Marlin 505020 High Current IO Module

CREATED: B. BERTOLASI   DATE: 3/30/23
CHECKED: J. COOPER   DATE: 6/20/23
APPROVED: J. COOPER   DATE: 6/20/23
ECN: 17321E
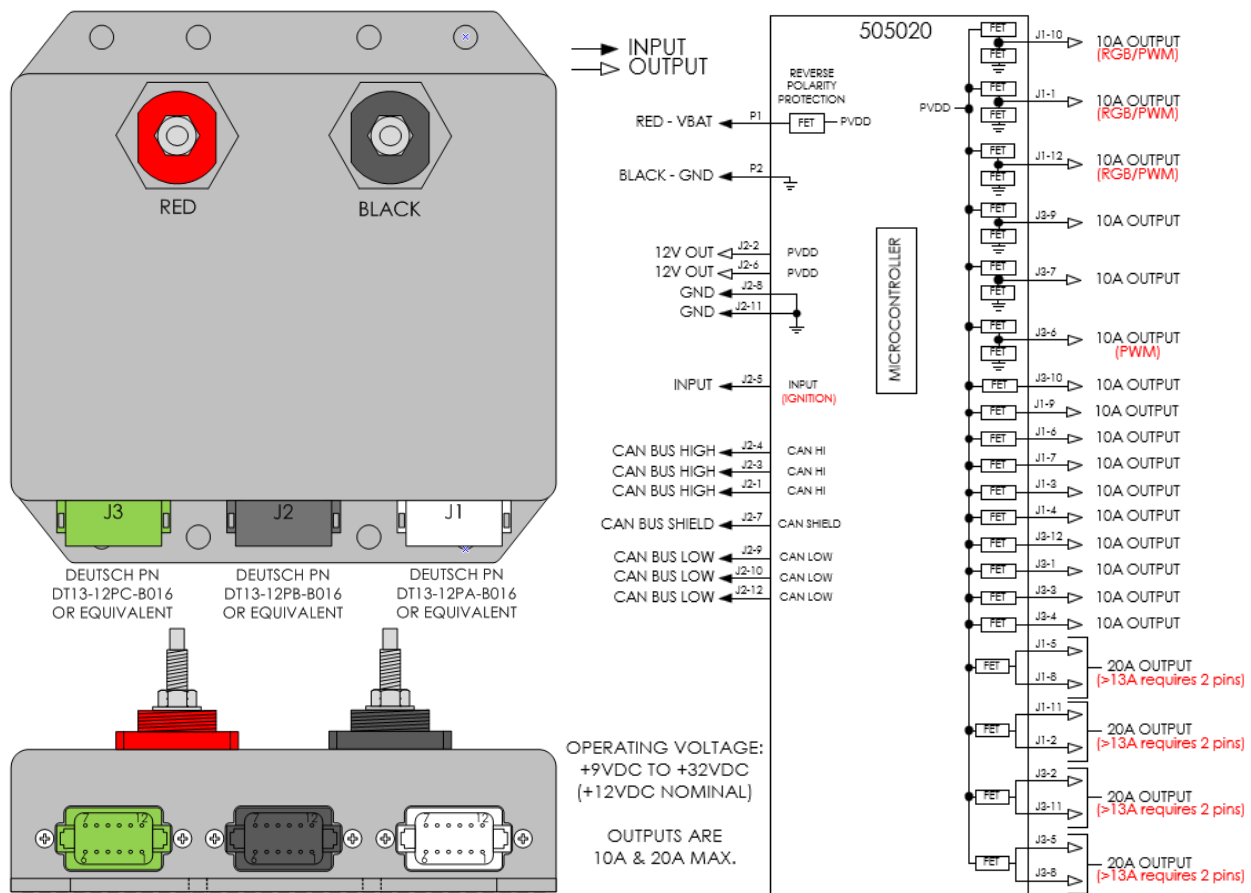
The Marlin 505020 High Current IO Module is a severe duty controller providing power distribution to up to 20 "fused" outputs and pairs with the 505004(4i4o) or 505000(8i8o) for additional inputs and outputs. Six of the outputs are Bi-Directional (Half-Bridge style) 10A outputs, ten of the outputs are Hi-Side 10A outputs, and four of the outputs are Hi-Side 20A outputs. When enabled, the module will turn on when power is applied to Ignition pin J2-5 and will shut off after the defined time when Ignition power is removed. The module is fully controlled when linked to a pair of keypads that allow simple and effect control of the outputs and you can choose a variety of output functionalities. This is all configurable through the Marlin Programming Tool. Button assignments assume Buttons are arranged in Rows of 8 (regardless of the Keypad size)

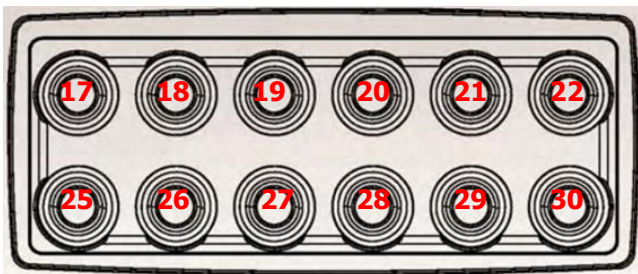Keypad #1   Keypad#3

| 1 | 2 | 3 | 4 | 5 | 6 | 7   8 | **33 thru 40** |
| 9 | 10 | 11 | 12 | 13 | 14 | 15   16 | **41 thru 48** |
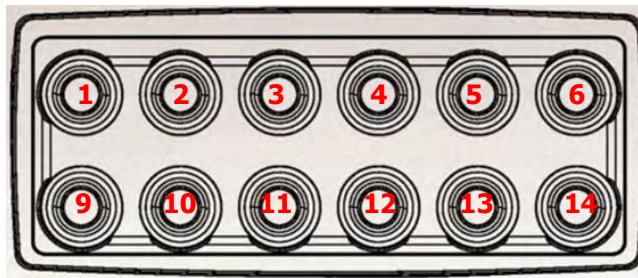
Keypad#2   Keypad#4

| 17 | 18 | 19 | 20 | 21 | 22 | 23   24 | **49 thru 56** |
| 25 | 26 | 27 | 28 | 29 | 30 | 31   32 | **57 thru 64** |

Alternate M-FLEX Keypads
-    Automatically detects Keypad type for each position.
-    1st Keypad always starts at Button   1 for the first Button
-    2nd Keypad always starts at Button 17 for the first Button
-    3rd Keypad always starts at Button 33 for the first Button
-    4th Keypad always starts at Button 49 for the first Button
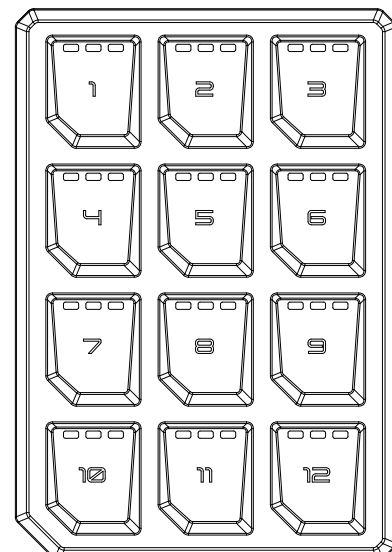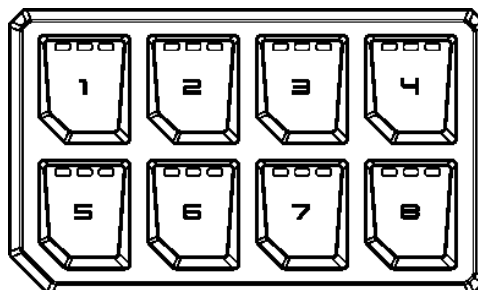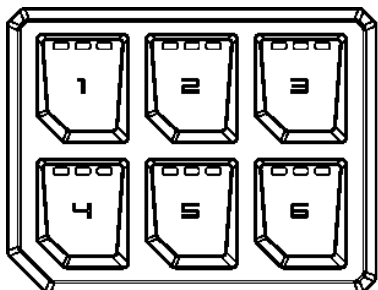
(System Configuration without using the Marlin Programming Tool)

Enter Keypad Configuration (Both Keypads)

Enter by pressing and holding the two left buttons on both keypads for 10 seconds. The buttons will start to pulse with their defined Button Colors when you have entered this mode.
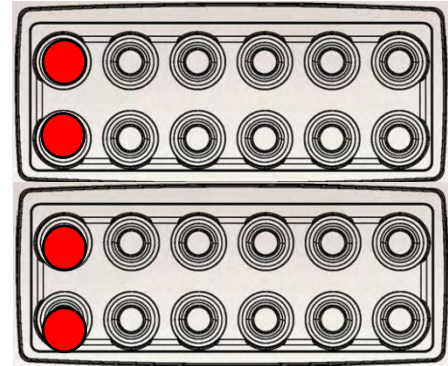
Change Button Colors (Both Keypads)

Tap each button individually to change its color to the next one in the RGB button color binary sequence.   (BLU / GRN / CYA / RED / YEL / MAG / WHT / ORG / PNK / USER1 / USER2 / USER3 / USER4 / USER5 / USER6 / repeat)

Change DayTime Brightness (Keypad#1 Only)

Press and hold the Keypad#1 Upper Left button for >1sec.
Button colors will go solid when you enter this option.
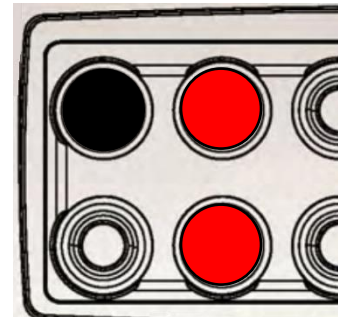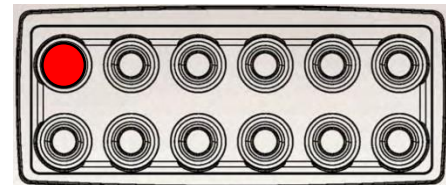(Top row is Daytime and Bottom is Nighttime Brightness)

Continue to hold the Keypad#1 Upper Left button:

Increase DayTime Brightness
Press and Hold the 2nd Upper Left button to scroll up through the brightness to maximum level. Tap the button to increment up one level at a time.
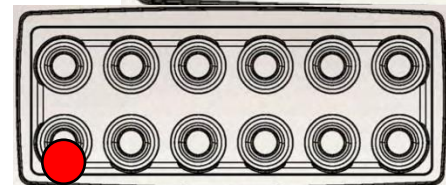Decrease DayTime Brightness
Press and Hold the 2nd Lower Left button to scroll down through the brightness to minimum level. Tap the button to decrement up one level at a time.

Change NightTime Brightness (Keypad#1 Only)

Press and hold the Keypad#1 Lower Left button for >1sec.
Button colors will go solid when you enter this option.
(Top row is Daytime and Bottom is Nighttime Brightness)

Continue to hold the Keypad#1 Lower Left button:

Increase NightTime Brightness
Press and Hold the 2nd Upper Left button to scroll up through the brightness to maximum level. Tap the button to increment up one level at a time.
Decrease NightTime Brightness
Press and Hold the 2nd Lower Left button to scroll down through the brightness to minimum level. Tap the button to decrement up one level at a time.
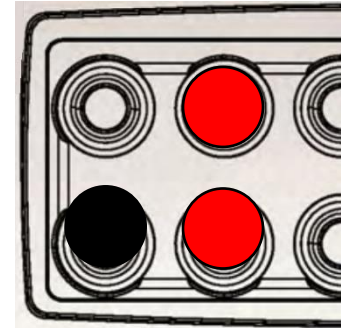
Individual Button Color Selection (Any Button)

Enter by pressing and holding the button for 10 seconds. The buttons will start to pulse with the primary Button Color when you have entered this mode. Each press of the button will change its color to the next one in the RGB button color binary sequence.

(BLU / GRN / CYA / RED / YEL / MAG / WHT / USER1 / USER2 / USER3 / USER4 / USER5 / USER6 / repeat).

Once the primary color has been selected, if the button is not pressed for 10 seconds, then the button will start to pulse with the secondary Button Color. Press the Button to change the secondary color.

Once the secondary color has been selected, if the button is not pressed for 10 seconds, then the button will start to pulse with the 3rd Button Color. Press the Button to change the 3rd color.

Once the 3rd color has been selected, if the button is not pressed for 10 seconds, then the button will exit the color Selection Mode. If the Button is not pressed after entering the Color Selection Mode, then it will drop through the colors, 10 seconds each, and exit back to normal operation.

External 505004 M-Flex 4i4o Module support
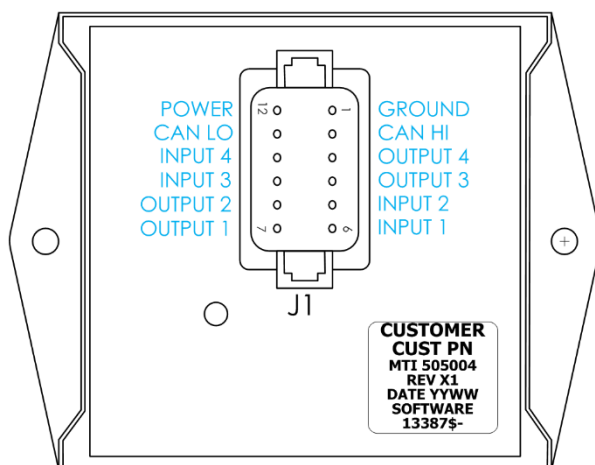
The Digital Switcher can link to a Marlin M-Flex 4i4o Module to provide additional Inputs and Outputs to the Digital Switcher.   Possible configuration of the 4i4o Module would be as follows:

Phy_63 = 1	Configure Mode to CAN_IO
Phy_54 = 1	Config Output1 to HS_Dig (*)
Phy_55 = 1	Config Output1 to HS_Dig (*)
Phy_56 = 1	Config Output1 to HS_Dig (*)
Phy_57 = 1	Config Output1 to HS_Dig (*)
	(* - Or as needed)
Can_00 = 10	Tx Rate of Dig In Msg PGN: FF40
Can_63 = 25	CAN Cmd MessageTimeouts

POWER — 12 — 1 — GROUND
CAN LO — CAN HI
INPUT 4 — OUTPUT 4
INPUT 3 — OUTPUT 3
OUTPUT 2 — INPUT 2
OUTPUT 1 — 7 — 6 — INPUT 1

J1

CUSTOMER
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MTI 505004
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External 505000 M-Flex 8i8o Module support

Please refer to the 11697SB 8i8o CAN IO Module Specification.

Configuration using the Marlin Programming Tool

Module Information:

      Source Address: Module Source Address on CAN [0xB0 - 0xBF]
      BaudRate: CAN Network Baud-rate [25,50, or 100 *10kBaud]

      Enable Debug Messages: Turn on CAN messages to Debug Inputs and various Logic States
      Enable Current Messages: Turn on FF60-FF64 CAN messages to report all output currents
      Enable 501009 LED SrcAddr: Forces FFD7 Msg to pair with the 501009 LED Service Module

      Keypad 1A Source Address: Which Keypad is the first Keypad #1
      Keypad 1B Source Address: Which Keypad is the second Keypad #1 (If more than one)
      Keypad 1C Source Address: Which Keypad is the third Keypad #1 (If more than two)

      Keypad 2A Source Address: Which Keypad is the first Keypad #2
      Keypad 2B Source Address: Which Keypad is the second Keypad #2 (If more than one)
      Keypad 2C Source Address: Which Keypad is the third Keypad #2 (If more than two)

      Keypad 3A Source Address: Which Keypad is the first Keypad #3
      Keypad 3B Source Address: Which Keypad is the second Keypad #3 (If more than one)
      Keypad 3C Source Address: Which Keypad is the third Keypad #3 (If more than two)
           (Note: Keypad 3 does not support the M-Flex

      Keypad 4A Source Address: Which Keypad is the first Keypad #4
      Keypad 4B Source Address: Which Keypad is the second Keypad #4 (If more than one)
      Keypad 4C Source Address: Which Keypad is the third Keypad #4 (If more than two)

      M-Flex 4I4O/8I8O Source Address: Source Address of the M-Flex I/O module to pair with

      Ignition Sleep Delay: Time until module goes to sleep after J2-5 Ignition turns off [in 0.1sec/bit]
               (Allowed range of 0.0 to 25.0 seconds.)

      MaxCurrentLimit: Maximum Total Current Limit for the Module [10-100A, 1A/bit]

System Information:

Module Option Flags:
Bit 0 (+1) = Use Input J2-5 as a True Ignition Switch [0=Disabled, 1=Enabled]
(Digital Switcher will go to Sleep [low power] after Ignition Sleep Delay)
Bit 1 (+2) = Lock the RGB Color Change by Button [0=Disabled, 1=Enabled]
(When enabled, you can only set the RGB button colors in the XML)
Bit 2 (+4) = RGB_Color_Override Disable [0=RGB Color, 1=Button Colors]
(Forces all buttons to copy RGB button colors [0] or be individual [1])
Bit 3 (+8) = Enable "Save Button Information" feature for each button on Key-Off

DayTimeBrightness(On): Set the Brightness of the Keypad backlights during the day when the associated Output is On. [0-100%, 0.4%/bit]
(Used as the Button LED Daytime brightness on the M-Flex Keypad)

DayTimeMinBrightness(Off): Set the Brightness of the Keypad backlights during the day when the associated Output is Off. [0-100%, 0.4%/bit]
(Used as the Background Daytime brightness on the M-Flex Keypad)

NightTimeBrightness(On): Set the Brightness of the Keypad backlights during night time when the associated Output is On. [0-100%, 0.4%/bit]
(Used as the Button LED Nighttime brightness on the M-Flex Keypad)

NightTimeMinBrightness(Off): Set the Brightness of the Keypad backlights during night time when the associated Output is Off. [0-100%, 0.4%/bit]
(Used as the Background Nighttime brightness on the M-Flex Keypad)

NightTimeButtonNumber: Designate which Button will switch the buttons to NightTime mode.

NightTimeButtonStates: Designate which Button State triggers the NightTime Mode
If zero, then NightTimeMode is active if any output is on.
Bit0 = State1 (Lo)
Bit1 = State2 (Med)
Bit2 = State3 (Hi)

Fault Indicator Button: Select which button to use for SystemOutput Fault Status

Fault Indicator Button Color: Set what color the Button is when there No Faults

Button Off Color: Select default color for all Buttons when Output is off [0=Off, Index# 1-15]

RGB Color Change Delay: Select how long (in seconds) before you can select the RGB color

RGB MinPWM: Sets the lowest PWM value allowed for the RGB Output [12-240]

PWM MinPWM: Sets the lowest PWM value allowed for the PWM Output [12-240]

M-Flex LED Pattern: Select use of the Patterns below if 0, or All 3 LEDs on if Output(s) are on

Number of Button Presses ->		M-Flex LED Pattern = 0					M-Flex LED Pattern = 1	
		0 (Off)	1 (On/Lo)	2 (Med)	3 (Hi)		0	1,2,3
Disabled	0							
Momentary	1		▨					▨
On/Off Toggle	2		▨					▨
L/M/H PWM	3		▨	▨	▨			▨
L/M/H PWM (Primary)	4		▨	▨	▨			▨
L/M/H PWM (Secondary)	5		▨	▨	▨			▨
RGB_Red	6		▨					▨
RGB_Green	7		▨					▨
RGB_Blue	8		▨					▨
RGB_Blue (Negative)	9		▨					▨
Lo/Hi (Primary)	10		▨	▨				▨
Lo/Hi (Secondary)	11		▨	▨				▨
Hi/Lo (Primary)	12		▨	▨				▨
Hi/Lo (Secondary)	13		▨	▨				▨
			Min	Middle	Max			
PWM_Inc/Dec	14		▨	▨	▨			▨
Turn Signal	15		▨					▨
Lo/Med/Hi 3-Way (Lo)	16		▨	▨	▨			▨
Lo/Med/Hi 3-Way (Med)	17		▨	▨	▨			▨
Lo/Med/Hi 3-Way (Hi)	18		▨	▨	▨			▨
Slow Toggle	19		▨	▨				▨

Output RGB Color Information:

For the RGB option, the controller provides the option to tune the Red, Green, and Blue portion of the RGB outputs to match the Keypad colors for all color options with a value from 0(off) to 255(full on). The defaults are:

Index#	Name	Red	Green	Blue
0-	Black	0	0	0
1-	Blue	0	0	255
2-	Green	0	255	0
3-	Cyan	0	255	255
4-	Red	255	0	0
5-	Magenta	255	0	255
6-	Yellow	255	255	0
7-	White	255	255	255
8-	Orange	255	64	0
9-	Pink	128	128	255
10-	User1(Bright Pink)	255	0	128
11-	User2(Marlin Teal)	0	255	255

12-	User3(Marlin Blue)	0	80	255
13-	User4(Packer Gold)	255	128	0
14-	User5(Packer Green)	0	255	0
15-	User6(Gater Orange)	255	32	0

Output Channel and (*) Ignition Function Information:

Initial Output State(*): Set the initial state of the output when the unit turns on
- 0=Off
- 1=On   … or First Condition on Dual Outputs or multi-level outputs
- >1=On   … sub-sequent conditions on Dual Outputs or multi-level output
- *(For multi-output options, make sure all outputs have the same Initial State)*

Button Type: Set how the Button controls the output   (0=Output Disabled)

0=Disabled	No Button Controls this	
1=Momentary	Output is On only while button(1 or 2) is pressed	
2=On/Off Toggle	Press button(1 or 2) to turn output On, press again to turn Off.	
3=Lo/Med/High PWM	Press button(1 or 2) to toggle Output = 0/33/66/100 % PWM	
4=Lo/Med/Hi Primary	Dual Out: First Output, Button Toggles Off/On/Off/On	
5=Lo/Med/Hi Secondary	Dual Out: Second Output, Button Toggles Off/Off/On/On	
6=RGB – Red Out	Red Output color of RGB	
7=RGB – Green Out	Green Output color of RGB	
8=RGB – Blue Out	Blue Output color of RGB	
9=RGB – (Neg)Blue Out	Blue Output color of RGB (all 3 are Inverted)	
10=Lo/Hi PrimarySw	Dual Out: First Output,	Button Toggles Off/On/On
11=Lo/Hi Secondary Sw	Dual Out: Second Output,	Button Toggles Off/Off/On
12=Hi/Lo PrimarySw	Dual Out: First Output,	Button Toggles Off/On/On
13=Hi/Lo Secondary Sw	Dual Out: Second Output,	Button Toggles Off/On/Off
14= PWM Inc/Dec	20-step PWM Output	1st Btn=On/Inc, 2nd Btn=Off/Dec
15=Turn Signal	Flashes Output	1st Btn=On/Off, 2nd Btn=Hazard
16=L/M/H 3-Way (Lo)	3-way: Lo Output	Button Toggles Off/ On/ On/On
17=L/M/H 3-Way (Med)	3-way: Med Output	Button Toggles Off/Off/On/On
18=L/M/H 3-Way (Hi)	3-way: Hi Output	Button Toggles Off/Off/Off/On
19=Slow Toggle	Output On(1) or Off(2) for xx Seconds and then toggles state.	

Button Number(*): Set which Button Input controls the Output
- 0   No Button   [NOTE: Button=0 AND Type=0 forces Output to be Off]

- 1- 8 Keypad #1, Top Row   (starting from the left)
- 9-16 Keypad #1, Bottom Row (starting from the left)
  - *(M-Flex Keypad #1 is 1-16 starting top left going right, then down)*

17-24   Keypad #2, Top Row   (starting from the left)
25-32   Keypad #2, Bottom Row (starting from the left)
         (M-Flex Keypad #2 is 17-32 starting top left going right, then down)

33-40   Keypad #3, Top Row   (starting from the left)
41-48   Keypad #3, Bottom Row (starting from the left)
         (M-Flex Keypad not supported in Keypad #3 positions)

49-56   Keypad #4, Top Row   (starting from the left)
57-64   Keypad #4, Bottom Row (starting from the left)
         (M-Flex Keypad not supported in Keypad #4 positions)

Button Number (Continued):
         (M-Flex 505000 [8i8o] Inputs)
220 = Input 5 (Assignable?), Hi State
221 = Input 5 (Assignable?), Lo State
222 = Input 6 (Assignable?), Hi State
223 = Input 6 (Assignable?), Lo State
224 = Input 7 (Assignable?), Hi State
225 = Input 7 (Assignable?), Lo State
226 = Input 8 (Assignable?), Hi State
227 = Input 8 (Assignable?), Lo State

         (M-Flex 505000/505004 [8i8o/4i4o] Inputs)
230 = Input 1 (Assignable? / Pin 6), Hi State
231 = Input 1 (Assignable? / Pin 6), Lo State
232 = Input 2 (Assignable? / Pin 5), Hi State
233 = Input 2 (Assignable? / Pin 5), Lo State
234 = Input 3 (Assignable? / Pin 9), Hi State
235 = Input 3 (Assignable? / Pin 9), Lo State
236 = Input 4 (Assignable? / Pin 10), Hi State
237 = Input 4 (Assignable? / Pin 10), Lo State

240   Ignition **Input (J2-5)** controls this Output
250   System Fault State controls this Output

Button2 Number: Set which Button is the secondary Input *(if used by Button Type)*
         (2nd Button for PWM Inc/Dec Type is the Off/Down Button)
         (2nd Button for Turn Signal Type is the Hazards Button)

Button Color(*): Set the Buttons Primary Color Index# for outputs 1st state/On [Index# 1-15]

Button 2nd Color: Set the Buttons Color Index# for outputs 2nd state [Index# 1-15]
         (Hazard Button color for Turn Signal option)

Button 3rd Color: Set the Buttons Color Index# for outputs 3rd state [Index# 1-15]
         (Refer to Color Information Index# List)

Button Fault Color: Set the Buttons Color Index # when an output fault is active [Index# 1-15]
         (Refer to Color Information Index# List)

Fuse Type: Set the Fuse Style [0=Fast Blow, 1=Slow Blow] *(Future Option)*

Fuse Rating: Set the Output Fuse Rating/Current Limit [in 0.1A/bit]

Fuse Priority: Set the Priority of the output from 1(Highest) to 20(Lowest) for which outputs are turned off to keep the total current load below the Max Module Current. When current drops back below (MaxCurrent – 10A), then each increasing priority number is turned back on.

Button Option Flags:
Bit 0 (+1) = Ignition Dependence, Output only allowed to turn on if Ignition Signal is On
Bit 1 (+2) = Save Button Information on Ignition Key Off sequence
Bit 2 (+4) = Invert Toggle Sequence of the Switch Type (L/M/H to H/M/L)

Button Conditional Value: The usage of this value depends on the Button Type.

Button Type:	Usage Definition	
(1) Momentary:	If not zero, then used as Minimum Output Current Rating [0.1A/bit]	
(2) On/Off Toggle:	If not zero, then used as Minimum Output Current Rating [0.1A/bit]	
(3) L/M/H PWM:	If not zero, then used as Minimum Output Current Rating [0.1A/bit]	
(4-5) L/M/H Dual:	If not zero, then used as Minimum Output Current Rating [0.1A/bit]	
(16-18) L/M/H 3-way:	If not zero, then used as Minimum Output Current Rating [0.1A/bit]	
(6-9) RGB_Colors:	PWM value to use when Output is turned On	[0.4%/bit]
(14) PWM Inc/Dec:	PWM value to use when Output is turned On	[0.4%/bit]
(15) Turn Signal:	Flash Period of the Output [10mS/bit, 1-255]	
(19) Slow Toggle:	Time in Seconds of when to toggle Output State [1Sec/bit, 1-255]	