SELCO

C6200 FlexGen GENCONTROLLER

Configuration Manual

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1 Preface

The Littelfuse Selco C6200 FlexGen provides integrated protection, frequency stabilization, voltage stabilization, check and automatic synchronization, active and reactive load sharing, programmable inputs and outputs and data acquisition.

This manual describes the configuration of the C6200 FlexGen by the optional C6500 user interface module or by PC (RS232).

2 System Preparation

2.1 CAN Bus Address

The DIP-switch located on the right hand side of the C6200 FlexGen is used to set the CAN bus address. The CAN bus address is set as a binary value on the first 4 switches. Valid CAN bus addresses are 1 to 15.

The CAN bus address should be set according to the generator reference number.

It is advisable to assign address 1 to the first C6200 FlexGen, number 2 to the second C6200 FlexGen etc. A unique CAN bus address must be assigned to each C6200 FlexGen.

Please ensure that two or more C6200 FlexGen units do not have similar CAN bus addresses.

The binary system works on the principle described below.

- Switch 1 represents the decimal value 1
- Switch 2 represents the decimal value 2
- Switch 3 represents the decimal value 4
- Switch 4 represents the decimal value 8

Examples:

SW1	SW2	SW3	SW4	CAN Address
ON	OFF	OFF	OFF	1
OFF	ON	OFF	OFF	2
ON	ON	OFF	OFF	3
OFF	OFF	ON	OFF	4
ON	OFF	ON	OFF	5

As an example, the address 1 is assigned by setting switch 1 to ON and the remaining switches to OFF. Address 10 is assigned by setting switches 2 and 4 to ON and switches 1 and 3 to OFF. The decimal value corresponds to the sum of the ON switch values.

3 Auxiliary Commands

The C6200 FlexGen is configured using clear text commands. These commands are issued through the RS232 interface using either a PC based terminal emulator (TTY terminal) such as HyperTerminal. Littlefuse Selco also offers a specialized PC application called WinConfig.

The optional Littelfuse Selco C6500 user interface can also be used to monitor and configure the C6200 FlexGen.

The commands described in this section are used to read out the configuration, measurements and alarms. This section also describes how to switch the unit into write enabled mode.

The configuration itself is described in section 4.

3.1.1 Read Measurements

The following command show all measured and calculated parameters. Please note that the reading do not changes automatically. Retype the command to update the measurements.

READ MEAS

3.1.2 Read PMS

The command READ PMS shows the current state of the load depending start/stop system.

READ PMS

3.1.3 Read Alarms

Active alarms (e.g. fault conditions) will be show if the following command is issued.

READ ALARMS

3.1.4 Read Configuration

The READ CONFIG command dumps the current configuration of the C6200 FlexGen. The configuration is made up from a series of commands. Each command can be issued in the form shown, provided that the C6200 has been enabled to operate in write mode.

READ CONFIG

3.1.5 Read Event Log

C6200 saves the last XX events in an alarm log. This alarm log can be read out by following command:

READ LOG

3.1.6 Set the date

Current date for the event log can be set by following command.

DATE

The unit will reply with following prompt:

```
The current date is: 2008-09-03
Enter the new date: (yyyy-mm-dd)
```

Now type the date in the requested format (Year:Month:Day e.g. 2008:09:03).

3.1.7 Set the time

Current time for the event log can be set by following command.

TIME

The unit will reply with following prompt:

```
The current time is: 14:02:39:
Enter the new time: (hh:mm:ss)
```

Now type the time in the requested format (Hour:Minute:Second e.g. 14:02:39).

3.1.8 Enable Configuration Write mode

By default the C6200 FlexGen will be in read only mode. This means that the configuration can be viewed and dumped but not written or updated.

The C6200 must be enabled for writing before any attempt is made to update the configuration. The command to enable write mode is ENABLE.

ENABLE

Enable mode will prompt for the RS232 PIN. The default RS232 PIN is 0000 (four zeros).

3.1.9 Disable Configuration Write mode

To change back from configuration write mode or from service mode, use following command:

DISABLE

Please note that the RS232 console PIN is unique for each module. Also, the RS232 PIN is different from the menu PIN of the C6500 User interface.

3.1.10 Enable Service mode

The service parameters (SERVICE INTERVAL, DUTYHOUR and SERVICE CONFIRM) are protected with a separate PIN.

Use the following command to enable the service functions.

SERVICE ENABLE

3.1.11 Service Parameters

The service information (running hours of the generator and amount of running hours until the next service) can be viewed by issuing the following command.

READ SERVICE

3.1.12 Change of RS232 PIN

For changing the Read/Write Password it is necessary first to enable the Read/Write Mode as described in 3.1.88.

The RS232 console PIN can be changed by the following command, followed by the 4 digit making up the new PIN.

WRITE RS232 PIN

The RS232 PIN can be any combination of digits within the range of 0000 to 9999.

3.1.13 Change Service PIN

For changing the Service Password it is necessary first to enable the Service mode.

The service PIN can then be changed by the following command, followed by the 4 digit making up the new PIN.

WRITE SERVICE PASSWORD

The service PIN can be any combination of digits within the range of 0000 to 9999.

4 Configuration

The C6200 FlexGen can be configured by using a TTY terminal (RS232), the WinConfig PC application or the C6500 User Interface. This section describes the configuration by the TTY terminal (RS232).

The C6200 FlexGen is delivered with a default configuration.

4.1 Protection

The definite time protection functions are typically configured with a setpoint (trip level) and a delay.

The trip level is expressed as a percentage of the nominal value. It is important to understand how the 100% reference is calculated. This is described in the function section of this manual.

Each of the protection functions can be enabled or disabled. If disabled, the parameters of a given protection function has no influence on the operation.

All protection functions are intended to trip the generator circuit breaker.

4.1.1 Short Circuit Trip

The short circuit (SC) protection function will trip the circuit breaker in case a short circuit current is detected in any one of the three phases. The SC protection will always act on the highest of the three currents measured.

The trip level is configured as a percentage of the generator maximum rated current (GENMAXCUR), which is specified in the configuration.

The trip will be issued if the critical level is exceeded continuously for the duration of specified delay. The delay is configured in milliseconds.

$$I_1 or I_2 or I_3 \rangle \frac{Level \cdot GENMAXCUR}{100}$$

Please note that most marine classification societies require the installation of a discrete isolated short-circuit relay (such as the Littelfuse Selco T2300). This is in order to provide redundancy.

The short circuit protection function can be enabled or disabled by the following command. The parameter for the command is either YES or NO. The short circuit protection is enabled by default.

WRITE PROTECT SC ENABLED [YES / NO] (YES)

The level is set by the following command. The level can be set between 100 and 400 %. Resolution is 1 %. Default level is 250% of maximum rated current.

WRITE PROTECT SC LEVEL [100 - 400] (250)

The delay is expressed in milliseconds and can be set between 100 and 1000 ms. Resolution is 1 ms. Default is 100 ms.

WRITE PROTECT SC DELAY [100 – 1000] (100)

4.1.2 Over Current Trip

The over current (OC) protection function will trip the circuit breaker in case an over current is detected in any one of the three phases. The OC protection will always act on the highest of the three currents measured.

The trip level is configured as a percentage of the generator maximum rated current (GENMAXCUR) specified in the configuration.

The trip will be issued if the critical level is exceeded continuously for the duration of the time delay. The delay is configured in seconds.

$$I_1 or I_2 or I_3 \rangle \frac{Level \cdot GENMAXCUR}{100}$$

The over current protection function can be enabled or disabled by the following command. The choice can be either YES or NO. The over current protection is disabled by default.

WRITE PROTECT OC ENABLED [YES / NO] (NO)

The level is set by the following command. The level can be set between 50% and 200 %. Resolution is 1 %. Default is 100% of the maximum rated current.

WRITE PROTECT OC LEVEL [50 - 200] (100)

The delay is expressed in s and can be set between 2.0 and 20.0 s. Resolution is 0.1 s. Default is 5.0 s.

WRITE PROTECT OC DELAY [5.0 – 120.0] (5.0)

The over current protection can be configured to auto reset. Auto reset means that the circuit breaker can reclose immediately after trip (provided the condition for trip is no longer). If auto reset is not activated, the protection function must be reset before the circuit breaker can be reclosed.

WRITE PROTECT OC AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reclosure of the breaker is possible.

4.1.3 Overload

The overload (OL) protection function will trip the circuit breaker in case of excessive active load. The OL protection acts on the highest load in each individual phase.

4.1.3.1 Active Phase Load

The components of active loads will be calculated as shown below (active load mode).

$$P_1 = U_{1N} \times I_1 \times \cos\varphi \quad P_2 = U_{2N} \times I_2 \times \cos\varphi \quad P_3 = U_{3N} \times I_3 \times \cos\varphi$$

The trip level is defined as a percentage of the generators phase capacity. Please note that the reference is expressed by the preconfigured power factor (PF) set in the configuration.

$$P_1 \text{ or } P_2 \text{ or } P_3 \rangle \frac{\left(Level \cdot \left(\frac{NOMVOLT}{\sqrt{3}} \right) \cdot GENMAXCUR \cdot PF \right)}{100}$$

The overload protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE PROTECT OL ENABLED [YES / NO] (NO)

The trip level can be set between 50% and 200 %. Resolution is 1 %. Default is 100 %.

WRITE PROTECT OL LEVEL [50 - 200] (100)

The delay is expressed in s and can be set between 2.0 s and 20.0 s. Resolution is 0.1 s. Default is 5.0 s.

WRITE PROTECT OL DELAY [2.0 – 20.0] (5.0)

The over load protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be reset manually before the circuit breaker can be reengaged.

WRITE PROTECT OL AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that manual reset is required before reengagement of the breaker.

4.1.4 Voltage Protection

The voltage protection functions consists of an under voltage trip (UV) and an over voltage trip (OV). The voltage protection functions will trip the circuit breaker in case the phase-phase voltage between any of the three phases becomes either too low or too high. The Voltage protection will act on the lowest or the highest of the three phase-phase voltage measurements.

U_{12} U_{23} U_{31}

The trip level is configured as a percentage according to the nominal phase-phase voltage specified within the system configuration.

$$U_{12} \text{ or } U_{23} \text{ or } U_{31} \langle \frac{Lower\ Level \cdot NOMVOLT}{100}$$

And

$$U_{12} \text{ or } U_{23} \text{ or } U_{31} \rangle \frac{Upper\ Level \cdot NOMVOLT}{100}$$

The trip output for the voltage protection is the Protection Trip Relay (voltage free contact, terminals 48, 49 and 50).

4.1.4.1 Under Voltage Trip

The under voltage (UV) protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE PROTECT UV ENABLED [YES / NO] (NO)

The trip level of the under voltage trip function is expressed as a percentage of the nominal voltage of the generator. The level is set by the following command. The level can be set between 50 % and 150 %. Resolution is 1 %. Default is 70%.

WRITE PROTECT UV LEVEL [50 - 100] (70)

The delay is expressed in seconds and can be set between 2.0 s and 20.0 s. Resolution is 100 ms. Default is 2.0 s.

WRITE PROTECT UV DELAY [1.0 – 30.0] (2.0)

The under voltage protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be manually reset before the circuit breaker can be reengaged.

WRITE PROTECT UV AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.1.4.2 Over Voltage Trip

The over voltage (OV) protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE PROTECT OV ENABLED [YES / NO] (NO)

The trip level of the over voltage trip function is expressed as a percentage of the nominal voltage of the generator. The level is set by the following command. The level can be set between 50 % and 150 %. Resolution is 1 %. Default is 130 %.

WRITE PROTECT OV LEVEL [100 - 150] (130)

The delay is expressed in seconds and can be set between 2.0 s and 20.0 s. Resolution is 100 ms. Default is 2.0 s.

WRITE PROTECT OV DELAY [1.0 – 30.0] (2.0)

The over voltage protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has

disappeared). If auto reset is not activated the protection function must be manually reset before the circuit breaker can be reengaged.

WRITE PROTECT OV AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.1.5 Frequency Protection

The frequency protection functions will trip the breaker in case the generator frequency becomes either too low or too high. These functions are only active when the circuit breaker is closed.

The trip level is configured as a percentage according to the rated frequency specified within the system configuration.

$$f < \frac{Lower\ Level \cdot RATEFREQ}{100}$$

or

$$f > \frac{Lower\ Level \cdot RATEFREQ}{100}$$

The trip output for the frequency protection is the Protection Trip Relay (voltage free contact, terminals 48, 49 and 50).

4.1.5.1 Under Frequency Trip

The under frequency (UF) protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE PROTECT UF ENABLED [YES / NO] (NO)

The trip level of the under frequency trip function is expressed as a percentage of the nominal frequency of the generator. The level is set by the following command. The level can be set between 50 % and 150 %. Resolution is 1 %. Default is 70 %.

WRITE PROTECT UF LEVEL [50 - 100] (70)

The delay is expressed in seconds and can be set between 2.0 s and 20.0 s. Resolution is 100 ms. Default is 2.0 s.

WRITE PROTECT UF DELAY [1.0 – 30.0] (2.0)

The under frequency protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be manually reset before the circuit breaker can be reengaged.

WRITE PROTECT UF AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.1.5.2 Over Frequency Trip

The over frequency (OF) protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE PROTECT OF ENABLED [YES / NO] (NO)

The trip level of the over frequency trip function is expressed as a percentage of the nominal frequency of the generator. The level is set by the following command. The level can be set between 50 % and 150 %. Resolution is 1 %. Default is 130%.

WRITE PROTECT OF LEVEL [100 - 150] (130)

The delay is expressed in seconds and can be set between 2.0 s and 20.0 s. Resolution is 100 ms. Default is 2.0 s.

WRITE PROTECT OF DELAY [1.0 – 30.0] (2.0)

The over frequency protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be manually reset before the circuit breaker can be reengaged.

WRITE PROTECT OF AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.1.6 Reverse Power Trip

The reverse power (RP) protection function will trip the circuit breaker in case of “motoring”, which occurs when the generator is running as an electric motor and taking power from the bus bar.

The trip signal will be issued if the critical level is exceeded continuously for the duration of the time delay.

The trip output for the reverse power protection is the Protection Trip Relay (voltage free contact, terminals 48, 49 and 50).

The reverse power protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE PROTECT RP ENABLED [YES / NO] (NO)

The trip level of the reverse power function is expressed as a percentage of the nominal active current in a single phase of the generator. The 100 % reference is the generator’s maximum current in one phase (GENMAXCUR) multiplied by the rated power factor (PF).

The level is set by the following command. The level can be set between 0 % and -20 %. Resolution is 1 %. Default is -2.0 %.

WRITE PROTECT RP LEVEL [0.0 - -20.0] (-2.0)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 5.0

WRITE PROTECT RP DELAY [2.0 - 20.0] (5.0)

The reverse power protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be manually reset before the circuit breaker can be reengaged.

WRITE PROTECT RP AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that manual reset is required before reengagement of the breaker.

4.1.7 Excitation Loss Trip

The excitation loss (EL) protection function will trip the circuit breaker in case of reverse reactive current, which occurs in case the generator loses its excitation.

The trip signal will be issued if the critical level is passed continuously for the duration of the delay.

The trip output for the excitation loss protection is the Protection Trip Relay (voltage free contact, terminals 48, 49 and 50).

The excitation loss protection function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO

WRITE PROTECT EL ENABLED [YES / NO] (NO)

The excitation loss function reacts on a negative reactive current. The trip level of the excitation loss protection function is expressed as a percentage of the nominal re-active current in a single phase of the generator. The 100 % reference is the generator's maximum current in one phase (GENMAXCUR) multiplied by rated SIN(phi).

The level is set by the following command. The level can be set between 0 % and -150 %. Resolution is 1 %. Default is -50 %.

WRITE PROTECT EL LEVEL [150.0 – 0.0] (-2.0)

The delay is expressed in seconds and can be set between 0.5 s and 20.0 s. Resolution is 100 ms. Default is 5.0 s.

WRITE PROTECT EL DELAY [2.0 - 20.0] (5.0)

The excitation loss protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be manually reset before the circuit breaker can be reengaged.

WRITE PROTECT EL AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.1.8 Frequency Deviation Protection

This frequency deviation (FD) protection function is normally only used in grid paralleling applications.

The frequency deviation protection will protect the generator from damages due to asynchronous reconnection to the grid following a disconnection of a short duration.

The function will trip the generator in case the frequency changes above the setpoint within a certain amount of time. Thus the adjustment is done in Hz per second (if the frequency changes more that X Hz per second the function will trip).

Such frequency changes can happen as a result the sudden and significant load changes that might happen if the grid is lost (grid breaker trips).

The Frequency deviation protection is very similar to the vector shift protection. Basically these two protection functions are just two different ways of expressing the same phenomenon.

The trip output for the frequency deviation protection is the Protection Trip Relay (voltage free contact, terminals 48, 49 and 50).

The frequency deviation protection can be enabled or disabled. This is done by the following command. The choice can be set to either *YES* or *NO*. Default is NO.

WRITE PROTECT FD ENABLED [YES / NO] (NO)

The trip level is expressed in hertz per second with one decimal. The trip level is set by the following command. The range is 0.0 Hz/s to 20.0 Hz/s. Resolution is 0.1 Hz/s. Default is 5.0 Hz/s.

WRITE PROTECT FD LEVEL [0.5 - 20.0] (5.0)

The frequency deviation protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be reset before the circuit breaker can be reengaged.

WRITE PROTECT FD AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.1.9 Vector Shift Protection

This vector shift (VS) protection function is normally only used in grid parallel applications.

The vector shift protection will protect the generator from damages due to asynchronous reconnection to the public grid after short time disconnections.

The vector shift protection will trip the breaker in case it detects a phase shift in the generator voltage. For example if a zero crossing occur some degrees earlier or later than expected. Adjustment is done in degrees.

The vector shift is depending on the change of the generator frequency. If the grid is lost, it will result in a sudden change in generator frequency. A change in frequency will move the zero crossing of the generator voltage to occur earlier (in case the generator load has dropped) or later (in case the generator load has increased). This shift is expressed in degrees. If this vector shift is larger than a certain set point the relay will trip.

The vector shift protection is very similar to the frequency deviation protection. Basically these two protection functions are two different ways of expressing the same phenomenon.

The trip output for the vector shift protection is the Protection Trip Relay (voltage free contact, terminals 48, 49 and 50).

The Vector Shift protection can be enabled or disabled. This is done by the following command. The choice can be set to either *YES* or *NO*. Default is NO.

WRITE PROTECT VS ENABLED [YES / NO] (NO)

The trip level is expressed in º (phase angle). The trip level is set by the following command. The range is 0 º to 90 º. Resolution is 1º. Default is 15º.

WRITE PROTECT VS LEVEL [0 - 90] (15)

The vector shift protection can be configured to auto reset. Auto reset means that the circuit breaker can reengage immediately after the protection trip (provided the trip cause has disappeared). If auto reset is not activated the protection function must be reset before the circuit breaker can be reclosed.

WRITE PROTECT VS AUTORESET [YES / NO] (NO)

The choice can be either YES or NO. Default is NO, meaning that reset is required before reengagement of the breaker.

4.2 Alarms

The alarm functions are typically set up by a set point (alarm level) and a delay. The alarm level is expressed as a percentage of the nominal value, so it is important to understand how the 100% reference is calculated. This is described in the function section of this manual.

Each of the alarm functions can be enabled or disabled as desired. The parameters of a given alarm function have no influence on the system if the function is disabled.

Alarm functions will not trip the breaker but only be indicated on the optional display.

It is also possible to program the programmable outputs to activate for alarms (see chapter 0).

4.2.1 Over Current Alarm

The OC alarm will issue an alarm in case an over current is detected in any one of the three phases of the power source. The OC alarm will always act on the highest of the three currents measured among the three phases.

$$I_1 \quad I_2 \quad I_3$$

The alarm level is configured as a percentage according to the generator maximum current (GENMAXCUR) specified in the configuration.

The alarm signal will be issued if the critical level is exceeded continuously for the duration of the time delay. The delay is configured in seconds.

$$I_1 \cdot I_2 \cdot I_3 \rangle \frac{Level \cdot GENMAXCUR}{100}$$

The over current alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is YES.

WRITE ALARM OC ENABLED <Choice>

The level of the over current protection function is expressed as a percentage of the nominal current (see GENMAXCURRENT) of the generator. The level is set by the following command. The level can be set between 50% and 200 %. Resolution is 1 %. Default is 100%.

WRITE ALARM OC LEVEL [50 - 200] (100)

The delay is expressed in s and can be set between 2.0 s and 20.0 s. Resolution is 0.1 s. Default is 5.0 s.

WRITE ALARM OC DELAY [2.0 – 20.0] (5.0)

4.2.2 Overload

The OL alarm will issue an alarm in case of excessive active load. The OL alarm acts on the highest load in each individual phase.

4.2.2.1 Active Phase Load

The components of active loads will be calculated as shown below (active load mode).

$$P_1 = U_{1N} \times I_1 \times \cos\varphi \quad P_2 = U_{2N} \times I_2 \times \cos\varphi \quad P_3 = U_{3N} \times I_3 \times \cos\varphi$$

The alarm level is defined as a percentage of the generators phase capacity. Please note that the reference is expressed by the preconfigured rated power factor.

$$P_1 \text{ or } P_2 \text{ or } P_3 \rangle \frac{\left(Level \cdot \left(\frac{NOMVOLT}{\sqrt{3}} \right) \cdot GENMAXCUR \cdot PF \right)}{100}$$

The over load alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is YES.

WRITE ALARM OL ENABLED <Choice>

The alarm level of the over load alarm function is expressed as a percentage of the nominal power of the generator. The level is set by the following command. The level can be set between 50% and 200 %. Resolution is 1 %. Default is 100%.

WRITE ALARM OL LEVEL [50 - 200] (100)

The delay is expressed in s and can be set between 2.0 s and 20.0 s. Resolution is 0.1 s. Default is 5.0 s.

WRITE ALARM OL DELAY [2.0 – 20.0] (5.0)

4.2.3 Voltage Alarm

The voltage alarm function consists of an over voltage alarm and an under voltage alarm. The alarm will be issued in case the phase-phase voltages between any of the three phases becomes either too low or too high. The Voltage alarm will act on the lowest or the highest of the three phase-phase voltage measurements, depending on whether the low or the high level is passed.

$$U_{12} \quad U_{23} \quad U_{31}$$

The alarm level is configured as a percentage according to the nominal phase-phase voltage specified within the system configuration.

In default configuration the alarm will only be shown in the optional C6250 or S6500 display. It will not trip the breaker. However it is possible to configure any of the programmable outputs to activate on the alarm (see Programmable I/O).

4.2.4 Prestart in case of voltage alarms

The over and under voltage alarm can be combined with a pre-start function for the standby generator. When activated, a generator can be started in case of a bus bar voltage alarm, before the voltage protection has tripped the breaker, thus keeping the blackout time shorter than if the replacement generator would be started after blackout. If this function is required it must be activated under the alarm configuration for the voltage alarms.

4.2.4.1 Under Voltage Alarm

The under voltage alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE ALARM UV ENABLED <Choice>

The alarm level of the under voltage alarm function is expressed as a percentage of the nominal voltage of the generator. The level is set by the following command. The level can be set between 50 and 150 %. Resolution is 1 %. Default is 70%.

WRITE ALARM UV LEVEL [50 - 150] (70)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 2.0s.

WRITE ALARM UV DELAY [2.0 – 20.0] (2.0)

4.2.4.2 Pre-start of standby generator in case of under voltage alarm

If the standby generator is to be started in case of an under voltage alarm, this can be configured as follows:

WRITE ALARM UV PRESTARTREQ <Choice>

The choice can be either YES or NO. Default is NO.

4.2.4.3 Over Voltage Alarm

The over voltage alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE ALARM OV ENABLED <Choice>

The alarm level of the over voltage alarm function is expressed as a percentage of the nominal voltage of the generator. The level is set by the following command. The level can be set between 50 and 150 %. Resolution is 1 %. Default is 130%.

WRITE ALARM OV LEVEL [50 - 150] (130)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 2.0s.

WRITE ALARM OV DELAY [2.0 – 20.0] (2.0)

4.2.4.4 Pre-start of standby generator in case of over voltage alarm

If the standby generator is to be started in case of an over voltage alarm, this can be configured as follows:

WRITE ALARM OV PRESTARTREQ <Choice>

The choice can be either YES or NO. Default is NO.

4.2.5 Frequency Alarm

The frequency alarm function consists of an over frequency alarm and an under frequency alarm. The alarm will be issued in case the frequency becomes either too low or too high.

The alarm level is configured as a percentage according to the nominal frequency specified within the system configuration.

In default configuration the alarm will only be shown in the optional C6250 or S6500 display. It will not trip the breaker. However it is possible to configure any of the programmable outputs to activate on the alarm (see Programmable I/O).

4.2.6 Prestart in case of frequency alarms

The over and under frequency alarm can be combined with a pre-start function for the standby generator. When activated, a generator can be started in case of a bus bar frequency alarm, before the frequency protection has tripped the breaker, thus keeping the blackout time shorter than if the replacement generator would be started after blackout. If this function is required it must be activated under the alarm configuration for the frequency alarms.

4.2.6.1 Under Frequency Alarm

The under frequency alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE ALARM UF ENABLED <Choice>

The alarm level of the under frequency alarm function is expressed as a percentage of the nominal frequency of the generator. The level is set by the following command. The level can be set between 50 and 150 %. Resolution is 1 %. Default is 70%.

WRITE ALARM UF LEVEL [50 - 150] (70)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 2.0s.

WRITE ALARM UF DELAY [2.0 – 20.0] (2.0)

4.2.6.2 Pre-start of standby generator in case of under frequency alarm

If the standby generator is to be started in case of an under frequency alarm, this can be configured as follows:

WRITE ALARM UF PRESTARTREQ <Choice>

The choice can be either YES or NO. Default is NO.

4.2.6.3 Over Frequency Alarm

The over frequency alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE ALARM OF ENABLED <Choice>

The alarm level of the over frequency alarm function is expressed as a percentage of the nominal frequency of the generator. The level is set by the following command. The level can be set between 50 and 150 %. Resolution is 1 %. Default is 130%.

WRITE ALARM OF LEVEL [50 - 150] (130)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 2.0s.

WRITE ALARM OF DELAY [2.0 – 20.0] (2.0)

4.2.6.4 Pre-start of standby generator in case of over frequency alarm

If the standby generator is to be started in case of an over frequency alarm, this can be configured as follows:

WRITE ALARM OF PRESTARTREQ <Choice>

The choice can be either YES or NO. Default is NO.

4.2.7 Reverse Power Alarm

The reverse power alarm will be issued in case of "motoring", which occurs when the generator is running as an electric motor and taking power from the bus bar.

The alarm will be issued if the critical level is exceeded continuously for the duration of the time delay.

In default configuration the alarm will only be shown in the optional C6250 or S6500 display. It will not trip the breaker. However it is possible to configure any of the programmable outputs to activate on the alarm (see Programmable I/O).

The reverse power alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE ALARM RP ENABLED <Choice>

The alarm level of the reverse power function is expressed as a percentage of the nominal active current in a single phase of the generator. The 100 % reference is the generator's maximum current in one phase (GENMAXCUR) x rated power factor (COSPHI).

The level is set by the following command. The level can be set between 0 and -20 %. Resolution is 1 %. Default is -2%.

WRITE ALARM RP LEVEL [0.0 - -20.0] (-2.0)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 5.0s

WRITE ALARM RP DELAY [2.0 – 20.0] (5.0)

4.2.8 Excitation Loss Alarm

The excitation loss alarm will be issued in case of reverse reactive current or power, which occurs in case the generator loses its excitation.

The alarm will be issued if the critical level is passed continuously for the duration of the delay.

In default configuration the alarm will only be shown in the optional C6250 or S6500 display. It will not trip the breaker. However it is possible to configure any of the programmable outputs to activate on the alarm (see Programmable I/O).

The excitation loss alarm function can be enabled or disabled by the following command. The choice can be either YES or NO. Default is NO.

WRITE ALARM EL ENABLED <Choice>

The excitation loss function reacts on a negative reactive current. The trip level of the excitation loss alarm function is expressed as a percentage of the nominal reactive current in a single phase of the generator. The 100 % reference is the generator's maximum current in one phase (GENMAXCUR) x rated sinPHI.

The level is set by the following command. The level can be set between 0 and -150 %. Resolution is 1 %. Default is -50%.

WRITE ALARM EL LEVEL [0 - -150] (-50)

The delay is expressed in seconds and can be set between 2.0 and 20.0 s. Resolution is 100 ms. Default is 5.0s

WRITE ALARM EL DELAY [2.0 – 20.0] (5.0)

4.3 Non Essential Load Trip (Preferential Trip/ Load Shedding)

The C6200.0100 includes a preferential trip function on two independent levels. The preferential trip function can be configured to operate either on low frequency, high load or high current. The two preferential trip functions can be configured individually with regard to trip level, delay and mode of operation.

When in load or current mode, the two load trip functions operate much like definite time protection functions (e.g. the OL protection function).

Note: It is required to configure one programmable output for each preferential trip function (see chapter IOFUNC).

Both preferential trip functions (NE1 load trip and NE2 load trip) can be enabled or disabled. If enabled, the NE load trip will issue the preferential trip signal in case of low frequency, high active current/load or high current. When configured to trip on load or current, the NE load trip acts on the highest of the three active current or load calculations (each individual phase component).

The trip level is configured as a percentage according to nominal frequency, the generator maximum current or the power sources active capacity. The power source active capacity is calculated from generator maximum current and the nominal phase-phase voltage located within the system configuration. The delay is configured in seconds. The trip signal will be issued if the trip level is exceeded continuously for the duration of the delay.

4.3.1.1 Frequency

The C6200.0100 will calculate the frequency to determine if it is low enough to trip the NE function.

f

The trip level is defined as a percentage of the generators rated frequency (RATEDFREQ).

$$f \langle \frac{Level \cdot RATEFREQ}{100}$$

4.3.1.2 Active Phase Current

The C6200.0100 module will calculate each component of active currents as follows (active current mode).

$IAct_1 = I_1 \times \text{Cos } \varphi \quad IAct_2 = I_2 \times \text{Cos } \varphi \quad IAct_3 = I_3 \times \text{Cos } \varphi$

The trip level is defined as a percentage of the generators maximal current (in one phase). Note that the reference is expressed by the preconfigured power factor.

$$IAct_1 \text{ or } IAct_2 \text{ or } IAct_3 \rangle \frac{(Level \cdot GENMAXCUR \cdot PF)}{100}$$

4.3.1.3 Active Phase Load

The components of active loads will be calculated as shown below (active load mode).

$$P_1 = U_{1N} \times I_1 \times \cos\varphi \quad P_2 = U_{2N} \times I_2 \times \cos\varphi \quad P_3 = U_{3N} \times I_3 \times \cos\varphi$$

The trip level is defined as a percentage of the generators phase capacity. Note that the reference is expressed by the preconfigured power factor.

$$P_1 \text{ or } P_2 \text{ or } P_3 \rangle \frac{\left(Level \cdot \left(\frac{NOMVOLT}{\sqrt{3}} \right) \cdot GENMAXCUR \cdot PF \right)}{100}$$

4.3.1.4 Current

The C6200.0100 module will measure each component of currents as follows (current mode).

$$I_1 \quad I_2 \quad I_3$$

The trip level is defined as a percentage of the generators maximal current (in one phase).

$$I_1 \text{ or } I_2 \text{ or } I_3 \rangle \frac{\left(Level \cdot GENMAXCUR \right)}{100}$$

4.3.2 Preferential Trip 1

The preferential 1 load trip function can be enabled or disabled by the following command. The choice can be either YES or NO.

WRITE LOADTRIP NE1 ENABLED <Choice>

The function can be configured to trip on either low frequency (under frequency), on high load or on high current. The selection is done by the following command. The choice can be FREQ, LOAD or CUR.

WRITE LOADTRIP NE1 PARAM <Choice>

The trip level of the NE1 trip function is expressed in one of three different ways.

1. According to the generators nominal frequency. The 100 % reference is the rated frequency (RATEDFREQ).

2. According to the generators maximum active current in a single phase. The 100 % reference is the generators maximum current in one phase (GENMAXCUR).

3. According to the generators maximum active load on one phase. The 100 % reference is the primary phase-neutral voltage multiplied by the generators maximum current

$$\frac{PRIMVOLT}{\sqrt{3}} \cdot GENMAXCUR$$

The level is set by the following command. The level can be set between 20 and 150 %. Resolution is 1 %.

WRITE LOADTRIP NE1 LEVEL [20 - 150] (90)

The NE1 function will automatically reset by hysteresis. The hysteresis is set by the following command. The level can be set between 0 and 50 %. The reference is the trip point defined by the level.

WRITE LOADTRIP NE1 HYST [0 - 50] (10)

The delay is expressed in seconds and can be set between 1.0 and 60.0 s. Resolution is 100 ms.

WRITE LOADTRIP NE1 DELAY [1.0 – 60.0] (10.0)

The output for the preferential trip is configured in the IOFUNC section.

The choce can be OFF, OUT1, OUT2…OUT8, default is OFF

WRITE IOFUNC NE1 <Choice>

4.3.3 Preferential Trip 2

The preferential 2 load trip function can be enabled or disabled by the following command. The choice can be either YES or NO.

WRITE LOADTRIP NE2 ENABLED <Choice>

The function can be configured to trip on either low frequency (under frequency), on high load or on high current. The selection is done by the following command. The choice can be FREQ, LOAD or CUR.

WRITE LOADTRIP NE2 PARAM <Choice>

The trip level of the NE2 trip function is expressed in one of three different ways.

4. According to the generators nominal frequency. The 100 % reference is the rated frequency (RATEDFREQ).

5. According to the generators maximum active current in a single phase. The 100 % reference is the generators maximum current in one phase (GENMAXCUR).

6. According to the generators maximum active load on one phase. The 100 % reference is the primary phase-neutral voltage multiplied by the generators maximum current

$$\frac{PRIMVOLT}{\sqrt{3}} \cdot GENMAXCUR$$

The level is set by the following command. The level can be set between 20 and 150 %. Resolution is 1 %.

WRITE LOADTRIP NE2 LEVEL [20 - 150] (90)

The NE2 function will automatically reset by hysteresis. The hysteresis is set by the following command. The level can be set between 0 and 50 %. The reference is the trip point defined by the level.

WRITE LOADTRIP NE2 HYST [0 - 50] (10)

The delay is expressed in seconds and can be set between 1.0 and 60.0 s. Resolution is 100 ms.

WRITE LOADTRIP NE2 DELAY [1.0 – 60.0] (10.0)

The output for the preferential trip is configured in the IOFUNC section.

The choce can be OFF, OUT1, OUT2…OUT8, default is OFF

WRITE IOFUNC NE2 <Choice>

4.4 Frequency Stabilization

The frequency stabilization feature ensures that the generator frequency is kept at a fixed level. The frequency control facility uses the rated frequency as its reference. The frequency stabilization feature will compensate for frequency deviations caused by change in active load.

4.4.1 Gain

The Gain parameter determines the response of the frequency stabilization. A low setting will result in slow accurate stabilization, high setting provide fast regulation with the risk of overshoot and instability. Resolution is 0,1. Range is 1,0 - 20,0. Default is 2.0

WRITE FREQSTAB GAIN [1.0 – 20,0] (2.0)

4.4.2 Delay

When using the analogue speed control outputs the Delay parameter works as a delay that provides the “patience” of the system as it allows the system to wait for a response (change in the actual value) before it proceeds to step up the control signal. A high delay will slow down the response of the system, but it may be necessary if the response of the speed control or voltage regulator is slow. The delay is expressed in ms. Range is 0ms – 5000ms. Resolution is 1ms. Default is 10

WRITE FREQSTAB DELAY [0 – 5000] (10)

When using the pulse contacts for speed control this setting defines the sum of the minimum duration of the pulse and the rest time until the next pulse is issued.

Setting the delay too low might result in overshoot and instability with a slow reacting (lagging) governor. A too high setting might slow down the regulation.

4.4.3 Deadband

The deadband parameter is only used when the speed adjustment is configured to operate with the speed relay. The deadband parameter determines the responsive range of the frequency stabilization feature. The frequency stabilization function will only attempt to correct the frequency if it is outside the deadband. A deadband which is too narrow will cause constant fine tuning of the frequency, while an overly wide deadband will cause deviation according to the reference (rated frequency). The deadband is expressed in percent with one decimal and is set by the following command. Resolution is 0.1 %. Range is 0.1% to 20.0%. Default is 1.0%.

WRITE FREQSTAB DEADBAND [0.1 – 20.0] (10)

4.5 Auto Synchronizing

The configuration of the auto synchronizing function depends on whether the speed control is done by the speed relay (increase/decrease contacts) or by analogue output 1.

4.5.1 Dead Bus Closure

The dead bus closure function provides the possibility of closing the circuit breaker when no voltage exists on the bus bar. The dead bus closure function can be disabled or enabled. Choice can be YES or NO.

WRITE AUTOSYNC DBCLOSE <Choice>

4.5.2 Gain

The auto synchronizer alters the frequency through control of the speed governor in order to obtain the permitted frequency and phase deviation. Low gain provides accurate but slow synchronization, while high gain introduces the risk of overshoot and instability. Gain is set by the following command. Resolution is 0,1. The range is 1,0 – 20,0. Default is 2.0

WRITE AUTOSYNC GAIN [0.1 – 20.0] (2.0)

4.5.3 Delay

When using the analogue speed control outputs the delay parameter works as a delay that provides the “patience” of the system as it allows the system to wait for a response (change in the actual value) before it proceeds to step up the control signal. A big delay will slow down the response of the system, but it may be necessary if the response of the speed control or voltage regulator is slow. The delay is expressed in ms. The range is 0ms – 5000ms. Resolution is 1ms. Default is 10

WRITE AUTOSYNC DELAY [0 – 5000] (10)

When using the pulse contacts for speed control this setting defines the sum of the minimum duration of the pulse and the rest time until the next pulse is issued.

Setting the delay too low might result in overshoot and instability with a slow reacting (lagging) governor. A too high setting might slow down the regulation.

4.5.4 Synctime

The synctime parameter determines how long the C6200 will try to synchronize a generator, before it issues a Synchronization error. The synctime parameter is expressed in seconds. Resolution is 1 second. The range is 1s – 1000s. Default is 60

WRITE AUTOSYNC SYNCTIME [1 – 1000] (60)

4.5.5 Circuit Breaker Close Time

The circuit breaker close time (circuit breaker make time) is only used when the speed control is configured to the speed relay. Auto synchronization by relay control is done according to the dynamic synchronization principle. Therefore, it requires the existence of a small positive frequency deviation. The circuit breaker close time must be set according to the specification of the circuit breaker. The circuit breaker close time is expressed in milliseconds without decimals. Resolution is 1 ms. The range is 1ms – 1000ms. Default is 80

WRITE AUTOSYNC CBCLOSETIME [1 – 1000] (80)

4.5.6 Frequency Deviation

The frequency deviation parameter describes the tolerated frequency deviation at breaker closure. Setting this parameter to high might stress the breaker and generator. A low setting will however make the synchronization procedure a lengthy process. The frequency deviation is expressed in Hz with two decimal. Resolution is 0,01 Hz. Range is 0,01Hz to 1,00Hz. Default is 0,10Hz.

WRITE AUTOSYNC FREQDEV [0.01 – 1.0] (0.1)

4.5.7 Check Synchronizer function

This function enables the C6200 to work as a check synchronizer. In case the generator is synchronized manually, the C6200 will issue a closure signal to the circuit breaker as soon as frequency, voltage and phase deviation between the incoming generator and the bus bar are within acceptable limits. The function can be enabled or disabled. The choice can be YES or NO.

WRITE AUTOSYNC CHKSYNC <CHOICE>

4.6 Active Load Sharing

The active load balance is communicated through a set of "parallel lines" that operates with a pre-configured DC voltage. The active load sharer includes a bonus feature of de-loaded trip together with programmable ramp-up and ramp-down of active load.

4.6.1 Gain

Gain defines the response of the active load sharer. The active load sharer will alter the active load through the governor in order to obtain the required load balance. Low gain provides accurate but slow load sharing. High gain introduces risk of overshoot and instability. Resolution is 0,1. The range is 0.1 – 20.0. Default is 1.0

WRITE ACTLS GAIN [0.1 – 20.0] (1.0)

4.6.2 Delay

When using the analogue speed control outputs the delay parameter works as a delay that provides the "patience" of the system as it allows the system to wait for a response (change in the actual value) before it proceeds to step up the control signal. A high delay will slow down the response of the system, but it may be necessary if the response of the speed control or voltage regulator is slow. The delay is expressed in ms. The range is 0ms – 5000ms. Resolution is 1ms. Default is 20

WRITE ACTLS DELAY [0 – 5000] (20)

When using the pulse contacts for speed control this setting defines the sum of the minimum duration of the pulse and the rest time until the next pulse is issued.

Setting the delay too low might result in overshoot and instability with a slow reacting (lagging) governor. A too high setting might slow down the regulation.

4.6.3 Deadband

The deadband parameter determines the responsive range of the active load sharer. The active load sharer will only attempt to outbalance the deviation in active load when deviation falls outside the deadband (compared to the pre-configured load deviation). A deadband which is too narrow will cause constant fine tuning of the active load balance, while an overly wide deadband will cause deviation according to the reference. The deadband is expressed in percent with one decimal and is set by the following command. Resolution is 0.1 %. Range is 0,1% to 20,0%. Default is 5.0%

WRITE ACTLS DEADBAND [0.1 – 20.0] (5.0)

4.6.4 Ramp Time

Ramp time defines how quickly the load sharer takes or releases active load after synchronization or after the unload signal has been activated. The parameters define the time to go from zero to full load (nominal load), or opposite. The ramp time parameter is expressed in seconds without decimals. Resolution is 1 s. The range is 1s – 100s. Default is 20

WRITE ACTLS RAMPTIME [1 – 100] (20)

4.6.5 Load Deviation

The load deviation parameter can be used to fine-tune the balance of the active load sharing. The load deviation is set according to ideal zero deviation. The parameter is expressed as a percentage without decimals. The parameter has reference to perfect balance. Resolution is 1%.
The range is -100% - +100%. Default is 0

WRITE ACTLS LOADDEV [-100 – 100] (0)

4.6.6 CB Trip Level

When a generator must be taken out of service, it is necessary first to unload the generator (by the unload command). After the C6200 has received the unload command it will decrease the load of the generator until the load reaches the unload CB trip level. After this, the C6200 will trip the circuit breaker. The CB Trip Level is expressed as a percentage of the nominal active current of the generator (GENMAXCURRENT x COSPHI). Resolution is 1%. The range is 1% - 50%.
Default is 5

WRITE ACTLS CBTRIPLEVEL [1 – 50] (5)

4.6.7 Parallel Lines

The load of the generator is communicated as an analogue voltage signal between the load sharers of all generators in an installation. The range of this analogue voltage signal can be programmed in order to match load sharers of different types (e.g. SELCO T4400 or T4800 load sharers). In case all generators are equipped with C6200 units, this parameter does not need to be changed. Resolution is 0.1 V DC. The range is -6,0V - +6,0V.

WRITE ACTLS PARLINES VOLTMIN <Voltage>

WRITE ACTLS PARLINES VOLTMAX <Voltage>

For parallel operation with **SELCO S6100** load sharers the parallel lines must be programmed to +/-6V (default setting).

For parallel operation with **SELCO T4800** load sharers the parallel lines must be programmed to +/-1V.

For parallel operation with **SELCO T4400** load sharers the parallel lines must be programmed to +/-3V.

For parallel operation with **LK-NES/ NESELCO/ SELCO B6000** load sharers the parallel lines must be programmed to +/-1V.

4.7 Voltage Matcher

The module includes voltage matching. Voltage matching will automatically bring the voltage within the range specified by the Voltage ok window. If enabled, voltage matching will be conducted before automatic synchronization is initiated. The voltage matching function is configured with stability and deadband.

4.7.1 Gain

The gain parameter determines how much signal is provided to the AVR and thereby how quickly the voltage is brought into the permitted operational area. A low setting will result in slow but accurate correction. A high setting provides fast correction with a potential risk of overshoot and instability. Resolution is 0,1. The range is 0.1 – 20.0. Default is 1.0

WRITE VOLTMATCH GAIN [0.1 – 20.0] (80)

4.7.2 Delay

When using the analogue voltage control outputs the delay parameter works as a delay that provides the "patience" of the system as it allows the system to wait for a response (change in the actual value) before it proceeds to step up the control signal. A high delay will slow down the response of the system, but it may be necessary if the response of the speed control or voltage regulator is slow. The delay is expressed in ms. Resolution is 1ms. The range is 0ms – 5000ms. Default is 20

WRITE VOLTMATCH DELAY [0 – 5000] (20)

When using the pulse contacts for voltage control this setting defines the sum of the minimum duration of the pulse and the rest time until the next pulse is issued.

Setting the delay too low might result in overshoot and instability with a slow reacting voltage regulator. A too high setting might slow down the regulation.

4.7.3 Deadband

The deadband parameter is only used when the voltage adjustment is configured to operate with relays. The deadband parameter controls the accuracy of the voltage matching function. The voltage matching function will only attempt to correct the voltage if the is outside the voltage OK window, plus/minus the deadband. A deadband which is too narrow will cause constant fine tuning of the AVR, while an overly wide deadband will cause an inaccurate setting. The deadband is expressed in percent with one decimal and is set by the following command. Resolution is 0.1 %. Range is 0,1% to 20,0%. Default is 1%.

WRITE VOLTMATCH DEADBAND [0.1 – 20.0] (80)

4.8 Reactive Load Sharing

The reactive load balance is communicated to a set of "parallel lines" that operates with a pre-configured DC voltage. The load sharer includes a bonus feature of programmable ramp-up and ramp-down of reactive load.

4.8.1 Gain

Gain defines the response of the reactive load sharer. The reactive load sharer will alter the reactive load through the AVR (automatic voltage regulator) in order to obtain the required reactive load balance. Low gain provides accurate but slow load sharing. High gain introduces risk of overshoot and instability. Resolution is 0,1. The range is 1,0 – 20,0. Default is 1.0

WRITE REACTLS GAIN [1.0 – 20.0] (1.0)<Value>

4.8.2 Delay

When using the analogue speed control outputs the delay parameter works as a delay that provides the "patience" of the system as it allows the system to wait for a response (change in the actual value) before it proceeds to step up the control signal. A high delay will slow down the response of the system, but it may be necessary if the response of the voltage regulator is slow. The delay is expressed in ms. Resolution is 1ms. The range is 0ms – 5000ms

WRITE REACTLS DELAY [0 – 5000] (20)

When using the pulse contacts for voltage control this setting defines the sum of the minimum duration of the pulse and the rest time until the next pulse is issued.

Setting the delay too low might result in overshoot and instability with a slow reacting voltage regulator. A too high setting might slow down the regulation.

4.8.3 Deadband

The deadband parameter determines the responsive range of the reactive load sharer. The reactive load sharer will only attempt to outbalance the deviation in reactive load when deviation falls outside the deadband (compared to the pre-configured load deviation). A deadband which is too narrow will cause constant fine tuning of the reactive load balance, while an overly wide deadband will cause deviation according to the reference. The deadband is expressed in percent with one decimal and is set by the following command. Resolution is 0.1 %. Range is 0,1% to 20,0%. Default is 5.0%.

WRITE REACTLS DEADBAND [0.1 – 20.0] (5.0)

4.8.4 Load Deviation

The load deviation parameter can be used to fine-tune the balance of the active load sharing. The load deviation is set according to ideal zero deviation. The parameter is expressed as a percentage without decimals. The parameter has reference to perfect balance. Resolution is 1%. The range is -100% - +100%.

WRITE REACTLS LOADDEV [-100 – 100] (0)

4.8.5 CB Trip Level

When a generator must be taken out of service, it is necessary first to unload the generator (by the unload command). After the C6200 has received the unload command it will decrease the load of the generator until the load reaches the unload CB trip level. After this, the C6200 will trip the circuit breaker. The CB Trip Level is expressed as a percentage of the nominal reactive current of the generator (GENMAXCURRENT x SINPHI). Resolution is 1%. The range is 1% - 50%.

WRITE REACTLS CBTRIPLEVEL [1 – 50] (5)

In newer versions of the C6200 firmware this parameter has been removed. The trip level is then the same as for active load sharing (ACTLS CBTRIPLEVEL).

4.8.6 Parallel Lines

The reactive load of the generator is communicated as an analogue voltage signal between the load sharers of all generators in an installation. The range of this analogue voltage signal can be programmed in order to match reactive load sharers of different types (e.g. SELCO T4900). In case all generators are equipped with C6200 units, this parameter does not need to be changed. Resolution is 0.1 V DC. The range is -6,0V - +6,0V.

WRITE REACTLS PARLINES VOLTMIN <Voltage>

WRITE REACTLS PARLINES VOLTMAX <Voltage>

For parallel operation with **SELCO S6100** reactive load sharers, the parallel lines must be programmed to +/-6V (default setting).

For parallel operation with **SELCO T4900** reactive load sharers, the parallel lines must be programmed to +/-1V.

4.9 Grid parallel operation schemes

In case the generator should be operated in parallel with the grid, it is necessary to choose the load sharing scheme. The load sharing scheme defines the load reference for the generator.

Activation of a grid parallel operation scheme will disable the internal frequency and voltage control. The generator would no longer try to keep the nominal voltage or frequency, but follow grid voltage and grid frequency. Only load (kW) and power factor would be controlled.

Following load sharing schemes are available:

- Fixed import
- Peak import
- Fixed export
- Excess export

4.9.1 Fixed import

Fixed import means that the installation imports a fixed load level from the grid. In case the installation requires more load than the predefined import load level (configured as a percentage of the grid capacity), the diesel generators will supply the rest of the load demand.

To activate this scheme use following command:

WRITE IMPORTEXPORTSCHEME FIXEDIMPORT

The load level that should be imported can be set with following command:

WRITE IMPORTEXPORTSCHEME VALUE 25

The 25 means 25% of rated power (the rated power programmed in the grid C6200 unit).

In case the power is controlled through the analogue input (FREQ. IN terminal 25), with above configuration it is possible to adjust the import power between 0-25% (0V → 25%, 5V→ 0%).

4.9.2 Peak import

Peak import means the installation will load the connected generators up to a pre-programmed load level. In case the load demand increases above this limit, the remaining power will be imported from the grid.

To activate this scheme use following command:

WRITE IMPORTEXPORTSCHEME PEAKIMPORT

The maximum load level of the generators can be set with following command:

WRITE IMPORTEXPORTSCHEME VALUE 25

The 25 means 25% of rated power programmed in the generator C6200 unit.

4.9.3 Fixed export

Fixed export means a certain amount of capacity will be exported to the grid. The 6200 of the grid forces the C6200 modules of the auxiliary generators to produce a certain amount of power into the grid C6200.

To activate this scheme use following command:

WRITE IMPORTEXPORTSCHEME FIXEDEXPORT

The load level that should be exported to the grid can be set with following command:

WRITE IMPORTEXPORTSCHEME VALUE 25

The 25 means 25% of rated power (the rated power programmed in the grid C6200 unit).

In case the power is controlled through the analogue input (FREQ. IN terminal 25), with above configuration it is possible to adjust the export power between 0-25% (0V → 25%, 5V→ 0%).

4.9.4 Excess export

Excess export means that the generator will run with a fixed power. Power that is not used in the installation will be exported to the grid.

To activate this scheme use following command:

WRITE IMPORTEXPORTSCHEME EXCESSEXPORT

The load level that the generator should run with can be set with following command:

WRITE IMPORTEXPORTSCHEME VALUE 25

The 25 means 25% of rated power programmed in the generator C6200 unit.

4.9.5 Power factor control

In case the generator is running in parallel with the grid, it is necessary to define a power factor.

Power Factor Control Mode is always active when any of the grid parallel schemes (Fixed Import, Fixed Export, Peak Import or Excess Export) is enabled.

The Power factor can then be defined by following command: WRITE SYS VOLTCTRL PFLEVEL 0.80

The range is 0.00 to 1.00, default is 0.80.

4.10 Load depending start and stop

A load depending start and stop function can be programmed with C6200.

WRITE LOADSTARTSTOP ENABLED NO

The choice is YES or NO. Default is NO.

For this function a generator priority, a start level, a start delay, a stop level and a stop delay must be programmed

It is also necessary to define the start and stop outputs (see Programmable I/O)).

4.10.1 Start Condition

The start condition can either be a percentage of the nominal power (LOADPERCENT) or a reserve power kW level. Reserve power kW level means that in case the reserve capacity falls below this level, the next generator is being started.

WRITE LOADSTARTSTOP STARTCONDITION [LOADPERCENT, LOADRESERVE]
(LOADPERCENT)

4.10.2 Start

The conditions for starting the next generator in line (according to the priority setup) are determined by the start level and the start delay. The start level is expressed as a percentage of the on-line capacity. The start delay is initiated as soon as the total load exceeds the start level. However, the C6200 module will not signal the generator to start until the start level has been exceeded continuously for the duration defined by the start delay.

The on-line capacity is calculated from the generator max current parameters (in C6200 Module) multiplied by the rated cosphi parameter (in C6200 Module). The total load is calculated as the sum of the active loads on generators running.

Generators that have failed or are switched to manual will not be started automatically. These generators are simply disregarded in the start/stop algorithm.

WRITE LOADSTARTSTOP STARTLEVEL 80

The start level can be programmed between 20% and 120% of rated load (Range 20-120). Default is 80%.

On newer units the term STARTLEVEL has been replaced by STARTPERCENT.

WRITE LOADSTARTSTOP STARTDELAY 10

The start delay can be adjusted between 2s and 32000s. Default is 10s.

4.10.3 Stop

The conditions for stopping the last generator in line (according to the priority setup) are determined by the stop level and the stop delay. The stop level is expressed as a percentage of the on-line capacity, minus the capacity of the generator which is about to be stopped. The stop delay is initiated as soon as the total load decreases below the stop level. However, the C6200 module will

not signal the generator to stop until the stop level has been passed continuously for the duration defined by the stop delay.

The on-line capacity is calculated from the generator max current parameters (in C6200 Module) multiplied with the rated cosphi parameter (in C6200 Module). The total load is calculated as the sum of the active loads on generators running.

Generators that have failed or are switched to manual will not be started automatically. These generators are simply disregarded in the start/stop algorithm.

WRITE LOADSTARTSTOP STOPLEVEL 60

The stop level can be programmed between 20% and 120% of rated load (Range 20-120). Default is 60%.

WRITE LOADSTARTSTOP STOPTDELAY 10

The stop delay can be adjusted between 2s and 32000s. Default is 10s.

On newer units the stop level is instead defined as a STOP HYSTERESE.

The stop hysterese defines the stop level as a certain percentage under the start level (STARTPERCENT) of the remaining generators.

If STARTPERCENT is set to 90 % and STOPHYST is set to 20 %, then the next generator will be stopped in case the load of the remaining generator would fall below 20 % lower than the STARTPERCENT:

Stop level = STARTPERCENT – STOPHYST

Stop level = 90 % - 20 % = 70%

WRITE LOADSTARTSTOP STOPHYST [1 % - 100 %], (10%)

The optional C6500 User Interface calculates and shows the stop level in kW in its power management display, so under commissioning it is very easy to keep track of this.

4.10.4 Sequence

The sequence defines the power management program (the principle of operation). Valid sequences are “Linear”, “Cyclic” and “Duty Hour”. The sequence is configured by the following command.

WRITE LOADSTARTSTOP SEQ LINEAR

The choice can be either LINEAR, CYCLIC or DUTYHOUR. Please note that the duty hour counter is stored in the C6200 configuration of the individual generator.

Linear:
The linear sequence starts and stops the generators according to the assigned priority. The highest (numerical lowest) prioritised generator is the first to be started, then the second highest etc. The linear sequence stops the generators following the “last in first out” principle.

Cyclic:
The cyclic sequence starts and stops the generators according the assigned priority. The highest (numerical lowest) prioritised generator is the first to be started, then the second highest etc. The cyclic sequence stops the generators following the "first in first out" principle. The start/stop procedure for three generators can be described as 1-2-3,2-3-1 ,3-1-2,1-2-3…

Duty Hour:
The generator with the lowest number of running hours is the first one started, while the generator with the most running hours is the first to be stopped.

4.10.5 Cool Down Time

With this command the cool down time for the engine can be defined. The cool down time is the time the engine continues running after the circuit breaker has been tripped.
The length of the cool down time can be programmed by following command:

WRITE LOADSTARTSTOP COOLDOWN 5

The range of this delay is between 0 and 10000s. The resolution is 1s and the default setting is 5s.

4.10.6 Pulse or continuous start signal

The start signal can be a pulse or a continuous signal (meaning that it is remains active as long as the generator should run).

WRITE LOADSTARTSTOP STARTSIGNAL [PULS, CONST] (PULS)

4.10.7 Start Time Out

After the C6200 has issued the start signal the C6200 expects the generator to reach rated frequency and voltage within a certain time limit. This limit is called Start Time Out. In case the generator does not reach rated frequency and voltage after the start time out has expired, an alarm will be issued. In case load depending start and stop is enabled and a stand by generator is available, the stand by generator will be started.

The start time out is expressed in seconds. The range is 5s to 500s. Default is 15s.

WRITE LOADSTARTSTOP STARTTIMEOUT 15

4.11 Large Consumer Request

Two Large Consumer Request inputs can be configured for each C6200.0100 module.

The large consumer request signal is connected to a programmable input. When a large consumer shall be used, the respective LC input has to be connected by a switch to the COM terminal.

The large consumer request signal must remain active as long as the Large Consumer shall be used.

After the LC request signal has been activated, the C6200.0100 system will check if there is enough reserve capacity available.

If enough reserve capacity is available, the corresponding LC acknowledge output (this is a programmable output configured for this function) will be activated.

If there is not enough reserve capacity available, the next available generator will be started.

Two conditions are required for an LC acknowledge output to energize (AND condition):

- LC request signal must be active
- Reserve capacity must be equal with or larger than the Large Consumer Request

In case more than one large consumer request is activated, the reserve capacity of these requests will be added to each other.

4.11.1 Power of the large consumer

The load represented by each of the large consumers can be set as as active load (expressed in kW).

To set the size of a large consumer, use the following command. LC1 represents Large Consumer No. 1, LC2 represents Large Consumer No. 2.

The range is 0 to 32000kW, default is 20kW for LC1 and 40kW for LC2.

WRITE LOADSTARTSTOP LC1 [0 - 32000] (20)

WRITE LOADSTARTSTOP LC2 [0 - 32000] (40)

4.11.2 Priority Source

The load depending start and stop priority can be adjusted either through programmable inputs, Modbus or through the C6500 User Interface.

WRITE LOADSTARTSTOP PRIOSRC [DIGIINP, CAN, MODBUS] (DIGIINP)

DIGIINP means adjustment through digital input, Modbus through Modbus communication and CAN through C5200 User Interface.

4.11.3 Standby Time

The load depending start and stop Standby Time parameters allows a forced change of the duty generator after it has been running a certain number of hours (standby time). After the time has expired the priorities will be changed a new duty generator will be started, synchronized and connected. The previous duty generator will be stopped and assigned lowest priority. This function is active in Cyclic mode.

WRITE LOADSTARTSTOP STANDBYTIME [0 – 30000] (0)

If set to 0 it means that forced priority change is disabled.

4.11.4 Configuration of Request Input and Release Output

The Request Inputs and Release Outputs are configured in the I/O FUNC section.

Request Input can be any of the programmable inputs (IN1, IN2...IN8) or it can be deactivated (OFF). Default is OFF.

Release Output can be any of the programmable outputs (OUT1, OUT2...OUT8) or it can be deactivated (OFF). Default is OFF.

WRITE IOFUNC LC1 <Request Input> <Release Output>

WRITE IOFUNC LC2 <Request Input> <Release Output>

4.11.5 Priority Selection

The load depending start/ stop priority can be selected via the C6500User Interface, via programmable inputs on the C6200 or via Modbus.

WRITE LOADSTARTSTOP PRIOSRC <Choice>

The choice can be DIGIINP, CANBUS or MODBUS.

DIGIINP means adjustment of priority by programmable inputs 5-8.

CANBUS means adjustment of priority by User Interface C6500. This function will make the digital inputs 5-8 available for other functions.

MODBUS means adjustment of priority by Modbus RTU communication (e.g. a PLC or a HMI panel). This function will make the digital inputs 5-8 available for other functions.

4.12 IO & Relays

The properties of the inputs, outputs and relays can be configured by the following parameters.

4.12.1 Alarm Relay Function

The alarm relay can be configured to signal either system alarm (internal faults of C6200 or communication errors) or system and protection alarms.

The relay function is set by the following command. The choice can be either SYS or SYSPROT. Default is SYSPROT

WRITE RELAYS ALARMFUNC <Choice>

4.12.2 Protection Trip Relay

The Protection Trip relay can be configured for normally de-energized or normally energized operation. The default setting is normally energized operation, as this setting would cause a C/B trip if the power supply is lost.

The relay function is set by the following command. The choice can be either ND or NE. Default is ND

WRITE RELAYS PROTTRIP CONTACT <Choice>

4.12.3 Unload trip

When the unload input is activated it will ramp down the load. The Unload Trip function will trip the breaker when the load is below trip level.

The relay function is set by the following command. The choice can be either ND or NE. Default is ND

WRITE RELAYS UNLOADTRIP CONTACT <Choice>

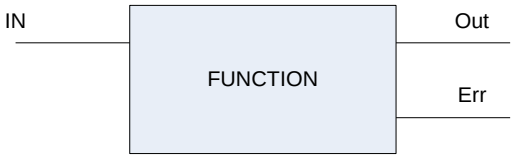
4.13 Programmable functions

The programmable functions can be controlled via user programmable inputs and outputs or by triggering the functions by Modbus.

4.13.1 Control of user defined function via inputs and outputs

Inputs and outputs can be used for a range of user defined functions. Programming these inputs and outputs can be done by either HyperTerminal or User Interface module. This manual shows programming via HyperTerminal.

A function consists of an Input (In), Output (Out) and Error Output (Err)



Each of these user defined functions consists of an input for activating the function, an output that activates in case the function has been completed successfully and an error output in case the function has not been completed successfully.

Input

The inputs activate the user defined function.

Output

The outputs works as an acknowledge signal or flag. It is a feedback that the requested function has been completed successfully. The flag can be used in a process overview to indicate the C6200 current status or it can be used to trigger the next stage in a PLC program.

Error Output

The error output can be assigned to any of the 8 user defined outputs or the common alarm output relay. The error output is activated if the function is not completed successfully (i.e. auto synchronization is not met within the specified time frame).

Programming

Each function can be assigned an input, output and an error output. When configuring a C6200 function an input and output must be assigned in the same command line.

A word of caution: there are no fail safes in regard to assigning incompatible functions to the same input/output

The command for assigning a function is.

WRITE IOFUNC <Choice> <Choice> <Choice>

The first choice defines the input used for the function. It can be OFF, IN1, IN2, IN3, IN4, IN5, IN6, IN7 or IN8.

The second choice defines which output will be used for the acknowledge signal. The choice can be OFF, OUT1, OUT2, OUT3, OUT4, OUT5, OUT6, OUT7 or OUT8.

The third choice defines which output should be used for the error signal. The choice can be OFF, OUT1, OUT2, OUT3, OUT4, OUT5, OUT6, OUT7, OUT8 or ALARM.

Not all choices are applicable for all functions. In case a choice is not applicable, it may be ignored in the RS232 command.

4.13.2 Control of governor by increase decrease pulse signals

In case increase decrease pulse signals should be used for speed control, it is possible to use the programmable inputs and outputs for that.

The input can be used for manual speed control (only active with C6200 in manual mode (terminal 41 MANUAL CONTROL connected to COM).

The output can be used as speed control output instead of the analogue speed setting output (terminal 33, 34, 35). This function is available in both manual and automatic mode (regardless of connection of terminal 41).

Example: Manual speed control input programmed to IN1 (increase speed) and IN2 (decrease speed). Pulse speed control output programmed to OUT1 (increase speed) and OUT2 (decrease speed).

Program command	Function	Input	Output
WRITE IOFUNC	SPEEDINC	IN1	OUT1
WRITE IOFUNC	SPEEDDEC	IN2	OUT2

An error output is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty.

4.13.3 Control of AVR by increase decrease pulse signals

In case increase decrease pulse signals should be used for voltage control, it is possible to use the programmable inputs and outputs for that.

The input can be used for manual voltage control (only active with C6200 in manual mode (terminal 41 MANUAL CONTROL connected to COM).

The output can be used as voltage control output instead of the analogue voltage setting output (terminal 37,38,39)). This function is available in both manual and automatic mode (regardless of connection of terminal 41).

Example: Manual voltage control input programmed to IN3 (increase voltage) and IN4 (decrease voltage). Pulse voltage control output programmed to OUT3 (increase voltage) and OUT4 (decrease voltage).

Program command	Function	Input	Output
WRITE IOFUNC	VOLTINC	IN3	OUT3
WRITE IOFUNC	VOLTDEC	IN4	OUT4

An error output is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.4 Definition of start/ stop in and out outputs for generators

C6200 offer the possibility of sending start and stop commands to the generators. This can be done either via start/ stop inputs or depending on load. For enabling this function the start and stop terminals must be defined. This can be done by following command:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	GENSTARTIO	IN1	OUT1	Alarm
WRITE IOFUNC	GENSTOPIO	IN2	OUT2	Alarm

Above example means that input 1 is the external start input for the generator, output 1 is the start output for the generator. In case the engine fails to start the alarm relay would be activated.

The start input is functional both in manual and automatic mode.

4.13.5 Outputs for short circuit alarm and trip

Outputs for the short circuit alarm and trip can be programmed to any of the programmable outputs.

In following example the short circuit trip is signaled on programmable output 1 and the short circuit alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output

WRITE IOFUNC	SC	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.6 Outputs for over current alarm and trip

Outputs for the over current alarm and trip can be programmed to any of the programmable outputs.

In following example the over current trip is signaled on programmable output 1 and the over current alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	OC	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.7 Outputs for over load alarm and trip

Outputs for the over load alarm and trip can be programmed to any of the programmable outputs.

In following example the over load trip is signaled on programmable output 1 and the over load alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	OL	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.8 Outputs for under voltage alarm and trip

Outputs for the under voltage alarm and trip can be programmed to any of the programmable outputs.

In following example the under voltage trip is signaled on programmable output 1 and the under voltage alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	UV	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.9 Outputs for over voltage alarm and trip

Outputs for the over voltage alarm and trip can be programmed to any of the programmable outputs.

In following example the over voltage trip is signaled on programmable output 1 and the over voltage alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	OV	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.10Outputs for under frequency alarm and trip

Outputs for the under frequency alarm and trip can be programmed to any of the programmable outputs.

In following example the under frequency trip is signaled on programmable output 1 and the under frequency alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	UF	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.11 Outputs for over frequency alarm and trip

Outputs for the over frequency alarm and trip can be programmed to any of the programmable outputs.

In following example the over frequency trip is signaled on programmable output 1 and the over frequency alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	OF	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.12Outputs for reverse power alarm and trip

Outputs for the reverse power alarm and trip can be programmed to any of the programmable outputs.

In following example the reverse power trip is signaled on programmable output 1 and the reverse power alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	RP	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.13 Outputs for excitation loss alarm and trip

Outputs for the excitation loss alarm and trip can be programmed to any of the programmable outputs.

In following example the excitation loss trip is signaled on programmable output 1 and the reverse excitation loss alarm is signaled on programmable output2:

Program command	Function	Protection Output	Alarm Output
WRITE IOFUNC	EL	OUT1	OUT2

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.14 Input and output for the frequency deviation trip

The frequency deviation trip can be configured to be monitored only after receipt of an external command. This is very important in application where a generator is sometimes running in island mode and sometimes in parallel with the grid. When running grid parallel this function has to be activated, otherwise it must be de-activated in order to avoid unintended trips due to sudden load changes.

An alarm output for the frequency deviation trip can be programmed to any of the programmable outputs.

In following example the frequency deviation trip is only monitored in case IN1 is connected to COM. Output 1 is programmed as alarm output for the frequency deviation trip:

Program command	Function	Input	Output
WRITE IOFUNC	FD	IN1	OUT1

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.15 Input and output for the vector shift trip

The vector shift trip can be configured to be monitored only after receipt of an external command. This is very important in application where a generator is sometimes running in island mode and sometimes in parallel with the grid. When running grid parallel this function has to be activated, otherwise it must be de-activated in order to avoid unintended trips due to sudden load changes.

An alarm output for the vector shift trip can be programmed to any of the programmable outputs.

In following example the vector shift trip is only monitored in case IN1 is connected to COM. Output 1 is programmed as alarm output for the vector shift trip:

Program command	Function	Input	Output
WRITE IOFUNC	VS	IN1	OUT1

Error output function is not applicable for this function. Therefore, the third choice will be ignored (it simply remains empty).

4.13.16Output for preferential trip

The output for the preferential trip function is configured by following command:

WRITE IOFUNC NE1 <Choice> (OUT1, OUT2…OUT8, OFF)

WRITE IOFUNC NE2 <Choice> (OUT1, OUT2…OUT8, OFF)

The choice can be any of the programmable outputs or OFF. Default is OFF.

4.13.17 External Trip (Abnormal trip)

The external trip function is typically used for external or manual trip of the breaker while the system is in automatic mode (e.g. doing load depending start and stop). If the breaker is to be tripped manually (or by external third party equipment) it is important that this function is used so that the C6200 “knows” about the external trip.

Program command	Function	Input	Output
WRITE IOFUNC	EXTTRIP	IN2	OUT3

The input is used for the external trip signal (connects to COM). The output serves as an acknowledgement from the C6200 that it has received the trip signal.

4.13.18 Load depending start and stop

The load depending start and stop function can be enabled by following command:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	LOADSTARTSTOPENABLE	IN1		

4.13.19 Generator priority selection for load depending start and stop

In case the load depending start and stop function is enabled, automatically the programmable inputs 5, 6, 7 and 8 (terminals 19, 20, 21 and 22) are used for the priority selection.

Priority 1 → Input 5 connected to COM

Priority 2 → Input 6 connected to COM

Priority 3 → Input 7 connected to COM

Priority 4 → Input 8 connected to COM

Priority 5 → Inputs 5 and 8 connected to COM

Priority 6 → Inputs 6 and 8 connected to COM

Priority 7 → Inputs 7 and 8 connected to COM

Etc.

Priority 1 means that this generator will be started first and stopped last.

4.13.20 Indication of 1st standby generator

It is possible to use one of the programmable outputs for indication of the first standby generator. When activated, this output will activate as soon as the respective generator becomes the first standby generator. Use following command for activation of this function:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	1STANDBYINDICATION		OUT1	

4.13.21 Light Load Cancel Mode

In some cases it is necessary to disable the load depending stop function, while having load depending start still activated.

This can be achieved by following command:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	LIGHTLOADCANCEL	IN1		

4.13.22 Light Load Indication

The programmable outputs can be used for indication that the load of the generator is lower than the load depending stop level:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	LIGHTLOADINDICATION		OUT1	

4.13.23 High Load Indication

The programmable outputs can be used for indication that the load of the generator is higher than the load depending stop level:

Program command	Function	Input	Output	Alarm

WRITE IOFUNC	HIGHLOADINDICATION		OUT1	

4.13.24 Low Capacity Alarm

This is the output for the Load Demand > Plant capacity alarm. It activates in case the load demand of the installation increases above the sum of the capacities of all generators that are in Auto Mode and available for automatic load sharing.

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	LOWCAPACITY		OUT1	

4.13.25 CAT2 Alarm

This input is used for replacing a generator in case of a non critical alarm with a standby generator.

Once activated, the C6200 will start the next available generator, synchronize it with the busbar transfer the load from the CAT2 ALARM generator to the standby generator and then stop the CAT2 ALARM generator. Cool down time applies.

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	CAT2ALARM	IN1	OUT1	

4.13.26Large Consumer Request In- and Outputs

The inputs and outputs for the large consumer request function are configured by following command:

WRITE IOFUNC LC1 <INx OUTx> (IN1, IN2…IN8, OFF, OUT1, OUT2…OUT8, OFF)

WRITE IOFUNC LC2 <INx OUTx> (IN1, IN2…IN8, OFF, OUT1, OUT2…OUT8, OFF)

The choice can be any of the programmable inputs and outputs or OFF. Default is OFF.

4.13.27 Voltage and Frequency ok Output

This output is used as a signaling output indicating that the generator has reached nominal voltage and frequency. The output activates as soon as both, the voltage gets inside the voltage ok window **and** the frequency gets inside the frequency ok window:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	VOLTFREQOK		OUT1	

4.13.28 Activation of load sharing schemes via programmable inputs

When running diesel generators in parallel with the grid, it is necessary to define a load set point for the diesel generators. This is done by choosing the load sharing scheme.

In case the generators are sometimes running in parallel with the grid and sometimes alone, it is required to activate and deactivate the load sharing scheme accordingly. This can be done either via RS485 or the programmable inputs.

Program command	Function	Input
WRITE IOFUNC	FIXEDIMPORT	IN1
WRITE IOFUNC	PEAKIMPORT	IN2
WRITE IOFUNC	FIXED EXPORT	IN3
WRITE IOFUNC	EXCESSEXPORT	IN4

Above example works as follows:
In case input 1 is activated, the generators will work in fixed import scheme.
In case input 2 is activated, the generators will work in peak import scheme.
In case input 3 is activated, the generators will work in fixed export scheme.
In case input 4 is activated, the generators will work in excess export scheme.

Output or error output functions are not applicable for this function. Therefore the second and third choices will be ignored (they simply remain empty).

4.13.29 Frequency Control Disable Output

In case a C6200 shall remote control the speed and/ or voltage of diesel generators through their respective C6200 units it is possible to send this command from one of the programmable outputs of the grid/ breaker C6200 unit:

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	FVDISABLE		OUT1	

4.13.30 CBBLOCK

The *CBBLOCK* function can be used to disable the closure of the circuit breaker. The input is active when at COM level and inactive if left open. The *CB BLOCK* will not prevent auto synchronization; it will only prevent closure of the circuit breaker (activation of the *C/B CLOSE* relay). Thus, the CBBLOCK input is handy during test and commissioning (e.g. to test auto synchronization without closing the breaker).

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	CBBLOCK	IN1		

4.13.31 TOTAL STOP

The TOTALSTOP function can be used in order to stop the generator regardless of load condition, e.g. in case an emergency generator is to be stopped in order to change back to normal supply via black out (without synchronizing). It can be understood as an unconditional stop.

This function is available in both manual and automatic mode. Once activated the C6200 will trip the circuit breaker and stop the generator (stop of engine after expiration of cool down time).

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	TOTALSTOP	IN1		

4.13.32 ENGINE ERROR

The ENGINE ERROR input is typically used as input for a shut down signal from an external engine controller. Once activated C6200 will give an alarm, trip the circuit breaker and send a stop command to the engine (without cool down time). The engine will be blocked for start until the input has disappeared and fault has been reset.

It is also possible to configure an output for this function.

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	ENGINEERROR	IN1	OUT1	

4.13.33 UNLOADSTOP

In case it is intended to stop the engine after the generator had been unloaded via the unload input (terminal 42), following command can be used:

WRITE IOFUNC UNLOADSTOP NO

Setting this command to NO means that the engine continues running after unload trip,

Setting this command to YES means that the engine is stopped after unload trip.

Cool down time applies if configured.

4.13.34Remote control of frequency and voltage stabilization

In case the C6200 should not start frequency stabilization immediately after it detects voltage on the generator, it is possible to configure a start frequency stabilization command. With this function activated, the C6200 will only start frequency stabilization after the start frequency stabilization command has been activated and the generator voltage is within the Voltage ok window. This command can be activated either by one of the programmable inputs or RS485.

Often this function is used together with the start command for the voltage stabilization. It is possible to trigger both start commands from the same input.

Example: The start command for frequency and voltage stabilization can be configured to use the same inputs and outputs.

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	FREQSTAB	IN4	OUT4	Alarm
WRITE IOFUNC	VOLTSTAB	IN4	OUT4	Alarm

In above example the frequency and voltage stabilization will start after input 4 has been connected to COM. After frequency and voltage stabilization have been accomplished, output 4 will activate. In case frequency or voltage stabilization cannot be done, the common alarm relay will be triggered.

4.13.35 Remote control of synchronization

In case the C6200 should not start synchronizing immediately after it detects voltage on bus bar and generator, it is possible to configure a start synchronizing command. With this function activated C6200 will first start synchronizing after the start synchronizing command has been activated and generator and bus bar are within the voltage ok window. This command can be activated either by one of the programmable inputs or RS485.

Example: Configuring Synchronization to Input 1, Output 1 and Alarm relay

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	SYNC	IN1	OUT1	ALARM

Above settings mean that the synchronization of the generator will start after input 1 has been activated. As soon as the generator is synchronized, C6200 will activate output 1 for indicating that the synchronization has been completed. In case C6200 fails to synchronize, the common alarm relay will be triggered.

4.13.36 Remote control of voltage matching

In case the C6200 should not start voltage matching immediately after it detects voltage on bus bar and generator, it is possible to configure a start voltage matching command. With this function activated, the C6200 will only start voltage matching after the start voltage matching command has been activated and generator and bus bar are within the voltage ok window. This command can be activated either by one of the programmable inputs or RS485.

Example: Configuring voltage matching to Input 1, Output 1 and Alarm Relay

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	VOLTMATCH	IN1	OUT1	ALARM

Above settings mean that voltage matching of the generator will start after the input 1 has been activated. As soon as the voltage of the generator and the bus bar correspond, C6200 will activate

output 1 for indicating that voltage matching has been completed. In case C6200 fails voltage matching, the common alarm relay will be triggered.

4.13.37 Remote control of active and reactive load ramp up

Usually, C6200 ramps up active and reactive load as soon as the circuit breaker is closed. In case this is not wanted a start ramp up command can be configured. With this function activated, the C6200 will wait for the start ramp up command before loading the generator.

Example: Start command for active RampUp & Reactive RampUp configured to use the same inputs and outputs.

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	ACTRAMPUP	IN3	OUT3	Alarm
WRITE IOFUNC	REACTRAMPUP	IN3	OUT3	Alarm

With above settings the active and reactive load will be ramped up as soon as the circuit breaker is closed and input 3 is connected to COM. After the load has been ramped up, output 3 will activate. If load ramp up fails, the common alarm relay will be triggered.

4.13.38 Remote control of active and reactive load sharing

In case C6200 should not start load sharing immediately after the circuit breaker has been closed, it is possible to configure a start load sharing command. With this function activated, C6200 will wait for the start load sharing command before loading the generator.

Example: Start command for active and reactive load sharing configured to use the same inputs and outputs.

Program command	Function	Input	Output	Alarm
WRITE IOFUNC	ACTLS	IN3	OUT3	Alarm
WRITE IOFUNC	REACTLS	IN3	OUT3	Alarm

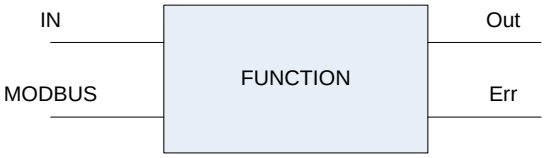
With above settings the active and reactive load sharing will be started as soon as the circuit breaker is closed and input 3 is connected to COM. After the load balance has been obtained, output 3 will activate. If load balance cannot be obtained, the common alarm relay will be triggered.

4.13.39 Control of user defined function via Modbus

It is possible to control the user defined functions by an assigned MODbus address via the MODbus protocol. This feature can be used with a PLC and other systems via the RS485 protocol

Basic block functionality:

Each Block has an Input (or Modbus Input), Output and an Error Output.



The C6200 MODbus memory map can be downloaded from www.selco.com

4.13.40 Function List

INx means any of the programmable inputs.

OUTx means any of the programmable outputs.

Error means a programmable output used as an error output.

Default settings are in **bold**.

Description	**Command text**	**Input/ Output Configuration**		**Error**
Speed Increase Input/ Output	SPEEDINC	INx, **OFF**	OUTx, **OFF**	N/A
Speed Decrease Input/ Output	SPEEDDEC	INx, **OFF**	OUTx, **OFF**	N/A
Volt Increase Input/ Output	VOLTINC	INx, **OFF**	OUTx, **OFF**	N/A
Volt Decrease Input/ Output	VOLTDEC	INx, **OFF**	OUTx, **OFF**	N/A
Under Voltage Protection and Alarm Output	UV	OUTx, **OFF**	OUTx, **OFF**	N/A
Over Voltage Protection and Alarm Output	OV	OUTx, **OFF**	OUTx, **OFF**	N/A
Under Frequency Protection and Alarm Output	UF	OUTx, **OFF**	OUTx, **OFF**	N/A
Over Frequency Protection and Alarm Output	OF	OUTx, **OFF**	OUTx, **OFF**	N/A
Reverse Power Protection and Alarm Output	RP	OUTx, **OFF**	OUTx, **OFF**	N/A
Excitation Loss Protection	EL	OUTx,	OUTx,	N/A

and Alarm Output		**OFF**	**OFF**	
Frequency Deviation	FD	INx, **OFF**	OUTx, **OFF**	N/A
Vector Shift	VS	INx, **OFF**	OUTx, **OFF**	N/A
External Trip	EXTTRIP	INx, **OFF**	OUTx, **OFF**	N/A
Frequency Stabilization	FREQSTAB	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Synchronizing	SYNC	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Active Load ramp up	ACTRAMPUP	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Active Load Sharing	ACTLS	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Voltage Stabilization	VOLTSTAB	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Voltage Matching	VOLTMATCH	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Reactive Load ramp up	REACTRAMPUP	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Reactive Load Sharing	REACTLS	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Power Factor Control	PFCTRL	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Start Input	GENSTARTIO	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Stop Input	GENSTOPIO	INx, **OFF**	OUTx, **OFF**	OUTx, **OFF**
Load depending start/ stop	LOADSTARTSTOPENABLE	INx, **OFF**	N/A	N/A
Indication 1st standby generator	1STANDBYINDICATION	N/A	OUTx, **OFF**	N/A

Light Load Cancel	LIGHTLOADCANCEL	INx, **OFF**	N/A	N/A
Light Load Indication	LIGHTLOADINDICATION	N/A	OUTx, **OFF**	N/A
High Load indication	HIGHLOADINDICATION	N/A	OUTx, **OFF**	N/A
Alarm in case Capacity < Load demand	LOWCAPACITY	N/A	OUTx, **OFF**	N/A
Replacement of a generator with Load transfer (category 2 alarm)	CAT2ALARM	INx, **OFF**	OUTx, **OFF**	N/A
Voltage and frequency ok output	VOLTFREQOK	N/A	OUTx, **OFF**	N/A
Fixed Import Mode	FIXEDIMPORT	INx, **OFF**	OUTx, **OFF**	N/A
Peak Import Mode	PEAKIMPORT	INx, **OFF**	OUTx, **OFF**	N/A
Fixed Export Mode	FIXEDEXPORT	INx, **OFF**	OUTx, **OFF**	N/A
Excess Export Mode	EXCESSEXPORT	INx, **OFF**	OUTx, **OFF**	N/A
Frequency/Voltage Ctrl. Disable	FVDISABLE	N/A	OUTx, **OFF**	N/A
C/B Close Block	CBBLOCK	INx, **OFF**	N/A	N/A
Unconditional stop of generator	TOTALSTOP	INx, **OFF**	N/A	N/A
Engine fault and start block	ENGINEERROR	INx, **OFF**	OUTx, **OFF**	N/A

4.14 Analogue Outputs

The analogue outputs are used like measurement converter outputs. Any of the C6200 measurements can be provided on these outputs as a voltage signal.

The analogue outputs are configured with the following parameters.

4.14.1 Analogue Output 1

The first parameter to set is the measurement that should be connected to the output.

The indicated parameter is set by the following command. The choice can be any one of the following parameters: BusU12 (voltage between L1 and L2 of the bus bar), GenU12 (voltage between L1 and L2 of the generator), I3 (current of L3 of the generator), P (Power of the generator), Q (reactive power of the generator), PF (power factor), VA (apparent power of the generator), F (frequency), Off (analogue output disabled). Default is GENU12.

WRITE ANAOUT OUT1 SRC <Choice>

The next two commands scale the chosen parameter. Default is 0 and 100% of the measured value in relation to the nominal value.

WRITE ANAOUT OUT1 SRCMIN <value>

WRITE ANAOUT OUT1 SRCMAX <value>

Finally, the output signal must be scaled. Default settings are 0 to 10 VDC.

WRITE ANAOUT OUT1 VOLTMIN <value>

WRITE ANAOUT OUT1 VOLTMAX <value>

4.14.2 Analogue Output 2

The first parameter to set is the “indicated” parameter (among all the available measured and calculated parameters).

The indicated parameter is set by the following command. The choice can be any one of the following parameters: BusU12 (voltage between L1 and L2 of the bus bar), GenU12 (voltage between L1 and L2 of the generator), I3 (current of L3 of the generator), P (Power of the generator), Q (reactive power of the generator), PF (power factor), VA (apparent power of the generator), F (frequency), Off (analogue output disabled). Default is GENU23.

WRITE ANAOUT OUT2 SRC <Choice>

The next two commands scale the chosen parameter. Default is 0 and 100% of the measured value in relation to the nominal value.

WRITE ANAOUT OUT2 SRCMIN <value>

WRITE ANAOUT OUT2 SRCMAX <value>

Finally, the output signal must be scaled. Default settings are 0 to 10 VDC.

WRITE ANAOUT OUT2 VOLTMIN <value>

WRITE ANAOUT OUT2 VOLTMAX <value>

4.15 Speed Control

Speed control can be done using either increase/decrease pulse signals or analogue output 1. The pulse signals are well suited for control of either a conventional governor or a motorized/electronic potentiometer through an external relay. The pulse outputs are open collector outputs.

Alternatively, speed control can be done by analogue output 1 using a voltage, current or PWM signal. The analogue speed output is intended for direct control of an electronic speed governor.

The C6200 speed control output can be reconfigured to operate as a frequency control signal (e.g. for remote control of other C6200 modules through the FREQ IN input). This function is commonly used in case two bus bar sections should be synchronized with each other.

4.15.1 Speed control signal

The speed control function can be enabled or disabled by the following command. The choice can be either YES or NO.

WRITE SYS SPEEDCTRL ENABLED <Choice>

4.15.2 Analogue output signal for speed control

The speed control by analogue output 1 can be configured to operate with either a DC voltage, current or a PWM signal. The type of output signal is set by the following command. Choice can be VOLT, CUR or PWM.

WRITE SYS SPEEDCTRL ANAOUT SIGNAL <Choice>

4.15.3 Pulse output signals for speed control

This function is only available with the user defined function Speed Increase/ Decrease Output activated.

The minimum pulse duration determines the duration of the shortest possible speed control pulse. The pulse duration setting is only in use when speed control is done by relays. Resolution is 1 ms. The range is 10ms to 10000ms.

WRITE SYS SPEEDCTRL MINPULSE <Duration>

Setting the parameter too low will result in slow regulation, while a high setting will result in overshoot on the speed regulation.

4.15.4 Voltage Range

The voltage minimum and maximum references define the lower and upper limits of the voltage output signal. These parameters are used when speed control is done by analogue output and when the analogue signal has been set to voltage. The VOLTMAX parameter is also used for defining the Voltage of the PWM output. Resolution is 0.001 V DC. The range is -10,000V to +10,000V.

WRITE SYS SPEEDCTRL ANAOUT VOLTMIN <Voltage>

WRITE SYS SPEEDCTRL ANAOUT VOLTMAX <Voltage>

4.15.5 Current Range

The current minimum and maximum references define the lower and upper limits of the current output signal. These parameters are only used when speed control is done by analogue output and when the analogue signal has been set to current. Resolution is 0.001 mA. The range is 0,000mA to 20,000mA.

WRITE SYS SPEEDCTRL ANAOUT CURMIN <Current>

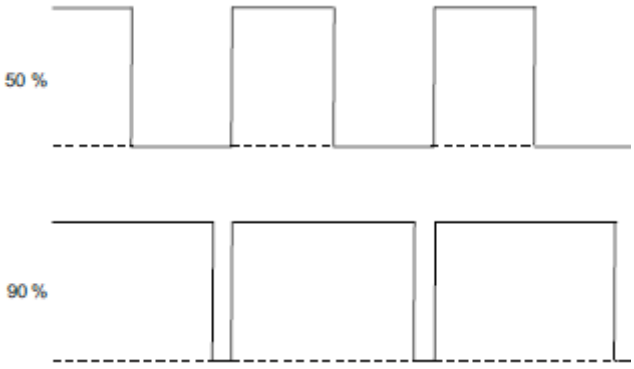
WRITE SYS SPEEDCTRL ANAOUT CURMAX <Current>

4.15.6 PWM Settings

This type of signal is used as input in some speed controllers (e.g. Woodward & Caterpillar).

The PWM output of C6200 is an open collector output. The frequency and voltage of the PWM signal can be configured.

The range of the pulse width is fixed between 5%1 - 95%. The reference point is 50%.



The PWM settings describe the properties of the pulse-width modulated (PWM) output signal. These settings are only used when speed control is done by analogue output and when the analogue signal has been set to PWM.

Resolution of the PWM base frequency is 1 Hz. The range is 100Hz to 32000Hz

WRITE SYS SPEEDCTRL PWMOUT FREQ <Frequency>

The Voltage of the PWM output is defined by the VOLTMAX parameter (see 4.15.4).

5 Voltage Control

Voltage control can be done using either increase/decrease pulse signals or analogue output 2. The pulse signals are well suited for control of either a conventional automatic voltage regulator (AVR) or a motorized/electronic potentiometer.

Alternatively, voltage control can be done by analogue output 2 using a voltage, current or PWM signal. The analogue voltage output is intended for direct control of an electronic AVR.

The C6200 voltage control output can be reconfigured to operate as a voltage control signal (e.g. for remote control of other C6200 modules through the VOLT IN input).

A minimum pulse time defines the minimum closure time for the relay contacts; likewise min/max references define the operational range of analogue output. The C6200 voltage regulator is configured using the following commands.

5.1.1 Voltage control signal

The voltage control function can be enabled or disabled by the following command. The choice can be either YES or NO.

WRITE SYS VOLTCTRL ENABLED <Choice>

In case the AVR is not controlled by C6200 this function must be disabled.

5.1.2 Analogue output signal for voltage control

The voltage control by analogue output 2 can be configured to operate with either a DC voltage, current or a PWM signal. The type of output signal is set by the following command. Choice can be VOLT, CUR or PWM.

WRITE SYS VOLTCTRL ANAOUT SIGNAL <Choice>

5.1.3 Pulse output signals for voltage control

The minimum pulse duration determines the duration of the shortest possible voltage control pulse. The pulse duration setting is only in use when voltage control is done by pulse signals. Resolution is 1 ms. The range is 10ms to 10000ms.

WRITE SYS VOLTCTRL MINPULSE <Duration>

Setting the parameter too low will result in slow regulation, while a high setting will result in overshoot on the voltage regulation.

5.1.4 Voltage Range

The voltage minimum and maximum references define the lower and upper limits of the voltage output signal. These parameters are used when voltage control is done by analogue output and when the analogue signal has been set to voltage. The VOLTMAX parameter is also used for defining the Voltage of the PWM output. Resolution is 0.001 V DC. The range is -10,000V to +10,000V.

Resolution is 0.001 V DC. The range is -10,000V to +10,000V.

WRITE SYS VOLTCTRL ANAOUT VOLTMIN <Voltage>

WRITE SYS VOLTCTRL ANAOUT VOLTMAX <Voltage>

5.1.5 Current Range

The current minimum and maximum references define the lower and upper limits of the current output signal. These parameters are only used when voltage control is done by analogue output and when the analogue signal has been set to current. Resolution is 0.001 mA. The range is 0,000mA to 20,000mA.

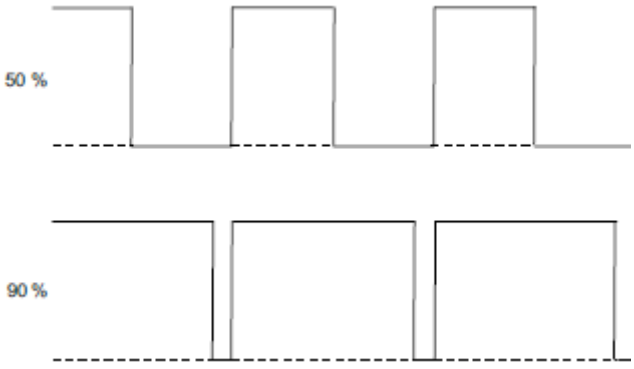
WRITE SYS VOLTCTRL ANAOUT CURMIN <Current>

WRITE SYS VOLTCTRL ANAOUT CURMAX <Current>

5.1.6 PWM Settings

The PWM output of C6200 is an open collector output. The frequency and voltage of the PWM signal can be configured.

The range of the pulse width is fixed between 5%1 - 95%. The reference point is 50%.



The PWM settings describe the properties of the pulse-width modulated (PWM) output signal. These settings are only used when voltage control is done by analogue output and when the analogue signal has been set to PWM.

Resolution of the PWM base frequency is 1 Hz. The range is 100Hz to 32000Hz

WRITE SYS SPEEDCTRL PWMOUT FREQ <Frequency>

The Voltage of the PWM output is defined by the VOLTMAX parameter (see 5.1.4).

5.2 Generator specification

The first thing to do is to configure the C6200 module to fit the generator.

5.2.1 Voltage

The C6200 module must know the nominal voltage of the generator as well as the primary voltage. The nominal voltage is the nominal voltage that will be present on the *VOLTAGE INPUTS* plug-in connector of the module (actual voltage between L1-L2 terminals). Please note that voltage settings are phase-phase voltages.

The nominal voltage is set by the following command. Resolution of the nominal voltage is 100 mV AC. The range is 63,0V – 690,0V

WRITE SYS NOMVOLT <nominal voltage>

The actual voltage might not be the same as the nominal voltage in case the C6200 is connected via external voltage transformers. The actual voltage could be higher (e.g. in medium voltage installations), in which case the power source primary voltage is transformed down by external PT (voltage transformer). In order to scale the measurements so that they fit to the primary voltage, following command is used. Resolution is 1 V AC. The range is 63V – 32000V.

WRITE SYS PRIMVOLT <primary voltage>

The primary voltage should be set to the same value as the nominal voltage when no intermediate PTs are used.

The voltage settings will affect the indication of phase-phase and phase-neutral voltages, as well as all parameters based on voltage (e.g. active/reactive loads, VA, generator capacity etc.). The nominal voltage is used for reference by the voltage stabilization function of the partner C6200 module (if installed).

5.2.2 Generator Maximum Current

The C6200 must be able to determine the capacity of the power source. The capacity is calculated through use of the primary voltage and the maximum current in one phase (the nominal current of the generator).

The nominal current of the generator can be calculated based on the following formula.

The formula is based on the kVA og kW rating and the primary phase-phase voltage.

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

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

The default settings are done using a power source of 42 kVA with a primary phase-phase voltage of 400 V AC. In this case the power factor (PF) is set to 1.00. The calculations would be as follows.

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

$$GENMAXCUR = \frac{42000}{3 \cdot \left(\left(\frac{400}{\sqrt{3}} \right) \cdot 1.00 \right)} = 60.6A$$

The example above illustrates that the maximum current in one phase (at full load at PF = 1.00) is 60.6 A. The generator maximum current could also have been derived from the generators kW rating (33.6 kW at PF = 0.8).

Another example is a generator defined by a capacity of 3 x 130 kW at PF = 0.8.

$$GENMAXCUR = \frac{130000}{3 \cdot \left(\left(\frac{400}{\sqrt{3}} \right) \cdot 0.8 \right)} = 234.54A$$

The maximum current is set by the following command. Resolution is 100 mA. The range is 0,5A – 30000,0A.

WRITE SYS GENMAXCUR <generator maximum current>

The maximum current is used as 100% reference for short-circuit and over current protection. The parameter is also used to calculate 100% reference for load (active and reactive) function, as well as the maximum capacity of the power source.

5.2.3 CT Primary Current

The C6200 module conducts its current measurements through an external current transformer CT). Two different versions of the C6200 module are available, one for 5 A secondary current and one for 1 A secondary current.

It is a requirement that the secondary rated current of the CT is either 5 A or 1 A. However, the primary current depends on the choice of the designer. In order to convert the measured secondary current to primary current, the C6200 module must know the primary rated current of the current transformer.

The CT primary rated current is set by the following command. Resolution is 100 mA. The range is 5,0A – 30000,0A.

WRITE SYS CTPRIMCUR <CT primary rated current>

The CT primary current is simply used to scale the measured current to the actual current.

5.2.4 Rated Frequency

The rated frequency must be set in order for the C6200 module to know the 100% reference for the frequency dependent trip functions (e.g. for trip of Non-Essential loads).

The rated frequency is set by the following command. Resolution is 0.1 Hz. The range is 35Hz – 70Hz. Default is 50

WRITE SYS RATEDFREQ *[35.0 – 70.0] (50)*

On a system equipped with the C6200, the generator speed will change when the rated frequency is altered provided that frequency stabilization is active.

5.2.5 Power Factor

The power factor is used for calculation of the 100% references for active power (kW) and reactive power (kVAr) related settings. C6200 will always calculate with a rated power factor of 0.8.

5.3 Restoring the factory default configuration

The factory default configuration can be restored at any time by issuing the command

WRITE SYS SETUPDEFAULT <Choice>.

The default configuration is restored when power to the module has been turned off and on again.

5.4 Power Up Delay

This delay defines the time delay between detection that the generator voltage is within the limits of the VOLTAGE OK WINDOW and start of operation of C6200.

WRITE SYS POWERUPDELAY <Value>

The value is the delay time in seconds and can be adjusted between 0s and 60s. The resolution is 1s. Default value is 0s.

5.5 Power Source

This command defines if the C6200 is connected as a auxiliary generator unit or as a shaft generator or grid unit.

WRITE SYS POWERSOURCE <Choice>

The choice can be AUXILIARY, SHAFT or GRID. Default is AUXILIARY.

5.6 Voltage ok Window

The Voltage ok Window defines the permitted voltage range in which C6200 is allowed to close the breaker. In case the voltage is outside these limits, C6200 cannot close the breaker.

The Voltage ok Window is expressed as a permitted deviation (+/-) in % from the nominal voltage.

The range is 0 to 20. Default is 10. (+/-0% to +/-20%, default +/-10%)

WRITE SYS VOLTOKWND < Value >

5.7 Frequency ok Window

The Frequency ok Window defines the permitted frequency range in which C6200 is allowed to close the breaker. In case the frequency is outside these limits, C6200 cannot close the breaker.

The Frequency ok Window is expressed as a permitted deviation (+/-) in % from the nominal frequency.

The range is 0 to 20. Default is 10. (+/-0.0% to +/-20.0%, default +/-10.0%)

WRITE SYS FREQOKWND < Value >

5.8 RS485

The RS485 communication interface can be configured with regard to MODBUS slave address, baud rate, data bit, parity and stop bits. It is important to ensure that the address is unique on the bus and that the remaining parameters are set according to specifications.

The MODBUS slave address is set by the following command.

WRITE RS485 ADDRESS <Addr>

The data transmission rate is defined by the baud rate, which is set as follows.

WRITE RS485 BAUDRATE <Baudrate>

The parity can be set by the following command.

WRITE RS485 PARITY <Parity>

The number of data bits is set as follows.

WRITE RS485 DATABITS <Databits>

The number of stop bits is set as follows.

WRITE RS485 STOPBITS <Stopbits>

6 Service configuration

This section describes the configuration of the service parameters. These parameters are only accessible with a separate service password.

6.1 Read Config

When in Service mode this command will only show the service configuration parameters (service interval, duty hour, service confirm and service password).

READ CONFIG

6.2 Service Interval

The service interval is the amount of running hours after which a Service Request Alarm will be issued.

With following command the service interval can be configured:

WRITE SERVICE INTERVAL <VALUE>

VALUE is the amount of running hours between each service.

6.3 Duty Hour

Duty Hour is the amount of running hours since the installation has been commissioned. The running hour counter starts when the C6200 gets a feedback that the circuit breaker is closed. It will stop counting when the C/B is opened again.

The amount of duty hours can be configured in the Service configuration by following command:

WRITE SERVICE DUTYHOUR <VALUE>

The value is the amount of running hours since commissioning.

The Dutyhour counter will not be reset with a firmware upgrade. The only possibility to alter the duty hours is via this command.

6.4 Service confirmation

After a service it is necessary to confirm this in the Service Configuration. This confirmation will reset the service counter.

WRITE SERVICE CONFIRM <CHOICE>

The CHOICE can be YES or NO.

For confirming a service, set this parameter to YES and toggle the power supply of C6200. After this has been done, the Service Counter has been reset and the CHOICE will automatically be set to NO again.