protection*	
	Check and adjust/test (if desired) the input frequency protection Check and adjust/test (if desired) the temperature protection	*2.5.5 Input frequency and temperature protection*	
	Check and adjust/test (if desired) the open circuit protection	*2.5.1 Open circuit protection*	
	Check and adjust/test (if desired) over current protection	*2.5.2 Over current protection*	
	Test MCU card leds	*2.3 View functions*	
9.	Check and adjust/test (if desired) the earth fault alarm levels and maintenance switch setting.	*2.6.3 Earth fault setting*	
	Calibrate earth fault monitor and test.	*2.4.4 Earth fault calibration*	
	Connect the output terminals to operating mode "normal" after the calibration.	*1.3.4 High voltage circuit*	
	Check and adjust/test (if desired) the lamp fault alarm levels and FAA switch.	*2.6.2 Lamp fault setting*	
	Check and adjust/test (if desired) the current fault alarm levels.	*2.6.5 Current fault setting*	
	Check and adjust/test (if desired) the VA drop alarm settings.	*2.6.4 VA-Drop setting*	
	Calibrate lamp fault monitor. Write down LF lim. 1.74...3.50A.	*2.4.3 Lamp fault and VA-Drop calibration*	
10.	Check and test (if desired) the remote control function according to remote control manual.		
11.	Fill up the commissioning test report in Appendix I and sign all sheets. Store the diary and all documents inside the CCR.	*Appendix I – Commissioniong test report form*	
All the CCRs have been factory tested and have factory settings, which in most cases can be used for the project, already set.			

6.0 Maintenance

	Warning! Only qualified personnel should do maintenance tasks!

***Note** : De-energize the CCR whenever disconnecting and connecting plug in electronic cards. With circuit selector all circuits are connected in series and short circuited. Circuits are not disconnected from the high voltage output. Selection of any combination of circuits is made within the circuit selector by removing the shorts. Always check for high voltage before any work with the AFL-circuit.*

6.1 Content of Maintenance Work

The CCRs are designed using proven technology to reduce the maintenance requirements to minimum.

The maintenance tasks are securing the optimal performance of the constant current regulator and minimizing service interruptions.

Preventive maintenance program is recommended to be applied whenever possible. It can be divided in the following categories:

Type of check	Action	Man.ref	CT ref *
Visual	Remove dust and dirt if necessary Check wiring, especially earth wires. Check if loosened terminal screws. Check if any damaged or loosened components.		
Functional	Run all current steps. Check remote controls and indications. Check protections (at least open circuit)	*2.5 Protective functions*	CT-8000-LC CT-8000-RC CT-8000-PR
Calibration	Output current calibration check.	*2.4.1 Output current I2 and voltage U2 calibration*	CT-8000-CA
	Other calibration check, if desired.	*2.4.x*	

** Appendix I – Commissioning test report form*

The front doors can be only opened when the main switch is in off-position. When the door is opened the main switch can be switched on with the small handle on the switch if test runs are needed to be performed. The doors can be also removed temporarily by lifting them from their hinges and disconnecting the earth connections.

***Note:** Remember to reconnect earth wires when reinstalling the doors and covers of the CCR.*

6.2 Standard of Maintenance Work

Personnel responsible of the maintenance tasks should be familiar with standards IEC61821, FAA AC150-5340-26 and the national and local safety regulations and requirements.

6.3 Cycle of Maintenance Work

Recommended maintenance period for CCR's installed in substation environment where the CCR is not targeted by excessive dirt or humidity is one year.

In environments where dust or dirt is very severe, cleaning and verification of air circulation inside the CCR can require shorter maintenance periods.

Preventive maintenance program is recommended to be applied whenever possible.

6.4 Tools

There are no special tools required for maintenance or troubleshooting.

Below are listed some basic tools that are needed:

- True rms-reading current and voltmeter for calibration.

Screwdriver set including at least:

- Slotted 3x0.5, connectors for wires.
- Slotted 5.5x1.0, for contactors and circuit breakers.
- Slotted 8x1.2, door and main transformer connections.
- Pozidriv No 1, plug in units.
- Pozidriv No 2, length 160mm, mounting screws on installation plate.

Hexagon socket drivers:

- 10mm for output connectors.
- 8mm for housing.
- Hex Key set, metric, for supply and main transformer in larger CCRs.
- Torque wrench.
- Clean compressed air for cleaning dust or dirt
- CCR manual for correct operation procedures.

In addition to the maintenance tools:

- Spare parts for component replacement.

7.0 Troubleshooting

Warning!
High voltage present! Only qualified personnel should do troubleshooting!
If the CCR has tripped because of input voltage, frequency or temperature failure it is possible that it starts automatically when the mains returns to accepted values!
Remember to check the fault indication and the fault log before troubleshooting.

7.1 CCR Does Not Start

Check / observe	Probable cause / corrective action	Man.ref
Ok led off on the power unit	Check main switch position. Check mains values Check fuses Check supply transformer T2	*1.3.2 Power circuit*
	Check / replace the power unit	*1.3.5 Control unit*
LCD display shows no main menu and display backlight is not on after start-up.	Check DC voltages from A1 motherboard connector X7-3 (+5V) X7-4 (+12V) X7-5 (-12V) X7-6 (GND) Replace power unit (if no power). Replace LCD unit (if power ok).	
LCD display shows no main menu and display backlight is on after start-up.	Check display contrast. If not enough, remove four screws that hold the LCD display in place. Adjust from Ccal trimmer, until display visible. Replace LCD unit (if contrast not visible). Replace MCU unit (if contrast visible).	*2.6.11 LCD contrast setting*
After change of MCU control unit or LCD display unit LCD display appears shifted.	Press F1 and F5 simultaneously for 5 seconds. Replace MCU control unit (if shift does not go away)	
U1 –A or U1 +A on display	Check mains voltage level	
	Check U1 calibration	2.4.2 Input voltage U1 calibration
	Check U1 nom setting	*2.5.4 Input voltage protection* and *2.6.7 Hardware system settings*
	Check sync transformer	
Freq. A- or Freq. A+ on display	Check mains frequency level	
	Check f1 nom setting	*2.5.5 Input frequency and temperature setting* and *2.6.7 Hardware system settings*
	Check sync transformer	
Temp A1 on display	Check the temperature value from View / E/T.	2.5.5 *Input frequency and temperature setting*
	Check that ventilation is not blocked.	*1.3.1 General*
	Check temperature sensor on the thyristor cooling element.	
E fault A or B on display * only if maintenance switch function is used.	Check if Earth fault maintenance switch is on and earth fault level B is reached. If no real earth fault exists check earth fault calibration and set levels.	*2.1 Control functions, 2.4.4 Earth fault calibration, 2.6.3 Earth fault setting*

7.2 CCR Trips

Check / observe	Probable cause / corrective action	Man.ref
Ok led off on the power unit	Check mains values.	
	Check fuses.	*1..3.2 Power circuit*
	Check / replace the power unit.	*1.3.5 Control unit*
U1 –A or U1 +A on display	Check mains voltage level	
	Check U1 calibration	*2.4.2 Input voltage U1 calibration*
	Check U1 nom setting	*2.5.4 Input voltage protection*
	Check sync transformer	
Freq. A- or Freq. A+ on display	Check mains frequency level	
	Check f1 nom setting	*2.5.5 Input frequency and temperature protection*
	Check sync transformer	
Opencirc on display	Check continuity of the AFL-circuit	
	Check continuity of high voltage circuit	*1.3.4 High voltage circuit*
	Check open circuit level and delay time	*2.5.2 Over current protection*
	Check current measurement transformer and wiring	*1.3.4 High voltage circuit*
	Check continuity of power circuitry Check thyristor controller and module	*1.3.2 Power circuit*
	Check output current calibration	*2.4.1 Output current I2 and voltage U2 calibration*
OverCu A or B on display	Check over current levels and delay times	*2.5.2 Over current protection*
	Check output current calibration	*2.4.1 Output current I2 and voltage U2 calibration*
	Check thyristor controller and module Check passive filter components	*1.3.2 Power circuit*
Temp A1 on display	Check temperature values from View / E/T. (Protection level is fixed 100°C)	*2.3 View functions*
	Check temperature sensor on the thyristor cooling element.	*1.3.1 General*
	Check that ventilation is not blocked	
E fault B or A on display * only if maintenance switch function is used.	Check if Earth fault maintenance switch is on and earth fault level A is reached. If no real earth fault exists check earth fault calibration and set levels.	*2.1 Control functions,* *4.4 Tools,* *2.6.3 Earth fault setting*
VA-Drop A on display and VA-drop TRIP is selected.	Check that selection VA-drop TRIP is made. Check the connected load. *Note! When incandescent lamp gets older, apparent power will decrease.* Check if two point earth faults exist. If necessary, recalibrate LF calibration for changed load.	*2.6.4 VA-Drop setting*

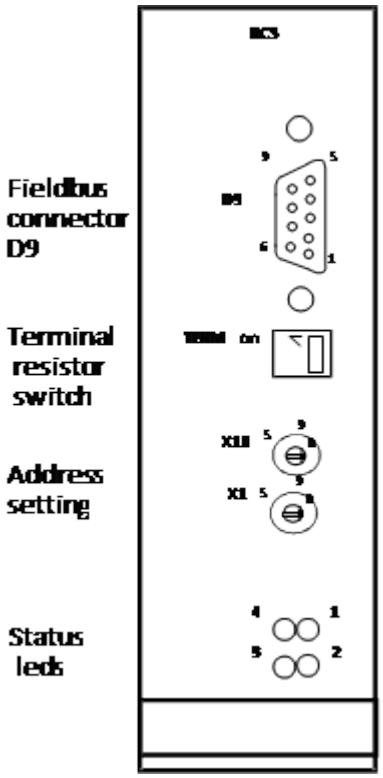
7.3 Incorrect Performance of the CCR

Check / observe	Probable cause / corrective action	Man.ref
Max output current not provided (I2max < 6.6A) Cur fail on display	Load too big for the CCR Check main transformer tapping	*3.4 Load matching*
	Check if input voltage below 0,95xU1nom	*1.3.5 Control unit*
Current step differs from the control system step request	Check that control switch is at remote position. Serial interface Check that the control card is online. Led in RCS card is green and R letter is visible on LCD display Check that the bus is working e.g. by checking that other units are online Check node address and bus termination settings	*1.3.6 Serial control interface*
	Parallel interface Check remote mode settings View/RCS Check control system voltage Check that control system voltage selector setting conforms to the cont.syst.voltage. Check that failsafe step setting conforms with the control system failsafe step Check that signal mode and coding settings conform with the control system settings Check / replace the control card	*1.3.7 Parallel control interface*
CCR provides excessive noise	Check fixing of the choke of the passive filter Check thyristor controller and module	*1.3.2 Power circuit*

Appendix A: Appendix A – Serial communication interface – Profibus DP connection

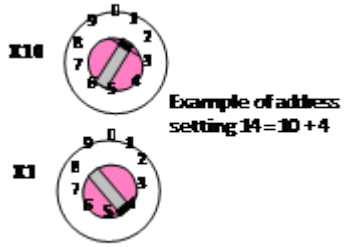
Bus cabling
The bus cabling is made in daisy chain form (from the first unit to second ... to last) Special Profibus DP cable must be used. Two wires (+ and -) are connected in each fieldbus connector.

	Warning! Make sure that the polarity is not mixed anywhere on the bus.



Bus connectors
D9 female connector provided on the card front plate. Special Profibus DP fieldbus connectors must be used. The connectors normally include 2 screw terminals for incoming and outgoing cable connection and may include also bus termination switches.
Bus termination
Profibus DP bus should be terminated from the both ends of the bus (i.e. the 1st and Last units). Termination can be done in following ways: 1. Active terminators with guaranteed power supply are recommended to use (protects against power loss of a CCR at the end of the bus). 2. If active terminators are not available use the terminators in the fieldbus connectors (disconnecting the connector will not affect the bus status) 3. As last a resort use the termination switches on the fieldbus cards.

	WaRning! Make sure that there is no double termination i.e. if use active or connector termination, Make sure that the other termination switches are off.

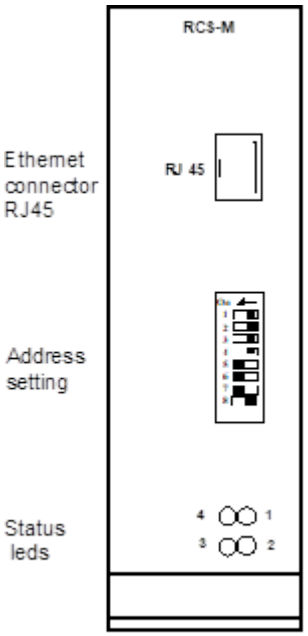


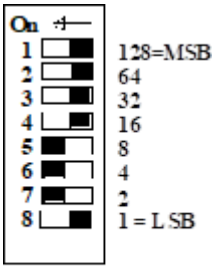
Addressing
Each fieldbus card (i.e. node) must have unique address which is set as a sum of two rotary switch settings x10' and x1' (from 0 to 99).

Status led information							
Led no.	Description	Colour	On	Off	Blink 1Hz	Blink 2hz	Blink 4hz
1	Not used						

2	Online	Green	Online	Offline	N.A	N.A	N.A
3	Offline	Red	Offline	Online	N.A	N.A	N.A
4	Diagnostics	Red	N.A	Ok	Conf err.	Parm.err.	Init.err.

Appendix B: Appendix B – Serial communication interface – Modbus TCP connection





Example of address setting 14 = 2+4+8

Cabling

Each communication interface has its own standard Ethernet connection cable which is connected (plug in) between the control system Ethernet switch (hub) and the CCR.

Connector

RJ45 female connector is provided on the card front plate.

Termination

No termination is required

Addressing

Each communication interface must have unique address on the Ethernet local area network where it is connected (including control system devices and CCR communication interfaces).

- IP address =192.168.0.n (default)

The last field n is binary coded with 8 dip-switches on the front plate of the communication interface.
***Note** : Addresses 0 and 127 cannot be used.*

- Subnet mask = 255.255.255.0 (default)
- Default gateway = 0.0.0.0 (default, no gateway set)
- It is possible to change the default IP address 192.168.0 (IAONA standard for private networks), the subnet mask and default gateway address if necessary by performing the following steps.
- Connect a PC directly to the RJ45 female connector on the CCR.
- Open a web browser and type the IP address of the CCR into the address field.
- The following screen will appear.
- 

- Type the new network information in the relevant fields.
- Store the configuration.
- Turn off the power to the CCR.
- Set the dip-switch on the CCR to address 0.

Status led information							
Led no.	Description	Colour	On	Off	Blink 1Hz	Blink 2hz	Blink 4hz
1	Link Activity	Green	Link	No link	----------	----------	----------
2	Module Status	Green	----------	---------	IP addr err	----------	----------
		Red	Double IP addr.	---------	Invalid MAC addr	Ethernet cnfg.error	Internal Err (fatal)
3	Network status	Green	No of Modbus established TCP connections = blinks / s				
4	Activity	Green	Blinks each time data packet is transmitted				

Power breaks
IDM 8000 equipped with single modbus TCP serial interface can manage 1s power breaks without any break on the control status. When returning from longer power breaks the failsafe setting will be taken and hold until the serial interface is in online mode and starts following the control system commands. The start-up time varies depending on the network status from 1 to 3s.

Appendix C: Appendix C – Serial control interface signal list – Profibus DP

Control bits:							
Bit	Byte	Signal	Remarks	Bit	Byte	Signal	Remarks
0	1	On a	Off + 7 steps	4	1	Circ 2	
1		On b	* binary coding	5		Circ 3	
2		On c	* static 1= on	6		Circ 4	
3		Dir 2/Circ 1	Acc. The CCR type	7		Hb	Heartbeat bit

Indication bits:							
Bit	Byte	Signal	Remarks	Bit	Byte	Signal	Remarks
0	1	On ind a	Off + 7 steps * binary coding * static 1= on	48	7	I2 / 0	I2 / Output current * 8A = 160 * digit = 0,05A *resol = 0,6% * Lsb= I2 / 0
1		On ind b		49		I2 / 1	
2		On ind c		50		I2 / 2	
3		Dir 2 / Circ 1	0=dir 1, 1=dir 2 / Circ 1 on	51		I2 / 3	
4		Circ 2		52		I2 / 4	
5		Circ 3		53		I2 / 5	
6		Circ 4		54		I2 / 6	
7		Remote / Local	Remote = 1	55		I2 / 7	
8	2	Pwr on	CCR powered	56	8	U2 / 0	U2 / Output voltage *resol = 0,8% *125=U2n (acc CCR size) * U2n = Pn / 6,6A * digit = U2n / 125 * eg 3,63V / 3kVA CCR * Lsb= U2 / 0
9		Oc	Over current alarm+fast I2 (1)	57		U2 / 1	
10		Uc	Open circuit alarm+SCO (2)	58		U2 / 2	
11		U1 A	Input voltage alarm)	59		U2 / 3	
12		U1 B	Input voltage warning	60		U2 / 4	
13		Freq A	Input frequency alarm	61		U2 / 5	
14		Freq B	Input freq. Warning	62		U2 / 6	
15		Temp A	Thyrist temp alarm	63		U2 / 7	
16	3	Temp B	Thyrist temp warning	64	9	P2 / 0	P2 / Output actual power * 125 = Pn (acc CCR size) * digit = Pn / 125 * eg 24W / 3kVA CCR * resol = 0,8% * Lsb= P2 / 0
17		VA-A	VA-drop level A	65		P2 / 1	
18		VA-B	VA-drop level B	66		P2 / 2	
19		Cf	Current fault	67		P2 / 3	
20		LF A	Lamp fault alarm	68		P2 / 4	
21		LF B	Lamp fault warning	69		P2 / 5	
22		EF A	Earth fault alarm (trip / m)	70		P2 / 6	
23		EF B	Earth fault warning	71		P2 / 7	

24	4	EF maint on	EF mainten. Switch on	72	10	Circ 5	Circuit 5 selected
25		EF / 0	EF / Earth fault value * value 0-100 * 127=off * Max 50M or 1G * Lsb= EF / 0	73		Circ 6	Circuit 6 selected
26		EF / 1		74		SCO	Series Cutout Open (Option)
27		EF / 2		75 - 79			Reserved
28		EF / 3		80-82	11	Type	0=Norm,1=Dir,2-4=Cs2-4
29		EF / 4		83			Reserved
30		EF / 5		84-87		Size	1=2,5kVA, 2=3kVA, 3=4kVA...12=30kVA
31		EF / 6		88	12	On a	Feedback of the other serial interface control bits when redundant duplicate interface is used
32	5	EF scale 0	Earth fault value scale 0=1k, 1=10k, 2=100k or 10M	89		On b	
33		EF scale 1		90		On c	
34		LF / 0	LF / Qty of lamp faults * 0-62 lamp faults * 63= monitoring off * Lsb = LF / 0	91		Dir2 / C 1	
35		LF / 1		92		Circ 2	
36		LF / 2		93		Circ 3	
37		LF / 3		94		Circ 4	
38		LF / 4		95		Hb.	
39		LF / 5		96-104	13		Reserved
40-47	6		Reserved	105-112	14		Reserved
				113-120	15		Reserved
				121-128	16		Reserved

(1) Fast I2: fast over current detection
(2) SCO: Optional series cut out device which opens the circuit for safe maintenance works.

Detailed descriptions of the numeric values	
EF (earth fault) isolation resistance / Bytes 4, 5 The isolation resistance value has two scaling bits: code 0= 1k / 1=10k and 2=100k or 10M ohms (in byte 5) to reduce the bits required to indicate the large scale of 1kohm-50Mohm and 1kohm-1Gohm respectively with proper accuracy. The value (0-100) has 7 bits (byte 4) and the display value can be calculated by multiplying it with the scale factor. Value 127 means that the monitoring function is off (Local control switch off)	

No of lamp faults LF / Byte 5
No of lamps faults (0-62) is coded with 6 bits in byte 5.
Value 63 indicates that the LF-monitor is off (CCR off / not all circuits selected)

I2 output current / Byte 7
The range is always from 0 to 8A regardless of the CCR size (CCR nominal output current is 6,6A). Value 160 is 8A and zero 0A.One digit is therefore 8A/160 =0,05A the resolution being 0.6%. Full range is used in order to display possible overshoots of nominal range, to get round numbers on PC display and also to minimize (often actions on change based) data transmission between the data collecting PLC and the monitoring PC which is displaying the values.

U2 output voltage / Byte 8
The value is always 0-125 in which 125 is the maximum output voltage of the CCR which again depends on the CCR size. This means that the PLC (or the PC) must have the CCR size as a parameter in order to display the actual U2. One digit is CCR size (VA) / 6.6A / 125.

P2 output actual power / Byte 9
The value is always 0-125 in which 125 is the maximum power of the CCR which again depends on the CCR size. This means that the PLC (or the PC) must use the CCR size parameter when displaying the actual P2- reading. One digit means CCR size (W) / 125

CCR type and size parameters / Byte 11 This byte indicates the CCRs type and size to control system and can be used to automatically update these parameters in the control system. Three first bits (80-82, Lsb=80) define the CCR type in binary coded format: 0=normal CCR, 1=direction changer, 2-4= 2-4 circuit selectors (Dec values) Four last bits (84-87, Lsb=84) define the CCR size in binary coded format: 1=2,5kVA, 2=3kVA, 3=4kVA, 4=5kVA, 5=7,5kVA, 6=10kVA, 7=12,5kVA, 8=15kVA, 9=17,5kVA, 10=20kVA, 11=25kVA and 12=30kVA (Dec values).
Redundant duplicated interface / other interface control bit status / Byte 12 This information is provided for the control system to facilitate control channel / interface monitoring.
Displays which can be calculated from the above values in the control system - S2 = I2 * U2 = Apparent power taken by the load -Pf2 = P2 / S2 = load power factor, how inductive the load is (lamp faults etc)

Appendix D: Appendix D – Serial control interface signal list – Modbus TCP

Control bits:							
Bit	Byte	Signal	Remarks	Bit	Byte	Signal	Remarks
0	1	On a	Off + 7 steps	8	2	Circ 5	
1		On b	* binary coding	9		Circ 6	
2		On c	* static 1= on	10			Reserved
3		Dir 2/Circ 1	Acc. The CCR type	11			Reserved
4		Circ 2		12			Reserved
5		Circ 3		13			Reserved
6		Circ 4		14			Reserved
7		Hb	Heartbeat bit	15			Reserved

Indication bits:							
Bit	Byte	Signal	Remarks	Bit	Byte	Signal	Remarks
0	1	On ind a	Off + 7 steps * binary coding * static 1= on	48	7	I2 / 0	I2 / Output current * 8A = 160 * digit = 0,05A *resol = 0,6% * Lsb= I2 / 0
1		On ind b		49		I2 / 1	
2		On ind c		50		I2 / 2	
3		Dir 2 / Circ 1	0=dir 1, 1=dir 2 / Circ 1 on	51		I2 / 3	
4		Circ 2		52		I2 / 4	
5		Circ 3		53		I2 / 5	
6		Circ 4		54		I2 / 6	
7		Remote / Local	Remote = 1	55		I2 / 7	
8	2	Pwr on	CCR powered	56	8	U2 / 0	U2 / Output voltage *resol = 0,8% *125=U2n (acc CCR size) * U2n = Pn / 6,6A * digit = U2n / 125 * eg 3,63V / 3kVA CCR * Lsb= U2 / 0
9		Oc	Over current alarm+fast I2 (1)	57		U2 / 1	
10		Uc	Open circuit alarm+SCO (2)	58		U2 / 2	
11		U1 A	Input voltage alarm)	59		U2 / 3	
12		U1 B	Input voltage warning	60		U2 / 4	
13		Freq A	Input frequency alarm	61		U2 / 5	
14		Freq B	Input freq. Warning	62		U2 / 6	
15		Temp A	Thyrist temp alarm	63		U2 / 7	

16	3	Temp B	Thyrist temp warning	64	9	P2 / 0	P2 / Output actual power * 125 = Pn (acc CCR size) * digit = Pn / 125 * eg 24W / 3kVA CCR * resol = 0,8% * Lsb= P2 / 0
17		VA-A	VA-drop level A	65		P2 / 1	
18		VA-B	VA-drop level B	66		P2 / 2	
19		Cf	Current fault	67		P2 / 3	
20		LF A	Lamp fault alarm	68		P2 / 4	
21		LF B	Lamp fault warning	69		P2 / 5	
22		EF A	Earth fault alarm (trip / m)	70		P2 / 6	
23		EF B	Earth fault warning	71		P2 / 7	
24	4	EF maint on	EF mainten. Switch on	72	10	Circ 5	Circuit 5 selected
25		EF / 0	EF / Earth fault value * value 0-100 * 127=off * Max 50M or 1G * Lsb= EF / 0	73		Circ 6	Circuit 6 selected
26		EF / 1		74		SCO	Series Cutout Open (Option)
27		EF / 2		75 - 79			Reserved
28		EF / 3		80-82	11	Type	0=Norm,1=Dir,2-6=Cs2-6
29		EF / 4		83			Reserved
30		EF / 5		84-87		Size	1=2,5kVA, 2=3kVA, 3=4kVA...12=30kVA
31		EF / 6		88	12	On a	Feedback of the other serial interface control bits when redundant duplicate interface is used
32	5	EF scale 0	Earth fault value scale 0=1k, 1=10k, 2=100k or 10M	89		On b	
33		EF scale 1		90		On c	
34		LF / 0	LF / Qty of lamp faults * 0-62 lamp faults * 63= monitoring off * Lsb = LF / 0	91		Dir2 / C 1	
35		LF / 1		92		Circ 2	
36		LF / 2		93		Circ 3	
37		LF / 3		94		Circ 4	
38		LF / 4		95		Hb.	
39		LF / 5		96-104	13		Reserved
40-47	6		Reserved	105-112	14		Reserved
				113-120	15		Reserved
				121-128	16		Reserved

(1) Fast I2: fast over current detection
(2) SCO: Optional series cut out device which opens the circuit for safe maintenance works.

Detailed descriptions of the numeric values

EF (earth fault) isolation resistance / Bytes 4, 5
The isolation resistance value has two scaling bits: code 0= 1k / 1=10k and 2=100k or 10M ohms (in byte 5) to reduce the bits required to indicate the large scale of 1kohm-50Mohm and 1kohm-1Gohm respectively with proper accuracy. The value (0-100) has 7 bits (byte 4) and the display value can be calculated by multiplying it with the scale factor.
Value 127 means that the monitoring function is off (Local control switch off)

No of lamp faults LF / Byte 5
No of lamps faults (0-62) is coded with 6 bits in byte 5.
Value 63 indicates that the LF-monitor is off (CCR off / not all circuits selected)

I2 output current / Byte 7
The range is always from 0 to 8A regardless of the CCR size (CCR nominal output current is 6,6A). Value 160 is 8A and zero 0A.One digit is therefore 8A/160 =0,05A the resolution being 0.6%. Full range is used in order to display possible overshoots of nominal range, to get round numbers on PC display and also to minimize (often actions on change based) data transmission between the data collecting PLC and the monitoring PC which is displaying the values.

U2 output voltage / Byte 8
The value is always 0-125 in which 125 is the maximum output voltage of the CCR which again depends on the CCR size. This means that the PLC (or the PC) must have the CCR size as a parameter in order to display the actual U2. One digit is CCR size (VA) / 6.6A / 125.

P2 output actual power / Byte 9
The value is always 0-125 in which 125 is the maximum power of the CCR which again depends on the CCR size. This means that the PLC (or the PC) must use the CCR size parameter when displaying the actual P2- reading. One digit means CCR size (W) / 125

CCR type and size parameters / Byte 11
This byte indicates the CCRs type and size to control system and can be used to automatically update these parameters in the control system.
Three first bits (80-82, Lsb=80) define the CCR type in binary coded format: 0=normal CCR, 1=direction changer, 2-6= 2-6 circuit selectors (Dec values)
Four last bits (84-87, Lsb=84) define the CCR size in binary coded format: 1=2,5kVA, 2=3kVA, 3=4kVA, 4=5kVA, 5=7,5kVA, 6=10kVA, 7=12,5kVA, 8=15kVA, 9=17,5kVA, 10=20kVA, 11=25kVA and 12=30kVA (Dec values).

Redundant duplicated interface / other interface control bit status / Byte 12
This information is provided for the control system to facilitate control channel / interface monitoring.

Displays which can be calculated from the above values in the control system
- S2 = I2 * U2 = Apparent power taken by the load
-Pf2 = P2 / S2 = load power factor, how inductive the load is (lamp faults etc)

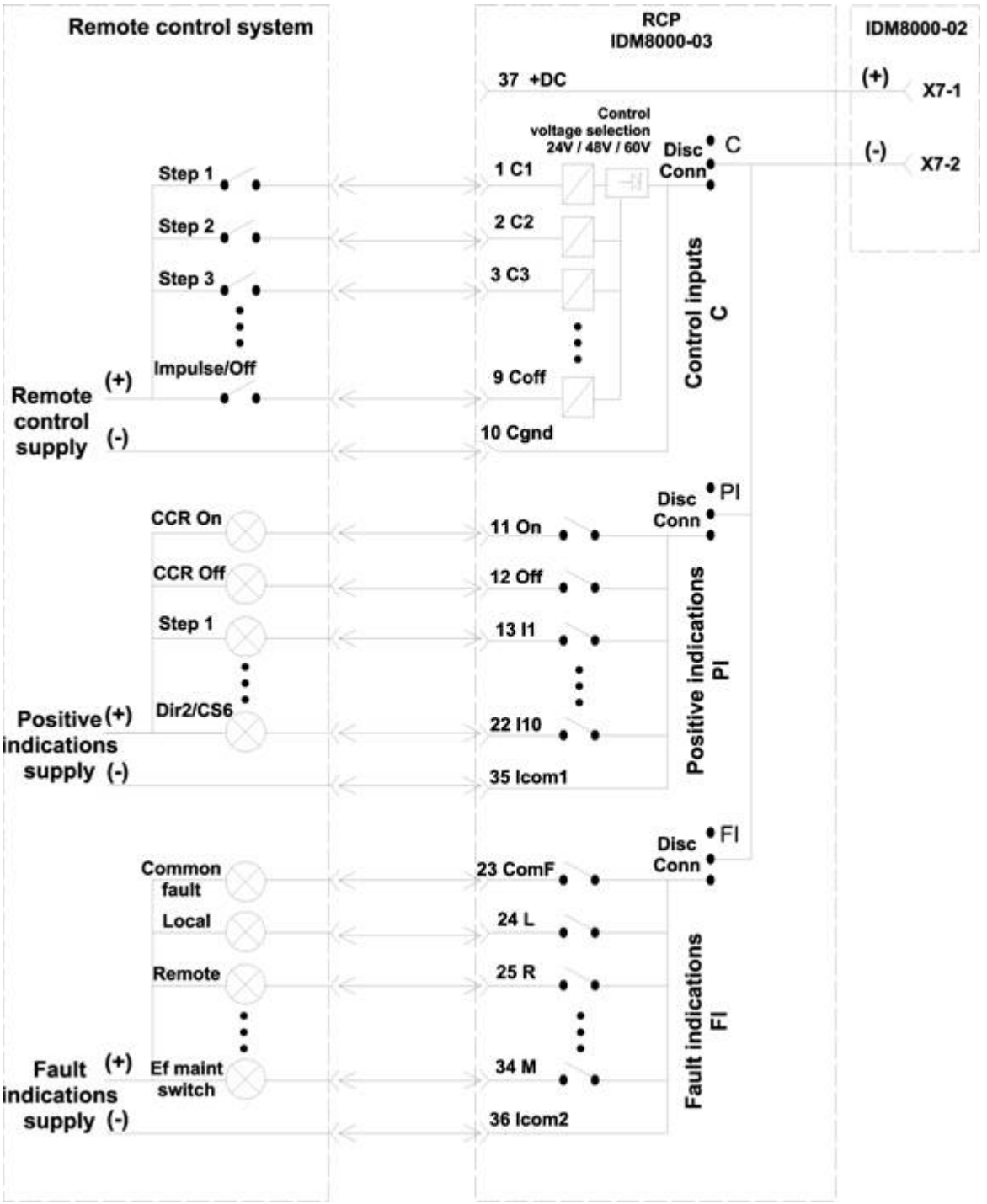
Appendix E: Appendix E – Parallel control interface signal list

D37-M connector on front panel:

Pin	Group	Abbrev.	Normal / dir CCR		Circuit selector CCR	
			Dec	Bin	Dec	Bin
1	C	C1	Control, step 1	Control b0	Control, step1	Control b0
2	C	C2	Control, step 2	Control b1	Control, step2	Control b1
3	C	C3	Control, step 3	Control b2	Control, step3	Control b2
4	C	C4	Control, step 4	N.A	Control, circuit 1	
5	C	C5	Control, step 5	N.A	Control, circuit 2	
6	C	C6	Control, step 6	N.A	Control, circuit 3	
7	C	C7	Control, step 7	N.A	Control, circuit 4	
8	C	C8	Control dir 2 , Start (If start in use dip sw)		Control, circuit 5	
9	C	C9	Control, off (imp)		Control, circuit 6	
10	CC	Cgnd	Control common			
11	PI	On	CCR on indication			
12	PI	Off	CCR off indication			
13	PI	I1	Step1 on indication	Step ind b0	Step 1 ind.	Step ind b0
14	PI	I2	Step2 on indication	Step ind b1	Step 2 ind.	Step ind b1
15	PI	I3	Step3 on indication	Step ind b2	Step3 ind.	Step ind b2
16	PI	I4	Step4 on indication	N.A	Circuit 1 on indication.	
17	PI	I5	Step5 on indication	N.A	Circuit 2 on indication	
18	PI	I6	Step6 on indication	N.A	Circuit 3 on indication	
19	PI	I7	Step7 on indication	N.A	Circuit 4 on indication	
Pin	**Group**	**Abbrev.**	**Normal / dir CCR**		**Circuit selector CCR**	
			Dec	**Bin**	**Dec**	**Bin**
20	PI	I8	N.A	N.A	N.A.	
21	PI	I9	Dir 1 ind.	Direction 1 ind.	Circuit 5 on indication	
22	PI	I10	Dir 2 ind.(Start if used)	Dir 2 ind.(Start if used)	Circuit 6 on indication	
23	FI	ComF	Common fault, according to mode selection (Comf): All indications = Sumf / Power + U1 +f1 + T =Sysf alarms			
24	FI	L	Local control indication.			
25	FI	R	Remote control indication.			
26	FI	Uc	Open circuit alarm			
27	FI	Oc	Over current alarm			
28	FI	Cf	Current fault alarm			
29	FI	Lfa	Lamp fault alarm A			
30	FI	Lfb	Lamp fault warning B			
31	FI	VA	VA-drop alarm			
32	FI	Efa	Earth fault alarm A			

33	FI	Efb	Earth fault warning B
34	FI	M	Earth fault maintenance switch on indication or optional SCO indication.
35	PI	Icom1	Common for positive (PI) indications
36	FI	Icom2	Common for alarm (FI) indications
37		DC	Internal DC out

Appendix F: Appendix F – Parallel remote control example



Example of remote control with parallel interface, refer to signal chart on *Appendix E – Parallel control interface signal list*.

Appendix G: Appendix G – Profibus DP design notes/AFL-control system designers

Profibus DP general features	
Topology	Linear bus with terminators
Communication mode	Half duplex
Transmission rate	Configurable 9,6k-12Mbd
Max. bus length	Up to 1200m depending on the transmission rate and busmaster type
Possible transmission media	Twisted pair (RS-485), fiber optic link or wave quide
Connector	9-pin Sub-D
Number of slave stations	Norm 32 without repeaters and 126 with repeaters
Number of repeaters	Norm max 3
Number of I/O / slave	2048 / 2048 max
Total bus I/O	E.g. 242 input and output words (Modicon PBY 100 busmaster module)

Fieldbus hardware signal connection / Profibus DP:		
D9 pin no	Signal / Profibus DP	Remarks
Housing	Shield	Bus cable shield, connected to PE
1	Not connected	
2	Not connected	
3	B-line	Positive RxD / TxD according to RS 485 specification
4	RTS	Request to send
5	GND BUS	Isolated GND for the BUS termination
6	+5V BUS	Isolated +5V for the bus termination
7	Not connected	-
8	A-line	Negative RxD / TxD according to RS 485 specification
9	Not connected	-

PROFIBUS DP CONFIGURATION NOTES	
Configuration tools	Profibus DP bus must be configured with a special configuration SW-tool.(e.g. Hilscher Sycon PB)
Gsd-file	A GSD file which defines properties of the slave is needed for each slave type and must be loaded into the configuration tool. From the GSD-file desired input / output modules can be selected: • Valid GSD-file : HMS1003.GSD • Output modules: 1 byte • Input modules: 16 bytes
Transmission speed	9,6k-12Mbit/s, according the bus length
Bus I/O capacity	Defines actually how many IDM 8000:s can be connected Max no of slaves= Int (I/O capacity (bytes) / 16) e.g. Int (484/16) = 30 IDM 8000:s if I/O capacity is 484 bytes .
Bus failsafe state	Normally continue / reset. Continue recommended in single bus systems

Failsafe mode / Use of the heartbeat bit recommended
The CCR is considered to be online if the Profibus DP protocol is running but cannot know if the connection to host computer actually exists. (It is possible that the Profibus DP busmaster is running without connection to the host computer). The failsafe Hb (heartbeat bit) function can be used to check the host computer connection: Hb bit changes it state in max 1s intervals (this functionality must be included in the control system) which the CCR checks to define its online status.

Appendix H: Appendix H – Modbus TCP design notes/AFL-control system designers

The interface uses Modbus TCP / IO-scanning service where the master device scans (i.e. reads and writes) the slave units with predefined time intervals (Scan time, tscan).

Typically Modbus TCP IO-scanning service may have max 64 or 127 slave units and at least following parameters for each scanned slave unit:

Scan time	Defines how often the slave units are scanned. Faster scan times provide faster response times but require more bandwidth from the communication network The required bandwidth can be roughly estimated with following formula: Bandwidth (kbit/s) = 500 / tscan (ms) * Qty of slaves (Factor 500 = 9*16bits * safety factor = data per slave) Recommended scan times (tscan) are 100-500ms.	
		Warning! Scan times over 900ms cannot be used with heartbeat bit failsafe setting because the heartbeat bit is checked in 1s intervals in the CCR.
	***Note** : Sometimes the master configuration may include several general scan level settings (e.g. fast / normal / slow) of which the desired level can be selected for each slave. If more than one level is used then the bandwidth calculation must be done for each scan level.*	
Unit IP address	Each slave has its own unique IP address. The same address which is set to the slave unit must be declared to master unit.	
Read ref (In area)	0 (dec) / 000(h) This setting defines where the read data is located in the Modbus TCP slave memory	
Write ref (Out area)	1024 (dec) / 400(h) This setting defines where the write data is located in the Modbus TCP slave memory	

Failsafe mode / Use of the heartbeat bit recommended
The CCR is considered to be online if a physical link to any Ethernet device exists regardless if any data is actually transmitted with the control system host computer. Therefore it is possible that the CCR is online without connection to the control system host computer. The failsafe Hb (heartbeat bit) function can be used to check the host computer connection: Hb bit changes it state in max 1s intervals (this functionality must be included in the control system) which the CCR checks to define its online status.

Appendix I: Appendix I – Commissioning test report form

IDM 8000 Commissioning Test

IDM 8000 COMMISSIONING			*Serial number*				*Sign/Date*						
IDM 8000 sw v2.30...							CT-8000-2k						
Project number							Station name						
Customer							CCR number						
CCR type number	IDM 8000-						SW version						
1. CIRCUIT INFORMATION											CT-8000-CD		
Check	Circuit 1		Circuit 2		Circuit 3		Circuit 4		Circuit 5		Circuit 6		
1. Circuit name / direction													
2. Continuity [Ω]													
3. Isolation [Ω]													
4. Primary cable length [m]													
5. Lamp power [W] / Trafo power rating [W] / Count													
6. Lamp life [hours]													
2. SAFETY											CT-8000-SA		
Check	Result						Check						Result
1. Supply cable size [mm^2]							4. Supply fuse for the CCR (LV panel)						
2. Earthing conductor size [mm^2]							5. Supply fuse identification / code						
3. Earthing resistance [< 0.5 Ω]							6. Supply voltage, measured value [V]						
3. SETTINGS HARDWARE											CT-8000-SE		
System (motherboard settings)	Dip switch setting						Remote control, Parallel					Jumper setting	
1. U1-nom. (dip sw 2-1)							7. Control voltage 24V / 48V / 60V DC						
2. F1–nom. (dip sw 3)							8. Failsafe step, 0-7 and circuit						
3. CCR type (dip sw 6-4)							9. Ind.grouping C, PI, FI C/D						
4. Parallel / Serial (dip sw 7)							Remote control, Serial (1 / 2)					Front panel setting	
5. (S) redundant /(P) start (dip sw 8)													
DIP POS	8	7	6	5	4	3	2	1	10. Field bus address				
6. HW setting dip switch									11. Terminator setting				

IDM 8000 COMMISSIONING	*Serial number*		*Sign/Date*	
4. SETTINGS SOFTWARE				CT-8000-SE
System settings		Remote control, Parallel		**Settings-Rcs**
Settings – Hrs	Result	6. Control coding Dec / Bin		
1. Clear operation time counters		7. Control mode Cont / Imp		
Settings – Sys	Result	8. Common fault content SumF / Sysf		
2. CCR Size		Remote control, Serial		**Settings-Rcs**
3. Maintenance switch use		9. Serial field bus type		

4. Lamp life monitoring		10. Interface count 1 / 2	
Settings – Time	Result	11. Failsafe mode	
5. Set time and date		12. Failsafe step 0-7	
5. LOCAL CONTROLS			CT-8000-LC
Check	Result	Check	Result
1. Main switch		4. Circuit selector control if available	
2. Local steps 1-7		5. Remote control mode	
3. Direction controls if available		6. Detection remote control interfaces	
6. CALIBRATION AND MAIN TRANSFORMER TAPPING			CT-8000-CA
Function	Result	Function	Result
1. U1 input voltage [V]		4. Tapping info [%]	
2. I2 output current [A]		5. Main trafo output tap setting [%]	
3. U2 output voltage [V]		6. CS min setting	

7. REGULATION								CT-8000-RU
U1 [V]	Load	Step	I2ccr [A]	I2ext [A]	Accept	U2ccr [V]	P2ccr [W]	Remarks
		1						
		2						
		3						
		4						
		5						
		6						
		7						

IDM 8000 COMMISSIONING			*Serial number*			*Sign/Date*			
8. PROTECTIVE FUNCTIONS									CT-8000-PR
Input and temp.	Limit	Delay	Func	Output	Limit	Delay	Reset m	Cap_m	Func
1. U1 B+				6. Open circuit					
2. U1 B-				7. Over current A				*NA*	
3. F1 B+				8. Over current B				*NA*	
4. F1 B-				9. SCO	*NA*	*NA*		*NA*	
5. Temperature B									

9. MONITORING FUNCTIONS AND CALIBRATION							CT-8000-MF
Earth fault	Limit	Delay	Func	Current fault	Limit	Delay	Func
1. EF A				9. CF +			
2. EF B				10. CF -			
3. EF maint	EF B	*NA*					
Calibration	Limit	Delay	OK	VA-drop	Trip	Alarm	Func
4. EF				11.VA (A/T/O)			
5. LF limit	A	*NA*					
Lamp fault	Limit	Delay	Func		Limit	Delay	Func

6. LF A				12. VA-A			
7. LF B				13. VA-B			
8. Lf1 FAA	*NA*	*NA*		14. Led test	*NA*	*NA*	

IDM 8000 COMMISSIONING		*Serial number*		*Sign/Date*		
10. REMOTE CONTROL				CT-8000-RC		
Controls	Func	Indic / Ctrl.	Func	Indic / Status	Func	Indic Fault	Func
Step 1 / a		On 1 / a		Off (P)		Open circuit/ SCO (P)*	
2 / b		2 / b		On		Over current	
3 / c		3 / c		Local control (P)		Current fault	
4 (P)		4 (P)*		Remote control		ComF (P)	
5 (P)		5 (P)		EF A		LF A	
6 (P)		6 (P)		EF B		LF B	
7 (P)		7 (P)		Maint sw ON or SCO		VA-drop A	
Dir 2 / CS 1		Dir 2 / CS 1		U1 A (S)		VA- drop B (S)	
CS 2		CS 2		U1 B (S)		EF [Ω] (S)	
CS 3		CS 3		F1 A (S)		SCO (S)	
CS 4		CS 4		F1 B (S)		CCR size (S)	
CS 5		CS 5		T1 A (S)		LF (S)	
CS 6		CS 6		T1 B (S)		I2 [A] (S)	
		DIR 1 (P)		Redundant control (S)		U2 [V] (S)	
Only* (P) = Parallel, (S) = Serial						P2 [W] (S)	
						Failsafe function	

11. UPDATES			CT-8000-UD	
Description	Ver.	Comments	Sign.	Date

Appendix J: Appendix J – Spare part list

Part ID's are labeled in the CCR and specified in *Appendix K – Components of electronics and Appendix L – CCR components*.

The following information, found on the name plate of the CCR, is required per CCR when ordering spare parts:

Type number:	
Serial number:	
Supply voltage:	
Rating:	
Remote control type:	

Figure call-out[1]	Version	Power rating	Ordering code
A1	Mother board	1 – 30 kVA	SG11478
A2	MCU Control unit [1]	1 – 30 kVA	SG16581
A3	Parallel control interface	1 – 30 kVA	SG11479
A3	Serial control interface PROFIBUS DP	1 – 30 kVA	SG11488
A3	Serial control interface MODBUS TCP	1 – 30 kVA	SG11487
A4	Power unit	1 – 30 kVA	SG11480
A5	LCD display unit [2]	1 – 30 kVA	SG11476
A6	Thyristor controller, for CCRs manufactured before 2003	3 – 4 kVA	SG15268
		5 – 30 kVA	SG15269
A6	Thyristor controller (Trigger unit)	1 – 30 kVA	SG11489
A7	Earth fault module LV, 50 MΩ range	1 – 30 kVA	SG11474
A8	Earth fault module HV, 50 MΩ range	1 – 30 kVA	SG11472
K1	Main contactor	1 – 3kVA	SG17789
		4 – 5 kVA	SG15513
		7.5 kVA	SG17790
		10 kVA	SG17791
		12.5 – 15.5 kVA	SG17792
		17.5 – 20 kVA	SG17793
		25 – 30 kVA	SG17794

Figure call-out [1]	Version	Power rating	Ordering code
L1	Choke (Inductor)	3 kVA	19245
		4 kVA	19246
		5 kVA	19247
		7.5 kVA	19248
		10 kVA	19249
		12.5 kVA	SG19250
		15 kVA	SG19251
		17.5 kVA	SG19252
		20 kVA	SG19253
		25 kVA	SG19254
		30 kVA	SG19255
SA1-2	Surge arresters Pair supply	1 – 30 kVA	SG11481
SA3-4	Surge arresters Pair output	3 kVA	11485
		4 – 7.5 kVA	11486
		10 kVA	SG11482
		12.5 – 15 kVA	SG11483
		17.5 – 30 kVA	SG11484
T2	U1 Synchronizing transformer	1 – 4 kVA	SG11521
		5 – 30 kVA	SG11522
T3	U2 Output voltage transformer	1 – 3 kVA	SG19234
		4 kVA	SG19235
		5 kVA	SG19236
		7.5 kVA	SG19237
		10 kVA	SG19238
		12.5 kVA	SG19239
		15 kVA	SG19240
		17.5 kVA	SG19241
		20 kVA	SG19242
		25 kVA	SG15429
		30 kVA	SG19243
T4	I2 Output current transformer	1 – 30 kVA	SG11524
V1 (incl. RC)	Thyristor pack (Thyristor Unit and RC)	3 – 4 kVA	SG11491
		5 – 17.5 kVA	SG11492
		20 – 30 kVA	SG11490
	Slide Switch Terminal (phased out)	1 – 30 kVA	ELLM6/8.STISPP

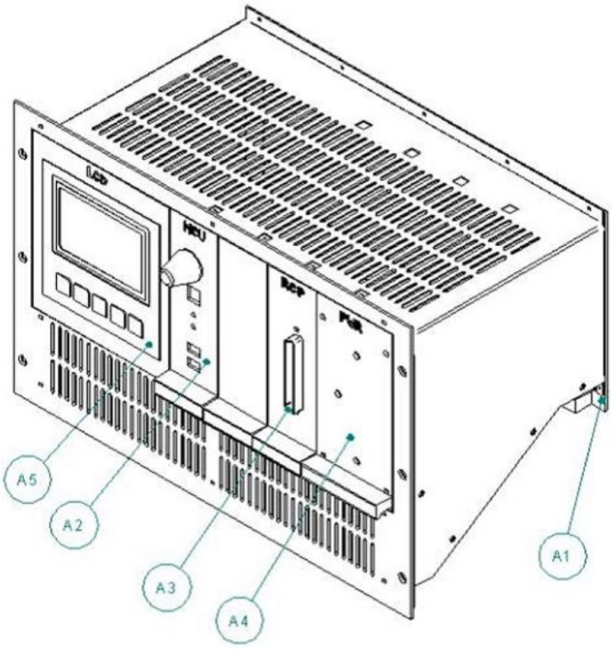
Figure call-out[1]	Version	Power rating	Ordering code
F1	MCB	1 kVA	SG19232
		3 kVA	SG17795
		4 kVA	17796
		5 kVA	SG17797
		7.5 kVA	SG17798
		10 kVA	SG17799
		12.5 kVA	SG17800
		15 kVA	SG15874
		17.5 kVA	SG17801
		20 kVA	SG16060
		25 kVA	SG16060
		30 kVA	SG17802
Not on drawing	Communication Card Slot Cover Plate	1 – 30 kVA	R008803
	Terminal Block For MW		ELLR002803U
	SCO Cut-out device		ELLB008800
	Wheels	with brake	H021810
		without brake	H021811

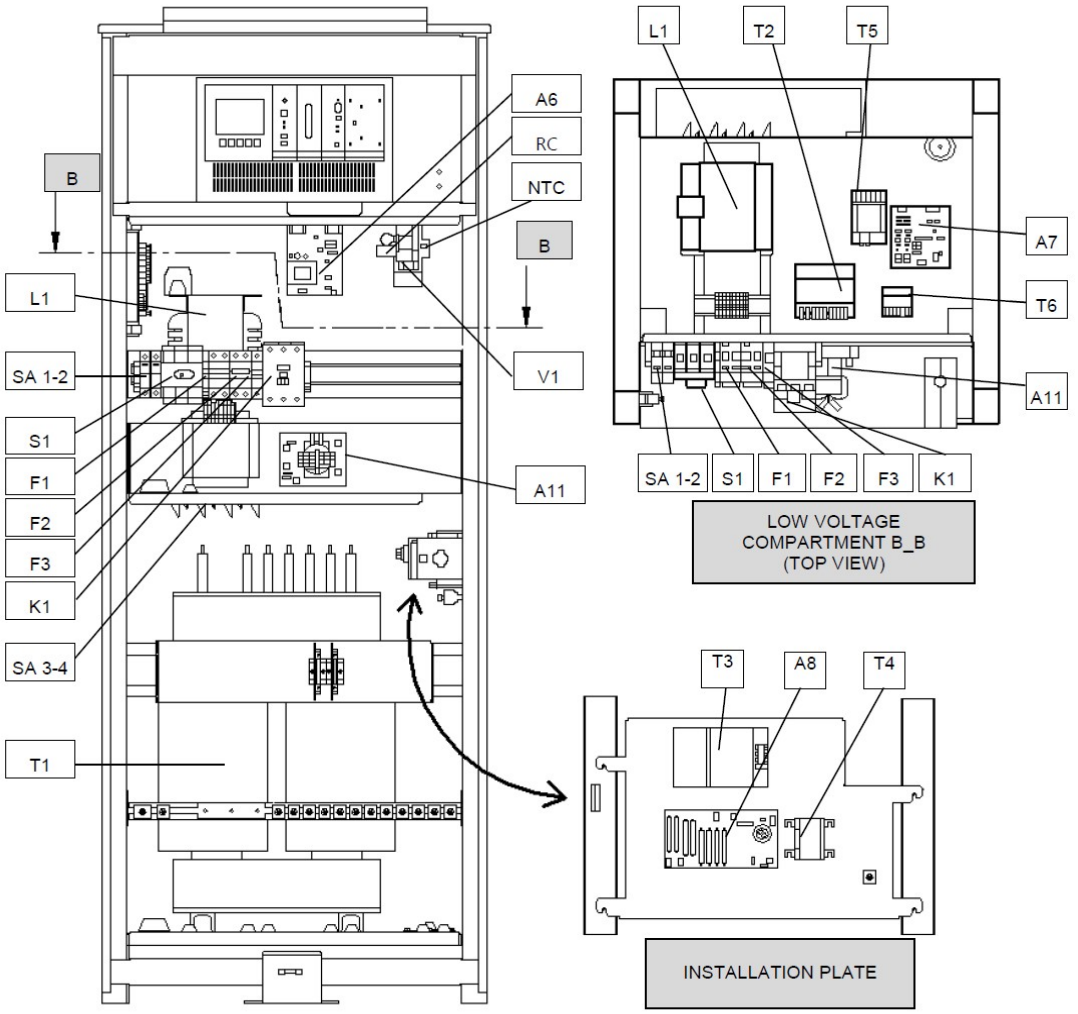
Notes

1 Refer to the figures at the bottom of this appendix.

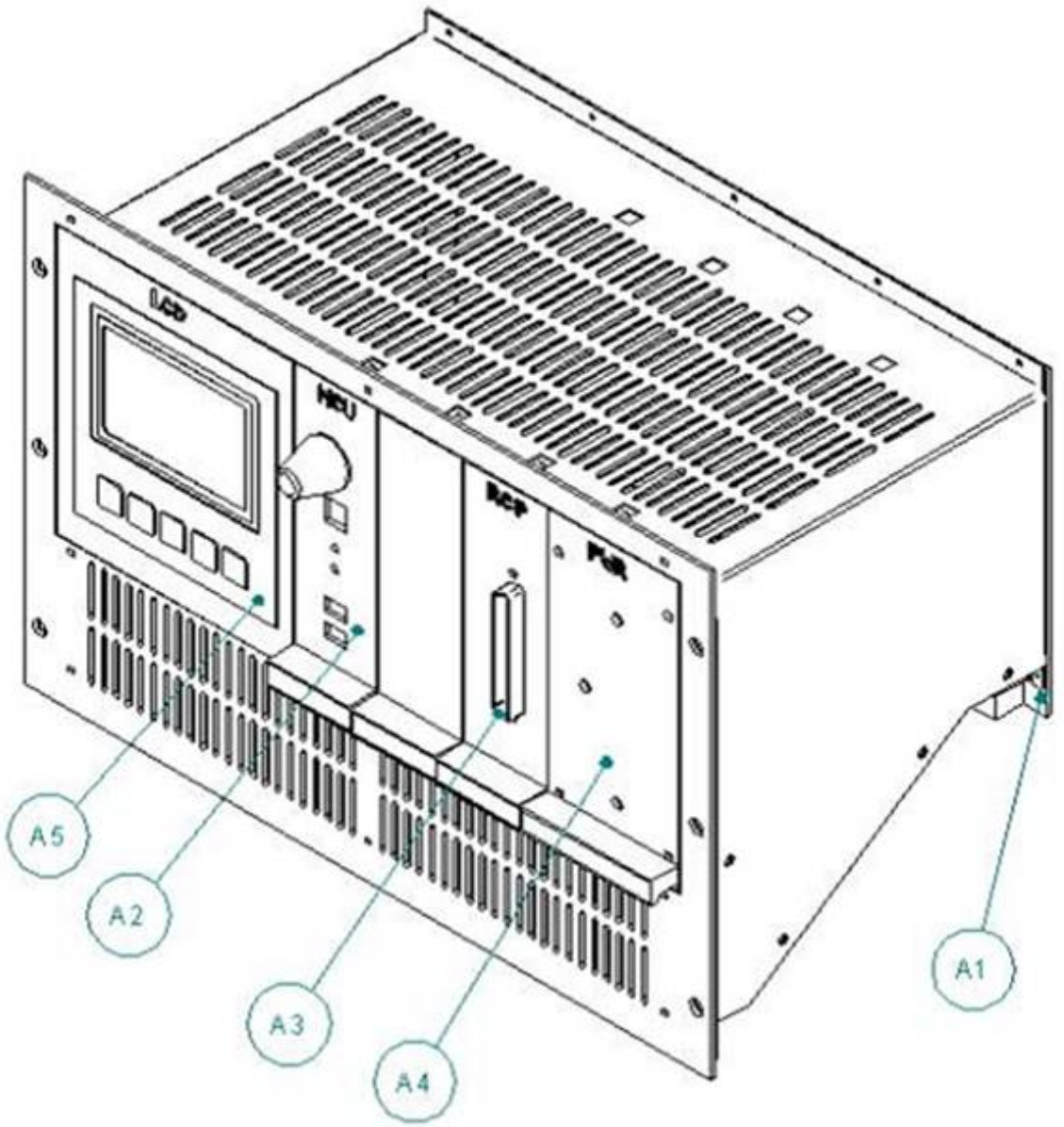
[1] When replacing an MCU control unit there may be a shift in the LCD display causing only half the screen to be displayed properly. If this is the case, press the F1 and F5 buttons simultaneously for more than 5 seconds to correct the problem. This is due to a generation shift in the LCD display units.

[2] When ordering a new LCD display unit, please check the software version of the MCU control unit. If it is version 2.30c or earlier, then the MCU control unit must also be replaced at the same time. The software version of the MCU can be viewed from the LCD display under the System Info menu, or noted in the Factory Test protocol in the door of the CCR, under “SW version”.



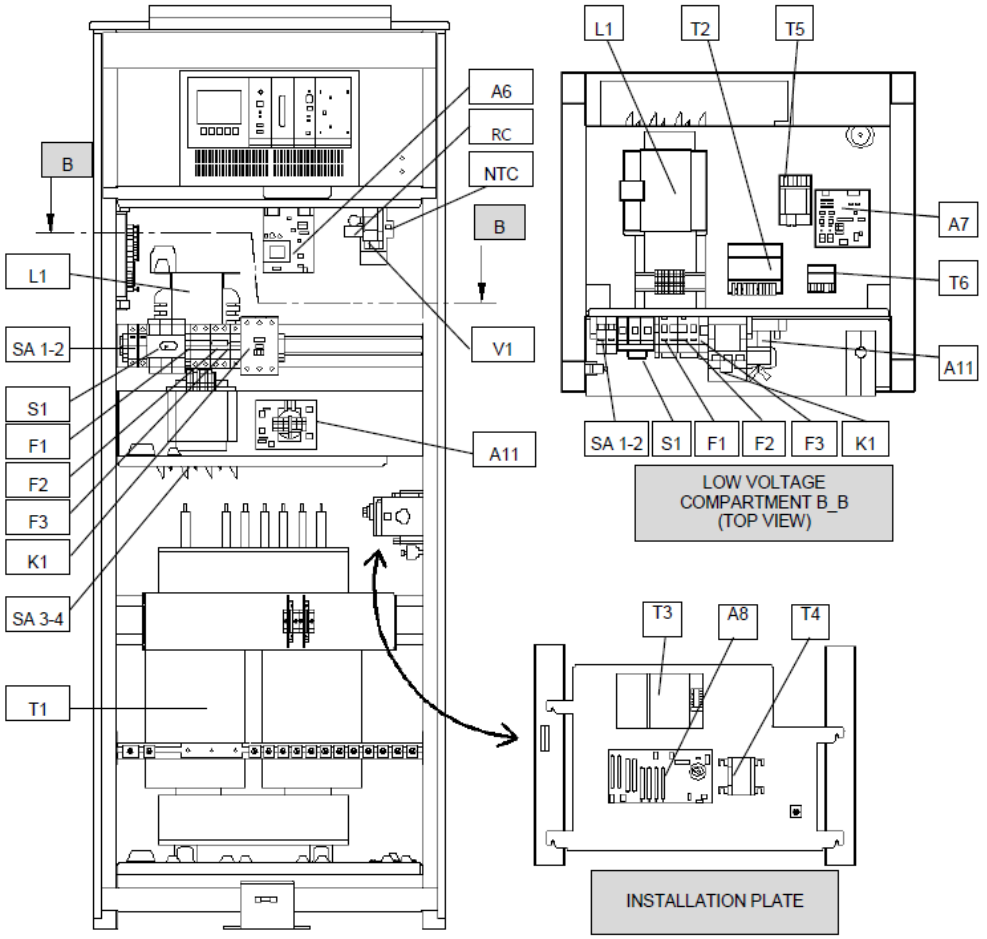


Appendix K: Appendix K – Components of electronics



Component ID	Description
A1	Mother board
A2	MCU control unit
A3	Control interface card
A4	Power unit
A5	LCD display unit

Appendix L: Appendix L – CCR components



Component ID	Description	Component ID	Description
A7	Earth fault module LV	T2	U1 Synchronizing transformer
A8	Earth fault module HV	T3	U2 Output voltage transformer
A11	EMI filter	T4	I2 Output current transformer
F1-F3	Circuit breakers	T5-T6	Earth fault measurement supply transformers
K1	Main contactor	V1	Thyristor unit
L1	Choke (Inductor)		
NTC	Temperature sensor		
RC	Snubber		
S1	Main switch (SG17188)		
SA 1-2	Surge arrester pair supply		
SA 3-4	Surge arrester pair output		

Appendix M: Appendix M – Output Terminals

M.1 Slide Switch Terminal, Option

Restriction

This option is phased out and is no longer available!

One pair of connectors is provided for each circuit of the CCR. Each pair is labeled with a capital and small character: e.g. **A** for output and **a** for return of the loop.

The output terminals are mounted on isolated rail and insulators are also used between the terminals in order to meet the dielectric test voltage requirements.

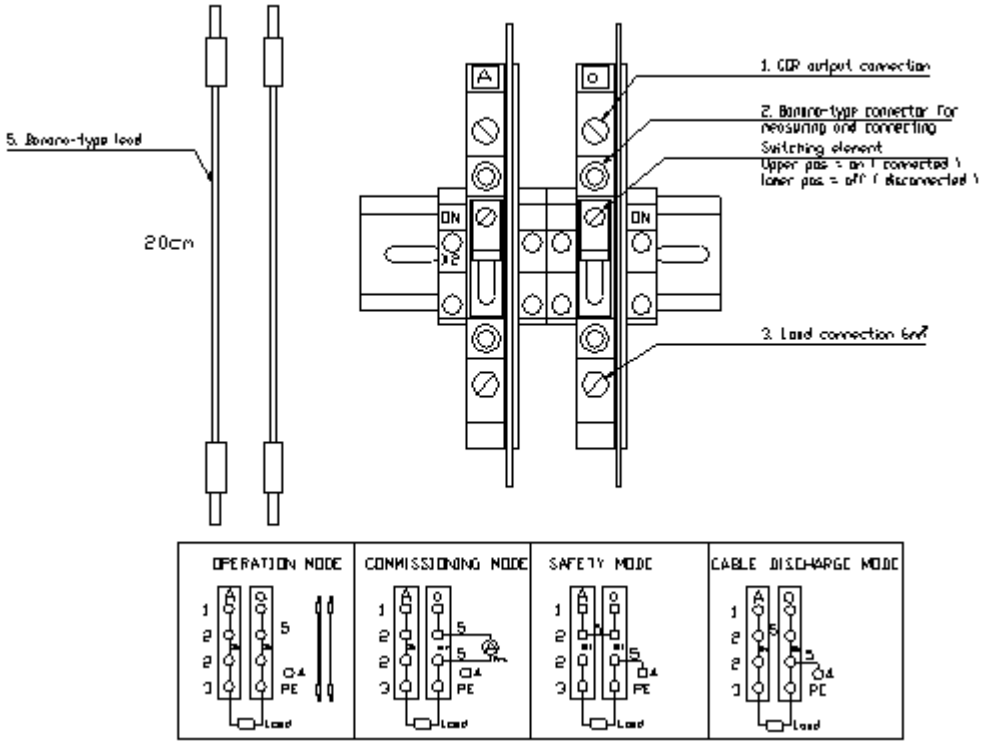


Figure 13 – Output terminal pair with different operating modes

- Commissioning mode: A-meter for calibration can be easily connected by turning the slide switch in off-position in one of the terminals and by connecting the meter with test leads supplied with the CCR into the meter output / return of the terminal.
- Safety mode: Grounding and output shorting can be achieved by turning off both slide switches and short circuiting the meter outputs of both terminals and connecting the meter return to the ground with the test leads.
- Cable discharge mode: Use cable discharge to remove capacitive voltage from the cable.

***Note** : Check that the slide switch is properly tightened after changing its position.*

M.2 Terminal Taps

One pair of connectors is provided for each circuit of the CCR. Each pair is labelled with a capital and small character: e.g. **A** for output and **a** for return of the loop.

This output terminal is standard for all CCRs.

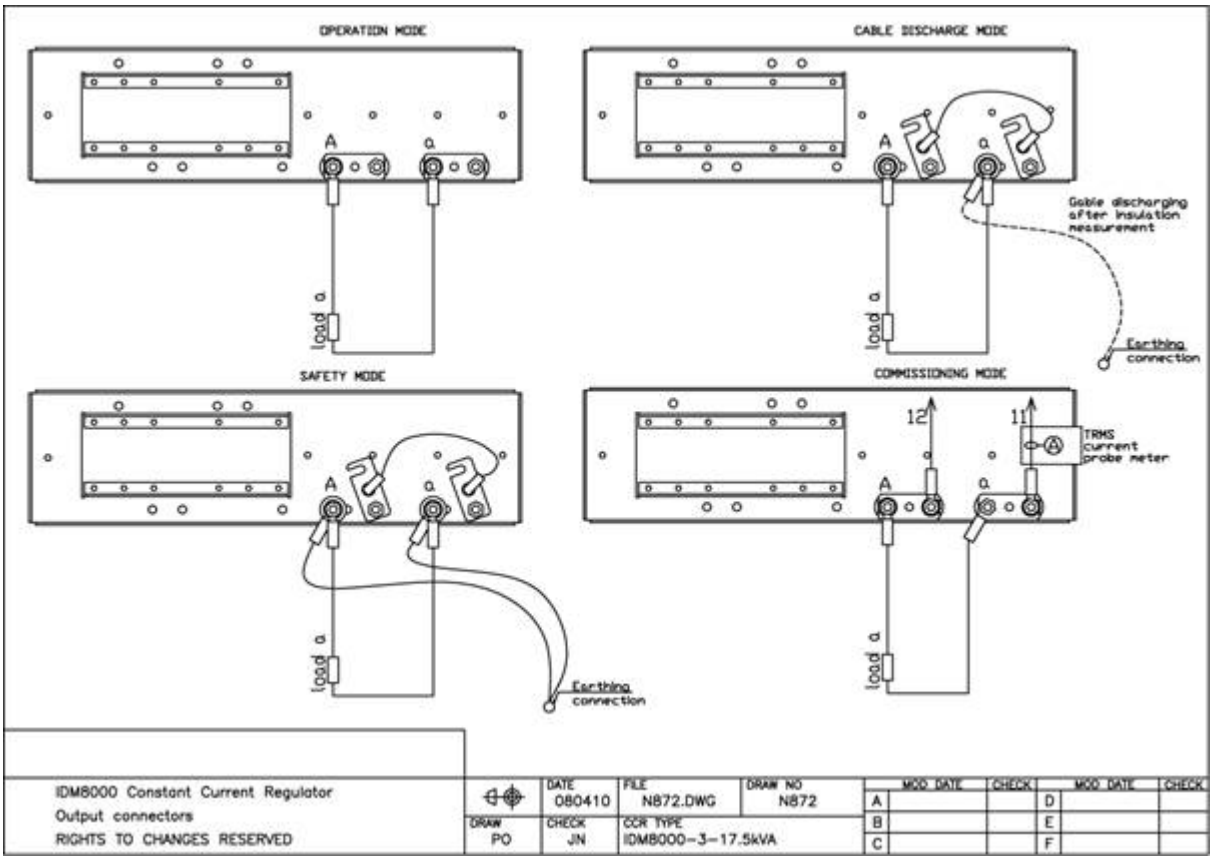


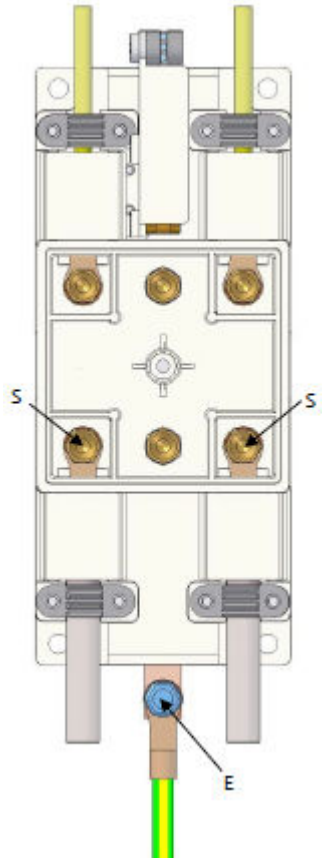
Figure 14 – Output terminal tap pair with different operating modes

- Commissioning mode: For output current checking and calibration use the TRMS current probe meter.
- Safety mode: Grounding and output shorting can be achieved by opening both terminal taps connection plates and short circuiting the meter outputs of both terminals and connecting the meter return to the ground with the test leads
- Cable discharge mode: Use cable discharge to remove capacitive voltage from the cable

***Note** : Check that the terminal taps are properly tightened after changing its position.*

M.3 Series Cut Out (SCO), Option

Connecting the cables to the SCO
Use the 6mm cable glands, provided with the SCO to connect the cables to the terminals marked with (S). Use the tension relief to hold the cables in position. Connection for the cable shield can be made by using the earthing rod (E).



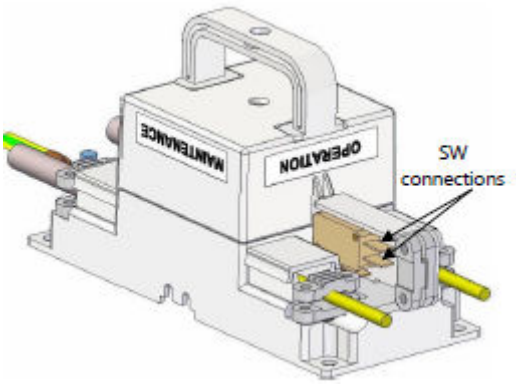
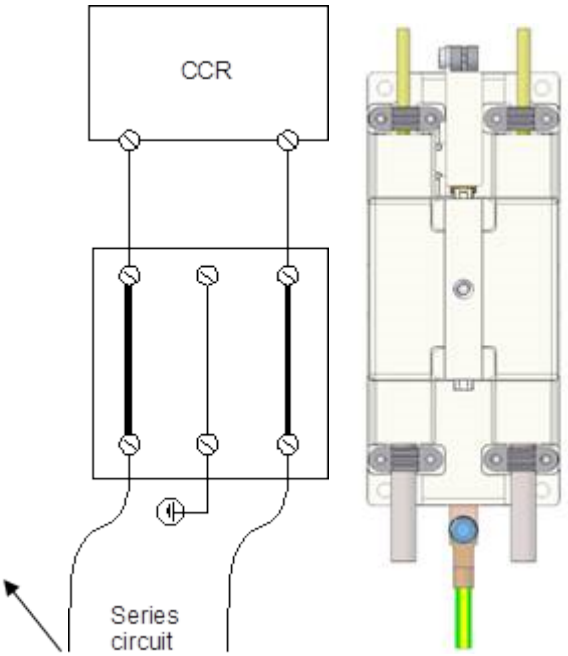


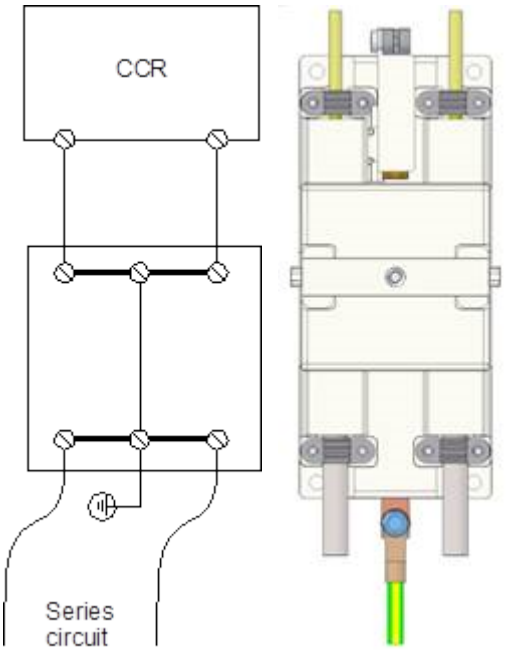
Figure 15 – SCO installation

SCO Use
Never leave the unit with the cover removed. To change the operation state, first turn off the CCR because the unit is not designed to interrupt the high voltages present in the series circuit. The micro switch is an added safety feature but should not be considered to be used to operate the CCR. When the CCR is off from the main switch, open the locking screw in the middle of the cover, remove gently the cover and insert the cover back to one of the following modes and tighten the locking screw. Be careful when inserting the cover that all connections are made properly. For more information, see the SCO manual or www.adbsafegate.com.

E



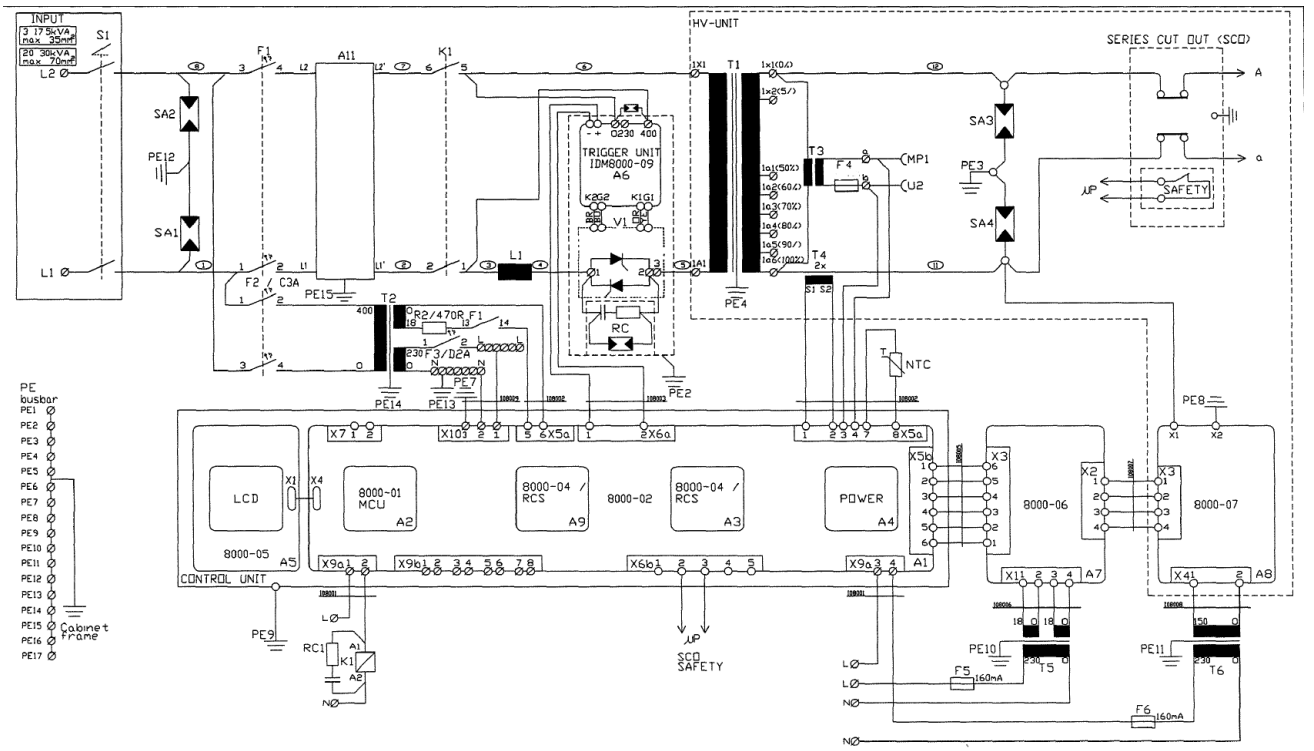
Operation mode



Maintenance mode

Figure 16 – SCO with different operating modes

Appendix N: Appendix N – Principle wiring diagram



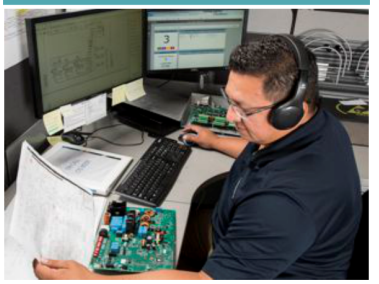
Appendix O: SUPPORT

Our experienced engineers are available for support and service at all times, 24 hour/7 days a week. They are part of a dynamic organization making sure the entire ADB SAFEGATE is committed to minimal disturbance for airport operations.

ADB SAFEGATE Support

Live Technical Support - Americas
If at any time you have a question or concern about your product, just contact ADB SAFEGATE's technical service department. Trained in all areas of system issues, troubleshooting, quality control and technical assistance, our highly experienced Technical support specialists are available 24 hours a day, seven days a week to provide assistance over the phone.
ADB SAFEGATE **Americas Technical Service & Support (US & Canada): +1-800-545-4157**
ADB SAFEGATE Americas Technical Service & Support (International): +1-614-861-1304
During regular business hours, you can also Chat with a Service Technician. We look forward to working with you!
Before You Call
When you have an airfield lighting or system control system problem it is our goal to support airfield maintenance staff as quickly as possible. To support this effort we ask that you have the following information ready before calling.

- The *airport code*
- If not with an airport, then company name (prefer customer id number)
- Contact phone number and email address
- Product with part number preferable or product number
- Have you reviewed the product's manual and troubleshooting guide
- Do you have a *True RMS* meter available (and any other necessary tools)
- Be located with the product ready to troubleshoot



Note
For more information, see www.adbsafegate.com, or contact ADB SAFEGATE Support via email at support@adbsafegate.com or
Brussels: +32 2 722 17 11
Rest of Europe: +46 (0) 40 699 17 40
Americas: +1 614 861 1304. Press 3 for technical service or press 4 for sales support.
China: +86 (10) 8476 0106

O.1 ADB SAFEGATE Website

The ADB SAFEGATE website, www.adbsafegate.com, offers information regarding our airport solutions, products, company, news, links, downloads, references, contacts and more.

O.2 Recycling

O.2.1 Local Authority Recycling

The disposal of ADB SAFEGATE products is to be made at an applicable collection point for the recycling of electrical and electronic equipment. The correct disposal of equipment prevents any potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling. The recycling of materials helps to conserve natural resources. For more detailed information about recycling of products, contact your local authority city office.

O.2.2 ADB SAFEGATE Recycling

ADB SAFEGATE is fully committed to environmentally-conscious manufacturing with strict monitoring of our own processes as well as supplier components and sub-contractor operations. ADB SAFEGATE offers a recycling program for our products to all customers worldwide, whether or not the products were sold within the EU.

ADB SAFEGATE products and/or specific electrical and electronic component parts which are fully removed/separated from any customer equipment and returned will be accepted for our recycling program.

All items returned must be clearly labeled as follows:

- For *ROHS/WEEE* Recycling
- Sender contact information (Name, Business Address, Phone number).
- Main Unit Serial Number.

ADB SAFEGATE will continue to monitor and update according for any future requirements for *EU directives* as and when *EU member states* implement new *regulations* and or *amendments*. It is our aim to maintain our *compliance plan* and assist our customers.

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