



SXDC GC Operations Manual

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1. Overview

The Kinetek Controls SXDC GC (Separately eXcited DC) Motor Controller is designed for use in 36-48V, 300Amp vehicles and various motor-driven equipment. The SXDC GC has programmable features and is simple to install, easy to use, inexpensive and reliable. The unit is potted for water-resistant operation and thermal efficiency.

Features:

- All solid state MOSFET driven technology w/ surface mount board fabrication to ensure reliability
- Fully potted for water-resistant operation
- Full current regenerative braking
- Fully programmable via laptop or PC
- Audible and visual diagnostics
- Supports 0-5K Pot Throttle as well as Inductive Throttle
- Regenerative braking option as throttle is removed.
- Constant temperature monitoring provided current and duty cycle reduction upon overheating.
- Full-bridge field and quarter-bridge armature power MOSFET design.
- Armature and Field Current measurement for reliable operation and motor protection
- Regenerative braking, providing longer operation on a single battery charge and quicker stopping.
- Programmable motor characteristics and operator preferences via PC.
- Diagnostic feedback through buzzer
- Automatic braking when throttle is reduced from either direction: Enhances safety by automatically initiating braking in an operator hands-off condition and in neutral.
- Reverse Polarity Protection prevents damage on all external controller connections.
- Continuous real-time diagnostics during operation
- Internal/External watchdog circuits prevent improper, and erratic operation.
- Field/armature short protection to battery.
- Potentiometer based or inductive based throttle support.
- Linear temperature, overvoltage and undervoltage cutback on motor currents; no sudden loss of power under any thermal conditions.

2. Installation and Wiring

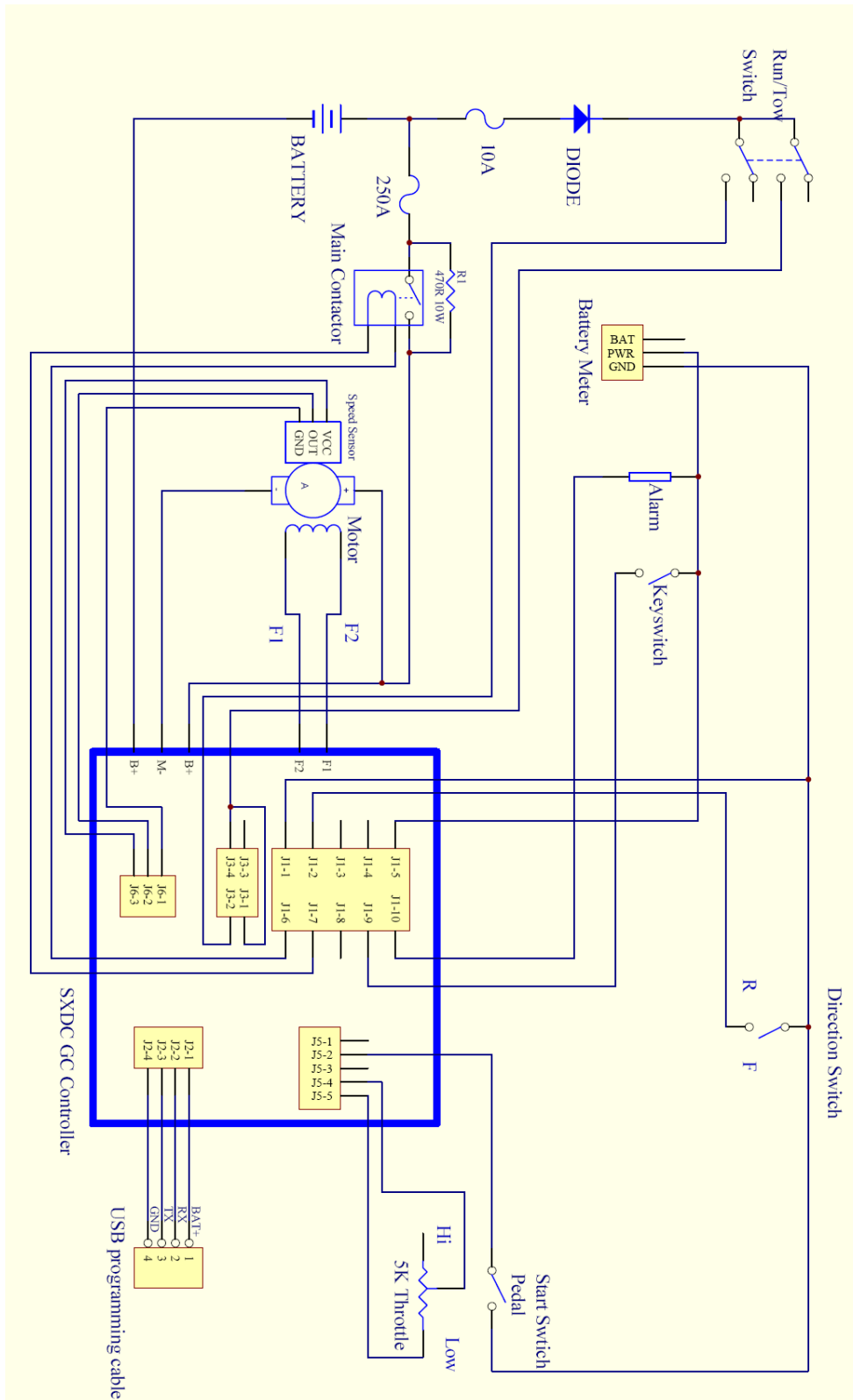


Figure 1. 6AWG - Armature and Battery Cables, 10AWG - Field Cables, 18AWG - All others.

3. Modifying Setup Parameters

SXDC GC Fairplay_Host Operational Instructions

ATTENTION: Changes to these values can cause unpredictable vehicle operation resulting in possible injury or fatality.

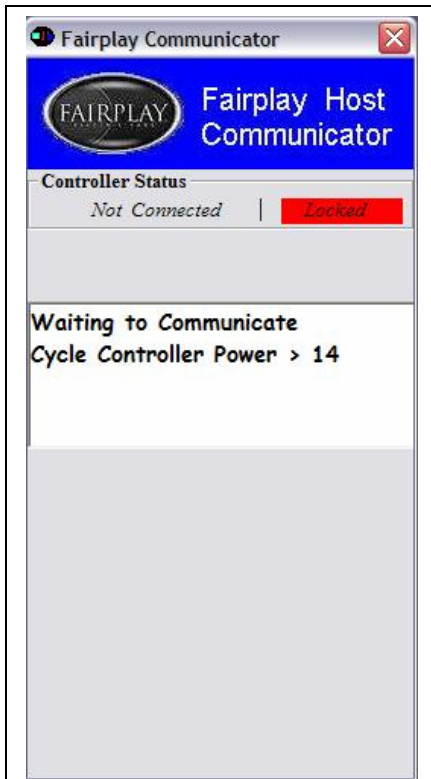
Please read carefully before attempting any changes.

(Refer to Screenshots following this description)

1. All setup values have a default setting pre-programmed for them. Some parameters are customers' preference. However, the parameters concerning the motor operation must be modified for the motor being used.
2. Insert the provided KC_Host Install Disk into your computer, and follow the instructions to install the software.
3. If the install program does not start automatically, please click on your CD drive in "My Computer" and double click on setup.bat.
4. If the install program detects duplicate files, please keep any files newer than what is on the install disk.
5. Attach the 9-pin D-shell connector to the 9-pin serial port connector on the back of the computer. KC_Host currently uses the PC's serial port COMM 1 to communicate with controllers. For the USB version programming cable, attach the USB connector to your computer.
6. Turn off the vehicle, and connect 4-pin plug to the 4-pin connector on the controller.
7. With a 9-pin D-shell connector programming cable attached, start the "KC_Host" program from the computer (Located now in Programs under the Start Menu.) It will state "Waiting to Communicate" "Cycle Controller Power" (**See Screenshot 1**) Notice under the main title there will be a message "Not Connected". KC_Host has not yet established communication with the controller.
With a USB programming cable attached, Start the "KC_Host_USB" program from the computer.
8. Turn on the vehicle The white status screen will soon say "Communication Established" and then "Please Select Mode". (**See Screenshot 2**) Under the main title you will now see that "Not Connected" has been replaced with the Controller Number and Firmware Version.
9. Click on "Setup." The screen will first read "Requesting Values from Controller" and once the parameters have been received it will read "Viewing Setup Parameters". (**See Screenshot 3**) Following this explanation is a list of the parameters, their descriptions, ranges and defaults. The arrow and tab keys work much like other Windows-based applications to navigate through the fields. Use the Next and Previous buttons to switch parameter display pages if the parameters are more than one page.
10. At the beginning, the user must input the lock code. After the user inputs the lock code, the lock tab will become green (**See Screenshot 4**), and the values are now allowed to be modified. Modify values by navigating to or clicking in the Value Box for variable desired and typing in a new value. Then hit RETURN or TAB. If you do

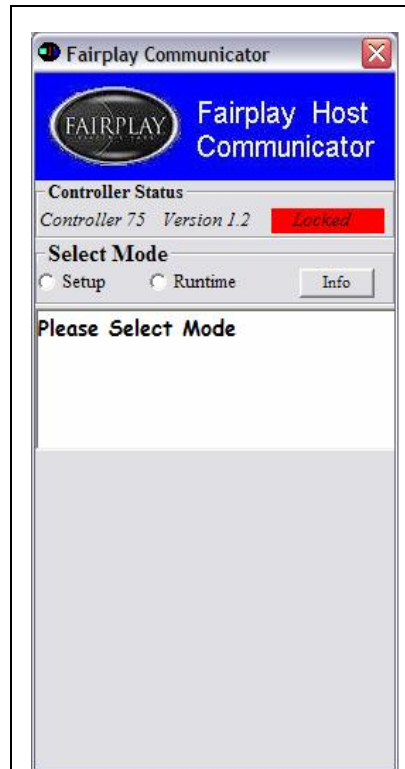
not press RETURN or TAB, KC_Host will not send the new value to the controller. Once the controller has been sent the new value, you will notice that a confirmation message will appear (**See Screenshot 5**).

11. If you happen to enter a number out of range for any parameter, the range will be displayed. (**See Screenshot 6**).



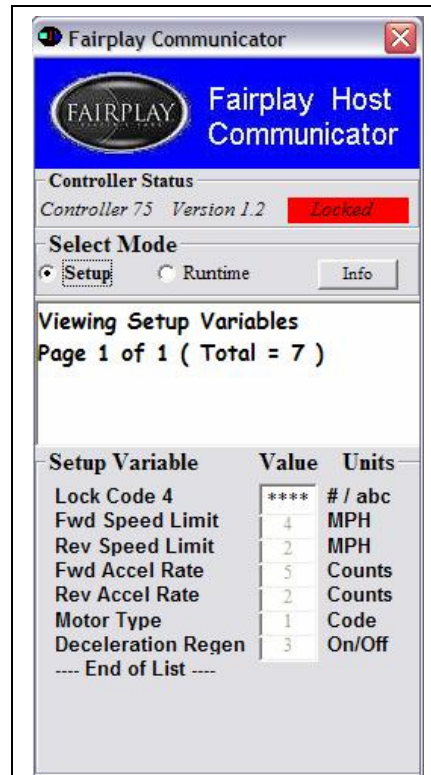
Screenshot 1

Activate KC_Host First and communication begins. Now, power up the controller and look for screenshot 2.



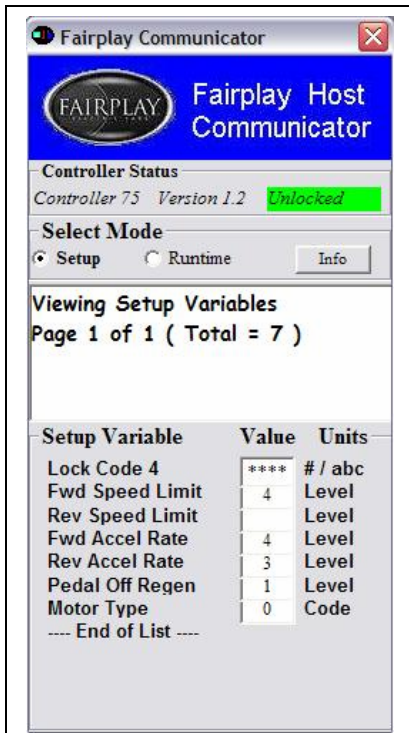
Screenshot 2

KC_Host has established communication. Notice the controller code & version are now displayed. The user can now select the mode.



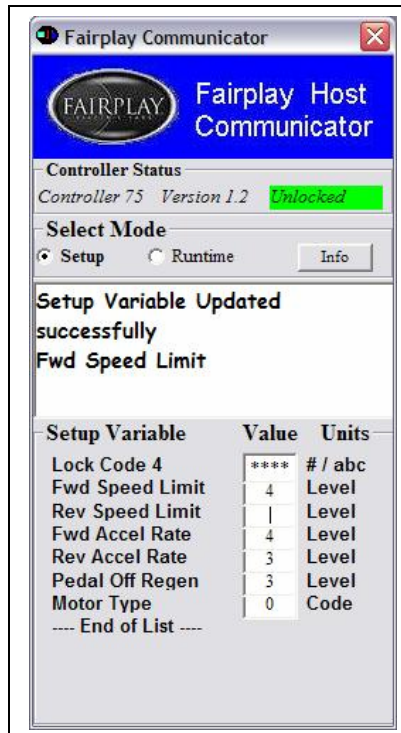
Screenshot 3

User has selected to review and SXDC GC setup values. The user has to input the correct lock code before values are allowed to be changed. Notice, the lock tab starts out as red.



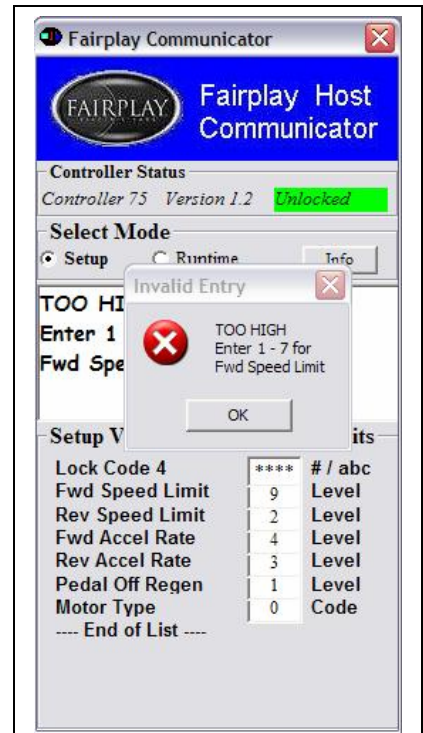
Screenshot 4

All values are allowed to be modified after you input correct lock code. Notice, the lock tab has become green



Screenshot 5

The User has changed the third setup value from 5 to 4 and then pressed RETURN or TAB. Notice the confirmation message.



Screenshot 6

All values have their ranges displayed **if** the user selects a number out of range. The number will be restored to its value before the request to change.

Setup Parameter List**Setup Page 1**

Name	Description	Typ./Default	Range
Lock Code	The lock code for changing the parameter values. Only after the user inputs the correct lock code can the parameters be changed.	“0000”	4 numbers and characters
Fwd Speed Limit	Setting of the forward top speed. A higher number allows a higher top speed.	5	1 - 7
Rev Speed Limit	Setting of the reverse top speed. A higher number allows a higher top speed.	2	1 – 2
Fwd Accel Rate	Setting of the forward acceleration rate. A higher number allows a faster acceleration rate.	3	1 – 5
Rev Accel Rate	Setting of the reverse acceleration rate. A higher number allows a faster acceleration rate.	1	1 – 3
Pedal Off Regen	This setting is to control the deceleration regen rate once the user lets off the accelerator when the car is moving. A higher number will stop the car quicker.	2	1 – 3
Motor Type	Setting of motor type. Based on which motor that the controller controls, select type 0 for 4.0 HP motor and type 1 for 5.5 HP motor.	0	0 – 1

4. SXDC GC Specifications

Nominal Input Voltage	48V
PWM operating frequency	15KHz
Electrical Isolation to Heatsink	500VAC (minimum)
Contactor drive output current	2A
Programmable Communication	Serial or USB interface to PC
Operating ambient temperature	-30°C to 40°C
Heatsink overtemperature cutback	85°C
Over voltage protection	Regen Cutback @ < 10% of Battery Voltage. Cutoff @ < 15% of Battery Voltage.
Undervoltage protection	Cutback @ < 68% of Battery Voltage. Cutoff @ < 50% of Battery Voltage.
Package environmental rating	IP53
Weight	2bs
Dimensions	9" x 6.5" x 3.5"
Regulatory Compliance	Safety, applicable portions: EN 1175-1:1998
EMC and EMI	Must be tested by customer
UL Recognized Compliance	TBD

Model	Nominal Battery Voltage (Volts)	Drive Current Limit (Amps)	Armature 2 Minute Rating (Amps)	Armature 1 Hour Rating (Amps)	Field 2 Minute Rating (Amps)	Field 1 Hour Rating (Amps)	Braking Current Limit (Amps)
SXDC GC	48	300	300	TBD	25	TBD	300

5. Diagnostics and Troubleshooting

When the SXDC GC controller software detects an error condition, it will shut down the operation of the controller and provide an audible (via external beeper) indication of the error code. Example: Error code 21 for Low battery will beep & flash 2 times long and then 1 time short. The error codes that are currently active on the SXDC GC V1.2 software below.

Errors CONTROLLER_FAILURE #13 , INVALID_CURRENT_LIMIT #17 and EE_VALIDATE_FAIL #18 are detected on power up only, all others are monitored 100 times/second.

Error Name	Code	Description
CONTROLLER_FAILURE	13	i.e. bad ROM checksum or RAM test failure
INVALID_CURRENT_LIMIT	17	EEPROM current limit value failed validation
EE_VALIDATE_FAIL	18	EEPROM (setup value) failed validation
LOW_BATTERY	21	battery reading < LO_BATT_STOP Volts for over 1/2 second
HIGH_BATTERY	22	battery reading > HI_BATT Volts for over 1/2 second
THERMAL_CUTBACK	23	Temperature too high (low A/D reading)
SOLENOID_FAILURE	24	if contactor in, Arm DC > 70%, & < 125 Amps
FIELD_NULL_ERROR	2A	Null reading out of Range
SOLENOID_WELDED	32	heatsink & battery difference is LESS THAN 1 Volt with no contactor
SOLENOID_DIDNT_CLOSE	33	contactor in & see < 2 Volts on heatsink reading
FLD_OV_ERROR	34	Field Over Voltage input after resetting OV circuit 4 times
DRAIN_SHORT	35	Drain voltage out of range for Batt_H and Arm DC
THROTTLE_FAULT	37	accelerator value too high without start switch active
SPEED_SENSOR_FAULT	38	arm DC > 70%, under 125 Amps, & no speed reading
SPEED_SENSOR_FAULT_H	39	speed reading was way too high
MOTOR_STALLED	42	Arm > 200 Amps and under 1 MPH for 2 1/2 seconds
ARM_OV_ERROR	44	ARM_OV_INPUT was low after resetting OV circuit 4 times
TEMP1_HI_ERROR	46	FET HI TEMP (below FET_HI_LIMIT)
TEMP1_LO_ERROR	47	FET LO TEMP (above TEMP_LO_LIMIT)
DIODE_LO_ERROR	4A	Diode_H reading was below DIODE_LO_LIMIT
DIODE_HI_ERROR	4B	Diode_H reading was over DIODE_HI_LIMIT