

MIC850 - IGNITION CONTROLLER

OPERATING MANUAL



MIC850
MOTORTECH IGNITION CONTROLLER

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1 GENERAL INFORMATION

Prior to use, read this operating manual carefully and familiarize yourself with the product. The installation and start-up should not be performed without reading and understanding this document. Keep this manual readily available so that you can reference it as needed.

1.1 What Is the Purpose of this Operating Manual?

This manual serves as an aid for the installation and operation of the product and supports the technical staff with all operating and maintenance tasks to be performed. Furthermore, this manual is aimed at preventing dangers to life and health of the user and third parties.

1.2 Who Is this Operating Manual Targeted to?

The operating manual provides a code of conduct for personnel tasked with the set-up, operation, maintenance, and repair of gas engines. A certain level of technical knowledge with respect to the operation of gas engines and basic knowledge of electronic ignition systems are necessary. Persons who are merely authorized to operate the gas engine shall be trained by the operating company and shall be expressly instructed concerning potential hazards.

1.3 What Symbols Are Used in the Operating Manual?

The following symbols are used in this manual and shall be observed:



Example

This symbol indicates examples that illustrate the necessary steps and techniques for you. Furthermore, the examples provide you with supplemental information to increase your knowledge.



Notice

This symbol indicates important information for the operator. Observe these instructions. Additionally, this symbol is used for overviews that provide you with a summary of the required work steps.



Warning

This symbol indicates warnings of potential risks of damage or danger to health. Read these warning notices carefully and take the stated safety precautions.

1 GENERAL INFORMATION



Danger

This symbol warns of danger to life, especially due to high voltage. Read these warning notices carefully and take the stated safety precautions.

1.4 What Abbreviations / Acronyms Are Used in the Operating Manual?

In the manual or the user interface, the following abbreviations / acronyms are used.

Abb.	Term	Description	Explanation
ADV	Advance	advanced with respect to the top dead center	Indicates the direction for the timing
ASC	Automatic Spark Control		Automatic spark duration control function
ASO	Auxiliary Synchronization Output	Auxiliary synchronization output	Output for synchronizing the MIC850 and other controllers
ATDC	After top dead center		
BTDC	Before top dead center		
CAN bus	Controller Area Network Bus	Bus for control devices / networks	Asynchronous serial connection system for networking control devices
CE	Conformité Européenne	Documents compliance with EU directives	Mark based on EU legislation for certain products in conjunction with product safety
CPU	Central Processing Unit	Central processing unit	
°crankshaft	Crankshaft angle in degrees		Unit for the rotation angle of the crankshaft
CSA	Canadian Standards Association		Organization that defines standards, inspects products for safety compliance, and issues pertinent certifications.
DC	Direct Current	Direct current	
DetCon	Detonation Control System	Detonation control system	Serves to prevent major engine damage that can be caused by knocking combustion.

Abb.	Term	Description	Explanation
EMI	Electromagnetic interference	Electromagnetic interference	
EMC	Electromagnetic Compatibility		Compatibility of electrical or electronic equipment items with their surroundings.
GPO	General Purpose Output	General purpose output	
HMI	Human-Machine Interface	Human-machine interface	Interface between human and machine or computer
HV	High Voltage	High voltage	
LED	Light Emitting Diode	Light emitting diode	Light emitting electronic semiconductor
MIC	MOTORTECH Ignition Controller	MOTORTECH ignition controller	
POT	Potentiometer		Continuously adjustable potential divider
PWR	Power	Output / current	
RET	Retard	retarded with respect to the top dead center	Indicates the direction for the timing
SCR	Silicon Controlled Rectifier		A special type of thyristor
SD card	Secure digital card	secure digital data storage medium	Digital storage medium
TDC	Top dead center		
USB	Universal serial bus		Serial wiring system to connect a computer to external equipment

2 SAFETY INSTRUCTIONS

2.1 General Safety Instructions

The following safety instructions must be observed in the environment in which the equipment is operated.



High voltage! Danger to life!

While the engine is running, especially the area around the ignition system holds the risk of danger due to high voltage. Therefore, the following parts must not be touched or removed:

- ignition coils and boots
- wires of the high voltage circuit
- connectors of the input / output wiring
- pickups and their wiring

MOTORTECH equipment is manufactured as state of the art and therefore safe and reliable to operate. Nonetheless, the equipment may cause danger or damage if the following instructions are disregarded:

- The gas engine must be operated by trained and authorized personnel, only.
- Operate the equipment only within the parameters specified in the technical data.
- Use the equipment correctly and for its intended use only.
- Never apply force.
- For all work such as installation, conversion, adaptation, maintenance, and repair, all equipment must be disconnected from the mains and secured against unintentional reactivation.
- Perform only such maintenance and repair work as is described in this operating manual, and follow the instructions described while working. For maintenance of the equipment, only use spare parts supplied by MOTORTECH. Further work must only be performed by personnel authorized by MOTORTECH. Non-compliance with the instructions will void any warranties for the proper function of the equipment as well as the responsibility for the validity of the certifications.
- Safety devices must not be dismantled or disabled.
- Avoid all activities that can impair the function of the equipment.
- Operate the equipment only while it is in proper condition.
- Investigate all changes detected while operating the gas engine or ignition system.
- Ensure compliance with all directives and regulations applicable to the operation of your system, including such not expressly stated herein.
- Always ensure adequate ventilation of the engine compartment.
- Ensure a safe position at the gas engine.

2.2 Electrostatic Discharge Hazards

Electronic equipment is sensitive to static electricity. To protect these components from damage caused by static electricity, special precautions must be taken to minimize or prevent electrostatic discharge.

Observe these safety precautions while you work with the equipment or in its vicinity.

- Before performing maintenance or repair work, ensure that the static electricity inherent to your body is discharged.
- Do not wear clothing made from synthetic materials to prevent static electricity from building up. Your clothing should therefore be made of cotton or cotton mix materials.
- Keep plastics such as vinyl and styrofoam materials as far away from the control system, the modules, and the work environment as possible.
- Do not remove the circuit boards from the housing of the device.

2.3 Special Safety Instructions for the Controller



Explosion hazard!

While the system is live, do not remove any connectors unless the absence of potentially explosive atmospheres around the system is ensured.



Explosion hazard!

The replacement of parts or assemblies can impair compliance with CSA Class I, Division 2 (Group C, D).



Explosion hazard!

Never remove the equipment while it is connected to a power source unless the absence of potentially explosive atmospheres around the system is ensured.



Explosion hazard!

Do not remove or replace the fuse while the equipment is live.

2 SAFETY INSTRUCTIONS



Risk of burning!

The surfaces of the system may heat up to high temperatures.



Operational safety!

All screws of the connectors must be adequately tightened.



Danger to persons with pacemakers!

The limits for effects on pacemakers can be exceeded by electromagnetic pulses in the cables connected to the ignition system. Persons with pacemakers must therefore not be present in the vicinity of the ignition system being operated. Mark the operating location of the ignition system with the corresponding standardized warning symbol.

2.4 Proper Disposal

After the expiration of its service life, MOTORTECH equipment can be disposed of with other commercial waste, or it may be returned to MOTORTECH. We will then ensure its environmentally friendly disposal.

3 INTENDED USE

3.1 Function Description

The devices of the MIC850 series are microprocessor controlled high-voltage capacitor discharge ignition systems that comprise one 32 bit main processor (CPU) and up to two output boards.

Please note that the manufacturer is not required to implement configurations of the ignition controller for specific engines, and that devices may be delivered without pertinent configuration.

The ignition controllers of the MIC850 series use information supplied by the pickups to precisely determine the correct timing for the respective outputs. The timing is influenced by various inputs made either automatically or manually. This can be implemented with manual potentiometers, the input signals (4-20 mA or 0-5 V), a speed characteristic, or with a serial interface (USB, CAN bus).

During operation, the ignition controllers continuously monitor the system status of all installed pickups and the correct operation of the primary ignition circuit by checking the information received.

Depending on the severity of an error that is detected, the device will shut down immediately or warn the operator. A corresponding message can be viewed on a connected PC or the optionally installed front face display.

To protect the engine, the ignition controllers additionally have an adjustable overspeed shut-off.

3.2 Applications

The ignition controllers of the MIC850 series are designed for specific 2- or 4-stroke gas engines. 1 to max. 24 ignition outputs are available for individual and multiple ignition applications.

The ignition controllers supply the energy required for the corresponding ignition coils of the gas engines and can supply signals for peripheral equipment. Any use other than the one described in the operating manual shall be considered improper use and will result in the voiding of all warranties.

4 PRODUCT DESCRIPTION

4.1 Technical Data

4.1.1 Certifications

The ignition controllers of the MIC850 series are certified as per the following directives/regulations:

CSA

- Class I; Division 2; Group C, D; T4
- CSA Std C22.2 No. 0 -M91 (R 2006),
- CSA Std C22.2 No. 142 -M91 (R 2004),
- CSA Std C22.2 No. 213 -M91 (R 2004),
- ANSI/ISA 12.12.01, Ed. 1 (2007),
- UL Std No. 916, Ed. 3 (1998)

CE

- EMC directives
 - Limits as per DIN EN 55011 (2007:11)
 - Interference emission for industrial environments as per DIN EN 61000-6-4 (2007:09)
 - Interference emission for industrial environments as per DIN EN 61000-6-2 (2006:03)

4 PRODUCT DESCRIPTION



Certificate: 2165361

Master Contract: 211392

Project: 2165361

Date Issued: 2009/05/29

-
- MIC850 Series of Motortech Ignition Controller, input ratings: 18 to 30Vdc., 8.0 A max.; output 390 V max.; Ambient temperature range -20°C to +60°C (with display) or -40°C to +70°C (without display).

APPLICABLE REQUIREMENTS

- CSA Std C22.2 No. 0 -M91 (R 2006) - General Requirements – Canadian Electrical Code – Part II
- CSA Std C22.2 No. 142-M1987 (R 2004) - Process Control Equipment
- CSA Std C22.2 No. 213-M1987 (R 2004) - Non-Incendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations
- ANSI/ISA 12.12.01, Ed 1 (2007) - Nonincendive Electrical Equipment for Use in Class I and II, Division 2 and Class III, Division 1 and 2 Hazardous (Classified) Locations
- UL Std No. 916, Ed 3 (1998) - Energy Management Equipment

MARKINGS

- CSA Monogram with “C” and “US” indicators
- Company name
- Model name or number
- Serial number or Date of manufacturing
- Electrical Ratings
- Hazardous Location Designation: Class I, Division 2, Groups C and D; T4
- Temperature Code
- Maximum Ambient Temperature
- Warning re. substitution of components (included in the Manual)
- Caution re. do not disconnect



Supplement to Certificate of Compliance

Certificate: 2165361

Master Contract: 211392

The products listed, including the latest revision described below, are eligible to be marked in accordance with the referenced Certificate.

Product Certification History

Project	Date	Description
2165361	2009/05/29	Original Certification

4 PRODUCT DESCRIPTION

CE DECLARATION OF CONFORMITY

The company: **MOTORTECH GmbH**
Hogrevestrasse 21-23
29223 Celle

declares that the products: **Ignition Controller**

purpose: **use with gas otto engines**

is in compliance with the specifications of the following EU directives:

EMC directive 2004/108/EC
Low-voltage directive 2006/95/EG
Application on gas engines

taking into account the following standards:

DIN EN 55011-2007:11
DIN EN 61000-6-2-2006:03
DIN EN 61000-6-4-2007:09


The identification code of the product is: **P/N 66.00.85x**

This declaration is delivered by:

Name: Florian Virchow Position within the company: Managing director

Celle, dated 07/01/2009

Place, date



Legally binding signature

4.1.2 Mechanical Data

The MIC850 has the following mechanical characteristics.

Characteristic	Value
Dimensions	343 x 279 x 163 mm (13.5 x 10.98 x 6.42 ") (length x width x height)
Weight	10,8 kg (23.8 lbs)
Shape of device	See chapter <i>Overview Drawings</i> on page 27.
Mechanical environmental conditions	The housing is resistant to general atmospheric contaminations. Resistant to gas engine lubricants. Protection class: 1 Degree of protection: IP65
Climatic environmental conditions	with HMI: -20° C to +60° C max. (-4° F to +140° F) without HMI: -40° C to +70° C max. (-40° F to +158° F) 85% relative humidity, max. without condensation up to 2000 m (6561.68') above sea level

4.1.3 Warning Notices on the Controller

Warning notice on front cover - Outside

WARNING! Read and understand the installation and operation manuals prior to installing or making any adjustments.

Warning notice on front cover - Inside

WARNING – EXPLOSION HAZARD – Do not disconnect while circuit is live unless area is known to be non-hazardous. For wiring details please refer to operation manual.


Warning notice on housing - side

CAUTION – Do not pressure wash this ignition module. Damage to electronic components may result. Do not disconnect while circuit is live.

4 PRODUCT DESCRIPTION

4.1.4 Product Identification - Labeling on the Device

Plate on cover panel, inside:

 <p>P/N 66.00.851-24-D Arrangement No. 852.24.CA00-100-AA-A S/N 00001 846 S/N CPU Board 0008 S/N Output Board A 1108-015 S/N Output Board B 1108-016</p>
--

Meaning
Part number of ignition controller
Arrangement No. of ignition controller
Serial number of ignition controller
Serial number of main processor circuit board (CPU)
Serial number of output board A
Serial number of output board B

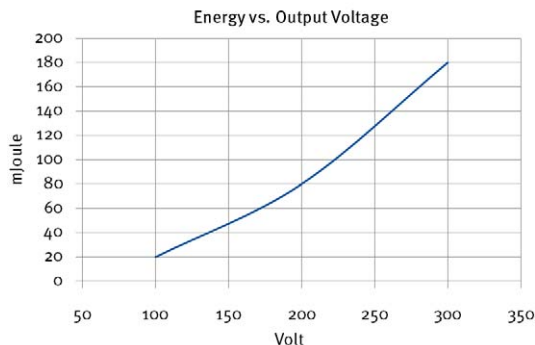
4.1.5 Electrical Data

The MIC850 has the following electrical characteristics.

Characteristic	Value
Power consumption	max. 144 W at 24 V
Power supply	18 to 30 V DC
Required current	Rest current with display module 0.45 A, current max. 8 A. An estimation of the power requirements can be found after this table.
Internal fuse	8 ampere, time-lag
Number of outputs	12 or 24 outputs, depending on the model, up to two output boards are connected.
Ignition frequency	max. 250 Hz $\text{Ignition Frequency}_{2 \text{ Stroke}} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times \text{Number of Ignition Outputs}$ $\text{Ignition Frequency}_{4 \text{ Stroke}} = \frac{1}{2} \times \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times \text{Number of Ignition Outputs}$
Ignition Angle	The size of the ignition angle depends on the max. overspeed. The smallest ignition angle per output board can be calculated using the following formula: $\text{Ignition Angle} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times 360^\circ \times 2,8 \text{ ms}$

Characteristic	Value
----------------	-------

Output voltage and energy	<p style="text-align: center;">Energy vs. Output Voltage</p> <p>The graph shows a non-linear relationship between output voltage and energy. The energy increases from 20 mJoule at 100 Volts to 180 mJoule at 300 Volts.</p>
---------------------------	--



Output connector	<p>Military connector</p> <ul style="list-style-type: none"> - one output board: Input connector, 14-pole, socket - two output boards: Input connector, 35-pole, socket <p>Additional configurations are possible upon request.</p>
------------------	---

Estimation of the current requirements

These current values are based on a nominal speed of 2000 RPM and 100% energy at 24 VDC input voltage.

Outputs	Voltage	Required current	Voltage	Required current
8	24 Volt	2.2 A	18 Volt	3.0 A
12	24 Volt	2.9 A	18 Volt	3.9 A
24	24 Volt	5.1 A	18 Volt	6.8 A

4 PRODUCT DESCRIPTION

Electrical data for inputs and outputs

The inputs and outputs of the ignition controller have the following electrical data:

Inputs and outputs	Values
4-20 mA input	working resistance 10 Ω to ground, damping 1 μ F Auxiliary power 18 to 30 V depending on the supply voltage of the MIC850, 0.3 amp
0-5 V input	working resistance 10 k Ω to ground, damping 1 μ F Auxiliary power 5 V, 0.3 amp
Digital input (Start/Stop)	Wiring Impedance: 10 k Ω ignition stop: 2.8-30 V ignition release: 0-0.8 V
Digital input (schedule A/B)	Wiring Impedance: 10 k Ω schedule A: 2.8-30 V schedule B: 0-0.8 V
Go/NoGo and GPO outputs	3 GPO (general purpose outputs) and 1 Go/NoGo output Implementation as optical MosFET Voltage applied: 7 to 60 V DC max. Peak/steady current: 0.45 A DC max. Output: 500 mW max. Internal resistance: 0.55 Ω typically / 2.0 Ω max. Activation delay: 5 ms / 100 mA load max. Deactivation delay: 1 ms / 100 mA load max. If a short is found at the output, a safety circuit is activated, which maintains the output in pulsed operation until the short is eliminated.
Signal LED	An LED for indicating the power supply, 10 others are used as status indicators.
ASO outputs (1 + 2)	TTL level (5 V) current: max. 2 mA

Inputs and outputs	Values
Pickup input	<p>Impedance: 10 kΩ</p> <p>Power supply for inductive pickups is dependent on the input voltage, e.g. 24 V for an input voltage of 24 V.</p> <p>Max. frequency for the pickups: 8 kHz</p> <p>The formula for determining the frequency of the pickups can be found in the note following this table.</p>
Ignition coil outputs	<p>Output voltage: 390 V max.</p> <p>Output energy: 180 mJ max.</p> <p>Internal resistance: 45 mΩ min.</p>
1:1 measuring output	<p>The 1:1 measuring output is connected to the storage capacitor of the ignition power supply via a series resistor (100 Ω). If this output is loaded, the following functions are no longer ensured:</p> <ul style="list-style-type: none"> - Misfire Detection - ASC analysis - SCR / HV error detection - Ignition Energy
1:10 measuring output	<p>Storage capacitor voltage with 1:10 divider. Can be loaded with max. 10 MΩ.</p>



Frequency of the pickups

The frequency of the pickups is calculated as per the following formula.

$$Frequency = \frac{Overspeed [min^{-1}]}{60} \times Number\ of\ Pickup\ Event\ per\ Revolution$$

4 PRODUCT DESCRIPTION

4.1.6 Interfaces

USB

- Compatible with USB 1.1 and USB 2.0
- The *Connector B* version is suitable only for temporary data exchange and not for permanent connections.

CAN bus 2.0B interface

- As per ISO 11898 standard, max. 1 MBit/s
- Protected against transients (automobile classification)
- 110 participants max.

SD card slot

- for software updates

The following SD cards are supported:

- SD cards with 1.0 (up to 1 GB) and 1.1 (up to 2 GB) specifications
- FAT16 or FAT32 formatting

4.1.7 HMI Display

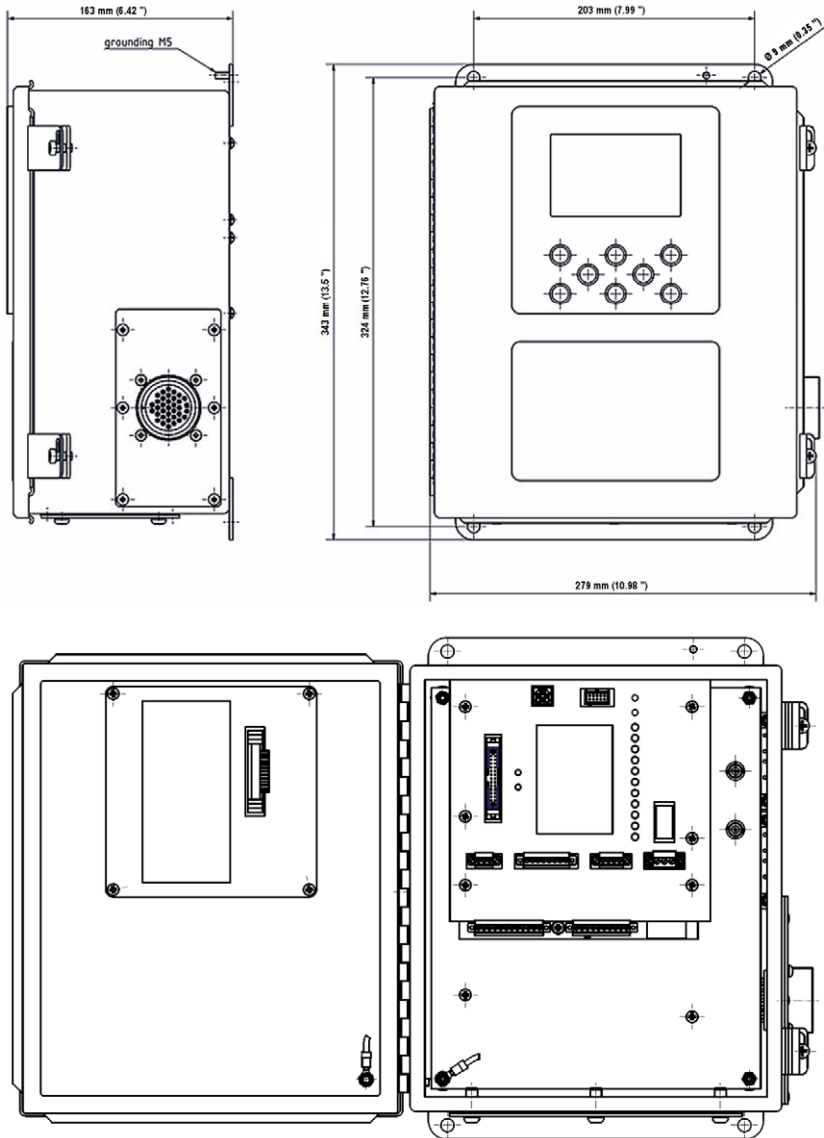
Graphics display

- 240 x 128 pixels
- With LED backlighting
- Eight keys for input

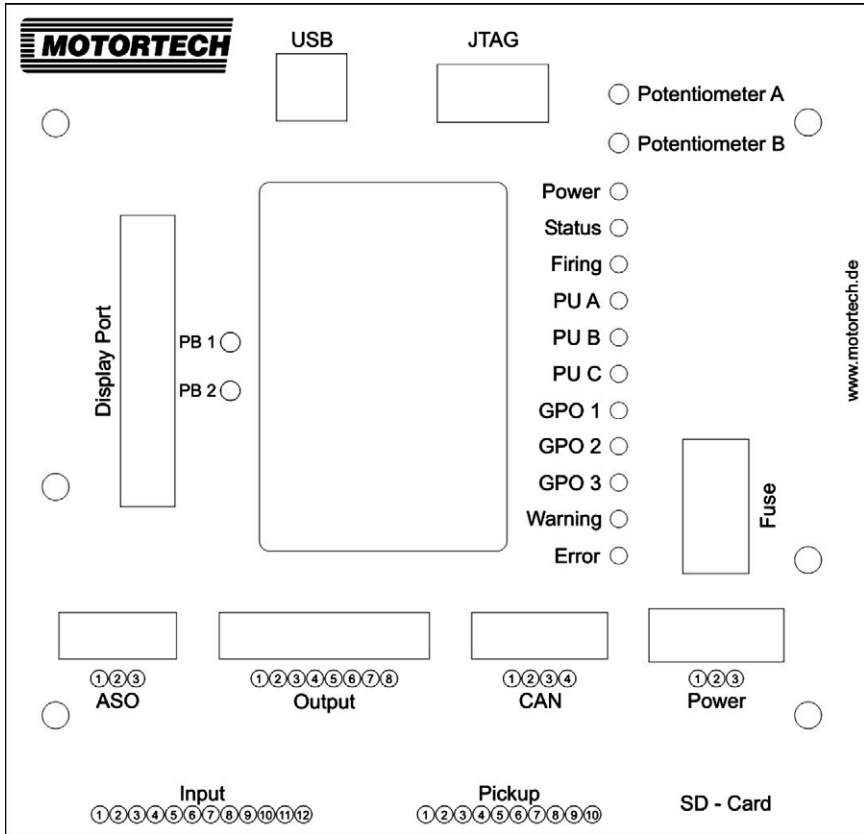
4.1.8 Requirements for External Equipment

External equipment shall fulfill the input and output specifications of the MIC850.

4.1.9 Overview Drawings



4 PRODUCT DESCRIPTION



Labeling	Function
USB	USB connection for connecting to the PC
JTAG	JTAG interface (to be used by factory only)
Potentiometer A/B	Potentiometer for manually adjusting the timing (adjustment has an effect only if the potentiometers were activated in the MICT).
Display port	Connection to HMI (optional)
PB 1	Pushbutton 1; briefly press it to acknowledge warnings, press longer to acknowledge errors, as well.
PB 2	Pushbutton 2; press and hold to restart the device.
Power (LED)	LED is on while the device is connected to the supply voltage.

Labeling	Function
Status	LED flashes when the device is active.
Firing	LED flashes when the ignition is active.
PU A to C	Flashing LEDs indicate activity of the pickups.
GPO 1 to 3	LED is on when the corresponding GPO is activated.
Warning	LED is on when a warning has occurred.
Error	LED is on when an error has occurred.
Fuse	Fuse (see <i>Electrical Data</i> on page 22)
ASO	Connection for the auxiliary synchronization outputs (see <i>Output Wiring - ASO</i> on page 38)
Output	Connection for the Go/NoGo and GPO 1 to 3 outputs
CAN	CAN interface for connecting external equipment (see <i>Output Wiring - CAN Bus - Interface</i> on page 39)
Power (connection)	Connection for the supply voltage (see <i>Input Wiring - Power Supply</i> on page 32)
Input	Connection for timing & safety devices (see <i>Input Wiring - Timing and Safety Devices</i> on page 35)
Pickup	Connection for the pickups (see <i>Input Wiring - Pickups</i> on page 33)
SD card	Slot for SD card for firmware updates (see <i>Firmware Update</i> on page 152)

5 INSTALLATION INSTRUCTIONS

5.1 Unpacking

Unpack the equipment, taking care not to damage it, and ensure that the operating manual is always stored with the ignition controller and is easily accessible. Check the contents for completeness and verify that the controller type meets your application requirements.

Scope of supply

The supply scope of the MIC850 ignition controllers consists in the following components:

- Ignition controller of the MIC850 series
- Installation set incl. four vibration dampers
- Ground strap
- CD-ROM with software for configuring the ignition controller
- USB interface cable for connecting the ignition controller to a PC/laptop
- Operating manual

5.2 Defining Installation Locations, Installing Sensors, Setting Timing Correction Range and Trigger Disc

The positions of the pickups must be determined depending on engine type and application (individual ignition, multiple ignition). All angle reference information is based on:

TDC #1 cylinder /compression cycle

The installation location for the pickups must have adequate mechanical strength and must not exceed the specified temperature ranges. The pickups are designed for the corresponding use only, multiple use of the pickup signal is not permissible. Ensure good accessibility to facilitate the calibration of the sensor. Comply with the pertinent regulations for the wire routing.

For the exact positioning of the individual pickups, refer to the examples given in the drawings (see section *Input Wiring - Pickups* on page 33).

5.3 Installation of the Ignition Controller

The installation of the MIC850 ignition controller is implemented on a fixed bracket or a wall near the engine. Always use the included vibration dampers and the ground strap. The installation location of the controller must be selected so that the distance to the pickups installed on the engine ensures a reliable signal transmission to the ignition controller, and so that there is adequate space for maintenance and repair work. The mechanical specifications must always be complied with. The ground strap serves to ground the ignition controller and must be used accordingly. Ensure a flawless electrical connection for this purpose.

Installation locations where strong vibrations or ambient temperatures of below $-40\text{ }^{\circ}\text{C}$ ($-40\text{ }^{\circ}\text{F}$) or above $70\text{ }^{\circ}\text{C}$ ($158\text{ }^{\circ}\text{F}$) exist are not permissible and result in the warranty being voided. For devices with HMI, the same applies to ambient temperatures of below $-20\text{ }^{\circ}\text{C}$ ($-4\text{ }^{\circ}\text{F}$) or above $60\text{ }^{\circ}\text{C}$ ($140\text{ }^{\circ}\text{F}$).



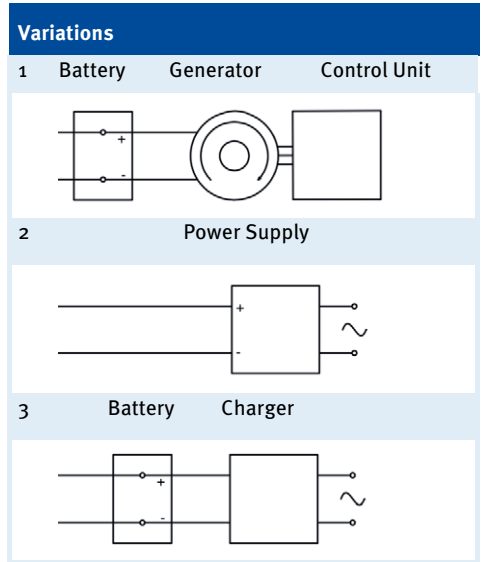
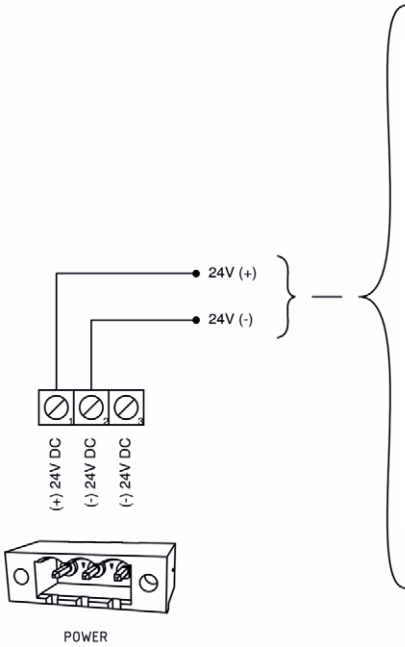
Risk of damage

The controller must not be installed directly on or at the engine, as vibration and heat may cause damage to electronic components.

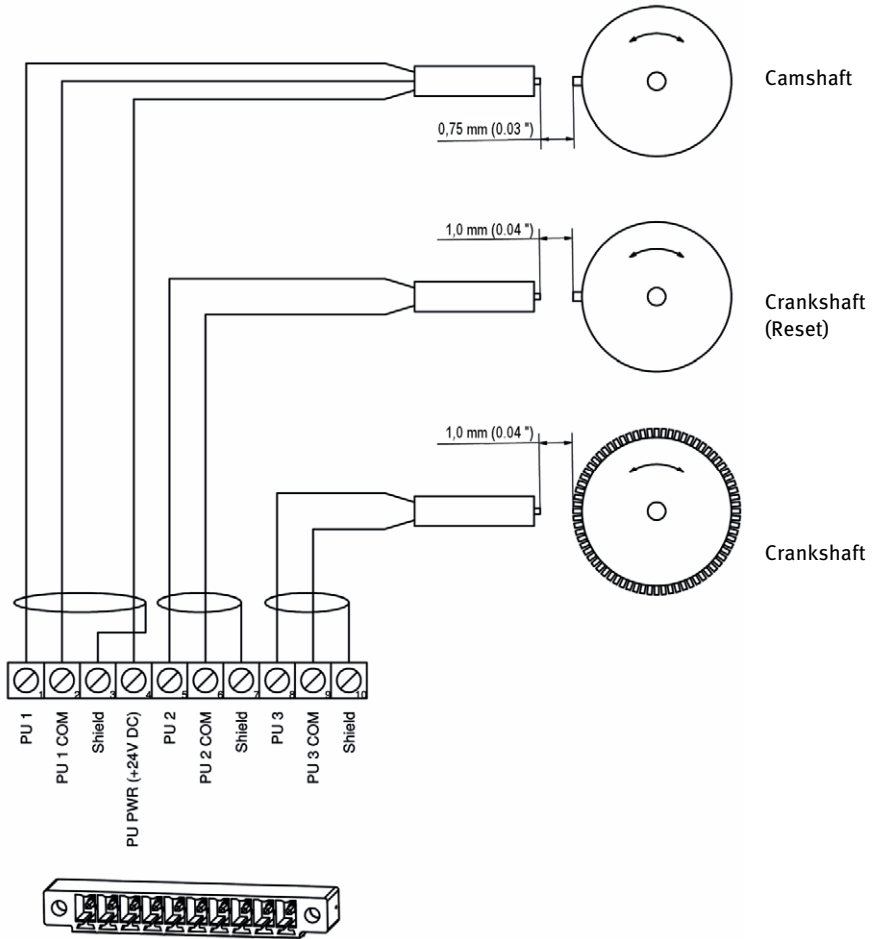
6 WIRING OF THE CONTROLLER

6.1 Input and Output Wiring on the Controller

6.1.1 Input Wiring - Power Supply



6.1.2 Input Wiring - Pickups



6 WIRING OF THE CONTROLLER

Assignment of wire colors

Camshaft

PIN	Labeling	Wire color
1	PU 1	black
2	PU 1 COM	blue
3	Shield	shield
4	PU PWR (+24 V DC)	brown

Crankshaft (Reset)

PIN	Labeling	Wire color	
5	PU 2	flywheel with PIN white	flywheel with hole brown
6	PU 2 COM	flywheel with PIN brown	flywheel with hole white
7	Shield	shield	

Crankshaft

PIN	Labeling	Wire color
8	PU 3	white
9	PU 3 COM	brown
10	Shield	shield

In case of problems with the pickup signal refer also to the section *Pickup Input Errors* on page 159.



Supply voltage for pickups

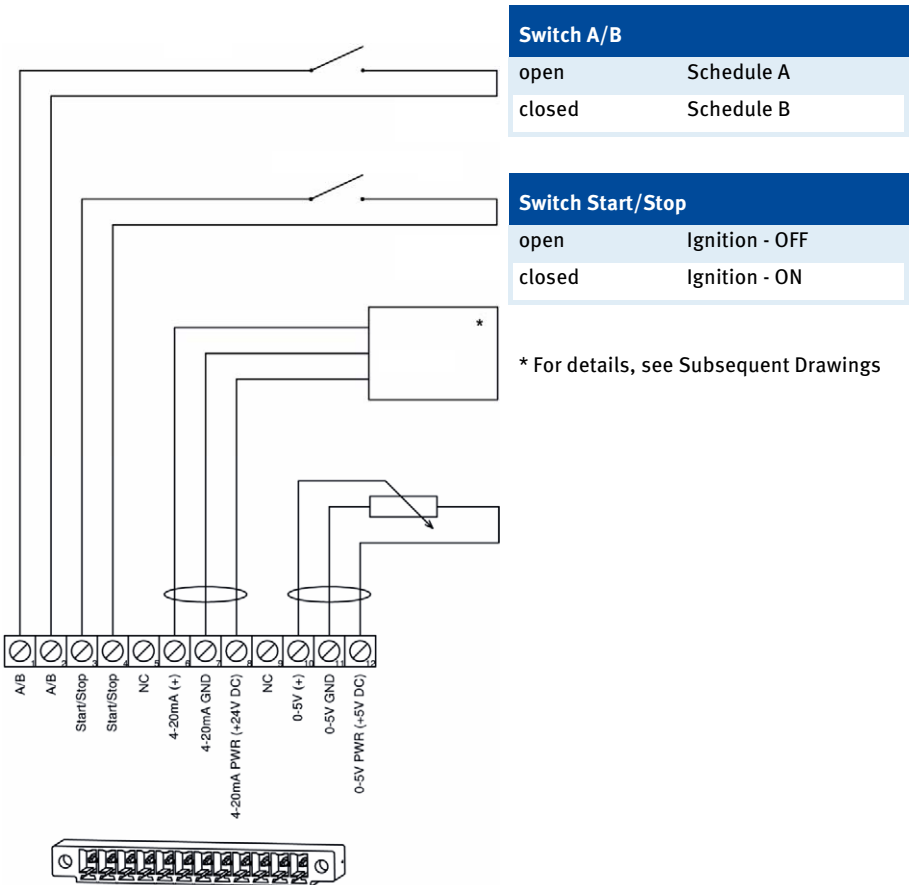
The supply voltage supplied from the MIC850 to the pickups equals the general supply voltage (24 V DC).



Adjusting the pickup sensitivity

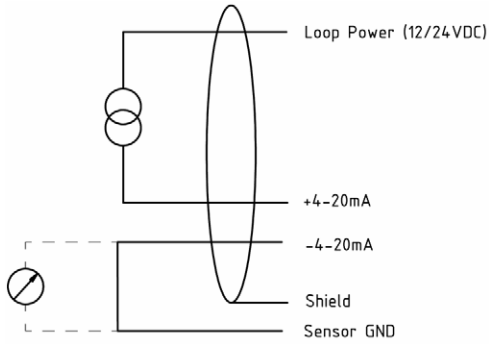
Depending on the type of impulse source (interference), it may be necessary to increase the pickup sensitivity to ensure that the resultant signal strength is sufficient for reliable operation. You can make these adjustments in the MICT. Refer to the section *Engine - Pickups* on page 72.

6.1.3 Input Wiring - Timing and Safety Devices

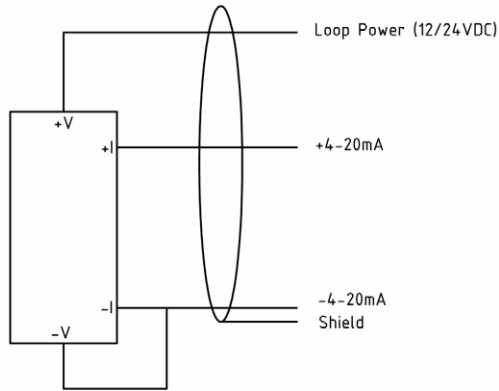


6 WIRING OF THE CONTROLLER

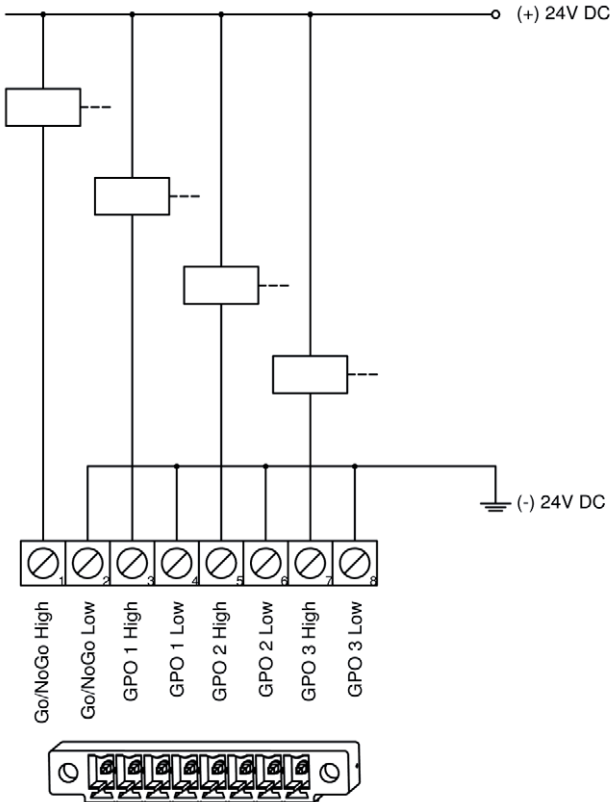
Two-wire transmitter



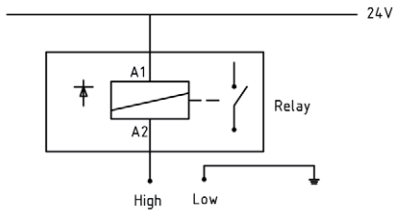
Four-wire transmitter



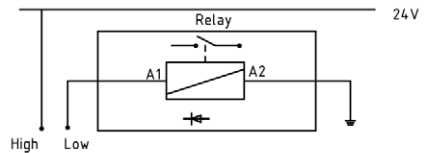
6.1.4 Output Wiring – Go/NoGo and GPO



I

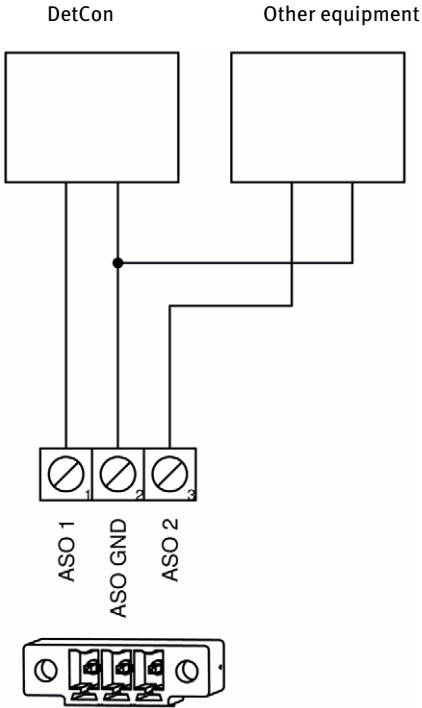


II

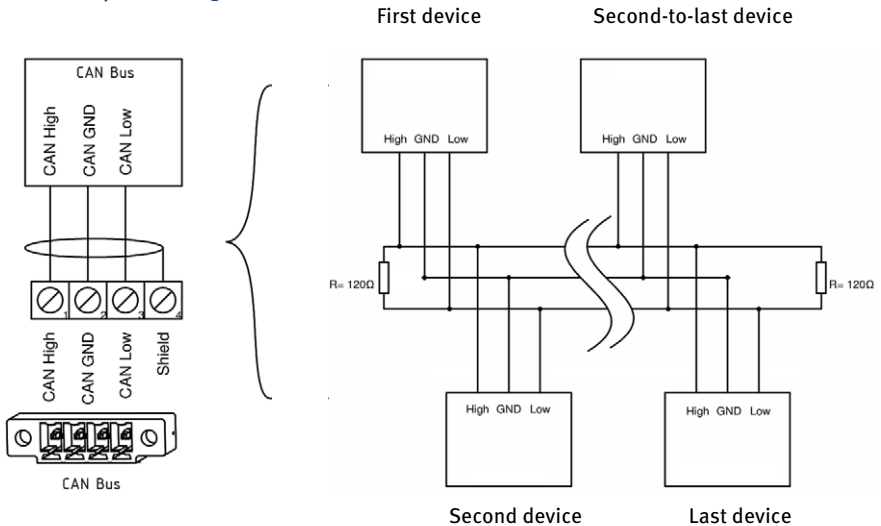


6 WIRING OF THE CONTROLLER

6.1.5 Output Wiring - ASO



6.1.6 Output Wiring - CAN Bus - Interface



CAN Bus Wiring

Follow the following instructions for the CAN bus wiring:

- Max. 110 devices can be connected to a CAN bus.
- The max. cable length is 250 m (820 ft).
- Each bus end must be fitted with a terminating resistor with 120 Ω (as indicated in the drawing).

6.2 Ignition Coil Wiring

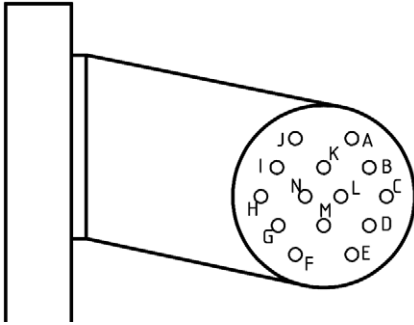


Default ignition coil wiring

The default wiring specifies that the first cylinder in the ignition sequence is connected to the A1 output, the second to B1 (A2 for an output board), etc. If a different wiring was implemented, the MICT configuration must be adapted accordingly. Please note that the wiring cannot be checked by the software.

6 WIRING OF THE CONTROLLER

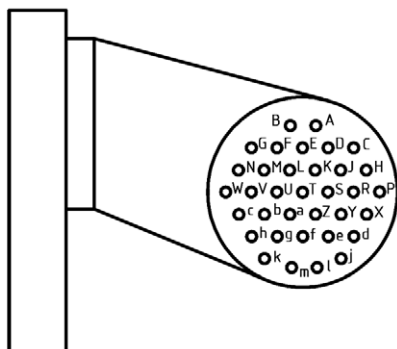
6.2.1 p/n 66.00.855-12(-D) – 14-Pole Connector, Socket (Standard Design)



Pole Assignment 14-Pole Connector, Socket (View: Socket from Outside)

Pole	Pole assignment
A	Output A1
B	Output A2
C	Output A3
D	Output A4
E	Output A5
F	Output A6
G	Output A7
H	Output A8
I	Output A9
J	Output A10
K	Output A11
L	Output A12
M	Measuring output (1:1)
N	Ground

6.2.2 p/n 66.00.855-24(-D) – 35-Pole Connector, Socket (Standard Design)

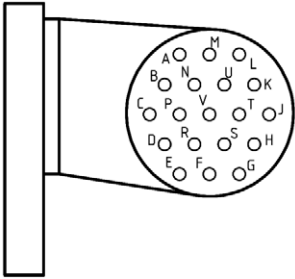


Pole Assignment 35-Pole Connector, Socket (View: Socket from Outside)

Pole	Pole assignment	Pole	Pole assignment
A	Output A1	U	Output B9
B	Output B1	V	Output A10
C	Output A2	W	Output B10
D	Output B2	X	Output A11
E	Output A3	Y	Output B11
F	Output B3	Z	Output A12
G	Output A4	a	Output B12
H	Output B4	b	Output not available
J	Output A5	c	Output not available
K	Output B5	d	Output not available
L	Output A6	e	Output not available
M	Output B6	f	Output not available
N	Output A7	g	Output not available
P	Output B7	h	Output not available
R	Output A8	j	Output not available
S	Output B8	k	Measuring output (1:1) A
T	Output A9	l	Measuring output (1:1) B
		m	Ground

6 WIRING OF THE CONTROLLER

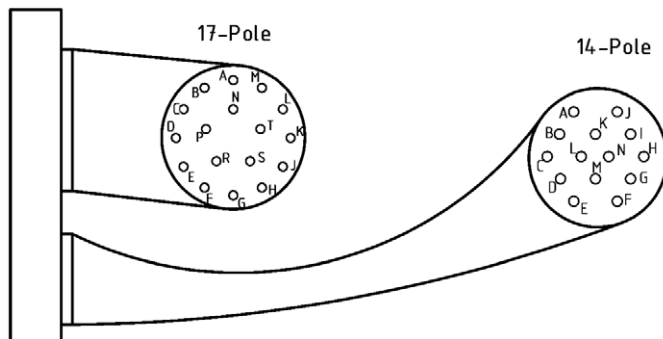
6.2.3 p/n 66.00.850-24(-D) – 19-Pole Connector, Socket (Special Design)



Pole Assignment 19-Pole Connector, Socket (View: Socket from Outside)

Pole	Pole assignment
A	Output A1
B	Output B1
C	Output A2
D	Output B2
E	Output A3
F	Output B3
G	Output A4
H	Measuring output (1:1) A
J	Ground
K	Output B4
L	Output A5
M	Output B5
N	Output A6
P	Output B6
R	Output A7
S	Output B7
T	Output A8
U	Output B8
V	Measuring output (1:1) B

6.2.4 p/n 66.00.851-24(-D) – 17-/14-Pole Connector, Socket (Special Design)

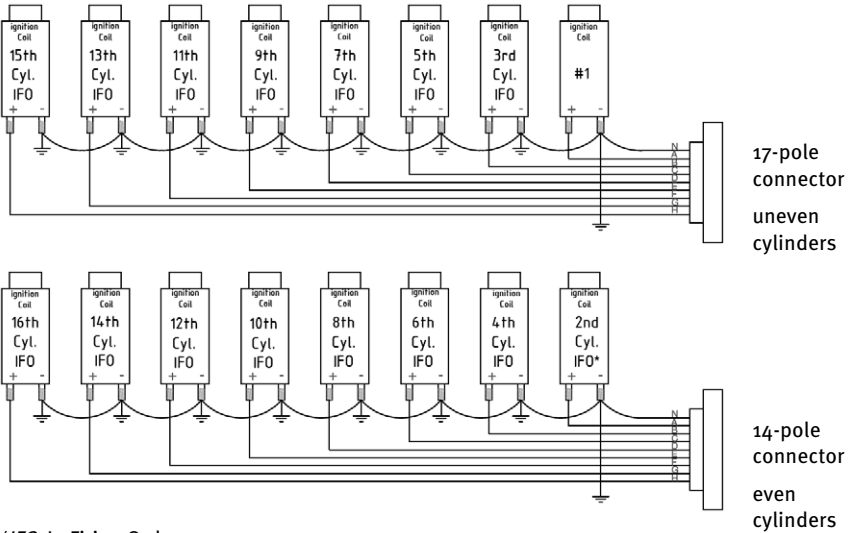


Pole Assignments (View: Socket from the Outside)

Pole	Pole assignment (17-pole):	Pole	Pole assignment (14-pole):
A	Output A1	A	Output B1
B	Output A2	B	Output B2
C	Output A3	C	Output B3
D	Output A4	D	Output B4
E	Output A5	E	Output B5
F	Output A6	F	Output B6
G	Output A7	G	Output B7
H	Output A8	H	Output B8
J	Output A9	I	Output B9
K	Output A10	J	Output B10
L	Output A11	K	Output B11
M	Measuring output (1:1) A	L	Output B12
N	Ground	M	Measuring output (1:1) B
P	Output A12	N	Ground
R	Output not available		
S	Output not available		
T	Output not available		

6 WIRING OF THE CONTROLLER

Wiring diagram - example: 16 cylinders



*IFO: In Firing Order

7 FUNCTIONS

The ignition controllers of the MIC850 series include freely configurable safety and auxiliary functions that, amongst others, can shut down the engine in case of fault.



Angle indications in the operating manual

All angles in this operating manual are given in °crankshaft. Exceptions are clearly identified.

7.1 Check of Pickup Signals

The MIC850 monitors the pickup signals. Potential errors are displayed in the MICT and HMI. For further information on errors, please refer to the overview in section *Message and Error Overview* on page 160.

7.2 Go/NoGo

The MosFET output (Go/NoGo) is a potential-free output that is closed during firing and opens when the ignition switches off. The max. switching current is 500 mA. The output can drive an external relay that e.g. opens a gas valve.

The following errors can cause the ignition outputs to shut down:

- Overspeed
- Pickup error
- SCR malfunction / Error HV power supply
- Overload / temperature shut-down
- Alarms (see MICT)
- Insufficient supply voltage (Low Power)

7.3 Timing Correction

The ignition controller has several functions for the timing correction.



Influencing the ignition timing

Please be aware that the actual timing of the engine can also be influenced by external signals (e.g. 0-5 V, 4-20 mA).

7 FUNCTIONS



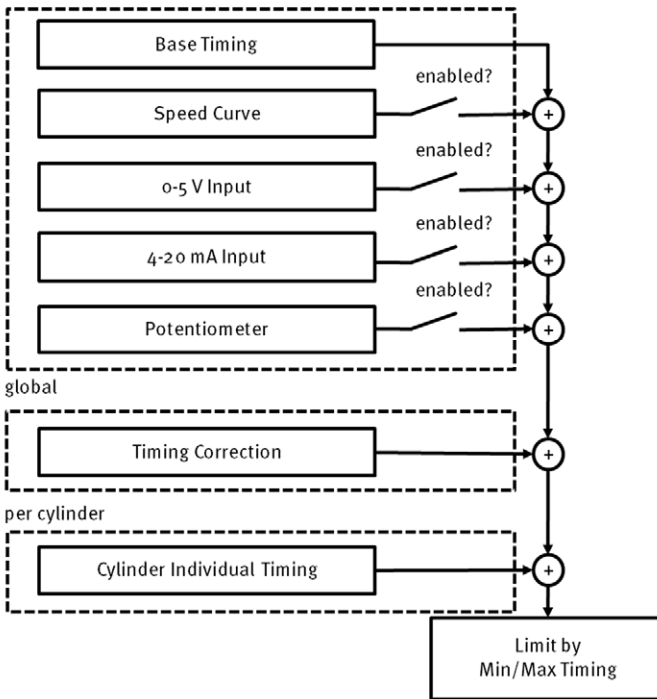
Operational Safety

The MIC850 ignition controller must first be configured for the engine used before you can start the engine.

An incorrect configuration can result in damage to the engine.

The figure below gives you an overview of the different functions of the timing correction, which will be explained in more detail in the subsequent sections.

per schedule



7.3.1 Manual Timing Correction

The ignition controllers of the MIC850 series include two permanently installed overwind-protected potentiometers for manually correcting the timing point. The max. range is defined with the corresponding limits that are set by the user. If schedule B was activated in the configuration, and input *Schedule A/B* is closed, the ignition controller will reference the configured values of schedule B.

7.3.2 Analog Inputs – 4-20 mA / 0-5 V

The timing point control can be adjusted with a linear 4-20 mA signal. This signal can be supplied e.g. by a potentiometer, a pressure sensor for charging pressure, or a detonation controller.

With the analog process signal (4-20 mA current loop signal) at the 4-20 mA input, the timing point can be offset in the advanced or retarded direction within a defined range.

At the 4-20 mA-PWR (+24 V DC) voltage output, the input voltage is supplied as an auxiliary voltage that can be used for supplying power to external sensors.

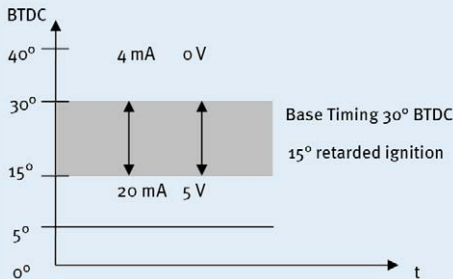
Similarly or additionally, the timing can also be influenced by a 0-5 V signal at the corresponding 0-5 V input.

You can configure the analog inputs with the MICT. Refer to the section *Timing - Schedule A/B* on page 76.

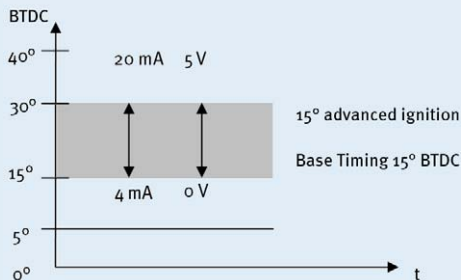


Sample configurations

Characteristic 4-20 mA / 0-5 V – Timing correction toward *retarded*.



Characteristic 4-20 mA / 0-5 V – Timing correction toward *advanced*.



7 FUNCTIONS



Error setup

The user must enter a pre-set 4-20 mA error setting (*default*), which ensures the safe and reliable operation if the input signal fails. The 0-5 V input does not have an error setting (*default*). In case a wire ruptures, the value set for 0 V is used. If voltages above 5 V occur, the value defined for 5 V is used.

7.3.3 Cylinder-to-Cylinder Alignment

The cylinder-to-cylinder alignment enables the user to change the timing for individual cylinders to optimize their combustion.

You can enter the settings for the cylinder-to-cylinder alignment with the MICT. Please refer to the section *Cylinder Individual Offsets* on page 107.



Use of measuring unit

Use this setup option only if no suitable measuring unit is available for determining the optimum timing point, so that the result of a change can be assessed immediately.

7.3.4 Speed Curve

To e.g. optimize the ignition during the start phase of the engine, a speed curve can be defined for the MIC850 ignition controllers. To create this curve, up to eight adjustable speed points are available.

You can configure the speed curve with the MICT. Refer to the section *Timing - Schedule A/B* on page 76.

7.3.5 Timing Correction

The timing correction can be implemented in different ways:

- CANopen
With CANopen, the cylinder individual timing points, delimited by the timing point limits of the current parameter settings, can be adjusted in 0.1° increments by max. +/- 12.7°crankshaft.
- MICT via USB
Please refer to the section *Runtime Adjustments - Timing* on page 105.
- HMI
Refer to the section *Setting the Timing* on page 129.

7.4 Ignition Angle

The min. distance between two ignition angles depends on the overspeed. The smallest ignition spacing per output board can be calculated using the following formula:

$$\text{Ignition Angle} = \frac{\text{Overspeed} [\text{min}^{-1}]}{60} \times 360^\circ \times 2,8 \text{ ms}$$

7.5 Misfire Detection

The MIC850 ignition controllers include a primary winding misfire detection (open circuit or short), which measures all misfires per cycle and compares the result to a misfire rate selected and set by the user. If this rate is exceeded, the ignition will be automatically deactivated. The misfire rate is determined individually for each output, based on 20 cycles.

If a specific coil type was set on the MICT, secondary winding misfires (open circuit or short) are also recorded and incorporated in the misfire rate.

For the max. misfire rate, you can define an Alarm in the MICT. Refer to the section *Outputs - Alarms* on page 78.



Operational safety

If no alarm was defined for the primary misfire detection, this can result in an unsafe or unreliable operational state when an open circuit occurs in the primary wiring.

7.6 SCR Error Detection / HV Power Supply Error Monitoring

On the output circuit boards of the MIC850 ignition controllers, thyristors (SCR: Silicon Controlled Rectifier) are used. If one of these thyristors is faulty, the respective cylinder output will fire permanently, which can result in damage to the engine. To avoid engine damage, the MIC850 ignition controllers are therefore fitted with an integrated monitoring feature, which shuts down the ignition if a problem is detected.

7.7 Schedules A/B

The MIC850 ignition controllers offer two separate schedules for the parameterization of:

- Timing point limits
- Base timing
- Potentiometer adjustments
- Settings of the analog inputs
- Speed Curve

7 FUNCTIONS

By closing input *Schedule A/B*, the listed parameter settings for schedule B can be selected. A possible application for this is e.g. the operation with different gases.

You can configure the schedules with the MICT. Refer to the section *Engine - Parameters* on page 66.



Parameter settings (Schedule)

The timing for the schedules can consist in:

Base timing

+ potentiometer

+ (4-20 mA)

+ (0-5 V)

+ speed curve

+ limits for timing



Operational Safety

If you use the schedules A and B, the advanced timing point should be linked to schedule B (switch closure). If a wire ruptures, the schedule A is automatically selected with the retarded (and thus safer) timing point.

7.8 Alarms

The MIC850 ignition controllers include 24 freely configurable alarms in total. These alarms can be freely allocated to the general purpose outputs (GPO) and set depending on the following functions:

- Limit for misfire rate exceeded / not reached
- Limit for speed exceeded / not reached
- Limit for engine hours exceeded / not reached
- Limit for energy level exceeded / not reached
- Limit for spark plug hours exceeded / not reached
- Warning active
- Error active
- Limit for temperature exceeded / not reached
- Limit for supply voltage exceeded / not reached

- Limit for global timing exceeded / not reached
- Set input voltage on 0-5 V input exceeded / not reached
- Set input current on 4-20 mA input exceeded / not reached

A hysteresis can be defined for some alarms. You can configure the alarms with the MICT. Refer to the section *Outputs - Alarms* on page 78.

7.9 GPOs: General Purpose Outputs

The function of each of the three general purpose outputs (GPOs) can be set as desired as normally closed or normally open. The GPOs can be used for the freely definable alarms.

You can enter the settings for the alarms with the MICT. Refer to the section *Outputs - GPOs (General Purpose Outputs)* on page 80.

7.10 ASO 1 / 2: Auxiliary Synchronization Outputs

The ASO is an output of the MIC850 for synchronizing the MIC850 ignition controller and a connected control unit. The possible applications include detonation control, valve control, and fuel injection control.

The ASO signal is Low-Active, i.e. the pulse width is defined as the time difference between the raising and falling edge (pulse width = $t_{\text{raising}} - t_{\text{falling}}$). The raising edge of the signal marks the configured engine rotation angle. With the variable pulse width, the values can be allocated to the engine rotation angle. A max. of 24 pulses can be configured for this purpose.

The pulse width is known at the time of the active edge, as the falling edge of the signal precedes the raising edge by the value of the pulse width. The controller calculates the duration of the falling edge from high-level to low-level and then back to the starting value of the high-level.

You can configure the auxiliary synchronization outputs with the MICT. Please refer to the section *Outputs - ASO 1 and 2 (Auxiliary Synchronization Outputs)* on page 81.



Application of the ASO Signal

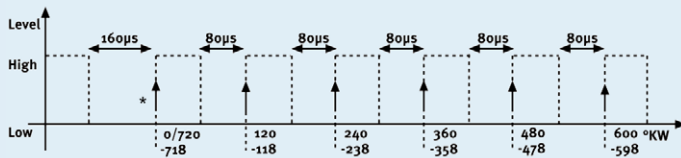
The following example will illustrate the application of the ASO signal:

- Four-stroke engine with 6 cylinders
- Ignition angle $120^\circ - 120^\circ$

Synchronization between MIC850 and valve controller

Cyl.	Ignition angle in °crankshaft	ASO signal in °crankshaft	Pulse duration in μs
1	0/720	718	160
2	120	118	80
3	240	238	80
4	360	358	80
5	480	478	80
6	600	598	80

Schematic representation



* active edge

The valve controller shall receive the active edge of the ASO signal before the top dead center of a cylinder. The first pulse duration shall be twice as long and thus mark the beginning of a cycle. The ASO signal generated by the MIC850 increases by 2° each time before the ignition signal from Low to High, as can be seen in the schematic drawing. This edge is analyzed by the valve controller as the active edge.

The ASO signal drops in accordance with the configured pulse duration from *High* to *Low* before the active edge. The valve controller then has already measured the pulse duration of the active edge and can provide information on the allocation of the signal. In the example shown here, the first cylinder is marked with a pulse width of $160 \mu\text{s}$ versus $80 \mu\text{s}$ for other cylinders. If the valve controller measures a pulse width of $160 \mu\text{s}$, the subsequent signal is therefore allocated to the first cylinder. The next signal then corresponds with the second cylinder in the ignition sequence, etc.

7.11 Ignition Energy

You can configure the ignition energy with the MICT. Refer to the section *Energy - Energy Level* on page 82.

7.11.1 Manual

The MIC850 ignition controllers supply ignition coils and spark plugs with an energy level that can be manually adjusted. It is possible to increase the set energy level automatically during the start process. This increase improves the start-up behavior.

7.11.2 Based on the Spark Plug Operating Hours

Aside from the manual energy level setting, it is possible to control the energy based on the operating hours of the spark plugs. For this control system, a curve consisting of up to eight points can be set.

7.11.3 Auto Spark Control (ASC)

The ignition energy is set by the Auto Spark Control (ASC) in such a way that the spark duration set with the MICT is reached. The spark duration shall be kept constant throughout the life of the spark plug. An automatic increase in energy results in an increase in spark duration. A manual change of the spark duration while in operation is not possible.



Operational Safety

To use the ASC function of the MIC850, only ASC-capable MOTORTECH ignition coils may be used, which are marked with the ASC logo.

7.12 Pickup Sensitivity

To increase the signal interference distance, the sensitivity of the pickup signal inputs can be changed for suitable pickup signals. For this purpose, a pre-trigger voltage can be set below which signals are interpreted as interference and are therefore not analyzed. A pre-trigger voltage set to a high level will thus result in a low pickup sensitivity level.

You can enter the settings for the pickup sensitivity with the MICT. Refer to the section *Engine - Pickups* on page 72.

7.13 Cylinder Individual Multiple Ignition

The MIC850 offers the option of a cylinder individual multiple ignition for very high ignition energy demand. In this case, all cylinders of the engine are supplied with ignition energy from the output board A, the MIC850 then offers the option of supplying each cylinder a second time with ignition energy from the output board B with a freely adjustable delay. This is only possible for engines up to 12 cylinder.

7 FUNCTIONS

You can configure the multiple ignition with the MICT. Refer to the section *Engine - Ignition Outputs* on page 69.

7.14 Access Control

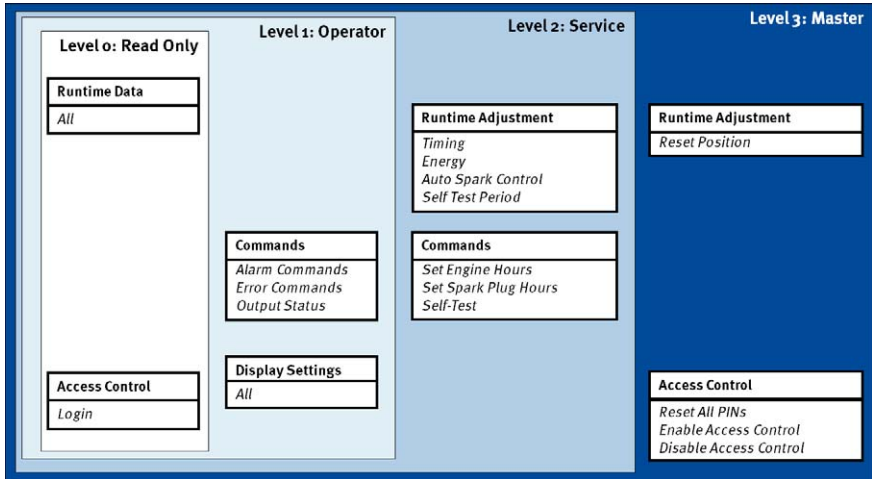
The MIC850 has four operating levels, three of which can be secured with different PINs. As a default setting, the access controls are not activated. If the access control for the MIC850 is activated, it is independent from the access levels that control authorizations within the MICT.



Access control in the MICT and on the MIC850

A user is logged in to the *Advanced Service* access level on the MICT. He changes a configuration and would like to download the change to the MIC850. Although he has the full authorization set in the MICT, he is prompted to log in with the PIN for the *Level 3 (Master)* on the MIC850.

On the four operating levels of the MIC850, different functions are at your disposal. The figure below illustrates this:



The following functions are available on the different levels:

- **Level 0 (read only)**
Enables read-only access for all users.
- **Level 1 (operator)**
The user can access and use the commands Alarms, Error commands, and Output status on this level. Additionally, all display settings can be changed.

- **Level 2 (Service)**
Only the Service level has access to modifications of the runtime adjustment for the timing point, ignition energy and self test period and to the commands Set engine/ spark plug hours and Self test.
- **Level 3 (Master)**
On this level, the Master can, in addition to the other adjustments, reset the runtime adjustment and reset all PINs as well as activate/disable the access control.

For information on the access levels in the MICT, please refer to the sections *Access Levels in the MICT* on page 57.

8 SETTINGS VIA THE MICT

MICT is an abbreviation for *MOTORTECH Ignition Configuration Tool*. With the MICT, you can configure your ignition controller, and you can view and adjust the operating data of your engine.

8.1 MICT System Requirements

For the installation of the MICT, the following min. requirements must be fulfilled:

- x86 compatible PC, min. performance category Intel Pentium 4 with 2 GHz
- 128 MB free working memory
- 80 MB free disc space
- USB 1.1 - compatible Interface
- Display with min. XGA resolution (1024 x 786 pixels)
- Microsoft Windows 2000 / XP

8.2 MICT Installation

The software you need for installing the MICT is located on the CD-ROM included with the ignition controller.

To install the MICT, proceed as follows:

1. Start the installation.
 - CD-ROM as installation medium
Insert the CD-ROM in the CD/DVD drive of your PC. If the Autostart function is activated for the drive, the installation will start automatically. If the function is disabled for the drive, the installation routine can be started with the file *setup.exe* from the CD-ROM directory.
 - Alternative
Copy the installation routine *setup.exe* to your PC. The installation is started by executing the file.
2. Run the installation.
Follow the instructions of the installation routine. Please note that the license agreement terms must be accepted before using the MICT. If the terms are not accepted, the installation cannot continue.
3. Install the USB driver by executing the file *CDM2.04.16.exe*.
 - ▶ The MICT is now set up. You can connect your PC to the ignition controller via the USB interface.

8.3 Access Levels in the MICT

After opening the MICT, select the access level for which you have clearance. The access level controls the options you have at your disposal in the MICT. The password required for access is sent to you together with the ignition controller.



The following access levels are possible:

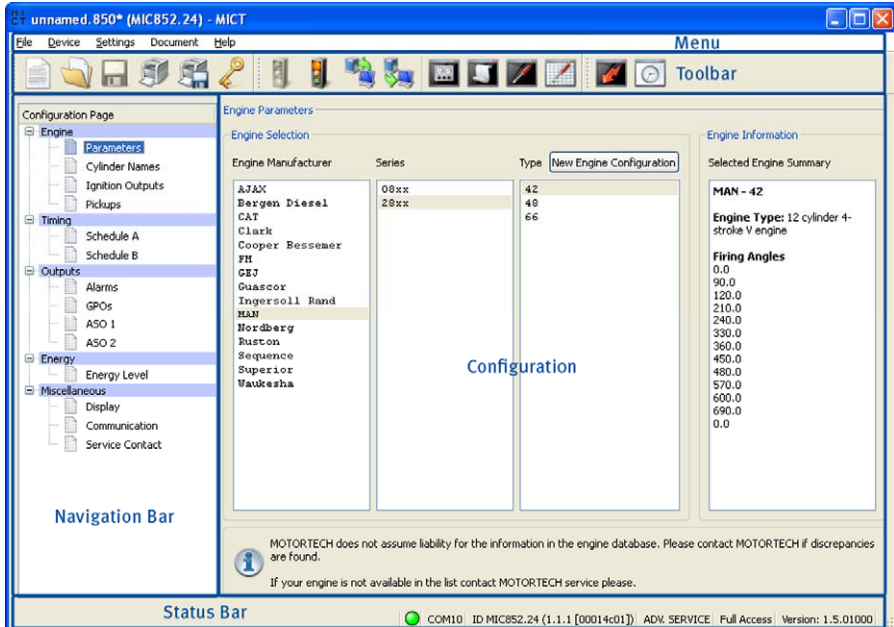
- **Read Only**
 On this level, the user can open a configuration and transfer it to the controller. They can, however, not make changes to the configuration. The user has read-only access to all other settings.
- **Customer**
 This level enables the configuration of the basic functions required for operation in addition to the read-only function.
- **Service**
 This level contains all functions for a standard installation.
- **Advanced Service**
 This level offers full access to all functions of the MICT and is enabled and accessible for specially trained personnel only.

The following sections will describe the options at your disposal with the *Advanced Service* access level. If you have registered for a different level, you cannot execute all functions shown.

8 SETTINGS VIA THE MICT

8.4 Configuration Page (Overview)

The configuration pages are divided into the following sections:













The functions in the menu, navigation bar, and the toolbar as well as the configuration section will be described in the following.

The status bar provides you with the following information (from left to right):





- Status display
Indicates whether a connection is established with the controller.
 - Green: connection established
 - Red: the connection was interrupted and is being restored
 - Gray: the connection is not established and is not being restored
- Identification of the interface that is being used for a connection with the controller.
- Indication of the device ID
- Indication of the access level of the user in the MICT
- Indication of the operating level for the MIC850 if the access control feature was activated and the user has logged in with a PIN.
- Indication of the MICT program version



8.5 Menubar and Toolbar

The following functions are available to you via the symbols on the toolbar and the entries in the menu bar:

Symbol	Menu	Function
	<i>File -> New</i>	Creates a new configuration.
	<i>File -> Open</i>	Opens an existing configuration.
	<i>File -> Save / File -> Save As</i>	Saves the current configuration.
	<i>File -> Close</i>	Closes the current configuration.
	<i>File -> Open Trace</i>	Opens a trace of recorded runtime data (.trace file). Please refer to the section <i>Runtime Data</i> on page 87.
	<i>File -> Change Access Level</i>	Changes the access level for accessing the configuration data and functions.
	<i>File -> Print</i>	Prints the current configuration.
	<i>File -> Print To PDF File</i>	Prints the configuration to a PDF file.
	<i>File -> Print Preview</i>	Opens a print preview of the configuration.
	<i>File -> Quit</i>	Exits the MICT.
	<i>Device -> Connect</i>	Connects to the device.
	<i>Device -> Disconnect</i>	Cuts the connection to the device.
	<i>Device -> Download to device</i>	Downloads configuration data from the PC to the device. This function can only be executed while the ignition is not active.
	<i>Device -> Upload from device</i>	Uploads configuration data from the device to the PC.

8 SETTINGS VIA THE MICT

Symbol	Menu	Function
	<i>Device -> Runtime data</i>	Opens the window <i>Runtime Data</i> . Please refer to the section <i>Runtime Data</i> on page 87.
	<i>Device -> Log</i>	Opens the window <i>Log (Advanced service only)</i> . Please refer to the section <i>Log</i> on page 103.
	<i>Device -> Runtime adjustments</i>	Opens the window <i>Runtime Adjustments (Service and Advanced Service only)</i> . Please refer to the section <i>Runtime Adjustments</i> on page 104.
	<i>Device -> Cylinder individual offsets</i>	Opens the window <i>Cylinder Individual Offsets (Advanced Service only)</i> . Please refer to the section <i>Cylinder Individual Offsets</i> on page 107.
	<i>Device -> Set spark plug runhours</i>	Opens the window <i>Set spark plug runhours</i> .
	<i>Device -> Set engine operating hours</i>	Opens the window <i>Set engine operating hours</i> .
	<i>Device -> Send command -> Reset output status flag</i>	The status of the outputs of the ignition controller is reset. Misfires that occurred at the outputs are thus no longer displayed.
	<i>Device -> Send command -> Start self test</i>	The self test is started. The cylinders of the connected engine fire sequentially. Please refer to the section <i>Running a Self Test</i> on page 162.
	<i>Device -> Send command -> Stop self test</i>	The self test is ended.
	<i>Device -> Send command -> Acknowledge operational errors</i>	All operating errors are acknowledged. This can only be implemented while the engine is standing still.
	<i>Device -> Access Control</i>	The setup for the access controls for the MIC850 are described in a separate section. Please read the section <i>Access Control for the MIC850</i> on page 62.
	<i>Device -> Temperature Extremes</i>	Opens the window <i>Temperature Extremes</i> in which the minimum and maximum temperatures of the controller and output boards are displayed.

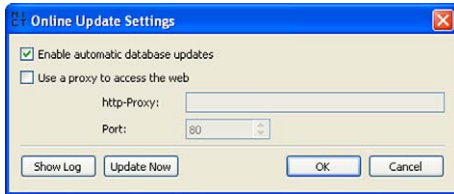
Symbol	Menu	Function
	<i>Device -> HMI Screenshot</i>	Opens a window in which you can create a screenshot of the current display (HMI).
	<i>Device -> Supply voltage snapshot</i>	Opens a diagram of the supply voltage trend during the last second.
	<i>Device -> Low power supply voltage trend</i>	Opens a diagram of the supply voltage trend during the last second before last shutdown or last low power error.
	<i>Settings-> Language</i>	Opens the window <i>Language selection</i> in which you can change the interface language of the MICT.
	<i>Settings -> Online update settings</i>	Opens the window <i>Online update settings</i> . Please refer to the section <i>Online Update Settings</i> on page 62.
	<i>Settings -> Temperature scale</i>	Opens the window <i>Select Temperature Scale</i> , in which you can change the unit for the temperatures shown in the MICT.
	<i>Settings -> Display by cylinders</i>	The entries in the window <i>Runtime Data – Ignition</i> are displayed by cylinders. To use this function it's necessary to assign the cylinders to the ignition outputs on the configuration page <i>Engine – Ignition Outputs</i> .
	<i>Document -> Energy curve</i>	Opens the window <i>Energy curve</i> . Please refer to the section <i>Energy Curve</i> on page 108.
	<i>Document -> Schedule curve</i>	Opens the window <i>Schedule curve</i> . Please refer to the section <i>Schedule Curve</i> on page 109.
	<i>Help -> Help</i>	Opens the online help function.
	<i>Help -> About MICT</i>	Opens detailed information on the MICT.

8 SETTINGS VIA THE MICT

8.6 Online Update Settings

The MICT uses data from an engine database and a coil database for the configuration. Such data can be updated with automatic online updates. The settings for the update can be entered with the following menu entry:

Settings -> Online update settings



You have the following options:

- **Enable automatic database updates**
Activate and disable the online update with the check box. As the default setting, the online update is activated and is executed daily (if an Internet connection is established) at first start-up of the MICT.
- **Use a proxy to access the web**
With the check box, you can activate settings for Internet access via a proxy server, which you can then set up by entering *http Proxy* and *Port*.
- **Show Log**
With this button, you can open a window in which the online updates performed are logged.
- **Update Now**
With this button, you manually start an online update.

8.7 Access Control for the MIC850

If the access controls for the MIC850 were activated, access to the following areas is possible with a PIN only:

- **Runtime Adjustment** (Reset, timing, ignition energy, Auto Spark Control (ASC), and self test period)
- **Commands** (Alarms, error commands, set motor/spark plug operating hours, and self test).
- **Configuration** (Transferring a configuration to the MIC850)

The access control controls the access to the controller with both the HMI and the MICT. For explanations concerning access control to the MIC850 and the delimitation of the access levels in the MICT, refer to section *Access Control* on page 54.

The access control functions can be accessed in the menu bar via:

Device -> Access Control

8.7.1 Activating/Disabling the Access Control



Enabling and disabling access controls

As a default setting, the access control is not activated, and all PINs are set to *0000*. Once the access control has been activated, and the PINs were changed, these PINs will continue to be used. To activate the access controls again, you will need the PIN for level 3 (*Master*). It is therefore recommended to reset all PINs before disabling.

If that was not done, or a system must be unlocked for another reason, a request key can be issued in the MICT. Refer to the section *Resetting all PINs* on page 64.

To activate or disable the access control, proceed as follows:

1. Open the input dialog via *Device -> Access control -> Activate or disable access control*.
2. Enter the PIN for the level *Master (level 3)*.
3. Accept the input with OK.

8.7.2 Login/Logout

If the access controls are activated, you are prompted to log in if you want to execute functions that are allocated to a specific operating level. In addition, you can log in specifically to an operating level via the menu bar.

To log into a specific operating level, proceed as follows:

1. Open the input dialog via *Device -> Access control -> Login*.
2. First select the level you wish to log on to.
3. Enter the PIN for the desired level.
4. Accept the input with OK.
 - ▶ You are now logged into the corresponding level and can execute all functions that are allocated to this operating level without having to log in again.

After completing the log-in, you can log out again as follows:

Device -> Access control -> Logout

8 SETTINGS VIA THE MICT

8.7.3 Changing the PIN

To change the PIN for a specific operating level, proceed as follows:

1. Open the input dialog via *Device -> Access control -> Change PIN*.
2. First select the level for which you wish to change the PIN.
3. Enter the current PIN for the desired level.
4. Enter the new PIN in the two subsequent fields.
5. Accept the input with OK.
 - ▶ The PIN for this operating level has now been changed.

8.7.4 Resetting all PINs

To reset all PINs, proceed as follows:

1. Open the input dialog via *Device -> Access control -> Reset all PINs*.
2. If you are not logged in to the level *Master (level 3)* yet, you will be prompted to log in with the pertinent PIN.
3. Accept the input with *OK*.
4. To reset all PINs, you will be prompted again to enter the PIN for the level *Master (level 3)*.
5. Accept the input with *OK*.
 - ▶ All PINs are now reset to the value *0000*.

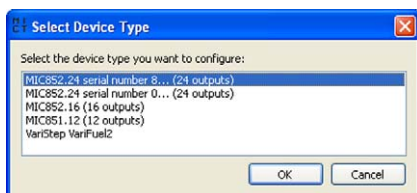
To reset all PINs, you need the PIN for the level *Master (level 3)*. To be able to unlock a system in case of emergency that was locked in this way, you have the following option:

1. With the menu entry *Device -> Access control -> Get reset all PINs request key*, open the window with the same title.
2. Send the request key with the serial number to your service contact partner at MOTORTECH. This key is valid only for the respective controller and only for a certain amount of time.
 - ▶ Your information will be verified, and you will receive an authorization key from your contact partner.
3. With the menu entry *Device -> Access control -> Set reset all PINs authorization key*, open the window with the same title.
4. Enter the authorization key received in the input field.
5. Accept the input with *OK*.
 - ▶ If the input was correct, all PINs are reset to the default value *0000*.

8.8 Selecting the Device Type



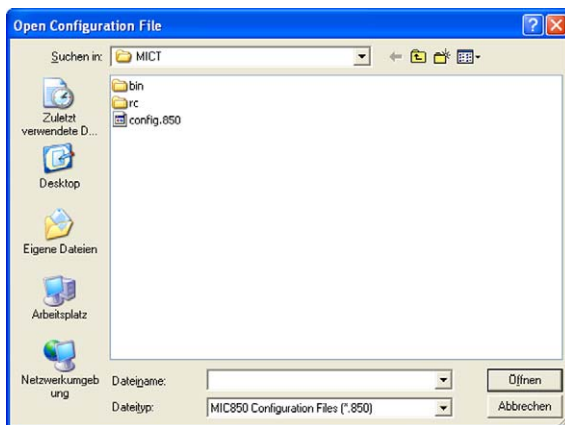
Click on the symbol to start a new configuration, and select the corresponding device type from the list. The device type of your ignition controller corresponds with the first five digits of the arrangement number, which you can find on the plate on the inside of the housing cover.



8.9 Opening an Existing Configuration File



Click on the symbol to open an existing configuration file.

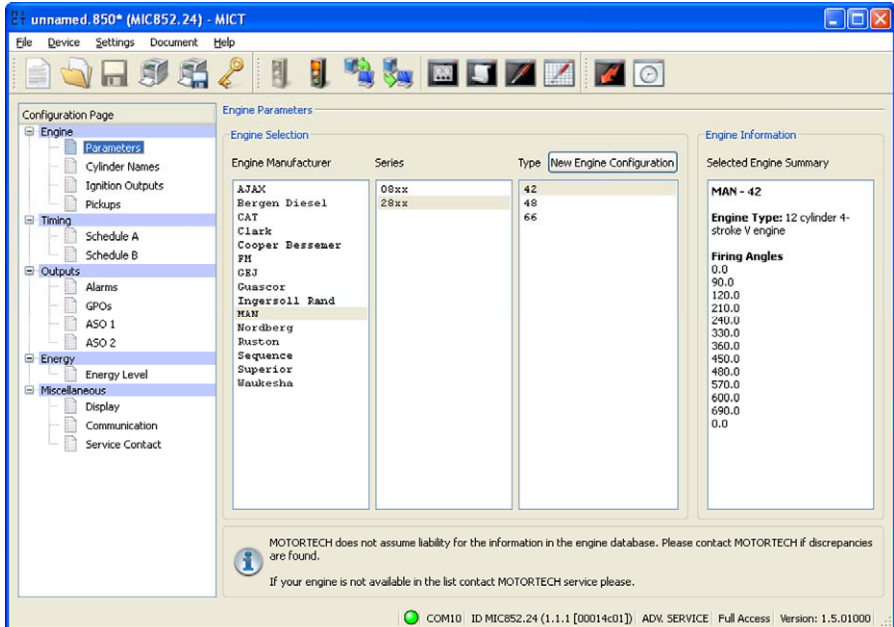


8.10 Configuration

The window opens after you select the device type for a new configuration or an existing configuration or have uploaded one from the ignition controller. You can make changes to the configuration by selecting an entry from the navigation bar. The pertinent configuration data are then displayed in the configuration section and can be processed. The following sections will describe the settings and adjustments you can implement in the different areas.

8 SETTINGS VIA THE MICT

8.10.1 Engine - Parameters



Engine Selection

The MICT holds an engine database with data from various manufacturers and model series. Select the desired engine manufacturer, series, and type by clicking on the corresponding fields. After making your selections, the right hand section *Engine Information* will display a summary of the stored engine data.

If the pertinent engine is not available in the database, the settings can also be entered by selecting the corresponding sequence. For this purpose, click on the entry *Sequence* in the column *Engine Manufacturer* and select the firing stroke in the column *Series*, then the number of cylinders, and the ignition offset of the engine as needed. After making your selections, the right hand section *Engine Information* will display a summary of the parameters selected.

The summarized data are transferred to the subsequent configuration page *Ignition Outputs*. The values displayed there can only be changed by users with authorization to access the *Advanced Service* level.



Engine Database

MOTORTECH does not assume liability for the information in the engine database. Please contact MOTORTECH if discrepancies are found.

Staff with the authorization for the *Advanced Service* level additionally has the option for entering the engine data manually, i.e., without selecting entries from the engine database. For this purpose, click on the *New Engine Configuration* button and select the engine type, number of cycles, and number of cylinders in the dialog box opening up. Additional information can be entered on the configuration page *Ignition Outputs*.

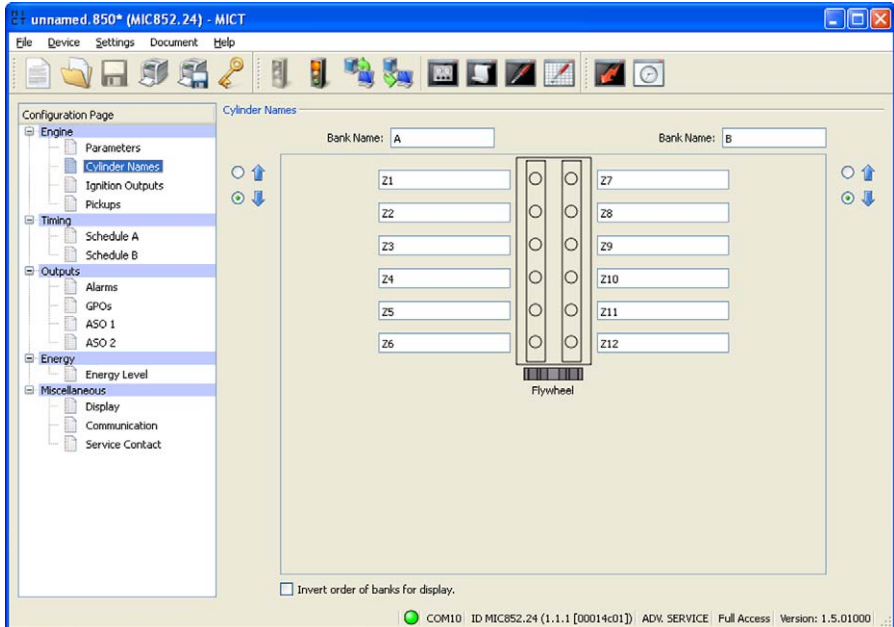
The screenshot shows a standard Windows-style dialog box titled "Dialog". It contains three dropdown menus: "Engine Type" (with a blue arrow pointing down), "Strokes" (set to "4-stroke"), and "Number of Cylinders" (set to "12"). Below these is a checkbox labeled "Multiple Ignition:" which is currently unchecked. At the bottom of the dialog, there is a text box containing the note: "Note: Specify Firing Order and Firing Angles on the Ignition Outputs Page!". Below the text box are two buttons: "OK" and "Cancel".

Multiple Ignition


If you check the box *Multiple Ignition*, the settings for multiple ignition can be entered. You can then configure a second output for each cylinder that fires with an offset. Refer to the pertinent section *Engine - Ignition Outputs* on page 69.

8 SETTINGS VIA THE MICT

8.10.2 Engine - Cylinder Names



To facilitate the assignment of the cylinders during the configuration of the ignition outputs, you can individually name each cylinder. At this you are supported by a schematic top view of the selected engine. Enter the following settings:

- **Bank Name**
Enter a name of the respective cylinder bank.
- **Cylinder Names**
Enter a name of the respective cylinder. If the checkbox *Multiple ignition* was enabled for the configuration, you have two input fields for each cylinder to name the two ignition coils per cylinder differently.
- 
Define the order of the cylinders of the respective bank for the display of the runtime data. If you select the bottom arrow the order is equivalent to the order shown on the configuration page. If you select the upper arrow the order is inverted for the display.
- **Invert order of banks for display**
Enable the checkbox to invert the order of the banks in the display of the runtime data.



Display by Cylinders

For the display by cylinders in the runtime data the following steps are necessary:

1. Name the cylinders on the configuration page *Engine – Cylinder Names*.
2. On the same configuration page you can make additional display settings (e.g. invert the order of the cylinders for display), if desired.
3. Assign the cylinders to the ignition outputs on the configuration page *Engine – Ignition Outputs*.
4. Enable the function via the menu entry *Settings -> Display by cylinders*.
5. Download the modified configuration to the device.
 - ▶ In the window *Runtime Data – Ignition* the values are now displayed in the order of the cylinders

8.10.3 Engine - Ignition Outputs

The screenshot shows the 'Ignition Outputs' configuration page. The left sidebar contains a tree view with the following items: Configuration Page, Engine (Parameters, Cylinder Names, Ignition Outputs, Pickups), Timing (Schedule A, Schedule B), Outputs (Alarms, GPOs, ASO 1, ASO 2), Energy (Energy Level), and Miscellaneous (Display, Communication, Service Contact). The 'Ignition Outputs' section is active, showing two output boards.

Output Board A

Cylinder	Output	Angle [°]
Z1	1	0.0
Z3	2	120.0
Z2	3	240.0
Z9	4	360.0
Z7	5	480.0
Z8	6	600.0
Z7	1	0.0
Z9	1	0.0
Z11	1	0.0
	1	0.0
	1	0.0
	1	0.0

Output Board B

Angle [°]	Output	Cylinder
90.0	1	Z12
210.0	2	Z10
330.0	3	Z11
450.0	4	Z4
570.0	5	Z6
690.0	6	Z5
0.0	1	Z8
0.0	1	Z10
0.0	1	Z12
0.0	1	
0.0	1	
0.0	1	

At the bottom of the window, the status bar shows: COM10 ID MIC852.24 (1.1.1.1 [00014c01]) ADV. SERVICE Full Access Version: 1.5.01000

8 SETTINGS VIA THE MICT

Make adjustments to the following settings as needed:

- **No. of Outputs**
Select the number of outputs for the respective output board.
- **Column: Cylinder**
Select a cylinder. The displayed names are set on the configuration page *Engine – Cylinder Names*.
- **Column: Output**
Select the number of the respective output.
- **Column: Angle**
Enter the ignition angle for each output.

Default application

If you select from the engine database, the data stored for the selected configuration are displayed. These data can only be changed by personnel with access to the *Advanced Service* level.

New Engine Configuration

If you created a new engine configuration on the configuration page *Engine – Parameters* via the corresponding button, the number of outputs is first distributed based on the number of cylinders on the output board A and output board B. Selecting the number of outputs enables access to the fields for the configuration of the outputs. We recommend that you distribute the number of outputs evenly among the output boards and allocate the larger number to the A board if the number is uneven.

By default, the ignition outputs are distributed so that cylinder 1 of the ignition sequence is always allocated to output board A with an ignition angle of 0°. The further distribution is implemented by alternating between output boards A and B. The ignition angle for each output results from the addition of the ignition spacing to the respective previous output.



Display by Cylinders

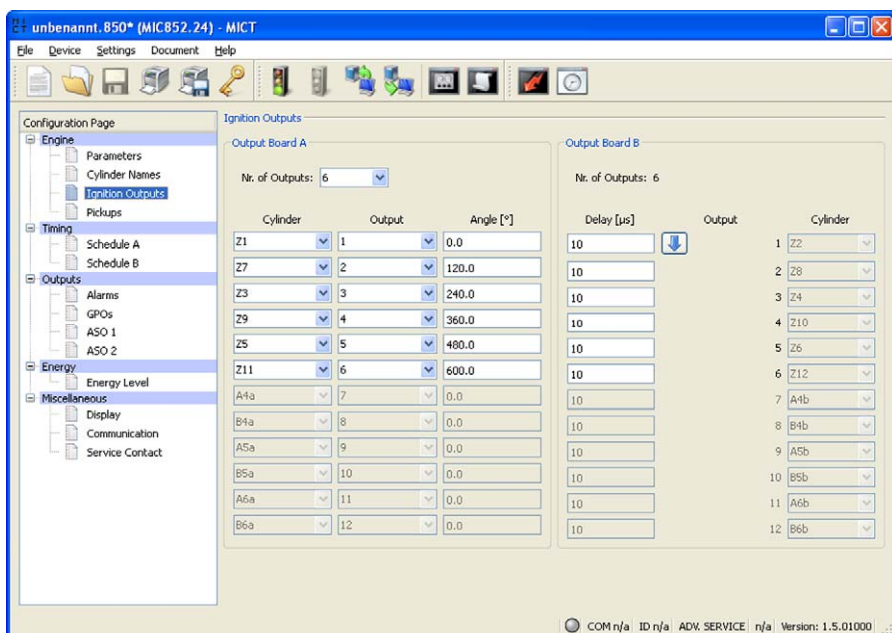
For the display by cylinders in the runtime data the following steps are necessary:

1. Name the cylinders on the configuration page *Engine – Cylinder Names*.
2. On the same configuration page you can make additional display settings (e.g. invert the order of the cylinders for display), if desired.
3. Assign the cylinders to the ignition outputs on the configuration page *Engine – Ignition Outputs*.
4. Enable the function via the menu entry *Settings -> Display by cylinders*.
5. Download the modified configuration to the device.
 - ▶ In the window *Runtime Data – Ignition* the values are now displayed in the order of the cylinders

Multiple Ignition

The MIC850 can also be used to drive two ignition coils per cylinder (up to twelve cylinders possible). If this function is used, the number of outputs used on each board is the same. The first ignition impulse is set via the angle, and the second ignition impulse is set by a delay compared to the first impulse.

The corresponding setup options will only be visible in the subsequent window and the function will only be usable if the box *Multiple Ignition* was checked. You can find the latter in the window that was opened via the configuration page *Engine – Parameters* and the button *New Engine Configuration*.



Additionally, enter the following setting for multiple ignition:

- Column: **Delay [µs]**

Enter the delay for the second ignition impulse for each output. With the button you can apply the setting in the adjacent field to all outputs.

8 SETTINGS VIA THE MICT



Operational safety

Never connect more than one output to each ignition coil, as the output boards can otherwise be damaged!

The allocation of outputs on the output boards to contacts of the output connector of the device and the cylinders is determined by the wiring. The user must take the wiring into account during the configuration; it cannot be checked by the software.



Interval between two ignitions

The interval between two ignitions on an output board must be min. 2.8 ms. During the check, the configured overspeed is used in the calculation.

8.10.4 Engine - Pickups

The screenshot shows the MICT software interface for configuring engine pickups. The window title is "unnamed.850* (MIC852.24) - MICT". The menu bar includes "File", "Device", "Settings", "Document", and "Help". The left sidebar shows a tree view with "Engine" expanded, and "Pickups" selected under "Engine". The main area displays the "Pickups" configuration page.

Pickup Setup Information

3PU (N events (passive) and 1 reset event (passive) from crankshaft and 1 event (active high) from camshaft)

Input 1 (Cam): trigger disc type SINGLE EVENT and active high pick up on camshaft
Input 2 (Reset): trigger disc type SINGLE EVENT and passive pick up on crankshaft
Input 3 (Trigger): trigger disc type N with 160 events and passive pick up on crankshaft

Pickup Setup

Predefined Setup: 3PU
Index/Reset Position: 22.9 BTDC Adjust Arbitrary Pickup Setup
Pickup Sensitivity: medium
Trigger No. of Triggers: 160

Speed Settings

Ignition Release: 50
Security Speed: 200
Nominal Speed: 1500
Overspeed: 2000

COM10 ID MIC852.24 (1.1.1.0[00014c01]) ADV. SERVICE Full Access Version: 1.5.01000



Supply voltage for pickups

The supply voltage supplied from the MIC850 to the pickups equals the general supply voltage (24 V DC).

Pickup Setup Information

The settings made in the *Pickup Setup* section were summarized once again in the section *Pickup Setup Information*.

Pickup Setup

Enter the following settings in this section:

- **Predefined Setup**
 Select the pickup configuration suitable for your application from the list. The configurations available for selection depend on the previously entered settings.
- **Index/Reset position**
 Enter the distance between the first event after the set index/ reset marking and the top dead center. With the button *Adjust*, you can enter the measured ignition angle for a given nominal value. The system calculates the difference from these values, which is added to or subtracted from the index/reset position.
- **Pickup Sensitivity**
 Open the pick list and select the desired sensitivity level for the pickup from the list offered. This setting overwrites the value of the pre-trigger voltage if the latter was defined in the user-defined pickup settings.
 - **high**
 The signal processing starts at low engine speeds. This setting can result in increased susceptibility to failure.
 - **moderate**
 Standard setting of the MICT. This is a trade-off between start-up speed and sensitivity.
 - **low**
 The signal processing does not start until high engine speeds are reached. This setting can result in reduced susceptibility to failure.
- **Cam/Trigger**
 Enter the number of events. The input for *Cam* or *Trigger* is automatically selected by the MICT and is governed by the selection of the pre-defined pickup settings.

8 SETTINGS VIA THE MICT

– Arbitrary Pickup Setup

Staff authorized to access the *Advanced Service* level can, in addition to the standard settings access, use a manual setup option by clicking on the button *Arbitrary Pickup Setup*.

Input	Type	No. of Events	Speed	Active/Passive
Pickup Input 1 (CAM):	SINGLE EVEN	1	CAMSHAFT	active high
Pickup Input 2 (RESET):	SINGLE EVEN	1	CRANKSHAFT	active high
Pickup Input 3 (TRIGGER):	N	60	CRANKSHAFT	active high

Pre-Trigger Voltage: 1.5 V

OK Cancel

Trigger Disc Type, Default = NONE

– Type

Select the type of events that will occur on the respective input for each pickup input. Type and number of events are defined by the discs or ring gears used. If you decide not to use a pickup input, select the entry *not used* from the list. You can set the following types:

N

disc, which causes a uniformly distributed number (N) of events (per rotation), e.g. a ring gear with 160 teeth (N=160).

N+1

Disc of type *N* with one additional event, e.g. a disc with 12 teeth and one additional tooth for the index signal (N=12).

N-1

Disc of type *N* where one event is missing, e.g. a ring gear with 160 teeth on which one tooth was removed (N=160). This missing event is used to determine the index signal.

N Magnets, Individual Magnet (not currently implemented)

You will always use these two types together for a disc with magnets with opposite polarity. A fixed number (N) of the magnets has the same polarity, and a single magnet has the opposite polarity. Thus, the disc supplies two signals that can be analyzed by a pickup. Such a disc can e.g. be structured as follows: 60 magnets (N=60) point to the pickup with their north pole, and one magnet points to it with its south pole. All magnets are arranged at equal distances on the disc.

Individual Result

Disc that supplies a single event, e.g. a disc with one tooth or one magnet.

– Number of Events

Enter the number of events that occur on the pickup if more than one event is expected. For the types *N+1* and *N-1*, enter the value for N and not the total number of events. With the type *N Magnets*, the number of magnets with identical polarity must be entered. The number of events must lie between three and 500. Additionally, it must be ensured that the sum of the frequencies at the pickup input does not exceed the limit of 8 kHz at the pre-set overspeed.

- **Speed**
 Select whether the respective pickup will pick up the signal off the camshaft or the crankshaft.
- **Active/Passive**
 Select the pickup to be used from the pre-defined pick list:
 passive
 passive pickup
 active (low)
 active pickup with High level as quiescent level
 active (high)
 active pickup with Low level as quiescent level.
- **Pre-Trigger Voltage**
 Enter a value between 0.1 V and 4.5 V to set the pickup sensitivity level. Signals that fall short of the set voltage will not be analyzed. A low pre-set value therefore results in a high sensitivity level, a high value results in a low sensitivity level.



Pickup Setup Information

The respective latest setting in the area of the pre-defined or arbitrary pickup settings is transferred to and displayed under *Pickup setup information*.

Speed settings

Enter the following settings in this section:

- **Ignition Release**
 Enter the release speed for the ignition at which the first ignition is to fire. The value shall not exceed 1/7 of the nominal speed.
- **Security Speed**
 Enter the security speed (max. half the nominal speed). Below the value entered, the ignition can be switched on and off as desired. If the ignition is deactivated during operation if the set speed is exceeded, the ignition cannot be immediately reactivated. Only when the ignition no longer reads a speed, i.e., the engine has come to a standstill, can the ignition be reactivated.
- **Nominal Speed**
 Enter the nominal speed at which your engine is to be operated. With engines that are to be operated with variable speeds, the max. speed of the operating range must be entered.

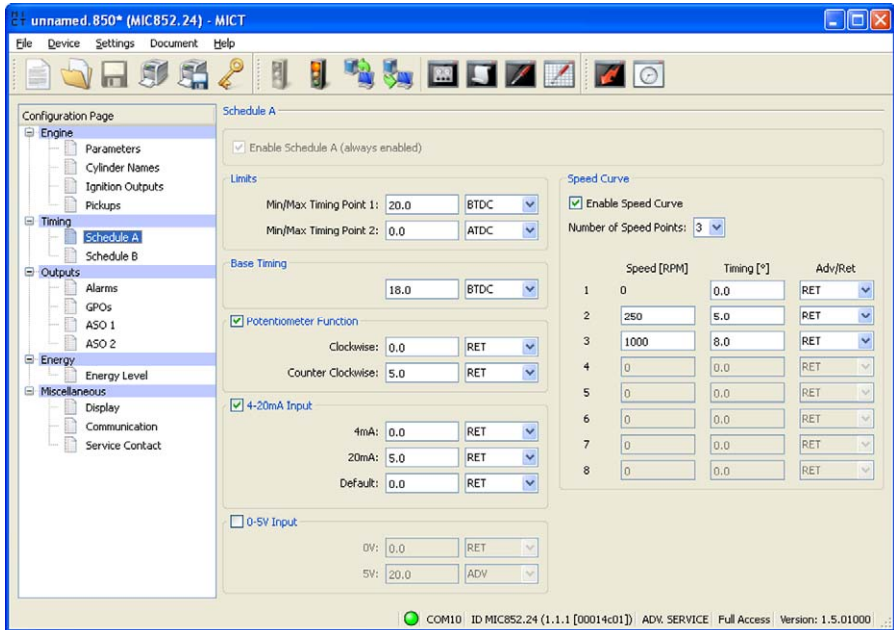
8 SETTINGS VIA THE MICT

– Overspeed

Enter the speed at which the ignition is to be shut off as overspeed protection. With engines that are to be operated with variable speeds, a speed above the operating range must be entered. The following input will not be accepted by the device:

- Input higher than 6000 RPM
- Input causing pickup frequencies above 8 kHz.
- Input that causes the average ignition frequencies of each output board to exceed 250 Hz.

8.10.5 Timing - Schedule A/B



Schedule A

The MIC850 offers two parameter sets for implementing the necessary settings for the timing of the engine. The schedules A and B can be used for dual fuel operation, for example. The system switches between the schedules via the input *Schedule A/B*. If only one set is configured (schedule A is enabled by default), the switch is ignored. The configuration options for schedule B are identical to those for set A. The settings are enabled or disabled by checking/unchecking the box.

Limits

Enter the limits of the timing point at which the ignition can fire. The timing points of the outputs will be limited to this range relative to the respective top dead center of the pertinent cylinder. The global timing can then not be shifted beyond this range by any adjustments.

Base Timing

Enter the timing specified by the engine manufacturer. This point must be within the limits entered and is a static portion of the global timing.

Potentiometer Function

The check box *Potentiometer Function* activates and disables the potentiometer function for manually adjusting the global timing by the respective stops of the potentiometer set in dependence on the rotation direction. If the potentiometer is disabled again afterwards, the system will no longer access the data during the subsequent data transfer to the controller and restart of the engine, and the controller will no longer use them to calculate the global timing.

Analog Inputs

By clicking on the inputs *4-20 mA* and *0-5 V*, they can be activated or disabled. If you have the choice, you should prefer the *4-20 mA* input due to its lower sensitivity to faults. Enter the values by which the adjustment is to be implemented for the corresponding input current. For the *4-20 mA* input, an additional default value can be entered by which the value (e.g. wire rupture) is to be adjusted in case the *4 mA* limit is not reached, or if the signal fails completely.

Speed curve

The speed curve can be activated and disabled by mouse click and offsets the timing in dependence on the speed. A max. of eight speed points are available. If you select a number of points from the list, the corresponding number of fields is activated for input.

The first speed point is always set to 0 RPM. All other timing points are assigned with the value by which the signal is to be offset when the respective speed is reached. For the last speed point, the timing of the nominal speed should be entered. Please note that the speed points must always be entered in ascending order.

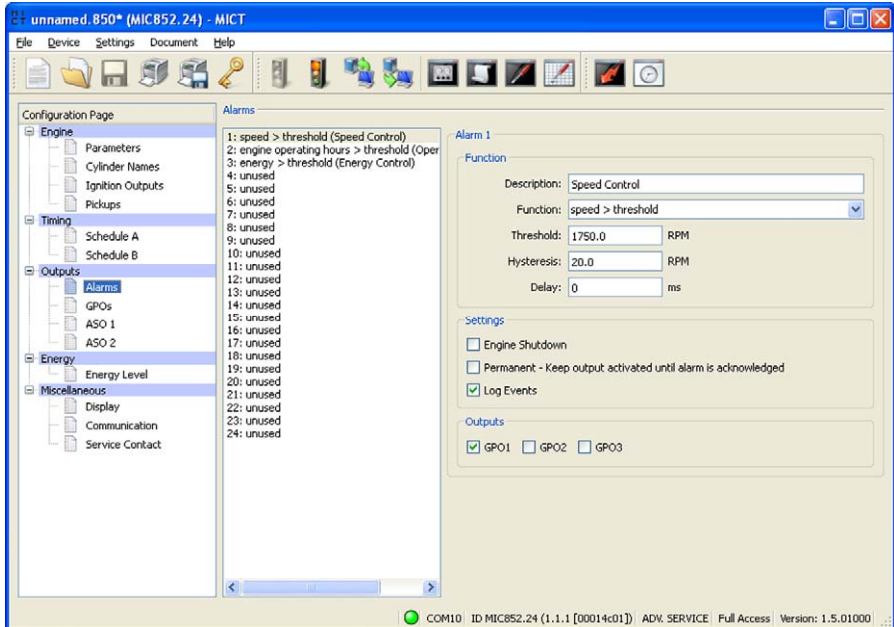


Simulation function

To verify the values entered, the simulation function can be started via the symbol *Schedule Curve* or with the menu *Document -> Schedule Curve*.

8 SETTINGS VIA THE MICT

8.10.6 Outputs - Alarms



The MIC850 ignition controllers include a total of 24 configurable alarms that can be freely allocated to the general purpose outputs.

- **Description**
You can enter any desired description for an alarm. The description is used for logging the alarms that have occurred in the alarm lists in the MICT and the HMI.
- **Function**
The alarms can be used depending on the following functions:
 - unused
 - Misfire rate above threshold / below threshold
 - Speed above threshold / below threshold
 - Engine operating hours above threshold / below threshold
 - Energy above threshold / below threshold
 - Spark plug operating hours above threshold / below threshold
 - Warning active
 - Error active
 - Temperature above threshold / below threshold

- 0-5 V input above threshold / below threshold
- 4-20 mA above threshold / below threshold
- Global timing above threshold / below threshold
- Supply voltage above threshold / below threshold
- Min. spark duration above threshold / below threshold
- **Threshold**
Input of desired threshold value.
- **Hysteresis**
Input of desired hysteresis value.
- **Delay**
Input of desired delay The threshold value defined in the alarm must have been exceeded or not reached for a longer period than the specified time for an alarm to be triggered. If a corresponding value occurs for a shorter period of time, no alarm is triggered.
- **Engine Shutdown**
If this checkbox is checked, the ignition is switched off as soon as the alarm is triggered.
- **Permanent - output activated until alarm is acknowledged**
If this box is checked, the output remains permanently active until the alarm is acknowledged. If the box is not checked, the output remains active only for as long as the alarm is active.
- **Log Events**
If this box is checked, the MICT and HMI will log in the alarm list when the alarm occurred or when it was acknowledged.
- **Outputs**
Selection of the general purpose output (GPO) that is activated when the alarm is triggered.



Sample alarm definitions

The following alarms are frequently used to support the safe and reliable operation of the engine.

- **Speed switch**
With the function *speed > threshold*, you can, for example, determine that an output is activated upon reaching a speed just below the overspeed, which takes over a controller function for the engine.
- **Misfire rate**
A high misfire rate indicates an unreliable or unsafe operating state. To make the ignition controller react to an excessive misfire rate, e.g. by shutting down the engine, define an alarm with the function *misfire rate > threshold* and check the box *Engine Shutdown*.

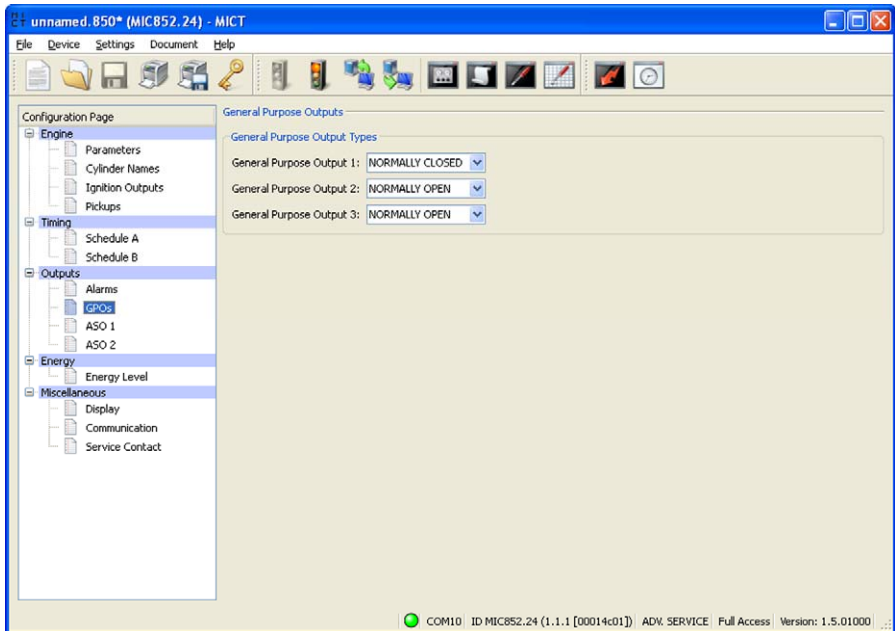
8 SETTINGS VIA THE MICT



Alarm for energy > threshold

Please note with alarms for the function *energy > threshold* that a higher energy level may have been defined for the start phase of the engine than for the regular operation.

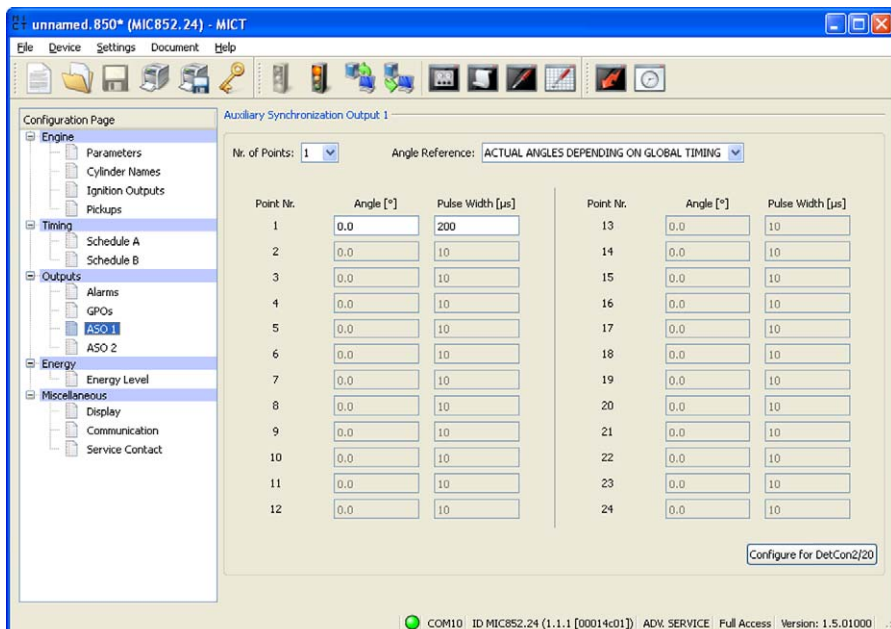
8.10.7 Outputs - GPOs (General Purpose Outputs)



– General purpose outputs 1 - 3

The MIC850 has three configurable general purpose outputs. It is possible to configure the outputs as *Normally closed* or *Normally open*. The allocation of the general purpose outputs to alarms is carried out on the configuration screen *Outputs - Alarms* on page 78.

8.10.8 Outputs - ASO 1 and 2 (Auxiliary Synchronization Outputs)



With the two auxiliary synchronization outputs, freely definable impulses depending on the angle of the crankshaft can be generated. For each output, the user defines whether the angle will be absolute or based on the global timing. Each output can generate between 1 and 24 impulses and only be assigned to one system at a time. One example of the application of the ASO outputs for a detonation controller can be found in section *ASO 1 / 2: Auxiliary Synchronization Outputs* on page 51.

– No. of Points

Select the number of impulses from the *No. of Points* list. Please note that the DetCon detonation controller devices require a single impulse with 200 µs synchronous with the first cylinder in the ignition sequence. You get this setting via the button *Configure for DetCon2/20*.

– Angle Reference

Select from the *Angle Reference* drop-down list whether the angle shall be based on the absolute angle of the crankshaft or the actual angle depending on the global timing. Then, enter the trigger angle for each impulse and the length of the impulse in µs.

8 SETTINGS VIA THE MICT



Maximum impulse duration

Please note that the duration of the impulse can be entered as max. 300 μ s. Input of higher values will not be accepted by the system.

8.10.9 Energy - Energy Level

	Runtime [h]	Energy [%]
1	0	20
2	250	50
3	750	75
4	1300	100
5	0	20
6	0	20
7	0	20
8	0	20

Coil Parameters

Select the ignition coil type used for the engine from the list. The stored coil characteristic is used to determine the spark duration and the secondary voltage in the runtime data. If no coil type was selected, the Auto Spark Control (ASC) function cannot be used. In addition, secondary voltage and spark duration cannot be determined, and the secondary winding misfire detection cannot be implemented.



Operational Safety

Only one ignition coil type must be installed on the engine. Combining different types is not possible.

Start Phase

Until the selected speed is reached, the energy is defined independently from other settings. After reaching this speed, the ignition controller switches back to the other settings. A speed between 0 RPM (min.) and half the nominal speed (max.) can be entered as the limit value. The energy value entered may vary between 20% and 100%.

Energy Mode

Define by mouse click whether the ignition energy will be determined manually, dependent on the operating hours of the spark plugs, or via the Auto Spark Control (ASC) when the start phase is completed.

Manual Energy

If you select the manual energy setting, enter the ignition energy that is to be used after completing the start phase.

Energy depending on Spark Plug Runtime

With this setting, you define the energy curve in dependence on the operating hours of the spark plugs. Select the desired number of points for the curve from the No. of Points list. Enter the operating hours and the respective desired energy level for each point individually. If you select this energy mode, it is necessary to reset the operating hours counter of the spark plugs when the spark plugs are replaced. This setting can be made with menu item *MIC* → *Set spark plug runhours* or with the HMI.



Input of the operating hours

Please note that the operating hours must be entered in ascending order. You can open a visualization of the data entered with the symbol *Energy Curve*.

Auto Spark Control (ASC)

For the configuration of the spark duration, the ignition coil type must be defined under coil parameters. Selecting the function Auto Spark Control (ASC) in the energy mode area displays additional settings in the spark duration control area. These settings consist of the basic settings for drop-out energy and max. energy to 80%, for min. energy to 40%, and for the spark duration to 600 μ s. The energy ranges can be adjusted between 20 and 100%, the spark duration can be set within a range of 100-1500 μ s.

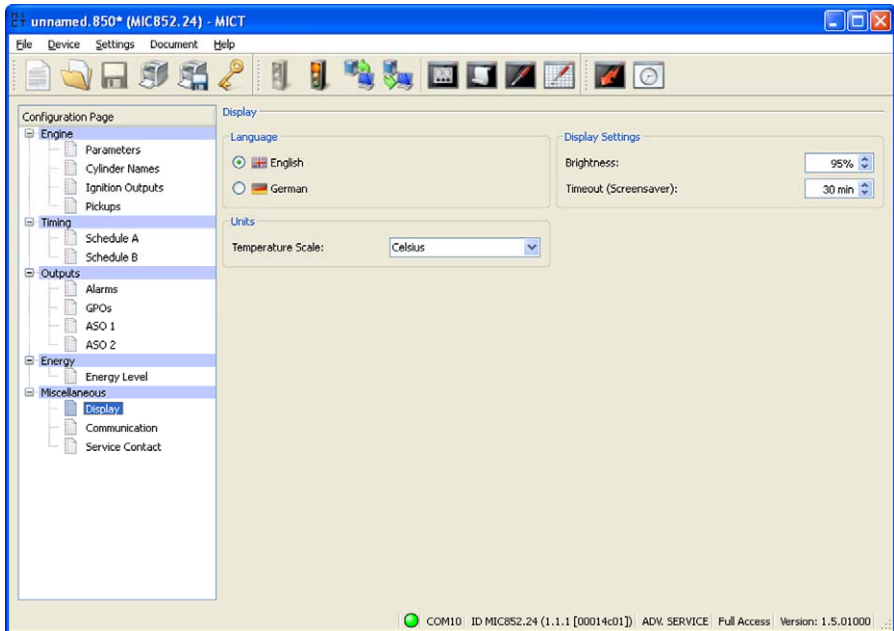
8 SETTINGS VIA THE MICT



Operational Safety

To use the ASC function of the MIC850, only ASC-capable MOTORTECH ignition coils may be used, which are marked with the ASC logo.

8.10.10 Miscellaneous - Display



Language

Select the language for the controller display by mouse click.

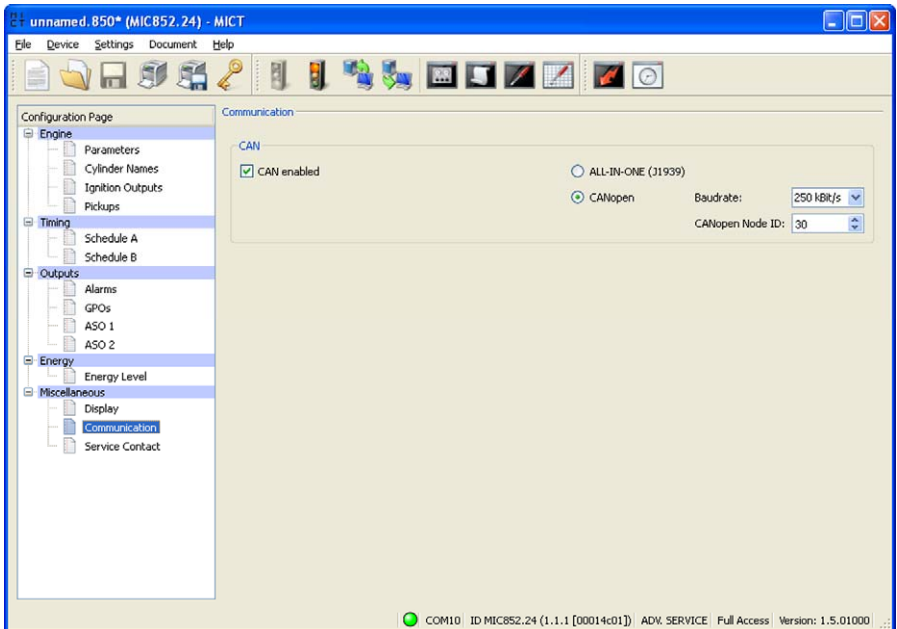
Display Settings

- **Brightness**
Enter the desired brightness for the controller display.
- **Timeout (Screensaver)**
Select the time after which the screensaver is to be activated.

Units

Select the desired unit (Celsius, Fahrenheit, or Kelvin) with which the temperatures shall be displayed on the controller.

8.10.11 Miscellaneous - Communication



CAN

Clicking on the field *CAN enabled* enables or disables the *CANopen* interface on the device.

- **ALL-IN-ONE (J1939)/CANopen**
 Please select the desired protocol, depending on whether you want to set the communication for the ALL-IN-ONE or any other master control. If *ALL-IN-ONE* is selected, the CAN interface works always with 250 kBit/s.
- **Baudrate**
 Select for the CANopen protocol the desired data transfer rate from the list. The CAN Baud rate can be defined between 10 kBit/s and 1 MBit/s, the recommended value being 250 kBit/s. For communicating with a PowerView2, set it to 250 kBit/s, as well.
- **CANopen Node ID**
 The CANopen node ID can be assigned between 1 and 123. The MIC850 takes up a total of five node IDs. Based on the node ID set, the four following IDs are then assigned. Please note that IDs cannot be assigned more than once.

8 SETTINGS VIA THE MICT

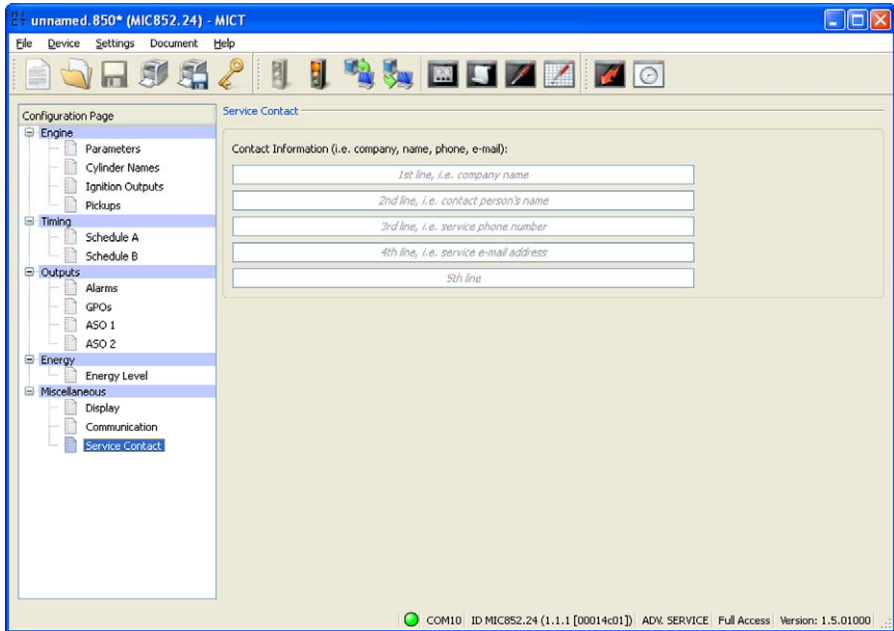


Setting the transfer rate

Please note that all equipment connected must be set to the same transfer rate.

8.10.12 Miscellaneous - Contact Information

This configuration page can be viewed by all users, but changes can only be made with authorization for the *Service* access level.



Contact Information






In this section, individual contact data can be saved that can be called up and displayed via MICT or HMI.

8.11 Runtime Data



Click on the symbol to open the window *Runtime Data*. The following sections will give you an overview of the data you can view on the individual tabs.

You can print and record the runtime data. For this purpose, the following functions are at your disposal in the toolbar in the window:

Symbol	Function
	Prints the runtime data.
	Prints the runtime data to a PDF file.
	Opens the print preview.
	Starts recording a trace of runtime data.
	Stops recording a trace of runtime data.

8 SETTINGS VIA THE MICT

8.11.1 Runtime Data - Overview



In this screen, you can find the following information:

- **Speed indicator (analog)**
 - Red pointer
Indicates the current speed
 - Yellow pointer
Indicates the max. speed reached
- **Speed indicator (digital)**
Digitally displays the current speed
- **Max. Speed**
Digital indication of the max. speed reached

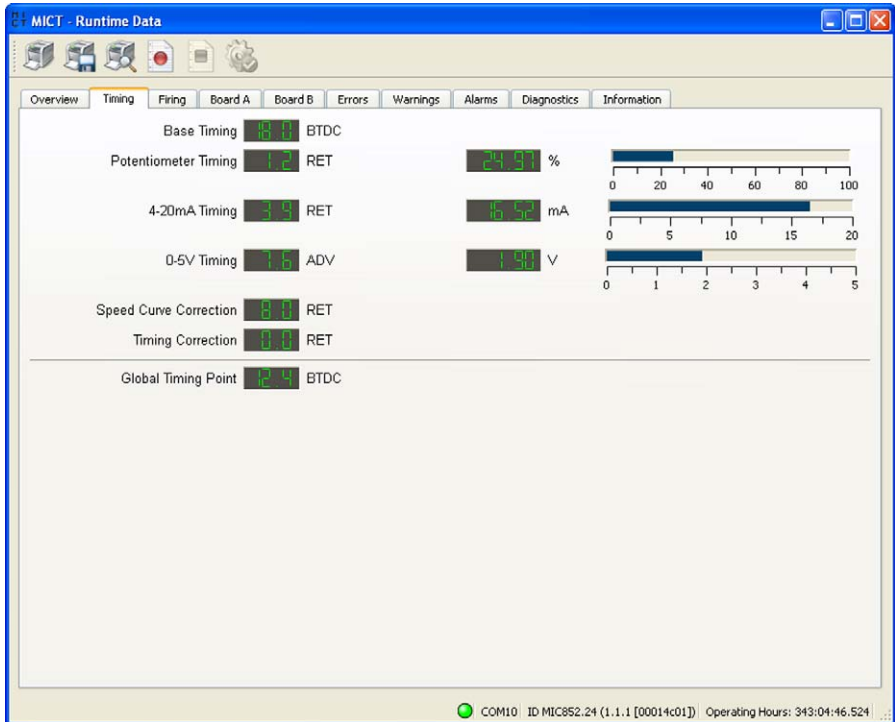
- **Timing Point indicator (analog)**
 - Red pointer
Indicates the current global timing
 - Yellow pointer
Indicates most advanced/retarded global timing that occurred since opening this screen
- **Global Timing**
Digital indication of the current global timing
- **Base Timing**
Digital indication of the current base timing
- **Firing Enabled**
This status display shows if the ignition has been released.
 - Green
released
 - Gray
not released
- **Energy**
Digital indication of the current energy level
- **Schedule A/B**
The green status display shows which parameter settings are currently used.
- **System State**
Indicates the system status with the following possible messages:

System status	Description
Initialization	The initialization is running.
Configuration	The device is being configured.
Ready	The ignition is ready and waiting for pickup activity.
Self Test	The self test is running.
Synchronization	Pickup signals are being received and analyzed.
Firing locked	Pickup signals are being received and are valid, ignition is not released.
Wait for o RPM	Pickup signals are being received, the ignition fired above the security speed, and the ignition release was retracted. The engine must now come to a standstill.
Firing active	The ignition is active.
Operational Error	An operational error was detected.
System Error	A system error occurred.

8 SETTINGS VIA THE MICT

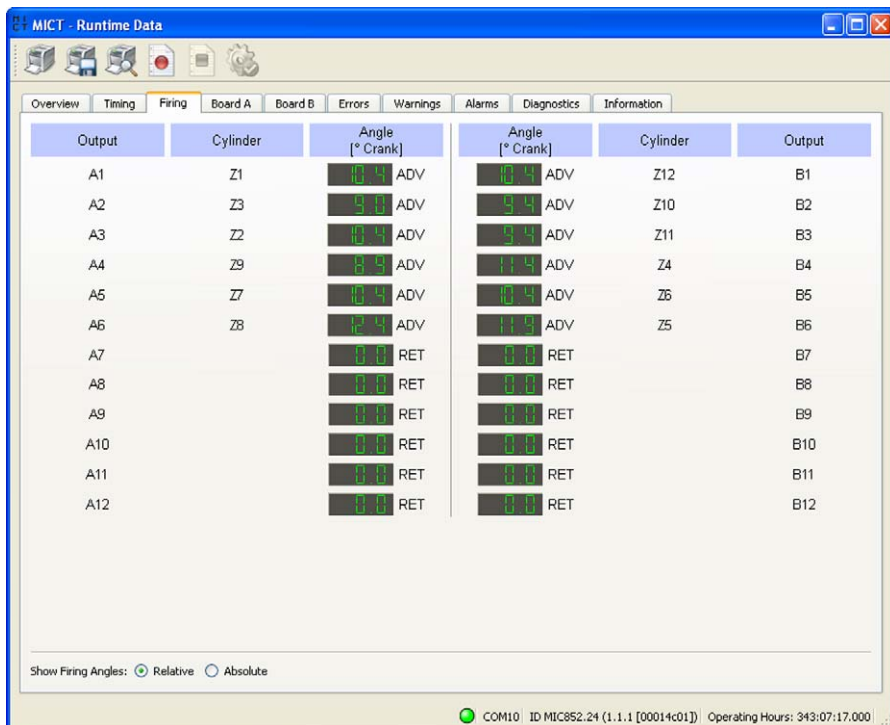
- **Error state**
A red status display shows that an error has occurred. For details, refer to the tab *Error*. Errors during engine operation result in the engine being shut down.
- **Warning state**
A red status display shows that a warning has occurred. For details, refer to the tab *Warnings*. Warnings do not result in the engine being shut down.
- **ASC State**
Indicates whether the Auto Spark Control (ASC) is activated.
- **Minimum Spark Duration**
Minimum spark duration that is currently reached.
- **Current Engine Operating Hours**
Indication of current operating hours of the engine.
- **Sparkplug Operating Hours**
Indicates the current operating hours of the spark plugs.

8.11.2 Runtime Data - Timing



In this view, the system displays all values and settings in the left hand section that influence the ignition timing. In the right hand section, values are additionally displayed and shown as a bar chart that are measured at the three inputs (potentiometer, 4-20 mA and 0-5 V) and thus cause the changes to the timing shown. The value for the speed curve results from the curve progression set in the configuration. Refer to the section *Timing - Schedule A/B* on page 76. The timing correction can be implemented for the runtime. Refer to the section *Runtime Adjustments - Timing* on page 105.

8.11.3 Runtime Data - Ignition



The following information is provided:

- Column: **Output**
Identification of the output
- Column: **Cylinder**
Assigned cylinder name
- Column: **Angle [°crankshaft]**
Current ignition angle of the outputs of board A or B

8 SETTINGS VIA THE MICT



Display by Cylinders

For the display by cylinders in the runtime data the following steps are necessary:

1. Name the cylinders on the configuration page *Engine – Cylinder Names*.
2. On the same configuration page you can make additional display settings (e.g. invert the order of the cylinders for display), if desired.
3. Assign the cylinders to the ignition outputs on the configuration page *Engine – Ignition Outputs*.
4. Enable the function via the menu entry *Settings -> Display by cylinders*.
5. Download the modified configuration to the device.
 - ▶ In the window *Runtime Data – Ignition* the values are now displayed in the order of the cylinders

8.11.4 Runtime Data - Board A and B

Output	Cylinder	Angle [° Crank]	Secondary Voltage [kV]	Spark Duration [µs]	Rate [%]	Misfire			
						primary open	secondary open	primary short	secondary short
A1	Z1	10.4 ADV	25.6	409	0	●	●	●	●
A2	Z3	9.0 ADV	0.0	505	100	●	●	●	●
A3	Z2	10.4 ADV	20.1	550	0	●	●	●	●
A4	Z9	8.9 ADV	4.0	765	33	●	●	●	●
A5	Z7	10.4 ADV	12.8	660	25	●	●	●	●
A6	Z8	12.4 ADV	20.1	532	0	●	●	●	●
A7		0.0 RET	0.0	0	0	●	●	●	●
A8		0.0 RET	0.0	0	0	●	●	●	●
A9		0.0 RET	0.0	0	0	●	●	●	●
A10		0.0 RET	0.0	0	0	●	●	●	●
A11		0.0 RET	0.0	0	0	●	●	●	●
A12		0.0 RET	0.0	0	0	●	●	●	●

Show Firing Angles: Relative Absolute

Reset Output Status Flags

COM10 ID MIC852.24 (1.1.1 [00014c01]) Operating Hours: 343:08:01.822

The following information is provided:

- Column: **Angle [°crankshaft]**
Current ignition angle of the outputs of board A or B (updated only while engine is running).
- Column: **Secondary Voltage [kV]**
Current secondary voltage of the respective output of board A or B.
- Column: **Spark Duration [µs]**
Current spark duration of the output.
- Column: **Rate [%]**
Current misfire rate of the respective output.
- Column: **primary**
Current misfire types on primary winding. In case of misfire, the status display turns red, otherwise it is gray. A yellow status display notifies the user of previous misfires that have occurred.
- Column: **secondary**
Current misfire types on secondary winding. In case of misfire, the status display turns red, otherwise it is gray. A yellow status display notifies the user of previous misfires that have occurred.

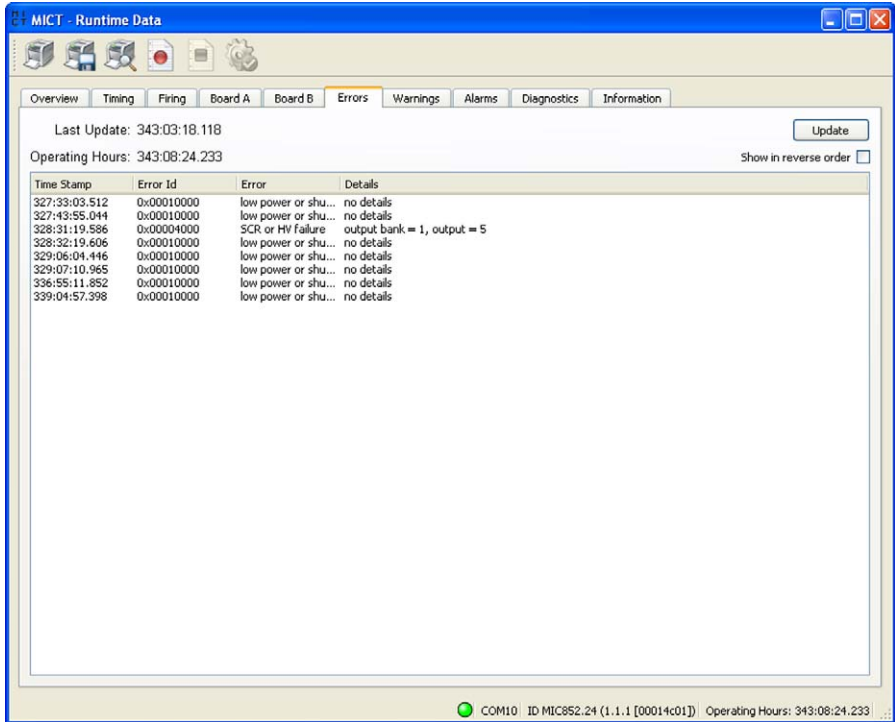
You have the following option:

- **Reset Output Status Flags**
The status of the ignition controller outputs is reset. The status displays for the outputs turn gray again.

8 SETTINGS VIA THE MICT

8.11.5 Runtime Data - Errors

All system or operating errors cause the engine to be shut down.



The screenshot shows the 'MICT - Runtime Data' application window. It features a menu bar with 'Overview', 'Timing', 'Firing', 'Board A', 'Board B', 'Errors', 'Warnings', 'Alarms', 'Diagnostics', and 'Information'. The 'Errors' tab is selected. The main area displays the following information:

Last Update: 343:03:18.118
Operating Hours: 343:08:24.233

Update button and Show in reverse order checkbox.

Time Stamp	Error Id	Error	Details
327:33:03.512	0x00010000	low power or shu...	no details
327:43:55.044	0x00010000	low power or shu...	no details
328:31:19.586	0x00004000	SCR or HV failure	output bank = 1, output = 5
328:32:19.606	0x00010000	low power or shu...	no details
329:06:04.446	0x00010000	low power or shu...	no details
329:07:10.965	0x00010000	low power or shu...	no details
336:55:11.852	0x00010000	low power or shu...	no details
339:04:57.398	0x00010000	low power or shu...	no details

COM10 ID MIC852.24 (1.1.1 [00014c01]) Operating Hours: 343:08:24.233

The following information is provided:

- **Time Stamp**
Status of the operating hours counter at which the error occurred.
- **Error ID**
The error ID is used to identify the error.

– **Error**

Short description of the error. The following errors are possible:

Error	Description
no error	No error
trigger count	Number of events per cycle counted does not correspond with set value.
trigger missing	Number of counted events is smaller than expected number.
cycle signal missing	Cycle signal was not detected in time. More events were counted than is expected per cycle.
reset count	Number of reset events is outside expected range.
trigger period	Current event period is outside the valid range with reference to the previous event period.
pickup pre-processor	Pre-processor pickup causing errors.
overspeed	Overspeed.
missing output board	Output board could not be detected.
SCR or HV error	Thyristor error occurred / Problems with primary high voltage generator.
misfire rate	Misfire rate exceeded.
low power or shut-off	Voltage too low.
general	General error.
alarm shutdown	The ignition is shut down due to an alarm.
reset by watchdog	The device was restarted by the watchdog.
temperature	The max. permissible device temperature was exceeded.
pickup signals in self test	The self test was aborted because pickup signals were detected.

You have the following option:

– **Update**

With the *Update* button, you can manually update the error list displayed. If an error occurs, the list is updated automatically. Errors displayed in red have been added since the last activation of the device.

– **Show in reverse order**

Please activate the checkbox to reverse the order of the listed entries

8 SETTINGS VIA THE MICT



Acknowledging an operating error

While the engine is shut down, you have the following options for acknowledging operating errors:

- with *Acknowledge operational error* in the MICT
- with *Acknowledge* in the Error Commands screen in the HMI (optional)
- Disconnecting the supply voltage
- Press pushbutton *PBz* on the controller for several seconds.

8.11.6 Runtime Data - Warnings

Contrary to errors, warnings do not result in the engine being shut down.

The screenshot shows the 'Warnings' tab in the MICT software. The interface includes a menu bar with 'Overview', 'Timing', 'Firing', 'Board A', 'Board B', 'Errors', 'Warnings', 'Alarms', 'Diagnostics', and 'Information'. Below the menu, it displays 'Last Update: 343:03:18.486' and 'Operating Hours: 343:08:41.042'. A table lists various warnings with their time stamps, IDs, and details.

Time Stamp	Warning Id	Warning	Details
339:08:15.768	0x00000001	trigger count	trigger cnt = 120
339:08:16.091	0x00000001	trigger count	trigger cnt = 120
339:08:16.447	0x00000001	trigger count	trigger cnt = 120
339:08:16.848	0x00000001	trigger count	trigger cnt = 120
339:08:17.318	0x00000001	trigger count	trigger cnt = 120
339:08:17.914	0x00000001	trigger count	trigger cnt = 120
339:08:18.877	0x00000001	trigger count	trigger cnt = 118
339:12:35.389	0x00000001	trigger count	trigger cnt = 61
340:56:04.102	0x00000040	reset count	reset cnt = 1
340:58:40.653	0x00000001	trigger count	trigger cnt = 60
341:49:04.039	0x00000040	reset count	reset cnt = 1
341:53:17.936	0x00000040	reset count	reset cnt = 0

The following information is provided:

- **Time Stamp**
Status of the operating hours counter at which the warning occurred.

- **Warning ID**
The warning ID is used to identify the warning.
- **Warning**
Brief description of the warning. The following warnings are possible:

Warning	Description
no warning	No warning.
trigger count	Number of events counted does not correspond with set value.
trigger missing	Number of counted events is smaller than expected number.
cycle signal missing	Cycle signal was not detected in time. More events were counted than is expected per cycle.
trigger period	Event period outside the expected range.
spurious trigger	Event recognized as fault.
spurious reset	Event recognized as fault.
reset count	Number of reset events is outside expected range.
pickup pre-processor trigger number	Number of events detected in the pre-processor pickup is outside the expected range.
pickup pre-processor trigger missing	Event period of pre-processor pickup is outside the expected range.
pickup pre-processor index missing	Pre-processor pickup could not detect index/reset event.
pickup pre-processor	Pre-processor pickup causes warning.
misfire rate	Misfire rate exceeded.
overspeed	Overspeed.
no ASC signal	ASC signal was not detected.
low power	Voltage too low.
general	General warning
display access lost	Access to the display was lost.
config data CRC error	The configuration could not be read due to a CRC error.
short angle distance	The distance between two ignitions is smaller than the minimum ignition spacing because of the timing correction.

8 SETTINGS VIA THE MICT

You have the following option:

- **Update**
With the *Update* button, you can manually update the warning list displayed. If a warning occurs, the list is updated automatically. Warnings displayed in red have been added since the last activation of the device.
- **Show in reverse order**
Please activate the checkbox to reverse the order of the listed entries



Acknowledging warnings

You can acknowledge a warning by briefly pressing the pushbutton *PB1* on the controller.

8.11.7 Runtime Data - Alarms

Contrary to errors and warnings, which are specified by the ignition controller, up to 24 different alarms can be freely configured with the MICT. Refer to the section *Outputs - Alarms* on page 78.

Under the runtime data, you can view an overview of alarms that occurred and which ones were acknowledged. Additionally, the system logs instances of a changed configuration being transferred to the MIC, as this will reset the alarms.

Timestamp	Alarm	Description	Event
302:16:03.947	1	Drehzahlshalter 1	alarm triggered
303:51:49.659	1	Drehzahlshalter 1	alarm triggered
307:52:49.636	1	Drehzahlshalter 1	alarm triggered
319:33:08.310	1	Drehzahlshalter 1	alarm triggered
320:29:49.996	1	Drehzahlshalter 1	alarm triggered
321:11:39.710	1	Drehzahlshalter 1	alarm triggered
321:44:34.653	1	Drehzahlshalter 1	alarm triggered
322:19:45.155	1	Drehzahlshalter 1	alarm triggered
323:52:37.763	1	Drehzahlshalter 1	alarm triggered
324:41:30.177	1	Drehzahlshalter 1	alarm triggered
326:13:52.754	1	Drehzahlshalter 1	alarm triggered
327:25:56.341	1	Drehzahlshalter 1	alarm triggered
327:27:19.589	1	Drehzahlshalter 1	alarm triggered
327:31:46.381	1	Drehzahlshalter 1	alarm triggered
327:33:11.555	1	Drehzahlshalter 1	alarm triggered
327:45:38.434	1	Drehzahlshalter 1	alarm triggered
328:25:05.707			configuration changed - all alarms reset
328:25:13.621	1	Drehzahlshalter 1	alarm triggered
328:27:17.955			configuration changed - all alarms reset
330:32:58.999			configuration changed - all alarms reset
331:15:05.593			configuration changed - all alarms reset
331:17:00.913			configuration changed - all alarms reset
331:23:42.726			configuration changed - all alarms reset
331:24:45.949			configuration changed - all alarms reset
332:22:02.769			configuration changed - all alarms reset
333:23:23.210			configuration changed - all alarms reset
333:25:33.267			configuration changed - all alarms reset
335:15:53.538			configuration changed - all alarms reset
335:33:03.934			configuration changed - all alarms reset
335:35:13.481			configuration changed - all alarms reset

The following information is provided:

- **Time Stamp**
Status of the operating hours counter at which the alarm occurred.
- **Alarm**
Number of the alarm in the configuration
- **Description**
Description of the alarm that was entered on the configuration page *Outputs - Alarms*. Refer to the section *Outputs - Alarms* on page 78.

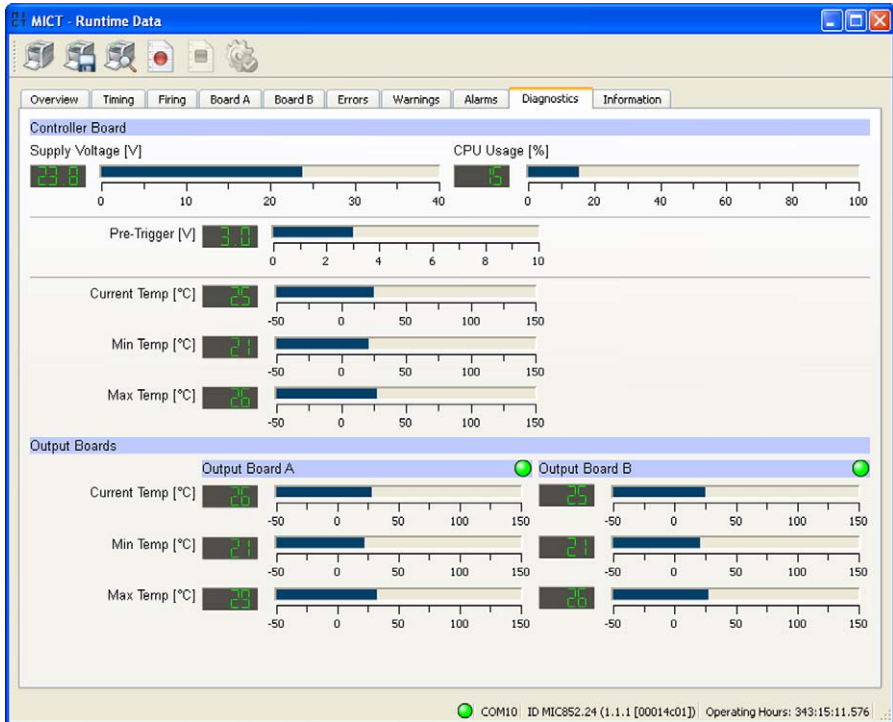
8 SETTINGS VIA THE MICT

- **Event**
Shows which event has occurred. Possible events include: Alarm triggered, Alarm acknowledged, and Configuration changed.

You have the following options:

- **Automatic scrolling**
If this box is checked, the system automatically displays the last list entry until a new event occurs.
- **Acknowledge alarms**
With this button, you can reset triggered alarms if they are no longer active.

8.11.8 Runtime Data - Diagnostics



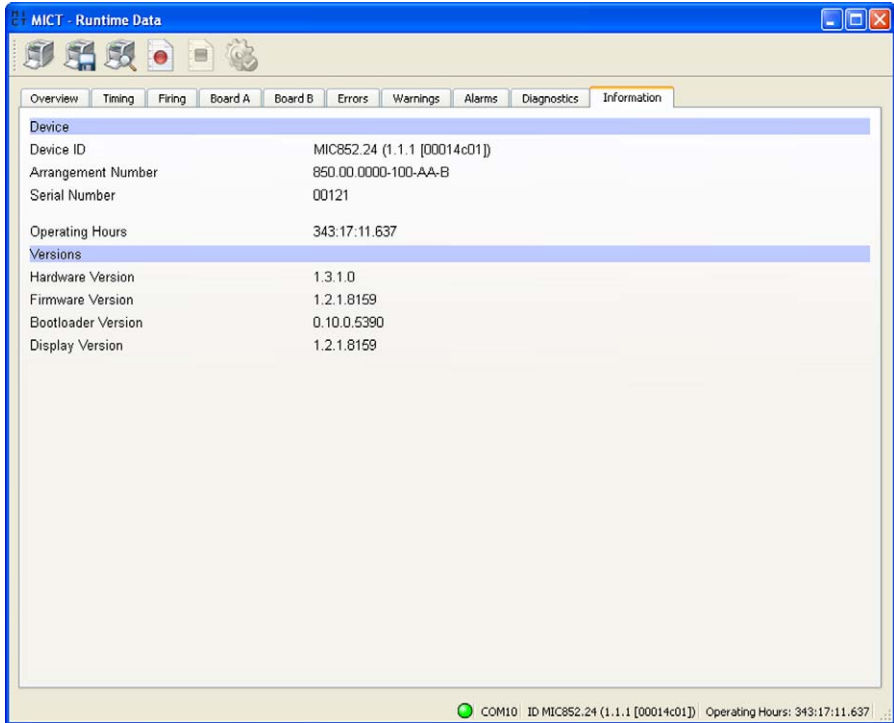
The following information is provided:

- **Supply Voltage**
Current voltage supply of the controller circuit board.

- CPU Usage
Current processor (CPU) usage in %
- Pre-Trigger
Current pre-trigger voltage
- Current Temp.
Current temperature of the controller board.
- Min. Temp.
Minimum temperature reached of the controller board.
- Max. Temp.
Maximum temperature reached of the controller board.
- Output Board
Output circuit board found
 - Green
Output board found
 - Gray
Output board not found
- Current Temp.
Current temperature of the output boards
- Min. Temp.
Minimum temperature reached of the output boards.
- Max. Temp.
Maximum temperature reached of the output boards.

8 SETTINGS VIA THE MICT

8.11.9 Runtime Data - Information

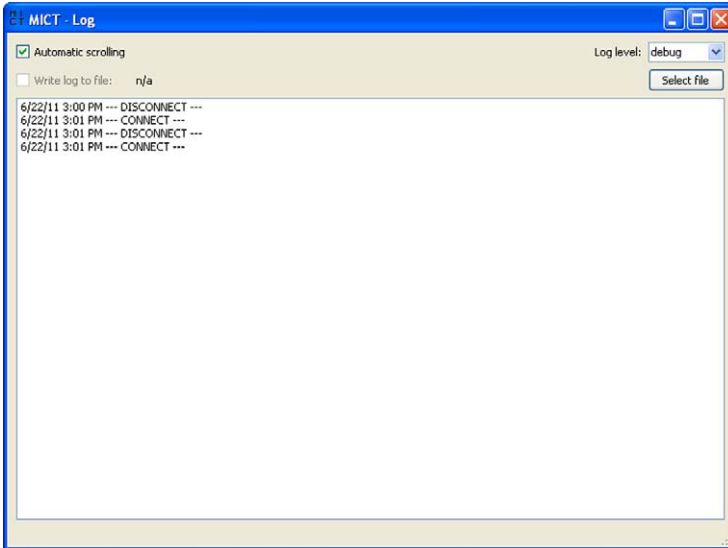


In this view, you can find an overview of the device and version data. In addition, you can print the current runtime data and, in case of problems, send them to the MOTORTECH service department via fax or as a PDF file via email. For fast support, we will then immediately have all required information available.

8.12 Log



Click on the symbol to open the window *Log*. This window is only available to users with authorizations starting at the access level *Advanced Service*.



The window *Log* serves to support error diagnostics by MOTORTECH.

- **Automatic scrolling**
If this function is activated, the display area focuses on the latest message.
- **Log level**
The selection of the Log Level is specified by MOTORTECH if needed.
- **Write log to file**
This check box activates or disables, respectively, the saving of the logged data in a selected file. If the function is disabled, the logged data are merely shown on the display.
- **Select file**
With this button, you can select a file to which you want to save the logged data.

If you are prompted to create a log file in case of a service request, proceed as follows:

1. Open the window *Log* via the toolbar or the menu bar.
2. Select a path with the file selection button and enter the file name for the log file.
 - ▶ If the file does not yet exist, it is automatically created with the extension *.log*.
3. Check the box *Write log to file*.

8 SETTINGS VIA THE MICT

4. Select the level specified by MOTORTECH from the list *Log level*.
5. Leave the window open.
 - ▶ The log messages are logged both in the window and in the selected file.

8.13 Runtime Adjustments



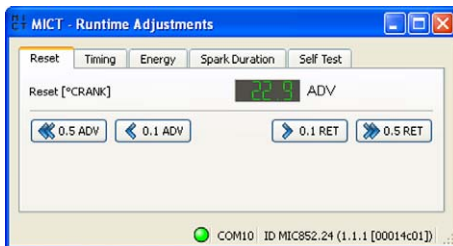
Click on the symbol to open the window *Runtime Adjustments*. This window is only available to users with authorizations starting with access level *Service*.



Runtime adjustments are implemented directly.

All runtime adjustments are implemented directly without requiring the input to be confirmed. The only exception to this is the adjustment of the self test period.

8.13.1 Runtime Adjustments - Reset

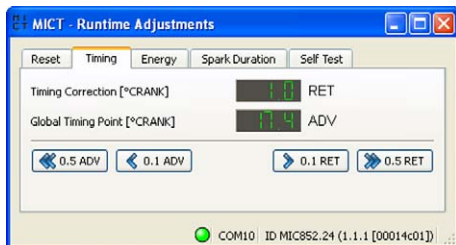


The index/reset position can be corrected by 5°crankshaft (advanced/retarded) while the controller is being operated. The correction is made with the keys:

- **0.1 ADV/RET**
in 0.1° increments to advance or retard
- **0.5 ADV/RET**
in 0.5° increments to advance or retard

The correction of the index/reset position is immediately implemented and stored. If the correction range is not sufficient, the reset/index position must be adjusted in the configuration.

8.13.2 Runtime Adjustments - Timing

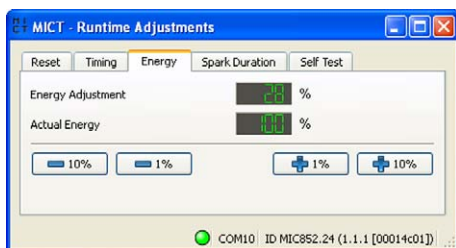


The global timing position can be corrected by 50°crankshaft (advanced/retarded) while the controller is being operated. The correction is made with the buttons:

- 0.1 ADV/RET
in 0.1° increments to advance or retard
- 0.5 ADV/RET
in 0.5° increments to advance or retard

The correction of the global timing point is immediately implemented and stored. The set value is also displayed in the runtime data. Refer to the section *Runtime Data - Timing* on page 90. The runtime adjustments cannot exceed or fall short of the limits set in the parameter settings for the timing point.

8.13.3 Runtime Adjustments - Energy



The output energy currently used by the ignition controller can be corrected while the controller is being operated. The correction is made with the keys:

- +/- 1%
increase or reduce in 1 % increments
- +/- 10%
increase or reduce in 10% increments

The correction of the output energy is immediately implemented and stored. This setting has no effect during the start phase of the engine and while the spark duration control (ASC) is activated. If the energy was configured to depend on the operating hours of the spark plugs, the defined energy curve is offset by the adjustment value.

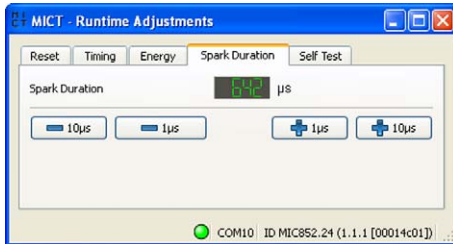
8 SETTINGS VIA THE MICT



Limp Mode

With a supply voltage below 18V, the MIC850 runs in the Limp mode and automatically limits the energy to 80%.

8.13.4 Runtime Adjustments - Spark Duration

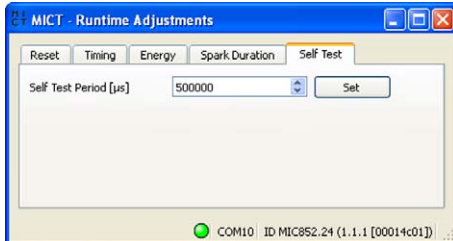


The value for the spark duration can be changed while the controller is in operation. The change is made with the keys:

- +/- 1 μs
increase or reduce in 1 μs increments
- +/- 10 μs
increase or reduce in 10 μs increments

The adjustment made only has an effect on the engine operation if the *Auto Spark Control (ASC)* was selected in the configuration.

8.13.5 Runtime Adjustments - Self Test

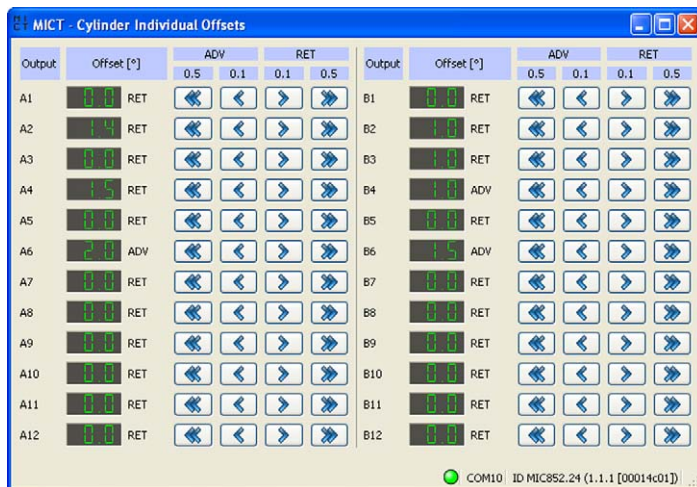


The self test function fires all configured outputs on a cycle. Select a value as desired between 4000 μs and 1000000 μs for the time between two ignitions in the field *Self Test Period* and then click on the button *Set* to apply the value entered. The energy for the self test is determined on the basis of the configured energy settings.

8.14 Cylinder Individual Offsets



Click on the symbol to open the window *Cylinder Individual Offsets*. This window is only available to users with authorizations starting with access level *Service*.



The cylinder individual offset can be applied to the position of the timing point while the controller is being operated. Offset via keys:

- 0.1 ADV/RET
in 0.1° increments to advance or retard
- 0.5 ADV/RET
in 0.5° increments to advance or retard

The function offers an option for adjustment of max. 12.7° crankshaft in each direction.



Immediate execution of the changes

Please note that changes made to the timing point are executed immediately at the next firing of the corresponding cylinder.

8 SETTINGS VIA THE MICT



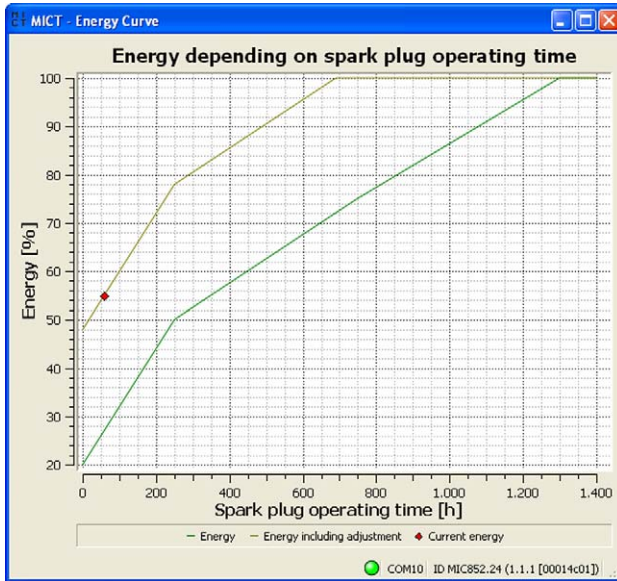
Minimum Ignition Space


For all timing corrections the device controls that the ignition space is not smaller than the minimum ignition space. Therefore it's possible that the offset of an individual cylinder can affect the timing of other cylinders.

8.15 Energy Curve



Click on the symbol to open the window *Energy Curve*.



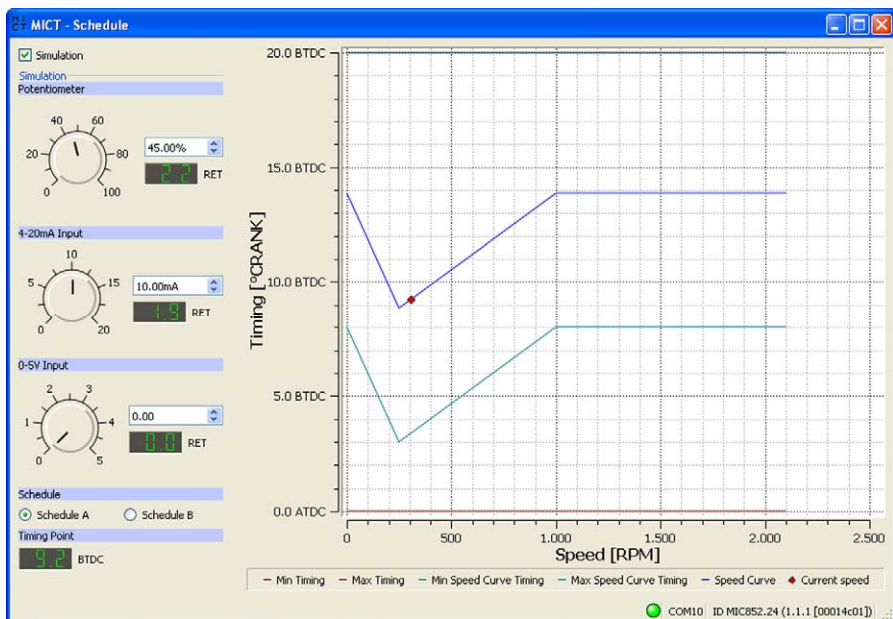
The representation of the energy curve results from the input for the energy depending on the operating hours of the spark plug, which were entered in the *Energy level* area. The symbol  *Current energy* shows the current energy level and the operating hours of the spark plugs in the curve if the device is connected.

8.16 Schedule Curve



Click on the symbol to open the window *Schedule*.

8.16.1 Schedule Curve - Simulation




The schedule curve visualizes the configurations of the schedules and simulates the influence of the inputs via the speed range. With the optional input fields, you can switch between schedule A and B. Changes made by turning the control buttons or entering the desired values are displayed simultaneously.

- **Simulation**
The simulation is activated or disabled with the check box.
- **Potentiometer**
Simulation of the potentiometer
 - Control button for adjustments between 0% and 100%
 - Field for manual input of the desired value in %
 - Displays the value in °crankshaft by which the timing is offset

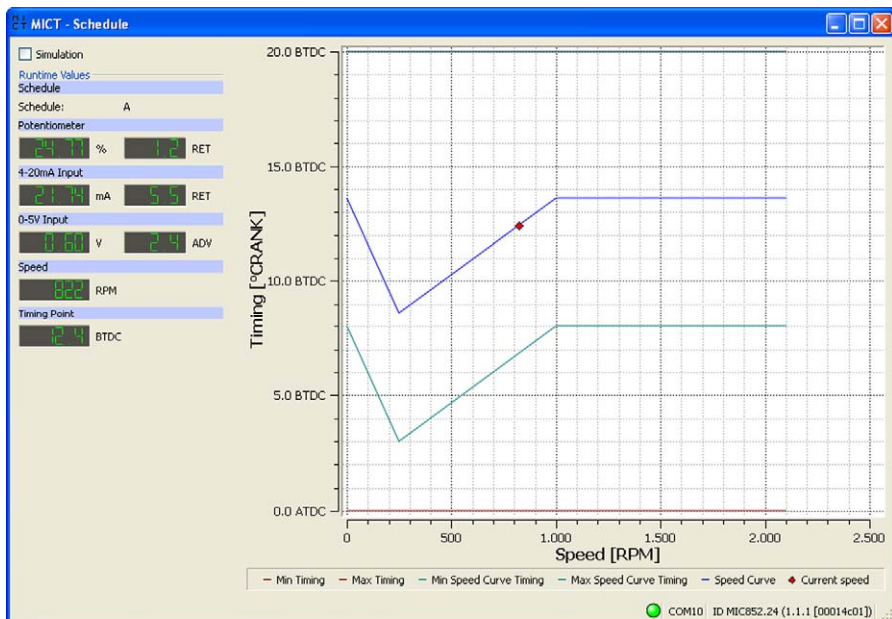
8 SETTINGS VIA THE MICT

- **4-20 mA Input**
Simulation of the 4-20 mA input
 - Control button for adjustments between 0 mA and 20 mA
 - Field for manual input of the desired value in mA
 - Displays the value in °crankshaft by which the timing is offset
- **0-5 V Input**
Simulation of the 0-5 V input
 - Control button for adjustments between 0 V and 5 V
 - Field for manual input of the desired value in V
 - Displays the value in °crankshaft by which the timing is offset
- **Schedule A/B**
Select parameter settings A or B
- **Timing Point**
Displays the global timing as it changes during the simulation.

While connected to the device, the timing is simulated depending on the actual engine speed and marked in the chart as .

8.16.2 Schedule Curve - Runtime Values

If the box *Simulation* is unchecked, the window *Schedule curve* switches to the current runtime data.



The following information is provided:

- **Schedule**
Displays the parameter settings currently selected.
- **Left column: Potentiometer, 4-20 mA Input, 0-5 V Input**
Displays the newly calculated adjustment values for the potentiometer, 4-20 mA and 0-5 V input.
- **Right column: Potentiometer, 4-20 mA Input, 0-5 V Input**
Displays the values supplied by the ignition controller for the potentiometer, 4-20 mA and 0-5 V input.
- **Speed**
Displays the current speed.
- **Timing Point**
Displays the simulated global timing.

9 SETTINGS VIA THE HMI

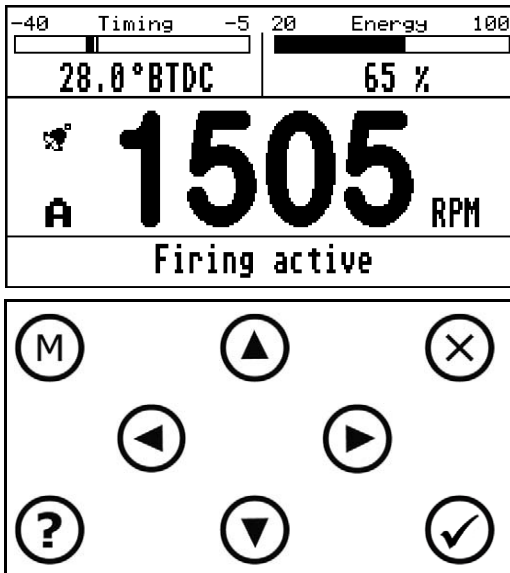
The Human-Machine Interface (HMI) is used to visualize the ignition and diagnostics data. It can be operated intuitively with eight keys. The user can navigate through the different views with menu controls or a closed-loop structure.

With the HMI, you can view operating data and make adjustments while the engine is running. In addition, you can execute certain commands, such as acknowledging alarms or errors. The configuration settings, however, can only be implemented with the MICT (e.g. configuration of the parameter settings/schedule or the alarms). Some of the configuration data can be viewed with the HMI.

The areas *Commands* and *Runtime Adjustments* are subdivided into different operating levels that can be secured with different PINs. If this access control is activated, a user is prompted to enter the PIN required for the respective level when they call up the corresponding views.



9.1 HMI Design

The HMI consists of a display and a control panel. In this case, the display shows the *main view*. This will be further explained in the following section.



9.1.1 Main View



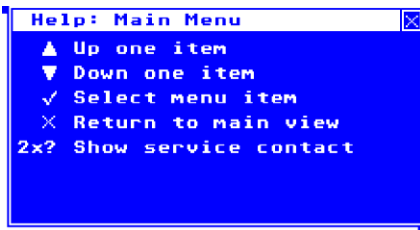


After starting the controller, the display shows the main view. This gives an overview of the most important ignition data. The main view of the HMI is organized in the following sections:


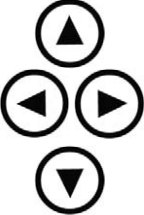
- **Timing**
 This area shows the current timing based on the top dead center as a numerical value and in diagrammatic form. The bar chart shown is limited by the limits set. The current timing point is visualized by a wide bar, the base timing by a narrow bar.
- **Energy**
 This area shows the current energy level in percent as a numerical value and a bar graph.
- **Speed range**
 In this section, you can find the following information in addition to the current engine speed:
 -  The symbol appears if alarms were configured with the MICT. At least one alarm must have been configured for which the results are logged. If no such alarm is configured, the symbol does not appear. If an alarm occurs, the symbol flashes. The alarm can then be acknowledged with the MICT or the HMI. The latter is possible only if the threshold given in the alarm condition is no longer being exceeded or not reached.
 -  The symbol indicates that the access control is activated. If you have entered the PIN for an operating level, the lock opens and is displayed with the number of the operating level.
 - **A or B**
 A or B indicate the current parameter settings that were set with the corresponding input on the controller.
- **Status bar**
 The status bar shows the operating status of the ignition controller.

9 SETTINGS VIA THE HMI

9.1.2 Keys of the Control Panel

You can operate the functions of the HMI with the control panel underneath the display. The following table gives an overview of the keys and their functions.

Key	Function
	Main Menu With this key, you can access the main menu through which you can call up other submenus.
	Help/Service Contact In this view, you can call up a context sensitive help page with this key, in which the operating options of the respective view are described briefly.  <p>Help: Main Menu</p> <ul style="list-style-type: none">▲ Up one item▼ Down one item✓ Select menu item× Return to main view2x? Show service contact <p>Pushing the help key twice will open the view <i>Service contact</i>. The information given there can be managed with the MICT. Refer to the section <i>Miscellaneous - Contact Information</i> on page 86.</p>  <p>Service Contact</p> <p>Motortech GmbH Service Hotline +49 5141 93 99 0 motortech@motortech.de Germany</p>
	Close/Main View With this key, you can close the view you are currently in back to the starting level, or you can switch directly to the main view. In the main view, you can switch off the display with this key (not the controller).

Key	Function
	<p>Acknowledge</p> <p>With this key, you can confirm a selection or input and switch to the next view.</p>
	<p>Navigation</p> <p>With the navigation keys, you can move within the views and menus or set the input values.</p>





9.2 General Operation

9.2.1 Operation with Menu Controls or Closed-Loop Structure

In Principle, there are two Options for Operating the HMI:

- operation using the menus shown on the display, starting with the main menu
- operation by scrolling through a pre-defined closed-loop structure for the runtime data, starting with the main view

Operation with Menu Controls

Starting with the main menu, which you can open in all views with the button , you can access all areas of the user interface via additional submenus. Select a menu entry using the navigation keys  and  and acknowledge the selection with the button . As an example, below is a screenshot of the main menu:

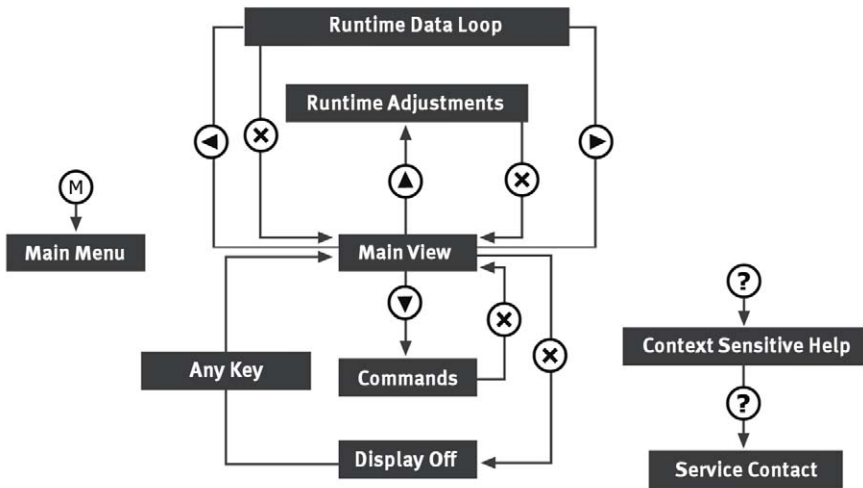


9 SETTINGS VIA THE HMI

Operation with closed-loop structure

Using the navigation keys ◀ and ▶ you can scroll through the pre-defined *runtime data loop* in which important views of the runtime data are organized in a closed-loop structure. The loop comprises the views *Schedule A/B*, *Firing Angle*, *Misfire*, *Secondary Voltage Counter*, *Operating hours overview*, *Errors*, *Warnings*, *Alarms*, *Diagnostics*, *Temperatures*, and *Information*, and can only be called up from the main view with this method.

In addition, you can access the menus *Runtime Adjustments* and *Commands* directly from the main view using the buttons ▲ and ▼.



9.2.2 Conventions Used in the Following

In the subsequent sections, the views will be explained that provide you with information or allow you to enter settings. The path for accessing the respective view is indicated with a short hand notation.

In this short hand notation, an arrow connects the individual steps (->). The menu and the entry in the menu to be selected are separated by a colon (:). The following example illustrates the short hand notation.

Short hand notation

(M) -> Main Menu: Commands -> Commands: Set Sparkplug Hours -> Set Sparkplug Hours

Meaning

1. Open the main menu with the button **(M)** in the control panel.
2. Select the entry *Commands* from the main menu.
 - ▶ The Commands menu is being displayed.
3. Select the entry *Set Sparkplug Hours* from the *Commands* menu.
 - ▶ The view *Set Sparkplug Hours* is being displayed.

9.3 For Diagnostics

With the menu *Runtime Data*, you can access diagnostics information that offers you an overview of your system. You can access the menu as follows:

Main View -> **(M)** -> Main Menu Runtime Data -> Runtime Data

or

Main View -> **(◀)** -> Runtime Data

For the other views, only the paths via the main menu will be described.

The diagnostics information supports your troubleshooting and engine maintenance activities. For example, an increased secondary voltage demand indicates wear of individual spark plugs, or the misfire overview can show a wire rupture or a short circuit.

9.3.1 Viewing a Schedule

The information concerning the currently used parameter settings can be accessed as follows:

(M) -> Main Menu: Runtime Data -> Runtime Data: Schedule -> Schedule A or B

Schedule A	
Base:	28.0° BTDC
Potentiometer:	8.4° ADV
4-20mA:	5.0° RET
0-5V:	3.0° RET
Speed Curve:	0.0° RET
Timing Correction:	0.0° RET
Global Timing:	20.4° BTDC

9 SETTINGS VIA THE HMI

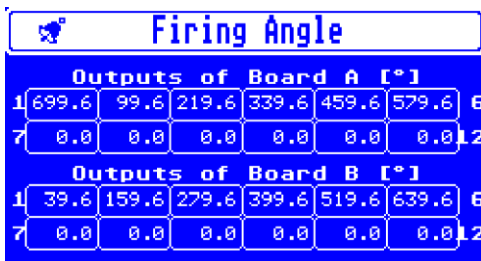
In this view, you can find the following information:

- **Base**
Currently used base timing point that was configured with the MICT.
- **Potentiometer**
Timing correction set with the respective potentiometer (*A* or *B*).
- **4-20 mA**
Timing point correction resulting from the 4-20 mA input.
- **0-5 V**
Timing point correction resulting from the 0-5 V input.
- **Speed Curve**
Timing point correction resulting from the set speed curve.
- **Timing Correction.**
Timing point correction that is transmitted via the CAN bus or implemented manually.
- **Global Timing**
Global ignition angle. This value results from the sum of the preceding values.

9.3.2 Viewing Firing Angles

The ignition angle information can be accessed as follows:

Ⓜ -> Main Menu: Runtime Data -> Runtime Data Firing Data -> Firing Data: Firing Angle -> Firing Angle



The screenshot displays the 'Firing Angle' HMI screen. It features a title bar with a gear icon and the text 'Firing Angle'. Below the title bar, there are two sections: 'Outputs of Board A [°]' and 'Outputs of Board B [°]'. Each section contains a grid of 12 data points arranged in two rows of six. The top row of each grid is labeled '1' on the left and '6' on the right, and the bottom row is labeled '7' on the left and '12' on the right. The values for Board A are: 699.6, 99.6, 219.6, 339.6, 459.6, 579.6 (top row) and 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 (bottom row). The values for Board B are: 39.6, 159.6, 279.6, 399.6, 519.6, 639.6 (top row) and 0.0, 0.0, 0.0, 0.0, 0.0, 0.0 (bottom row).

Firing Angle											
Outputs of Board A [°]											
1	699.6	99.6	219.6	339.6	459.6	579.6	6				
7	0.0	0.0	0.0	0.0	0.0	0.0	12				
Outputs of Board B [°]											
1	39.6	159.6	279.6	399.6	519.6	639.6	6				
7	0.0	0.0	0.0	0.0	0.0	0.0	12				

This view will show you the current ignition angle for each of the twelve outputs of the output boards A/B. In the top row, the outputs 1-6 are shown, the lower row shows outputs 7-12. You can see in the overview whether a cylinder individual offset was applied to an ignition angle (e.g. by a detonation control).

9.3.3 Viewing Misfires

The misfire information can be accessed as follows:

Ⓜ -> Main Menu: Runtime Data -> Runtime Data: Firing Data -> Firing Data: Misfire -> Misfire

Misfire											
Outputs of Board A [%]											
1	10		0		6		0		0		6
7	0		0		0		0		0		12
Outputs of Board B [%]											
1	1		0		6		6		0		6
7	0		0		0		0		0		12

This view gives you the following information on all twelve outputs of the output boards A/B:


- Misfire rate in % for the respective output
- Misfire types of the misfires that have occurred up to this point:
 - Short circuit, primary winding
(is currently not supported)
 - Idle primary winding
 - Short circuit secondary winding
 - Idle secondary winding

You can call up the overview of the misfire types at any time using the key in the control panel. If misfiring occur, the causes for them must be found and eliminated. The overview supports you in locating the error and narrow it down.

9 SETTINGS VIA THE HMI

9.3.4 Viewing Secondary Voltage

The secondary voltage information can be accessed as follows:

 -> Main Menu: Runtime Data -> Runtime Data: Firing Data -> Firing Data: Secondary Voltage -> Secondary Voltage

Secondary Voltage												
Outputs of Board A [kV]												
1	17.4	14.5	18.1	15.4	17.6	19.7	6					
7	0.0	0.0	0.0	0.0	0.0	0.0	12					
Outputs of Board B [kV]												
1	22.0	26.6	22.9	19.9	20.1	19.7	6					
7	0.0	0.0	0.0	0.0	0.0	0.0	12					

This view will show you the current secondary voltage for each of the twelve outputs of the output boards A/B. An increased secondary voltage demand indicates that the corresponding spark plug is worn. Extremely low values point to a problem with the compression performance of the cylinder.

9.3.5 Viewing the Spark Duration

The spark duration information can be accessed as follows:

 -> Main Menu: Runtime Data -> Runtime Data: Firing Data -> Firing Data: Spark Duration -> Spark Duration

Spark Duration												
Outputs of Board A [μ s]												
1	570	630	572	613	577	553	6					
7	0	0	0	0	0	0	12					
Outputs of Board B [μ s]												
1	710	634	700	708	643	697	6					
7	0	0	0	0	0	0	12					

This view will show you the current spark duration for each of the twelve outputs of the output boards A/B. The spark duration also provides information on problems in the cylinder and spark plug area, similar to the secondary voltage.

9.3.6 Viewing the Operating Hours Counter

The operating hours counter can be accessed as follows:

(M) → Main Menu: Runtime Data → Runtime Data: Counter → Counter

Counter	
Operating Hours	
MIC	219 h
All Engines	12 h
This Engine	8976 h
Spark Plug	143 h

In this view, you find information on the following operating hours:

- MIC
Operating hours of the ignition controller (includes times without pickup signals)
- All Engines
Runtime of the MIC850 on all engines that the device was operated with.
- This Engine
Corresponds with the runtime of the engine on the (all) ignition controller if the engine runtime was correctly set via MICT or HMI when the MIC850 was first used.
- Spark Plug
Operating hours of the spark plugs

9.3.7 Viewing Errors and Error Details

All operating errors that occurred are compiled in an error list. You can call up a detail view for each error.

Error overview

The overview of the errors that have occurred can be accessed as follows:

(M) → Main Menu: Runtime Data → Runtime Data: Error → Error

Errors	
Lifetime	149:14:53
Time Stamp	Code
148:57:59	low power or shut off
148:33:26	low power or shut off
147:46:13	low power or shut off
145:53:19	low power or shut off
144:02:55	trigger period
143:59:24	low power or shut off

9 SETTINGS VIA THE HMI

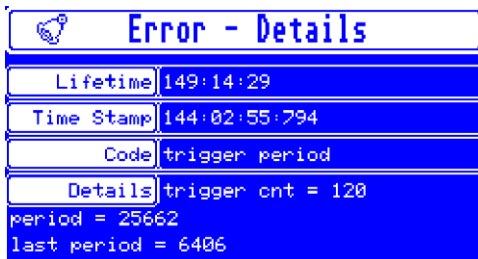
In this view, you can find the following information:

- **Lifetime**
Current operating time of the ignition controller
- **Time Stamp**
Operating time at which the adjacent error occurred.
- **Code**
Error code of the error. For explanations for the possible errors, please refer to section *Runtime Data - Errors* on page 94.

Error details



You can display details on any error shown in the overview. The detail view can be accessed as follows:

 -> Main Menu: Runtime Data -> Runtime Data: Error -> Error -> Select error -> Error Details



Error - Details	
Lifetime	149:14:29
Time Stamp	144:02:55.794
Code	trigger period
Details	trigger cnt = 120 period = 25662 last period = 6406

Aside from the values already given in the overview (operating time, timestamp, code), the view supplies you with additional detail information on the different errors. Contrary to the indication in the error overview, the timestamp is given including thousandths of a second. This information helps differentiate errors that occurred almost simultaneously.

- With the navigation keys  and  you can open the details for the preceding or subsequent error in the alarm list.

9.3.8 Viewing Warnings and Warning Details

All warnings that occurred are compiled in a warning notice list. You can call up a detail view for each warning.

Warning overview

The overview of the warnings that have occurred can be accessed as follows:

 -> *Main Menu: Runtime data -> Runtime Data Warnings -> Warnings*

Warnings	
Lifetime	149:18:19
Time Stamp	Code
149:17:30	trigger period
149:17:26	reset count
149:16:46	display access lost
149:16:28	trigger count
149:16:28	reset count
149:16:14	display access lost

In this view, you can find the following information:

- **Lifetime**
Current operating time of the ignition controller
- **Time Stamp**
Operating time at which the adjacent warning occurred.
- **Code**
Code of the warning. For explanations for the possible warnings, please refer to section *Runtime Data - Warnings* on page 96.

Warning Details

You can display details on any warning shown in the overview. The detail view can be accessed as follows:

 -> *Main Menu: Runtime Data -> Runtime Data Warnings -> Warnings -> Select warning -> Warning details*

Warning - Details	
Lifetime	149:18:48
Time Stamp	149:17:26:237
Code	reset count
Details	reset cnt = 1

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In addition to the values already given in the overview (operating time, timestamp, code), the view supplies additional detail information on the different warnings. Instead of the information in the warning overview, the timestamp is given including thousandths of a second. This information helps differentiate warnings that occurred almost simultaneously.

- With the navigation keys ◀ and ▶ you can open the details for the preceding or subsequent warning in the warning list.

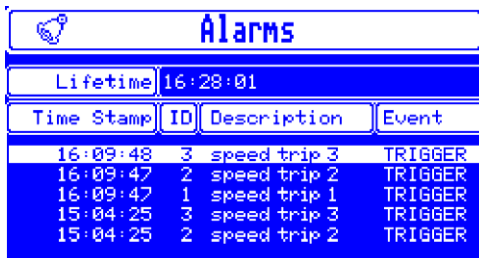
9.3.9 Viewing Alarms and Alarm Details

Contrary to errors and warnings, which are specified by the ignition controller, up to 24 different alarms can be freely configured with the MICT. In the runtime data, you can view an overview of the alarms that have occurred and details for each alarm. You can acknowledge an alarm that has occurred via the menu *Commands*.

Alarm overview

The overview of the alarms that have occurred can be accessed as follows:

Ⓜ -> Main Menu: Runtime Data -> Runtime Data: Alarms -> Alarms



Time Stamp	ID	Description	Event
16:09:48	3	speed trip 3	TRIGGER
16:09:47	2	speed trip 2	TRIGGER
16:09:47	1	speed trip 1	TRIGGER
15:04:25	3	speed trip 3	TRIGGER
15:04:25	2	speed trip 2	TRIGGER

The overview shows the latest five alarm events that occurred. All other alarms can be viewed with the MICT. In this view, you can find the following information:

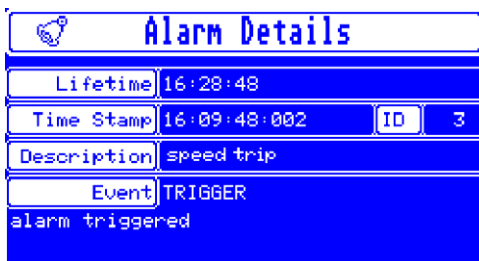
- **Lifetime**
Current operating time of the ignition controller
- **Time Stamp**
Operating time at which the adjacent alarm occurred.
- **ID**
Number of the alarm that was selected in the alarm configuration in the MICT for the corresponding alarm.
- **Description**
Brief description of the alarm that was entered in the MICT.
- **Event**
Abbreviated descriptions for one of the following events:
 - **TRIGGER**
The alarm was triggered.

- ACK
The alarm was acknowledged.
- CONFIG
The configuration was modified via the MICT - all alarms were reset.

Alarm Details

You can display details on any alarm shown in the overview. The detail view can be accessed as follows:

(M) -> Main Menu: Runtime Data -> Runtime Data: Alarms -> Alarms -> Select alarm -> Alarm Details



In the detail view, you can find information on the alarms in a slightly more detailed representation.

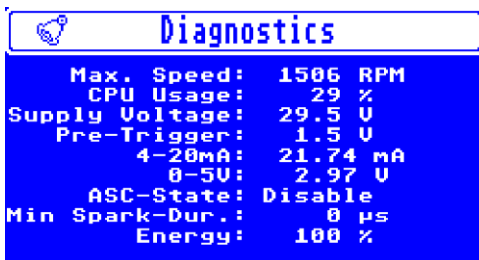
- With the navigation keys **(◀)** and **(▶)** you can open the details for the preceding or subsequent alarm in the alarm list.

9.3.10 Viewing Diagnostics

In the diagnostics view, you can obtain an overview of the key figures of internal processes and the values currently active at the inputs.

The diagnostics information can be accessed as follows:

(M) -> Main Menu: Runtime Data -> Runtime Data: Diagnostics -> Diagnostics



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In this view, you can find the following information:

- **Max. Speed**
Max. speed since the last start-up of the MIC850 and the engine. If only the MIC850 was restarted and the engine does not yet run, the previous max. value is indicated.
- **CPU Usage**
Current processor usage of the ignition controller CPU
- **Supply Voltage**
Current supply voltage of the ignition controller
- **Pre-Trigger**
Pre-Trigger voltage set in the MICT that controls the pickup sensitivity.
- **4-20 mA**
Current value at the 4-20 mA input
- **0-5 V**
Current value at the 0-5 V input
- **ASC State**
Indicates whether the Auto Spark Control (ASC) was activated in the MICT.
- **Min Spark Dur.**
Minimum spark duration that is currently reached.
- **Energy**
Current energy level

9.3.11 Viewing the Temperatures

The information on the current temperatures of the ignition controller can be accessed as follows:

 -> *Main Menu: Runtime Data -> Runtime Data Temperatures -> Temperatures*

 Temperatures			
[°C]	Cur.	Min	Max
CPU	36.0	35.2	36.5
Out A	30.8	29.8	32.3
Out B	29.5	28.5	31.3

! CPU Max: 105°C ! Output Max: 120°C

In this view, you can find the following information:

- **CPU**
Aside from the current temperature value of the CPU board, the min. and max. values are given that were measured since the last activation of the controller.

- **Out A and B**
 Aside from the current temperature values of the output boards A and B, the min. and max. values are given that were measured since the last activation of the controller.
- **CPU Max. and Output Max.**
 If the max. values given below the table are measured for more than one minute on any of the corresponding circuit boards, the engine and controller are shut down.

9.3.12 Viewing Information

Further ignition controller information can be accessed as follows:

(M) -> *Main Menu: Runtime Data -> Runtime Data: Information -> Information*

Information	
Device ID:	1.1.1
Arrangement:	852.24.H000-100
Serial:	00034911
<hr/>	
Lifetime:	16:31:34
<hr/>	
Hardware:	1.3.1.0
Software:	1.0.0.7096
Bootloader:	0.8.4.5085
Display:	1.0.0.7096


In this view, you can find the following information:

- **Device ID**
 The device ID serves to internally identify the device type.
- **Arrangement**
 The arrangement number provides information on the type of the ignition controller and the number of output boards and outputs, amongst other things.
- **Serial**
 The controller can be unambiguously identified with the serial number. It is needed for service requests.
- **Lifetime**
 Current operating time of the ignition controller
- **Hardware**
 Version number of the hardware used in the ignition controller
- **Software**
 Version number of the software used in the ignition controller
- **Bootloader**
 Version number of the bootloader
- **Display**
 Version number of the display software used in the ignition controller


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9.4 During Engine Operation

During engine operation, you can make adjustments via the menu *Runtime Adjustment*. The menu can be accessed as follows:

Main View →  → Main Menu: Runtime Adjustment → Runtime Adjustment

or

Main View →  → Runtime Adjustment

For the other views, only the paths via the main menu will be described.




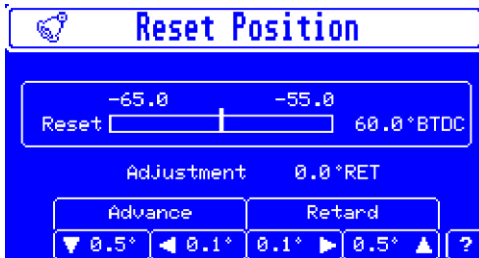
Runtime adjustments are implemented directly.

All runtime adjustments are implemented directly without requiring the input to be confirmed. The only exception to this is the adjustment of the self test period.

9.4.1 Setting the Reset Position

The setup for the reset position can be accessed as follows:

 → Main Menu: Runtime Adjustment → Runtime Adjustment: Reset Position → Reset Position



In this view, you can find the following information:

- **Reset**
The reset position currently set via the MICT is marked in the chart at the center with a short line. You can adjust the reset position by max. 5°crankshaft in both directions (advance/retard). Adjacent to the chart, the currently set value is given based on the top dead center. If the correction range is not sufficient, the reset position must be adjusted in the configuration via the MICT.
- **Adjustment**
Currently set adjustment value

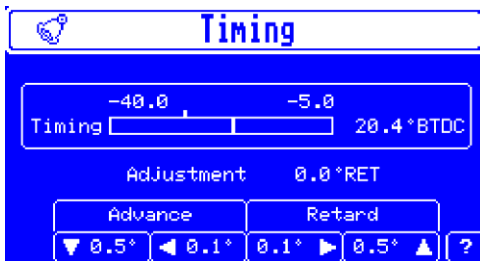
You have the following option:

- Adjust the reset position with the navigation keys in 0.1° or 0.5° increments.

9.4.2 Setting the Timing

The setup for the timing point can be accessed as follows:

(M) -> Main Menu: Runtime Adjustment -> Runtime Adjustment: Timing -> Timing



In this view, you can find the following information:

- **Timing**
 The currently set base timing point set via the MICT is marked in the chart at the center with a short line. You can correct the timing point within the configured timing point limits. Adjacent to the chart, the currently set value is given based on the top dead center.
- **Adjustment**
 Currently set adjustment value

You have the following option:

- Adjust the timing point with the navigation keys in 0.1° or 0.5° increments.

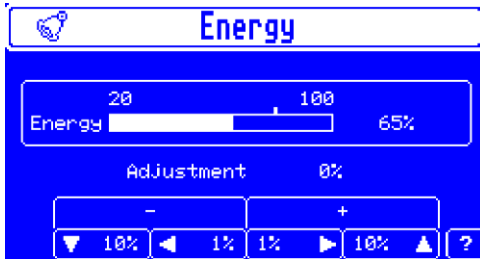
Also, a cylinder individual offset can be applied to the timing point with the MICT. Please refer to the section *Cylinder Individual Offsets* on page 107.

9 SETTINGS VIA THE HMI

9.4.3 Setting the Energy

The setup of the ignition energy can be accessed as follows:

Ⓜ -> Main Menu: Runtime Adjustment -> Runtime Adjustment: Energy -> Energy



In this view, you can find the following information:

- **Energy**
The energy level can be set between 20% and 100%. The default value of 80% is marked in the graphical representation with a short line. The currently set value is given next to the chart.
- **Adjustment**
Currently set adjustment value

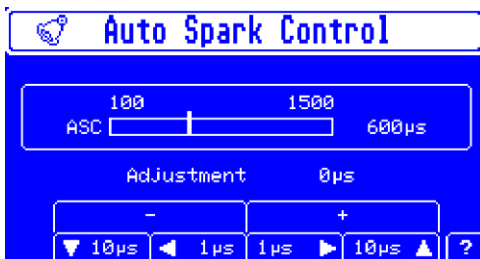
You have the following option:

- Adjust the energy level with the navigation keys in 1% or 10% increments.
This setting has no effect during the start phase of the engine and while the spark duration control (ASC) is activated. If the energy was configured to depend on the operating hours of the spark plugs, the defined energy curve is offset by the adjustment value.

9.4.4 Auto Spark Control Setup

The setup for the spark duration control (ASC) can be accessed as follows:

Ⓜ -> Main Menu: Runtime Adjustment -> Runtime Adjustment: Auto Spark Control -> Auto Spark Control



In this view, you can find the following information:

- **ASC**
The spark duration can be set within a range between 100 and 1500 μ s. The default value of 600 μ s is marked in the graphical representation with a short line. The currently set value is given next to the chart.
- **Adjustment**
Currently set adjustment value

You have the following option:

- Adjust the spark duration with the navigation keys in 1 μ s or 10 μ s increments. This setting only takes effect if the spark duration control (ASC) is activated. The nominal value for the Auto Spark Control is changed by adjusting the spark duration.

9.4.5 Setting the Self Test Period

You can set the period for the self test. This period defines the time between two ignitions during the self test. You can start the self test from the menu *Commands*. The setup for the self test period can be accessed as follows:

(M) -> Main Menu: Runtime Adjustment -> Runtime Adjustment: Self Test Period -> Self Test Period



In this view, you can find the following information:

- **Period**
The self test period can be set within a range between 4 and 1000 ms. The default value of 500 ms is marked in the graphical representation with a short line. The currently set value is given next to the chart.


You have the following options:

- Adjust the self test period with the navigation keys in 10 μ s or 100 μ s increments. Contrary to the other engine data settings, this setting is not directly transferred.
- **Set**
Confirm your adjustment with this key (✓).
- **Cancel**
Cancel your adjustment with this key (✗).

9 SETTINGS VIA THE HMI

9.5 In Case Service is Needed

Important settings for service requests can be accessed via the menu *Commands*. The menu can be accessed as follows:

Main View →  → Main Menu: *Commands* → *Commands*

or

Main View →  → *Commands*

For the other views, only the paths via the main menu will be described.

With the commands, some settings can be made for the corresponding views in the runtime data. In addition, you get direct access to important runtime data (e.g. errors, warnings, alarms, counters).

9.5.1 Calling up Alarm Commands

The view *Alarm Commands* gives you an overview of which of the 24 possible alarms were configured with the MICT, and which alarms are currently active.

The alarm commands can be accessed as follows:

 → Main Menu: *Commands* → *Commands: Alarm commands* → *Alarm commands*




In this view, you can find the following information:

- IDs of the 24 freely configurable alarms that were defined in the MICT.
- The bell symbol marks the alarms in general that were configured in the MICT. If the bell symbol is displayed in white, the respective alarm has occurred and has not yet been acknowledged.

You have the following options:

- **Acknowledge**

This option is only available when an alarm is active.

With the key  you can acknowledge all alarms that have occurred and the alarm condition for which is no longer fulfilled.

- **Cancel**
 This option is only available when an alarm is active.
 With the key (X) you can exit the view without acknowledging the alarms.
- **Events**
 With the key (◀) you can switch to the alarm list. Refer to the section *Viewing Alarms and Alarm Details* on page 124.
- **Alarms**
 With the key (▶) you can switch to the alarm configuration. For more information, also read the following section.

Alarm Configuration

For more detailed information on the alarms, you can view the alarm configuration that was implemented with the MICT. However, you cannot make changes via the HMI.

The alarm configuration can be accessed as follows:

(M) -> Main Menu: Commands -> Commands: Alarm commands -> Alarm commands: Alarms -> Alarm Configuration

ID	Description	Flags
1	speed trip1	--L1--
2	speed trip 2	--L-2-
3	speed trip 3	--L--3
4		-----
5		-----
6		-----
7		-----
8		-----

In this view, you can find the following information:


- **ID**
 IDs of the 24 freely configurable alarms that were defined in the MICT.
- **Description**
 Description of the alarm that was assigned in the MICT.
- **Flags**
 The flags correspond with the settings for the alarm in the MICT:
 - **S**
 The setting *Engine Shutdown* is activated.
 - **P**
 The setting *Permanent – Keep output activated until alarm is acknowledged* is active.
 - **L**
 The setting *Log Events* is activated.

9 SETTINGS VIA THE HMI

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The numbers indicate the outputs (GPO1, GPO2, GPO3) that were activated for the alarm.

You have the following option:

- Select an alarm from the list using the navigation keys.
With the key  you can open the details of the alarm configuration for the alarm selected.
For more information, also read the following section.

Alarm [ID] Details

In the detail view, you can view the further configuration settings of the alarms. The details of the alarm configuration can be accessed as follows:

 -> Main Menu: Commands -> Commands: Alarm commands -> Alarm commands: Alarms -> Alarm Configuration -> Select Alarm -> Alarm [ID] Details

Alarm 1 Details			
Description	speed trip1		
Function	speed > value		
Threshold	250,0 RPM		
Hysteresis	20,0 RPM		
Shutdown	<input type="checkbox"/> Permanent	<input type="checkbox"/> Logged	<input checked="" type="checkbox"/>
GPO1	<input checked="" type="checkbox"/>	GPO2	<input type="checkbox"/>
	<input type="checkbox"/>	GPO3	<input type="checkbox"/>

The configuration settings are edited with the MICT and are described in the corresponding section *Outputs - Alarms* on page 78.

9.5.2 Calling up Error Commands

With the error commands, you can acknowledge operating errors. This can only be implemented while the engine is standing still.

The error commands can be accessed as follows:





 -> Main Menu: Commands -> Commands: Error Commands -> Error Commands

Error Commands	
Lifetime	44:18:39
Time Stamp	Error Code
44:17:43 alarm shutdown	
<input checked="" type="checkbox"/> Acknowledge	Cancel X
◀ Errors	Warnings ▶ ?

In this view, you can find the following information:

- **Lifetime**
Current operating time
- **Time Stamp**
Operating time at which the error occurred.
- **Error Code**
Error code of the error.

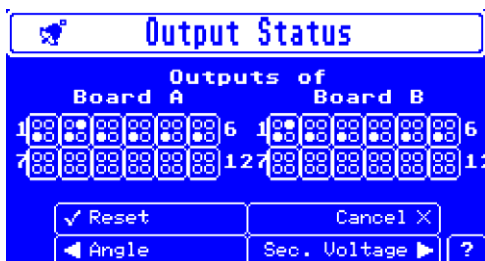
You have the following options:

- **Acknowledge**
This option is only available when an error has occurred.
With the key  you can acknowledge all operating errors when the engine stands still. If an error was triggered by an alarm, the alarm must first be acknowledged.
- **Cancel**
This option is only available when an error has occurred.
With the key  you can exit the view without acknowledging an error.
- **Errors**
With the key  you can switch to the error list. Refer to the section *Viewing Errors and Error Details* on page 121.
- **Warnings**
With the key  you can switch to the warning list. Refer to the section *Viewing Warnings and Warning Details* on page 123.

9.5.3 Resetting the Output Status





The output status can be accessed as follows:

 -> *Main Menu: Commands -> Commands: Output Status -> Output Status*







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In this view, you will find the following information on the individual outputs on the output boards A and B:

-  Short circuit primary winding
-  Idle primary winding
-  Short circuit secondary winding
-  Idle secondary winding

You have the following options:

- **Reset**
With the key  the status of all outputs is reset. If the cause for the short or idle was not eliminated, the output status is immediately displayed again after the reset.
- **Cancel**
With the key  you can exit the view.
- **Angle**
With the key  you can switch to the ignition angle view. Refer to the section *Viewing Firing Angles* on page 118.
- **Sec. Voltage**
With the key  you can switch to the secondary voltage view. Refer to the section *Viewing Secondary Voltage* on page 120.

9.5.4 Setting the Engine Hours

If you use the ignition controller on an engine that has already been running for a period of time, you can set the operating counter to the value of the operating hours already completed. This way, the engine operating hours are continuously measured correctly. The view in which you can set the engine operating hours can be accessed as follows:



 -> *Main Menu: Commands -> Commands: Set Engine Hours -> Set Engine Hours*



In this view, you can find the following information:

- **Current**
Operating hours currently stored in the MIC850 for the engine
- **New**
Newly set value for operating hours


You have the following options:

- Under *New*, set the desired value for the operating hours using the navigation keys.
- **Set**
With the key  you can confirm the value set under *New* for the operating hours.
- **Cancel**
With the key  you can discard the value set under *New* for the operating hours.

9.5.5 Setting the Sparkplug Operating Hours

You can set the value for the spark plug operating hours or reset the value to zero when you replace the spark plugs. This is predominantly required in cases where the energy mode is selected to be based on the operating hours of the spark plugs. Refer to the section *Energy - Energy Level* on page 82.

The view in which you can set the spark plug operating hours can be accessed as follows:

 -> *Main Menu: Commands -> Commands: Set Sparkplug Hours -> Set Sparkplug Hours*



In this view, you can find the following information:


- **Current**
Value for spark plug operating hours currently stored on the controller
- **New**
Newly set value for operating hours

You have the following options:


- Under *New*, set the desired value for the spark plug operating hours using the navigation keys.

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- Set


With the key  you can confirm the value set under *New* for the spark plug operating hours.

- Cancel

With the key  you can cancel the value set under *New* for the spark plug operating hours.

9.5.6 Running a Self Test

You can start a self test during which the individual cylinders of the engine are fired in the ignition sequence. The time between two ignitions is defined by the self test period. Refer to the section *Setting the Self Test Period* on page 131. The view in which you can start the self test can be accessed as follows:

 -> Main Menu: Commands -> Commands: Self Test -> Self Test



In this view, you can find the following information:

- Energy


During the self test, the chart shows the current energy level.. The value depends on the energy settings in the configuration. Changing the energy level (via HMI or MICT) during the self test can be helpful for diagnosing problems.

- Period

Currently set self test period

You have the following options:

- Start


Before starting the self test, please take note of the following safety instruction. With the key  you can start the self test. The latter will run until it is manually stopped again.



Operational Safety

If you use the self test function, it is compulsory to shut off the gas feed line and all cylinders are purged of fuel. Non-compliance can result in damage to equipment or injury to persons.

– Stop

When the self test is running, you can end it with the key  again.

9.6 Display Settings

All display settings implemented directly on the HMI are stored only temporarily. At every new start of the controller, the display settings will be used that are stored in the configuration that was downloaded from the MICT to the controller. You can access the display settings via the menu *Display options*. The menu can be accessed as follows:

Main View ->  -> Main Menu: Display Settings -> Display Settings

9.6.1 Adjusting the Brightness

The brightness settings can be accessed as follows:

 -> *Main Menu: Display Settings -> Display Settings: Brightness -> Brightness*



In this view, you can find the following information:

– Brightness

Currently set brightness of the display

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You have the following options:

- Adjust the brightness level with the navigation keys in 1% or 10% increments. The available range is 0-100%, the default setting is 90%. Uninterrupted operation at the 100% setting is not recommended, as this will make the display age more rapidly.
- **Set**
Confirm your adjustment with this key (✓).
- **Cancel**
Cancel your adjustment with this key (✗).

9.6.2 Set Timeout

The timeout setting of the display can be accessed as follows:

(M) -> Main Menu: Display Settings -> Display Settings: Timeout -> Timeout



In this view, you can find the following information:

- **Timeout**
Currently set period after which the display switches off.

You have the following options:

- Adjust the timeout via the navigation keys in 1 or 10 minute increments. The timeout can be set within a range between 0 and 240 minutes. The setting 0 corresponds with the uninterrupted operation of the display. The default setting is 30 minutes. It is recommended to switch off the display while it is not needed, as this will increase its service life.
- **Set**
Confirm your adjustment with this key (✓).
- **Cancel**
Cancel your adjustment with this key (✗).



Automatic logout when deactivating the display

If the access control was activated in the MIC850, all operating levels are automatically logged out when the display is switched off.

9.6.3 Setting the Language

The language setup of the HMI can be accessed as follows:

Ⓜ -> Main Menu: Display Settings -> Display Settings: Language -> Language



You have the following options:

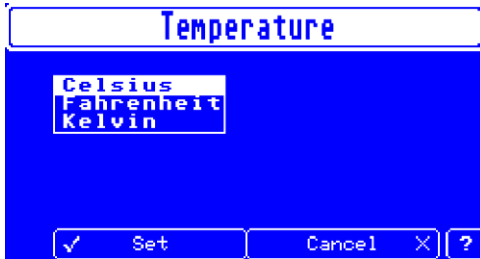
- Select the desired language with the navigation keys and
- **Set**
Confirm your selection with the key .
- **Cancel**
Cancel your selection with the key .

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9.6.4 Setting the Temperature Units

The temperature unit setup can be accessed as follows:

Ⓜ -> Main Menu: Display Settings -> Display Settings : Temperature -> Temperature



You have the following options:

- Select the desired unit (Celsius, Kelvin, Fahrenheit) for the temperatures using the navigation keys  and .
- **Set**
Confirm your selection with the key .
- **Cancel**
Cancel your selection with the key .

9.7 Access Control

If the access control is activated, access to the following areas is possible with a PIN only:

- **Runtime Adjustment** (Reset, timing, ignition energy, Auto Spark Control (ASC), and self test period)
- **Commands** (Alarms, error commands, set engine/spark plug operating hours, and self test).

The access control controls the access to the controller with both the HMI and the MICT. For explanations concerning access control to the MIC850 and the delimitation of the access levels in the MICT, refer to section *Access Control* on page 54.

The menu *Access Control* can be accessed directly via the main menu.

9.7.1 Activating the Access Control



Enabling and disabling access controls

As a default setting, the access control is not activated, and all PINs are set to 0000. Once the access control has been activated, and the PINs were changed, these PINs will continue to be used. To activate the access controls again, you will need the PIN for level 3 (*Master*). It is therefore recommended to reset all PINs before disabling.

If that was not done, or a system must be unlocked for another reason, a request key can be issued in the MICT. Refer to the section *Resetting all PINs* on page 64.

The view in which you can activate the access control can be accessed as follows:

Ⓜ -> Main Menu: Access Control -> Access Control: Enable Access Control -> Enable Access Control




You have the following options:

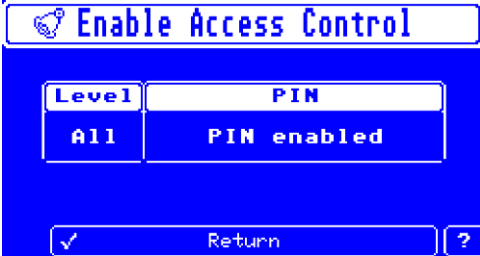
- PIN
Enter the PIN for level 3 using the navigation keys.


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- Confirm


With the key  you can acknowledge the PIN entered.

After acknowledging the PIN, the following view opens:



With the key  you can access the *Access Control* view, in which you can finish activating the access control with the menu item *Logout*.


- Cancel

With the key  you can cancel the PIN entered.

9.7.2 Login

Once the access controls are activated, you can log in for the respective operating levels to then access the views that pertain to the respective level.

The log-in view can be accessed as follows:

 -> *Main Menu: Access Control -> Access Control: Login -> Login*



You have the following options:


- Level

First select the level you wish to log in to via the navigation keys.

- PIN

Enter the PIN for the desired level using the navigation keys.


– Login

With the key  you can acknowledge the PIN entered.

- If you entered the PIN correctly, the access control menu is opened.
- If you entered the PIN incorrectly, the system shows the message that access is denied. You can repeat the input, but a hold view opens first on which the wait time is counted down. This time increases with each failed attempt. This system is designed to prevent potential intruders from systematically trying out all possible combinations.



– Cancel

With the key  you can cancel the PIN entered.

9.7.3 Logout

If you are logged in to an operating level, the entry *Logout* is available in the menu *Access Control*. In addition, you can specifically log out of an operating level and continue to work on a different level via the entry *Change level*. If the display is switched off either automatically or manually, the system will log the user out automatically.

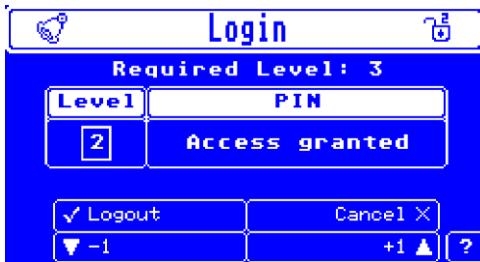
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9.7.4 Changing Levels

If you are logged into a specific operating level, you can switch to a higher or lower operating level. This is an alternative procedure to logging in and out for different levels.

The view in which you can change levels can be accessed as follows:

Ⓜ -> Main Menu: Access Control -> Access Control: Login -> Login -> Enter PIN for level 3 -> Access Control: Change Access Level -> Login



The view depends on the level you are logged into and if you wish to switch to a higher or a lower level. Changing to a higher level is implemented with a log-in for which the respective PIN is required. Switching to a lower level is implemented by logging out of the respective superordinate level.



Changing to a lower level

A user is logged in to level 3 and would like to switch to level 1. He selects level 2 in the view and then acknowledges the log-out from level 2 via *Logout*. The view shows that the user is then logged on to level 1. He can then exit the view with *Cancel*.

The operating options in the view are therefore identical with those for log-in or log-out.

9.7.5 Changing the PIN

To change the PIN for an operating level, you must first enter the current PIN for this level. The view in which you can change the PIN can be accessed as follows:

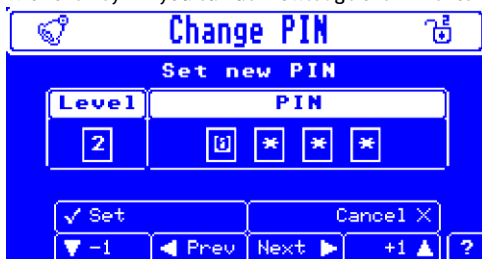
Ⓜ → Main Menu: Access Control → Access Control: Change PIN → Change PIN



You have the following options:


- First, enter the PIN you would like to change using the navigation keys.
- Confirm

With the key  you can acknowledge the PIN entered.



Enter the new PIN and confirm it. You will be prompted to enter the new PIN again. Once you confirm the new PIN again, the PIN is changed.

- Cancel

With the key  you can cancel the PIN entered.

9 SETTINGS VIA THE HMI



9.7.6 Resetting all PINs

If you have authorization for accessing level 3, you can reset all PINs to the default setting 0000. The view in which you can reset all PINs can be accessed as follows:

(M) → Main Menu: Access Control → Access Control: Reset All PINs → Reset All PINs



You have the following options:

- Enter the PIN for level 3 using the navigation keys.
- **Confirm**
With the key  you can acknowledge the PIN entered.
All PINs are reset to 0000.
- **Cancel**
With the key  you can cancel the PIN entered.
The PINs are not reset.

9.7.7 Disabling the Access Control



Enabling and disabling access controls

As a default setting, the access control is not activated, and all PINs are set to 0000. Once the access control has been activated, and the PINs were changed, these PINs will continue to be used. To activate the access controls again, you will need the PIN for level 3 (*Master*). It is therefore recommended to reset all PINs before disabling.

If that was not done, or a system must be unlocked for another reason, a request key can be issued in the MICT. Refer to the section *Resetting all PINs* on page 64.

The view in which you can disable the access control can be accessed as follows:

Ⓜ -> Main Menu: Access Control -> Access Control: Disable Access Control -> Disable Access Control



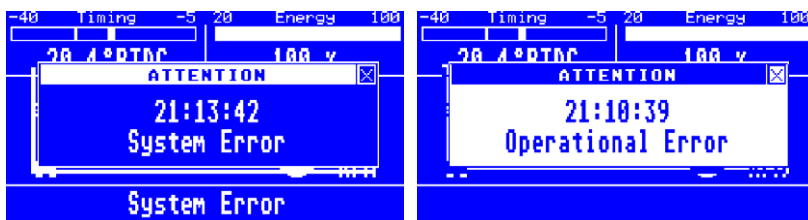
You have the following options:

- Enter the PIN for level 3 using the navigation keys.
- **Confirm**
 With the key you can acknowledge the PIN entered.
 The access control is disabled.
- **Cancel**
 With the key you can cancel the PIN entered.
 The access control remains activated.

9.8 Error

9.8.1 System / Operating Errors

If a system or operating error occurs, the display is activated, and the corresponding error message is displayed. The display remains switched on until the error message was closed.



The following information is provided:

- **Time stamp**
 Operating time at which the error occurred.

9 SETTINGS VIA THE HMI

- **System Error/Operational Error**
Error type.

You have the following options:

- Close the error message with the key **⊗**.
- Switch to the error and warning view to analyze the problem in more detail, e.g. via **Ⓜ** → *Main Menu: Commands* → *Commands: Error Commands* → *Error Commands*
- The MIC850 will not be ready for firing up the engine until the error was eliminated and acknowledged.

9.8.2 Software Installation Errors

The following display appears if the HMI software could not be installed after the firmware update. The MIC850 is then not in the system state *Ready*.



You have the following options:

- Set the MIC850 to the status *Ready* and repeat the HMI installation by acknowledging the warning with the **⊗** key. This is the recommended procedure.
- Ignore the warning and cancel the update with the key **⊗**. You can then continue to work with the old status of the HMI software. If the HMI software version is outdated, the ignition performance of the MIC850 is not affected. Merely display errors may occur on the screen. Upon restarting the ignition controller, the system will automatically attempt to update the HMI software.

10 OPERATION

10.1 Start-Up

Before you start up the MIC850 ignition controller, take note of the following:

- Were the correct engine, ignition sequence, and output configuration selected? If you are not completely sure, contact the corresponding engine manufacturer.
- Ensure that the ignition sequence of the engine or the wiring of the output wire harness is implemented correctly.
- Is the wiring of all pickups compliant with the drawings given in this operating manual?
- Are the distances of the pickups to trigger discs, projectiles, etc. correctly set? (See sections *Defining Installation Locations*, *Installing Sensors*, *Setting Timing Correction Range and Trigger Disc* on page 30).
- Ensure that the data were transferred flawlessly to the controller.
- Check whether the start/stop input is set to *Firing active*, or whether it works according to the control requirements of the superordinate control system.
- Check whether the input contact for parameter settings A/B (*Schedule A/B*) functions and ensure that the correct settings (A or B) were selected for start-up.
- Ensure that no gas is present in the inlet and exhaust systems before you start the engine.
- Ensure that the gas valve is closed.
- Perform the normal engine start-up process while the gas valve is closed (start only).
- Connect a stroboscope to the first firing cylinder (cylinder #1) and check whether the timing point set on the ignition controller coincides with the actual timing point on the crankshaft. If the timing point does not coincide exactly, change it (see section *Runtime Data* on page 87) until the optimum setting is reached. If the ignition does not fire, read the instructions in section *Troubleshooting and Eliminating Errors* on page 160.
- Check all other cylinders for correct ignition. If they are not correct, stop the engine, and recheck wiring and ignition sequence for correctness.
- Stop the starting process. If no problems occur, start the engine in accordance with the specifications of the engine manufacturer.

10.2 Shut-Down

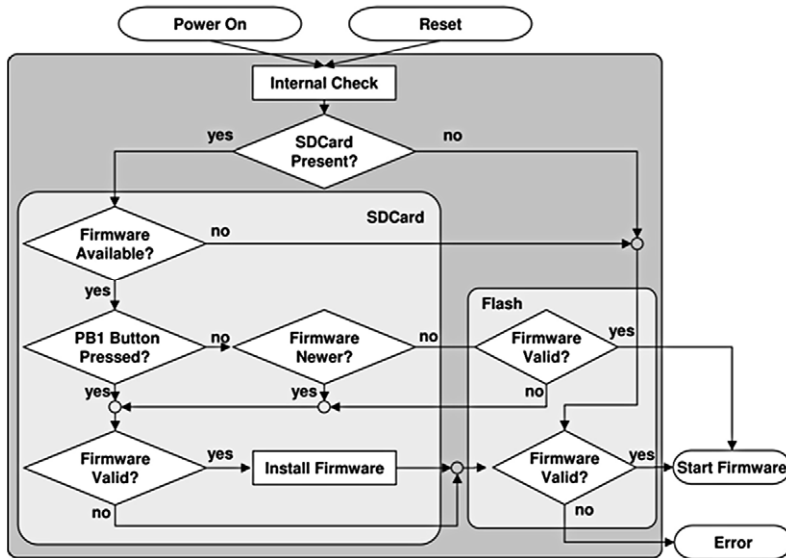
The ignition controller is shut down by disconnecting it from the power supply.

10.3 Behavior upon Activation (MIC Internal)

Upon activation or restart, internal checks are performed first, then the system checks if an SD card is inserted. If no SD card is found, a validity check of the firmware currently installed is performed. If the check is completed successfully, the firmware is started. Otherwise, an error code (GPO3 flashes twice, and the error LED is on) is indicated, and the program is aborted. If an SD card is found, and if suitable firmware is stored on this card, the system first checks if a downgrade is to be implemented. With a downgrade, the firmware to be loaded to the device is older than the one currently installed.

10 OPERATION

For this purpose, hold down PB1 during start-up until PU C flashes. Otherwise, the firmware found is checked whether it is newer, i.e., has a higher version number than the one already installed. If newer firmware was found, or if a downgrade was initiated, the data integrity of the new firmware is ensured with a check sum (PU B flashes). After that, the firmware is installed on the MIC850 (PU A flashes). If the installation was successful, the newly installed firmware is then started. If the firmware detected is corrupted, the firmware already installed is checked for validity instead and started if successful. If the latter is also corrupted, an error code (GPO2 and GPO3 flash twice alternately, and the Error LED is on) is indicated, and the program is aborted. If the firmware found is not newer than the one already installed, and no downgrade was activated, the firmware already installed is checked for validity instead and started if successful. If the latter is corrupted, the system will attempt to install and start the firmware found on the SD card, anyway. If the latter is also corrupted, an error code (GPO2 and GPO3 flash twice alternately, and the Error LED is on) is indicated, and the program is aborted.



10.4 Firmware Update

Perform the following to prepare for the firmware update:

1. Ensure a reliable power supply for the MIC850.
2. Back up all files stored on the SD card (particularly important are the files: *mic850.fwf*, *bl850.fwf* and *fw850.fwf*).
3. Copy the update file to the SD card and rename the file to *mic850.fwf* if necessary.

For the update, proceed as follows:

1. Insert the SD card and start the device.
 - ▶ The update runs automatically and takes several minutes.
Do not remove the SD card under any circumstances during this process!
 - ▶ The SD card is being initialized. The LED *PU C* flashes during this process.
 - ▶ The new firmware is checked for the correct hardware version, the proper device ID, a higher software version, and correct check sum. The LED *PU B* flashes during this process.
 - ▶ If everything is found to be correct, and the new firmware is a higher software version, it is adopted and started automatically. If the version number of the new firmware corresponds with the software version installed, or if it is lower, the new firmware is not installed. The LED *PU A* flashes during this process.
 - ▶ The new firmware is started.
 - ▶ The LED *Status* flashes.
2. Remove the SD card once the update process has been completed. Otherwise, the check for a new firmware file will be performed every time the MIC850 is restarted.
3. After a successful firmware update of the MIC850, check all configuration data.

The following errors may occur during the firmware update:

Error code	Error	Measure
GPO 3 flashes twice, Error is on	Installed firmware defective	Reinstall firmware via SD card
GPO 2 and GPO 3 flash twice in alternating order, Error is on	Installed firmware and firmware on SD card defective	Copy new firmware to the SD card (repeat copying process if necessary)
Error flashes up to 40 times	Internal checks failed	Send device in if restart does not remedy the situation
PU C flashes indefinitely	Defective, wrongly formatted, or unreadable SD card	Reformat SD card if applicable (FAT 16)



Downgrade process

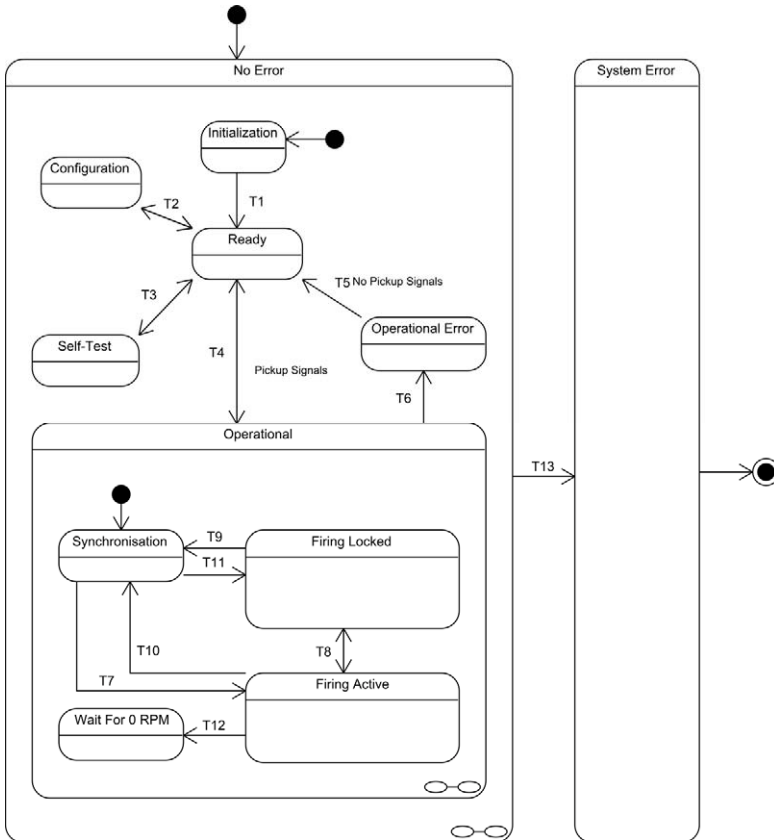
The process for a downgrade is largely the same as the update process. Immediately after inserting the SD card, simply start the controller, then immediately press the pushbutton *PB1*. If the SD card contains an older version of the firmware file (*mic850.fw*) than is currently installed, the downgrade process starts.

10 OPERATION

10.5 Operating Mode

10.5.1 Operating Statuses

On the MIC850, the automated status loop shown in the figure below is implemented. Central states during operation are the idle status *Ready* and the operating status *Operational*. In the following, we will explain the individual statuses and transitions.



'Initialization' status

The system is initially placed in the *Initialization* status in which the system is initialized. After successful initialization, the system transitions to the *Ready* status.

'Ready' status

In the *Ready* status, the system is ready to operate and waits for commands or events that trigger specific actions of the system.

'Configuration' status

The system transitions from *Ready* to *Configuration* status if a configuration command was received via the USB interface. The device configuration can be changed only with this status. Normally, the configuration is completed by a command received via the USB interface. After the command is received, the MIC850 performs a plausibility check and accepts the new configuration only if this check finishes successfully. If the new configuration cannot be accepted, the configuration set before the *Configuration* status is restored. Pickup signals are not analyzed during the configuration process.

'Self Test' status

By issuing commands that can be transmitted via the USB interface or the HMI, the system can be switched between the statuses *Self Test* and *Ready*. The self test is aborted if pickup signals are detected. The system then transitions to the *Operational Error* status.

'Operational' status

When pickup signals are received, the system automatically switches from the *Ready* status to the *Operational* status. Once the engine stands still, the system switches back to the *Ready* status. In case of operational errors (e.g. pickup errors or overspeed), the system switches to the *Operational Error* status. While in the *Operational* status, there are sub-statuses, which depend on ignition release and speed and on whether the pickup signal analysis has just begun.

'Synchronization' status

The *Synchronization* status is the initial status within *Operational*. In this state, a machine cycle (camshaft signal) is expected first. After that, the system waits for the events that are being anticipated during a crankshaft rotation (ring gear signal, reset signal). When all events have been detected, the system switches, depending on the ignition release, to *Firing Locked* or *Firing Active*.

'Wait For o RPM' status

In this state, the system waits for the absence of the pickup signals and thus engine standstill. Once the engine is standing still, the system transitions to the *Ready* status.

'Firing Locked' status

If the pickup signals can be analyzed, but there is no ignition release, the system switches to the *Firing Locked* status. If the ignition release is issued, the system switches to the *Firing Active* status. If errors are detected in the pickup signals, the system switches to *Synchronization* or *Operational Error*, depending on the speed.

'Firing Active' status

With the *Firing Active* status, ignition is activated. In case of absence of the pickup signals, the system switches to *Synchronization* or *Operational Error*, depending on the speed. If the ignition release is retracted at a speed below the security speed, the system switches to *Firing Locked*, otherwise, it switches to *Wait For o RPM*.

10 OPERATION

'Operational Error' status

In case of operational errors in the *Operational* status, the system switches to the *Operational Error* status. In this state, the device can only be monitored via the USB interface, but configuration, self test, or ignition functions are blocked. Only when no more pickup signals are detected can the error be acknowledged with a command via the USB interface or the HMI, and the system switches back to the *Ready* status.

'System Error/No Error' status

If a severe error occurs, after which the system can no longer be operated without restarting it, the system switches to the *System Error* status. Usually, the device can still be monitored via the USB interface or the HMI. All other statuses are sub-statuses of *No Error*.

Transition T1

The transition occurs after successful initialization of the firmware. If the firmware cannot be initialized, a critical error has occurred, which is being signaled with the LED on the cover panel. Also, the firmware execution is stopped.

Transition T2

The transition to *Configuration* is triggered with a command received via the USB interface. The transition back to *Ready* either occurs when a command to end the configuration is received via the USB interface, or if the connection to the PC is interrupted.

Transition T3

The transition to *Self Test* is triggered by a command received via the USB interface or from the HMI. The transition back to *Ready* is triggered with a command received via the USB interface or from the HMI.

Transition T4

If the system receives pickup signals, it transitions to *Operational*. Once the engine is standing still, the system transitions back to the *Ready* status.

Transition T5

If no pickup signals are registered, and the corresponding command is received from the USB interface or the HMI, the system transitions to *Ready*.

Transition T6

In case of operational errors (e.g. pickup errors or overspeed), the system switches to the *Operational Error* status. This immediately shuts down the ignition.

Transition T7

If a machine cycle and then all events that are being anticipated during a cycle (ring gear signal, reset signal) have been detected, and the ignition has been released, the system transitions to *Firing Active*.

Transition T8

The transition to *Firing Locked* is implemented when the ignition release is retracted and no ignition has occurred above the security speed since the standstill of the machine. Also, the ignition is immediately shut down. The system transitions to *Firing Active* if the ignition release is issued.

Transitions T9, T10

In case of errors in the pickup signals and low speed, the system transitions to *Synchronization*.

Transition T11

If a machine cycle and then all events that are being anticipated during a cycle (ring gear signal, reset signal) have been detected, and the ignition has not been released, the system transitions to *Firing Locked*.

Transition T12

If the ignition release is retracted while the speed is higher than the security speed, the system transitions to the *Wait For 0 RPM* status. This shuts down the ignition.

Transition T13

The system transitions to the *System Error* status when an error is detected after the system can no longer be reliably operated (without restart). The ignition is immediately shut down, and the error cannot be acknowledged.

11 FAULTS

11.1 Possible Faults

The MIC850 ignition controllers include several safety functions that can shut down the engine in case of fault:

- Overspeed protection
- External shut-down contact (Start/Stop)
- Misfire detection (primary)
- SCR error detection / internal failure of the high voltage supply
- Shut-down in case of faulty pickup /signals
- Alarms
- Faulty voltage supply
- External EMI signals

11.2 Causes for Faults

11.2.1 Overspeed

The engine speed has exceeded the overspeed value.

Potential causes:

- Speed controller does not function properly
- Fuel supply to engine is not optimum.
- Faulty pickup signal

11.2.2 SCR Error Detection

An internal failure of the high voltage supply or a defective thyristor occurs.

Potential cause:

- Hardware defect on the MIC850.

11.2.3 Misfire Detection (Primary)

The primary misfire rate has exceeded the value configured in the alarm for primary misfiring.

Potential causes:

- Defect in the output wiring
- Ignition coil defective

11.2.4 Pickup Input Errors

Faulty input signals from the pickups are detected.

Potential causes:

- Number of teeth on the flywheel does not coincide with the set number.
- Interference in the wiring of the pickup.
- Wiring of the pickup is not correct.
- Distance of the pickup is not correct.
- Contamination on the pickup.

11.2.5 Low Power

An error has occurred in the power supply to the MIC850.

Potential causes:

- The power supply is dimensioned too small.
- The battery is worn out.
- The wiring for the power supply is defective.
- The wiring for the power supply is routed incorrectly.

Indication of the error codes for *Low Power Error* via the LEDs upon activation:

- if the *PUA* LED lights up yellow, and the *PUB* LED flashes yellow, this signifies that the voltage supply has dropped below 12 V.
- if the *Error* LED flashes red, and *PUA* and *PU C* are on, this signifies that a critical error (*Low Power Error*) has occurred.

11.2.6 Acknowledging Faults

While the engine is shut down, you have the following options for acknowledging operating errors:

- with *Acknowledge operating error* in the MICT
- with *Acknowledge* in the Error Commands screen in the HMI (optional)
- Disconnecting the supply voltage
- Press pushbutton *PB1* on the controller for several seconds.

11 FAULTS

11.3 Troubleshooting and Eliminating Errors

11.3.1 Message and Error Overview

The following errors and messages can be displayed in the MICT and HMI:

Error code	Description	Causes
no error	No error	
trigger count	Number of events per cycle counted does not correspond with set value.	<ul style="list-style-type: none">– Set value is wrong.– Ring gear is defective.– Trigger disc runs out-of-center– Faults in reset, index camshaft/crankshaft.– Reset is polarized incorrectly.– Pickup is dirty.– Pickup wiring is damaged.– Faulty connection to pickup
trigger missing	Number of counted events is smaller than expected number.	<ul style="list-style-type: none">– Reset is polarized incorrectly.– Contaminations have occurred on the trigger disc during operation.– Trigger disc / ring gear was damaged during operation.– Pickup wiring is faulty.
cycle signal missing	Cycle signal was not detected in time. More events were counted than is expected per cycle.	<ul style="list-style-type: none">– Reset is polarized incorrectly.– Faults on reset, index camshaft/crankshaft occurred.– Wiring to camshaft/crankshaft pickup is faulty.– Trigger signal was jammed.
reset count	Number of reset events is outside expected range.	NOTE Only for 4-stroke engines: Fault coupled with reset signal.


Error code	Description	Causes
trigger period	Current event period is outside the valid range with reference to the previous event period.	<ul style="list-style-type: none"> – Fault coupled with trigger signal – The wiring to the trigger pickup is faulty. – The trigger pickup is dirty. – Trigger disc / ring gear was damaged during operation.
pickup pre-processor	Pre-processor pickup causing errors.	NOTE N+1 / N-1 trigger discs
overspeed	Overspeed.	<ul style="list-style-type: none"> – Overspeed – Fault coupled with trigger signal
missing output board	Output board could not be detected.	– An output board is defective.
SCR or HV error	Thyristor error occurred / Problems with primary high voltage generator.	<ul style="list-style-type: none"> – Thyristor is faulty. – Problem occurred with high voltage generator. <p>NOTE Send the device to MOTORTECH.</p> <ul style="list-style-type: none"> – Short circuit on 1 to 1 output.
misfire rate	Misfire rate exceeded.	– The misfire rate was exceeded.
low power or shut-off	Voltage too low.	<ul style="list-style-type: none"> – Deactivation of the device. – Problems with the 24 V power supply.
general	General error.	NOTE Send the device to MOTORTECH.
alarm shutdown	The ignition is shut down due to an alarm.	– The limit set for an alarm resulting in engine shut-down was exceeded or not reached.

11 FAULTS

Error code	Description	Causes
reset by watchdog	The device was restarted by the watchdog.	NOTE Consult MOTORTECH service department.
temperature	The max. permissible device temperature was exceeded.	– ambient temperature too high
pickup signals in self test	The self test was aborted because pickup signals were detected.	– Fault coupled with pickup signal. – Engine was started

11.3.2 Running a Self Test

You can run the self test via the MICT or the HMI to check the sequence of the wiring and the connection between the ignition controller outputs and the spark plugs. Start the self test as follows:

- MICT: *Device -> Send commands -> Start self test*
- HMI:  *->Main Menu: Commands -> Commands: Self Test -> Self Test*



Operational Safety

If you use the self test function, it is compulsory to shut off the gas feed line and all cylinders are purged of fuel. Non-compliance can result in damage to equipment or injury to persons.

11.3.3 Customer Service Information

You can reach our customer service during business hours by phone, fax, or e-mail at:

- Tel. +49 5141 9399 0
- Fax +49 5141 9399 99
- E-mail servicemail@motortech.de

11.3.4 Returning Equipment for Repair / Inspection

Enclose an insert containing the following information when returning the equipment for repair and inspection:

- Name of operating company
- Name and location at which the equipment is installed
- Name and phone number of a contact person
- Engine type
- Part and serial numbers of the device
- Description of the defect/error
- Instructions concerning the desired type of repair/inspection

Providing this information will ensure the speedy and smooth processing of your repair order.

Send the equipment to one of the two addresses below or to the nearest MOTORTECH representative:

MOTORTECH GmbH

Hogrevestrasse 21-23
29223 Celle

Germany

Tel. +49 51 41 - 93 99 0
Fax +49 51 41 - 93 99 98

www.motortech.de
motortech@motortech.de

MOTORTECH Americas

1400 Dealers Avenue
New Orleans, LA 70123

USA

Tel. +1 504 355 4212
Fax +1 504 355 4217

www.motortechamericas.com
info@motortechamericas.com

11.3.5 Instructions for Packaging the Equipment

For return shipment, equipment should be packaged as follows:

- Use packaging material that does not damage the equipment surfaces.
- Wrap the equipment with sturdy materials and stabilize it inside the packaging.
- Use sturdy adhesive film to seal the packaging.

12 MAINTENANCE

12.1 Maintenance Instruction

Please follow the following maintenance instructions:

- Do not use caustic liquids or steam cleaners for cleaning the optional display. Do not use blunt force on the display during cleaning.
- To control the energy levels based on the operating hours of the spark plugs, you must reset the operating hours counter for the spark plugs each time you replace the spark plugs.
- Clean the passive pickups at regular intervals.
- Check the ignition wires at regular intervals.
- Replace the pickups at regular intervals if operating them under elevated temperature conditions (> 90 °C / > 194 °F).
- Regularly inspect all wires of the ignition system for damage and replace the wires as needed.
- Check all plug-in connections for proper condition.
- Service the spark plugs as per the instructions of the spark plug and engine manufacturers.

12.2 Spare Parts and Accessories

For spare parts and accessories for MIC850 ignition systems, please refer to our current product guide, which is available to you for download on the Internet at www.motortech.de.

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