coiltek
coil technology inc.®

OPERATING MANUAL

CS-6200 Series Controls

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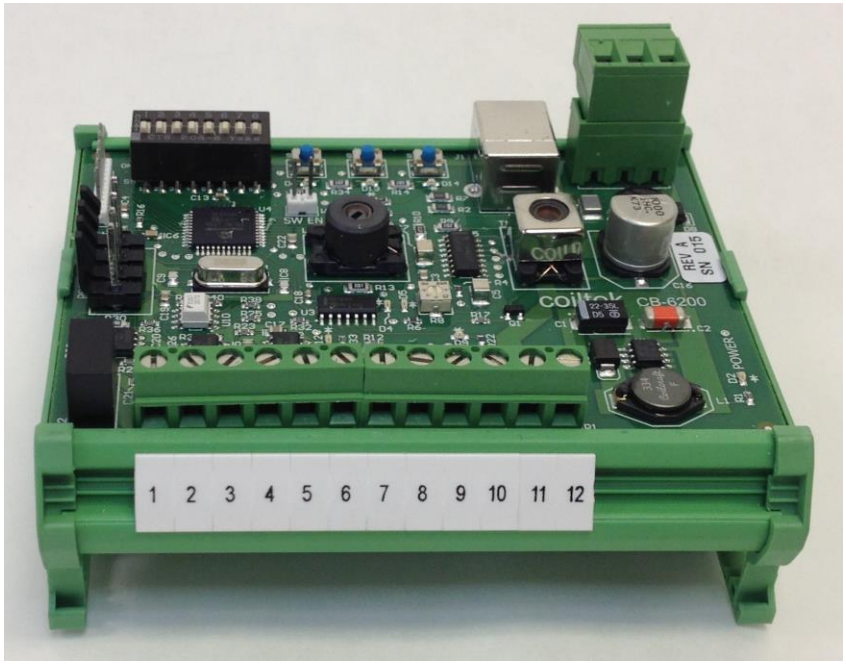


Introduction

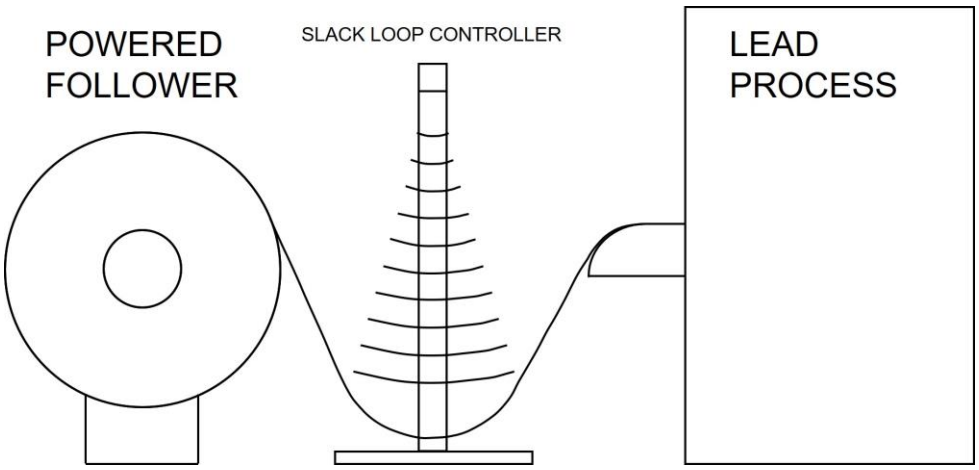
The CS-6200 is an ultrasonic sensor integrated with a microprocessor based control card. The sensor is housed in a sturdy aluminum enclosure and connected to the processor card by a 20 ft.(6M) coaxial cable. Performance of the sensor improves if the cable is shortened to the maximum length required for the application. The control may be ordered in a 10x 8 x 4 electrical enclosure using the part number CS-6201.

The control has been specifically designed to monitor material hung in a slack loop. Slack loop control is used for the feed and/or rewind of products manufactured in a continuous, linear manner. The diagram below is more instructive of the control's purpose. Typically, the CS-6200's sensor is placed over a draped loop of slack material. The position of the loop valley is sensed and is used to govern the speed of a follower device (in the diagram, it's a powered winder). These controls may be programmed to control either upstream or downstream process followers. Typical of upstream devices would be decoilers, straightener/flatteners, dereelers. Typical downstream devices would be winders, cut-to length machinery.

The ultrasonic transduction is fairly straightforward. A burst of acoustic energy is broadcast toward the target (the loop valley). Milliseconds later, the transducer is switched to receive mode to await the echo return. The time between transmit and receive is measured. The speed of sound in air is reasonably constant so the position of the target is accurately calculated by the system's processor.

The system works best when the target viewed is perpendicular to the beam axis. Some angular variation is tolerated (about +/- 5 angular degrees), but when the angle is too severe, the echo return misses the receiver entirely. In this case, the system will register a far loop even if the target is physically in the control range. Most loops have either a parabolic or catenary curvature which aids in bouncing the echo back to the receiver, much like a radar dish does.

When the system is set-up, a *control range* is defined. Near and far set-points define it. Within the control range, a signal (both 0-10VDC and 4-20mA are available) varies from either low to high or high to low.



Standard Configurations and Options

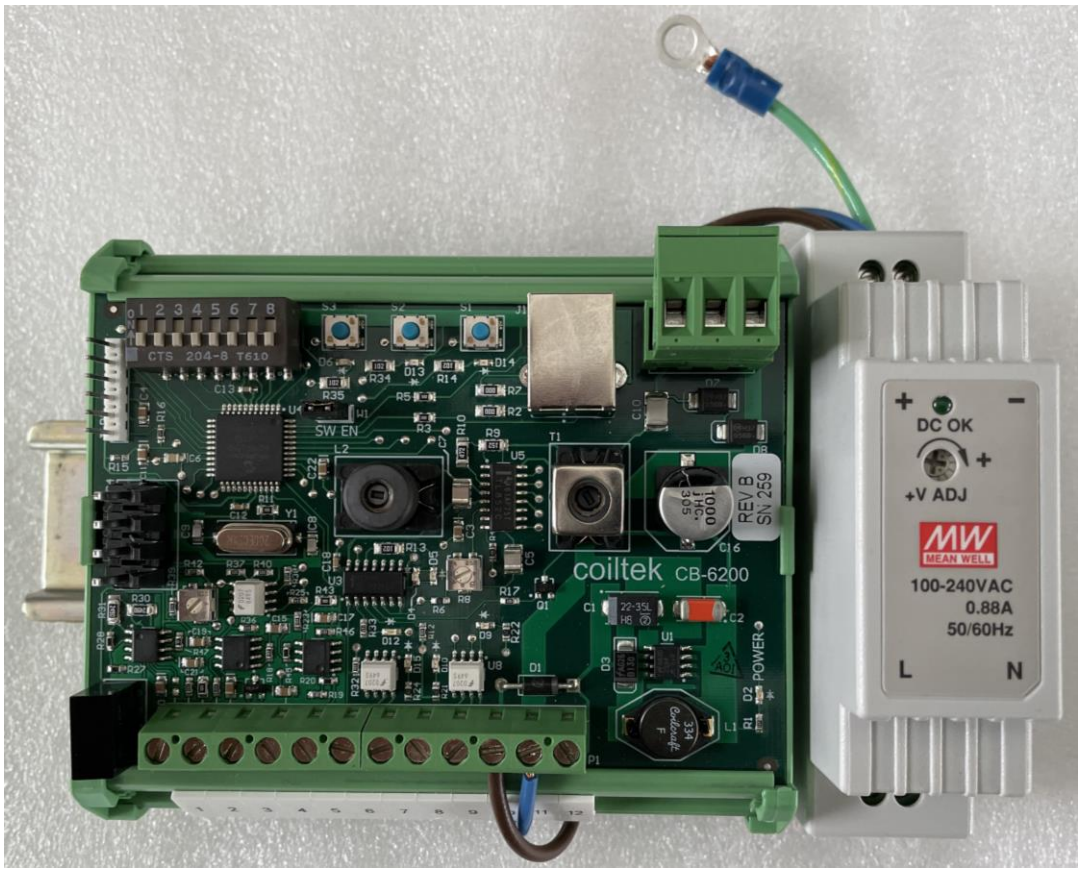
The CS-6200 has been made since 2014. The control (main) circuit board operates on 24VDC. This is a common industrial standard voltage source. The standard configuration of the main board includes a small, 0.8W power supply, as shown below. The supply accepts any AC power source between 90 and 240VAC. The supply requires only L1 and L2. Connect incoming ground to the subpanel or enclosure.

The power supply is pre-wired to the card. We recommend connecting the negative side (-) of the DC source to panel ground. A ring terminal is provided for this purpose.

The CS-6200 or CS-6201 may be ordered without the supply (-LPS) when a 24VDC grounded source of sufficient amperage is available.

The CS-6201control may be ordered with an M12 connector termination.

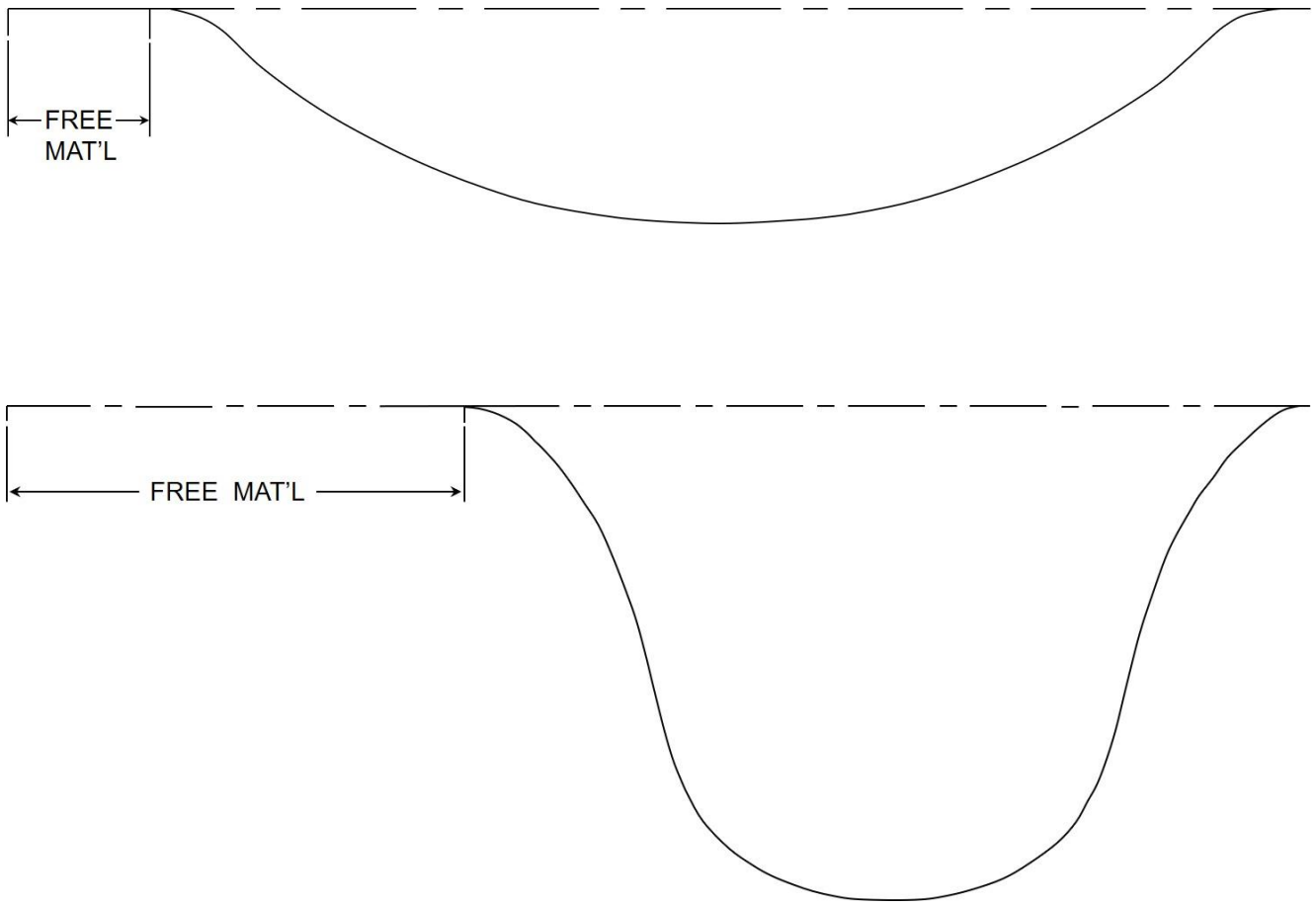
The layout of the CS-6200's main processor board with power supply is shown below.



Notes on Slack Loop Control

Loop Geometry

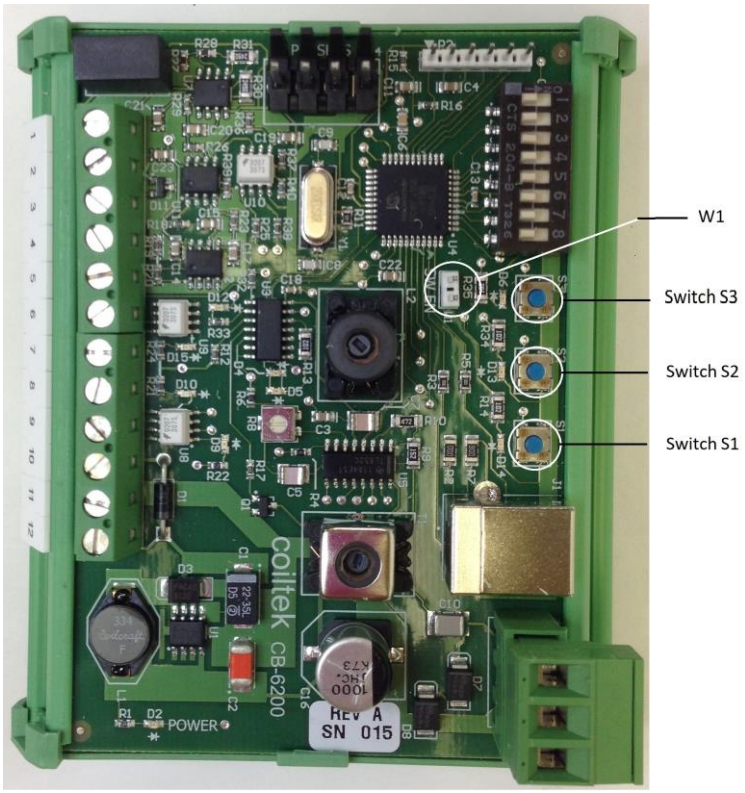
While it may seem counter-intuitive, slack loop control works best when the two points from which the stock is draped are as close together as possible. It is the amount of slack or free material in the loop that provides the time for the follower device to accelerate or decelerate.



In the diagrams above, it's clear that the deeper 'U' shaped loop develops the most free material between long and tight loop, avoiding the generally undesired tight loop shown at the top.
There is a caveat: some materials will be damaged if pressed into too tight of a bend. The cross-section of tubing or hose may be distorted or crimped. Thick metal strip may be pushed past elastic limits.
Good loop geometry is a balance between mutually exclusive parameters.

Manual Set-Up

The CS-5000 is easy to set up if the W1 jumper is in place. Here's how:



1. Press button S1. Lights below buttons S2 and S3 will begin to blink.
2. Put a target beneath the sensor (unless the product is very narrow, say <3/4" wide, use the material you're running). Place it in the position farthest from the sensor. It will be the outer limit of your control range. Press S3. The light above S3 will stay on and stop blinking.
3. Place the same target at the desired near point of the control range. Press S2. If the set-up is accepted, the lights above S2 and S3 will go out and the system will return to run mode. Calibration is complete.

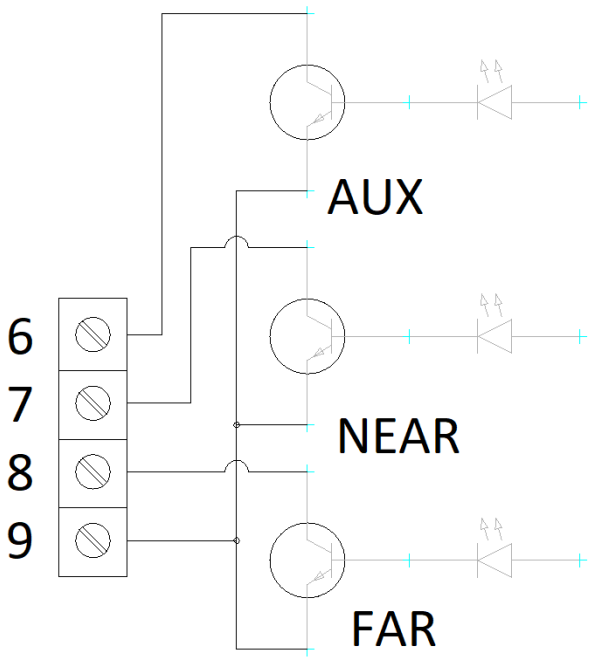
Alternately:

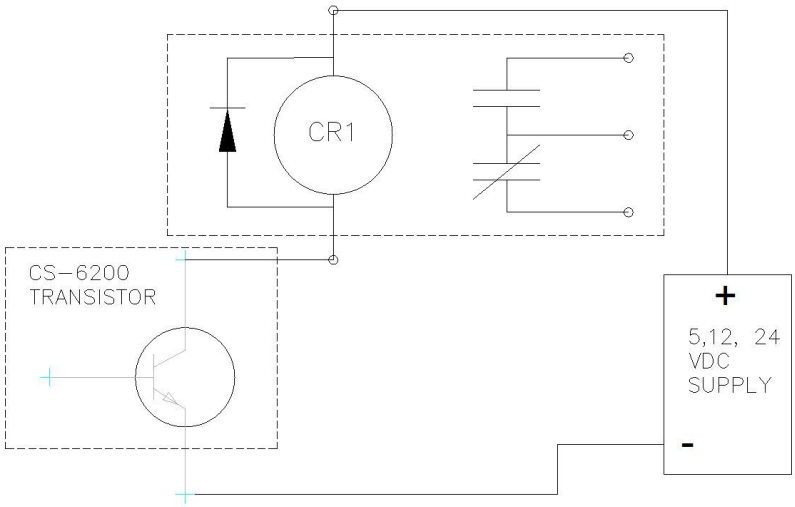
1. Press button S1. Lights above buttons S2 and S3 will begin to blink.
2. Put a target beneath the sensor. Place it in the desired near position. It will be the upper limit of your control range. Press S2. The light above S2 will stay on and stop blinking.
3. Place the same target at the desired far point of the control range. Press S3. If the set-up is accepted, the lights above S2 and S3 will go out and the system will return to run mode. Calibration is complete.

As shipped, after performing the procedure above, signal output will be 0VDC (4mA) at the far point and 10VDC (20mA) at the near point of the control range. This output may be used to control upstream or process feeding devices. In order to control downstream processes, the signal must be inverted. To do this, turn on DIP switch #7. If you remove jumper W1, your target distance settings cannot be over-written.

Discrete Outputs, Short Burst

The CS-6200 has three open collector transistors that may be used for actuating relays or PLC inputs. Terminals 6, 7 and 8 are the connections to these discrete outputs. They are referenced to a separate common on terminal #9. When the set-up is complete, the operation of two of these outputs (#7 and #8) is defined. Terminal 7 is toggles when a near limit is exceeded, terminal 8 toggles when the far limit is passed. The outputs operate in a fail-safe manner. Attendant LEDs indicate the state of the transistors. If lit, the associated transistor is ON. Specifically, the NEAR transistor is ON unless the near limit is encroached. The FAR transistor is ON unless the target drops below the far limit. The auxiliary output is accessible by using CSWin and may be programmed to toggle at any point in the control range.





TYPICAL OPEN COLLECTOR RELAY WIRING

Short Burst Mode

The standard acoustic transmission (burst) from the sensor is 60 cycles, warbling from 50 to 60 kHz. This is fine for measuring distances from 0.5 TO 6 meters. The short burst mode halves the number of cycles, making for a weaker signal, but also shortens the time between transmission and reception. This way the transducer may be mounted much closer to near point of a target (about 15cm (6”). It’s useful in situations like measuring roll or coil diameters or stacks of parts where closer proximity to the target is desirable.

To switch to short burst mode, push the S2 button when the control is in RUN mode (not setup). S2 toggles modes between normal long burst and short burst.

Program Lock Out

As previously mentioned, the W1 jumper must be in place to manually program the system. When it is removed, programming the system manually is not possible. This may be useful in plants where only authorized personal are allowed access to machinery set-up.

Diagnostics

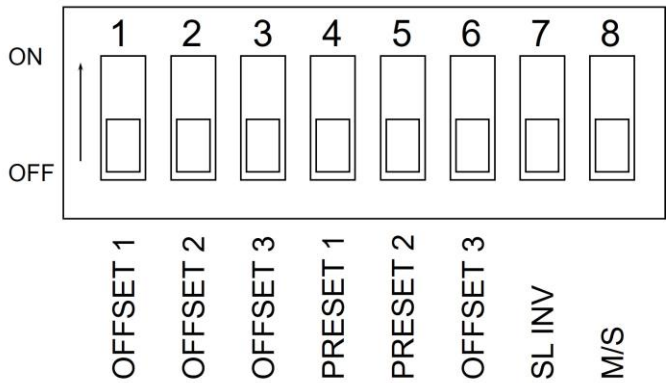
Ultrasonic sensing is fairly straightforward. A pulse of 64 cycles at 50kHz is presented to the sensor, after a short 'ring-down' the receive circuitry is enabled to listen for an echo return. The time between pulse generation and echo reception is used by the main board to calculate the distance measurement.

Normally, the LEDs D2 and D3 on the main board indicate the position of the target as follows:

- Above the control range, RED or, after 7-2020, blinking RED
- In the control range, GREEN
- Below the control range, RED

DIP Switch Functions

The settings of the DIP switches dictate how the control behaves. The system is capable of storing and instantly retrieving a number of behaviors as presets. The functions of the individual switches are labeled in the graphic below.



The first six settings, for OFFSET and PRESET operation are covered.

Slope Inversion

Switch 7, labeled SL/INV inverts the output slope. The default (SW7 OFF) is a 0V (4mA) signal at the FAR position of the control range. The signal increases as the target gets closer to the sensor. This behavior is associated with the control of machinery that feeds a process, such as a decoiler. With SW7 ON, the output is inverted such that 0V (4mA) is generated at the near point of the control range and

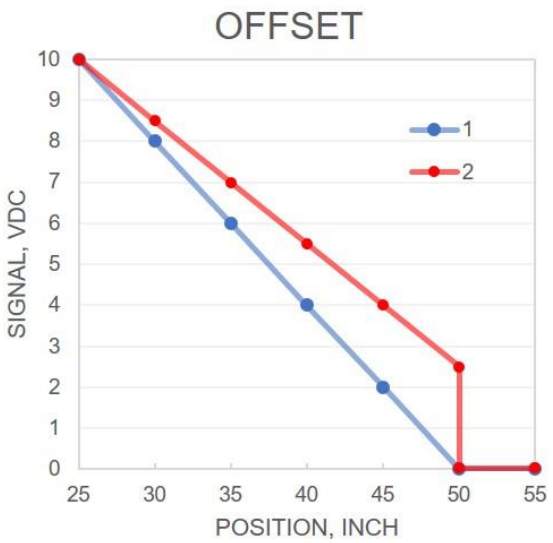
increases as the target draws away from the sensor. This behavior is requisite for rewinding or other take-up equipment. The setting of the SW7 dictates how the control will react in a given PRESET when the set-up procedure is performed.

0-5VDC Operation

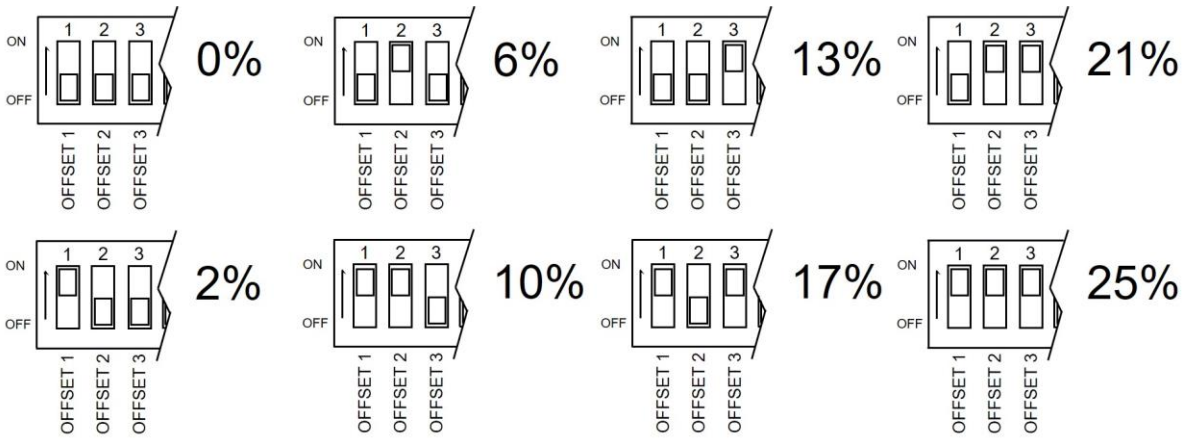
Some PLC's and maker boards require no more than 5VDC to their analog card. To change the 0-10VDC output to 0-5VDC, turn on DIP switch #8. The position of this switch does not change the 4-20mA signal.

Offset

Offset bias is available and useful in some situations. The graph at right explains what happens when offset is employed. The standard control signal is shown in blue in the foreground. Behind it, the red shows the output of the CS-5000nwhen 25% offset is implemented. Here, the output of the control jumps to 2.5 VDC when the loop crosses the long loop limit into the control range. The discontinuity in the output may be useful when the follower machinery must start rapidly. Since the working slope is reduced, this feature is frequently chosen in stamping operations with long feed progressions. Feed 'wow' is reduced.



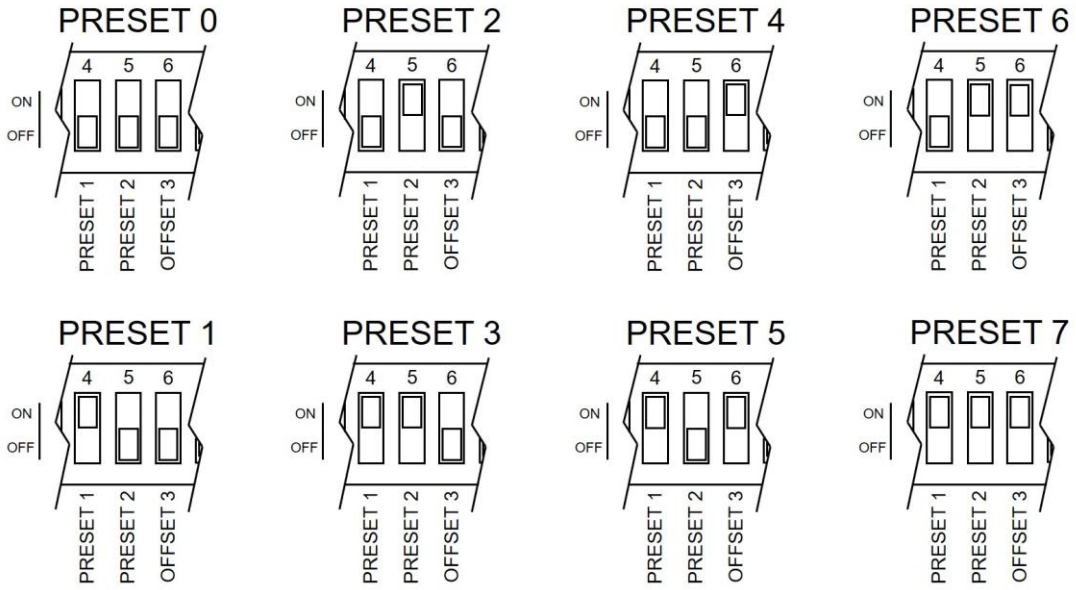
To set up offset, set DIP switches 1-3 in position to implement the desired amount of offset. See the key below. Using CSWin, offset as large as 50% may be set.



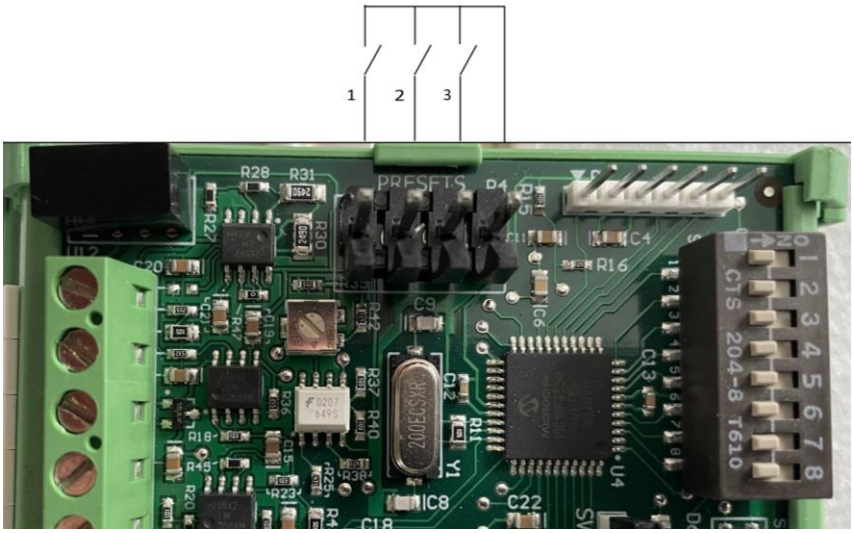
Presets

The CS-6200 is capable of storing multiple loop control set-ups. The graphic below shows the binary address scheme for programming and retrieving programmed presets manually. The switch setting in place at the time of set-up dictates where that particular setup is stored. Removal of the jumper from W1, as with any of the set-up parameters, makes the preset(s) programmed non-volatile.

If you frequently switch between several presets, you may want to consider integrating a 3CPO accessory into your unit. This 3- position selector switch allows for immediate, remote access to presets. Please also see the section on programming your presets with our CSWin software.



Presets are set up and addressed by selecting PRESET switches (switches 4, 5 and 6) on the DIP switch block. These 3 preset selector switches allow the setup of 8 distinct loop control settings. Moreover, the presets may be accessed remotely by dry contacts by connecting to the board's P2 header. Typically, the DIP switches are used for manual programming of the system. Then, they are all turned off and the remote switches or contacts access the presets via the header at P4. Since the DIP switches and the contacts of P2 address the same processor inputs, combining DIP switch and remote switching may have unintended consequences.



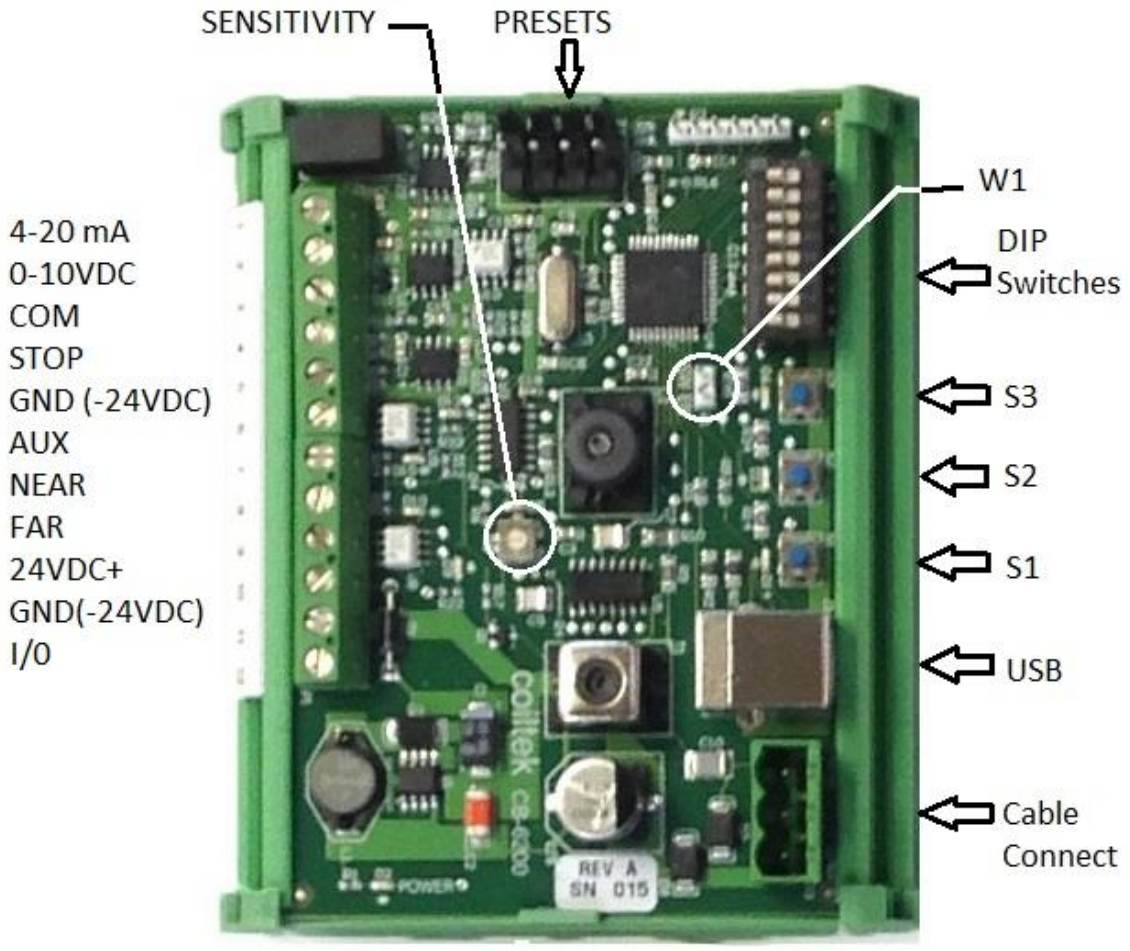
Preset Number	State SW 1	State SW 2	State SW 3
0	0	0	0
1	1	0	0
2	0	1	0
3	1	1	0
4	0	0	1
5	1	0	1
6	0	1	1
7	1	1	1

The truth table for preset access follows. Remote preset access must be via dry contact.

DO NOT USE PLC 24VDC SOURCING OR SINKING PLC OUTPUTS.

Terminals and Inputs

The layout of the CS-6200's main board is shown below.



Analog Outputs

The sensed position of the target is output as either 4-20mA (terminal 1) or 0-10VDC (terminal 2), either one referenced to common on terminal 3. Both of these output signals are optically isolated. They may be used to control any sort of drive, including inexpensive DC drives that have a common reference of -90 or -180 VDC. If employing a CS-6200 for such a drive, it is crucial that the common of terminal 3 is not brought in contact with earth ground. The op-amps of the CS-6200 will be damaged, and the warrantee void.

Stop Input

If a contact closure is made between terminals 4 and 5, the analog control outputs will drop to zero (<4mA if using the current output). This is regardless of target position. A red LED (D12) lights when STOP is active.

Sensitivity

There is a potentiometer that offers some control over the gain of the 'hearing-aid'. We strongly recommend leaving it in its factory position. If you have trouble detecting your stock, please call us.

Cable Connections

Sensor

The RF connection to the sensor is a TNC connector. The cable threads on to make the connection as shown.

Mainboard

The three terminal, removable connector is wired as shown. The connector plugs into the header on the main board. The center terminal is not used.

The cable may be truncated if all 20 feet (6M) are not needed. Shortening the cable decreases cable capacitance, thereby increasing sensitivity of the sensing system.

Software

Setting Up Your Unit with a PC

The new CB-5501M mainboard has a USB connector for connection and programming the control via PC. The actual connection is RS-232 with USB emulation. As such, a driver is included with the downloadable software CSWin32. Upon connection with the control, Windows will recognize a new device. It will query for a driver. Choose to manually select the driver and use the mchpcdc.cat driver downloaded. A new version of our software, CSWin64, is under development. When available it will be posted in the downloads section of coiltek.com.

Notes