



CA-ESS-SC-PL
Industrial Controller

User Guide

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PREFACE

This document describes the integration of several components to create the Industrial Controller.

Hardware and software described in this document are subject to ongoing development and improvement. Consequently there may be minor discrepancies between the information in this document and the performance and design of the hardware and software.

Refer to the glossary in the Appendices for the definition of any uncommon acronyms or terminology encountered while reading this document.

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REVISION HISTORY

Revision	Date	Changes
R01	September 2007	<ul style="list-style-type: none">• First Release
R02	May 2008	<ul style="list-style-type: none">• Added Siren Functionality and small programming changes
R03	August 2010	<ul style="list-style-type: none">• Update Schematic
R04	August 2014	<ul style="list-style-type: none">• Added Figure 4, firmware configuration

1. PRODUCT OVERVIEW

1.1. General Description

There are several industrial control plants which require the ability to remotely shutdown certain processes in the event of health and safety situation. The Industrial Controller has been custom designed to respond to output from the Motorola radio upon decode of the MDC signaling in order to affect a remote shutdown of an external industrial process. A local shutdown and a bypass circuit for testing have been provided to ensure complete functionality. LED indicators offer a visual indication of the Industrial Controller(s) current state.

1.2. System Description - Theory of Operation

1.2.1 Assumptions

- Each location will be equipped with a single Industrial Controller
- Each Industrial Controller uses a unique CTCSS tone in order to allow it to operate on a simplex frequency with other controllers.
- Each Controller provides for Local Shutdown, Reset, Bypass and Remote Shutdown functionality
- The Radio's to be used are simplex radio's
- MDC Signaling arrives after the CTCSS Tone has been decoded to ensure the appropriate site is triggered
- Power is supplied through the radio interface cable
- The Industrial Process being controlled interfaces to the relay contacts made available on the terminal strip inside the Industrial Controller enclosure
- A set of contacts is provided to control an audio siren
- LED's are provided to indicate current state of the Shutdown and Bypass Relays
- On Power-Up there is a 10-sec boot delay before the system is functional
- After Power-up the Industrial Controller is in Normal Operation/State.

1.2.2 Normal Operation/State

In its normal state, the Industrial Controller allows the industrial process, as expected, to control and to operate. The SHUTDOWN RELAY is open and the BYPASS RELAY is closed ensuring that the industrial process is presented with an open circuit. Both the SYSTEM SHUTDOWN and SYSTEM BYPASS LED's will be Green.

1.2.3 Local Shutdown Operation/State

By pressing the Local Shutdown button (BLUE), the siteCOMMANDER controller board will see a contact to ground on Digital Input 5 which is programmed to close the SHUTDOWN RELAY. This will present a closed circuit to the connected industrial process and an open circuit to the Siren contacts. The SYSTEM SHUTDOWN LED will now indicate as RED. The SYSTEM BYPASS LED will remain Green. The siren, if attached, will sound.

1.2.4 Remote Shutdown Operation/State

The Remote Shutdown is nearly identical to the Local Shutdown; however, it can be affected remotely using a portable radio which provides the appropriate CTCSS tone and MDC Emergency Signal.

Upon receiving the correctly selected CTCSS tone, Relay R3 is closed for 2.5 secs allowing the MDC Emergency signal to the siteCOMMANDER controller board. The MDC Emergency signal reaches Digital Input 1 of the siteCOMMANDER which is programmed to close the SHUTDOWN RELAY. This will present a closed circuit to the connected industrial process and an open circuit to the Siren contacts. The SYSTEM SHUTDOWN LED will now indicate as RED. The SYSTEM BYPASS LED will remain Green. The siren, if attached, will sound.

1.2.5 System Bypass Operation/State

The System Bypass button allows the Industrial Controller to be tested for proper operation both locally and remotely without impacting the state of the industrial process under control.

Pressing the System Bypass button will cause the siteCOMMANDER controller board to see an open circuit on Digital Input 3 which will toggle the state of the BYPASS RELAY and SYSTEM BYPASS LED. Pressing the System bypass button again will cause it to toggle to the other state.

When the System Bypass is active the SYSTEM BYPASS LED will be RED and the BYPASS RELAY will be open. This allows either the Local or Remote Shutdown procedures to be executed without closing the circuit present to the Industrial Process under control however the siren, if attached, will sound.

1.2.6 System Reset Operation/State

The System Reset button is used to return the SHUTDOWN RELAY back to its normal state (open). This would typically be pressed after a situation with the process under control is resolved.

Pushing the System Reset button presents a contact to ground on Digital Input 4 of the siteCOMMANDER controller board. This will reset the state of the SHUTDOWN and SIREN RELAY to normal (closed). If the SHUTDOWN and SIREN RELAY are already in their normal states when the System Reset is pressed they will remain in their normal states.

2. CONFIGURATION

The configuration file for the siteCOMMANDER controller board is available on the USB Key or CD provided with the equipment.



Figure 1: Image of Terminal Strip inside Industrial Controller

TERMINAL STRIP	
Pin	Legend
1	+12V DC
2	GROUND
3	RECEIVE AUDIO
4	EMERGENCY INPUT (MDC SIGNAL)
5	PROCESS CONTACTS
6	PROCESS CONTACTS
7	SIREN CONTACTS
8	SIREN CONTACTS

Figure 2: Pin outs for Industrial Controller



Figure 3: Front image of Industrial Controller

The current siteCOMMANDER firmware version is used. The firmware configuration settings from the CCF file are shown below.

Contact Input Configuration									
	1	2	3	4	5	6	7	8	ALL
Enable Events	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Off State	Open	Closed	Closed	Open	Open	Open	Open	Open	
Input Mode	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal	Normal
Hold (secs)	1	1	2	2	4	1	1	0	
Local Output	1	3	2	1	1	4	4	--	
Output Delay	0	0	0	0	0	0	0	0	0
Output Action	Set	Normal	Normal	Reset	Set	Set	Reset	Normal	

Output Configuration									
	1	2	3	4	5	6	7	8	ALL
Off State	Closed	Open	Open	Closed	Open	Open	Open	Open	
Output Mode	Latch	Latch	Pulse	Latch	Latch	Latch	Latch	Latch	
Pulse Width (mS)	0	0	2550	0	0	0	0	0	2550

Figure 4: siteCOMMANDER digital input and output configuration

Industrial Controller - Wiring Diagrams

CDM1250 – Radio Pinout

Pin 4 – Grey – Emergency Output
 Pin 6 – Blue – Reset Input
 Pin 7 – Black – Ground
 Pin 11 – Green – Rx Audio Output
 Pin 13 – Red – +12V DC

*NOTE:

Pins: 20,19,18,17 are not present on the connector

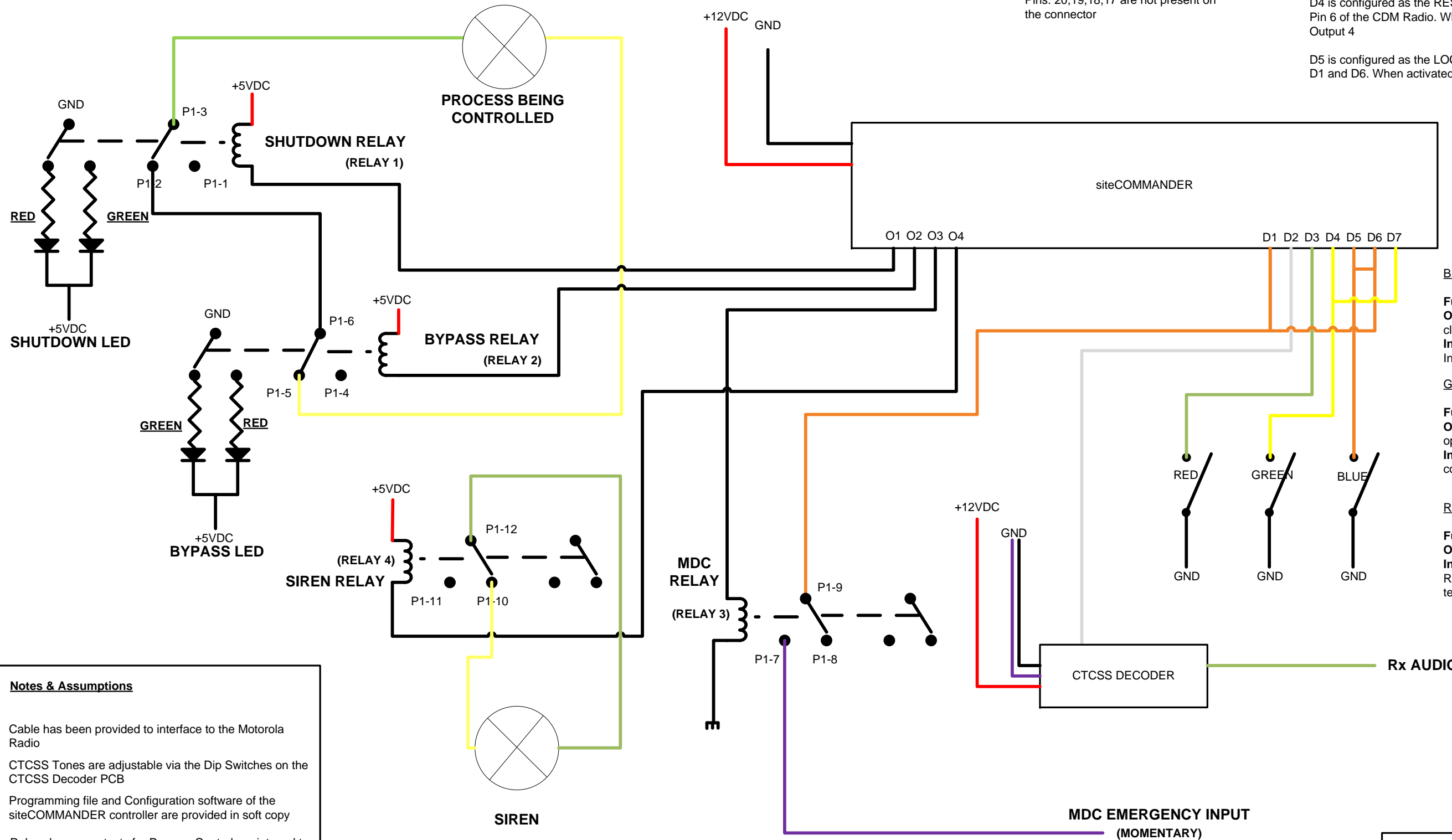
D1 is configured as the MDC signal input and is wired in parallel with D5 and D6. When activated it opens Output 1 and closes Output 4

D2 is configured as the CTCSS input. When a valid CTCSS tone is decoded this input is activated causing Output 3 to pulse for 3secs.

D3 is configured as the BYPASS input and when activated triggers Output 2 to open the Bypass Relay (opening the Control Process circuit)

D4 is configured as the RESET input and is wired in parallel to D7 and also Pin 6 of the CDM Radio. When activated it closes Output 1 and Opens Output 4

D5 is configured as the LOCAL SHUTDOWN and is wired in parallel to D1 and D6. When activated it opens Output 1 and closes Output 4



BLUE Push Button

Function: LOCAL SHUTDOWN
Operation: Causes SHUTDOWN RELAY to close
Intention: Initiate a Local Shutdown of the Industrial Process being controlled

GREEN Push Button

Function: RESET
Operation: Causes SHUTDOWN RELAY to open (return to Normal State)
Intention: Return the Industrial Process being controlled to a normal or running state

RED Push Button

Function: BYPASS
Operation: Causes BYPASS RELAY to open
Intention: Initiate a BYPASS of the SHUTDOWN RELAY in order to allow either Local or Remote testing of the SHUTDOWN circuit

Notes & Assumptions

Cable has been provided to interface to the Motorola Radio

CTCSS Tones are adjustable via the Dip Switches on the CTCSS Decoder PCB

Programming file and Configuration software of the siteCOMMANDER controller are provided in soft copy

Relay closure contacts for Process Control are internal to the enclosure on the terminal strip. Process and Siren output controls are Normally Closed as per configuration file October 22nd 2008

Relay closure contacts for the SIREN are internal to the enclosure on the terminal strip and function irrespective of the BYPASS RELAY



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Date: 12/08/2010

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