



Product: 2018, MMU-1600, MMU-1600D, & MMU-1600G

Title: Monitoring Flashing Yellow Arrow Left Turns

Release Date: October 02, 2009

Scope: All Reno A&E Monitors.

The following Reno A&E monitors now support Flashing Yellow Arrow (FYA) left turn movements: 2018, MMU-1600 (12 Option Switch version), MMU-1600D, and MMU-1600G. This feature is enabled in the following ways:

Monitor	Firmware	Location	Label
2018	01.05.00	Circuit Board - Option Switch 2	FYA EN
MMU-1600	01.07.12	Front Panel - Option Switch 10	FYA ENABLE
MMU-1600D	01.07.12	Front Panel - Option Switch 10	FYA ENABLE
MMU-1600G	01.07.12	Menu System - Configuration Settings > Fault Monitoring Settings > Settings > FYA Left Turns	FYA ENABLE

The monitor must have the indicated firmware version or higher in order to support this feature. The latest firmware version for all of these monitors is available on the Reno A&E website at www.renoae.com under Support > Monitor Support > Firmware.

In order to understand how the monitor handles FYA heads there are a couple of terms that need to be defined:

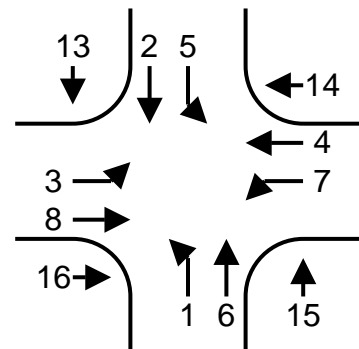
FYA Parent Channel: This is the channel that will monitor the three solid arrow indications (Green, Yellow, and Red) of the FYA head. All FYA settings for a particular FYA head will be made to this channels settings. This is usually the protected left turn channel.

FYA Conflicting Child: This is the channel that conflicts with the FYA parent channel and will be Green while the flashing yellow arrow is active. This is usually the opposing through to the FYA parent channel.

FYA Permissive Child: This is the channel that will monitor the flashing yellow arrow section of the FYA head. This channel must be permissive with the FYA parent channel and the FYA conflicting channel. This is usually an overlap channel.

EXAMPLE 1

Now, lets see how to derive these settings from a typical intersection. We will use the phasing diagram to the right to figure out these settings. Lets assume that we want to have FYA left turns movements for all four left turns at this intersection and the greens of the overlap channels 9 - 12 will be used to drive the flashing yellow arrow sections of the FYA heads.



First, we will have four FYA parent channels: 1, 3, 5, and 7. Channel 1 will have an FYA conflicting child channel of 2 as it is the opposing through to channel 1 and an FYA permissive child channel of 9 as it is the first overlap channel. We would continue this logic for the other three left turns and arrive at the following settings:

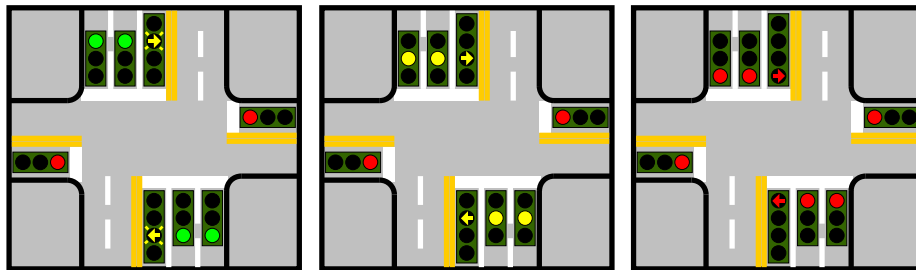
Parent Channel	Conflicting Child Channel	Permissive Child Channel
1	2	9
3	4	10
5	6	11
7	8	12



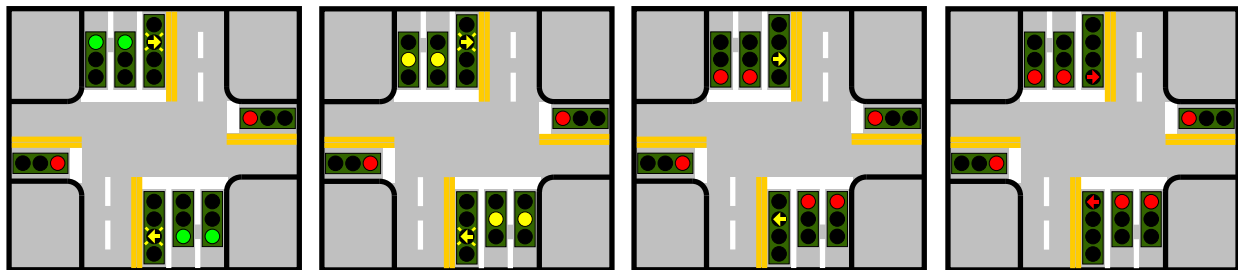
Next, there are two other settings that need to be determined to complete the information needed to program all of the FYA settings of the monitor.

The first one is which input of the permissive child channel will be used to monitor the flashing yellow arrow section of the FYA head. The monitor defaults to monitoring the green of the permissive child channels. To monitor the yellow inputs the FYA USES YEL DRIVER option must be enabled. Starting with firmware version 01.06.00 for the 2018 monitor, this monitor supports split FYA child channels. This allows a single channel of the monitor to monitor two FYA displays. For our example we said we would be using the greens of the overlap channels to driver the flashing yellow arrow sections so we do not need to enable this option.

The second one has to do with how the controller will terminate the flashing yellow arrow and the conflicting child channel when both are active (green ball for conflicting child is ON and flashing yellow arrow of permissive child is ON). If the yellow for both will begin at the same time, a conflict will exist. The solid yellow arrow used to terminate the flashing yellow arrow is in the parent channel and the yellow ball used to terminate the green ball is in the conflict child channel. These two channel conflict by definition. However, the FHWA advocates this sequence and the 2009 MUTCD will allow this particular sequence for just this purpose. To instruct the monitor to ignore this FYA yellow vs. conflicting child yellow the FYA IGNORE YEL CONFLICT (also called "FYA No Yel Conf") option should be enabled. If it is not enabled, the only way to terminate the green ball and flashing yellow arrow is to time the yellow for the green ball first, once that channel is red, begin timing the yellow for the flashing yellow arrow. This does not create a conflict but does require two clearance intervals. By default this option is disabled but most installations will require enabling this option.



Termination of Flashing Yellow Arrow with FYA IGNORE YEL CONFLICT option enabled. Also called concurrent yellows.



Termination of Flashing Yellow Arrow with FYA IGNORE YEL CONFLICT option disabled. Also Called dual clearance.

This covers the settings of the monitor. Now, we need to look at the program card and see how it needs to be configured to deal with flashing yellow arrow heads. Lets continue our assumption that we are adding four FYA heads with the overlaps channels being channels 9-12. And that the permissive child for channel 1 is channel 9, channel 3 is channel 10, channel 5 is channel 11, and channel 7 is channel 12.



APPLICATION NOTE

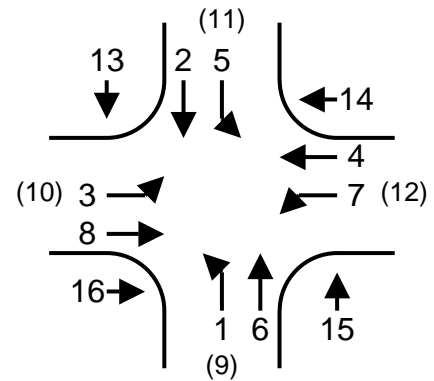
AN-005

Our modified phasing diagram will now look like the one to the right.

Permissives

The standard permissives should exist with the addition of the following:

- Permissive child must be permissive with opposing through vehicle movement. 2-9, 4-10, 6-11, and 8-12.
- Permissive child must be permissive with opposing through pedestrian movement. 9-13, 10-14, 11-15, and 12-16.
- Permissive child must be permissive with opposing permissive child. 9-11 and 10-12.
- Permissive child must be permissive with parent channel. 1-9, 3-10, 5-11, and 7-12. This permissive's use is not obvious but is required to keep from getting short clearance faults when terminating a flashing yellow arrow. Because the solid yellow arrow is in a different channel than the flashing yellow arrow, a short clearance fault will occur during the transition from the flashing yellow arrow to the solid yellow arrow if the two channels are not permissive. A short clearance fault is when a green turns off and a conflicting green or yellow turns on within 2.7 seconds. Therefore, the flashing yellow arrow channel must be permissive with the channel that will time its yellow clearance.



Minimum Yellow Change Disable (MMU-1600 Monitors)

MYCD should not be jumpered for the parent channel or permissive child channel. If you will be using the yellow portion of a pedestrian load switch to drive the flashing yellow arrow display, then MYCD must be jumpered.

Yellow Disable (2018 Monitors)

Yellow Disable should not be jumpered for the parent channel or permissive child channel. If you will be using the yellow portion of a pedestrian load switch to drive the flashing yellow arrow display, then Yellow Disable must be jumpered.

Other settings of the monitor that must be considered are:

Dual Indication – Should be ON for the parent channel and OFF for the permissive child channel.

Per Channel Red Enable – Should be ON for the monitor (only applies to NEMA monitors). The red enable (or red fail) for the parent channel should be set to ON and the permissive child channel should be set to OFF.

Flashing Don't Walk Monitoring – If enabled, should be OFF for the parent channel and the permissive child channel.

SUMMARY

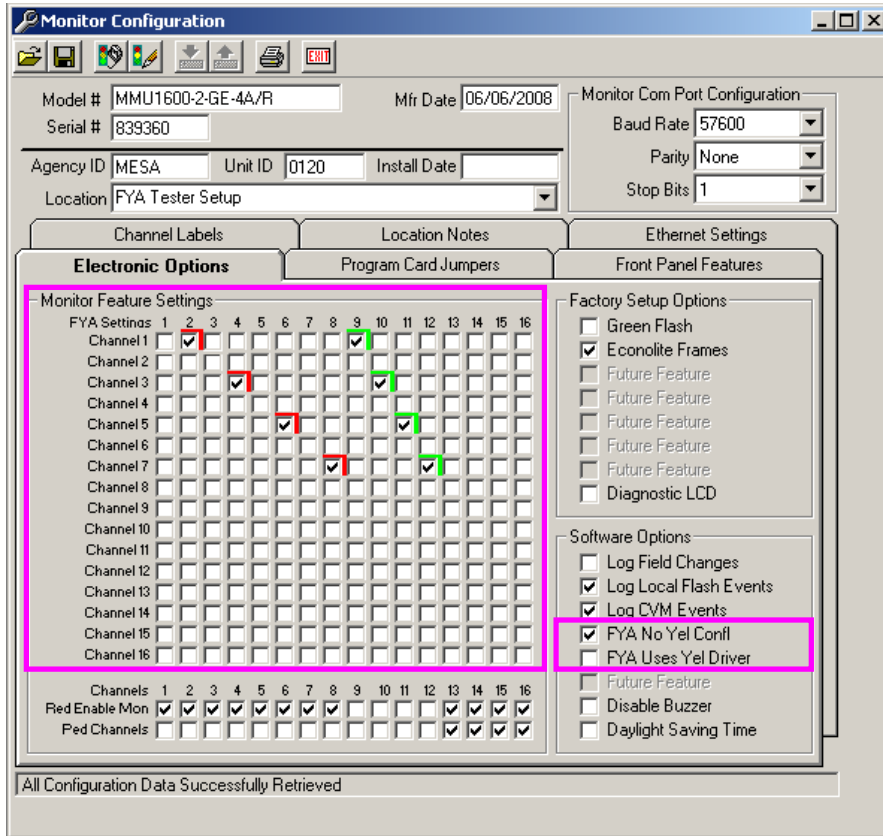
So to summarize the configuration settings and connections to the monitor for our example implementation:

Flashing yellow arrow head connections to the monitor:

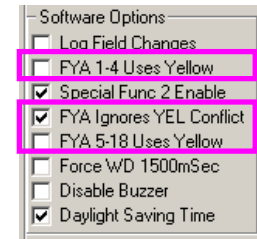
	Channel 1 Left Turn	Channel 3 Left Turn	Channel 5 Left Turn	Channel 7 Left Turn
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
FYA Arrow	Channel 9 Green	Channel 10 Green	Channel 11 Green	Channel 12 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green



Flashing yellow arrow settings are FYA IGNORE YEL CONFLICT is enabled (checked) and FYA USES YEL DRIVER is disabled (not checked). For FYA parent channel 1 the conflicting child is channel 2 and the permissive child is channel 9. For FYA parent channel 3 the conflicting child is channel 4 and the permissive child is channel 10. For FYA parent channel 5 the conflicting child is channel 6 and the permissive child is channel 11. For FYA parent channel 7 the conflicting child is channel 8 and the permissive child is channel 12. You must use the RaeComM software to configure these settings.



This is the Software Options box for the 2018 monitor with 01.06.00 or higher firmware.



Dual Indication should be ON for channels 1 through 8, and 13 through 16.

Per Channel Red Enable should be ON for the monitor (only applies to NEMA monitors).

The channel red enables should be ON for channels 1 through 8, and 13 through 16. For NEMA DIP switch monitors, you must use the RaeComM software to configure these settings.

Flashing Don't Walk Monitoring, if used, should be enabled and ON for channels 13 through 16. For DIP switch monitors, you must use the RaeComM software to configure these settings.

Permissives should be configured as follows:

- 1-5, 1-6, 1-9, 1-11, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 3-7, 3-8, 3-10, 3-12, 3-16, 4-7, 4-8, 4-10, 4-12, 4-14, 4-16, 5-9, 5-11, 5-13, 6-9, 6-11, 6-13, 6-15, 7-10, 7-12, 7-14, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15, and 14-16

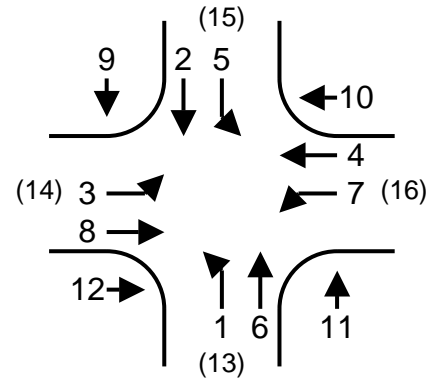
Minimum Yellow Change Disable (NEMA) or Yellow Disable (2018) should be jumpered for channels 13 through 16.



EXAMPLE 2

We will use the phasing diagram to the right as the phasing for the intersection that we are going to configure for flashing yellow arrows.

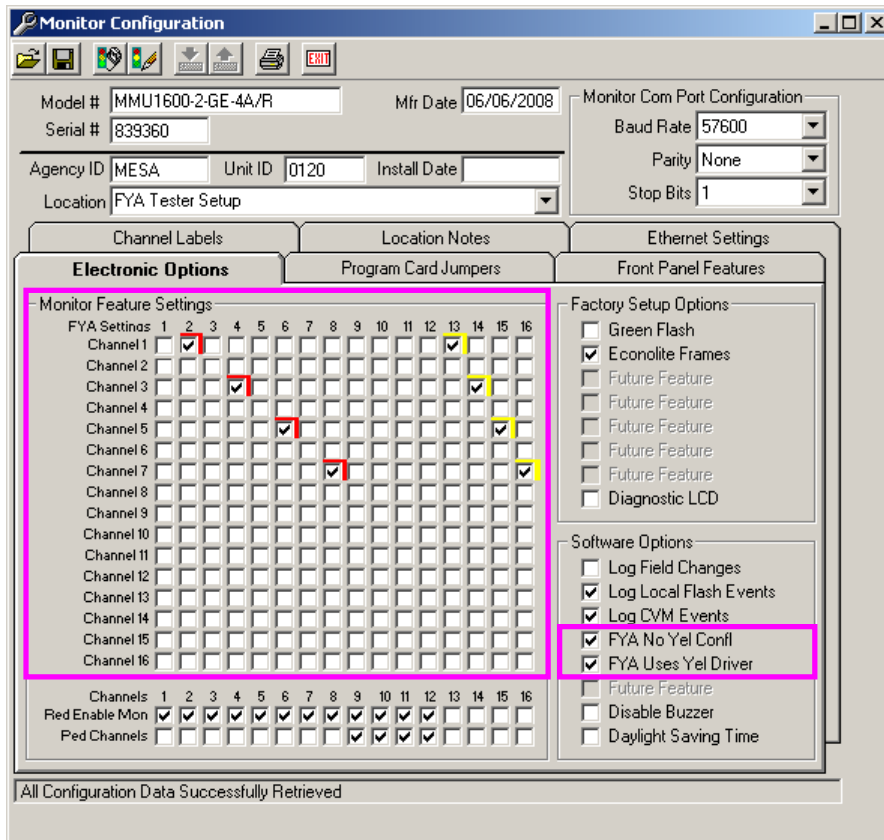
We want to have FYA left turns movements for all four left turns at this intersection and the yellows of the overlap channels 13 through 16 will be used to drive the flashing yellow arrow sections of the FYA heads. The FYA yellow will be timed concurrently with the opposing yellow ball.



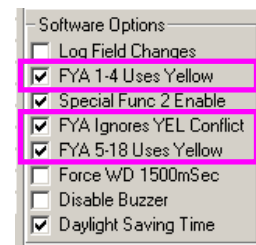
Flashing yellow arrow head connections to the monitor:

	Channel 1 Left Turn	Channel 3 Left Turn	Channel 5 Left Turn	Channel 7 Left Turn
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
FYA Arrow	Channel 13 Yellow	Channel 14 Yellow	Channel 15 Yellow	Channel 16 Yellow
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

Flashing yellow arrow settings are FYA IGNORE YEL CONFLICT is enabled (checked) and FYA USES YEL DRIVER is enabled (checked). For FYA parent channel 1 the conflicting child is channel 2 and the permissive child is channel 9. For FYA parent channel 3 the conflicting child is channel 4 and the permissive child is channel 10. For FYA parent channel 5 the conflicting child is channel 6 and the permissive child is channel 11. For FYA parent channel 7 the conflicting child is channel 8 and the permissive child is channel 12. You must use the RaeComM software to configure these settings.



This is the Software Options box for the 2018 monitor with 01.06.00 or higher firmware.





Dual Indication should be ON for channels 1 through 12.

Per Channel Red Enable should be ON for the monitor (only applies to NEMA monitors).

The channel red enables should be ON for channels 1 through 12. For NEMA DIP switch monitors, you must use the RaeComM software to configure these settings.

Flashing Don't Walk Monitoring, if used, should be enabled and ON for channels 9 through 12. For DIP switch monitors, you must use the RaeComM software to configure these settings.

Permissives should be configured as follows:

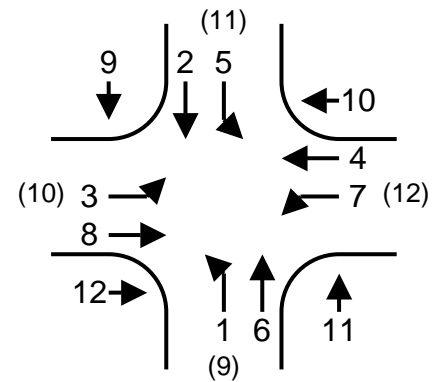
- 1-5, 1-6, 1-11, 1-13, 1-15, 2-5, 2-6, 2-9, 2-11, 2-13, 2-15, 3-7, 3-8, 3-12, 3-14, 3-16, 4-7, 4-8, 4-10, 4-12, 4-14, 4-16, 5-9, 5-13, 5-15, 6-9, 6-11, 6-13, 6-15, 7-10, 7-14, 7-16, 8-10, 8-12, 8-14, 8-16, 9-11, 9-13, 9-15, 10-12, 10-14, 10-16, 11-13, 11-15, 12-14, 12-16, 13-15, 14-16

Minimum Yellow Change Disable (NEMA) or Yellow Disable (2018) should be jumpered for channels 9 through 12.

EXAMPLE 3

We will use the phasing diagram to the right as the phasing for the intersection that we are going to configure for flashing yellow arrows.

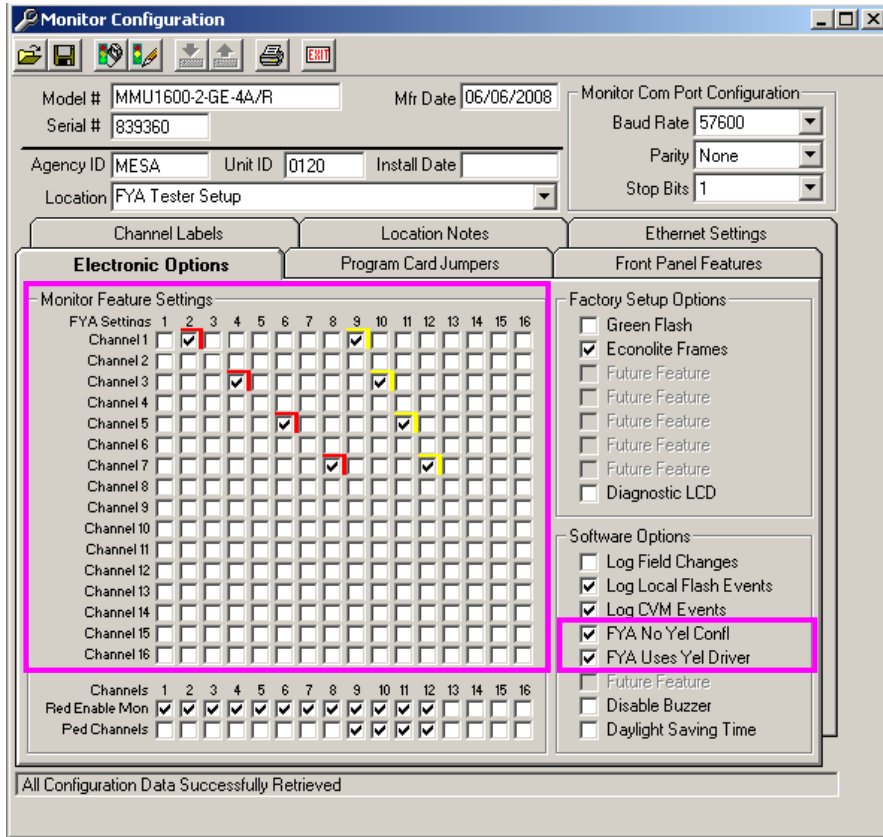
We want to have FYA left turns movements for all four left turns at this intersection and the yellows of the pedestrian channels 9 through 12 will be used to drive the flashing yellow arrow sections of the FYA heads. The FYA yellow will be timed concurrently with the opposing yellow ball.



Flashing yellow arrow head connections to the monitor:

	Channel 1 Left Turn	Channel 3 Left Turn	Channel 5 Left Turn	Channel 7 Left Turn
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
FYA Arrow	Channel 9 Yellow	Channel 10 Yellow	Channel 11 Yellow	Channel 12 Yellow
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

Flashing yellow arrow settings are FYA IGNORE YEL CONFLICT is enabled (checked) and FYA USES YEL DRIVER is enabled (checked). For FYA parent channel 1 the conflicting child is channel 2 and the permissive child is channel 9. For FYA parent channel 3 the conflicting child is channel 4 and the permissive child is channel 10. For FYA parent channel 5 the conflicting child is channel 6 and the permissive child is channel 11. For FYA parent channel 7 the conflicting child is channel 8 and the permissive child is channel 12. You must use the RaeComM software to configure these settings.



Dual Indication should be ON for channels 1 through 12.

Per Channel Red Enable should be ON for the monitor (only applies to NEMA monitors).

The channel red enables should be ON for channels 1 through 12. For NEMA DIP switch monitors, you must use the RaeComM software to configure these settings.

Flashing Don't Walk Monitoring, if used, should be enabled and ON for channels 9 through 12. For DIP switch monitors, you must use the RaeComM software to configure these settings.

Permissives should be configured as follows:

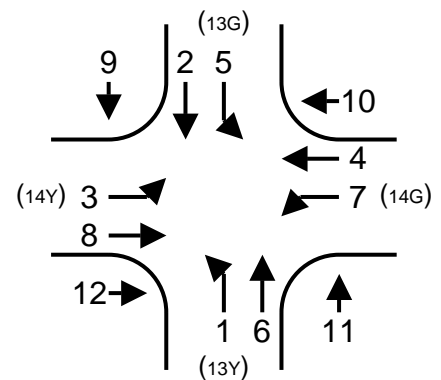
- 1-5, 1-6, 1-9, 1-11, 2-5, 2-6, 2-9, 2-11, 3-7, 3-8, 3-10, 3-12, 4-7, 4-8, 4-10, 4-12, 5-9, 5-11, 6-9, 6-11, 7-10, 7-12, 8-10, 8-12, 9-11, and 10-12

Minimum Yellow Change Disable (NEMA) or Yellow Disable (2018) should be jumpered for channels 9 through 12.

EXAMPLE 4

We will use the phasing diagram to the right as the phasing for the intersection that we are going to configure for flashing yellow arrows.

We want to have FYA left turns movements for all four left turns at this intersection and the greens and yellows of the overlap channels 13 and 14 will be used to drive the flashing yellow arrow sections of the FYA heads. The FYA yellow will be timed concurrently with the opposing yellow ball. This configuration can only be accomplished with the 2018 monitor with 01.06.00 or higher firmware.

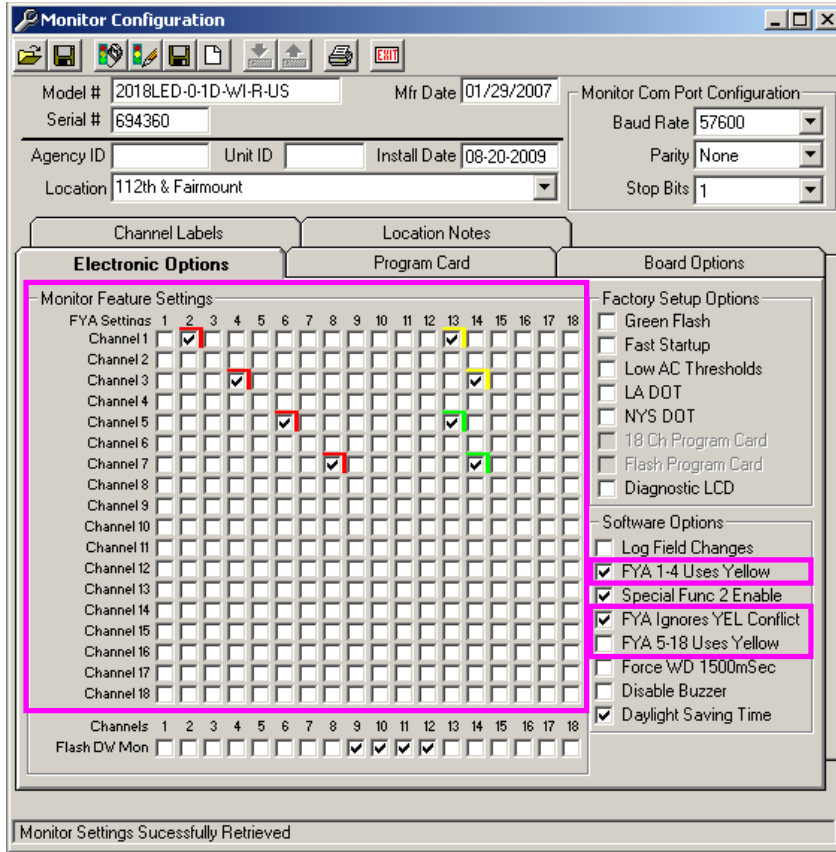




Flashing yellow arrow head connections to the monitor:

	Channel 1 Left Turn	Channel 3 Left Turn	Channel 5 Left Turn	Channel 7 Left Turn
Red Arrow	Channel 1 Red	Channel 3 Red	Channel 5 Red	Channel 7 Red
Yellow Arrow	Channel 1 Yellow	Channel 3 Yellow	Channel 5 Yellow	Channel 7 Yellow
FYA Arrow	Channel 13 Yellow	Channel 14 Yellow	Channel 13 Green	Channel 14 Green
Green Arrow	Channel 1 Green	Channel 3 Green	Channel 5 Green	Channel 7 Green

Flashing yellow arrow settings are FYA IGNORE YEL CONFLICT is enabled (checked) and FYA 1-4 USES YELLOW is enabled (checked) and FYA 5-18 USES YELLOW is disabled (not checked). For FYA parent channel 1 the conflicting child is channel 2 and the permissive child is channel 13. For FYA parent channel 3 the conflicting child is channel 4 and the permissive child is channel 14. For FYA parent channel 5 the conflicting child is channel 6 and the permissive child is channel 13. For FYA parent channel 7 the conflicting child is channel 8 and the permissive child is channel 14. You must use the RaeComM software to configure these settings.



Dual Indication should be ON for channels 1 through 12.

The channel red enables should be ON for channels 1 through 12.

Flashing Don't Walk Monitoring, if used, should be enabled and ON for channels 9 through 12. You must use the RaeComM software to configure these settings.

Permissives should be configured as follows:

- 1-5, 1-6, 1-11, 2-5, 2-6, 2-9, 2-11, 2-13, 3-7, 3-8, 3-12, 3-14, 4-7, 4-8, 4-10, 4-12, 4-14, 5-9, 5-13, 6-9, 6-11, 6-13, 7-10, 7-14, 8-10, 8-12, 8-14, 9-11, 9-13, 10-12, 10-14, 11-13, and 12-14

Yellow Disable should be jumpered for channels 9 through 12.