WOODWARD

easYgen-1000
Genset Control

Application Manual

WARNING

Read this entire manual and all other publications pertaining to the work to be performed before installing, operating, or servicing this equipment. Practice all plant and safety instructions and precautions. Failure to follow instructions can cause personal injury and/or property damage.

The engine, turbine, or other type of prime mover should be equipped with an overspeed (overtemperature, or overpressure, where applicable) shutdown device(s), that operates totally independently of the prime mover control device(s) to protect against runaway or damage to the engine, turbine, or other type of prime mover with possible personal injury or loss of life should the mechanical-hydraulic governor(s) or electric control(s), the actuator(s), fuel control(s), the driving mechanism(s), the linkage(s), or the controlled device(s) fail.

Any unauthorized modifications to or use of this equipment outside its specified mechanical, electrical, or other operating limits may cause personal injury and/or property damage, including damage to the equipment. Any such unauthorized modifications: (i) constitute "misuse" and/or "negligence" within the meaning of the product warranty thereby excluding warranty coverage for any resulting damage, and (ii) invalidate product certifications or listings.

CAUTION

To prevent damage to a control system that uses an alternator or battery-charging device, make sure the charging device is turned off before disconnecting the battery from the system.

Electronic controls contain static-sensitive parts. Observe the following precautions to prevent damage to these parts.

- **Discharge body static before handling the control (with power to the control turned off, contact a grounded surface and maintain contact while handling the control).**
- **Avoid all plastic, vinyl, and Styrofoam (except antistatic versions) around printed circuit boards.**
- **Do not touch the components or conductors on a printed circuit board with your hands or with conductive devices.**

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Important definitions

WARNING

Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

CAUTION

Indicates a potentially hazardous situation that, if not avoided, could result in damage to equipment.

NOTE

Provides other helpful information that does not fall under the warning or caution categories.

Revision History

Rev.	Date	Editor	Changes
NEW	08-05-21	TP	Release based on 37305D

Content

Chapter 1.
General Information

Type		English	German
easYgen-1000 Series			
easYgen-1000 V2.1 - Installation		37390	GR37390
easYgen-1000 V2.1 - Configuration		37391	GR37391
easYgen-1000 V2.1 - Operation		37392	GR37322
easYgen-1000 V2.1 - Interfaces		37393	GR37393
easYgen-1000 V2.1 - Application	this manual ⇨	37394	GR37394
Additional Manuals			
IKD 1 - Manual		37135	GR37135
Discrete expansion board with 8 discrete inputs and 8 relay outputs that can be coupled via the CAN bus to the control unit. Evaluation of the discrete inputs as well as control of the relay outputs is done via the control unit.			
IKN 1 - Manual		37136	GR37136
20channel NiCrNi temperature scanner that monitors the temperature values for exceeding or falling below a threshold value, measured through senders on the IKN 1. A configured relay on the board of the IKN 1 will trip. The IKN 1 can be coupled with the control unit using the CAN bus to display measuring values as well as alarms.			
LeoPC1 - Manual		37146	GR37146
PC program for visualization, configuration, remote control, data logging, language upload, alarm and user management, and management of the event recorder. This manual describes the set up of the program and interfacing with the control unit.			
LeoPC1 - Manual		37164	GR37164
PC program visualization, configuration, remote control, data logging, language upload, alarm and user management, and management of the event recorder. This manual describes the configuration and customization of the program.			
GW 4 - Manual		37133	GR37133
Gateway for transferring the CAN bus to any other interface or bus.			
ST 3 - Manual		37112	GR37112
Control to govern the Lambda value of a gas engine. The Lambda value will be directly measured though a Lambda probe and controlled to a configured value.			

Table 1-1

Intended Use The unit must only be operated for the uses described in this manual. The prerequisite for a proper and safe operation of the product is correct transportation, storage, and installation as well as careful operation and maintenance.

NOTE

This manual has been developed for a unit fitted with all available options. Inputs/outputs, functions, configuration screens and other details described, which do not exist on your unit may be ignored.

The present manual has been prepared to enable the installation and commissioning of the unit. On account of the large variety of parameter settings, it is not possible to cover every possible combination. The manual are therefore only a guide. In case of incorrect entries or a total loss of functions, the default settings can be taken from the list of parameters.

Chapter 2.
Application Notes Starting Firmware V1.0016

Rated Voltage / Frequency Mains

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The proportional values for emergency mode relate to the generator nominal voltage. The mains has no own parameters yet (implemented in V1.0017).

Rated Voltage Generator

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The generator rated voltage relates to the secondary values of the generator voltage transformer. Since V1.0017 it relates to the primary values!

Close GCB in MANUAL Mode

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The generator undervoltage monitoring level 1 and 2 must be enabled to close the GCB in MANUAL mode.

Emergency Mode

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When the mains return after a mains failure and the DI release MCB is disabled, the GCB will stay closed as long as the mains settling time is active. After that the GCB will open and the generator will shutdown. To prevent a dead busbar the unit needs a signal for **"Start req. in AUTO"**, see also Test With Load on page 18.

Chapter 3.
Application Notes Starting Firmware V1.0017

Preheating of Coolant Water

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To set up a preheating of the coolant water the following is required:

1 temperature sensor, connected to T1 or T2, e.g. PT100
1 free limit of this analog input
1 free relay output for the heating (here relay2)

The temperature sensor is connected to the analog input (AI), here T1 (terminal 13/12). The first monitoring limit of this AI is set to the selected temperature, e.g. 10°C with a delay time of 3s. The alarm class will be "control", the monitoring is set to "Underrun", and self acknowledge to "YES".

The level 2 monitoring can be used for high temperature monitoring.

Example for all parameters in analog input 1

Parameter, German	Setting	Parameter, English
Type	Pt100	Type
Auswahl Hardware	0 to 500Ohm	select hardware
Beschreibung (nur über LeoPC1)	Kuehlwassertemp / cool.water temp	name (only via LeoPC1)
Hysterese	1	Hysteresis
Überwachung Stufe 1	Ein / ON	Monitoring
Limit Stufe 1	10	Limit level 1
Verzögerung Stufe 1	3.00 s	Delay level 1
Überwachung Stufe 1 auf	Untersch. / Underrun	Monitoring level 1 at
Alarmklasse Stufe 1	Steuer / control	Alarm class level 1
Selbstquittierend Stufe 1	Ja / Yes	Self acknowledge
Verzögert d.Motordr. Stufe 1	Nein / No	Delayed by engine
Überwachung Stufe 2	Ein / ON	Monitoring level 2
Limit Stufe 2	90	Limit level 2
Verzögerung Stufe 2	1.00 s	Delay level 2
Überwachung Stufe 2 auf	Überschr / Overrun	Monitoring level 2
Alarmklasse Stufe 2	Klasse C / Class C	Alarm class level 2
Selbstquittierend Stufe 2	Nein / No	Self acknowledge
Verzögert d.Motordr. Stufe 2	Nein / No	Delayed by engine
Drahtbruchüberw.	Oben	Monit. wire break
Drahtbruch Alarm	Klasse B / Class B	Wire break alarm class
Drahtbruch selbstquitt.	Nein / No	Self acknowledge wire break
Filter	3	Filter

The relay 2 is energized as soon as level 1 is reached. It de-energizes when the temperature is 10°C+hysteresis (Figure 3-1).
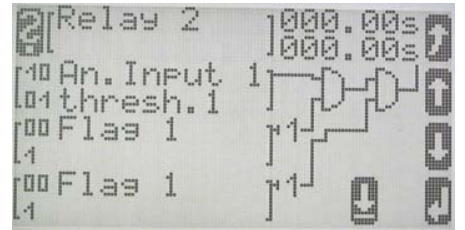
Figure 3-1

Emergency Mode with an External Mains Protection (without Message Emergency Mode)

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It is possible to close the GCB before the delayed engine monitoring is active like in emergency mode. If the device does not monitor the mains voltage itself it can get a signal from an external monitoring unit. Therefore you need:

1 external mains protection unit, e.g. MFR11xx/MP or VDEW which has a signal connected to
1 free DI with alarm class "control" (here DI4)

The default value for the *LogicsManager* "Undelayed close GCB" is "4.9 Emergency mode". Enter the DI4 here (Figure 3-2)

Figure 3-2

The parameter Flag 1 [1] is the default value, in this case there is no need to change it.

The DI4 must be in the conditions for "Start req. in auto" if the unit is supposed to run as soon as the external mains protection is active (Figure 3-3). Enter an OFF-delay time (here 10s) also to keep the engine running during a mains settling time or make sure that the signal is active for enough time, e.g. with a fall back delay time in the MFR11.
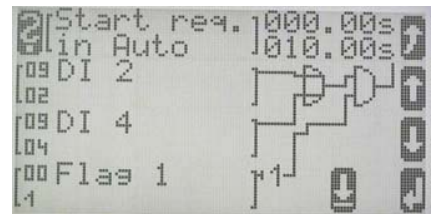
Figure 3-3

The parameter Flag 1 [1] is the default value, in this case there is no need to change it.

Start in Auto Via Clock Daily/Weekly/Monthly

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The timer functions provide a wide range of possibilities how they could be used. Each of the settings can be used and combined in the *LogicsManager*. They can be made longer or shorter depending on the OFF-delay and ON-delay timers of the *LogicsManager* flags.

Setpoint 1/2   Is an adjustable time. If used in the *LogicsManager* it is active when this time of the day is overrun. It is FALSE at midnight.

Application: Setpoint 1 and 2 can trigger a "Start req. in auto" daily between 8:00 (AM) and 17:00 (5:00PM). This is the default setting for flag 8 (Figure 3-4). For a start in automatic, the result of flag 8 (00.08) must be entered as input condition in "Start req. in auto".
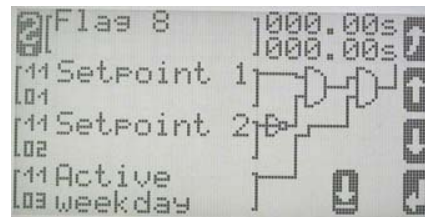
Figure 3-4

Active day   Is the day of the month, e.g. 15 is every 15th of the month. It is TRUE for 24h as long as this date is displayed from the internal clock.

Application: It could initiate an automatic start of the engine once a month (together with an active hour).

Active hour   It is TRUE for 60 minutes, e.g. 15 means between 15:00:00 (3:00PM) and 15:59:59 (3:59:59PM).

Application   Can be combined with other signals or e.g. open a louver/shutter every day for one hour.

Active minute   It is TRUE the same minute every hour, e.g. the 5th minute for 60 seconds.

Application   Can be combined with other signals or e.g. a lube pump runs for one minute every hour.

Active second   TRUE every minute for one second.

Application   Can be combined with other signals.

Monday active   The internal calendar checks the actual weekday. The setpoint is active during the specified day from 0:00:00 to 23:59:59.

Application   See Figure 3-4 above, default is set to run the engine every Monday till Friday but not on Saturday and Sunday.

Tuesday to Sunday active: see Monday.

Special Functions for Discrete Inputs,
e.g. External Acknowledge and Firing Speed

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Firing Speed Reached (from V1.0100 with *LogicsManager*)

A discrete input can be used as a signal that the firing speed is reached e.g. from an electrical generator. Firing speed reached means the starter is de-energized, the delayed engine monitoring timer starts and this DI will be monitored with the "Speed/frequency mismatch" monitoring.

Example (high signal = firing speed reached), here for DI3:

Configure engine	DI for firing speed	= 3
Configure digital inputs	DI3 operation	= N.O.
	DI3 delay	= min 80ms, depending on application
	Alarm class	= Control
	DI3 delayed by engine speed	= No
	DI3 self acknowledge	= No

External Acknowledgement (from V1.0100 with *LogicsManager*)

This DI needs a high signal twice, the first to shut off the horn, the second to acknowledge all alarm messages. If a momentary-contact switch is used please make a label saying it has to be pushed twice. The duration of pushing depends on the setting of the DI delay time.

Examples of How To Define the Analog Input Tables

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If a sensor type is used that has no selectable characteristic, the table A and B can be used. It is possible to choose every point on the X-axis as well from the Y-axis.

The **X-axis** offers values between 0 and 100%, this is the minimum and maximum of the configured hardware range. The device creates a straight line between the single points internally. It also creates a straight line between 0% and the first entered value and between the last entered value and 100%.
Here in this example:
last entered value X=50% Y= -2000   The unit displays always the value –2000 between 250 and 500 Ohms (or 10-20mA)

The range for the **Y-axis** is –9999 to +9999. It has no dimension and no decimals. For values greater than –999 the parameter value format needs five zeros, the minus symbol needs one. For decimal values a decimal point is required in the parameter value format, e.g. 000.0°F, see also Display the Analog Input Value in °F and psi on page 19.

value format = 00000   (only via LeoPC1) All zeros in this parameter will be overwritten with the actual measured value

0%= 0Ohm and 100%= 500Ohm

The X-values can be choosen in a way that the range with the highest curvature has the most points, see the (extreme) example below:
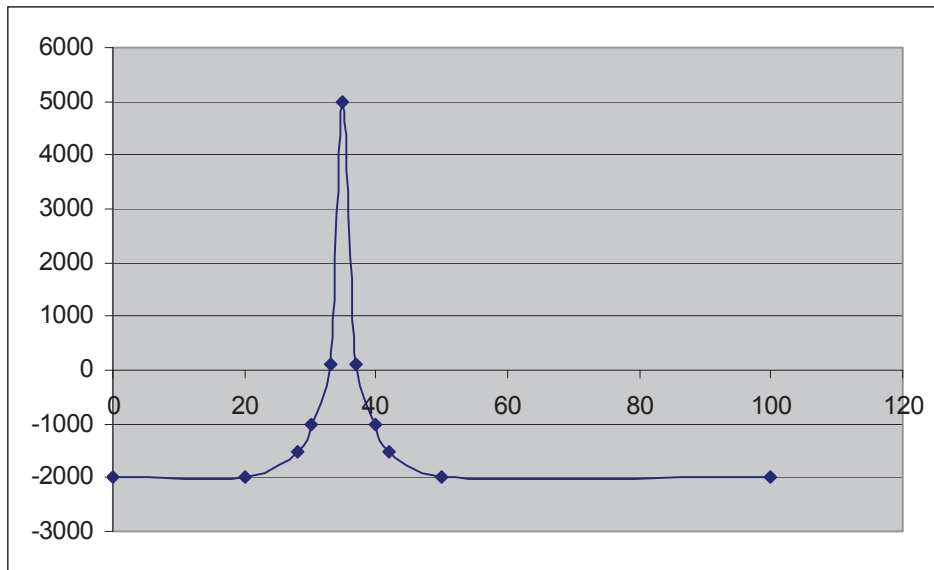
Figure 3-5

The parameters inside the device look like this (X-value 0% and 100% are not entered)

	X- Value	Y-Value	Resistance	Current 0 to 20mA	Current 4 to 20mA
	0	-2000	0 Ohm	0 mA	4,0 mA
1. Point	**20**	**-2000**	100 Ohm	4,0 mA	7,2 mA
2. Point	**28**	**-1500**	140 Ohm	5,6 mA	8,48 mA
3. Point	**30**	**-1000**	150 Ohm	6 mA	8,8 mA
4. Point	**33**	**100**	165 Ohm	6,6 mA	9,28 mA
5. Point	**35**	**5000**	175 Ohm	7,0 mA	9,6 mA
6. Point	**37**	**100**	185 Ohm	7,4 mA	9,92 mA
7. Point	**40**	**-1000**	200 Ohm	8,0 mA	10,4 mA
8. Point	**42**	**-1500**	210 Ohm	8,4 mA	10,72 mA
9. Point	**50**	**-2000**	250 Ohm	10,0 mA	12,0 mA
	100	-2000	500 Ohm	20,0 mA	20,0 mA

Table 3-6

Using an Analog Input Instead of a Discrete Input

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It is possible to use an analog input instead of a digital input. We recommend a potential free contact. T1 is used in this example (terminal 13-12).

Attention! The contact resistance has to be less than 500 Ohms. The maximum current is limited to 2,3 mA at 0 Ohms (see also technical data in the installations manual)

The analog input is set to 0-500 Ohms, linear scale. The default 0-1000 is ok. Enter the name in LeoPC1, like "Door open". Only one limit is used, the other is switched off. Filter should be OFF, this is the shortest processing time. The limit is set in the upper range (e.g. 800) to avoid problems if a **contact resistance** occurs.

Analog Input 1

Parameter, German	Setting	Parameter, English
Typ	Linear	Type
Auswahl Hardware	0 to 500Ohm	Select hardware
Beschreibung (nur über LeoPC1)	Tür offen / Door open	Description (only via LeoPC1)
Benutzerdef. Lineare Skala		User defined scale
Wert bei 0%	0	Value at 0%
Wert bei 100%	1000	Value at 100%
Hysterese	1	Hysteresis
Überwachung Stufe 1	Ein / On	Monitoring level 1
Limit Stufe 1	800	Limit level 1
Verzögerung Stufe 1	0,10s	Delay level 1
Überwachung Stufe 1 auf	Übersch / overrun	Monitoring level 1
Alarmklasse Stufe 1	Steuer / control	Alarm class
Selbstquittierend Stufe 1	Ja / Yes	Self acknowledge level 1
Verzögert d.Motordr. Stufe 1	Nein / No	Delayed by engine level 1
Überwachung Stufe 2	AUS / OFF	Monitoring level 2
Alle anderen Param. Stufe 2	irrelevant/ unimportant	All other parameters
Drahtbruchüberw.	AUS / OFF	Monit. wire break
Alle anderen Param. Stufe 2	irrelevant/ unimportant	All other parameters
Filter	Aus / OFF	Filter

The analog input displays now 1000 if the contact is open and 0 if it is closed. Depending on when the alarm should come the monitoring is set to overrun or underrun and the requested alarm class and delay time is entered.

The shortest possible time until the GCB opens in case of a stopping alarm is 50 to 70ms. The time until a relay energizes via the *LogicsManager* is about 110ms.

Critical Mode (Sprinkler Operation)

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This *LogicsManager* flag is only active in automatic mode. There is no critical mode in manual mode, all alarms keep their alarm classes.

General

All shutdown alarms become only warning alarms during critical mode. This mode is for a fire pump that is connected to the genset (before the GCB).

Alarm classes

Class A	remains A
Class B	remains B
Class C	becomes B
Class D	becomes B
Class E	becomes B
Class F	becomes B

So a stop of the engine can only come from the settings in the *LogicsManager*, e.g. "Start fail" as a protection of the starter and DI1 emergency stop. These are default settings and can be changed if necessary.

The number of start attempts is fixed to 10, in V1.0100 it is selectable

The engine provides a normal cooldown phase if the *LogicsManager* flag "critical mode" becomes FALSE. All existing alarms get their original alarm classes and might stop the engine now!

Stop Engine During Critical Mode Manually

Switch to MANUAL mode: Press the start/stop button. All alarms return to their original alarm classes.

Switch to STOP mode: Press the STOP button once and the engine will stop with a cooldown. Press the STOP button twice and it will stop the engine immediately without a cooldown. All alarms return to their original alarm classes.

Critical Mode and Emergency Power Simultaneously {2oc}

The emergency power operation has priority. If a mains failure occurs during critical mode, the generator will supply the busbar. Therefore the MCB will be opened and the GCB will be closed. A message "Emerg/Critical" or "Notstrom/Sprinkler" (German) is displayed. All shutdown alarms become warning alarms.

Critical mode ends before mains recovery: The emergency power operation will be continued and all shutdown alarms will become active again. If the mains return, the unit transfers the load after the mains settling time from generator supply back to mains supply.

Emergency power operation ends before the end of the critical mode: The critical mode is maintained and after the expiration of the mains settling time the load is transferred from generator supply to mains supply. The engine remains running until the conditions for the critical mode become FALSE.

Critical Mode and Start Request

The critical mode operation has priority. If there is a critical mode request while the generator is running, the GCB will open (in application mode {2oc} the mains will take over the load). A message "Critical mode" or "Sprinklerbetrieb" (German) is displayed. All shutdown alarms become warning alarms.

Critical mode ends before the start request: The engine keeps running, in {2oc} there will be a change from mains to generator supply. All shutdown alarms will become active again. After resetting the start request the GCB will open and the engine will shutdown after a cooldown.
Start request is terminated before critical mode: The critical operation is continued. The engine keeps running until the conditions for critical mode are FALSE. The engine will shutdown after a cooldown.

Configure Critical Mode

All default settings are suggestions. They can be changed depending on the requirements.

Two parameters have to be changed to activate a critical mode with the default settings:
Remove the "0" for flag 3 in "critical mode" (configure engine->start/stop -> critical mode V1.0017, or in configure application->critical mode V1.0100). Then it should look like Figure 3-8.
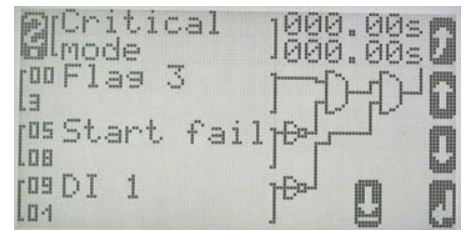
Figure 3-8

2. Remove the "0" for DI5 in flag 3 (configure logic manager->Flag 3 V1.0017; configure logic manager->internal flags->Flag 3 V1.0100) change the alarm class for DI5 (or any other DI that is configured here) to control. Flag 3 has a default OFF-delay time of 600s, this means a postrun of 10min after the DI is "0" again. (Figure 3-9) Any other requested time could be entered here.
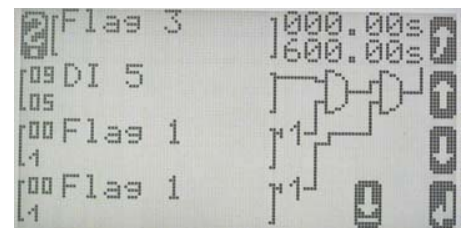
Figure 3-9

The parameter Flag 1 [1] is the default value, in this case there is no need to change it.

Stop of Critical Mode

The default settings interrupt a critical mode when an alarm start fail occurs (protection of the starter) or DI1 becomes active (see Figure 4-14). DI1 is preconfigured as "Emergency stop". If another input is used for this it has to be entered here. A hard wired shutdown is also required. If nothing may stop the critical mode, a "1" has to be entered on position 2 and 3.

If more shutdown inputs are required e.g. overfrequency (gen. Voltage) or overspeed (pickup) an additional free available flag is required (here 4). Replace one of the stop conditions with flag 4 (Figure 3-10) and enter all required shutdown conditions in this flag 4 (Figure 3-11).
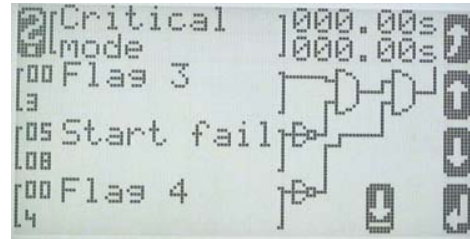
Figure 3-10
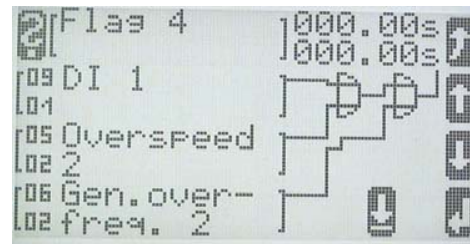
Figure 3-11

NOTE

Differences to other software versions: In {1oc} the GCB will always close if critical mode is active.

Load Shedding

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The device has internal load limits for the generator and the mains. A load shed via the generator power is set like below:

Configure *LogicsManager*

Gen. load limit 1 or 2   = enter requested load limit, the value relates to the generator rated active power, default 80/90%

Gen. load hysteresis   = default is 5%, set depending on the load that is disconnected

The parameters 03.09 Gen load limit 1 and 03.10 Gen load limit 2 are used to energize a relay, here relay 1. An ON-delay of 10s is set in this example. (Figure 3-12).
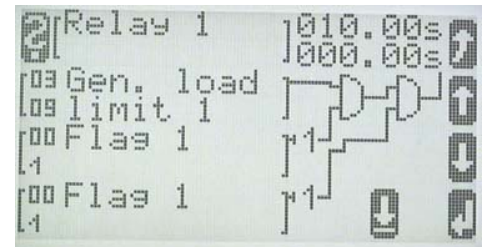
Figure 3-12

With this setting the relay 1 closes if the generator active load reaches limit 1 (80%) for 10s. This relay could disconnect all load that is not needed urgently. It opens if the generator active load goes below 75% again. The parameter Flag 1 [1] is the default value, in this case there is no need to change it.

Emergency Mode

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When the mains return after a mains failure and the DI release MCB is switched OFF the GCB will stay closed as long as the mains settling time is active. After that the GCB will open and the generator will shutdown. To prevent a dead busbar the unit needs a signal for **"start in AUTO"**.

Unable To Close GCB In 1-CB Mode

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The message in the display reads "GCB dead bus cls" but the relay is not energized. All voltages are in range, there is no stopping alarm (class C, D, E or F).

-> The relay 8 terminal 40/41 (close MCB in a 2-CB application) has to be open in this time. As long as this relay is energized, the GCB close relay will stay open!

Solution:
Use relay 8 only for functions that are not active at this time

Chapter 4.
Application Notes Starting Firmware V1.0100

NOTE

This version requires LeoPC1 V 3.1.000 or higher! Older versions don't display the *LogicsManager* correctly.

Test Mode: How To Set Up a Test with or without Load

===========================

There are a lot of different opinions of the behavior of a proper test mode. The easYgen-1500 can support the following two modes: **Test with load** and **test without load.** Both modes work only in automatic mode. The correct test mode depends on your local specifications.

Test With Load

This is the **start in auto**matic mode in the block "Configure application". No special message appears on the display. If the mains fail during start in auto the unit keeps running until the mains return and the mains settling time is expired or the conditions for "Start in auto" are FALSE again. It depends on which is longer active.

Test Without Load

A special logic manager flag was created in the block "Configure application" called "**Start without load**". If the conditions for this logic manager flag are true the engine will provide an automatic starting sequence and keep the generator running until this flag is FALSE again. Then the unit will perform an automatic stop sequence and remain stand by in auto mode. No special message will occur during the test without load. If the mains fails during test without load and the emergency mode is switched ON the unit will take over the load.
It will open the mains CB and close the Generator CB. When the mains comes back it will open the GCB after the mains settling time and reclose the MCB. The engine will keep running until the conditions for Start without load are false again.

Example for test without load: The engine shall start once a month and run for one hour without overtaking the load. The test day shall be every fifteenth of a month (with flag 2, see also chapter Start in Auto Via Clock Daily/Weekly/Monthly on page 10). A relay output can be configured that this test is running, e.g. for a signal lamp (no figure).

Settings for the timer (Configure logic manager –> set timers)
Active day: 15
Active hour: e.g. 10

Flag for start via clock, here 2 (no default) (Figure 4-1)
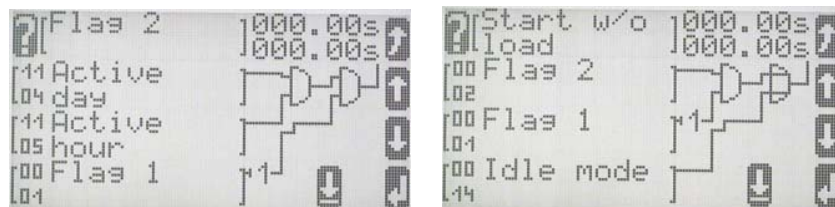

Figure 4-1

Note: The default settings will cause a "start w / o load" (LM flag) if idle mode is active. This is to make sure that the GCB won't close or will open as soon as idle is selected. This is only for automatic mode! If the breaker is already closed in manual mode when idle is selected it will stay closed!
The parameter Flag 1 [1] is the default value and it is blocked by [1].

Display the Analog Input Value in °F and psi

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The freely programmable tables for the analog inputs are preconfigured for two VDO sensors. The table A is used for pressure VDO 0 to 145psi (0 to 10bar), table B for temperature VDO 104 to 120°F (40 to 120°C). The values in the table are with one digit after the comma, e.g. the value 512 in table A means 51.2 psi.

The following parameters have to be changed:

Analog input 1 or 2:	Type:	Table A or Table B
	Select hardware:	0 to 500 Ohm
	Offset:	usually 0 Ohms except for contact resistance, then enter the value in Ohms
	Description:	Name, e.g. oil pressure
	Value format:	**000.0psi or 000.0 °F** in some versions of LeoPC1 the degree symbol is not supported
	Limits:	table A: for 26.0psi enter 260
		table B: for 190.0°F enter 1900,
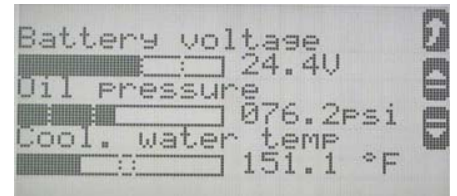
Figure 4-2

Table A - Pressure, Probe Type "IV"
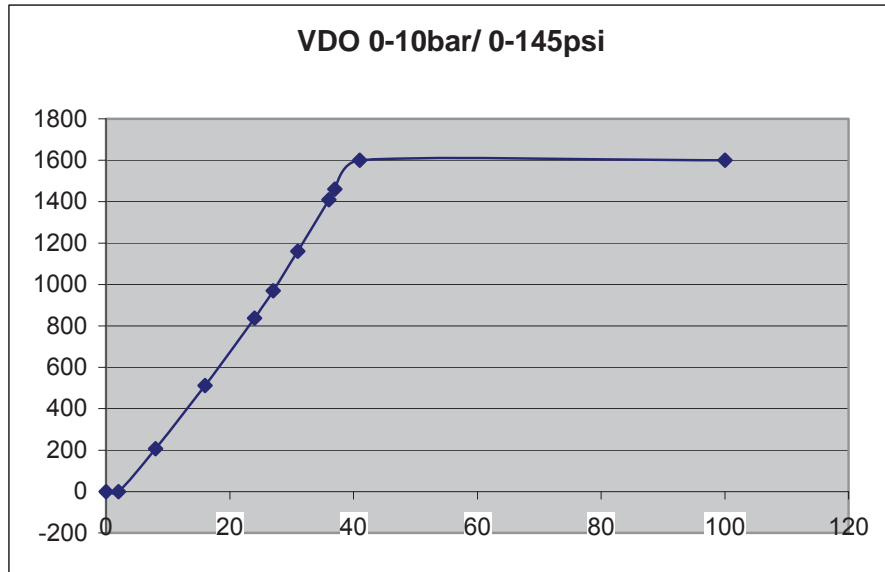
Figure 4-3

	X- Value	Y-Value	Resistance
	0	0	0 Ohm
1. Point	2	0	10
2. Point	8	207	40
3. Point	16	512	80
4. Point	24	838	120
5. Point	27	970	135
6. Point	31	1160	155
7. Point	36	1409	180
8. Point	37	1461	185
9. Point	41	1600	205
	100	1600	500 Ohm

Table 4-4
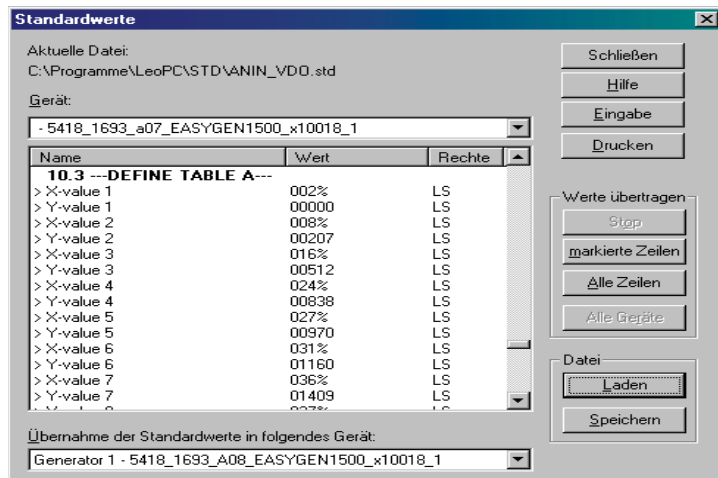
Figure 4-5

Table B - Temperature, VDO Probe "92-027-004"

VDO 40-120°C/ 104-248°F
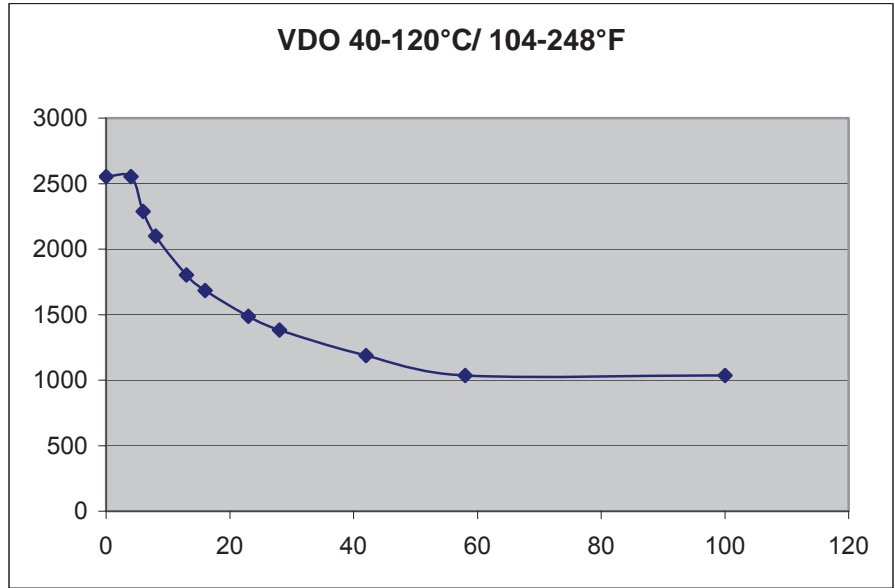
Figure 4-6

	X- Value	Y-Value	Resistance
	0	2553	0 Ohm
1. Point	4	2553	20
2. Point	6	2288	30
3. Point	8	2100	40
4. Point	13	1802	65
5. Point	16	1685	80
6. Point	23	1488	115
7. Point	28	1382	140
8. Point	42	1188	210
9. Point	58	1035	290
	100	1035	500 Ohm

Table 4-7

Emergency Mode Ends and the Release of the
MCB Is Switched OFF (Meet NFPA)

When the emergency mode ends and the MCB release (terminal 6) is switched OFF the GCB will open (after mains settling time) and cooldown. To prevent a black busbar in this case and to meet the NFPA requirements the default settings for "start in auto" are set like below (Figure 4-8). Make sure that flag 7 looks like the default setting in Figure 4-9 below.

Figure 4-8

Figure 4-9

Now the flag "Start in auto" will come TRUE when the mains release is "0" (parameter 9.06) and the reply for the MCB is open (9.7) and the mains voltage and frequency is in range (2.11). The generator will keep running until the release for the MCB is "1" again. An OFF delay time longer than the "mains fail delay time" might help in case the mains fails in this condition again.

Using a Key Switch to Change Between Local and External Control:
New *LogicsManager* (LM) Flags for
Operation Mode AUTO, MAN, STOP

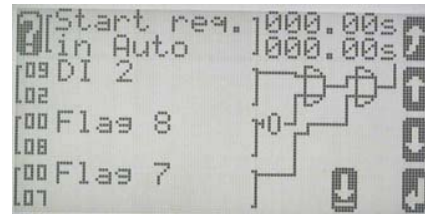The following parameters are required if a key switch shall change between external and local control.

Local control: the operation modes can be selected via the push buttons on the front. This is the normal operation.

External control: the operation modes are selected via the *LogicsManager* flags Operation mode AUTO, MAN, STOP. The buttons on the front can't change the operation mode as long as one of these is TRUE (from V2.000, they are not displayed anymore).

With a discrete input (here DI3) from a key switch, the *LogicsManager* flag Operation mode AUTO may be switched to TRUE (Figure 4-10). The operation mode is fixed to AUTO. The unit will start automatically be-cause of mains failure (emergency mode), start in auto (LM), critical mode (LM) or start without load (LM).
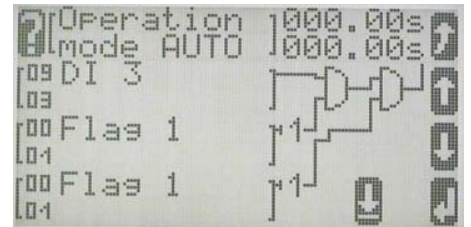

Figure 4-10

DI3 can either be alarm class "control" (no message on the display) or alarm class A with a message e.g. "Key switch ext.". Then the customer knows that he cannot change the operation mode. Disadvantage: Other messages like "emergency mode" or "start-pause" will stay in the background. A new alarm will come in front. From V2.000, the switch symbols are not displayed anymore.

New *LogicsManager* (LM) Flags:
External Acknowledge and Firing Speed

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External Acknowledge

The parameter "DI for external acknowledge" from previous versions was replaced with this LM flag. It is possible to acknowledge all alarms simultaneously from remote, e.g. with a discrete input. The conditions of the LM have to become TRUE twice. The first time is for acknowledging the horn, the second for all alarm messages. (Figure 4-11). In this example, the DI4 is used to acknowledge. The On-delay time (here 0,5s) is the minimum time the input signals have to be "1". The OFF-delay time (here 1s) is the time how long the input conditions have to be "0" before the next high signal is accepted.
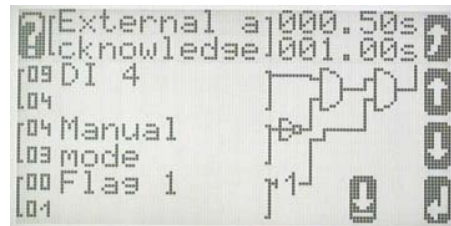
Figure 4-11

Firing Speed

The parameter "DI for firing speed" from previous versions was replaced with this LM flag. The parameter *LogicsManager* **for firing speed** YES/ NO **must be YES**. Then the software uses this LM flag for the monitoring of "Speed detection" as well. It has to be TRUE when the engine is running.

It is possible to select a limit of an analog input e.g. oil pressure or a discrete input coming from an electric generator (dynamo). (Figure 4-12) In this example limit 1 from the analog input 1 is used. Its alarm class is set to "control". If a delay time is required it could be entered either in the LM or in the level 1 of the analog input.
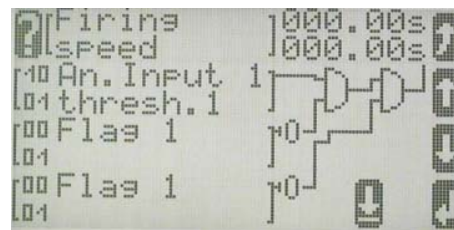
Figure 4-12

What happens if this LM flag comes true: The starter will be disengaged, the timer for delayed engine monitoring starts.
If the command variable would be disabled during operation of the genset, this will be detected and indicated by the "Speed detection" watchdog (frequency/speed mismatch). This watchdog should therefore be activated.

Duplicate Circuit Breaker Close Command for
Special Applications/Circuit Breakers (e.g. ABB)

=========================

For some applications, a CB close command coming from two independent relays is required. The internal *LogicsManager* provides this functionality. Every relay (1-11) can be used as an input signal for another relay. It is active whenever the first relay is energized. The internal time delay between the original and the second relay is about 10ms.

Example:

A second relay (here 5) is energized 100ms later than GCB close command (relay 10). The *LogicsManager* for relay 5 is set up like below (Figure 4-13)

NOTE
Make sure that the GCB close command is longer than 100ms.

Figure 4-13

Idle/Rated Speed

=========================

Some speed controllers have the possibility to run with an idle speed as a warm up function. To prevent the easYgen-1500 from trip with alarms like under voltage and under frequency the unit has to know that the engine runs in idle.

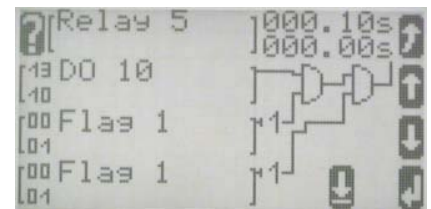In the block configure monitoring is a new *LogicsManager* parameter called "Idle mode". It will **block** all **undervoltage**, **underfrequency** and **underspeed** alarms when its input conditions are TRUE. As soon as it is FALSE again all of these alarms will be monitored again.

In the following example, a discrete input is configured for idle speed (here 3) (Figure 4-14). Its alarm class can be either A (message in display and event logger) or control (no message). The timer OFF-delay (here 5s) is the time that the speed governor needs to get back to nominal speed. A relay (here 2) is energized as an output signal going to the speed governor. (Figure 4-15)
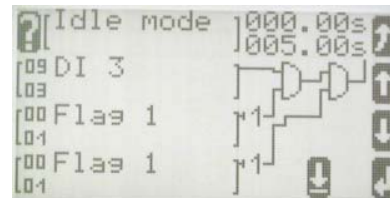
Figure 4-14
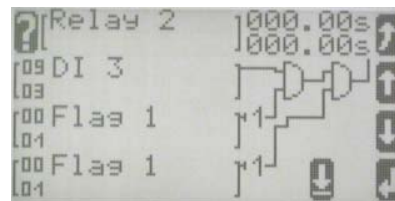
Figure 4-15

Parameters for DI3:

Name	Idle mode (if a message is requested) or **default**
Alarm class	A (if a message is requested) or **control**
Self ackn.	Yes (if a message is requested)

DI3 can be either alarm class "control" (no message on the display) or alarm class A with a message e.g. "Key switch ext.". Then the customer knows he cannot change the operation mode. Disadvantage: Other messages like "emergency mode" or "start-pause" will stay in the background. A new alarm will come in front.

NOTE

The default settings will cause a "start w/o load" (LM flag) if idle mode is active. This is to make sure that the GCB won't close or will open as soon as idle is selected. This is <u>only</u> for <u>automatic</u> mode! If the breaker is already closed in <u>manual</u> mode when idle is selected it will <u>stay closed</u>!

New Parameters for the Critical Mode

======================

The parameters have a new order in the easYgen: (Configure application->Critical mode)

Close GCB in Override

The water pump is connected to the busbar, the GCB will close during critical mode is active.

NOTE

If the LM "start w/o load" is active at the same time, the GCB will stay open. Please make sure that this cannot happen.

Override alarmcl. also in MAN

Enter YES if it is requested to have no shutdown alarms in manual mode also.

Break Emergency in Override

0	=	no break
xxx seconds	=	this is the time how long the unit opens the GCB if emergency is active when critical mode becomes active. In this case the complete power of the genset is available for the startup of the water pump (pump is connected before the GCB).

Start Attempts in Override

The number of start attempts in the critical mode is selectable between 1 and 20. Regard the starter specifications.

Receive Data from the easYgen-1000 Via a GW4 Gateway

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It is possible to have up to 4 easYgens together with one GW4 connected to the CAN bus with different CAN device numbers and protocol type LeoPC1. Each of the easYgens needs an expanded block from the transmitting capability of the GW4.

For the Use of a GW4 with SW Version 2.0018 and Higher

Configuration and visualization:
In the GW4:   Use the Protocol Type **3** and set "Expand block 1" = **YES**
In LeoPC1:   Devices->Settings->Service configuration->ID for the first setting for remote monitoring
                  set to **50000**

For the Use of a GW4 with SW Version Below 2.0018

Configuration:
In the GW4:   Use the Protocol Type **2** and say "Expand block 1" = **YES**
In LeoPC1:   Devices->Settings->Service Configuration->ID for the first setting for remote monitoring
                  set to **50000**

You'll find a detailed example about this under Connecting a GW 4 (GW 4 starting V2.0018) on page 46.

Visualization:
In the GW4:   Use the Protocol type **2** and say "Expand block 1" = **YES**
In LeoPC1:   Devices->Settings->Service configuration->ID for the first setting for remote monitoring
                  set to **"0"**

NOTE

Not all J1939 visualization data is transmitted by the GW4. Further information about this can be found in manual 37133.

Problems with LeoPC1 During Read and Write of the Parameters

=============================

NOTE

LeoPC1 V3.1.xxx or higher must be installed to read and write the parameters for the *LogicsManager* **correctly.**

With some computers a crash may occur during reading/writing of parameters with LeoPC1. If this happens change the following settings:

In LeoPC1 (English):
Devices-> Settings-> (Data communication) Settings-> Options ->
Timeout after writing a command, change to **100,** this could also be another value (except 0), depending on the computer´s capacity

LeoPC1 (Deutsch):
Geräte-> Einstellungen-> (Datenkommunikation) Einstellungen-> Optionen->
Timeout nach dem Schreiben eines Befehls auf **100** setzen.
Der Wert kann je nach PC-Leistung auch geringer oder höher eingestellt werden.

Connect 100V or 400V Measuring Inputs

=============================

Depending on the parameter voltage transformer **secondary** the corresponding voltage measuring input terminals have to be connected like this (each for generator and mains):

     From 50 to 130V: use 100V inputs

     From 131 to 480V: use 400V inputs

Otherwise the reading of the voltage is incorrect.

Using the easYgen-1500 Only for Start/Stop (No Voltage Connected)

==

It is possible to use only the start/stop sequence of this unit e.g. for a single motor. The engines' voltage and current will not be connected to the easYgen. In this case the unit will monitor the speed via pickup and engine signals like discrete and analog inputs. It can not operate a circuit breaker. It will still display the screens for the generator voltage and current but the ones for the mains can be switched off. The turning arrow in the generator symbol in the base screen displays a running engine. It is also possible to display the ECU data via CAN bus if connected. As there is no "GCB open" signal it might be necessary to configure a relay which energizes when a stopping alarm (parameter 1.09) occurs to open a breaker.

In this application you will only use the monitoring of start/stop, pickup, 2 analog inputs and 8 discrete inputs.

Configure application:

The number is the same like in the LeoPC1 software.

2.	Application mode:	None	(no circuit breaker available)
2.	Show mains data :	No	(mains measuring screen will disappear)

Switch OFF the following monitoring:

The number is the same like in the LeoPC1 software.

6.1.3	Generator under frequency level 1	= OFF
6.1.4	Generator under frequency level 2	= OFF
6.1.7	Generator under voltage level 1	= OFF
6.1.8	Generator under voltage level 2	= OFF
6.4.5	Engine speed detection (f/n mismatch)	= OFF

Stop cranking and start the timer for the delayed engine monitoring:

The easYgen will stop cranking during startup when the pickup speed is over the firing speed limit. The level of an analog input (oil pressure) or a discrete input (oil pressure switch, signal from electrical generator - dynamo) can also stop cranking. In this case the *LogicsManager* flag "Firing speed" is used. The alarm class of this input is configured to "control". If a delay time is required it could be entered either in the LM or in the settings of this signal. The parameter *LogicsManager* **for firing speed** YES/ NO **must be YES**. Then the software uses this LM flag to stop cranking and the timer for the delayed engine monitoring starts.

⚠️ **CAUTION**

There is no monitoring if the input condition of the *LogicsManager* fails while the engine is running!

Usually there is the engine speed detection (f/n mismatch) which takes care of this problem but this is not possible in this special application. If you want to use the *LogicsManager* you have to configure an extra monitoring limit for this "firing speed reached" signal.

Solution: A discrete input must be bridged to a second discrete input.
                 An analog input needs the second level for the monitoring.
Configure the second input and the second level to "delayed by engine speed" =YES. Verify that the monitoring is for the right state (NO/NC or over-/underrun) and configure the respective alarm class.

LogicsManager: **Create self-toggling (pulsing) relays**

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There are a lot of different functions possible with the *LogicsManager*. This is a simple example of a relay output that toggles from energized to de-energized in automatic mode with adjustable on and off time. Relay 1 is the discrete output (DO1) and flag 5 is used as an auxiliary flag. Relay 1 will be ON (energized) for 2 seconds and then OFF (de-energized) for 2 seconds as long as the easYgen is in automatic mode.
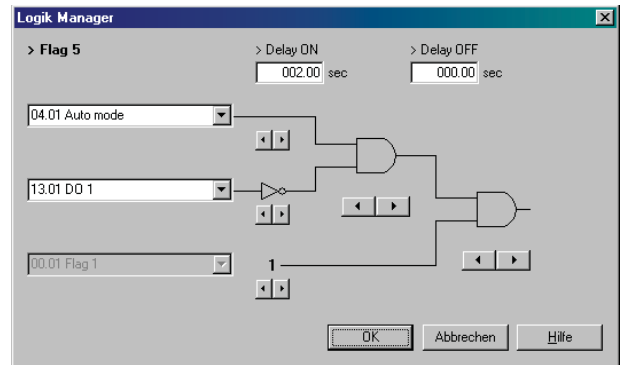
In this example is the Delay ON time in the *LogicsManager* of Flag 5 indicates how long the pause is. The Delay OFF time of relay 1 is the pulse duration.
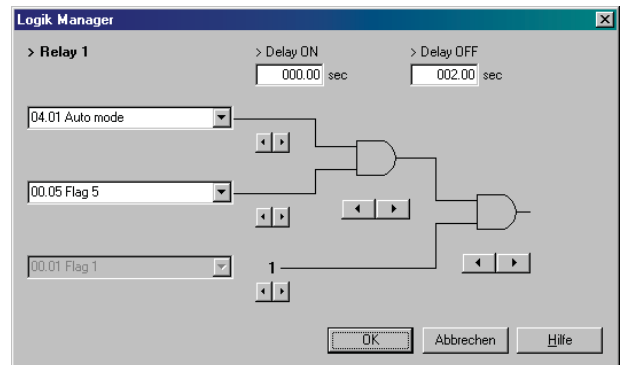
Chapter 5.
Application Notes Starting Firmware V1.0200

Connecting an ECU with J1939 Protocol

From this version on and higher the easYgen can support the J1939 protocol including some special data from ECUs like the Scania S6 and the Deutz EMR. It is possible to have the ECU parallel to an external extension board - IKD or Phoenix - or parallel to the LeoPC1 via a CAN board or a GW4 as long as the baud rate is the same (the GW4 requires 125 kBaud, where an ECU usually requires 250 kBaud).

It is possible to use si-multaneously:	Protocol	ECU	Protocol	Device
Either	J1939	S6 Scania, EMR Deutz, or…	CAN-Open	IKD, or Phoenix or PLC
or	J1939	S6 Scania, EMR Deutz, or…	LeoPC1	GW4, or direct via CAN interface in PC/ PLC

⚠️ **CAUTION**

All devices on the same CAN bus need the same baud rate. The easYgen can handle different protocols on the same bus, see table above.

ⓘ **NOTE**

Not all J1939 visualization data is transmitted by the GW4. Further information about this can be found in manual 37133.

Parameter setting in the easYgen for the ECU

Set up comm. Interfaces -> Set up CAN interfaces -> **12.1.1** J1939 interface ->

Device type	**= Standard, S6 Scania or EMR (Deutz)**
Request send address	= 003 (default)
Receive device number	= 000 (default)
Reset prev. active DTCs – DM3	= No (default)
SPN version	= Version 1 (default)

The easYgen will display the values from the ECU in the base screen and in the visualization screen via DPC (Modem) or CAN bus. Messages which are not available in the ECU will disappear in the easYgen. In the visualization screen there will be a "missing".

The parameter delay time of the interface monitoring is also the time how long a message is displayed when the bus is disconnected.

For more details see also the interface manual (37393).

You'll find a detailed example about this under Connecting External Components on page 43.

Connecting a Charging Alternator (D+)

It is possible to create a relay output for a charging alternator connection. Use one free relay and configure it to the parameter "03.02 Starter". We recommend to have **no** time delays in the *LogicsManager* for the signal of the charging alternator. Connect the "battery plus" to one side of the relay contact and "D+" to the other side together with a current limiting resistor.

Dimension of the current limiting resistor:

For 12V applications	105 to 120 Ohm, 6 Watt
For 24V applications	210 to 240 Ohm, 6 Watt
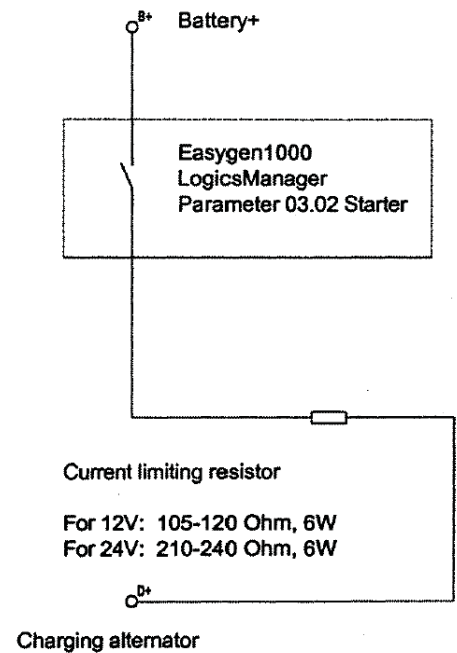
NOTE

The easYgen is NOT able to measure the voltage of the auxiliary alternator at the relay output.

Connecting a GSM Modem

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| easYgen 1500 RJ45 socket edgewise | Configuration wire with galvanic isolation (black box) DPC-1 P/N 5417-557 | e.g. INSYS GSM Modem | Laptop with modem with Windows operation system 9x, NT, ME, 2000, XP LeoPC configuration and visualization |

Function

It is possible to establish a cellular connection to the system using a GSM modem. This application is intended for mobile use.

It is also interesting to trigger a call in case of an alarm with this application. The GSM modem provides a discrete input for this, which can trigger e.g. a short message (SMS) (depending on the network provider, it can also be possible to send a fax message).

Different actions can be performed 'online' using the application software LeoPC1, which is delivered on the CD-ROM with the product. These actions include:

- Configuration
- Visualization with data logging
- Remote control (start and stop via parameter "start in auto"; from V2.000 via remote control button "F")
- Transfer standard values to and from the harddrive

Preconditions for this Example

- easYgen-1000
- DPC-1 interface set (DPC-1 P/N 5417-557)
- Wireless modem INSYS GSM 4.0 with antenna (www.insys-tec.de)
- SIM card with data transfer enabled (to be enabled by the GSM provider)
- PC or notebook with Windows OS 9x, NT, ME, 2000, XP with external analog modem
- Application software LeoPC1 version 3.1 or higher
- Configuration files available (*.cfg, *.asm, *.opt, ...)
- FAX/SMS receiver for receiving alarm messages

> **NOTE**
>
> **If a SIM card is used, which is enabled to send SMS messages, an SMS can be sent by the GSM modem. To establish a data connection, data transfer has to be enabled by the network provider.**

> **NOTE**
>
> **The INSYS GSM Modem 4.0 has two discrete inputs, which can be used to send two different alarm messages. One relay of the easYgen is required for each alarm message.**
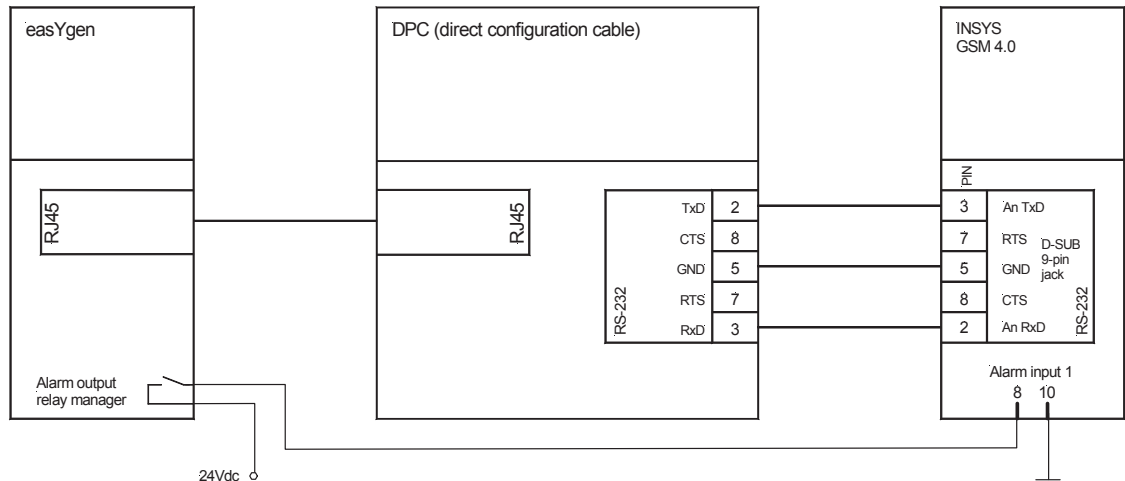
> **NOTE**
>
> **Using other GSM modems.**
>
> **The easYgen does not send AT commands to the connected modem. The dispatch of an alarm message is performed by the modem after energizing a discrete input.**
>
> **If a different modem is used, this has to accept incoming calls automatically and establish a connection between calling PC and easYgen.**

Connection

It is possible to issue an active call in case of a malfunction using a relay of the relay manager. No DPC is neces-sary for this (moreover, issuing an alarm call is not possible via DPC). But it is required to establish a remote connection with the easYgen. Connect the easYgen and the modem with the power supply as directed.

NOTE

Use the *straight* RS-232 cable delivered with the GSM modem for connecting the DPC with the modem instead of the *twisted* RS-232 cable delivered with the DPC.

When commissioning the system, use the DPC with the *twisted* cable to configure the easYgen using a PC with LeoPC1 and use the *straight* cable to configure the modem with a PC.

Settings in the easYgen

Configure the following setting in the easYgen to connect to the modem for configuration purposes (the same as in the modem):

Serial interface:	Parameter	Value
	Baudrate	9600
	Parity	No
	Stop bits	One

NOTE

If the transmission quality of the phone line is poor, the baud rate should be lowered since no data flow control is performed between easYgen and modem.
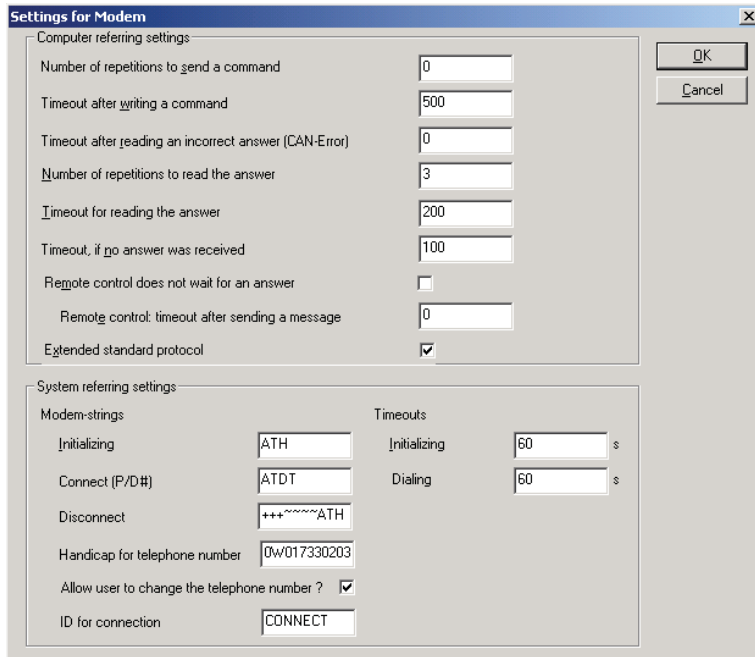
When configuring with LeoPC1, the baud rate has to be configured accordingly.

Generally, the connection via modem is a bit slower than a direct connection of PC and easYgen.

Configure the relay(s) connected with the modem using the easYgen *LogicsManager*.

Setting in LeoPC1

Install LeoPC1 according to the manual and copy the configuration files of the device to the respective folders.

In LeoPC1, select Devices -> Settings -> Driver = Modem, and click Settings in the Driver section. Select the COM port to which your modem is connected and set up the window Settings for Modem like shown on the left.

Note: If a connection is to be established using an exchange line, the following settings are recommended:
- Initialization   ATH&F0
- Establish connection   ATX1DT

If no PABX is used, the 0W can be left out.

If you select connect, the field with the phone number appears again

Settings at the GSM Modem

INSYS Microelectronics provides the application software HS-COMM to configure the GSM modem for the application. Refer to the operation manual of the modem for detailed information.

The following settings form an example for sending an alarm message as short message.

Descriptions of the individual parameters can be taken from the operation manual of the modem.
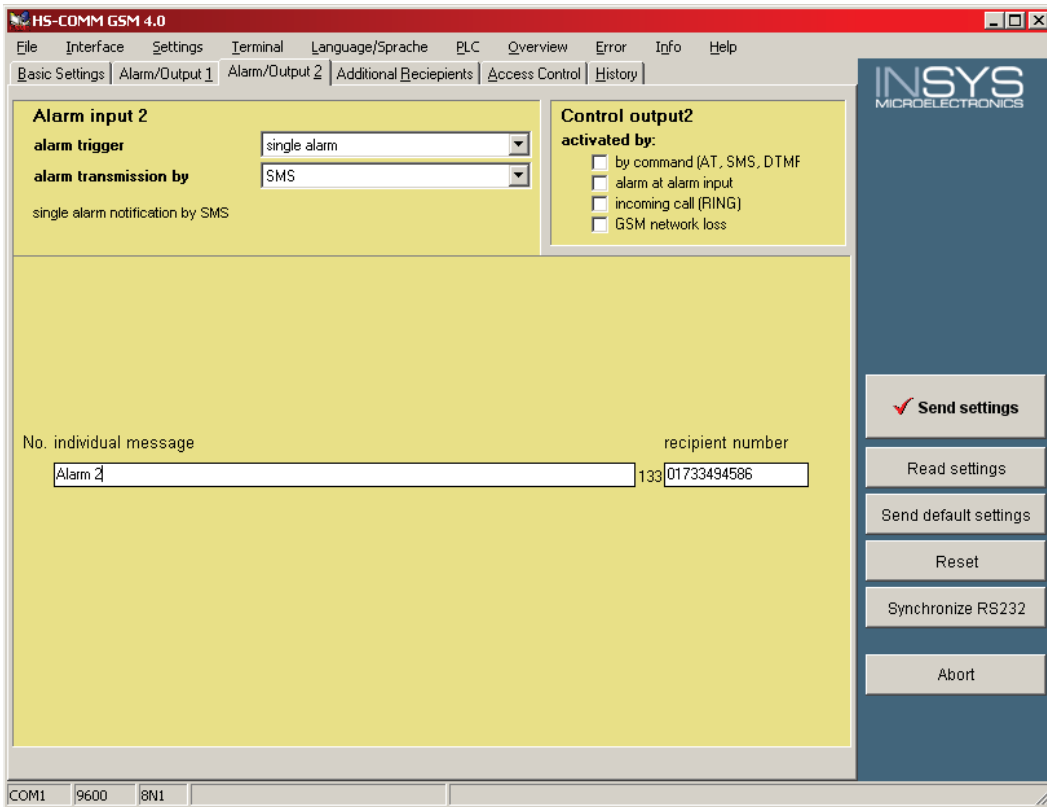
Settings using the configuration software

Make the following settings on the tab Basic Settings. These settings configure the modem to accept an incoming call for remote configuration. The phone number and the text can be set as required.
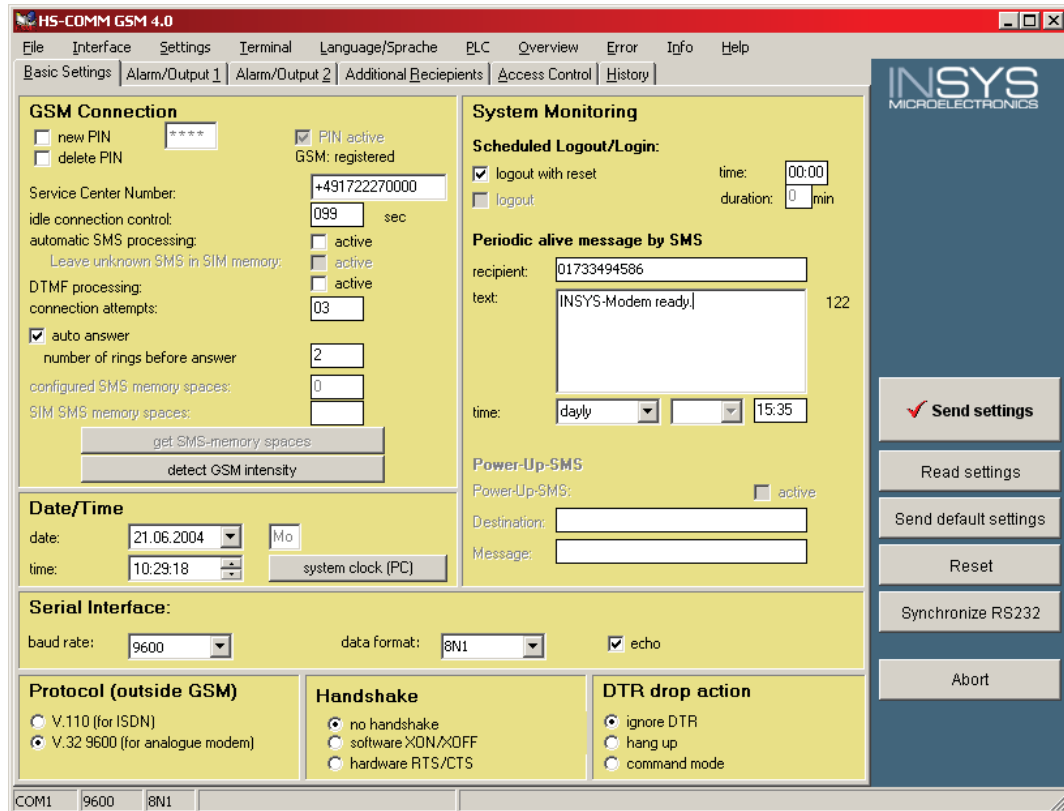
Make the following settings on the tab Alarm/Output 1. The phone number and the text can be set as required.
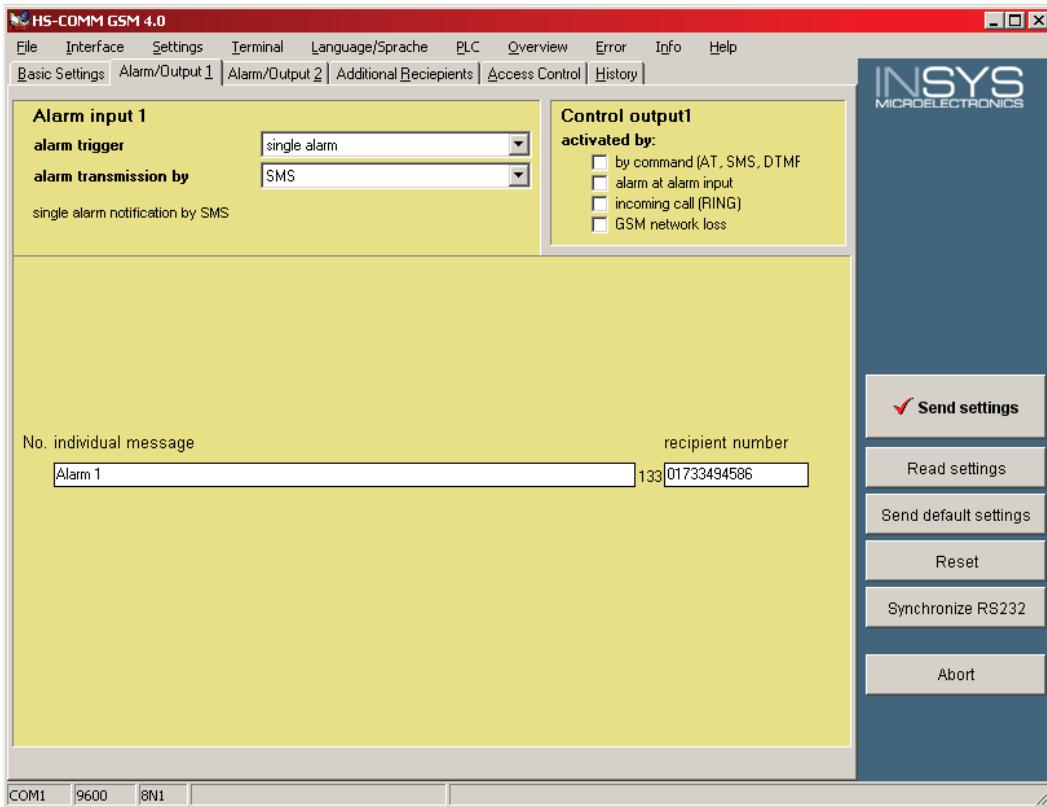
Make the following settings on the tab Alarm/Output 1. The phone number and the text can be set as required.

Connecting a Fixed-Network Modem

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easYgen 1500
RJ45 socket edgewise

Configuration wire
with galvanic isolation
(black box)
DPC-1 P/N 5417-557

e.g. Phoenix
landline Modem
with discrete input for dial up

Laptop with modem
with Windows operation
system
9x, NT, ME, 2000, XP
LeoPC
configuration and visualization

Function

It is possible to establish a phone connection to the system using a modem. This application is intended for stationary use, where a steady remote control is required.
It is also interesting to trigger a call in case of an alarm with this application. The Phoenix modem provides a discrete input for this, which can trigger e.g. a call or a fax message.

Different actions can be performed 'online' using the application software LeoPC1, which is delivered on the CD-ROM with the product. These actions include:

- Configuration
- Visualization with data logging
- Remote control (start and stop via parameter "start in auto"; from V2.000 via remote control button "F")
- Transfer standard values to and from the harddrive

Preconditions for this Example

- easYgen-1000
- DPC-1 interface set (DPC-1 P/N 5417-557)
- Phoenix PSI data/fax modem/RS232 (www.phoenixcontact.com)
- Straight RS-232 cable SUB-D9/SUB-D9 (jack/jack) like Phoenix PSM-KA-9SUB9/BB/2METER
- PC or notebook with Windows OS 9x, NT, ME, 2000, XP with external analog modem
- Application software LeoPC1 version 3.1 or higher
- Configuration files available (*.cfg, *.asm, *.opt, ...)
- FAX/SMS receiver for receiving alarm messages

NOTE
Sending an SMS via the fixed-network line may be enabled by the network provider.

NOTE
The Phoenix PSI-Data/Fax-Modem/RS232 has one discrete input, which can be used to send an alarm message. One relay of the easYgen is required for the alarm message. It is also possible to use the switch output of the modem to operate a discrete input of the easYgen, for example for a remote start.
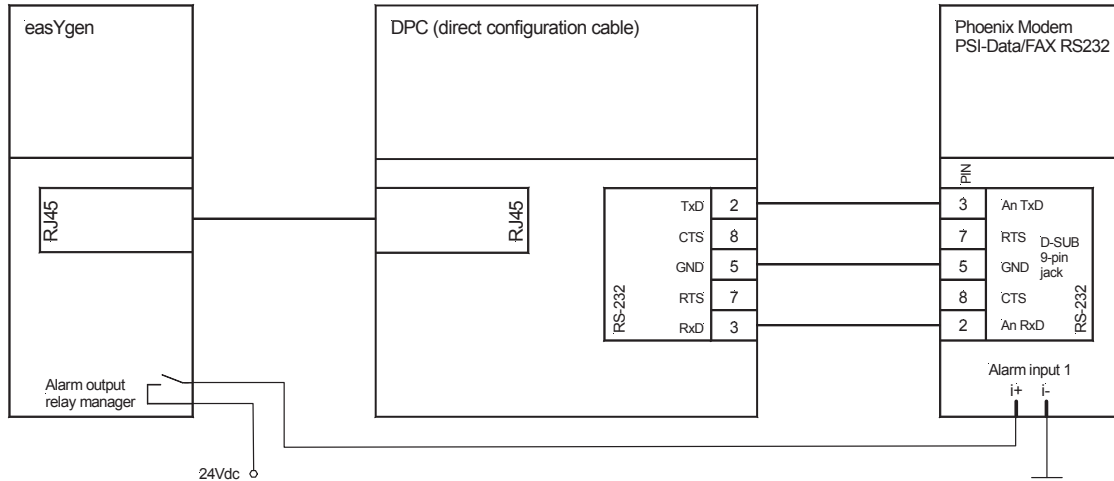
NOTE
Using other modems.

The easYgen does not send AT commands to the connected modem. The dispatch of an alarm message is performed by the modem after energizing a discrete input.

If a different modem is used, this has to accept incoming calls automatically and establish a connection between calling PC and easYgen.

Connection

It is possible to issue an active call in case of a malfunction using a relay of the relay manager. No DPC is necessary for this (moreover, issuing an alarm call is not possible via DPC). But it is required to establish a remote connection with the easYgen. Connect the easYgen and the modem with the power supply as directed.

NOTE

Use the *straight* RS-232 cable which is neither part of the modem nor the DPC and must be ordered separately for connecting the DPC with the modem instead of the *twisted* RS-232 cable delivered with the DPC.

When commissioning the system, use the DPC with the *twisted* cable to configure the easYgen using a PC with LeoPC1 and use the *straight* cable to configure the modem with a PC.

Settings in the easYgen

Configure the following setting in the easYgen to connect to the modem for configuration purposes (the same as in the modem):

Serial interface:

Parameter	Value
Baudrate	4800
Parity	No
Stop bits	One

NOTE

If the transmission quality of the phone line is poor, the baud rate should be lowered since no data flow control is performed between easYgen and modem.

When configuring with LeoPC1, the baud rate has to be configured accordingly.

Generally, the connection via modem is a bit slower than a direct connection of PC and easYgen.

The maximum baud rate depends on the used modem. The easYgen supports the following baud rates: 2400, 4800, 9600, 14400, 19200, 38400, 65000, and 11500 Bauds.

Configure the relay(s) connected with the modem using the easYgen *LogicsManager*.

Setting in LeoPC1

Install LeoPC1 according to the manual and copy the configuration files of the device to the respective folders.

In LeoPC1, select Devices -> Settings -> Driver = Modem, and click Settings in the Driver section. Select the COM port to which your modem is connected and set up the window Settings for Modem like shown on the left.

Note: If a connection is to be established using an exchange line, the following settings are recommended:
- Initialization   ATH&F0
- Establish connection   ATX1DT

If no PABX is used, the 0W can be left out.

If you select connect, the field with the phone number appears again

Settings at the Phoenix Modem

The settings refer to an example for sending an alarm message via fax.
Descriptions of the individual parameters can be taken from the operation manual of the modem.

DIP Switches

All DIP switches are set to OFF (default state).

Settings using the configuration software

Phoenix provides an application software to configure the modem for the application. Refer to the operation manual of the device for detailed information.
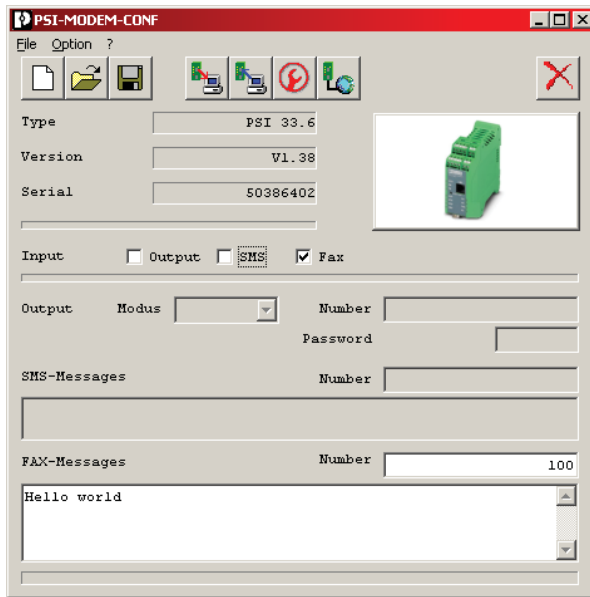The following settings form an example for sending an alarm message via fax.
Descriptions of the individual parameters can be taken from the operation manual of the modem.
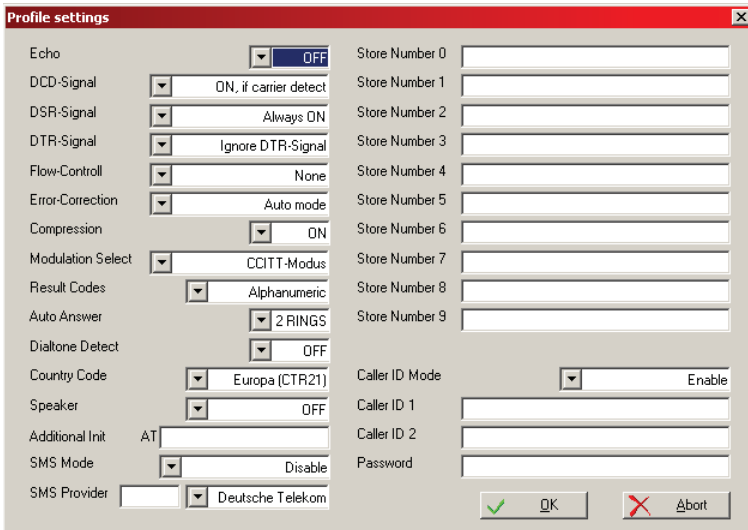
To configure the modem, proceed as follows.
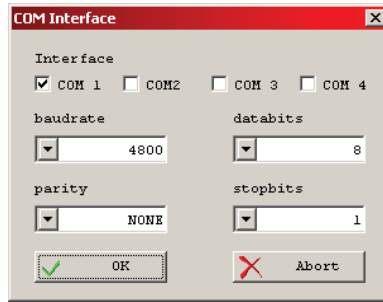
Configure the COM port

The phone number and the text can be set as required.

These settings configure the modem to accept an incoming call for remote configuration.

Chapter 6.
Connecting External Components

It is possible to connect external components (e.g. extension cards like 2x Woodward IKD or 1x Phoenix 16DI/16DO) to the CAN bus using the CANopen protocol. You will find some examples in the following. See the interface manual 37393 for details.
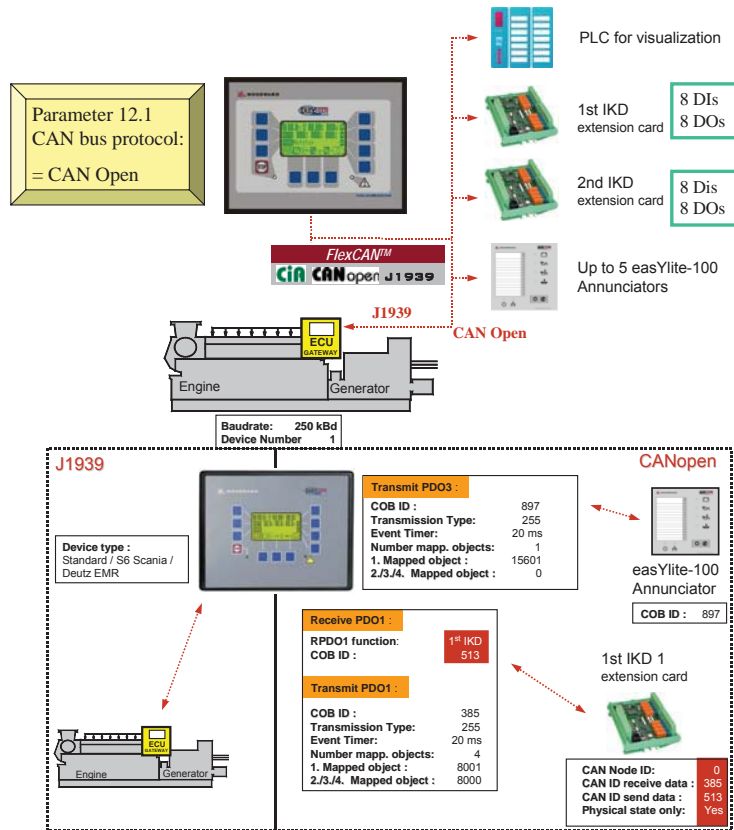
Interface Overview
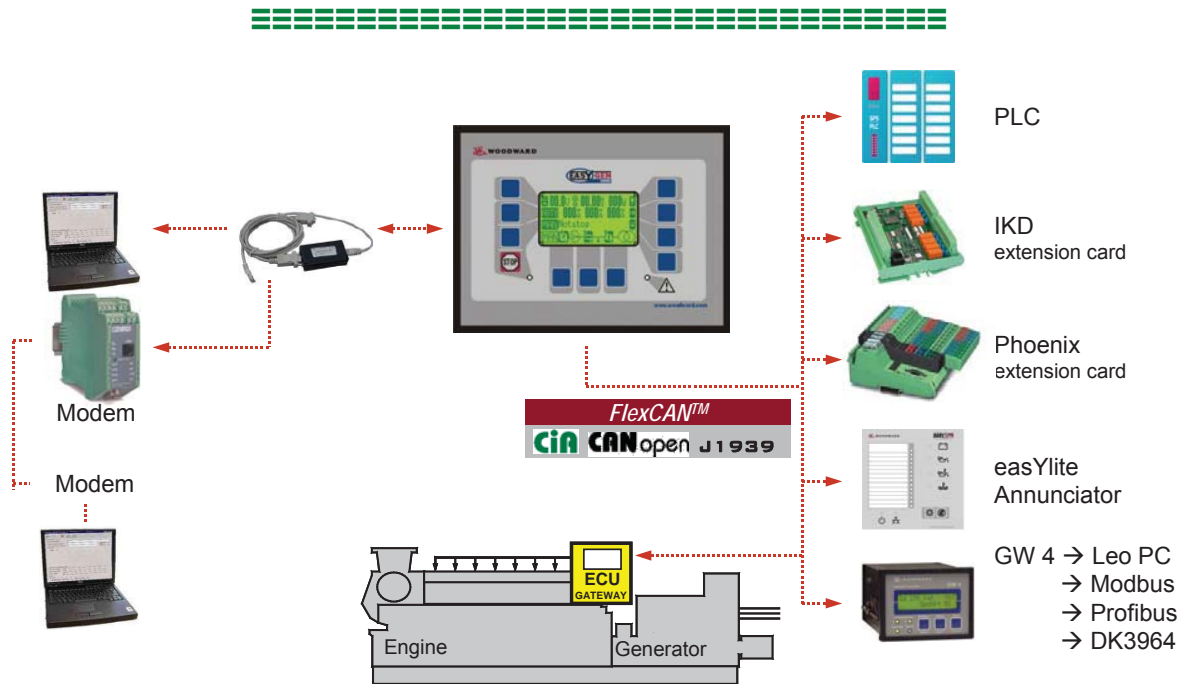
2 x IKD1, up to 5 easYlite-100 and Visualization for PLC

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The following example describes the simultaneous connection of two expansion boards IKD1, up to five remote annunciators easYlite-100 and a visualization solution for a PLC to one CAN bus.
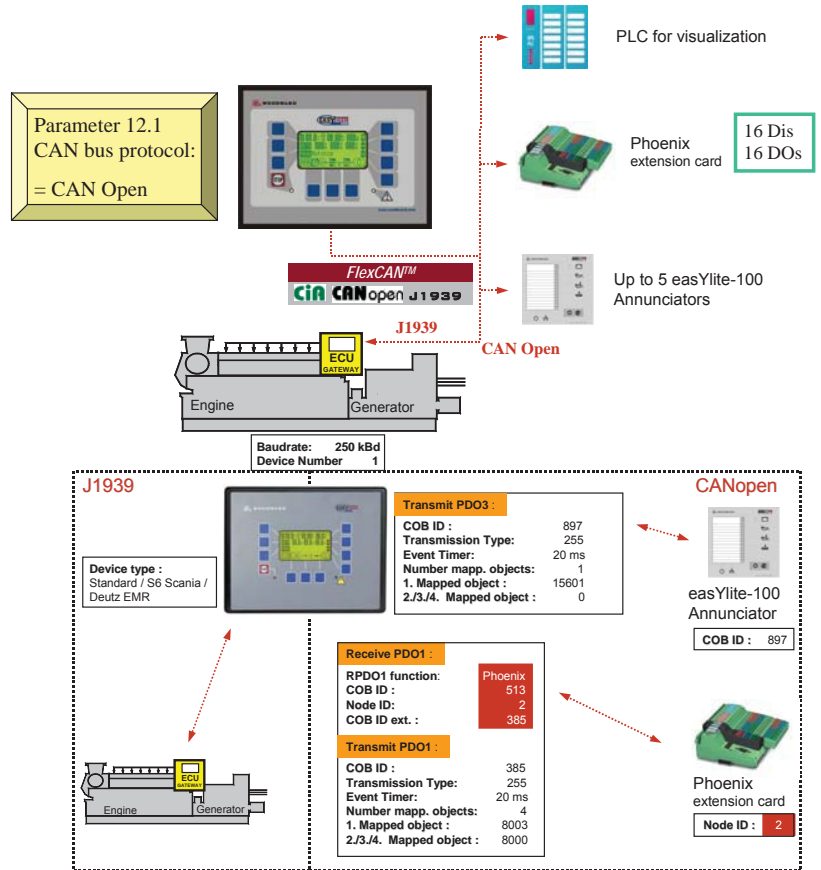

You must make the following settings (highlighted in blue) at the connected devices:

No.	Parameter easYgen-1500	Settings easYgen	Parameter 1st IKD	Settings 1st IKD
12.1	CAN interface protocol	CANopen	Baud rate	250 kBd
	CAN interface baud rate	250 kBd	CAN Node ID	00
12.1.1	CANopen master	YES	CAN ID receive data	385 (181hex)
12.1.1.1	CANopen RPDO1 function	1st IKD	CAN ID send data	513 (201hex)
12.1.1.1	RPDO1 COB ID	513 (201hex)	Send only physical state	YES
12.1.1.1	RPDO1 Node ID	2	Parameter 2nd IKD	Settings 2nd IKD
12.1.1.1	RPDO1 RPDO-COB-ID ext.1	385 (181hex)	Baudrate	250 kBd
12.1.1.2	CANopen RPDO2 function	2nd IKD	CAN Node ID	00
12.1.1.2	RPDO2 COB ID	514 (202hex)	CAN ID receive data	386 (182hex)
12.1.1.2	RPDO2 Node ID	3	CAN ID send data	514 (202hex)
12.1.1.2	RPDO2 RPDO-COB-ID ext.2	386 (182hex)	Send only physical state	YES
12.1.1.4	CANopen	TPDO1	TPDO2	TPDO3	TPDO4
12.1.1.7	COB-ID	385 (181hex)	386 (182hex)	897 (381hex)	1153 (481hex)
	Transmission type	255	255	255	255
	Event timer	20	20	20	20
	Number of mapped objects	4	4	1	1
	1st Mapped object	8001	8002	15601	3190
	2nd Mapped object	8000	8000	0	0
	3rd Mapped object	8000	8000	0	0
	4th Mapped object	8000	8000	0	0
	Note	1. IKD	2. IKD	easYlite-100	Visu for SPS
12.2	12.2 J1939 device type	Standard		or Scania S6 or Deutz EMR	

1 x Phoenix, up to 5 easYlite-100 and Visualization for PLC

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The following example describes the simultaneous connection of a Phoenix expansion board, up to five remote annunciators easYlite-100 and a visualization solution for a PLC to one CAN bus.

PLC for visualization

Parameter 12.1
CAN bus protocol:

= CAN Open

Phoenix extension card — 16 DIs 16 DOs

FlexCAN™
CiA CANopen J1939

J1939   CAN Open

Up to 5 easYlite-100 Annunciators

Engine   Generator   ECU GATEWAY

Baudrate: 250 kBd
Device Number   1

J1939

Device type :
Standard / S6 Scania / Deutz EMR

CANopen

Transmit PDO3 :
COB ID :   897
Transmission Type: 255
Event Timer: 20 ms
Number mapp. objects: 1
1. Mapped object :   15601
2./3./4. Mapped object :   0

easYlite-100 Annunciator
COB ID :   897

Receive PDO1 :
RPDO1 function: Phoenix
COB ID :   513
Node ID: 2
COB ID ext. :   385

Transmit PDO1 :
COB ID :   385
Transmission Type: 255
Event Timer: 20 ms
Number mapp. objects: 4
1. Mapped object :   8003
2./3./4. Mapped object :   8000

Phoenix extension card
Node ID :   2

Engine   Generator   ECU GATEWAY

You must make the following settings (highlighted in blue) at the connected devices:

No.	Parameter easYgen-1500	Settings easYgen	Parameter Phoenix	Settings Phoenix
12.1	CAN interface protocol	CANopen	Baud rate	250 kBd (DIP switch)
	CAN interface baud rate	250 kBd	CAN Node ID	2 (via DIP switch)
12.1.1	CANopen master	YES		
12.1.1.1	CANopen RPDO1 function	Phoenix "Co 16DIDO"		
12.1.1.1	RPDO1 COB ID	513 (201hex)		
12.1.1.1	RPDO1 Node ID	2		
12.1.1.1	RPDO1 RPDO-COB-ID ext.1	385 (181hex)		
12.1.1.2	CANopen RPDO2 function	No function		
12.1.1.2	RPDO2 COB ID	514 (202hex)		
12.1.1.2	RPDO2 Node ID	3		
12.1.1.2	RPDO2 RPDO-COB-ID ext.2	386 (182hex)		

		TPDO1	TPDO2	TPDO3	TPDO4
12.1.1.4	CANopen	TPDO1	TPDO2	TPDO3	TPDO4
12.1.1.7	COB-ID	385 (181hex)	386 (182hex)	897 (381hex)	1153 (481hex)
	Transmission type	255	0	255	255
	Event timer	20	20	20	20
	Number of mapped objects	4	4	1	1
	1st Mapped object	8003	8002	15601	3190
	2nd Mapped object	8000	8000	0	0
	3rd Mapped object	8000	8000	0	0
	4th Mapped opject	8000	8000	0	0
	Note	Phoenix	OFF	easYlite-100	Visu for SPS
12.2	12.2 J1939 device type	Standard		or Scania S6 or Deutz EMR	

Connecting a GW 4 (GW 4 starting V2.0018)

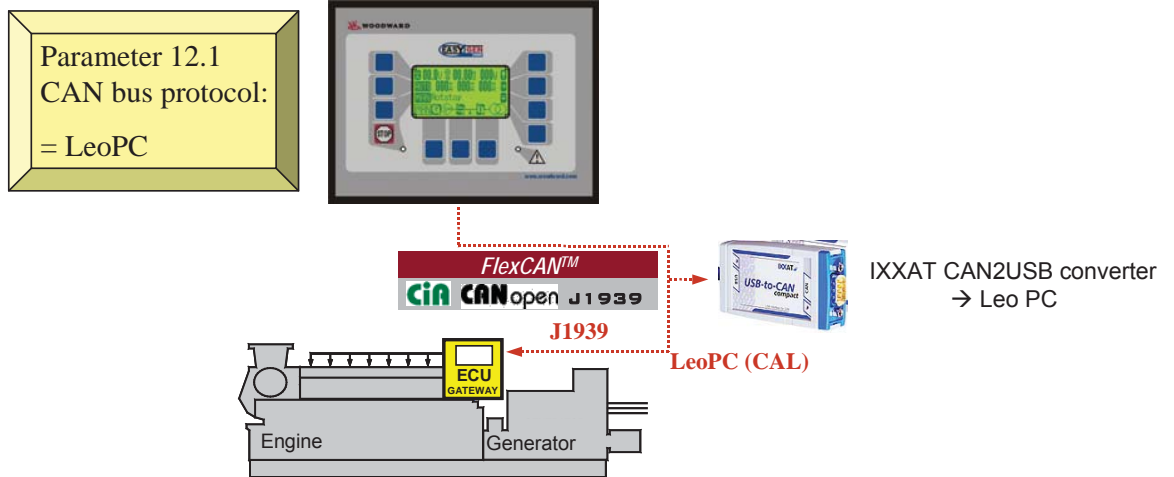The following example describes the simultaneous connection of a GW 4 Gateway to the CAN bus.
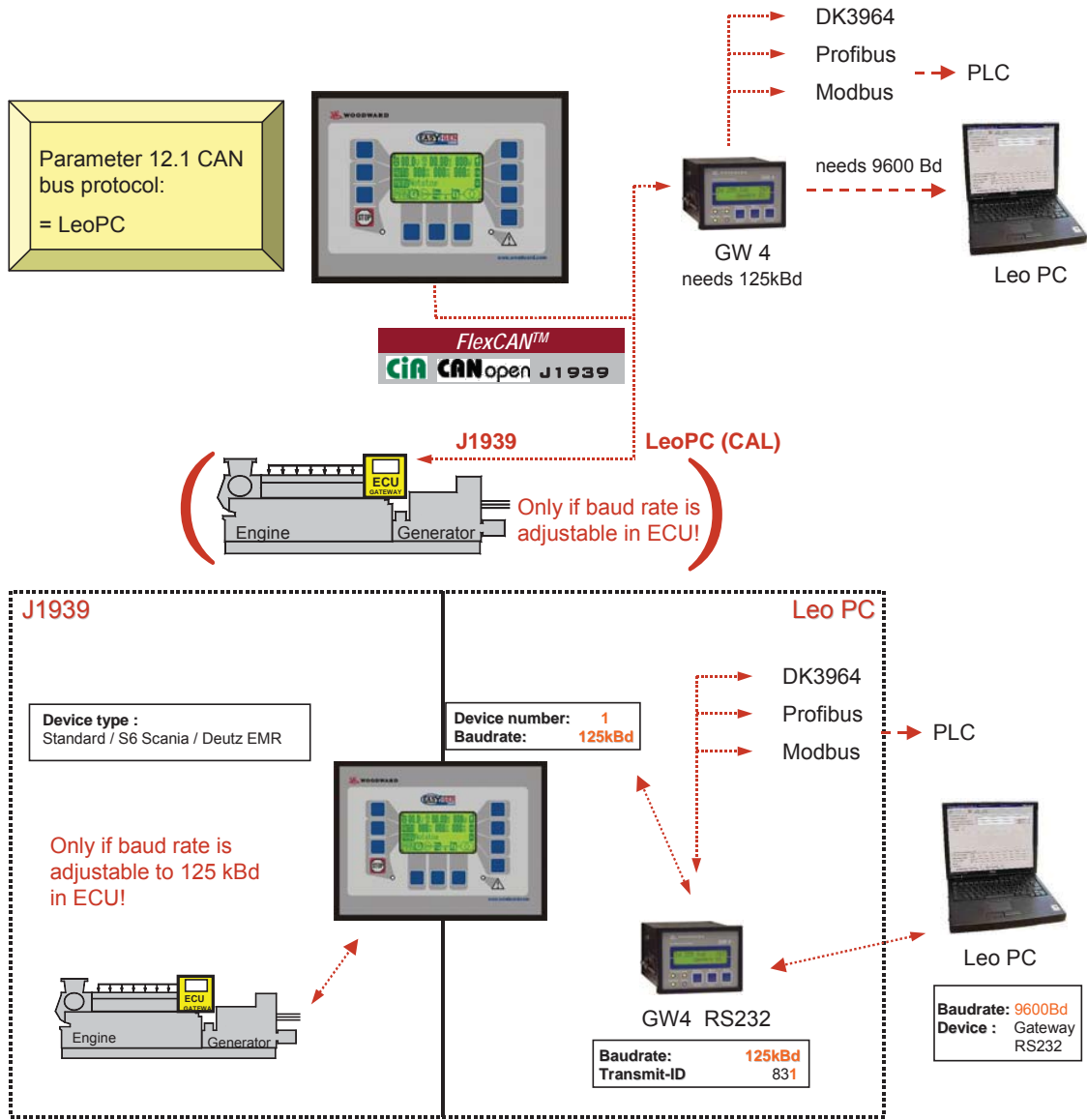
You must make the following settings (highlighted in blue) at the connected devices:

No.	Parameter easYgen-1500	Settings easYgen		Parameter GW 4	Settings GW 4
12.1	CAN interface protocol	LeoPC		Baud rate	125 kBd (fixed)
	CAN interface baud rate	125 kBd		Expand block 1	YES
12.1.1.4	CANopen	TPDO1	TPDO2	TPDO3	TPDO4
12.2	12.2 J1939 device type	Standard		or Scania S6 or Deutz EMR	

Connecting a CAN to USB Converter

The following example describes the simultaneous connection of a CAN to USB converter to the CAN bus.

You must make the following settings (highlighted in blue) at the connected devices:

No.	Parameter easYgen-1500	Settings easYgen		Parameter LeoPC1	Settings LeoPC1
12.1	CAN interface protocol	LeoPC		Baud rate	250 kBd
	CAN interface baud rate	250 kBd			
12.1.1.4	CANopen	TPDO1	TPDO2	TPDO3	TPDO4
12.2	12.2 J1939 device type	Standard		or Scania S6 or Deutz EMR	

ⓘ NOTE

The baud rate must be the same for all connected devices for all previous examples!

Chapter 7.
Application Notes Starting Firmware V2.0000

Emergency Operation with 1CB (GCB) Applications

Principally, there is no emergency power operation with a 1CB unit. Therefore, the following must be observed to start the generator in case of a mains failure if the GCB application is selected:

An internal flag, here "**Flag 3**", generates a start signal. It will be enabled by the **negated** parameter "**02.11 Mains ok**". A delay time may be configured here, e.g. **2s**. This corresponds with **"Mains fail delay time"**.

The internal timer "**Mains settling time**" does not expire because there is no AMF operation. In order to remain enabled during the "**Mains settling time**" for the signal, a "**Delay OFF**" must also be configured for "**Flag 3**", e.g. **60s**. If a short-term mains failure occurs during the "**Mains settling time**", the timer re-starts.
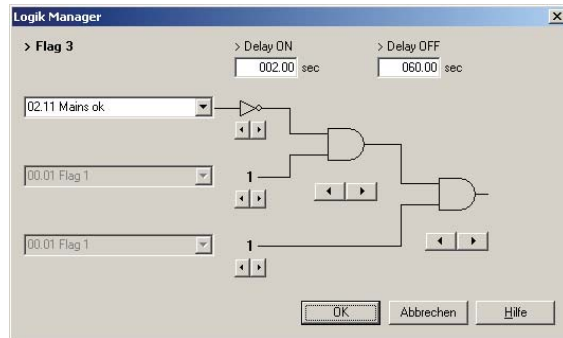
This signal may now be used to perform a "**Start req. in Auto**".
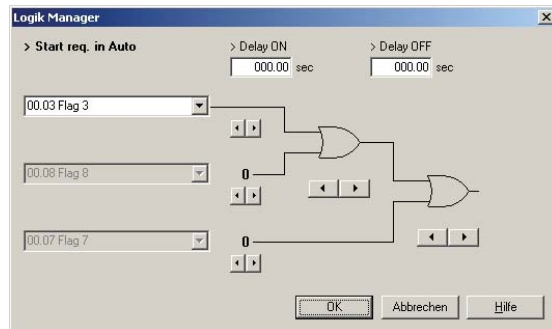
There is an **undelayed closure of the GCB** for normal emergency power operation, i.e. prior to the expiration of the engine monitoring delay. This allows an earlier supply of the plant by the generator. This may be achieved by combining the logical output "**Undelayed close GCB**" with "**Flag 3**".
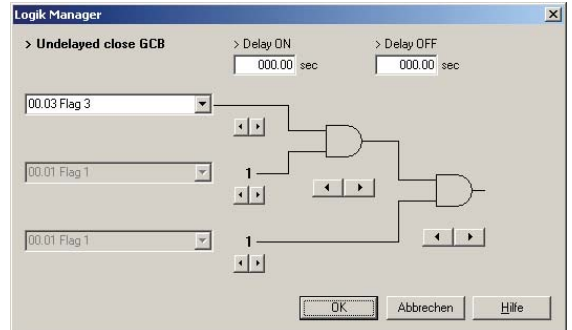
There is no **reply of the MCB**. Therefore, it may be required to configure a DI, which prevents the closure of the GCB, here DI4 (configured as Control). The blocking is performed using "**Start w/o load**". It is important here to configure a Delay OFF of at least 20ms (resulting from internal expiration times of the easYgen).
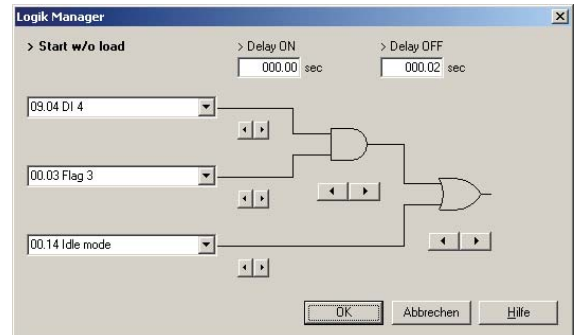
Blocking the Closure of the GCB

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Some applications require that the GCB must NOT be closed while the generator is running.

Application with 1 Circuit Breaker {1oc}

The closure of the GCB may be blocked using the logical output "**Start w/o load**" of the *LogicsManager*. This may be achieved by entering the desired condition as command variable into the logical output.

Application with 2 Circuit Breakers {2oc}

Basically, the same is valid as for 2 CBs, but the GCB will be closed despite the fact that emergency power operation is enabled. If the GCB is intended to remain opened in case of a mains failure as well, the emergency power operation must be blocked with "**Start w/o load**" as command variable in the logical output "**Inhibit emergency run**".
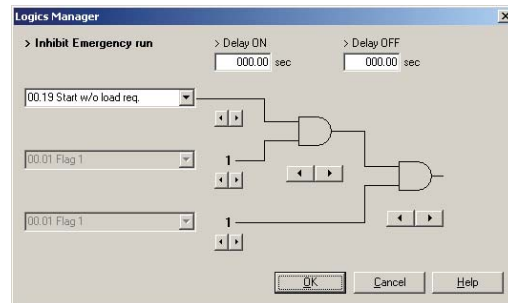
Application with no Circuit Breaker {none} or only GCB OPEN {1o}

The CB closure is performed externally, therefore no blocking.

Performing Remote Start/Stop and Acknowledgement

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Starting with software version 2.xxxx, the easYgen may be started, stopped, or acknowledged with LeoPC1 or Modbus protocol via the interface. Two new command variables are available for this in the *LogicsManager*:

04.13   Remote request
04.14   Remote acknowledge

These may be used in the corresponding logical output, for example:
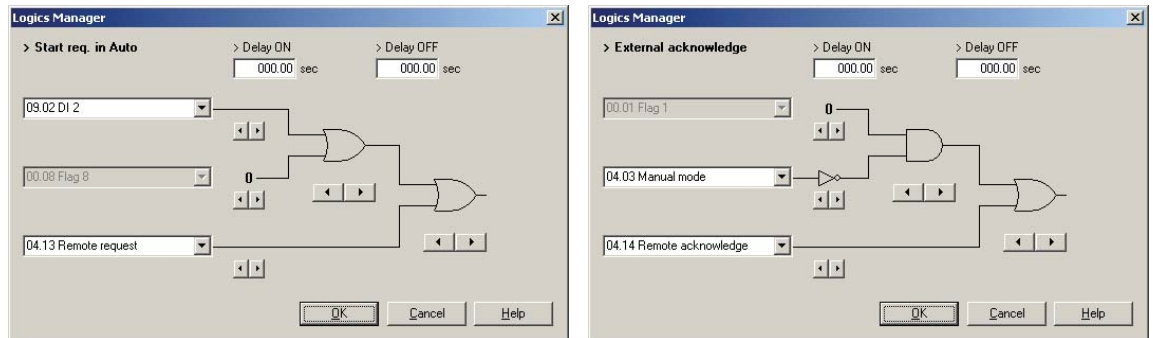
> **NOTE**
>
> **All interfaces access to the same bits. They remain enabled in the easYgen until a new command is sent or the power supply failed or is removed.**

Remote start: The command variable "04.13 Remote request" changes to "1" (high) if the start bit is enabled and changes back to "0" (low) if the stop bit is enabled.

Acknowledgement: The command variable "04.14 Remote acknowledge" is the reflection of the control bit. The easYgen deactivates the horn with the first change from "0" to "1" of the logical output "External acknowledge", and acknowledges inactive alarm messages with the second change from "0" to "1".

> **ATTENTION**
>
> **The easYgen does NOT react on the disabling of the start bit, but only on the enabling of the stop bit. This has the advantage that it is not required to maintain the connection established for the whole time in case of a remote start via a modem.**

The following figure shows the reaction of the command variable on the various changes of the bits:
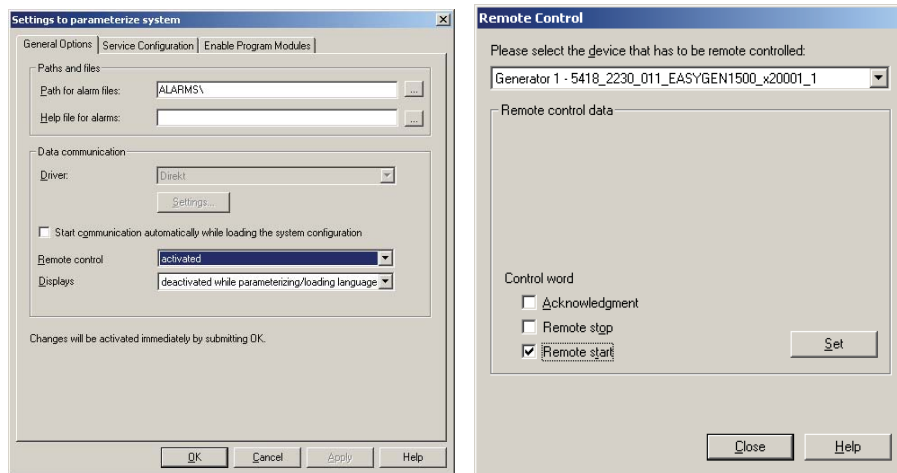
Start bit

Stop bit

Com. var. 04.13
Remote request

no reaction,
because simultanous

stops, because
higher prioritized
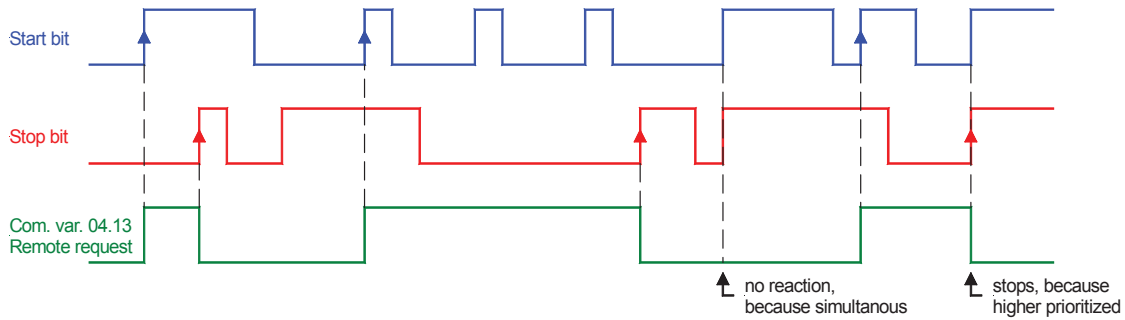
Enabling the bits may be performed with several methods:

Bit Enabling via LeoPC1 and Direct Configuration Interface

For this, the Remote Control window must be activated. Remote control may be performed with all drivers: Direct, Modem, GW4, and IXXAT CAN card

The start or stop bit may then be enabled in the **Remote Control** window (call with "F4" or "F"). The status of the start and stop bit will only be updated after pressing the "Set" button.

Remote acknowledgement: LeoPC1 resets the "Acknowledgement" bit back to "0" automatically. The check mark disappears again if no further bit has been enabled. The check mark must only be enabled again for the next change of the acknowledgement bit from "0" to "1".

Bit Enabling via Modbus Protocol and Direct Configuration Interface

The parameter ModBus Slave ID must be configured. The control bits are sent on address 503 for a start via Modbus.

Bit 0   Start
Bit 1   Stop
Bit 4   Acknowledgement

Bits 2 and 3 must be "0" (for the watchdog).

Example of the remote control message with the ModScan32 Software (ModScan32 adds always "1" to the data address):
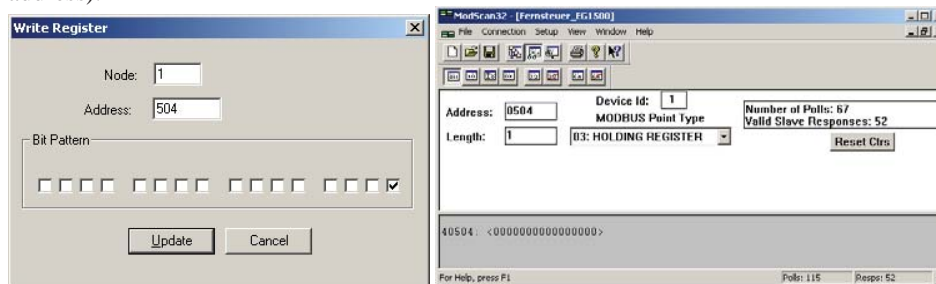
Demo software of ModScan32 is available under http://www.win-tech.com/

Bit Enabling via Can Bus Protocol and the Terminals 3 and 4

Protocol LeoPC1:   Using a GW 4 and LeoPC1 proceed as described under Bit Enabling via LeoPC1 and Direct Configuration Interface and the GW 4 operation manual 37133.

Protocol CANopen: For further information refer to the interface manual 37393 and the CANopen file *.eds, which is delivered with the unit.

Priority Hierarchy of the Logical Outputs in the *LogicsManager*

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The following table contains the priority relationships between the start conditions of the logical outputs in the *LogicsManager*:

| Prioritized function	overrides	Reaction
Critical mode	Stop req. in Auto	A start will still be performed.
	Start req. in Auto	The GCB will be opened (critical mode). If the parameter "Close GCB in override" is configured to YES, the GCB will be closed.
Critical mode + GCB CLOSE	Start w/o load	The GCB will be closed nevertheless.
Stop req. in Auto	Start req. in Auto	No start will be performed.
	Start w/o load	No start will be performed.
	Emergency power	No start will be performed.
	Idle mode	No start will be performed.
Start w/o load	Start req. in Auto	The GCB remains open / will be opened.
Emergency power	Start w/o load	The GCB will be closed nevertheless.
	Critical mode	The GCB will be closed nevertheless. The alarm class management is still performed like for the critical mode. If emergency power is already enabled and the critical mode will be enabled then, a pause time may be configured for the emergency power operation.
Inhibit emergency run	Emergency power	No start will be performed.
	Emergency power during Start w/o load	The generator keeps on running without taking over load.

Continuous Signal for Closing the MCB

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In order to control a power contactor without external relays, the MCB must be closed using a continuous signal (the MCB opens if the signal is disabled).

This may be achieved using an additional relay output (e.g. Relay 1). The configuration of the relay output required for this is described in the following.
The relay energizes, if "Command: close MCB" (13.08 DO 8) or "Reply: MCB is closed" (09.07 DI 7) is enabled, and "Command: Open MCB" (13.09 DO 9) is not enabled.
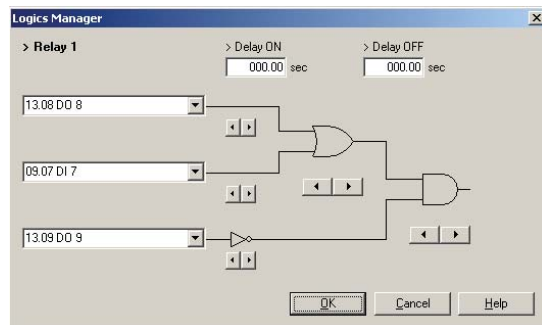
⚠ **WARNING**

This application requires to lock the MCB with external relays. Otherwise, the power supply would break down if the easYgen will be disconnected or disabled.

Using External DOs as Additional *LogicsManager* Flags

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8 internal flags are available for working with the *LogicsManager*. These flags may be used as 'auxiliary flags'. Auxiliary flags may always be used whenever the possible configuration of 3 command variables is not sufficient. In this case, you are able to configure the remaining command variables to the output of the auxiliary flag and use this as command variable (00.01 - 00.08) again.

For all applications, which require more than 8 flags, the *LogicsManager* outputs of the external discrete outputs may be used as auxiliary flags from version 2.0000 on – however, this is only possible if no external expansion boards are connected, otherwise the relays of this boards would energize accidental with activating these flags. This enables to use another 16 auxiliary flags with the command variables 14.01 - 14.16.

Additional Flexible Limits

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The analog inputs are now equipped with 4 new 'flexible limits'. These limits may be used if the existing 2 limits per analog input are not sufficient anymore, e.g. if a warning, a stopping, and an additional limit is required for control purposes (coolant heating).
In addition, they may be used to monitor the analog inputs of an ECU, which is connected via the CAN bus. Apart from that, the values on the ECU are only read out by the easYgen-1500 and no reaction will take place.

The flexible limits offer the full functionality of other monitoring functions, too. Either a shutdown or a control function may be performed, which may be configured using the alarm class. If an alarm class is selected, a freely configurable text entry will be written to the event recorder.

The flexible limits may react on the following inputs:

Analog In1	analog input 1, directly connected with the unit, terminals 13 / 12
Analog In2	analog input 2, directly connected with the unit, terminals 11 / 12
ECU SPN 110	coolant temperature from the ECU, via CAN, terminals 3 / 4 connected
ECU SPN 100	oil pressure from the ECU, via CAN, terminals 3 / 4 connected
ECU SPN 190	speed from the ECU, via CAN, terminals 3 / 4 connected

The alarm class and the associated text may also be configured. The setting ranges are described in detail in the configuration manual 37391 under Analog Inputs: Configure Flexible Thresholds.

Repeater Function

▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄

Some applications require that only one out of two available gensets is supplying the load; both generators are intended to alternate daily or, in case a stopping alarm is present at one genset, the other one will start. If both gensets are not ready for operation, it will be switched back to mains supply. The mains circuit breaker control is performed by the easYgen-1500. Enabling or blocking the gensets shall be realized without external wiring and logic.
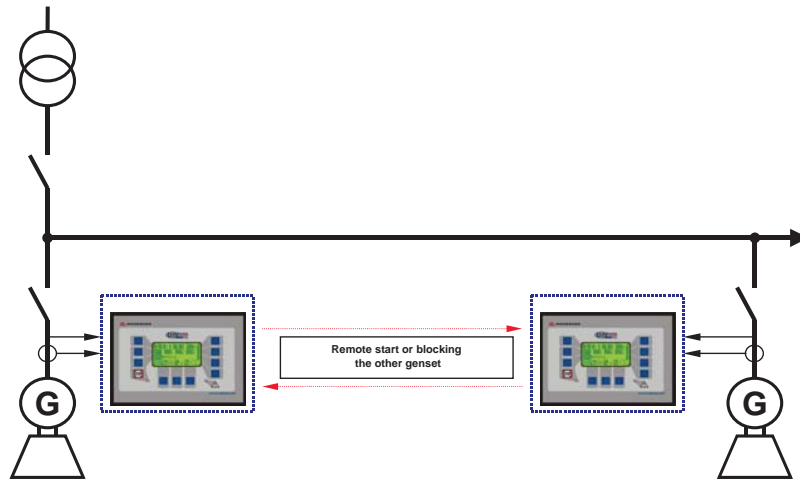
ATTENTION

Please observe that both gensets never feed the same busbar at the same time, because the easYgen-1500 is only designed for single generator operation.

We recommend a hard-wired interlock between both GCBs and the MCB.
The following example shows how relay 6 blocks the other genset via DI 5.
The general release is performed via DI 1.
The MCB will be enabled by relay 1 for each of the easYgen-1500 units.
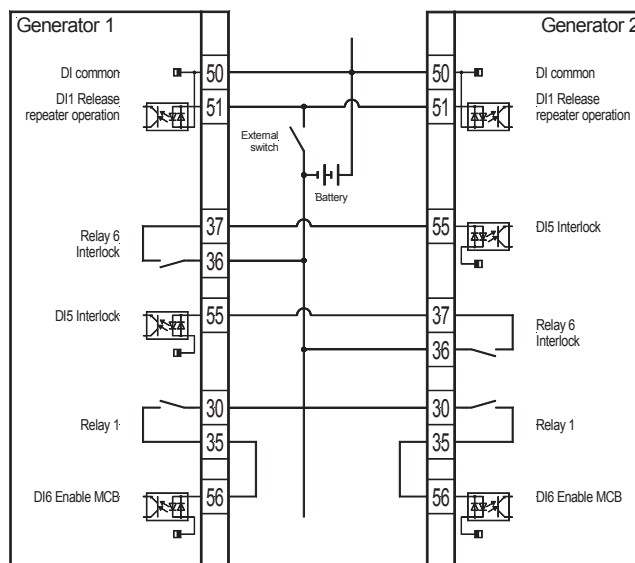
Parameter Settings

- Emergency power: OFF
- Configuration of the start condition with the parameter "Start req. in Auto"
  Generator 1 is enabled for even days (Monday, Wednesday, etc.)
  Generator 2 is enabled for odd days (Tuesday, Thursday, etc.)
- If one generator fails, the other generator is forced to start
- The MCB is only enabled if both generators shutdown or by blocking of one generators

LogicsManager Settings

Start Condition

DI 1 activates the repeater operation via the start sequence (Start req. in Auto). In order to balance the operating hours or to enable only one genset, the active days are evaluated. This enables the first genset only on odd days and the second genset only on even days.
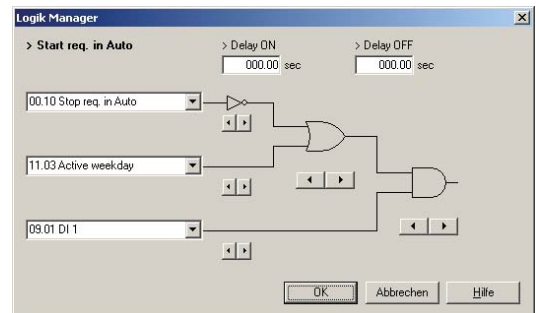
Stop Condition

The blocking signal (Stop req. in Auto) is used to realize the "forced start" of the not enabled genset in case of a malfunction. This control uses the discrete input DI 5. This DI is activated by the other genset.
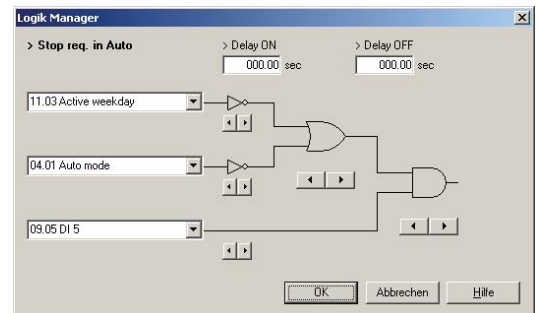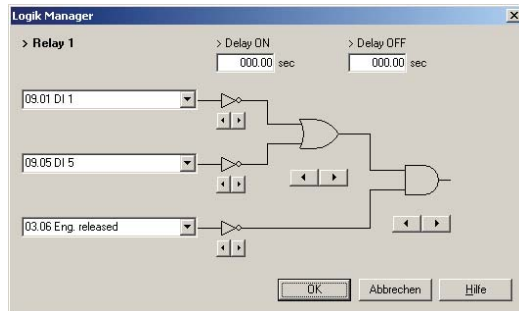
Blocking the Other Genset

The output of relay 6 activates the discrete input of the other genset.
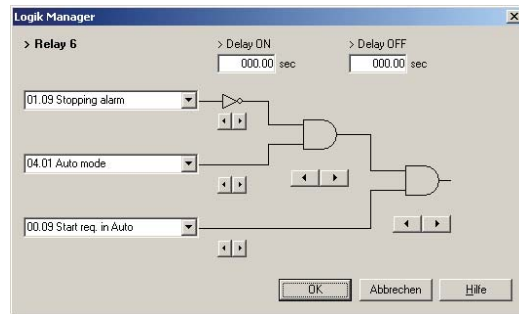
Enabling the MCB

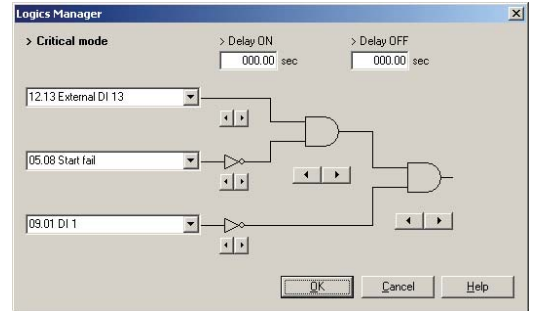The MCB is enabled to close depending on the start release (DI 5).
The MCB will be enabled (DI 6) by activating the output of relay 1. This enables each control to enable it's circuit breaker itself.

New Parameter for Critical Mode Post Operation

The following example shows how to activate the critical mode with the external discrete input 13:

There is a new parameter to configure the post operation time in critical mode. For a detailed description of this parameter refer to the configuration manual 37391 under Application: Critical Mode in the parameter description. The default value for the post operation time is 10 min (600 s). This time expires after the *LogicsManager* output "Critical mode" becomes FALSE. All shutdown alarm classes have only the functionality of warning alarm classes during this time. Therefore, the critical mode cannot be stopped immediately in case of a possible start failure; there will be attempts to start the engine for the full critical mode post operation time, which may cause an overheating of the starter.
The following suggested solution may be used to prevent this:

The *LogicsManager* output "Operation mode STOP" is activated by the alarm messages, which shall stop the genset without post operation (e.g. start fail and DI 1 emergency stop). This changes the operation mode and stops the critical mode post operation.
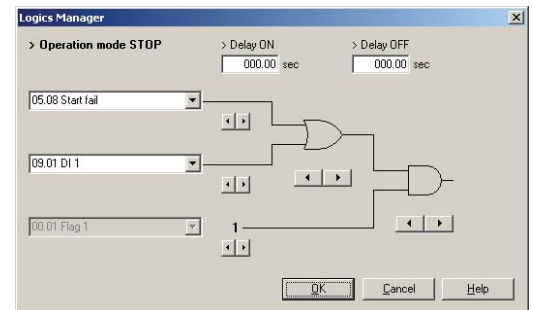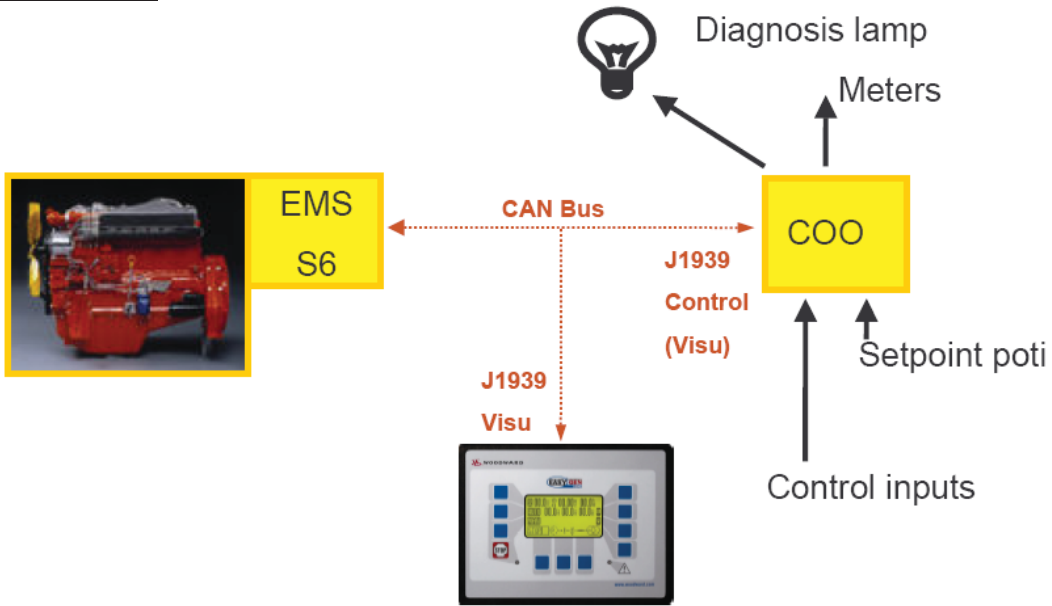
Controlling a Scania S6 ECU via the J1939 CAN Bus
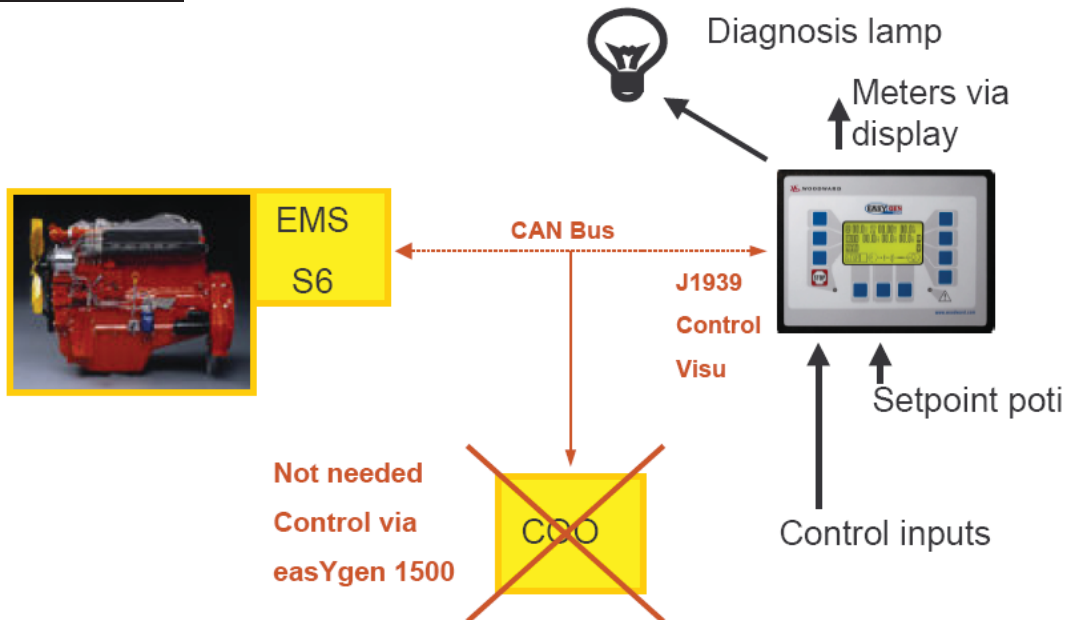
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Starting with version 2.0000, a Scania S6 ECU (Engine Control Unit) may be controlled directly via the J1939 CAN bus of the easYgen-1500. With this, the Scania Coordinator (COO) is not necessary anymore. The two following figures show the fundamental difference:

easYgen-1500 < V2.0000:

easYgen-1500 > V2.0000:

The easYgen-1500 is able to send start/stop messages as well as change the engine to droop mode, or read out and display the blink code. A set point control via an analog input of the easYgen is also possible. The individual functions are described in the following.

The following, partly new parameters are available for control. The parameters for controlling the Scania ECU are only displayed on the unit, if "S6 Scania" is configured as device type. The default value is stated in brackets.

The parameters are located in section 12.2.1 J1939 Parameters:

Device type:	S6 Scania (OFF)
…	
ECU remote controlled	ON (OFF)
ECU set droop mode	(OFF)
Frequency Offset ECU	(OFF) AnalogIn1, AnalogIn2

The following new *LogicsManager* command variables are available for a relay output:

03.13	Blinking lamp ECU	A lamp may be connected here
03.14	ECU special ignition	This enables to read out the blink code when engine is stopped

Connecting the ECU

The CAN bus will be connected to connector B1 according to the instructions of the manufacturer. The baud rate is 250 kBd. A terminating resistor must be present at both ends of the CAN bus. The Scania ECU has already an internal 120 Ohms resistor; another such a resistor must be connected on the easYgen side.
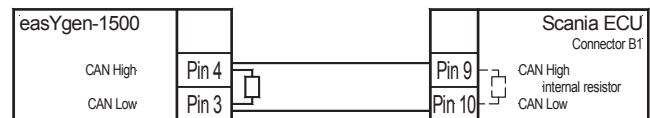

The ignition input U15 (connector B1, terminal 3) may either be enabled via a manual switch or the easYgen-1500. There are two possibilities for this depending on whether the blink code is to be read out when the engine is stopped or not:

- Connection of the ignition U15 via the relay "Fuel relay", terminals 33/35 (Parameter 03.03):
  The blink code may only be read out when the engine is running.
- Connection of the ignition U15 via the *LogicsManager*, in this example configured to relay 5:
  If the engine is not running, the blink code may be read out as well as reset, if the relay with parameter "03.14 ECU spec. ignition" is configured like in the following example.

> **(i) NOTE**
> **The ECU sends messages at the CAN bus only if the ignition is activated/enabled.**
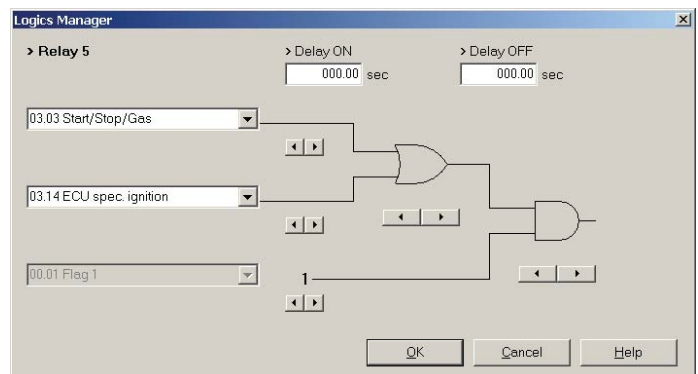
Start/Stop

As soon as the parameter "ECU remote controlled" is configured to ON, the easYgen sends messages in J1939 format at the CAN bus in case of a start request. The ECU follows these messages and starts the engine accordingly. The sent message contains the following information:

Start/Stop	dynamically
Enable starter	dynamically
Idle mode active	dynamically
Droop	ON/OFF
Speed set point = nominal frequency	(50 Hz = 1500 r/min, 60 Hz = 1800 r/min)
Speed offset	(via analog input)
Critical mode	(Override) dynamically, if configured accordingly
Requesting the blink code and deleting the fault storage in the ECU	

The speed set point value is sent depending on the parameter "Rated frequency".

The start process and the "Idle mode active" signal follow the normal start process or the settings of the easYgen, e.g. number of start attempts, start pause time or idle mode active/not active.

The droop mode may be enabled and disabled via the configuration. This state is not determined dynamically, but always transmitted constantly depending on the setting.

Blink Code

Scania ECUs issue a failure message using a blink code. This code may be requested via the "Blink code req." button. In order to read this code, it is possible to connect a lamp to a relay, which has been configured to the parameter "03.13 Blink code ECU", or to read directly in the display from the small square field next to the digit 00. For an easier to read display, the easYgen displays the result as a number (here 00) in the display after successfully receiving a blink code sequence. The display is maintained until a new blink code is requested or the power supply of the easYgen is disconnected.

Long blink signals (approx. 1 s) identify tens digits and short blink signals (approx. 0.4 s) identify ones digits. A pause of approx. 0.5 s is between each blink signal. The following example shows blink code 14, coolant temperature sensor, (long-short-short-short-short = 10+1+1+1+1):
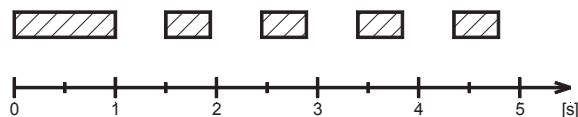
The next blink code is read out by pressing the "Blink code req." button again. If no blink code is present anymore, the lamp is illuminated for 4 seconds.

The failure codes inside the Scania ECU may also be deleted. For this, the ignition U15 must be connected via the *LogicsManager* (03.14 ECU spec. ignition, see further up). Then, it is possible to start the deletion by pressing the "Reset Blinkcode" button when the engine is stopped.
Refer to Connecting the ECU on page 61 for detailed information about reading out the blink codes with stopped engine.

Speed Change via Analog Input

If an analog input of the easYgen is selected at "Frequency Offset ECU", it is possible to transmit a frequency offset to the ECU via a connected potentiometer for example. The easYgen offers no closed control circuit, it monitors only a set point value. It will not be monitored whether this is adjusted. The actual set point value may be read out at the configured analog input. For this, the following configuration is required (example for analog input 1):

Frequency Offset ECU	AnalogIn1
...	
Type:	linear
Select hardware	0 to 500Ohm
…	
Bargraph minimum	-125
Bargraph maximum	125
Limit level 1 / 2	OFF
Linear scale value at 0%	-125
Linear scale value at 100%	125
Text	e.g "Speed Offset ECU"

With this settings, a rated speed offset of -125 to 125 r/min* is sent to the ECU. Either a 0 to 500 Ohm potentiometer may be connected or one, which provides a current value of 0 to 20 mA to the analog input (in this case, hardware selection must be configured accordingly different.

* It is a precondition for this, that the same or a lower speed offset is configured in the ECU.

Starter Battery Change-Over

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Sequence Scheme

This application provides two starter batteries for the start procedure.
An automatic change-over logic ensures that only three start attempts are made with each battery.

Counting the start attempts and changing the battery shall be performed with the easYgen-1500.
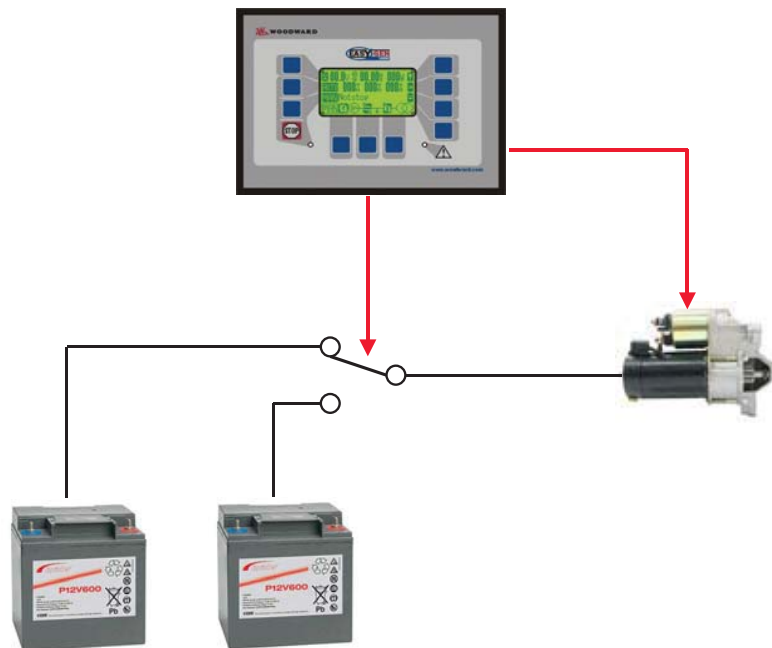
Possible Solution

Only three start attempts are configured in the unit.
A start failure is issued after expiry of these start attempts. This monitoring function is assigned alarm class A (display only) and initiates the change-over to the second starter battery.
Afterwards, the alarm class will be acknowledged automatically and the remaining three start attempts are initiated. It will be stopped after a total of six start attempts.
If a shutdown alarm class is desired, a discrete input must be connected with a relay, which has been configured to "Start fail", and configured with a delay of approx. 4 s.
Changing into STOP operation mode switches back to the first starter battery.

Settings

The start failure monitoring (Protection -> Engine - > Start Failure) must be configured as follows:

|	
Monitoring	ON
Start attempts	3
...	
Alarm class	A
Self acknowledge	NO

The utilized discrete input (e.g. discrete input DI 3) must be configured as follows:

DI 3 operation	(depending on connection)
DI 3 delay	4 s
DI 3 alarm class	C
DI 3 delayed by eng.speed	NO
DI 3 self acknowledge	NO
DI 3 text	Max. start attempts (suggested text)

The discrete input DI 3 will be activated by a relay, which is configured to the command variable "05.08 Start fail".

Start Blocking

The stop condition "Stop req. in Auto" is used to block the start procedure if the alarm message "Start fail" is present. The start failure will be acknowledged automatically when changing to the second battery.
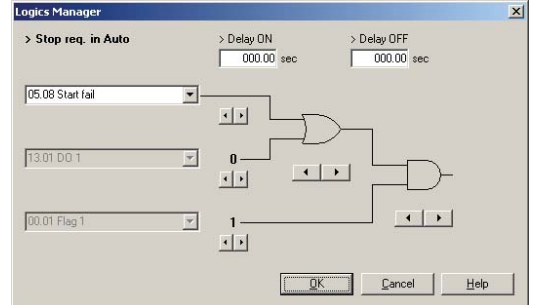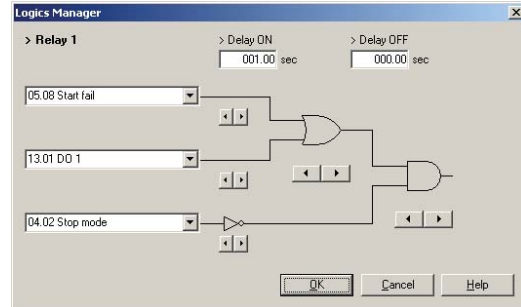

External Acknowledgement

The external acknowledgement in the AUTOMATIC operation mode is used to acknowledge the start failure after the first three start attempts and changing over to the second starter battery.
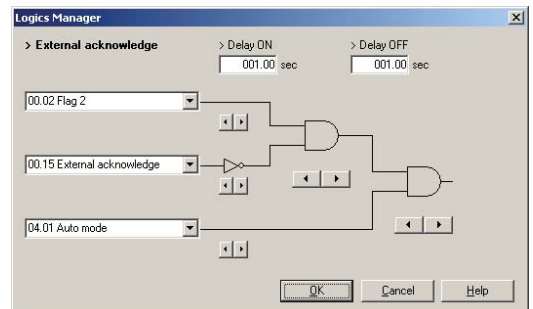

Change-Over Starter Battery

Relay 1 is used to pre-select the starter battery. Changing into STOP operation mode switches back to the first starter battery again.
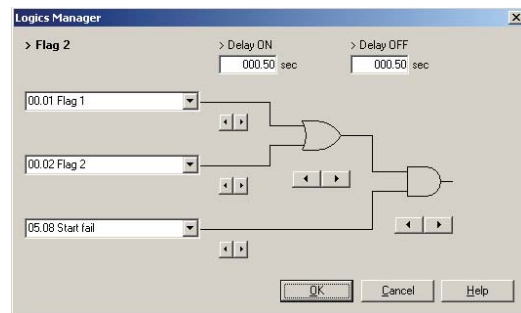

Internal Flags

This flag is used to activate the acknowledgement if the start failure occurs for the first time.
The AND combination with the relay output for the battery change-over prevents the automatic acknowledgement of the start failure after a total of six start attempts.
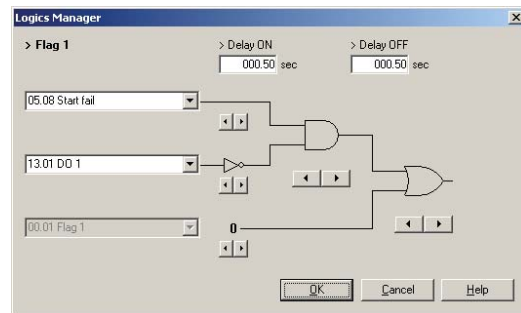
This flag is used as "pulse-stretching element" for the external acknowledgement.
This prevents overlapping times between acknowledgement and battery change-over.

WOODWARD