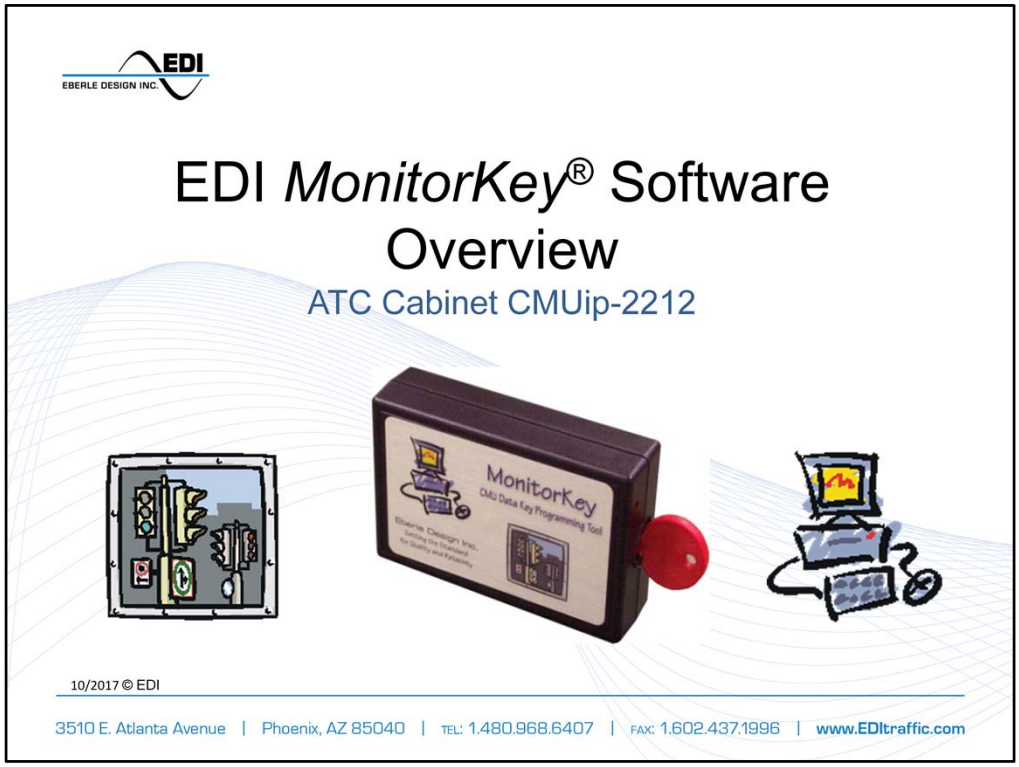


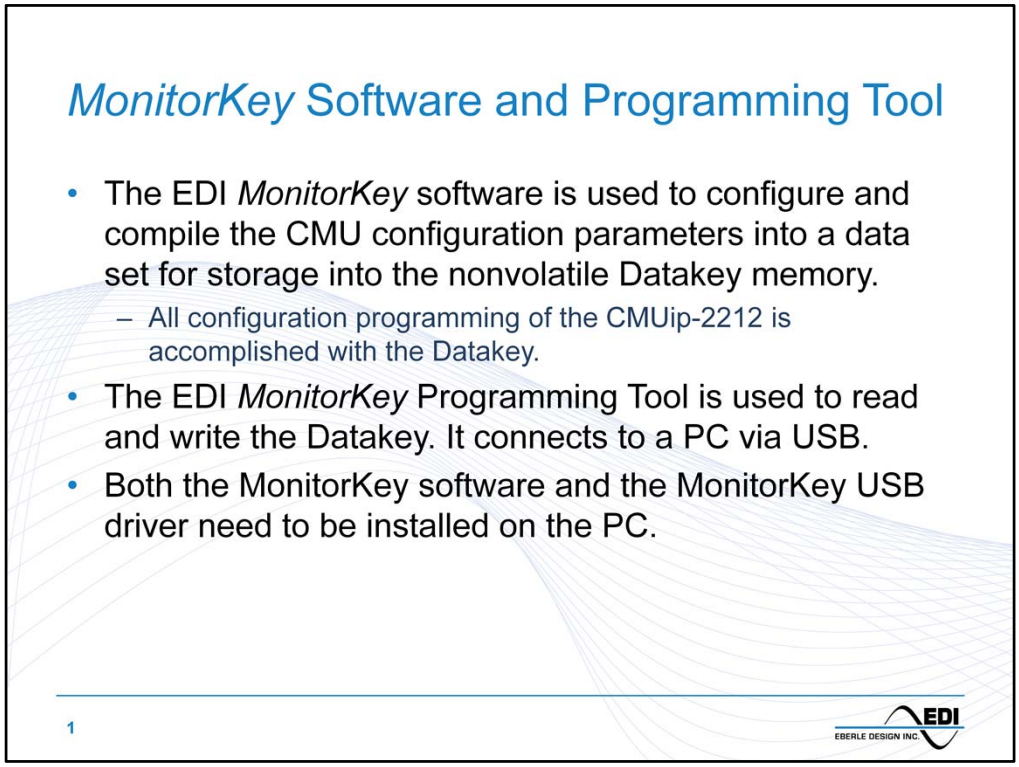
Additional Resources:

MonitorKey® Operation Manual:
www.EDItraffic.com/wp-content/uploads/888-1212-001-MonitorKey-Operation-Manual.pdf

CMUip-2212 Operation Manual:
www.EDItraffic.com/wp-content/uploads/888-2212-001-CMU-2212-Operation-Manual.pdf

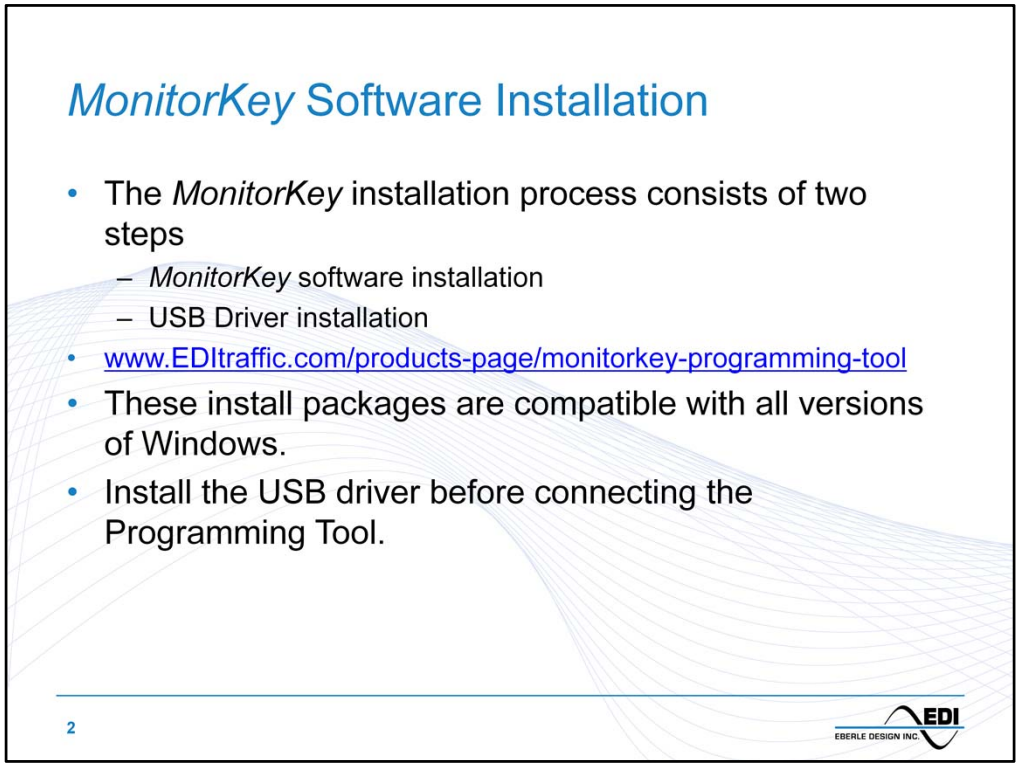
iPack® 2202 Operation Manual:
www.EDItraffic.com/wp-content/uploads/888-2202-001-HDSP-FU-2202-Operation-Manual.pdf

MonitorKey® Software download:
www.EDItraffic.com/monitorkey-programming-tool-download/



The Eberle Design *MonitorKey*® programming tool set is used to format and program the nonvolatile memory of the Datakey™ device used to configure the CMUip-2212 ATC Cabinet Monitor Unit series, CMU-212 ITS Cabinet Monitor Unit series and the 2018KCL Signal Monitor series.

The hardware is designed to interface the USB port of a personal computer to the Datakey™ electronics. The *MonitorKey*® software provides the capability to format the monitor programming data and transfer this data to and from the Datakey™ device.



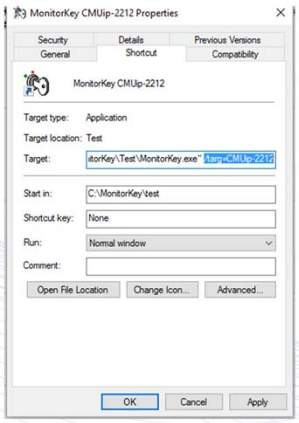
The *MonitorKey* installation process is straight forward and consists of two steps, the software installation and the USB driver installation.

It is important to specify the correct target monitor (CMUip-2212, CMUip-212, 2018KCLip) to the program in order for the *MonitorKey* software to produce the appropriate forms for the monitor type.

The *MonitorKey* software will inquire about the Target monitor the first time the program is launched. The Target monitor can be changed later or specified when the program is launched with a command line option.

Specify the MonitorKey Target Monitor

- The *MonitorKey* software supports several monitor types:
  - CMUip-2212 ATC Cabinet
  - CMUip-212 ITS Cabinet
  - 2018KCLip 332 Cabinet
- The Target monitor needs to be correctly selected at install time or when the program is launched.
  - Menu: SETUP / TARGET / CMUip-2212, or
  - Modify the Short Cut Property:
    <path> /targ=CMUip-2212



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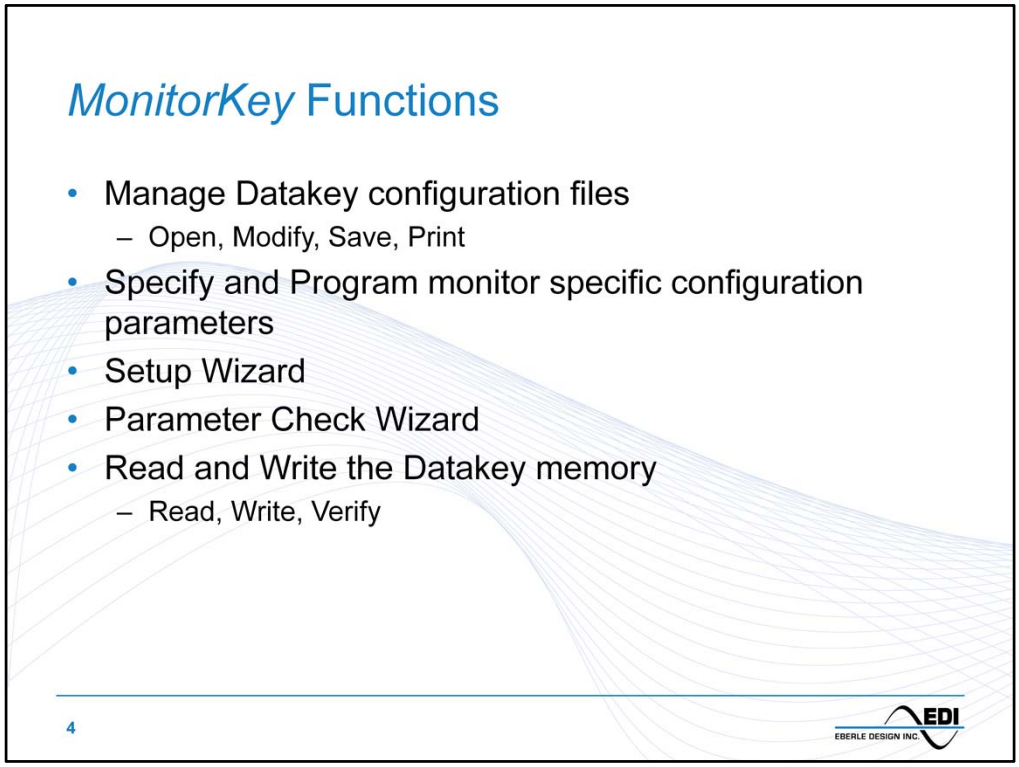
The correct Target monitor must be set for the *MonitorKey* software. This can be done at installation time, through the menu at run time, or selected by a desktop shortcut. The shortcut method is recommended if multiple target monitors are going to be managed.

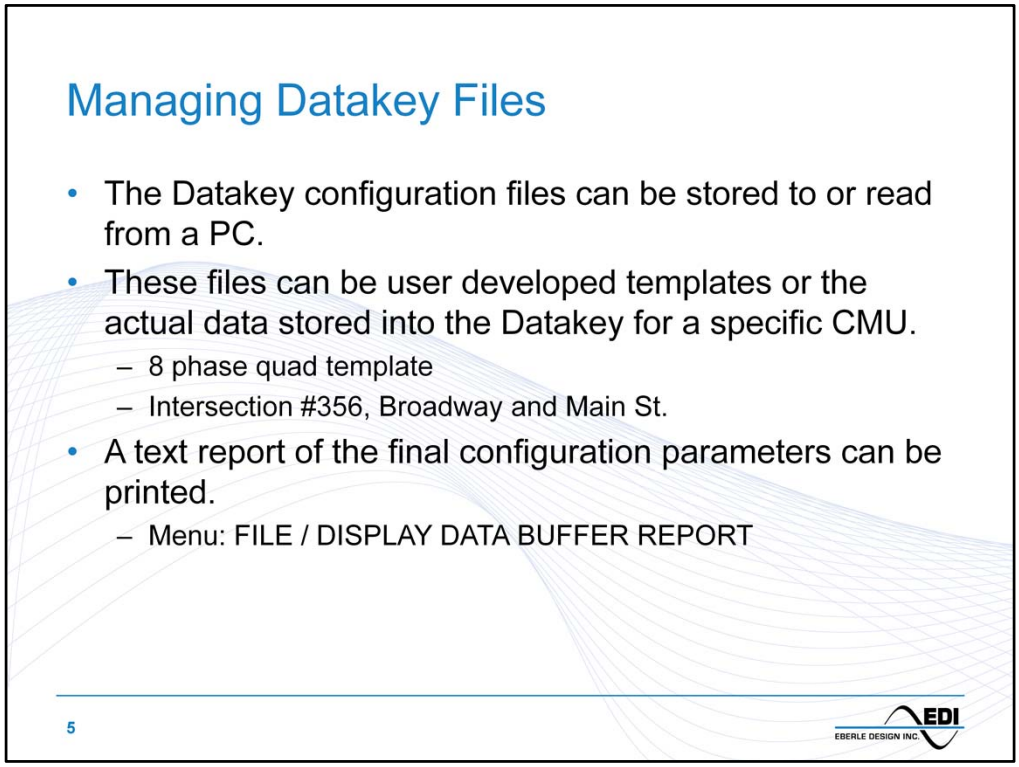
1. Copy the *MonitorKey* shortcut to the desktop.
2. Rename it to MonitorKey CMUip-2212.
3. Select the Properties
4. Add the command line option parameter to the shortcut Target parameter: /targ=CMUip-2212
    1. Note: be sure this option field is outside of any quotes used in the MonitorKey launch path text.
5. Create additional shortcuts for other target monitors if needed.



The *MonitorKey*® software provides a simple to use tool to develop and view the configuration programming for the CMUip-2212 ATCC Cabinet Monitor Unit. Templates or data sets can be loaded from the PC and final configuration data set files saved back to the PC.

A Set-Up Wizard helps develop the detailed programming needed to configure the CMU for an intersection application by answering a series of simple questions related to cabinet wiring and phase assignments. The Parameter Check Wizard will ensure that inconsistent parameters in the configuration are identified and corrected.

Once the configuration is finalized, the Programming Tool will then write the data set to the non-volatile memory of the Datakey device.



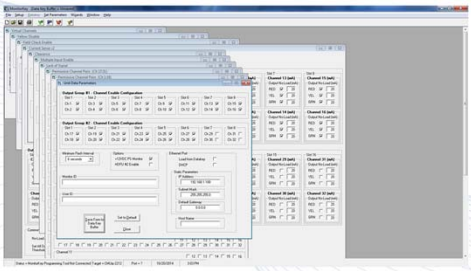
The *MonitorKey*® files are binary files that must be read or written by the *MonitorKey*® software. While a unique file could be developed for each cabinet in an inventory, usually these configurations are common to a few different intersection applications and a template system can be developed to facilitate quick data set development.

For example, a template file could be developed and stored that provided the basic configuration for an 8-phase quad cabinet configuration. When a new CMU is being deployed, this 8-phase template could be read by the *MonitorKey*® software and then customized if necessary for the specific intersection if needed.

Once the data set is completed then a hard copy report can be printed, the file saved to the PC, and the resulting data set written to the Datakey for deployment.

Specifying the CMU Parameters

- For each CMU monitoring function, a form (window) is provided to fill in the parameters.



- After the parameters are selected, click on the *Save Form to Datakey Buffer* button.

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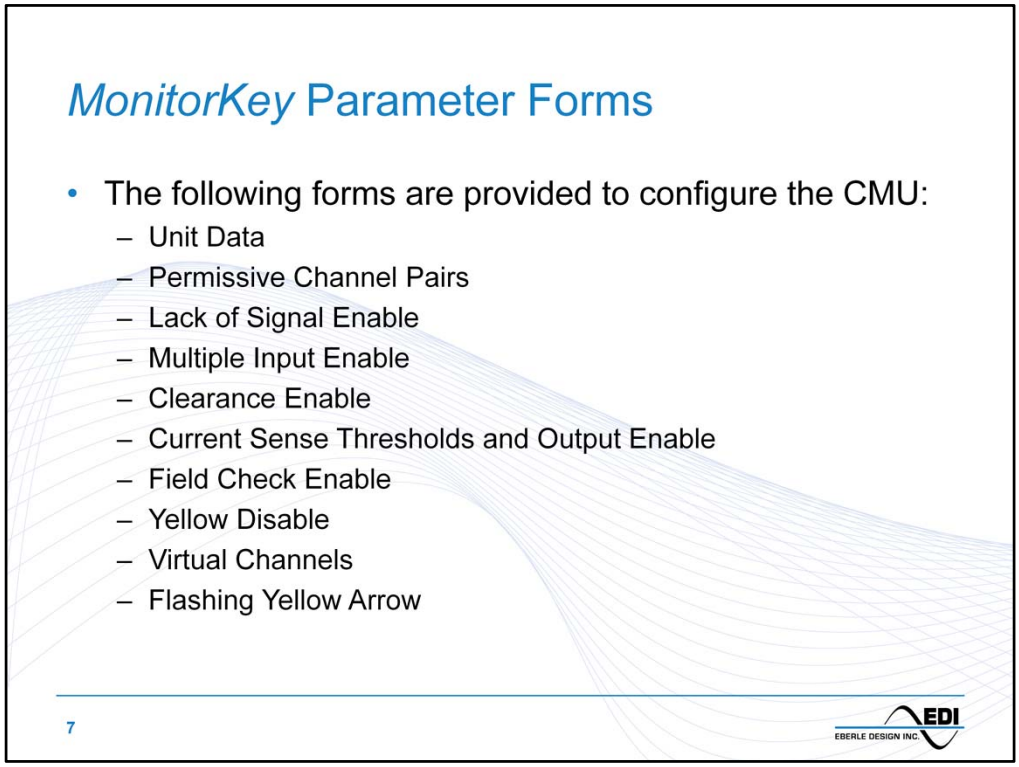
Each monitor function is configured using a separate *form*. Once a form is completed the *Save Form to Buffer* button should be selected to add this programming data to the data set buffer.

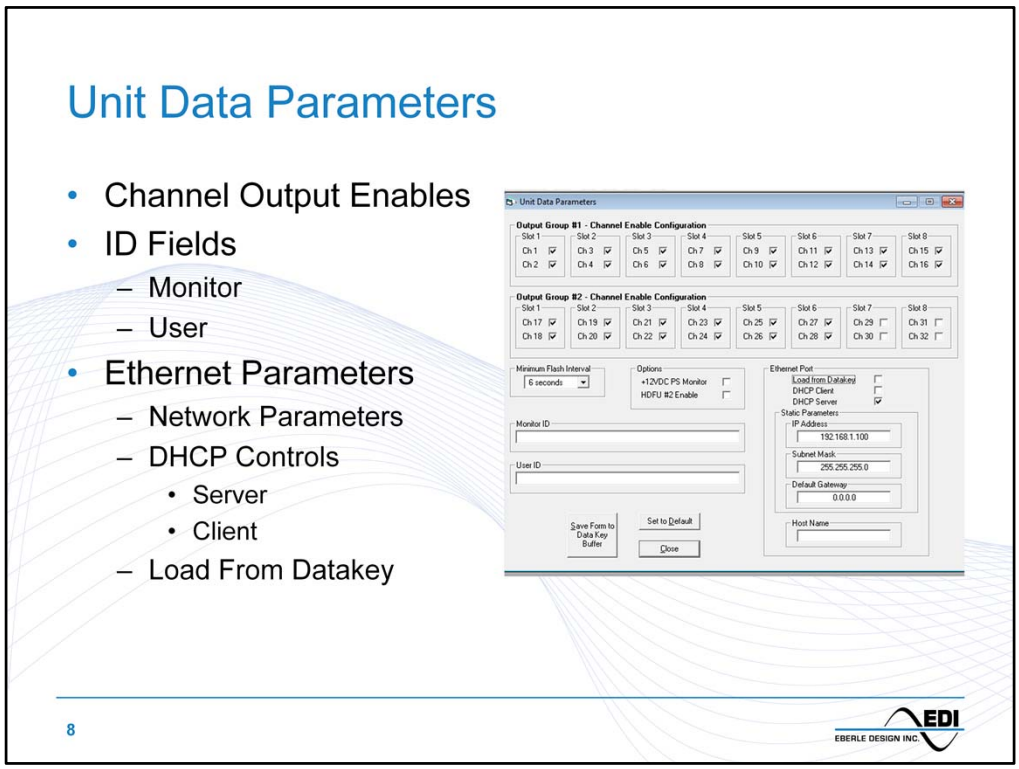
A *form* may also have various *frames* included. Each frame typically consists of a programming parameter set.

Each form provides a button to reset the contents back to default state if needed. If a form has been changed but not stored to the buffer, a warning message will be generated if the form is closed or the Datakey is written with unsaved forms present.



A typical data set development process would be as follows:

1. Load a template file from the PC ,or start with a default buffer (FILE / NEW)
2. Manually configure the following forms:
    1. Unit Data
    2. Permissive Channel Pairs
    3. Lack of Signal Dark Maps
    4. Current Sense Thresholds (if necessary)
    5. Virtual Channels (if necessary)
    6. Flashing Yellow Arrow (if necessary)
3. Run the Set-up Wizard (WIZARDS / PARAMETER SETUP WIZARD). This configures the following forms automatically:
    1. Lack of Signal Enable
    2. Multiple Input Enable
    3. Clearance Enable
    4. Current Sense Output Enable
    5. Field Check Enable
    6. Yellow Disable
4. Run the Parameter Check Wizard to check for consistency errors or warnings (WIZARDS / PARAMETER CHECK)
5. Write the data set buffer to the Datakey.

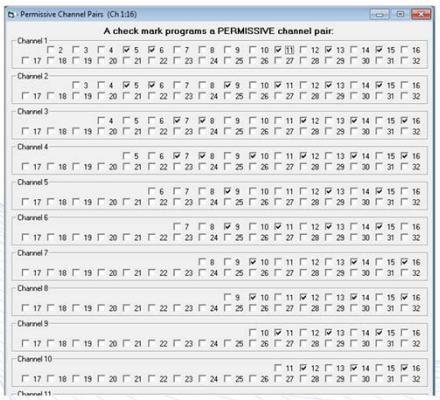


Unit Data specifies the basic CMU parameters for HDSP configuration and other non-channel related parameters.

- **HDSP Enable**
  - For each installed *iPack*®HDSPdevice, Enable a channel if it is driving a signal load
- **Minimum Flash**
  - This parameter should be set to a time longer than the boot time of the CU
- **12VDC Monitor**
  - If the cabinet power supply provides a 12VDC output ANDit should be monitored (fail produces flash), then Enable it. Typically the 12VDC option is used for powering detection and no monitoring is necessary.
- **HDFU #2 Enable**
  - If a second *iPack*®HDFU is provided in the cabinet, then it should be Enabled for Flasher Output Alarm monitoring.
- **ID text parameters**
  - These two parameters are text fields and can contain any relevant information.
- **Ethernet Network Parameters**
  - IP Address
  - Subnet Mask
  - Gateway Address (if necessary)
  - Host Name if DHCP Client is enabled
  - Load From Datakey – If checked then the CMU Ethernet Port will automatically use the parameters in this frame.
  - DHCP Client Enable – If checked then the CMU Ethernet Port will request the network parameters from a DHCP server on the network
  - DHCP Server Enable – If checked then the CMU Ethernet Port will provide the network parameters to a direct connected PC that is set to use DHCP.

Permissive Channel Pairs

- A check mark configures a channel to be Permissive with the associated channel.
- Two separate forms
  - Channels 1:16
  - Channels 17:31
- For example:
  - Ch 2 with 5, 6, 9, 11, 13, 15
  - Ch 4 with 7, 8, 10, 12, 14, 16



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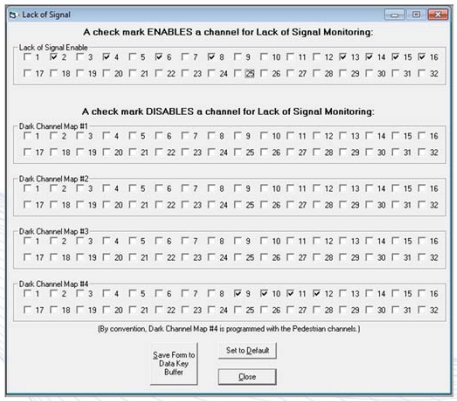
The Permissive Channel Pairs form configures the Conflict compatibility matrix. When a channel pair is checked, then the two channels are Permissive and can run concurrently.

This Conflict Compatibility matrix is sent to the CU and compared to the CU ring structure. If the CU determines that conflicting channels in the CU are set to permissive in the CMU then a CU directed fault state will be produced (CU/ Local Flash, LFSA or NFSA).

Lack of Signal (LOS) Enable

- Lack of Signal is similar to NEMA Red Fail;
  - No active Red, Yellow Or Green
  - It also includes Load Current.
- Dark Maps are selected by the CU and temporary override the Lack of Signal programming during preemption or CU flash.
  - Dark Map #4 sets channels that go dark during CU flash.
  - Typically Peds



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Lack of Signal monitoring is used to detect a dark channel, i.e. No Red, No Yellow, and No Green active on a channel. If the RYG voltages are all below the CMU thresholds (off) OR the Output Load Current is below the threshold (no-load), then a LOS fault will be detected.

Each channel is Enabled for LOS monitoring using the check boxes of the Lack of Signal frame. This frame will be set by the Setup Wizard.

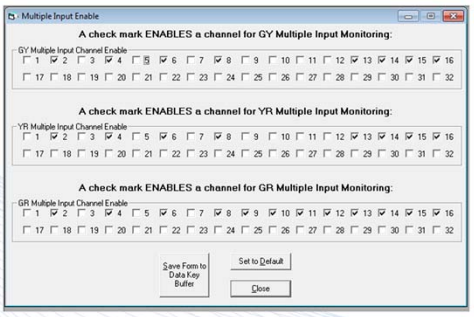
The Dark Channel Maps will define the channels that are selected to be temporarily made dark by the CU during special cases such as preemption, TOD flash, or CU Diagnostic flash. The CU transmits the Dark Map selection (1, 2, 3, or 4) to the CMU during run time operation via SB#1.

By convention the Dark Map #4 frame will be configured with the channels that are dark during CU flash; typically the Pedestrian channels.

Dark Maps #1, #2, and #3 are set manually. Dark Map #1 is typically all unchecked. Dark Map #4 is configured by the *MonitorKey* Setup Wizard.

Multiple Input Enable

- Detect more than one color active on a channel
- Separate Enables for:
  - Green and Yellow
  - Yellow and Red
  - Green (W) and Red (DW)



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A vehicle channel (RYG) should have all three monitoring combinations (G-Y, Y-R, G-R) Enabled. Channels with outputs that are not loaded or driving signal heads are typically Disabled.

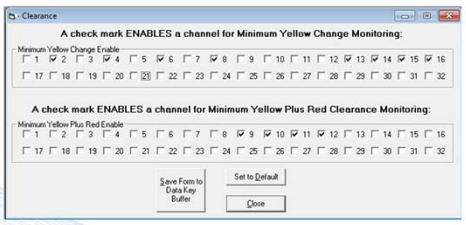
For example, a 2-section right turn overlap with only a Green and Yellow arrow should have G-Y Enabled and G-R and Y-R Disabled.

For example, a Ped channel should have G-Y and Y-R Disabled, since the Yellow output is not driving a signal head.

This form will be configured by the *MonitorKey* Setup Wizard.

Clearance

- *Minimum Yellow Change* monitors the clearance interval for a vehicle channel with a Yellow signal
- *Minimum Yellow Plus Red* monitors the clearance interval for a pedestrian channel with no Yellow signal
  - Disable for FYA OLP channels



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The Minimum Yellow Change frame will enable a channel for Yellow Clearance monitoring. A channel should be Enabled if it produces a Yellow signal prior to Red such as a vehicle RYG channel. A Ped channel or two section GY channels should be Disabled.

The Minimum Yellow Plus Red frame will enable a channel for Clearance monitoring by checking the minimum time between the channel Green signal terminating and the next Conflicting Green channel going active. This should be Enabled for Pedestrian channels or other channels without a true Yellow signal, or without a true Red signal.

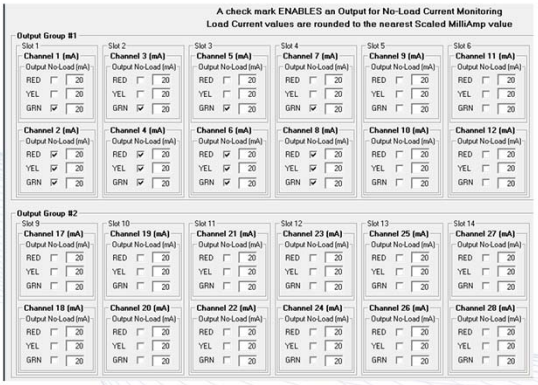
The Minimum Yellow Plus Red function is typically left Enabled unless there is a need to disable it. Thus can be left Enabled for Vehicle or other RYG type channels.

Note that the Minimum Yellow Plus Red function MUST be Disabled for the Flashing Yellow Overlap channel (Ra, sYa, fYa). This prevents a Clearance fault from occurring when the CU cycles from a permissive (fYa) channel directly to the associated protected channel (Ga) without a solid Yellow indication, i.e. lagging left turn.

This form will be configured by the *MonitorKey* Setup Wizard.

Load Current Sense

- No Load Current results in a Lack of Signal fault (LOS)
- Enable any color output that has a signal load connected
- The Threshold is set to the minimum current allowed before it goes dark, 20 mA default (<2.4 watts)



Maintenance monitoring of load current to detect a partial outage is not recommended without full characterization of the signal heads over voltage, time, temperature, ambient light, and brand.

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Each *iPack*® HDSP output can be monitored for a minimum level of output load current. This ensures that a no-load condition (dark approach) due to a broken field wire or single signal lamp failure can be detected at the time of the failure.

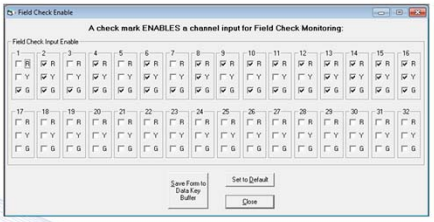
Each RYG output is Enabled individually. An output should be Enabled if a signal load is attached.

The minimum current threshold is set in milliamps. If the measured output load current for the output falls below this threshold value than a Lack of Signal fault is produced. Typically this value is set for a minimum level that is below the load current value for a single lamp. The default value is 20 mA, which corresponds to approximately 2.4 watts at 120 Vrms.

The RYG Output Enable programming will be configured by the *MonitorKey* Setup Wizard. The current threshold is set manually.

Field Check Enable

- Field Check detects that the Load Switch output (field signal) does not match the CU command
- Field Check is the basis for the Diagnostic Wizard
- Enable any color output that has a signal load connected



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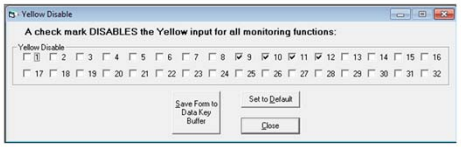
Field Check monitoring is the basis for the patented CMUip-2212 Diagnostic Wizard *SmartMonitor®* technology.

Each RYG output is Enabled individually. An output should be Enabled if a signal load is attached.

This form programming will be configured by the *MonitorKey* Setup Wizard.

Yellow Disable

- When a Yellow load switch output does not have a load connected or is to be unmonitored (e.g. BOS), it can be disabled
- When checked, a Yellow input will be sensed at 0 Vrms



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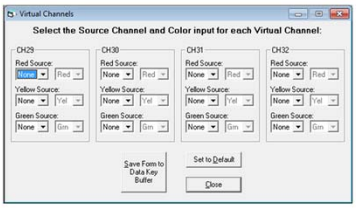
The Yellow Disable function can be used to disable monitoring of an unused Yellow output. It generally avoids needing a dummy resistor load might be applicable to driving an unmonitored Blank Out Sign (BOS) or other reassignment of the Yellow output.

Checking a box will Disable the Yellow input and the CMU will report the input as Off (0 Vrms).

The Yellow Disable programming will generally be configured by the *MonitorKey* Setup Wizard, but additional settings may be required for special applications (BOS, beacons, etc.). Note that disabling the Yellow output of a Ped channel prevents the CMU from detecting a Conflict condition during the Ped Clearance interval (flashing DW).

Virtual Channels

- Virtual channels are used to remap unused load switch outputs to channels 29:32
- Unused outputs may be R&Y from FYA G-arrow channels, Red arrows from PPLT or RT, or Ped Yellows
- Typically used when 16 channel physical capacity is exceeded by one or two channels.



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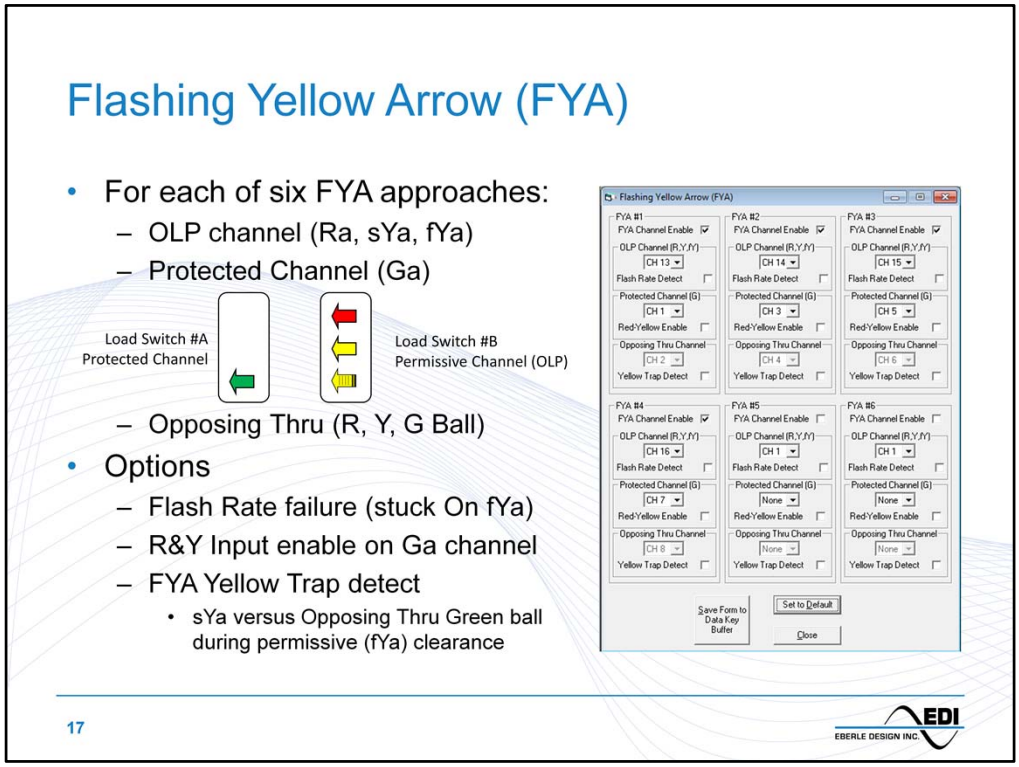
Virtual Channels can be used to remap unused outputs from a physical *iPack®* HDSP channel into a monitored channel 29-32. Unused outputs may result from two section GY turns or OLPs Reds, or Ped Yellows, or FYA protected channels Red and Yellows, etc.

To use Virtual Channels, the CU must provide IO mapping capabilities. If Virtual Channels are used, then this form should be completed before running the MonitorKey Setup Wizard.

Note that if physical *iPack®* HDSP units are installed for channels 29 through 32 (slots 15, 16), then Virtual Channels cannot be used.



The CMUip-2212 supports up to six FYA approaches. Each FYA approach is configured separately and consists of four outputs (Ra, sYa, fYa, and Ga) from two separate *iPack®* HDSP channels.

FYA Channel Enable
This checkbox Enables a channel pair for FYA monitoring,

OLP Channel
The OLP channel is the *iPack®* HDSP channel that drives the R arrow, solid Y arrow, and flashing Y arrow.

Protected Channel
The Protected channel is the *iPack®* HDSP channel that drives the G arrow. If the signal is a Permissive Only FYA (no Ga), then select *None*.

Options:

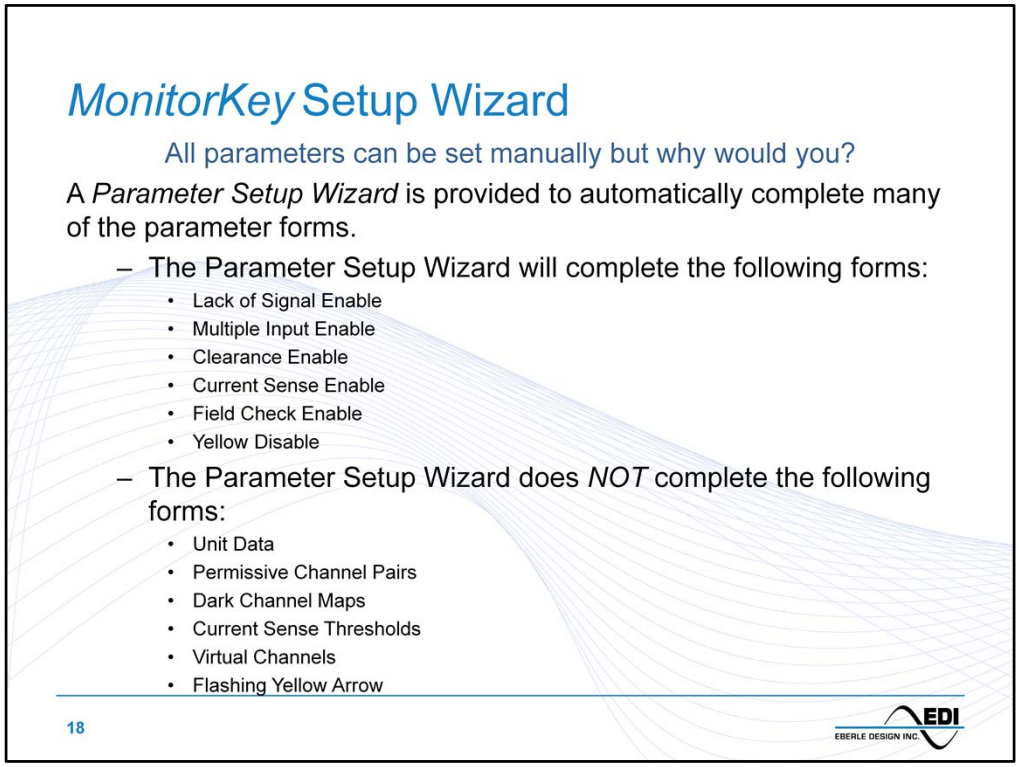
Flash Rate Detect
If this Option is Enabled then a Flash Rate fault will be set if the fYa output is stuck in the On state.

R&Y Input Enable
Typically the Red and Yellow outputs on the Protected channel are not used. If they are instead driving signals then they must be Enabled.

Yellow Trap Detect
A Yellow Trap is detected if the FYA OLP channel is driving the solid Yellow arrow while the Opposing Thru channel is driving a Green ball. If this Option is enabled then the Opposing Thru channel must be selected. This function should be Disabled for a right turn FYA signal.

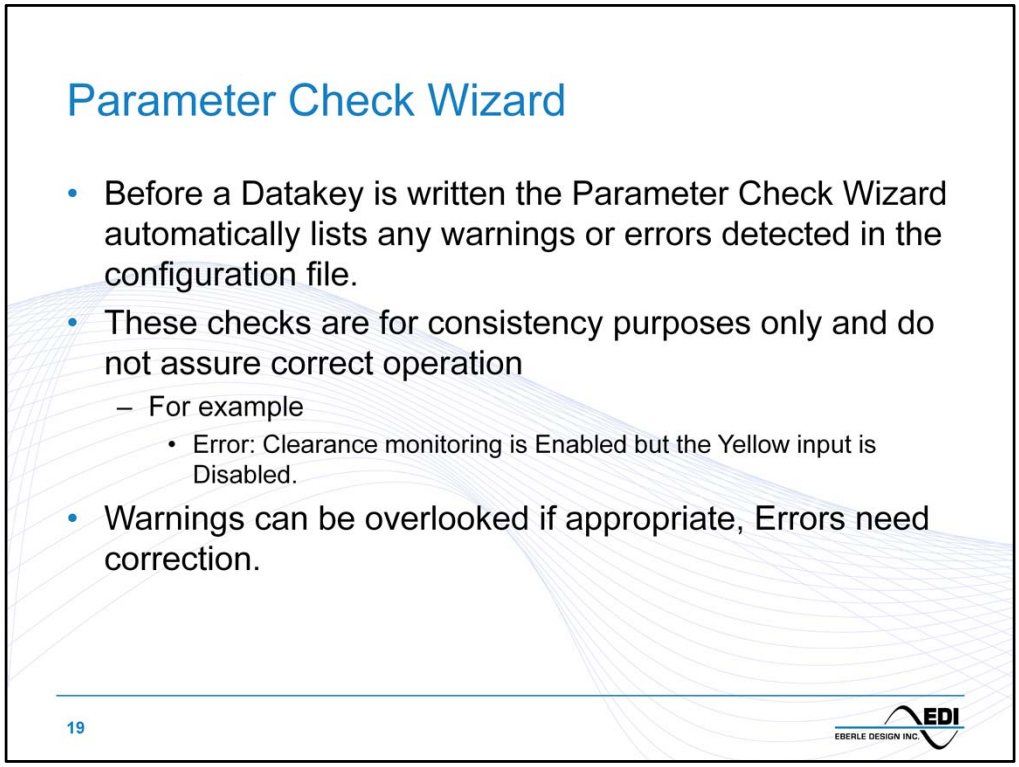
Opposing Thru Channel
If Yellow Trap monitoring is Enabled then this channel is the Opposing Through channel (i.e Green Ball) to the FYA OLP channel (i.e. conflicting with the protected Ga).

If Flashing Yellow Arrow is used, then this form should be completed before running the MonitorKey Setup Wizard.



The *MonitorKey* Setup Wizard will assist in completing many of the channel based configuration forms. It should provide the exact settings generally needed for full operation but there may be a need to adjust the resulting settings after the Wizard is run depending on special requirements or perhaps the use of non-vehicle channels.

The *MonitorKey* Setup Wizard can be executed with the menu item WIZARDS / PARAMETER SETUP.

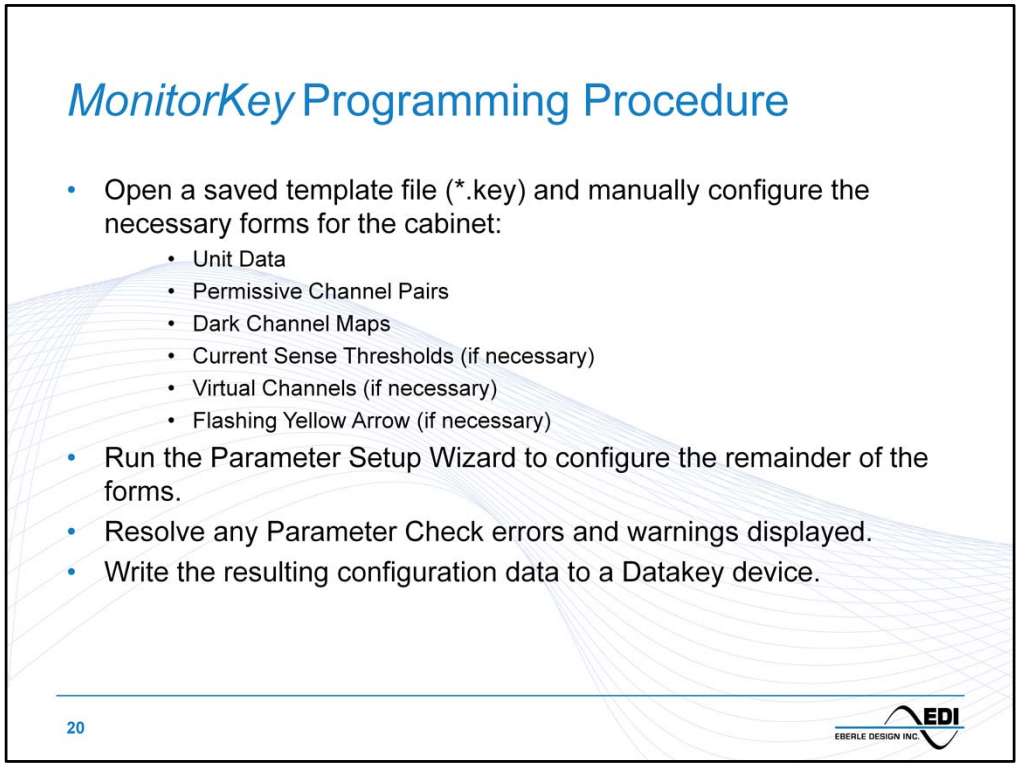


The *MonitorKey* Parameter Check Wizard is executed automatically when the Write Datakey function is selected . If there are no resulting warnings or errors in the data set, then no report is generated. If a warning or error is detected by the MonitorKey Parameter Check Wizard then a report will be displayed with the details.

The results of the *MonitorKey* Parameter Check Wizard are intended to help identify data set issues where inconsistent programming parameters have been selected. For example, a channel is Enabled for Yellow Clearance monitoring but the Yellow Disable input is also selected would produce an Error message.

Any Warnings should be examined closely for correctness, but may in fact be the intended configuration. Any identified Errors must be corrected or improper CMU monitoring may result. In either case of identified warnings or errors, the data set may be written to the Datakey if it is intended.

The *MonitorKey* Parameter Check Wizard can also be executed with the menu item WIZARDS / PARAMETER CHECK or clicking the Parameter Check Wizard Toolbar icon .



This is the general procedure to create and program a data set to the Datakey device.

MonitorKey® Software Overview

Setting the Standard for Quality and Reliability

Eberle Design Inc.

www.EDItraffic.com