

“FlexGen”

Integrated Generator Control

C6200 Application

SELCO



SELCO C6200 + C6250
400 VAC phase-phase
5 A current transformers

130/80 kVA Atlas Copco Gensets
Volvo Engines + Ansaldo alternators

EDC 4 ECU (Speed Control)
Mecc Alte U.V.R.6 Voltage regulator

Barber Colman DYN10794 Speed Controller
Mecc Alte U.V.R.6 Voltage regulator



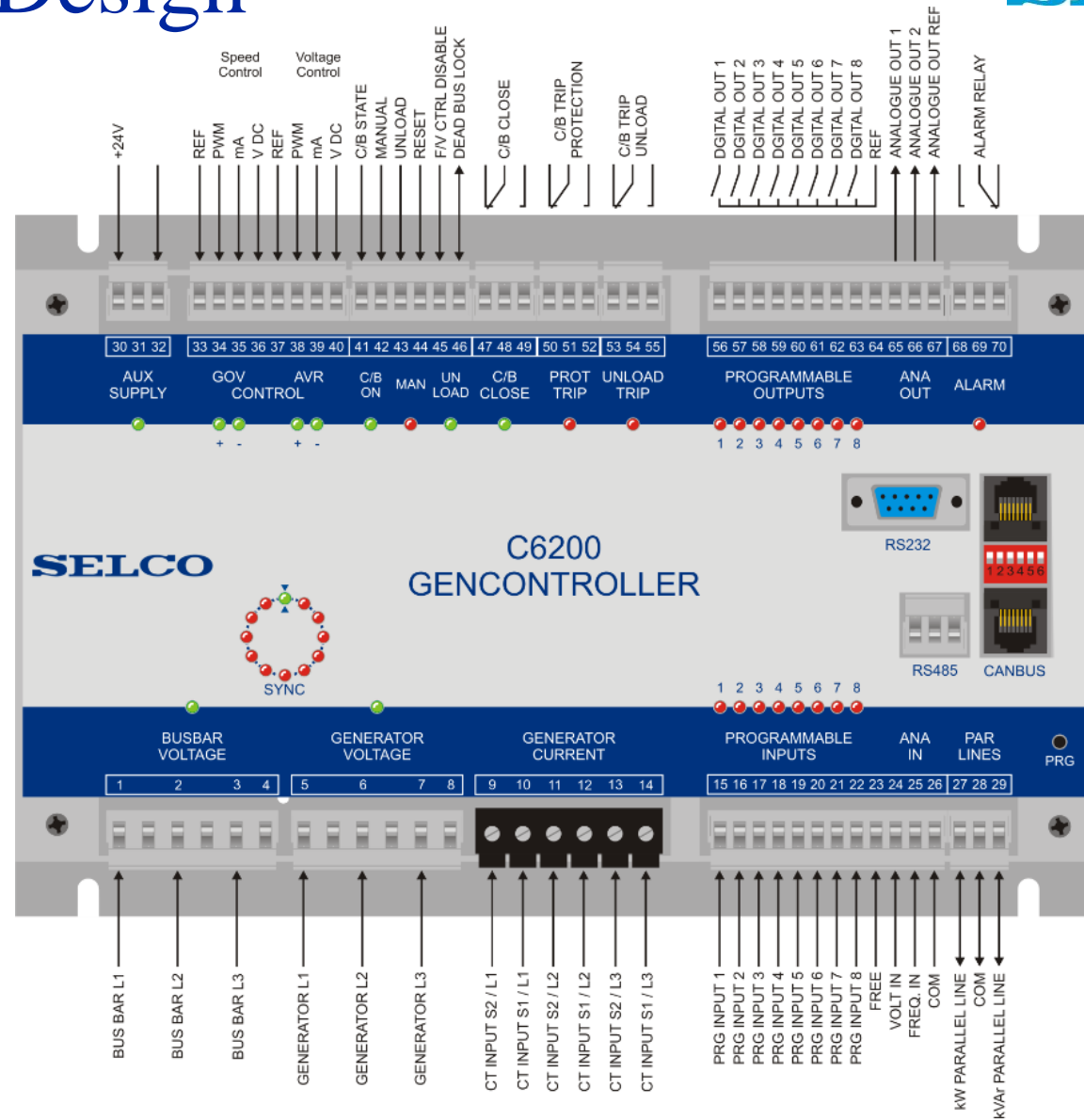
A vertical collage of images related to technology and industry. At the top, there are digital readouts showing numbers like '506', '558.13973', and '0.05'. Below these are technical diagrams, a satellite dish, a ship, and various other industrial and technological elements. The overall theme is modern technology and engineering.

A vertical collage of images related to technology and industry. At the top, there are digital readouts showing numbers like '506', '558.13973', and '0.05'. Below these are technical diagrams, a satellite dish, a ship, and various other industrial and technological elements. The overall theme is modern technology and engineering.



C6200 Design

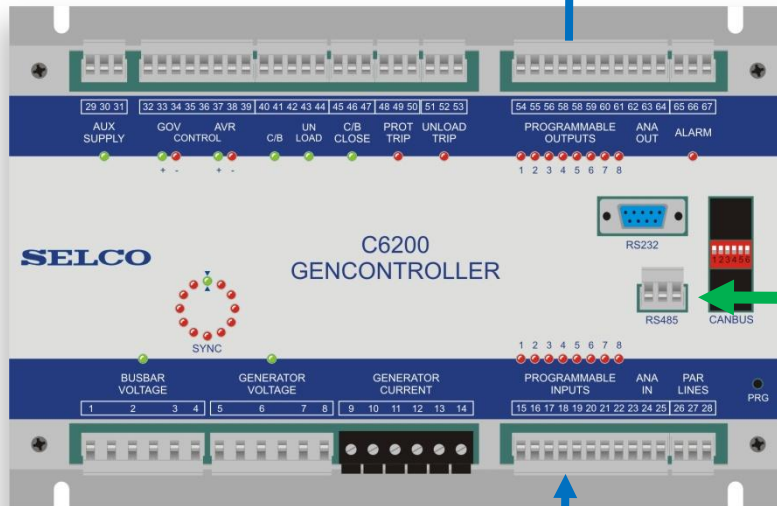
SELCO



Seamless Integration with PLC

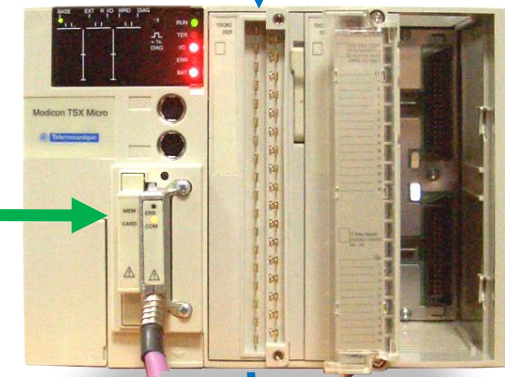
SELCO

C6200 Slave (Semi-Auto)



Digital inputs with feedback on procedures

PLC Master



RS485
MODBUS

Digital outputs to enable/disable procedures

Core Genset
Controls

Programmable
I/O

Logic Controls / Decisions
(e.g. Master PMS og Co-Gen Control)

Before going ahead (checklist)

SELCO

- Do I have the required experience (**training at SELCO**)?
- What is my responsibility (**customer perceptance**)?
- Will this be a feasible project?
- Application (Land or Marine)?
- What about Engine Control logic?
- Required functionality?
- If required, what kind of protection?
- Current Transformers (1A/5A)?
- How to control speed / frequency?
- If required, how to control excitation /voltage?
- Required integration (SCADA etc.)?
- Is the site ready for my work?
- Do I have access to all the necessary tools?
- How to test and prove my system? (**customer acceptance**)



Isolation (Very important!)

SELCO

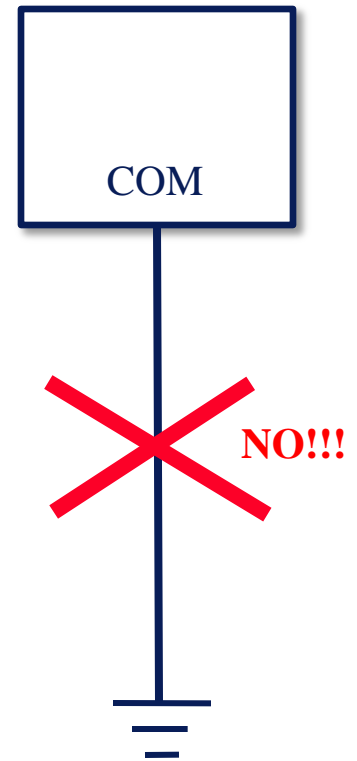
Common reference (COM) and ground should not be connected together.

Connecting any of the COM connections on the C6200 module to ground (or switchboard chassis) may cause instability within the system.

In a ship installation the hull is considered “ground”.

As a general rule:

1. COM terminals should not be connected to ground, switchboard chassis or ships hull.
2. Negative poles of the power supplies should not be connected to ground, switchboard chassis or ships hull.

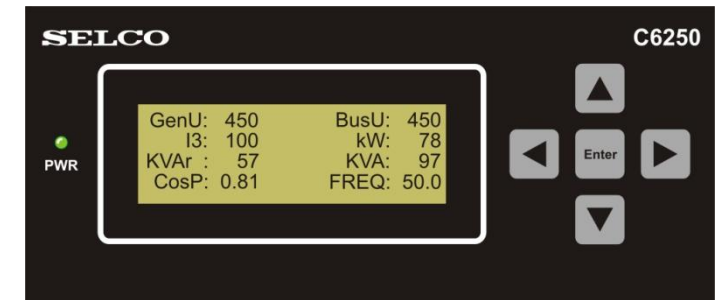


Configuration by C6250/S6500

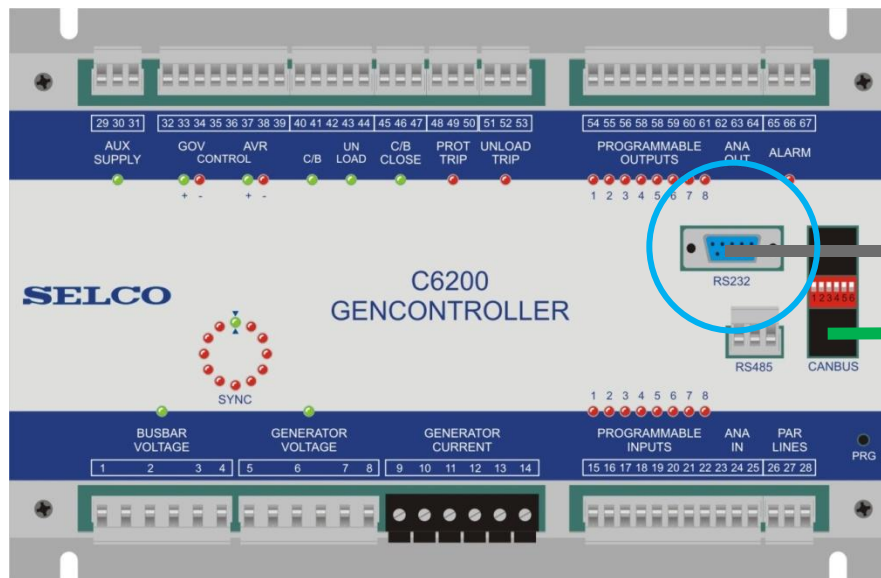
SELCO

C6250 is a convenient substitute for the PC HyperTerminal. C6250 is optional but practical "terminal" for configuration and indication.

Flush Mount 144 x 96 x 25 mm.



Configuration Terminal
Configuration Backup/Restore
Multimeter



RS232
(No external supply)

CAN



S6500

Auxillary Supply

SELCO

24 VDC

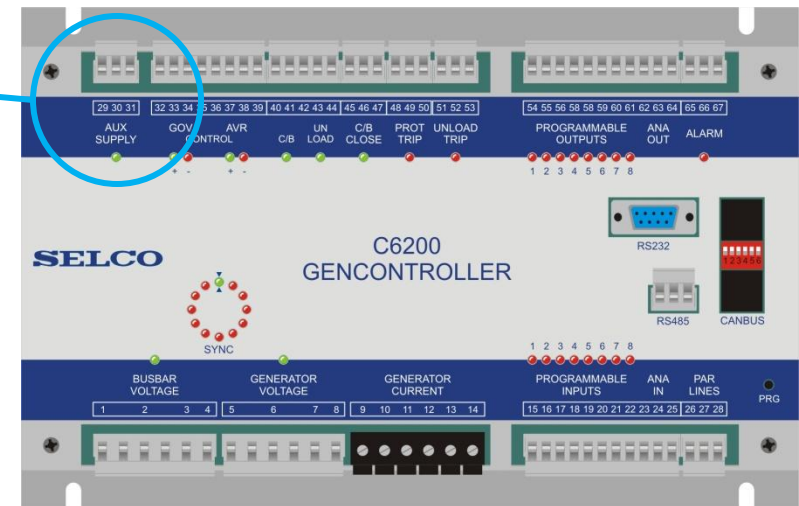
-30% / +20%

+ -



Supply reference (-) has connection to the modules COM terminals (same potential). Auxillary supply is NOT isolated

The front AUX SUPPLY LED illuminates with a steady green light to indicate that the supply voltage is OK and within the limits of safe operation



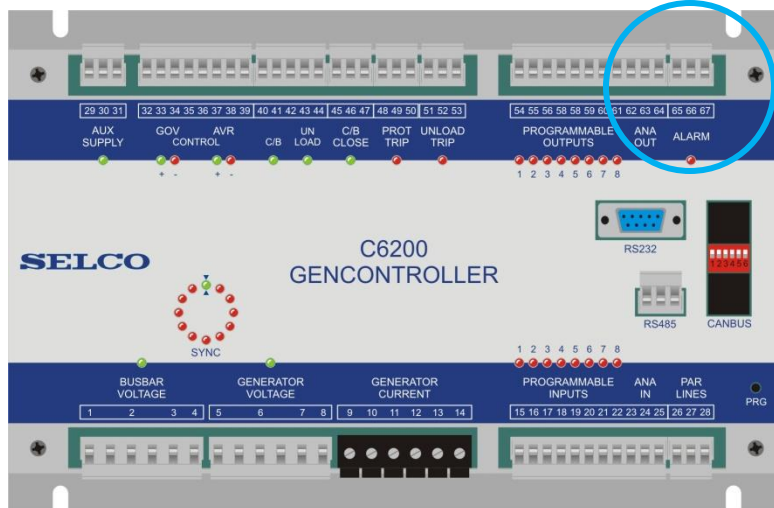
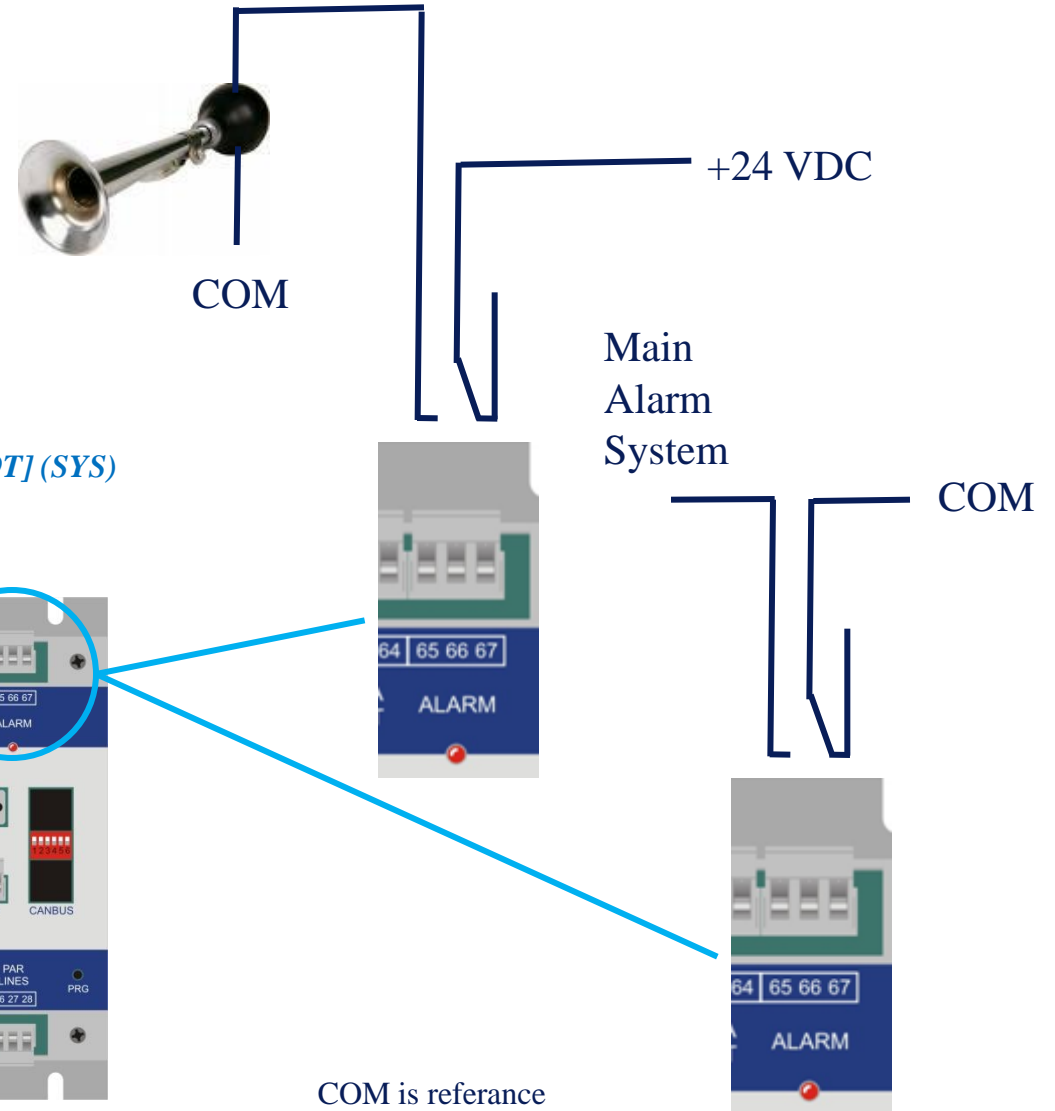
SELCO

Normally energized Alarm relay.
Cannot be reconfigured.

De-energizes on system (or system or general) alarm. Will also de-energize if auxillary supply is lost.

Change-over relay with potential free contacts.

WRITE RELAYS ALARMFUNC [SYS, SYSPROT] (SYS)

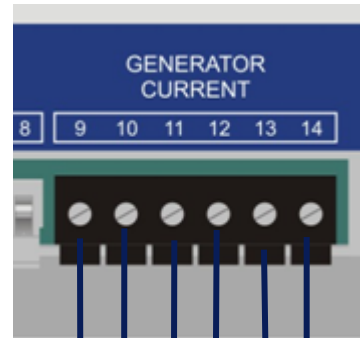
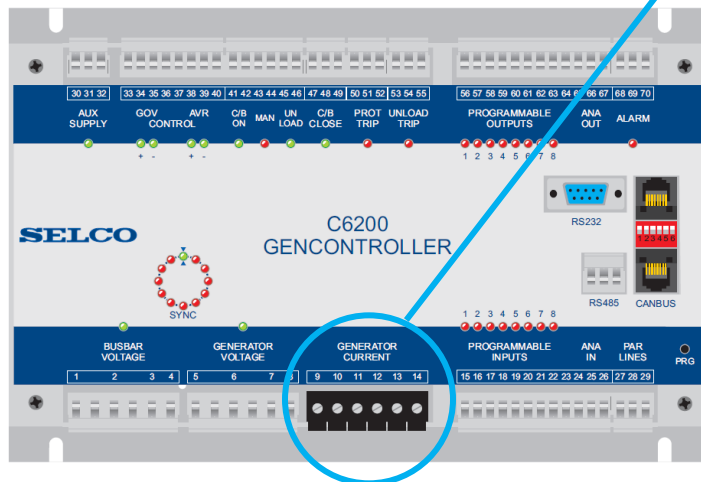


COM is reference

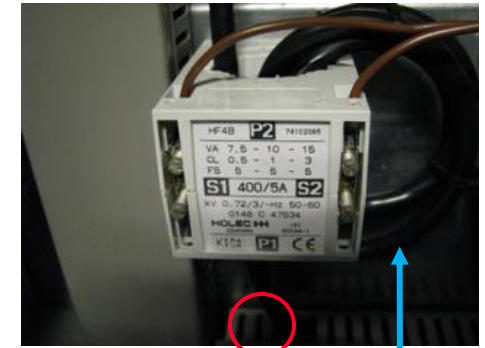
5A / 1A Current Measurement

C6200 variants for 5A and 1A available.

WRITE SYS CTPRIMCUR 100.0

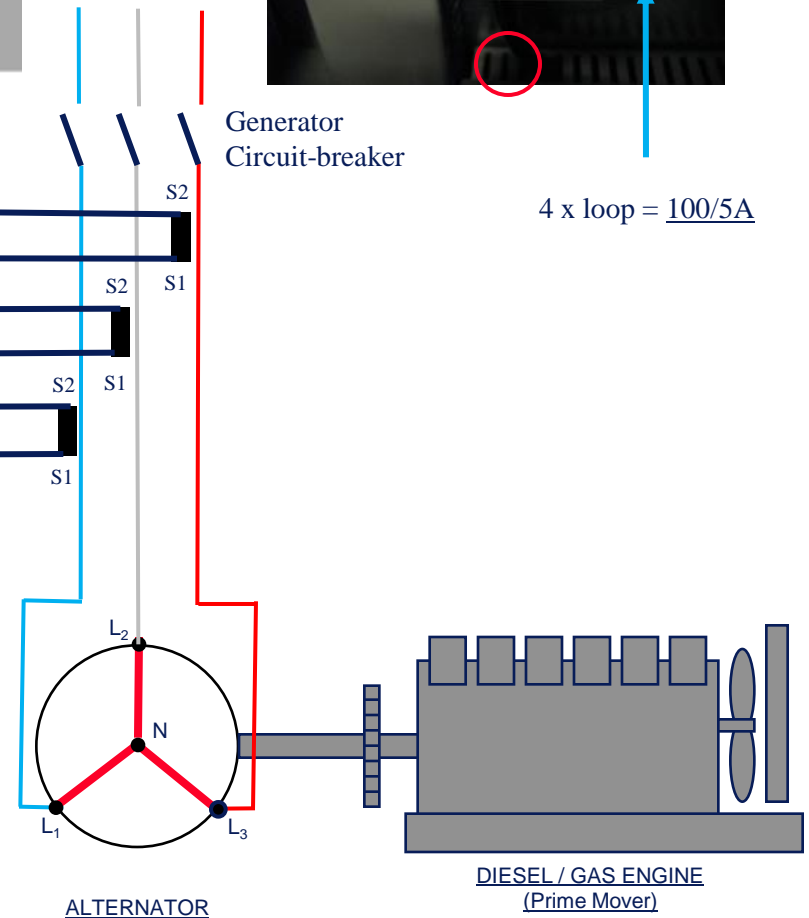


SELCO



Generator
Circuit-breaker

4 x loop = $\frac{100}{5A}$



ALTERNATOR

DIESEL / GAS ENGINE
(Prime Mover)

AC Voltage Measurement

SELCO

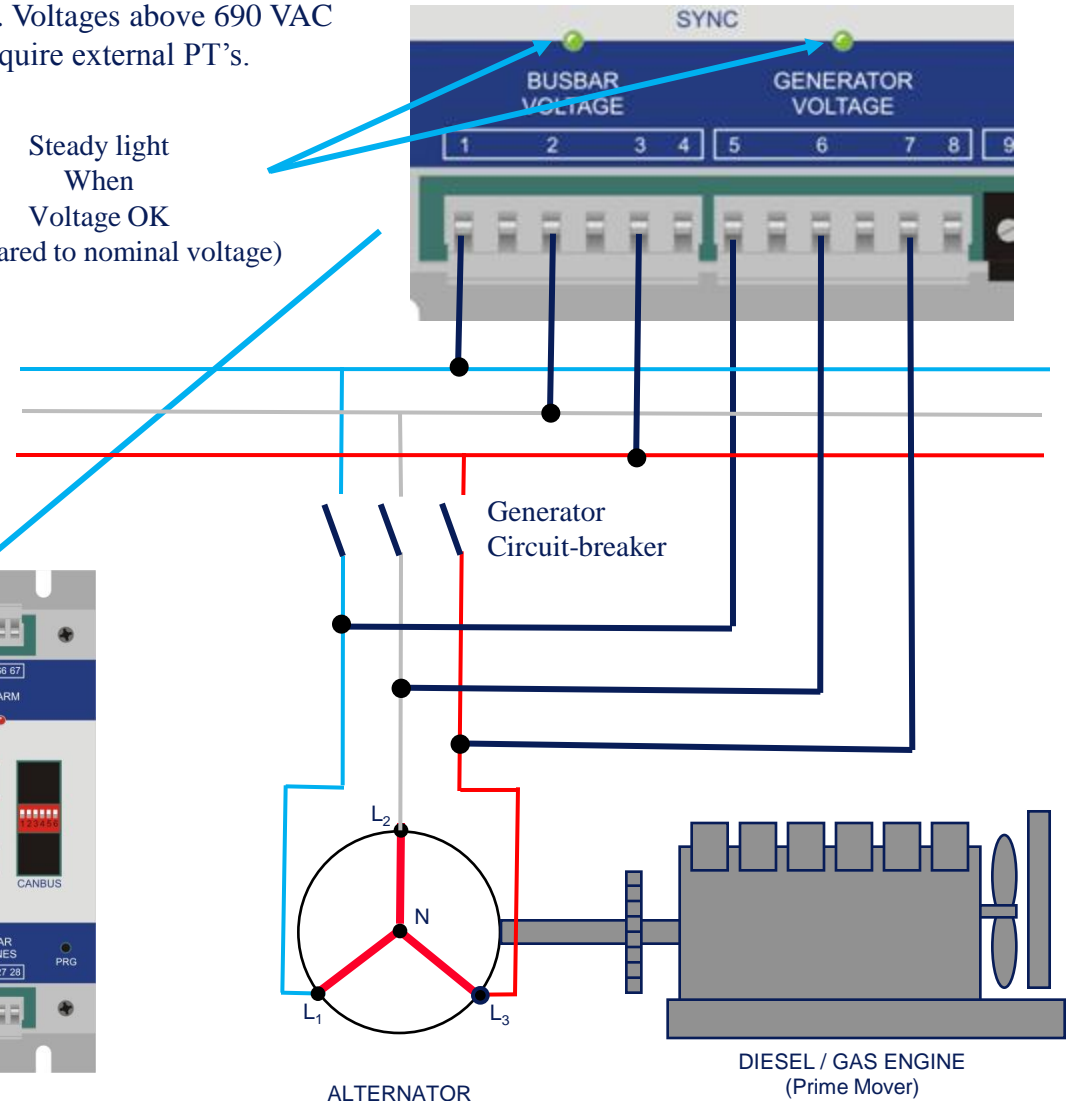
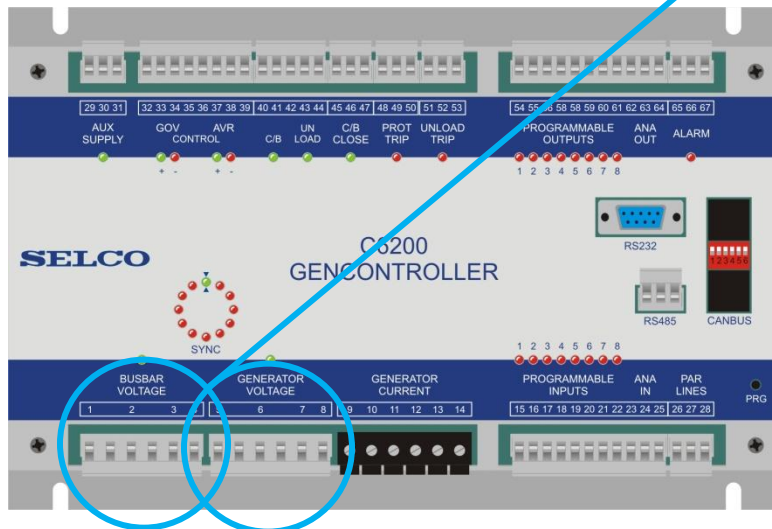
Voltage measurements on busbar and generator are three-phased.

Make sure that the phases are connected correctly, as incorrect connection will affect power factor and load calculations.

Voltage range is 63 to 690 VAC nominal. Voltages above 690 VAC require external PT's.

Steady light
When
Voltage OK
(Compared to nominal voltage)

WRITE SYS NOMVOLT 400.0
WRITE SYS PRIMVOLT [63 – 32000] (400)
WRITE SYS RATEDFREQ 50.0
WRITE SYS VOLTOKWND 10



General Input/Output

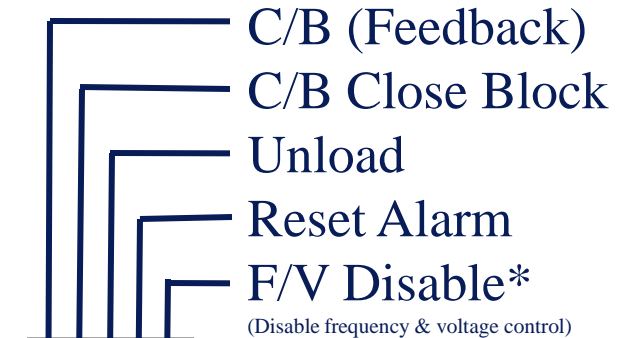
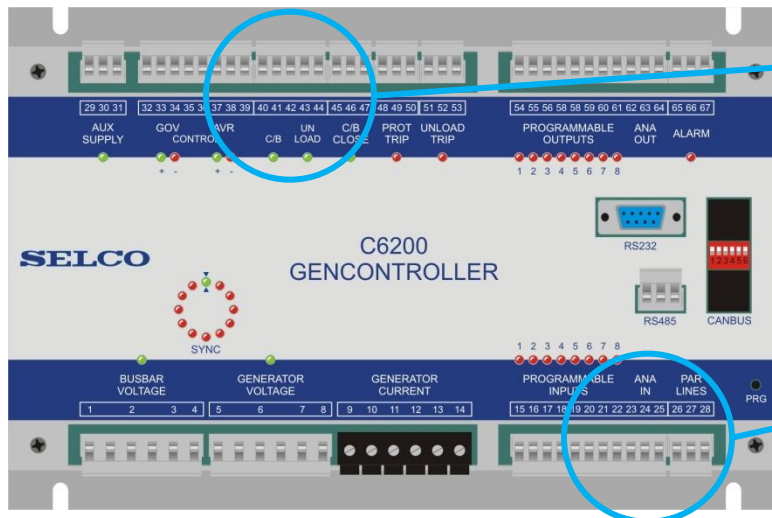
SELCO

C/B (Feedback) is VERY important!

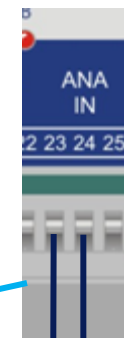
Together with the generator and busbar voltage measurements, it tells the C6200 about its "State of Operation":

- Running idle?
- Need to Synchronize?
- Running in parallel?

The C6200 is **BLIND** without C/B (Feedback)!



* External frequency and voltage control



COM is reference

Volt. In
(-1 to 1 VDC)
Freq. In
(-1 to 1 VDC)

"Size" of the Generator

SELCO

Calculating Generator maximum current (GENMAXCUR):

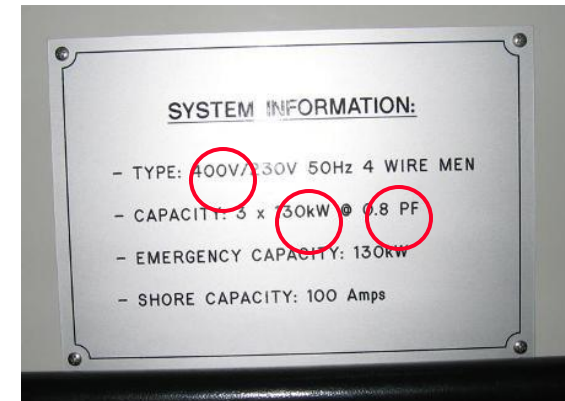
$$GENCAP = 3 \cdot \left(\left(\frac{PRIMVOLT}{\sqrt{3}} \right) \cdot GENMAXCUR \cdot \cos \varphi \right) \Leftrightarrow$$

$$GENMAXCUR = \frac{GENCAP}{3 \cdot \left(\left(\frac{PRIMVOLT}{\sqrt{3}} \right) \cdot \cos \varphi \right)}$$

Two examples:



$$GENMAXCUR = \frac{45.000VA}{3 \cdot \left(\left(\frac{400V}{\sqrt{3}} \right) \cdot 1.00 \right)} = 65A \quad \Bigg/ \quad GENMAXCUR = \frac{36.000W}{3 \cdot \left(\left(\frac{400V}{\sqrt{3}} \right) \cdot 0.80 \right)} = 65A$$



$$GENMAXCUR = \frac{130.000W}{3 \cdot \left(\left(\frac{400V}{\sqrt{3}} \right) \cdot 0.8 \right)} = 234.54A$$

WRITE SYS GENMAXCUR [0.5 – 30000] (60.6)

Circuit Breaker Protection Trip

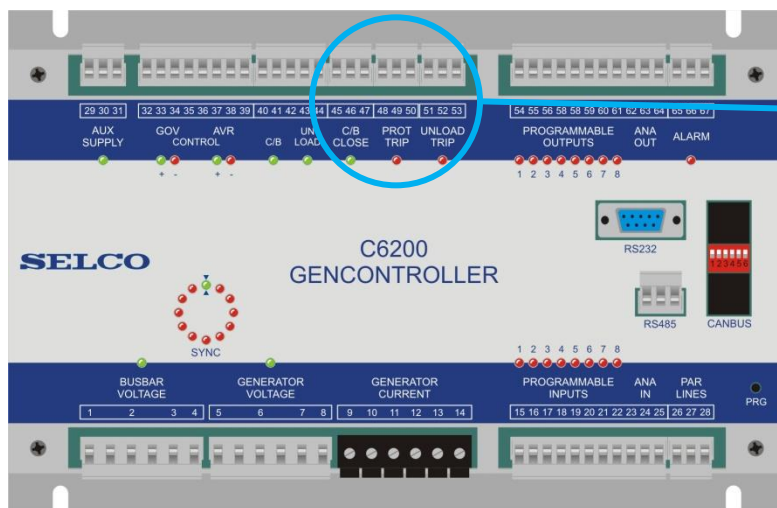
SELCO

Change-over relay for opening the
Breaker to protect the generator.

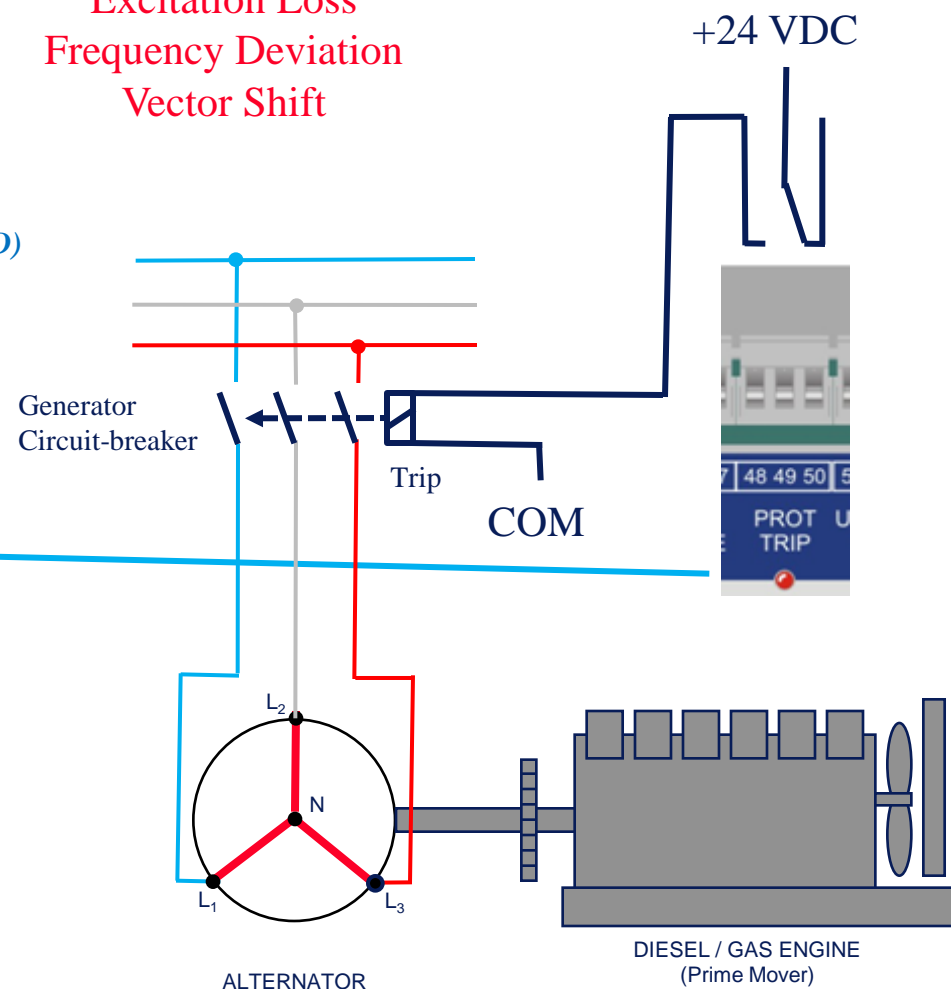
Relay is normally energized but can be
configured for normally energized
operation as well.

Trip cause can be signalled on
programmable outputs as desired.

WRITE RELAYS PROTTRIP CONTACT [ND, NE] (ND)
WRITE IOFUNC RP OUT1
WRITE IOFUNC EL OUT2
WRITE IOFUNC FD OUT3
WRITE IOFUNC VS OUT4



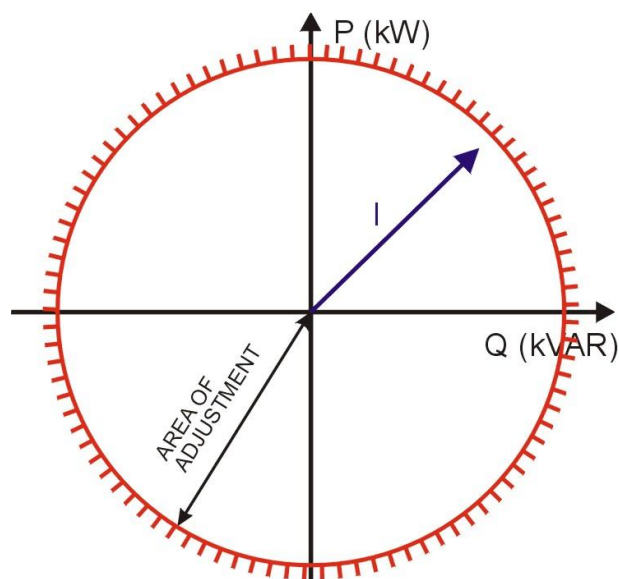
Reverse Power
Excitation Loss
Frequency Deviation
Vector Shift



Generator Protection

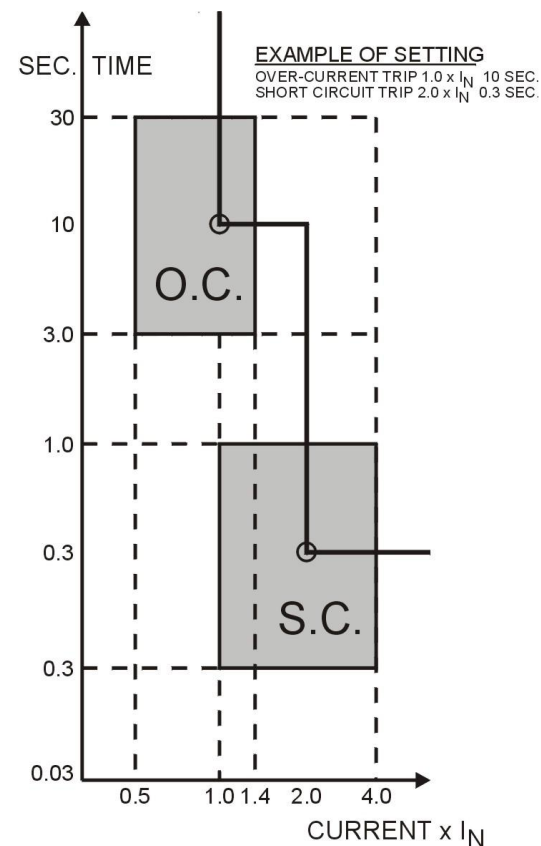
SELCO

Over Current and Short Circuit



WRITE PROTECT SC ENABLED [YES, NO] (YES)
WRITE PROTECT SC LEVEL [100 - 400] (250)
WRITE PROTECT SC DELAY [100 - 1000] (100)
WRITE PROTECT OC ENABLED [YES, NO] (YES)
WRITE PROTECT OC LEVEL [50 - 200] (100)
WRITE PROTECT OC DELAY [2.0 - 20.0] (5.0)

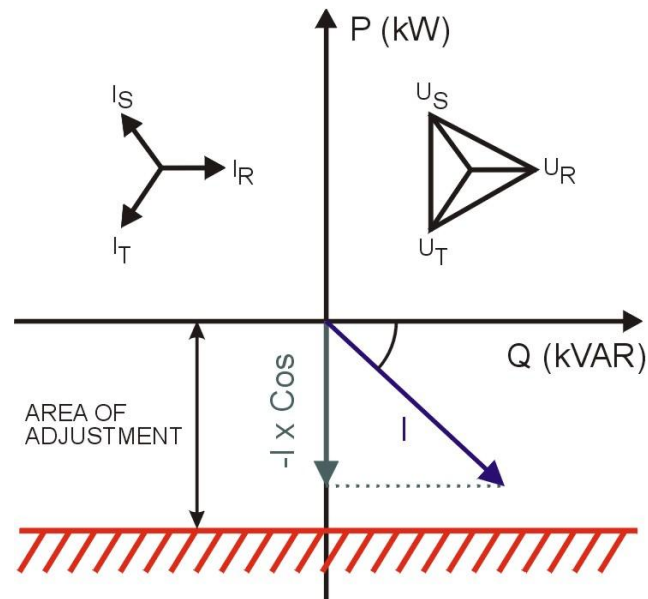
WRITE IOFUNC SC [OFF, OUTx] (OFF OFF)
WRITE IOFUNC OC [OFF, OUTx] (OFF OFF)



Generator Protection

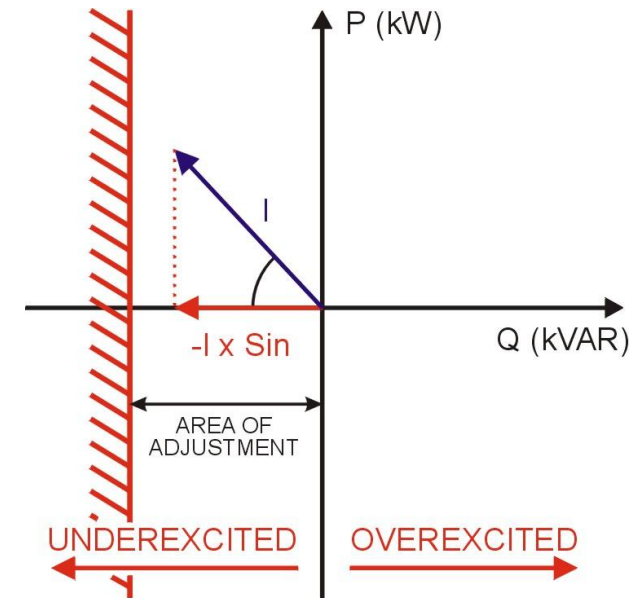
SELCO

Reverse Power



WRITE PROTECT RP ENABLED [YES, NO] (YES)
WRITE PROTECT RP LEVEL [0.0 - -20.0] (-2.0)
WRITE PROTECT RP DELAY [2.0 - 20.0] (5.0)
WRITE IOFUNC RP [OFF, OUTx] (OFF)

Excitation Loss



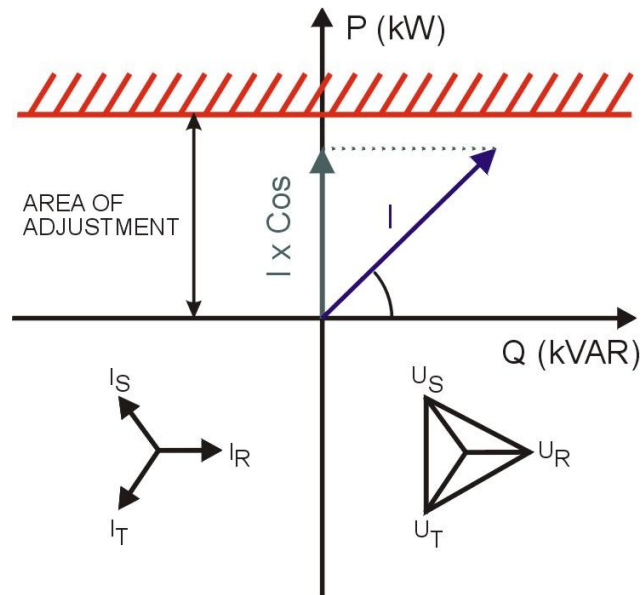
WRITE PROTECT EL ENABLED [YES, NO] (YES)
WRITE PROTECT EL LEVEL [0 - -150] (-50)
WRITE PROTECT EL DELAY [2.0 - 20.0] (5.0)
WRITE IOFUNC EL [OFF, OUTx] (OFF)

3 Phase Short-Circuit and Over Current by T2500 or Breaker

Generator Protection

SELCO

Overload



WRITE PROTECT OL ENABLED [YES, NO] (YES)
WRITE PROTECT OL LEVEL [50 - 200] (100)
WRITE PROTECT OL DELAY [2.0 - 20.0] (5.0)
WRITE IOFUNC OL [OFF, OUTx] (OFF)

Voltage Monitoring

WRITE PROTECT UV ENABLED [YES, NO] (YES)
WRITE PROTECT UV LEVEL [50 - 150] (70)
WRITE PROTECT UV DELAY [2.0 - 20.0] (2.0)
WRITE PROTECT OV ENABLED [YES, NO] (YES)
WRITE PROTECT OV LEVEL [50 - 150] (130)
WRITE PROTECT OV DELAY [2.0 - 20.0] (2.0)

WRITE IOFUNC OV [OFF, OUTx] (OFF)
WRITE IOFUNC UV [OFF, OUTx] (OFF)

Frequency Monitoring

WRITE PROTECT UF ENABLED [YES, NO] (YES)
WRITE PROTECT UF LEVEL [50 - 150] (70)
WRITE PROTECT UF DELAY [2.0 - 20.0] (2.0)
WRITE PROTECT OF ENABLED [YES, NO] (YES)
WRITE PROTECT OF LEVEL [50 - 150] (130)
WRITE PROTECT OF DELAY [2.0 - 20.0] (2.0)

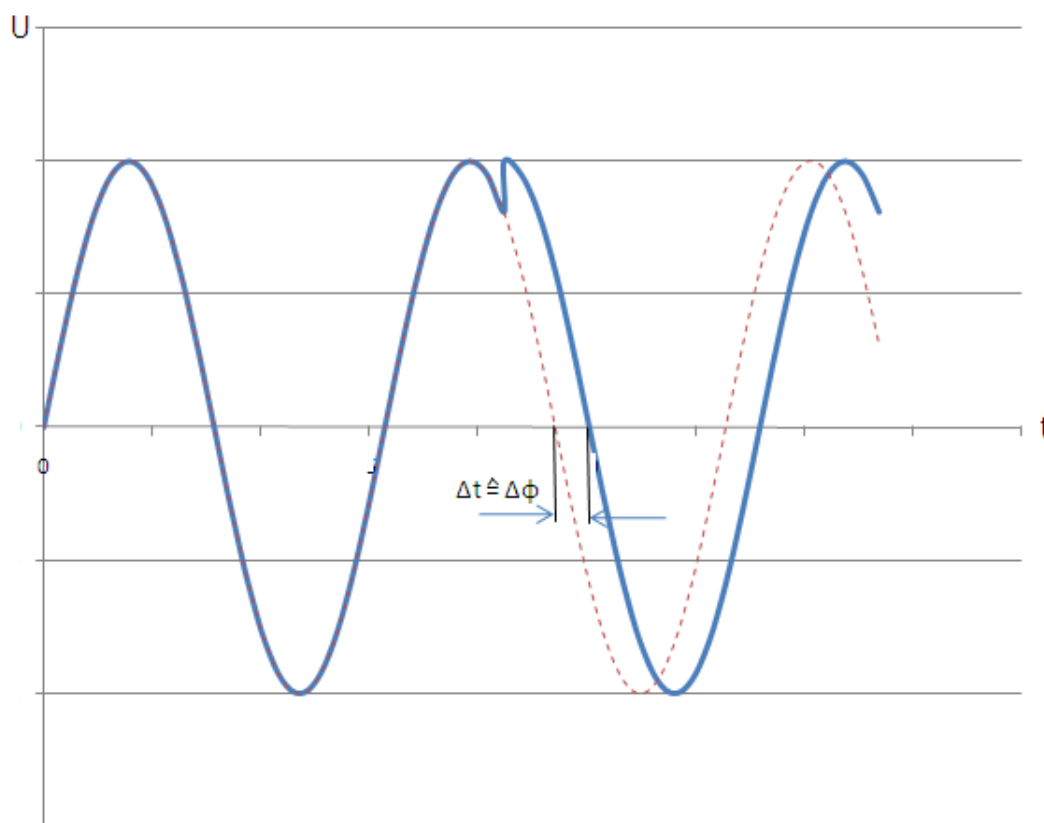
WRITE IOFUNC OF [OFF, OUTx] (OFF)
WRITE IOFUNC UF [OFF, OUTx] (OFF)

Grid monitoring

SELCO

Frequency Deviation/ Rate of Change of Frequency (ROCOF)

- Disconnection of the generator in case of short time interruptions of the grid.



- Detection of zero crossings
- Calculation of frequency
- Trip of breaker in case change of frequency increases above a certain setpoint [Hz/s]

WRITE PROTECT FD ENABLED [YES, NO] (NO)
WRITE PROTECT FD LEVEL [0.0 – 20.0] (2.0)

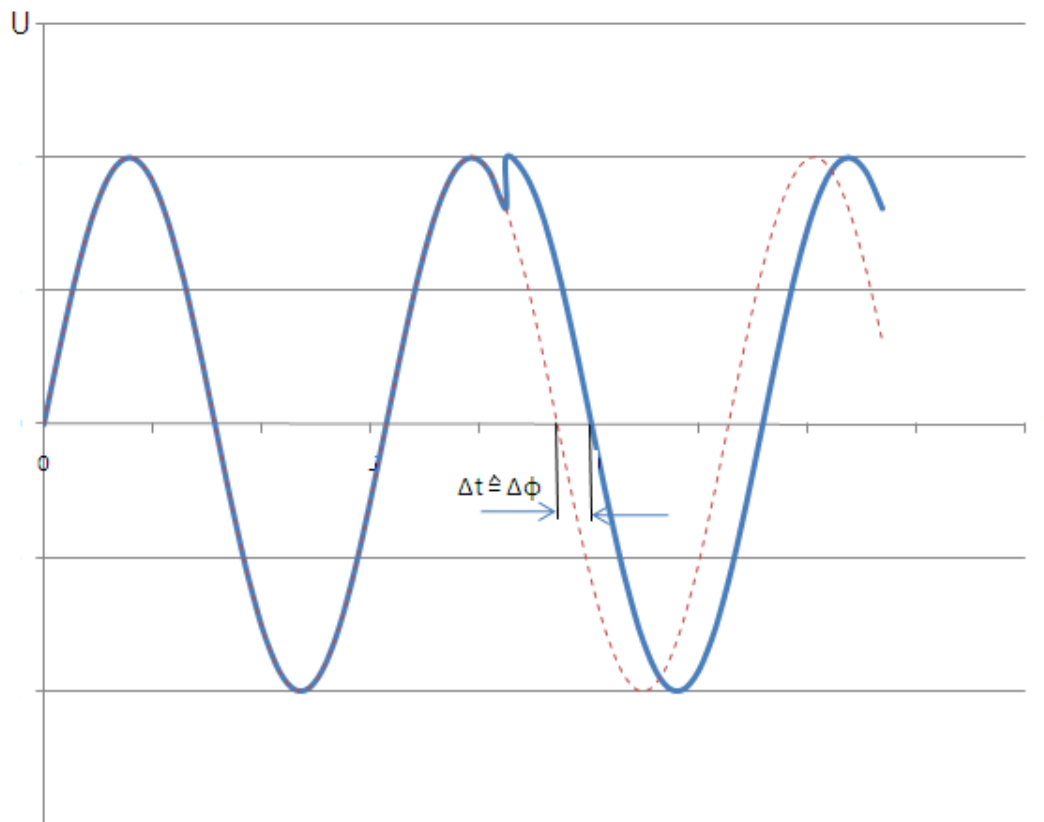
WRITE IOFUNC FD [OFF, OUTx] (OFF)
WRITE IOFUNC FD [OFF, OUTx] (OFF)

Grid monitoring

SELCO

Vector Shift

- Disconnection of the generator in case of short time interruptions of the grid.



- Detection of zero crossings
- Comparison of expected zero crossing with actual zero crossing
- Trip of breaker in case change zero crossing is shifted more than a certain setpoint [°] (degrees)

WRITE PROTECT VS ENABLED [YES, NO] (NO)
WRITE PROTECT VS LEVEL [0.0 – 20.0] (2.0)

WRITE IOFUNC VS [OFF, OUTx] (OFF)
WRITE IOFUNC VS [OFF, OUTx] (OFF)

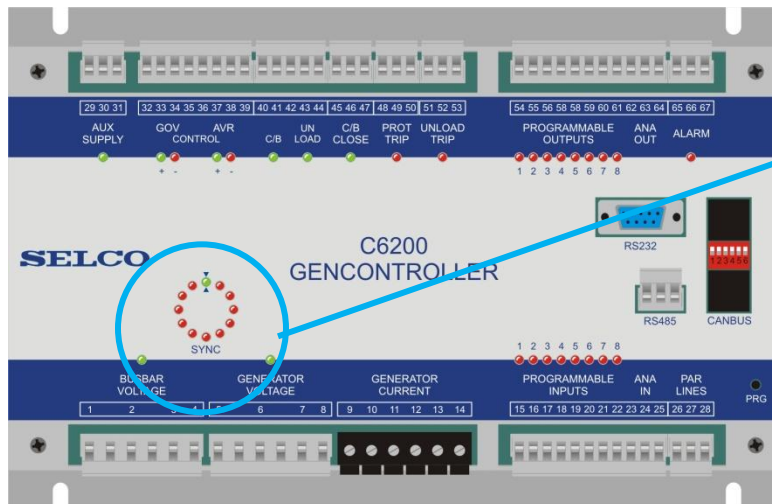
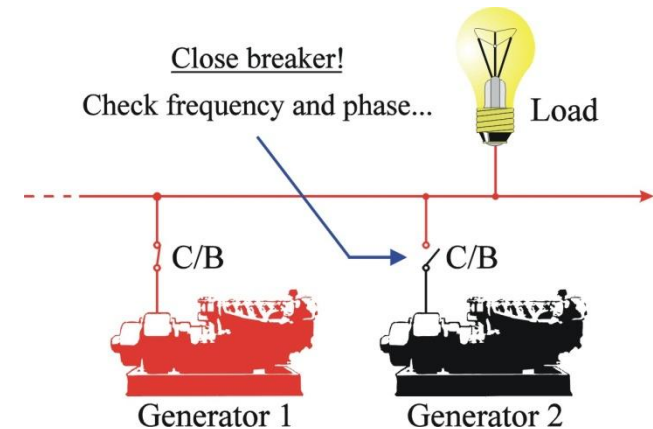
Auto-Synchronization

SELCO

Aim is to match frequency (speed),
phase (position). Voltage is "matched"
by voltage matching function.

C6200 can maintain synchronization
without closing the breaker.

WRITE AUTOSYNC DBCLOSE [YES, NO] (NO)
WRITE AUTOSYNC GAIN [1.0-20.0] (2.0)
WRITE AUTOSYNC DELAY [0 - 5000] (10)
WRITE AUTOSYNC SYNCTIME [1 - 1000] (60)
WRITE AUTOSYNC CBCLOSETIME [1 - 1000] (80)
WRITE AUTOSYNC CHKSYNC [YES, NO] (NO)



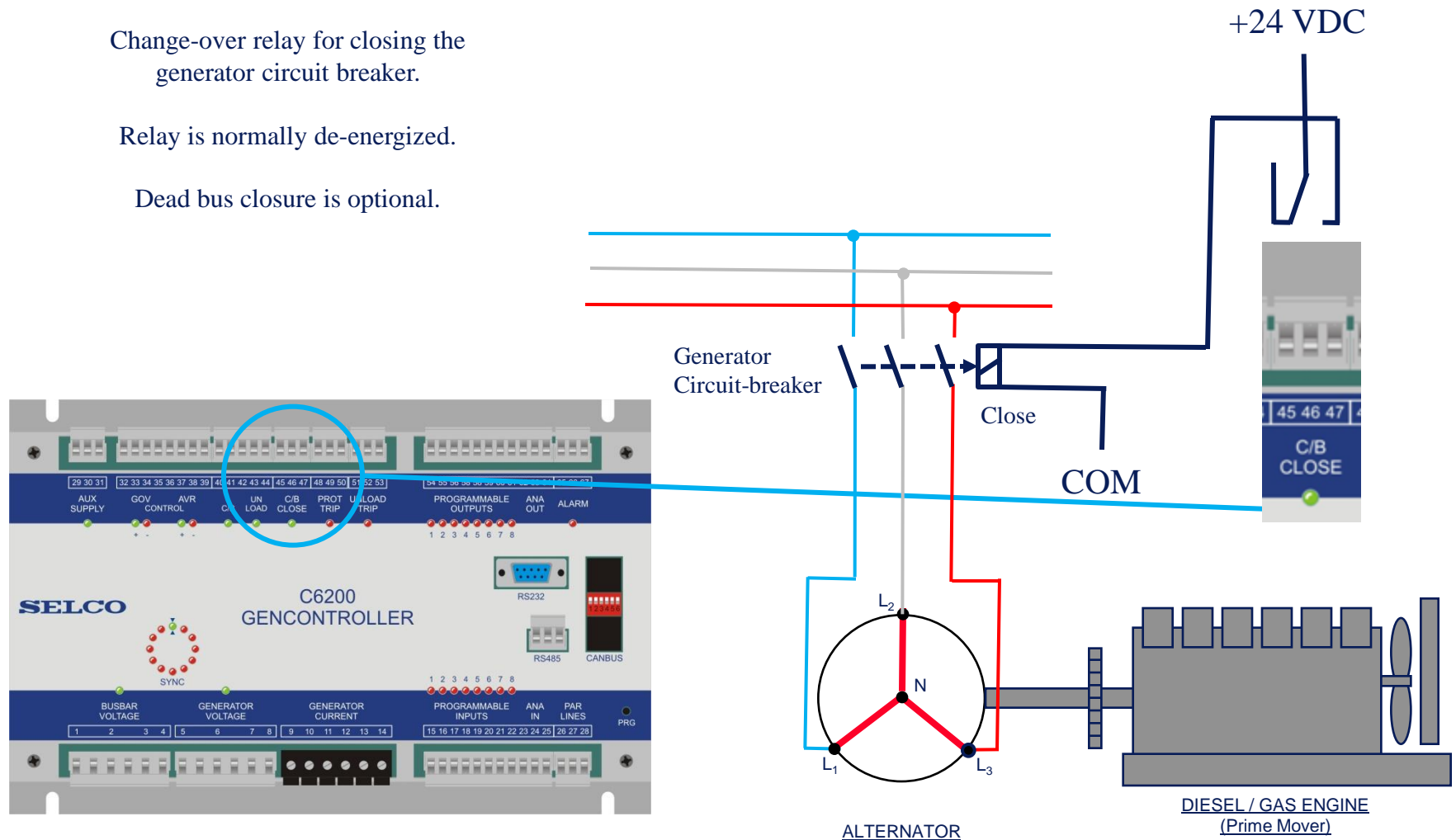
Circuit Breaker Closure

SELCO

Change-over relay for closing the generator circuit breaker.

Relay is normally de-energized.

Dead bus closure is optional.



Load Sharing / Parallel Lines

SELCO

Load balance (active and/or reactive) is communicated using a DC-voltage between -6 and 6 VDC. Voltage span can be configured to match e.g. T4800 or T4400 (0-1 / 0-3 VDC).

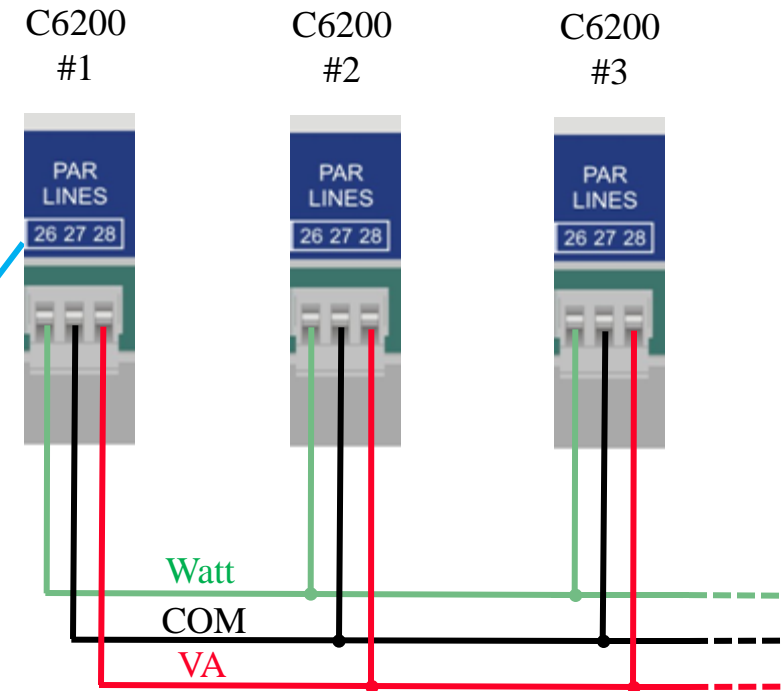
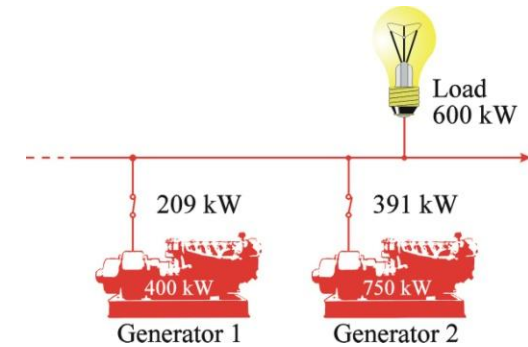
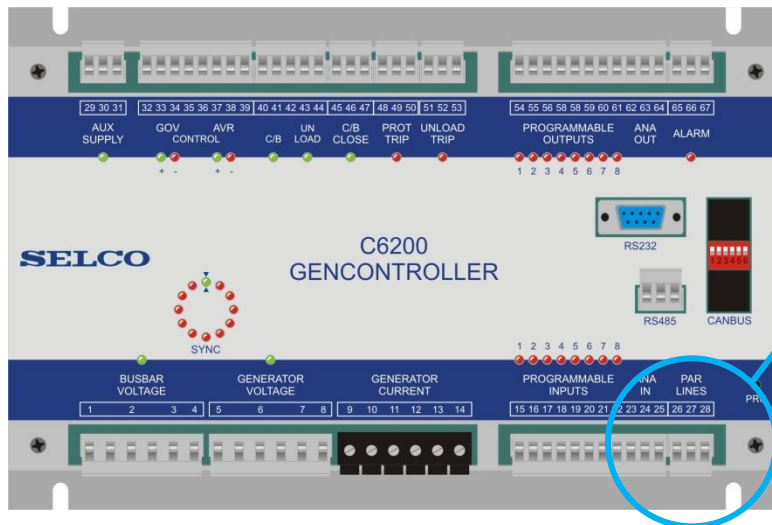
COM is reference.

WRITE ACTLS PARLINES VOLTMIN [-6.0 – 6.0] (0.0)

WRITE ACTLS PARLINES VOLTMAX [-6.0 – 6.0] (6.0)

WRITE REACTLS PARLINES VOLTMIN [-6.0 – 6.0] (0.0)

WRITE REACTLS PARLINES VOLTMAX [-6.0 – 6.0] (6.0)



Unload Trip

SELCO

Change-over relay for opening the Breaker after unload of active and/or reactive load.

Relay is normally de-energized but can be configured for normally energized operation as well.

By Ramp...

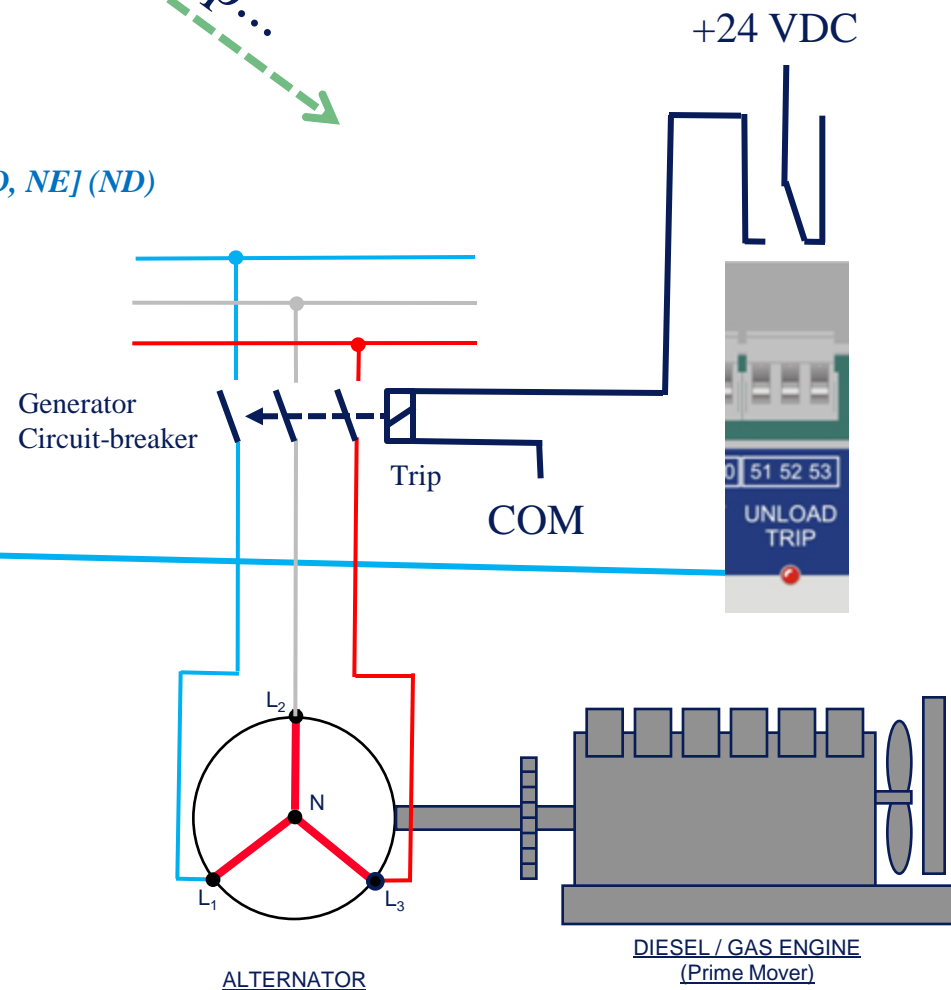
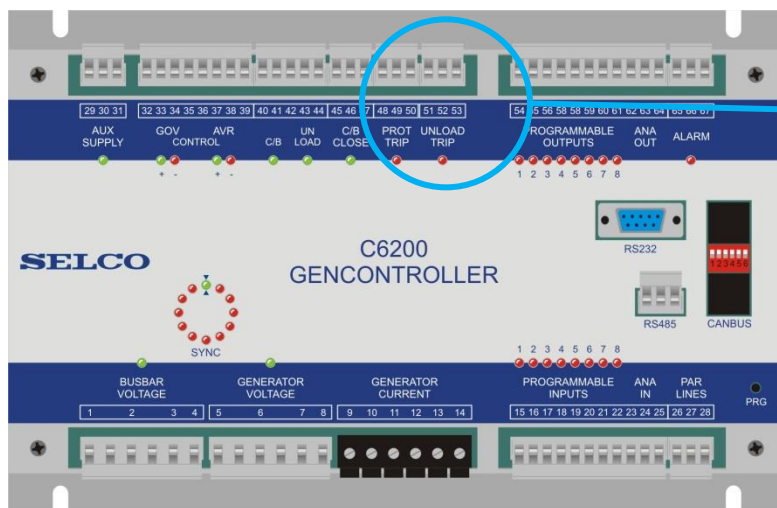
WRITE RELAYS UNLOADTRIPRELAY CONTACT [ND, NE] (ND)

WRITE ACTLS RAMPTIME [1 - 100] (20)

WRITE ACTLS CBTRIPLEVEL [1 - 50] (5)

WRITE REACTLS RAMPTIME [1 - 100] (20)

WRITE REACTLS CBTRIPLEVEL [1 - 50] (5)



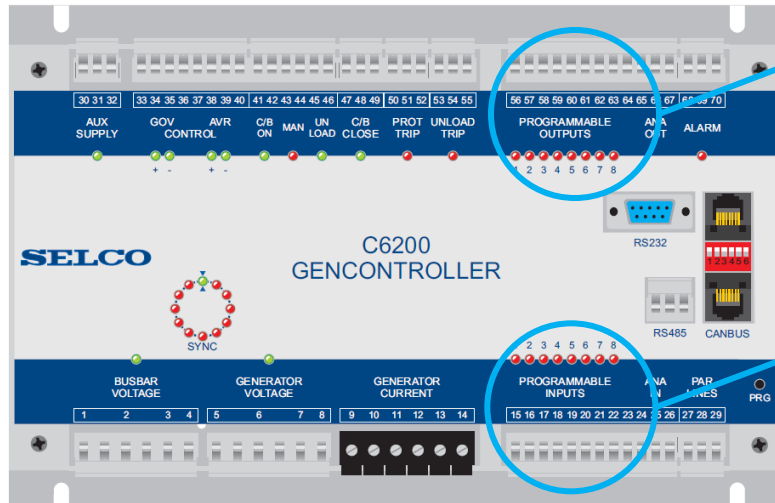
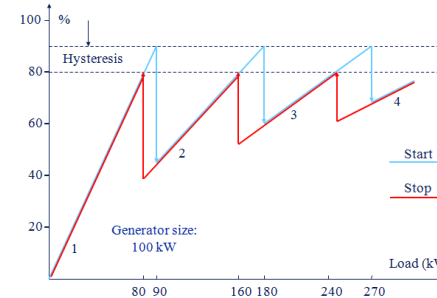
Load Depending Start/Stop

SELCO

No Master Module Needed!

WRITE LOADSTARTSTOP ENABLED YES
 WRITE LOADSTARTSTOP STARTLEVEL 80
 WRITE LOADSTARTSTOP STARTDELAY 10
 WRITE LOADSTARTSTOP STOPLEVEL 60
 WRITE LOADSTARTSTOP STOPDELAY 10

WRITE IOFUNC GENSTARTIO OFF, OUT1
 WRITE IOFUNC GENSTOPIO OFF, OUT2
 WRITE IOFUNC LOADSTARTSTOPENABLE OFF
 WRITE IOFUNC 1STANDBYINDICATION OUT3
 WRITE IOFUNC LIGHTLOADCANCEL OFF, IN1
 WRITE IOFUNC LIGHTLOADINDICATION OUT5
 WRITE IOFUNC HIGHLOADINDICATION OUT4



- Start Generator
- Stop Generator
- Stand-by (Next to start)
- High Load (Pre-warn.)
- Light Load Cancel
(Only Start, no Stop)



Light
Load Cancel
(Only Start, no Stop)

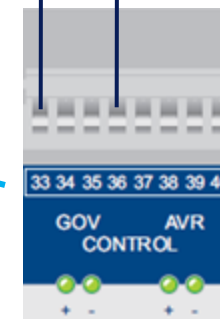
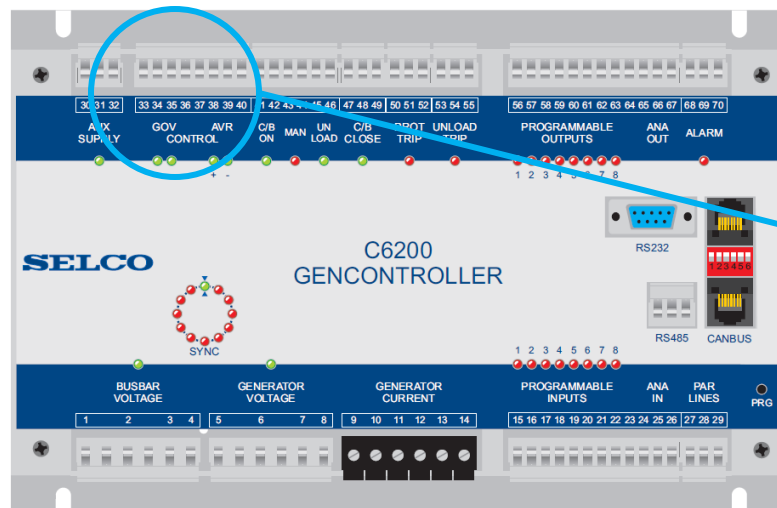
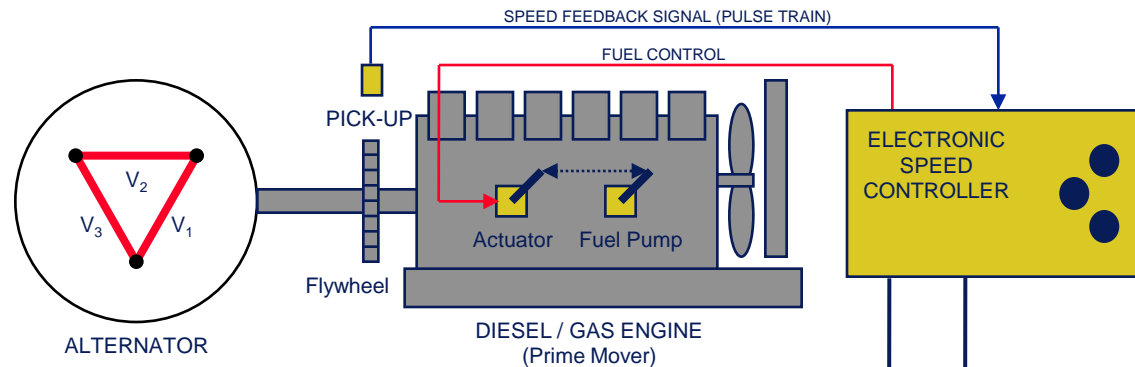
Priority
Selector Switch
(1-2-3-4)

If no. of Priorities > 4:
 5 = IN5 + IN8 to COM
 6 = IN6 + IN8 to COM
 7 = IN7 + IN8 to COM
 Etc.

Controlling RPM/f by VDC

SELCO

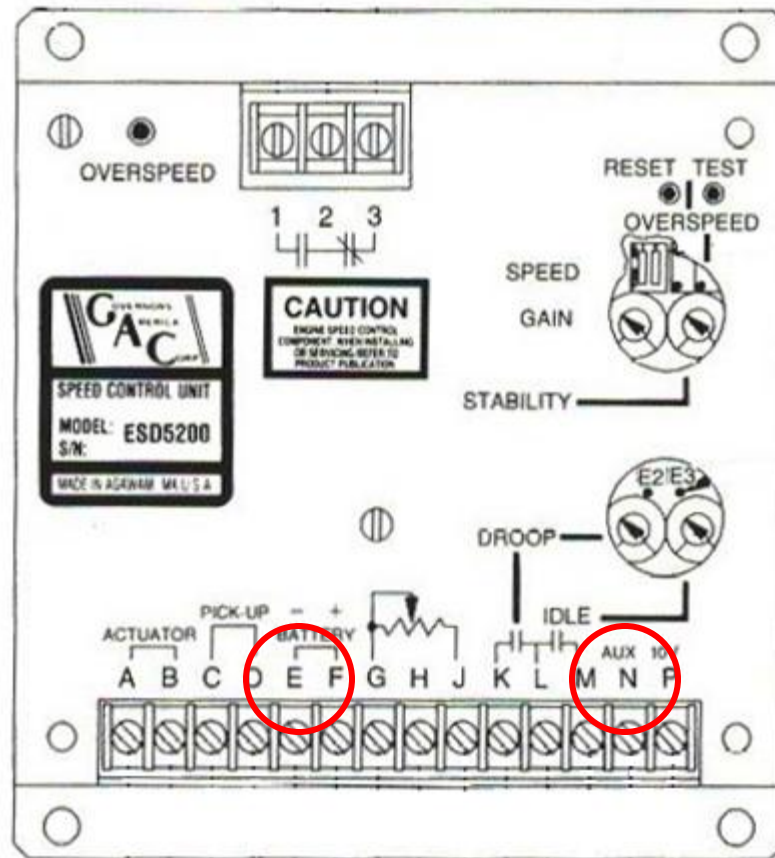
WRITE SYS SPEEDCTRL ENABLED *YES*
WRITE SYS SPEEDCTRL ANAOUT SIGNAL *VOLT*
WRITE SYS SPEEDCTRL ANAOUT VOLTMIN *10.000*
WRITE SYS SPEEDCTRL ANAOUT VOLTMAX *0.000*



Electronic Governors with Voltage inputs

SELCO

GAC ESD5200
(other GAC ESD series are similar in interfacing)



External control by DC voltage!

C6200 terminal 32 to Governor E (BATT NEGATIVE)
C6200 terminal 35 to Governor N (AUX)

WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL VOLT
WRITE SYS SPEEDCTRL ANAOUT VOLTMIN 10.0
WRITE SYS SPEEDCTRL ANAOUT VOLTMAX 0.0

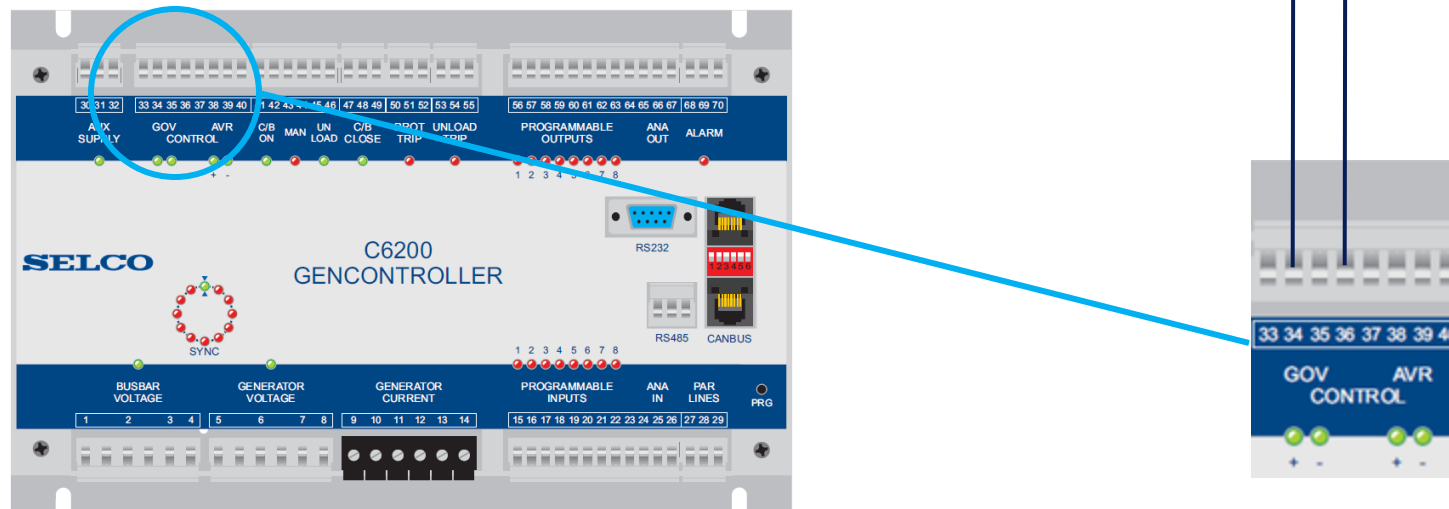
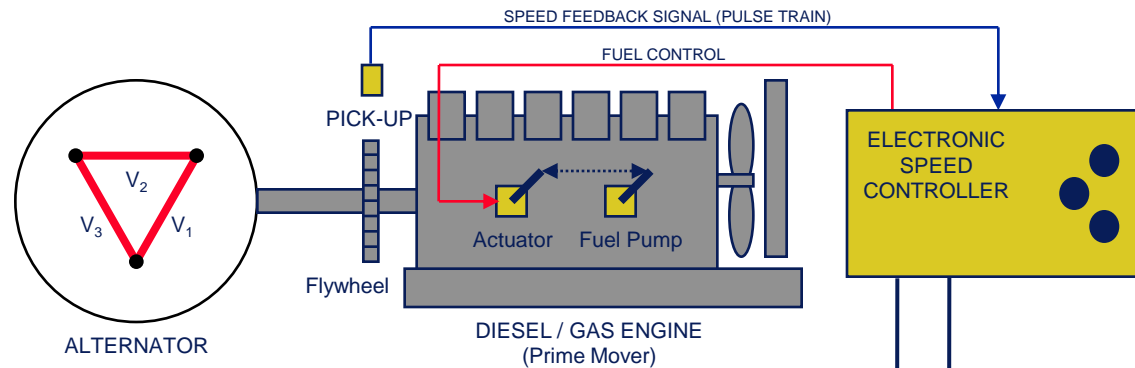
1. GAIN can affect stability after large fluctuations in load. Make sure that governor control is stable before connecting C6200.
2. Readjust SPEED setting after connecting the C6200 to the AUX input (while generator is running with out connection to the busbar).
3. Potentiometer (SPEED TRIM) input can be used as fall-back in conjunction with SELCO E7800.

Interfacing to other GAC ESD type governors are similar.

Controlling RPM/f by mA

SELCO

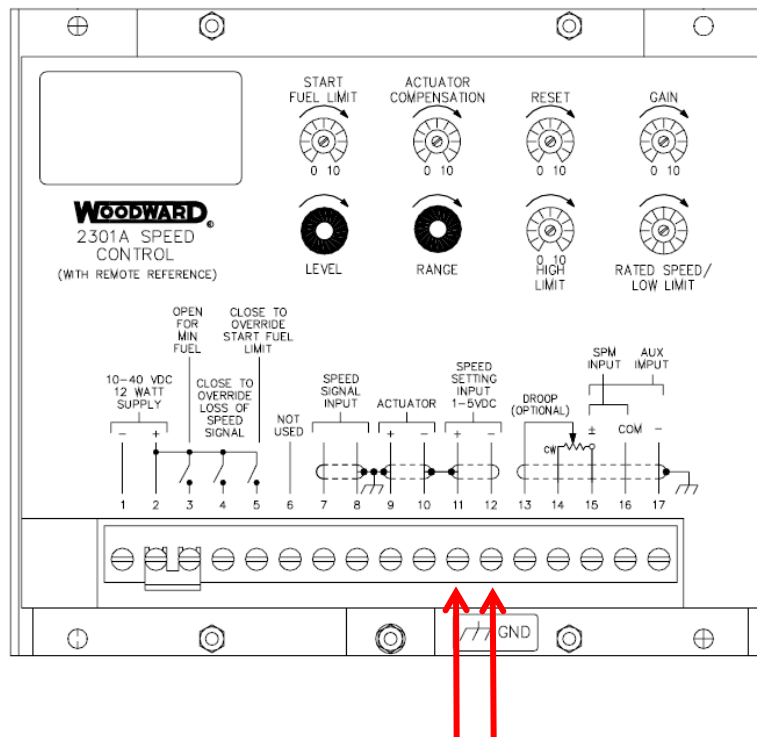
WRITE SYS SPEEDCTRL ENABLED *YES*
WRITE SYS SPEEDCTRL ANAOUT SIGNAL *CUR*
WRITE SYS SPEEDCTRL ANAOUT CURMIN *4.000*
WRITE SYS SPEEDCTRL ANAOUT CURMAX *20.000*



Electronic Governors with Current inputs

SELCO

Woodward 2301 A Speed Control
(version with 4-20 mA / 1-5 V speed set)



External control by DC current!

C6200 terminal 32 to Governor 12 (-)

C6200 terminal 34 to Governor 11 (+)

WRITE SYS SPEEDCTRL ENABLED *YES*

WRITE SYS SPEEDCTRL ANAOUT SIGNAL CUR

WRITE SYS SPEEDCTRL ANAOUT CURMIN 4.0

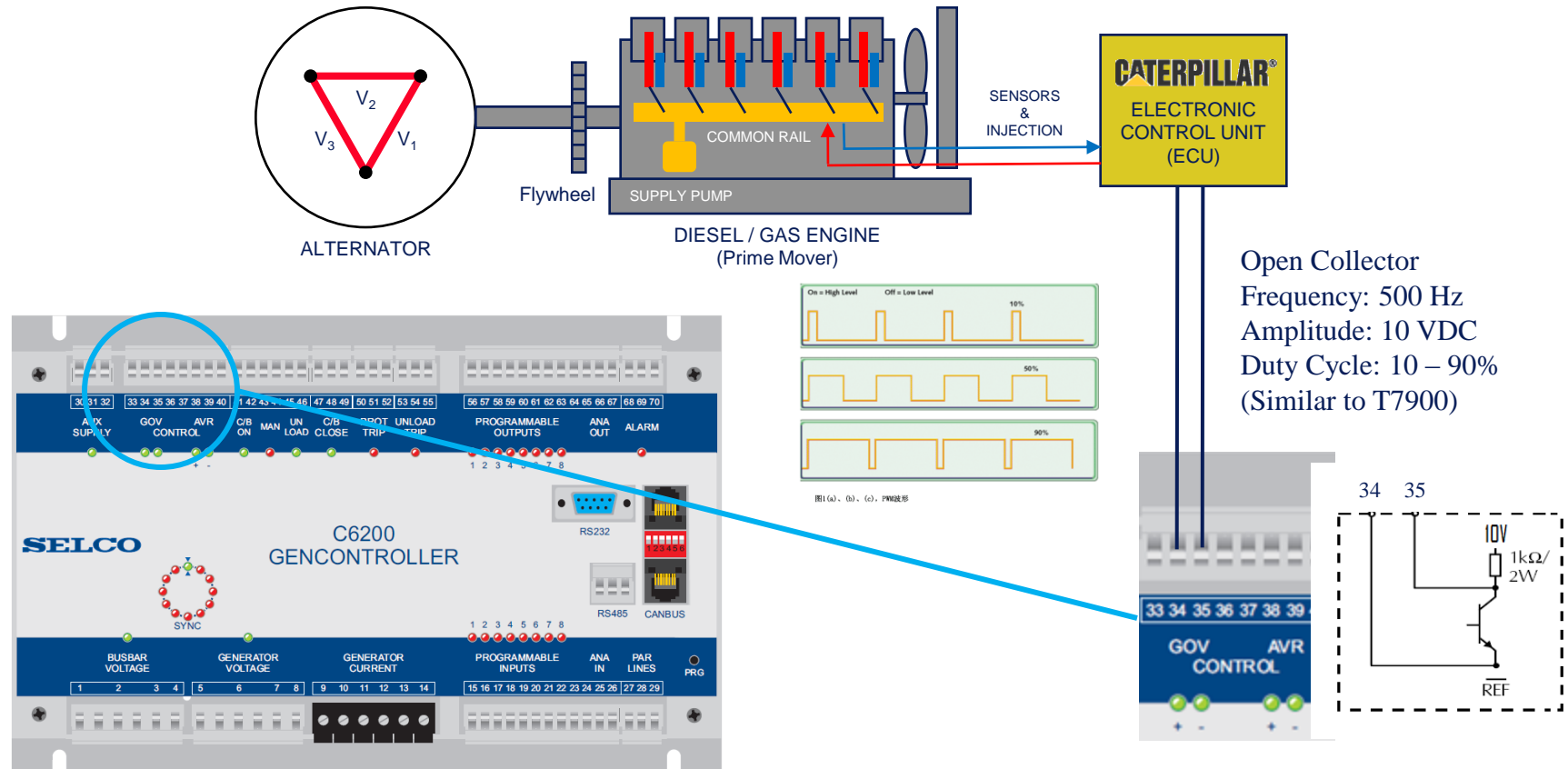
WRITE SYS SPEEDCTRL ANAOUT CURMAX 20.0

Controlling RPM/f by PWM

SELCO

WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL PWM
WRITE SYS SPEEDCTRL PWMOUT FREQ 500

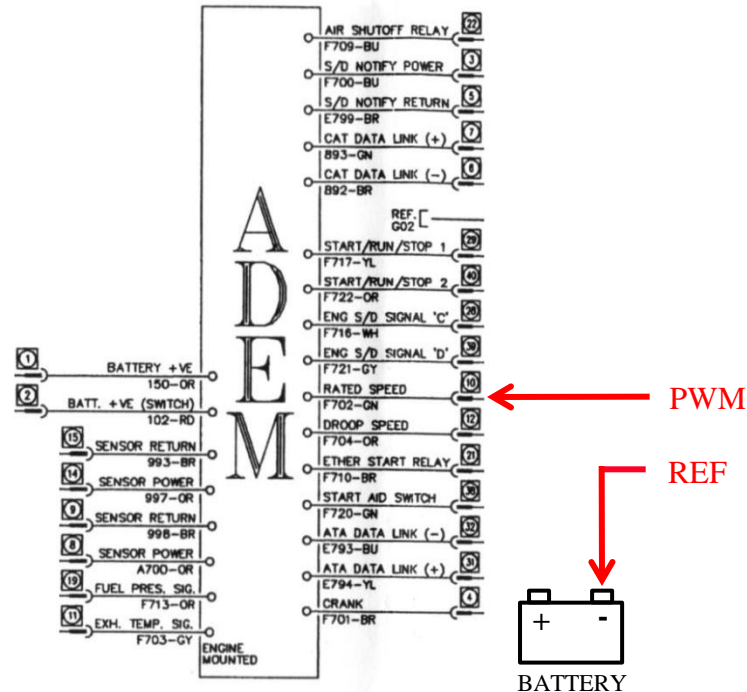
Open Collector / Amplitude 0-10 VDC



Governor Systems with 500 Hz PWM input

SELCO

Caterpillar ADEM

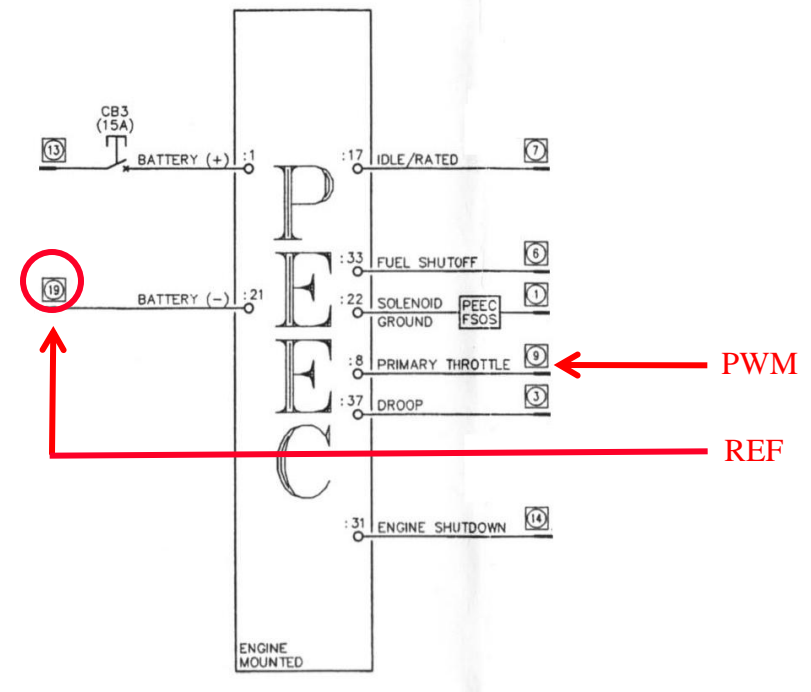


External control by PWM signal of ADEM!

C6200 terminal 32 to BATTERY -
C6200 terminal 33 to ADEM 10 (RATED SPEED)

WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL PWM
WRITE SYS SPEEDCTRL PWMOUT FREQ 500

Caterpillar PEEC



External control by PWM signal of PEEC!

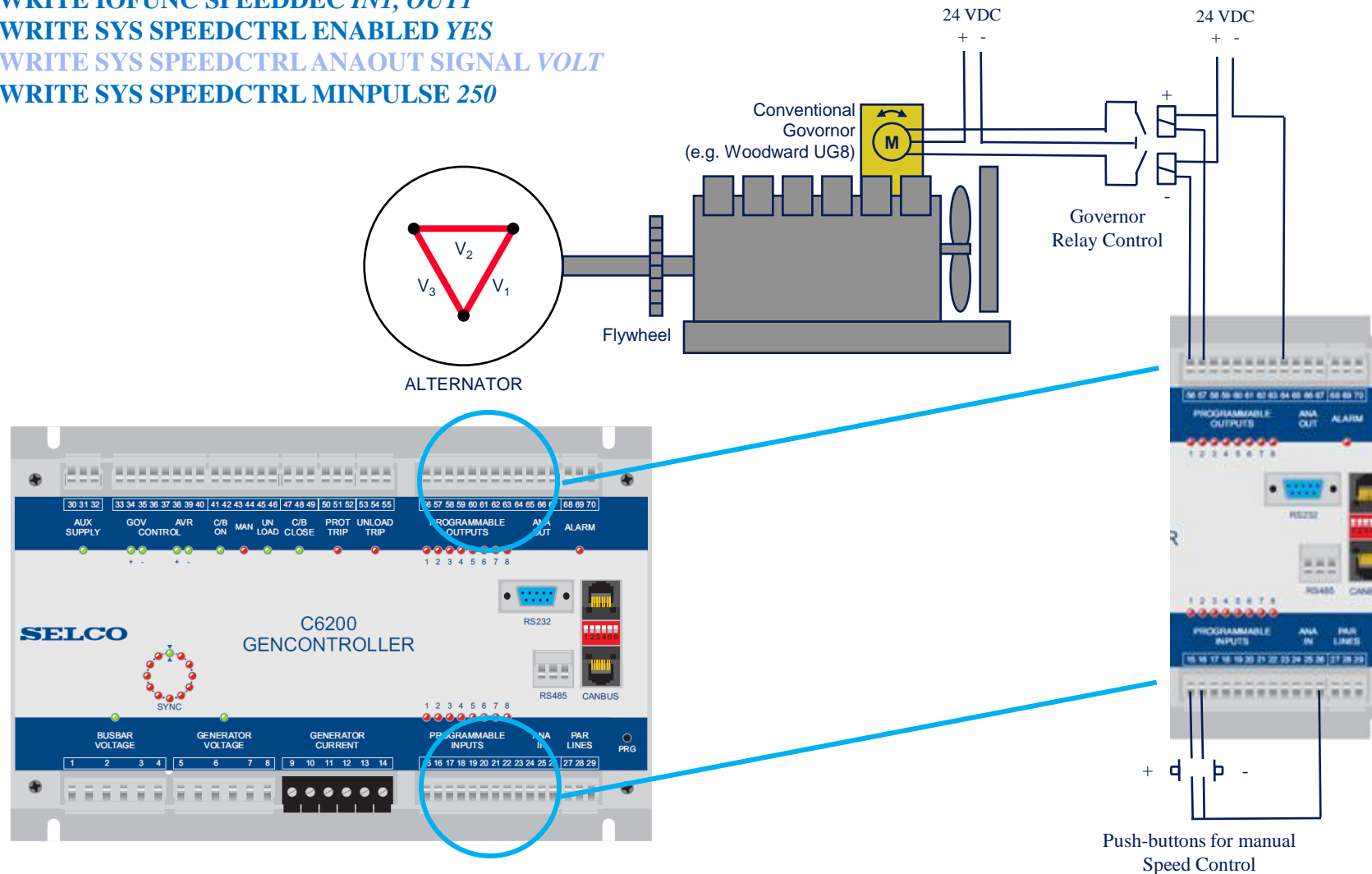
C6200 terminal 32 to PEEC 19 (BATTERY -)
C6200 terminal 33 to PEEC 9 (PRIMARY THROTTLE)

WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL PWM
WRITE SYS SPEEDCTRL PWMOUT FREQ 500

Controlling RPM/f by Relays

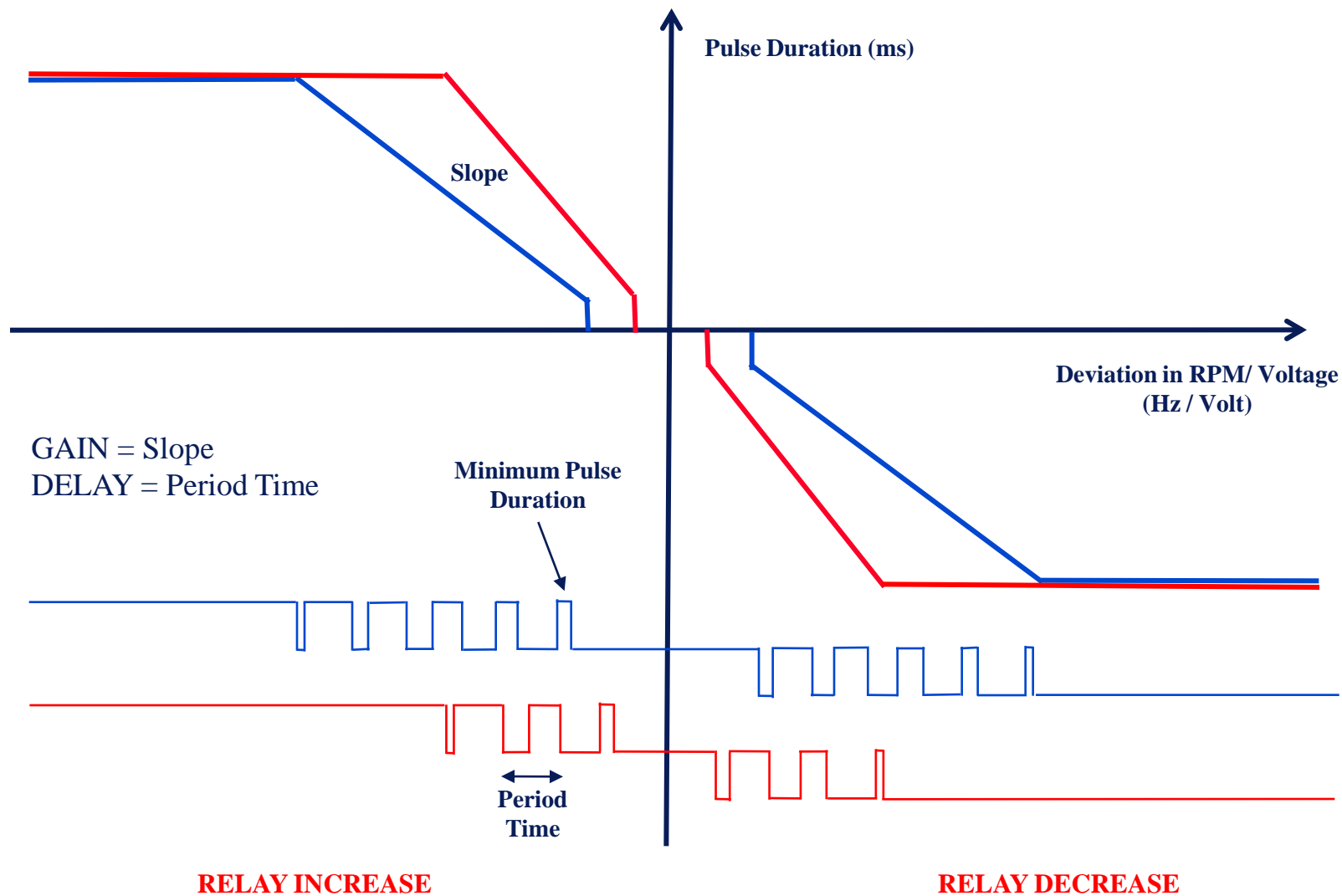
SELCO

WRITE IOFUNC SPEEDINC IN2, OUT2
WRITE IOFUNC SPEEDDEC IN1, OUT1
WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL VOLT
WRITE SYS SPEEDCTRL MINPULSE 250



Relay Control of RPM / Volt

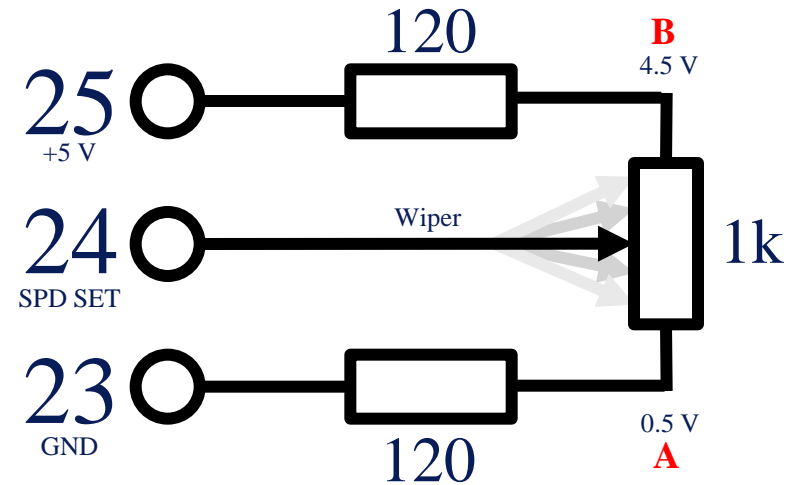
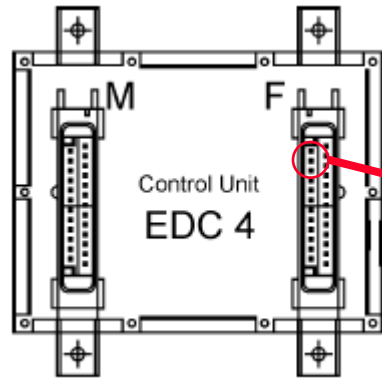
SELCO



Fuel Injection Systems (ECU) with Speed Trim Pot-meters

SELCO

Volvo Penta EDC 4 / Deutz EMR



External control by speed trim potentiometer!

Voltage between A and 23 = 0.5 VDC (1.380 RPM)

Voltage between B and 23 = 4.5 VDC (1.620 RPM)

0.5 to 4.5 VDC = 1.380 to 1.620 RPM

C6200 terminal 32 to ECU 23 (GND)

C6200 terminal 35 to ECU 24 (WIPER)

```
WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL VOLT
WRITE SYS SPEEDCTRL ANAOUT VOLTMIN 0.5
WRITE SYS SPEEDCTRL ANAOUT VOLTMAX 4.5
```

The two 120 Ohm resistors are for circuit check of the external throttle control wiring. Omitting these (going outside 0.5 to 4.5 V) will make the ECU throw an error code.

1. Where is the reference for the wiper?
2. What are the lower and upper limits of the wiper?
3. Which voltage span would I need to suit my purpose?
4. Is the ECU configured to external speed control?
5. PID settings of the ECU regulation can affect stability after large fluctuations in load.

Electronic Governors with Speed Trim Pot-meters

SELCO

Cummins EFC
(Woodward / Barbar-Colman DYN1)



External control by speed trim potentiometer!

Voltage between 7 and 2 = 3.5 VDC (600 RPM)

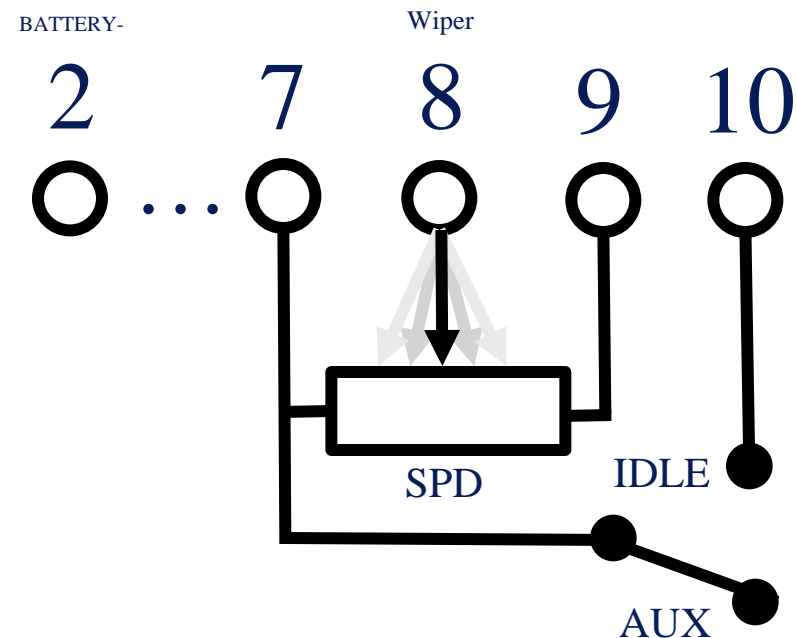
Voltage between 9 and 2 = 7.2 VDC (2.100 RPM)

4.7 to 6.2 VDC = 1.000 to 1.860 RPM

C6200 terminal 32 to Governor 2 (BATTERY-)

C6200 terminal 35 to Governor 8 (WIPER)

```
WRITE SYS SPEEDCTRL ENABLED YES
WRITE SYS SPEEDCTRL ANAOUT SIGNAL VOLT
WRITE SYS SPEEDCTRL ANAOUT VOLTMIN 4.7
WRITE SYS SPEEDCTRL ANAOUT VOLTMAX 6.2
```



1. Where is the reference for the wiper?
2. What is the lower and upper limits of the wiper?
3. Which voltage span would I need to suit my purpose?
4. RUN SPD settings can affect the settings!
5. GAIN can affect stability after large fluctuations in load.

Six PI-Regulators

SELCO

Step by Step tuning....

1. Breaker is open (or only generator on busbar)

1. Maintain frequency at nominal level by adjusting the speed (RPM) by the governor
2. Maintain voltage at nominal level by adjusting the excitation by the AVR

2. Breaker is open and busbar is live

1. Match voltage to busbar (within Voltage OK Window)
2. Auto-synchronize by speed adjustment on governor
3. Close Breaker when voltage, phase and frequency deviation is acceptable

3. Breaker is closed and busbar is live

1. Maintain frequency at 50/60 Hz by adjusting the speed (RPM) by the governor
2. Maintain voltage at e.g. 400 VAC by adjusting the excitation by the AVR
3. Share the active (Watt) load by adjusting the speed (RPM) by the governor
4. Share the reactive (VA) load by adjusting the excitation by the AVR

1. WRITE FREQSTAB GAIN [1.0 – 20.0] (4.0)
WRITE FREQSTAB DELAY [0 – 5000] (10)

WRITE VOLTSTAB GAIN [1.0 – 20.0] (1.0)
WRITE VOLTSTAB DELAY [0 – 5000] (10)

2. WRITE VOLTMATCH GAIN [1.0 – 20.0] (1.0)
WRITE VOLTMATCH DELAY [0 – 5000] (10)

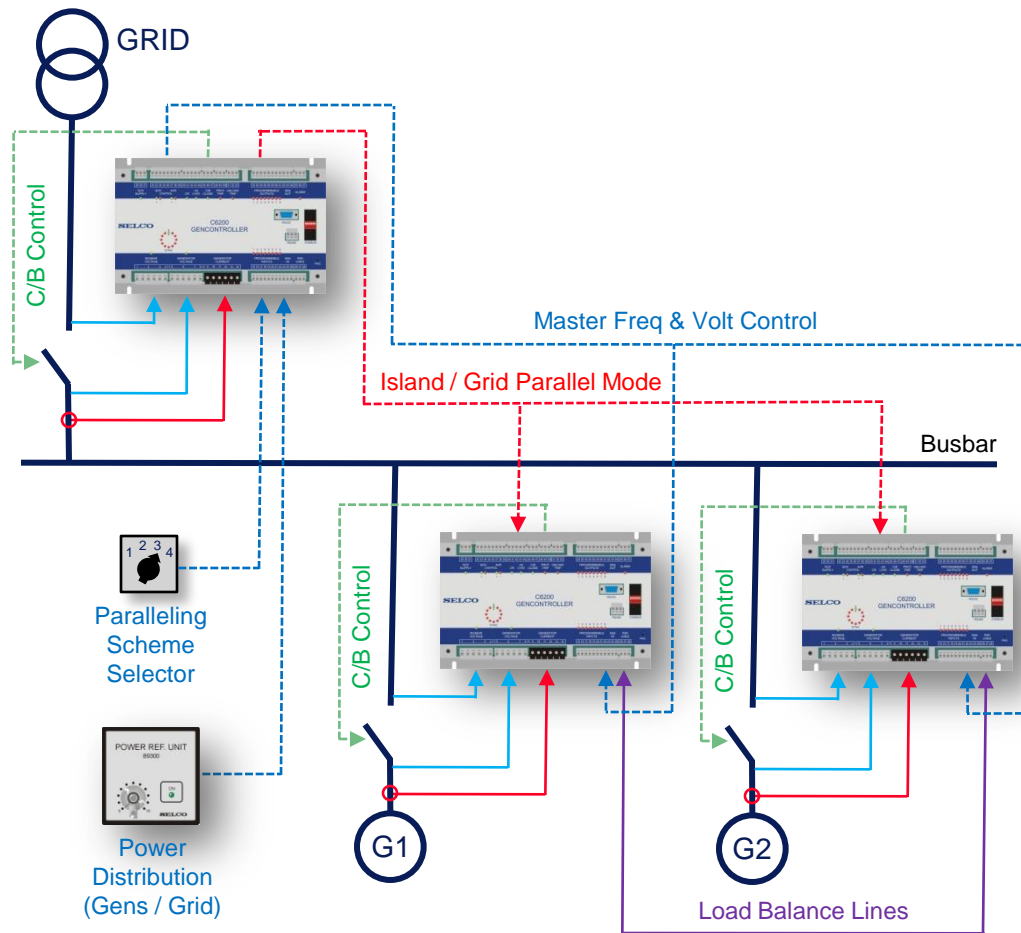
WRITE AUTOSYNC DBCLOSE [YES, NO] (NO)
WRITE AUTOSYNC GAIN [1.0-20.0] (2.0)
WRITE AUTOSYNC DELAY [0 – 5000] (10)
WRITE AUTOSYNC SYNCTIME [1 - 1000] (60)
WRITE AUTOSYNC CBCLOSETIME [1 – 1000] (80)
WRITE AUTOSYNC CHKSYNC [YES, NO] (NO)

3. WRITE ACTLS GAIN [1.0 – 20.0] (1.0)
WRITE ACTLS DELAY [0 – 5000] (10)
WRITE ACTLS RAMPTIME [1 - 100] (20)
WRITE ACTLS LOADDEV [-100 – 100] (0)
WRITE ACTLS CBTRIPLELEVEL [1 – 50] (5)
WRITE ACTLS PARLINES VOLTMIN [-6.0 – 6.0] (0.0)
WRITE ACTLS PARLINES VOLTMAX [-6.0 – 6.0] (6.0)

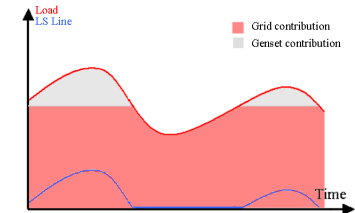
WRITE REACTLS GAIN [1.0 – 20.0] (1.0)
WRITE REACTLS DELAY [0 – 5000] (10)
WRITE REACTLS RAMPTIME [1 - 100] (20)
WRITE REACTLS LOADDEV [-100 – 100] (0)
WRITE REACTLS CBTRIPLELEVEL [1 – 50] (5)
WRITE REACTLS PARLINES VOLTMIN [-6.0 – 6.0] (0.0)
WRITE REACTLS PARLINES VOLTMAX [-6.0 – 6.0] (6.0)

Grid Paralleling (Import/Export)

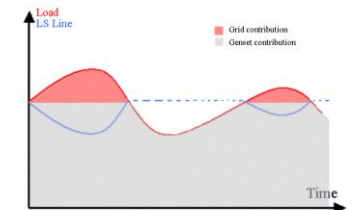
SELCO



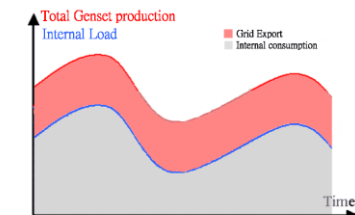
Fixed Import
(from Grid)



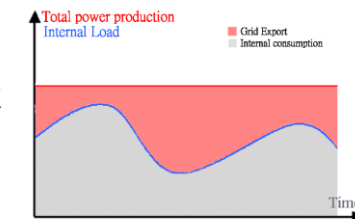
Peak Import
(from Grid)



Fixed Export
(from Gens)



Excess Export
(from Gens)



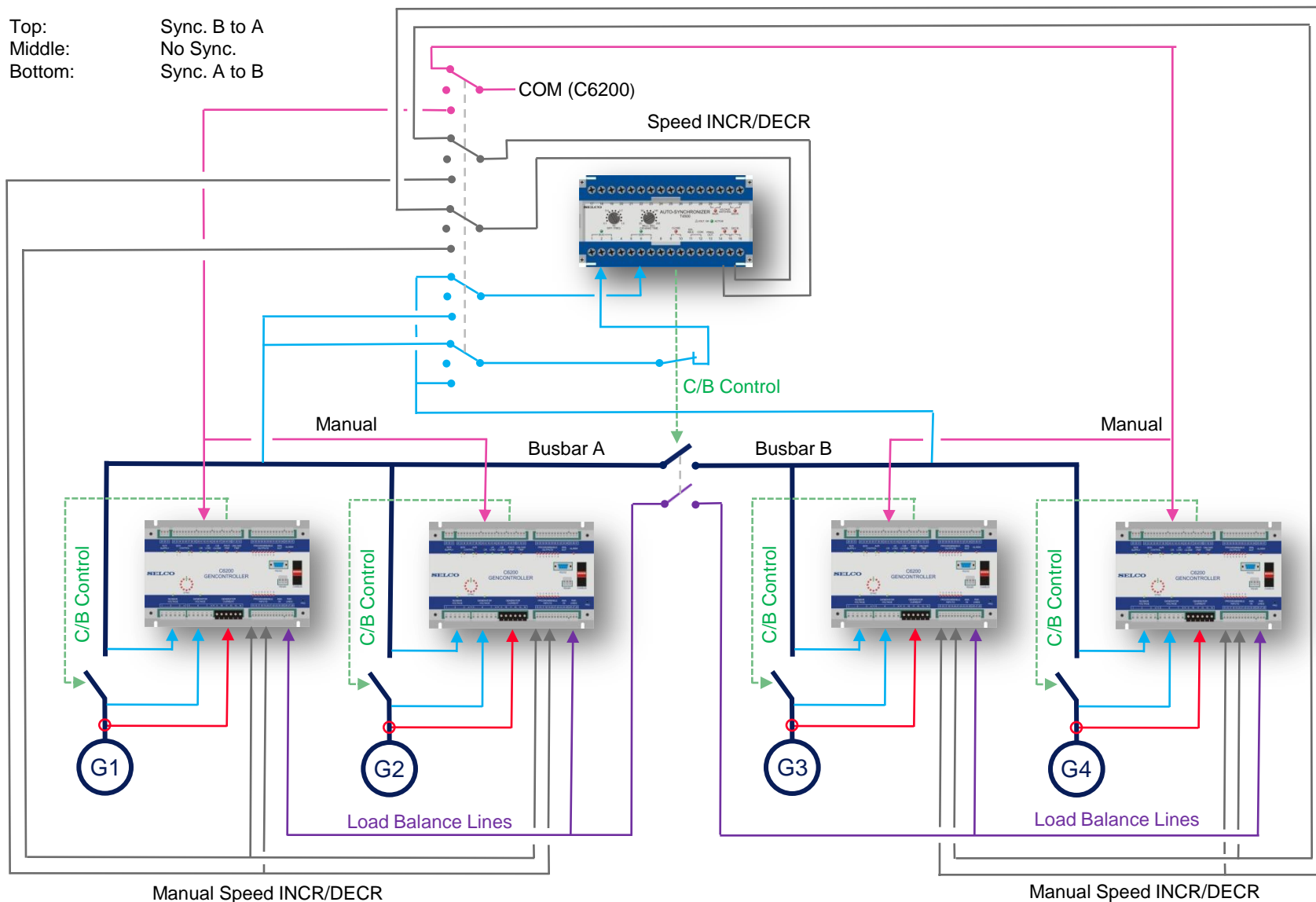
WRITE IMPORTEXPORT SCHEME [DISABLED, FIXEDIMPORT, PEAKIMPORT, FIXEDEXPORT, EXCESSEXPORT] (DISABLED)
 WRITE IMPORTEXPORT VALUE [1 – 100] (25)
 WRITE IMPORTEXPORT MODE [LS, PF] (LS)

Tie breaker Auto-Sync using T4500

SELCO

Selector Switch Position

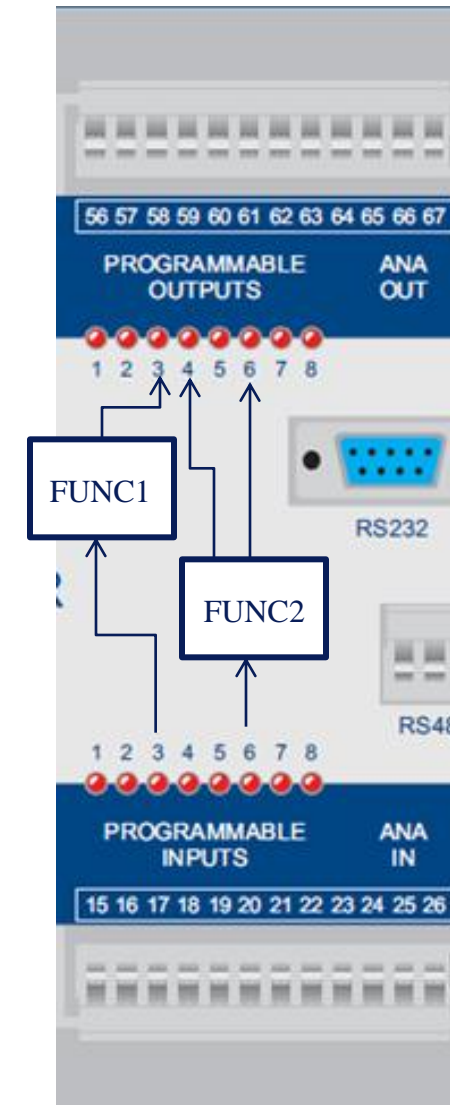
Top: Sync. B to A
Middle: No Sync.
Bottom: Sync. A to B



Programmable Functions +++

SELCO

WRITE IOFUNC **SPEEDINC** *IN_x, OUT_x*
WRITE IOFUNC **SPEEDDEC** *IN_x, OUT_x*
WRITE IOFUNC **VOLTINC** *IN_x, OUT_x*
WRITE IOFUNC **VOLTDEC** *IN_x, OUT_x*
WRITE IOFUNC **RP** *OUT_x*
WRITE IOFUNC **EL** *OUT_x*
WRITE IOFUNC **FD** *OUT_x*
WRITE IOFUNC **VS** *OUT_x*
WRITE IOFUNC **FREQSTAB** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **SYNC** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **ACTRAMPUP** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **ACTLS** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **VOLTSTAB** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **VOLTMATCH** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **REACTRAMPUP** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **REACTLS** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **PFCTRL** *IN_x, OUT_x, OUT_x (ALARM)*
WRITE IOFUNC **GENSTARTIO** *IN_x, OUT_x*
WRITE IOFUNC **GENSTOPIO** *IN_x, OUT_x*
WRITE IOFUNC **LOADSTARTSTOPENABLE** *IN_x*
WRITE IOFUNC **1STANDBYINDICATION** *OUT_x*
WRITE IOFUNC **LIGHTLOADCANCEL** *IN_x*
WRITE IOFUNC **LIGHTLOADINDICATION** *OUT_x*
WRITE IOFUNC **HIGHLOADINDICATION** *OUT_x*
WRITE IOFUNC **FIXEDIMP** *IN_x*
WRITE IOFUNC **PEAKIMP** *IN_x*
WRITE IOFUNC **FIXEDEXP** *IN_x*
WRITE IOFUNC **EXCESSEXP** *IN_x*
WRITE IOFUNC **FVDISABLE** *OUT_x*

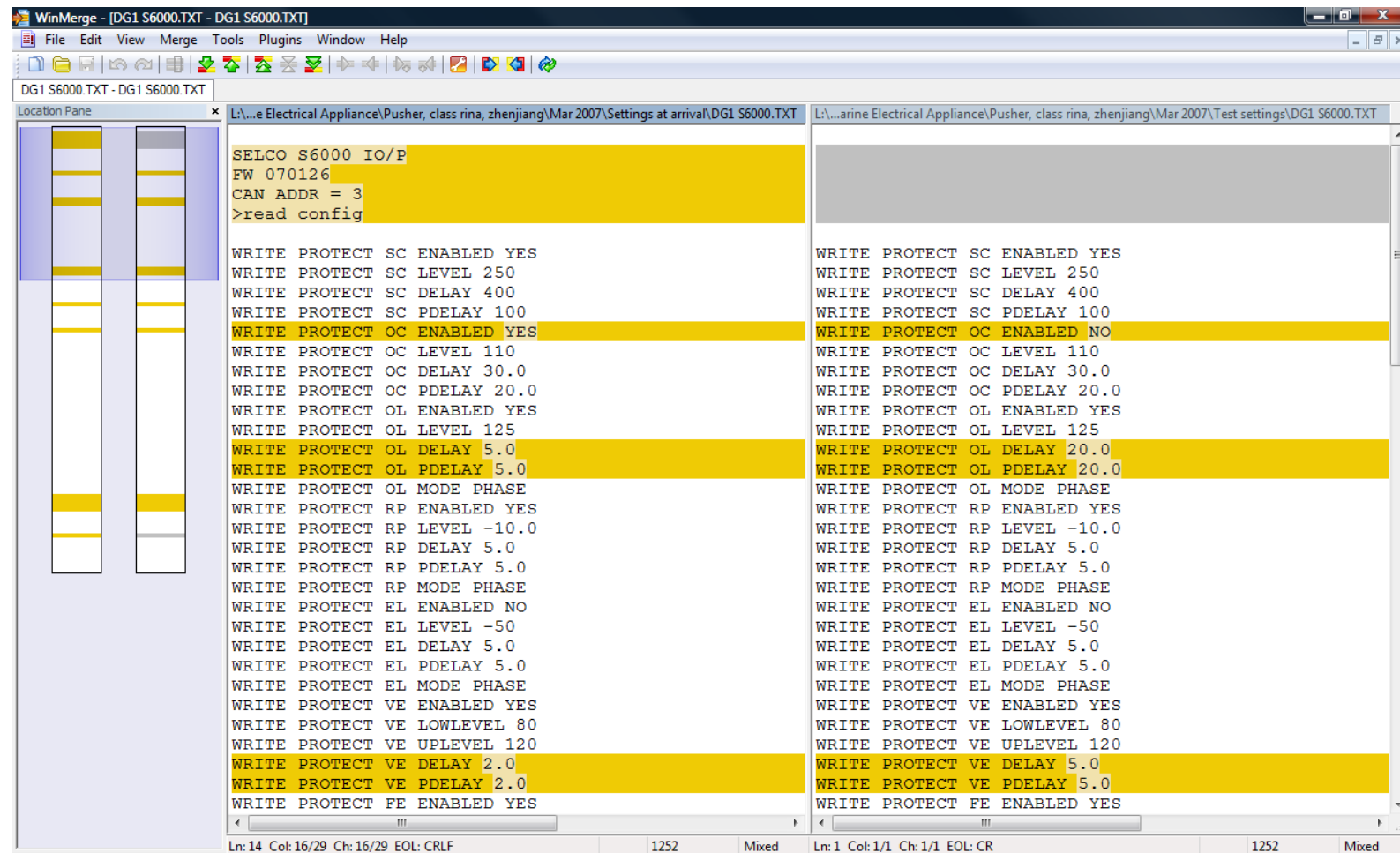


OR relation between functions sharing inputs and/or outputs!

Comparing configuration files

<http://winmerge.org/>

SELCO



WinMerge - [DG1 S6000.TXT - DG1 S6000.TXT]

File Edit View Merge Tools Plugins Window Help

DG1 S6000.TXT - DG1 S6000.TXT

Location Pane

L:\...e Electrical Appliance\Pusher, class rina, zhenjiang\Mar 2007\Settings at arriva\DG1 S6000.TXT

L:\...arine Electrical Appliance\Pusher, class rina, zhenjiang\Mar 2007\Test settings\DG1 S6000.TXT

```
SELCO S6000 IO/P
FW 070126
CAN ADDR = 3
>read config

WRITE PROTECT SC ENABLED YES
WRITE PROTECT SC LEVEL 250
WRITE PROTECT SC DELAY 400
WRITE PROTECT SC PDELAY 100
WRITE PROTECT OC ENABLED YES
WRITE PROTECT OC LEVEL 110
WRITE PROTECT OC DELAY 30.0
WRITE PROTECT OC PDELAY 20.0
WRITE PROTECT OL ENABLED YES
WRITE PROTECT OL LEVEL 125
WRITE PROTECT OL DELAY 5.0
WRITE PROTECT OL PDELAY 5.0
WRITE PROTECT OL MODE PHASE
WRITE PROTECT RP ENABLED YES
WRITE PROTECT RP LEVEL -10.0
WRITE PROTECT RP DELAY 5.0
WRITE PROTECT RP PDELAY 5.0
WRITE PROTECT RP MODE PHASE
WRITE PROTECT EL ENABLED NO
WRITE PROTECT EL LEVEL -50
WRITE PROTECT EL DELAY 5.0
WRITE PROTECT EL PDELAY 5.0
WRITE PROTECT EL MODE PHASE
WRITE PROTECT VE ENABLED YES
WRITE PROTECT VE LOWLEVEL 80
WRITE PROTECT VE UPLEVEL 120
WRITE PROTECT VE DELAY 2.0
WRITE PROTECT VE PDELAY 2.0
WRITE PROTECT FE ENABLED YES
```

Ln: 14 Col: 16/29 Ch: 16/29 EOL: CRLF 1252 Mixed

Ln: 1 Col: 1/1 Ch: 1/1 EOL: CR 1252 Mixed