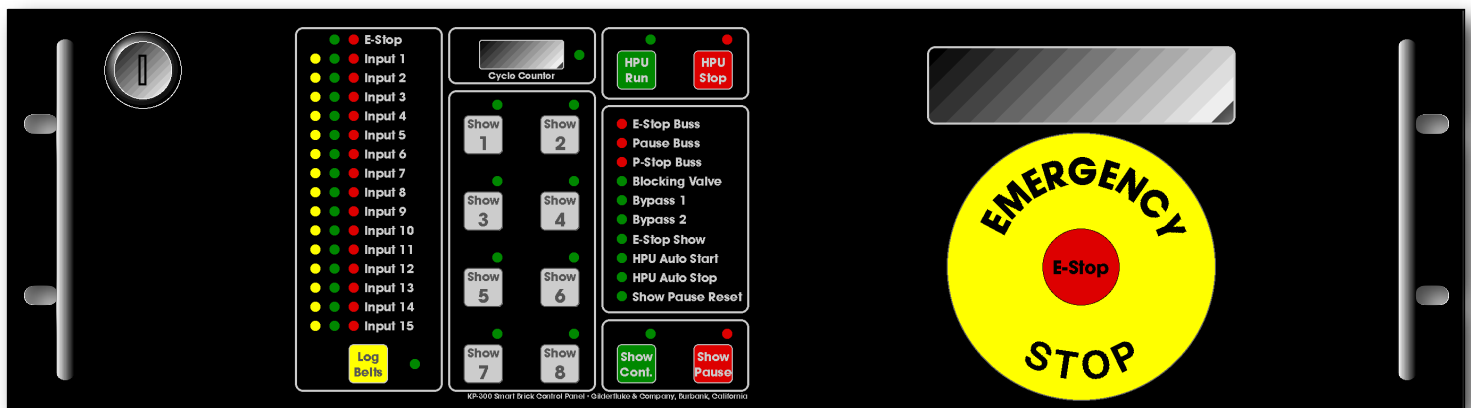


## Kp-300 Operator Control Panel



The Kp-300 has all the controls that are needed to run any motion base or other Smart Brick system. It mounts in 5-1/4" of standard 19" rack space. Operator controls include buttons for starting and stopping the Hydraulic Power Unit (HPU), pausing and then continuing a paused show, for 'logging' occupied seats, and for selecting and playing up to eight different shows.

Because many of the functions of the Kp-300 are safety related, the Kp-300 has no CPU of any kind. With no microcontroller, there is no possibility of a software crash.

**Safety Disclaimer:** Any electronic or mechanical system has a potential to fail. Certain applications using Gilderfluke & Company equipment may involve potential risks of death, personal injury, or severe property, or environmental damage (“Critical Application”). Gilderfluke & Company equipment is not designed, intended, authorized, or warranted to be suitable in life support applications, devices, or systems, or other critical applications. Inclusion of Gilderfluke & Company products in such applications is understood to be fully at the risk of the customer. In order to minimize risks associated with the customer's applications, adequate design and operating safeguards should be provided by the customer to minimize inherent or procedural hazards.

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## A note about this manual:

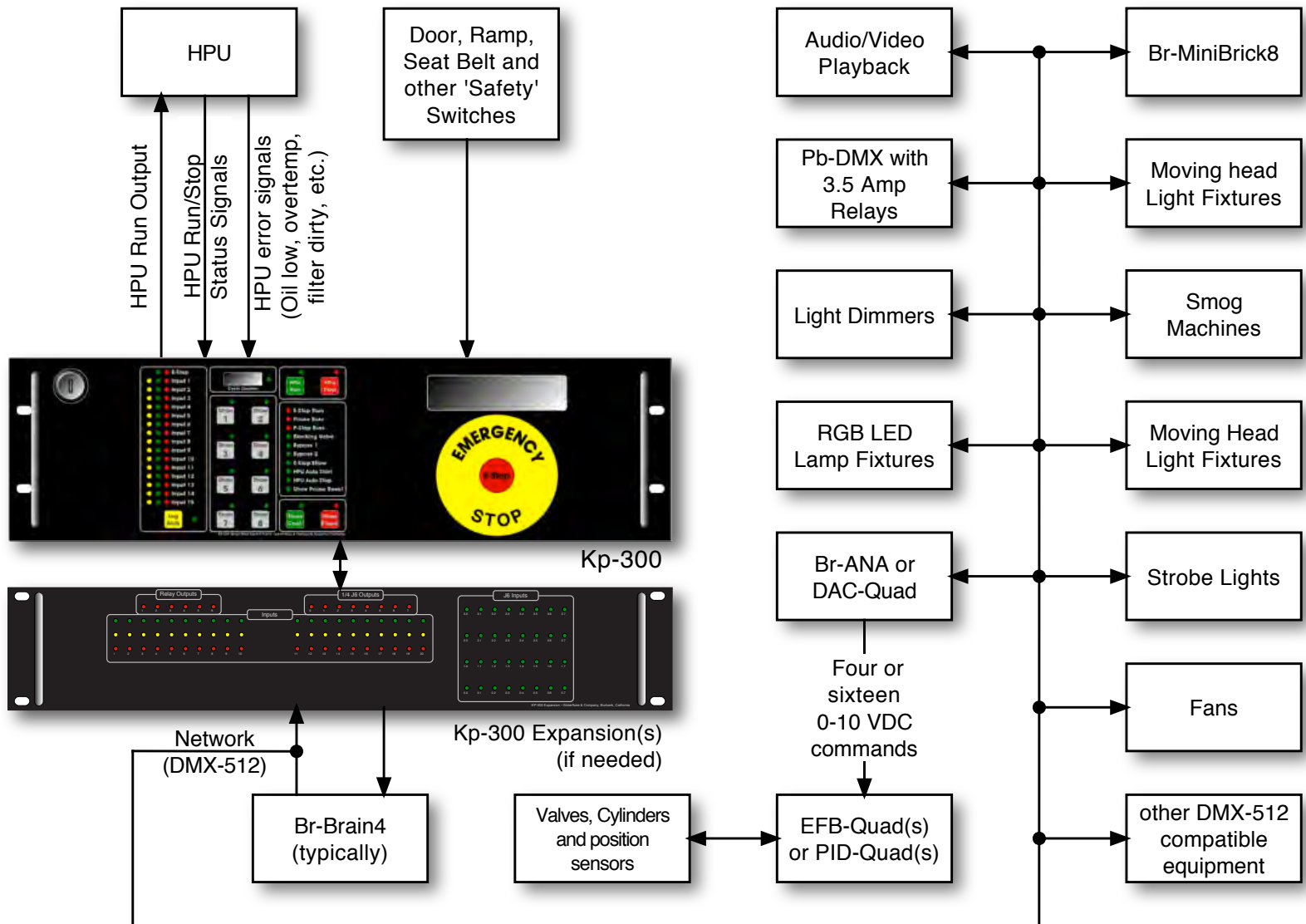
This manual covers the specifics of the **Kp-300**. To program the **Kp-300** you will also want to refer to the **PC•MACs** manual sections that cover the **PC•MACs** software.

The **Kp-300** is typically programmed in 'Software-only' or 'Hardwareless RealTime' mode. If you are using the **USB-DMX-512** for programming your **Kp-300** through the DMX-512 inputs, please refer to the **PC•MACs** 'Unlimited' mode.

The full **PC•MACs** manual can be downloaded from our web site at:

<http://www.gilderfluke.com>

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**Kp-300 Typical Block Diagram for a Hydraulic Motion Base**



## Kp-300 Overview

The Kp-300 features fifteen safety inputs, plus an onboard [E-Stop Button and Keyswitch](#) that can be used to lock the system. All the safety inputs are 'fail safe' (they want to see a closure on them and will be triggered by any wire break). With the one exception of the [E-Stop Button and Keyswitch](#) on the Kp-300, each safety input can be individually set to force the system to:

- Enter an E-Stop condition

- Pause the show

- Turn the HPU off (if there is one)

The [E-Stop Button and Keyswitch](#) on the Kp-300 always force an E-Stop condition. More safety inputs can be added if needed using the Kp-300 Expansion.

Safety inputs that trigger an E-Stop condition normally include only critical sensors. An example of these would be a low hydraulic fluid level sensor. If the motion base is running low on oil, this would trigger an immediate E-Stop, and as long as the oil level remained low, the Kp-300 would not let you start the HPU. All E-Stops turn the HPU off. The show always has to be started over from the beginning after an E-Stop.

A pause input is used for less critical sensors. An example of this is where a seat belt was opened by a rider. The show would instantly be paused and could only be continued by the operator when the condition that caused the pause had been cleared. Alternatively, if after the pause was triggered the operator deemed it necessary to evacuate the attraction, he could call up a show that parks the motion base or just E-Stop it to bring it home.

Door sensors are actually a point where a pause is generally safer to use than a full E-Stop. If a door is opened, instead of returning to home position the motion base will just freeze. This is less likely to take a leg off someone who is trying to step through the door.

Two [bypass busses](#) are available from the motion profile program. These are used to temporarily disable inputs that might otherwise cause an error condition to be flagged. An example of their use is on the door sensors. During the motion base 'flight', a door sensor should trigger an error condition (either a pause or E-Stop), but during the Load/Unload times it should not. For this reason this input would be bypassed during Load/Unload times by one of the two [bypass busses](#).

Seat belt logging allows any input which has been wired to a seat belt to be ignored once it has been logged as an unoccupied seat. The seat belt logging can be done from

the Kp-300, remotely via a switch closure, or automatically as part of the motion profile program.

Each safety input as well as the built in [E-Stop Button and Keyswitch](#) have indicator LEDs that show their current status.

- a) A green light means that the input is 'OK'.
- b) A yellow light means that the input has been logged as 'temporarily unused'. Typically this is used in an installation that has switches to monitor the seat belts. Before starting the ride, any inputs from unoccupied seats would be 'logged' so that they won't cause an error condition.
- c) If an input opens and triggers an error condition, then a red LED will flash next to that input to flag it as the one that caused the failure. This allows you to catch short lived error conditions like a HPU level sensor or pressure switch kicking an E-stop for just an instant.

A solid state counter records the number of show cycles that are run. Shows that are run with the HPU off or while the system is E-Stopped are not counted. The show cycle count is retained even during power outages.

With the addition of a three slot card cage (which mounts on the back of the Kp-300), a Smart Brick Brain, Analog or other Smart Brick (depending on the type of motion base you are running) and a Z-Brick, the Kp-300 becomes a complete motion base control system. When ordered in this way, the small LCD that normally is mounted on the front of a Br-Brain4 is replaced by a large format LCD display on the front of the Kp-300.

Since the entire system is networked, you can put components wherever you like. Dimmers and the controllers for your '4D' effects can be right in the cabin. The video playback can be mounted near to the projector or video screen. Just a single shielded twisted pair of wire connects the DMX-512 to control everything. This can be used to minimize the number of bulky multi conductor cables that need to be run, especially those that need to be run in a location that will require continuous flexing. All of this makes the initial connections, as well as adding new features in the future as simple as tapping into the existing cable.

Customized front panel artwork is available on the Kp-300. These can be custom branded, or labeled for specific show names and error inputs. Please contact the Gilderfluke & Company factory for details on generating custom Kp-300 labels.

## Kp-300 Panel Indicators

There are sixty-one LED indicators and one or two LCD displays on the front of the Kp-300. They are used as follows:

### A) Error Input Logged LEDs

*(One yellow LED for each Error Input)*

*(Fifteen LEDs total)*

These are lit to show that an input has been logged as inactive for the current show. Once an input which is open (green LED is not on) has been logged, it will be ignored until it is logged as active again. This feature is typically used to log seat belt inputs. A seat which is unoccupied will be logged so that it can't cause an E-Stop or Pause if it changes state during the show.

Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System is active. When this input is active, the safety inputs can be logged by either pressing the [Log Belts button](#) or activating the [Remote Log Belts Input](#) by pressing [Remote Log Belts Button\(s\)](#) attached to it. If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.

Input logging actually takes place at the instant that the [Log Belts Button](#), [Log Belts Remote Input](#), or [Show Pause Reset Input](#) are released. The LED next to the [Log Belts Button](#) will light whenever the seat belts are being logged.

### B) Error Input Status LEDs

*(One green LED for each Error Input, plus one for the [E-Stop Button/Keyswitch](#))*

*(Sixteen LEDs total)*

These are lit to show that an input is in its 'safe' condition. If any one of these inputs is off and that input hasn't been logged as an unoccupied seat (yellow LED IS on), then it is not safe to start the show.

All the inputs are configured to 'fail safe', which is to say that an error is triggered by an open circuit on an input. This is true even for the Kp-300's [E-Stop Button and Keyswitch](#). These are wired in series and trigger an E-Stop if this connection is opened at any point.

### **C) Error Input Events LEDs**

*(One red LED for each Error Input, plus one for the [E-Stop Button/Keyswitch](#))  
(Sixteen LEDs total)*

These LEDs flash on the input(s) that triggered an error condition. They allow you to find which input caused the error, even if it only existed for an instant.

An example of this feature's use is in events like a HPU filter dirty sensor which has been configured to trigger an E-Stop event. The dirty filter sensor on the HPU is typically a differential pressure switch which measures the pressure across the filter. If this pressure gets too high, then the switch opens to indicate a clogged filter and triggers the E-Stop condition. The thing that makes this hard to catch is that the E-Stop turns off the HPU, so the differential pressure immediately drops back into zero (the 'OK' region, as far as the switch is concerned), turning back on the green Error Input Status LED for the input. To further complicate things, because the HPU potentially turned off right in the middle of a show, the 'low pressure' error input (if there is one) will turn off its green Error Input Status LED because the pressure just went to zero. Under these circumstances the only Error Input Event LED that will be flashing will be the original 'Dirty Filter' one that initiated the E-Stop in the first place. All the other Error Input Event LEDs will be off.

Once these LEDs are turned on by an E-Stop event, they can only be cleared when the operator starts the next show. They will keep flashing until the next show is started. If they were triggered by a Show Pause event, they will stop flashing but remain lit after the error condition is cleared and the show is 'resumed'. They will be cleared when there is another E-Stop/Show Pause event or the next show is started by the operator.

### **D) Log Belts LED**

*(One yellow LED)*

This LED turns on when the error inputs are being logged as temporarily unused. Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System is active. When this input is active,

the safety inputs can be logged by either pressing the [Log Belts Button](#) or activating the [Remote Log Belts Input](#) by pressing [Remote Log Belts Button\(s\)](#) attached to it. If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.

Input logging actually takes place at the instant that the [Log Belts Button](#), [Log Belts Remote Input](#), or [Show Pause Reset Input](#) are released.

## **E) Show Start Button LEDs**

*(One green LED for each Show Start Button)  
(Eight LEDs total)*

These LEDs are controlled directly by the motion control profile stored in the Smart Brick System. This allows the LEDs to be programmed on, off or flashing as desired at any point in time. They are programmed to indicate which shows are available to the operator, or to indicate which show is already running. We typically program them in a chase pattern, lighting only the valid show selections. Once a show has started, we typically program all but the selected [Show Start Button LEDs](#) off, and flash the selected show LED a few times before turning it on through the rest of the show. If any other show selection is valid while another show is running, we then flash it discretely throughout the show that is running.

Whenever a [Show Start Button LED](#) is programmed to indicate that a [Show Start Button](#) is valid, it is also necessary to actually enable the corresponding [Show Start Button Enable Input](#) output from the Smart Brick System to make the [Show Start Buttons](#) active. If this is not done, then the [Show Start Buttons](#) will remain inactive.

## **F) Show Cycle Counter LED**

*(One green LED)*

This LED lights to show that the show cycle counter has been commanded to advance by the motion control profile stored in the Smart Brick System. The count on the LCD counter will advance by one if the Kp-300 is not currently in any type of E-Stop condition and the HPU is running, as indicated by 24 vdc being received on the [HPU Running Input](#).

The Show Cycle Count Advance Input pulse is typically programmed to take place towards the end of the motion base program. This lets a show which is aborted for any reason not be counted.

The LCD module that displays the current show cycle count permanently stores the count each time it is advanced. The count will be retained even if power is removed from the Kp-300. Please contact the Gilderfluke & Co. factory if you need a resettable cycle counter.

## **G) E-Stop Buss LED**

*(One red LED)*

This LED lights to show that the Kp-300 currently has an unresolved E-Stop condition. The beginning of any E-Stop event stops the HPU (if there is one), disables the [Blocking Valve output](#) and triggers the Smart Brick System to play the E-Stop Show through the [Blue 'E-Stop' Input](#) to the Smart Brick Brain. Calling up the E-Stop show sets the '[E-Stop Show Running](#)' output from the Smart Brick System (this must be programmed into the motion profile of the E-Stop show). This resets the first of the two E-Stop latches on the Kp-300. At this point you can start the HPU and any shows that have been enabled in the motion control profile of the E-Stop Show.

If this LED is ON, you should not run the show unless you just want to see the video and sound, without any motion. If a show is started while there is still an unresolved E-Stop condition, the Kp-300 can be configured to:

- a) Lock out the 'Blocking Valve' output until another show is started with the E-Stop Buss LED off. This is the safer of the two options, because the motion base will not start moving until a show is started cleanly.
- b) Lock out the 'Blocking Valve' output until the E-Stop condition is cleared. This can allow the motion base to spring into movement if the E-Stop condition is resolved half way through the show.

If you want to disallow shows to be run at all if there is an E-Stop condition present, you can configure one of the two [bypass busses](#) to momentarily (for just one frame) bypass all the possible E-Stop error inputs at the very beginning of all shows<sup>1</sup>. At the end of the [bypass buss](#) pulse, any error conditions that remain will trigger the E-Stop to keep even the video and audio

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<sup>1</sup> This technique is flexible enough that you can even leave it out of any maintenance shows that you want to be able to run without motion



from running. This technique should be used in applications that don't use the [Blocking Valve Output](#). Typical of these are most electric motion base installations.

## **H) Show Pause Buss LED**

*(One red LED)*

This LED lights to show that the Kp-300 currently has an unresolved Show Pause condition. If this LED is ON, you should not run the show. When the [Show Pause Reset Input](#) from the Smart Brick System goes away<sup>2</sup>, the Kp-300 will be paused. The condition that caused the Show Pause will then have to be cleared before the current show can be resumed. Alternatively, the operator can bail out by pressing the E-Stop or running another show that simply gets the operator back to the Load/Unload shows without triggering an E-Stop.

## **I) HPU Stop Buss LED**

*(One red LED)*

This LED lights to show that the Kp-300 currently has an unresolved HPU Stop condition. If this LED is ON, you should not run the show. The Kp-300 will keep the operators from starting the HPU until this condition is resolved. The error conditions that are typically used to trigger a [HPU Stop Buss](#) event are those which might cause damage to the HPU, Motion base or their riders. Typical of these are 'HPU Oil Level Low' or 'HPU Over Temperature' sensors.

It is not unusual for operators to try to override this type of safety feature. For this reason, many HPU applications use a number of techniques to lock out the show if the HPU is turned on locally:

- a) The primary technique is to run the HPU's 24 vdc '[HPU Stopped](#)' and '[HPU Running](#)' outputs through the 'Auto' position of the HPU 'Hand/Off/Manual' switch on the way to the Kp-300. By doing this, both the HPU LEDs on the Kp-300 will be off unless the HPU is in the 'Auto' mode. This has the added advantage of giving the operators a remote indication of the position of the HPU's 'Hand/Off/Manual' switch.
- b) The 'Auto' position of the HPU's 'Hand/Off/Manual' switches on

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<sup>2</sup> Usually at the start any of the Main shows. It is normally programmed as active during the E-Stop and Load/Unload shows

the HPUs wired into one of the error inputs of the Kp-300. This input is configured to keep the motion base from running if the HPU 'Hand/Off/Manual' switch is in anything but the 'Auto' position.

- c) The [Blocking Valve Output](#) from the Kp-300 can be run through the 'Auto' position of the HPU 'Hand/Off/Manual' switch. Unless the HPU is started by the Kp-300, this too will prevent the motion base from moving. This will only work on hydraulic motion bases that use a blocking valve.

## **J) Blocking Valve LED**

*(One green LED)*

This LED lights to show that the motion control profile stored in the Smart Brick System has enabled the Blocking Valve to allow the motion base to move. If the Kp-300 is still in an E-Stop condition or the HPU is not running (as indicated by 24 vdc being received on the [HPU Running Input](#)), this LED will simply flash and the [Blocking Valve output](#) will not be activated. If a show is started while there is still an unresolved E-Stop condition, the Kp-300 can be configured to:

- a) Lock out the 'Blocking Valve' output until another show is started with the E-Stop Buss LED off. This is the safer of the two options, because the motion base will not start moving until a show is started cleanly.
- b) Lock out the 'Blocking Valve' output until the E-Stop condition is cleared. This can allow the motion base to spring into movement if the E-Stop condition is resolved half way through the show.

## **K) Bypass Buss #1 LED**

## **L) Bypass Buss #2 LED**

*(Two green LEDs)*

These LEDs lights to show that the motion control profile has been programmed to bypass some or all the Safety inputs which have been configured to create an E-Stop or Show Pause. Typical examples of the use of the [bypass buss](#) are:

- a) **HPU Startup/Shutdown:** If the HPU is started and stopped as part of the motion profile, there will usually be a time just after it



is started and a time after it is stopped where any HPU pressure sensors inputs will need to be bypassed. Do this by programming the [Bypass Buss](#) you are using and [Remote HPU Start Input](#) to be active at the beginning of the show. The [Bypass Buss](#) needs to be active for the time it takes for the HPU to build up pressure. If the pressure doesn't come up during the time allotted, the Kp-300 will automatically trigger an error condition (either E-Stop or Show Pause, as configured).

If the HPU is to be turned off at the end of the show, then the [Bypass Buss](#) which is being used would be programmed active along with a pulse on the [Remote HPU Stop Input](#). This allows the HPU to be stopped without triggering an error condition. If configured to trigger an E-Stop, the [Bypass Buss](#) will also need to be programmed active during the E-Stop and Load/Unload shows so that the HPU's low pressure won't trigger an error during these shows when the HPU is off.

- b) **Door Sensors:** If the door or floor mat sensors inputs are set to trigger an E-Stop, they will need to be bypassed during the E-Stop and Load Unload shows. This is because although you want these inputs to trigger an error while the motion base is in flight, you don't want this to trigger an E-Stop when the doors are opened for the passengers to be loaded and unloaded.
- c) **Electric Motion Bases and other Installations that don't use the Kp-300 [Blocking Valve Output](#):** If you don't want to allow shows to be run if there is an E-Stop condition present, you can configure one of the two [bypass busses](#) to momentarily (for just one frame) bypass all the possible error inputs at the very start of all shows<sup>3</sup>. At the end of the [Bypass Buss](#) pulse, any error conditions that remain will trigger the E-Stop. This technique should be used in applications that don't use the [Blocking Valve Output](#). Typical of these are most electric motion base installations.

If you are using the Seat Belt Logging features of the Kp-300, be sure you don't configure the Kp-300 to bypass any inputs that are to be logged during the time during which they need to be logged. Bypassing an input will con-

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<sup>3</sup> This technique is flexible enough that you can even leave it out of any maintenance shows that you want to be able to run without motion.

vince the Kp-300 that the inputs are in the 'safe' position, and so they will not be logged as 'unoccupied'.

The Show Pause functions are usually disabled during the E-Stop and Load/Unload shows by the [Show Pause Reset Input](#) from the Smart Brick System. Inputs that trigger a Show Pause are never needed during the E-Stop and Load/Unload shows anyway, so there is no need to bypass them separately during these shows.

## **M) E-Stop Show Running LED**

*One green LED*

This LED lights to show that the motion control profile is running the E-Stop Show. The [E-Stop Show Running](#) output is normally only programmed active during the E-Stop Show, and is used reset one of the Kp-300's on-board latches to allow the HPU to be started and the E-Stop conditions to be cleared.

## **N) Remote HPU Start LED**

## **O) Remote HPU Stop LED**

*(Two green LEDs)*

These LEDs light to show that the motion control profile on the Smart Brick System has had the commands to start or stop the HPU embedded in it. This is an optional feature. If you don't want the HPU to be started and stopped automatically, just don't use them.

These outputs parallel the [HPU Start Button](#) and [HPU Stop Button](#) that are on the front of the Kp-300. If the HPU is being forced off by a [HPU Stop Buss](#) error, the [Remote HPU Start Input](#) can NOT override the error.

Any of the 'stop' inputs take precedence over any of the 'start' inputs. You can use an active [Remote HPU Stop Input](#) in the motion profile stored on the Smart Brick System to keep the operator or [Remote HPU Start Input](#) from starting the HPU.

## **P) Show Pause Reset LED**

*(One green LED)*

This LED lights to show that the motion control profile on the Smart Brick System has the [Show Pause Reset Input](#) command programmed to reset or

disable the Kp-300 Show Pause functions. This is normally programmed active only during the E-Stop and Load/Unload shows.

Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System is active. When this input is active, the safety inputs can be logged by either pressing the [Log Belts button](#) or activating the [Remote Log Belts Input](#) by pressing [Remote Log Belts Button\(s\)](#) attached to it. If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.

Input logging actually takes place at the instant that the [Log Belts Button](#), [Remote Log Belts Input](#), or [Show Pause Reset Input](#) are released. The LED next to the [Log Belts Button](#) will light whenever the seat belts are being logged.

## **Q) HPU Running LED**

*(One green LED)*

This LED lights to show that the Hydraulic Power Unit (HPU) is running. This LED is turned on only when a 24 vdc signal is applied to the [HPU Running Input](#). This signal normally comes from the HPU. If there is no HPU in the system, this input can be permanently attached to a 24 vdc or the [HPU Run Output](#).

Unless this signal is received by the Kp-300, the [Blocking Valve Output](#) will never turn on and the Show Cycle Counter will not advance.

To help keep shows from being run when the HPU has been started by its local Hand/Off/Auto switch, the [HPU Stopped Input](#) and [HPU Running Input](#) signals are often routed through the 'Auto' position on the switch. If the switch isn't in the 'Auto' position, the [HPU Stopped LED](#) and [HPU Running LED](#) won't light and the Blocking valve won't be enabled.

## **R) HPU Stopped LED**

*(One red LED)*

This LED lights to show that the Hydraulic Power Unit (HPU) is not running. This LED is turned on only when a 24 vdc signal is applied to the [HPU](#)

[Stopped Input](#). Unlike the [HPU Running Input](#), this input is not used for any other purpose than lighting this LED.

To help keep shows from being run when the HPU has been started by its local Hand/Off/Auto switch, the [HPU Stopped Input](#) and [HPU Running Input](#) signals are often routed through the 'Auto' position on the switch. If the switch isn't in the 'Auto' position, the [HPU Stopped LED](#) and [HPU Running LED](#) won't light and the Blocking valve won't be enabled.

## **S) Show Continue LED**

*(One green LED)*

This LED lights to show that the Motion profile on the Smart Brick System has been programmed with the [Show Pause Reset Input](#) inactive and that the current show has not been paused.

When a show is paused, the Kp-300 sends a signal to the Smart Brick Brain through its [Green 'Pause' Output](#). The Smart Brick Brain input must be configured to pause the currently running show on a closure on this input<sup>4</sup>. When a show is 'continued', the signal is dropped on the [Green 'Pause' Output](#) to the Smart Brick Brain. This input must be configured to continue the currently running show on an opening on this input.

Once a show has been paused, the only two ways to 'continue' a show are to:

- a) Send an active signal from the Smart Brick System to the Kp-300's [Show Pause Reset Input](#).
- b) Once the condition that caused the Show Pause has been removed, the operator can press the [Show Continue button](#).

## **T) Show Pause LED**

*(One red LED)*

This LED lights to show that the Motion profile on the Smart Brick System has been programmed with the [Show Pause Reset Input](#) inactive and that the current show has been paused by the operator pressing the [Show Pause Button](#) or an error condition.

When a show is paused, the Kp-300 sends a signal to the Smart Brick Brain through its [Green 'Pause' Output](#). The Smart Brick Brain input must be

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<sup>4</sup> In some applications, you may want to call up a different show using this input, instead of pausing the current show.

configured to pause the currently running show on a closure on this input<sup>5</sup>. When a show is 'continued', the signal is dropped on the [Green 'Pause' Output](#) to the Smart Brick Brain. This input must be configured to continue the currently running show on an opening on this input.

Once a show has been paused, the only two ways to 'continue' a show are to:

- a) Send an active signal from the Smart Brick System to the Kp-300's [Show Pause Reset Input](#).
- b) Once the condition that caused the Show Pause has been removed, the operator can press the [Show Continue button](#).

## **U) DMX-512 Receive LED (v3.0+ Only)**

*(One red LED, Located on back of Kp-300)*

To support the DMX-512 input, the v3.0+ Kp-300 adds an LED that flashes on each update via the DMX-512.

The Kp-300 requires DMX-512 that includes GilderChecksums.

If receiving DMX-512 without valid checksums, the [DMX-512 Receive LED](#) on the back of the Kp-300 will not flash and only the [Show Start Button LEDs](#) will follow the incoming the DMX-512. The signals like the [Show Start Button Enable Inputs](#), blocking valve enable, and automatic [HPU start/stop](#) will not work if the GilderChecksums are invalid.

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<sup>5</sup> In some applications, you may want to call up a different show using this input, instead of pausing the current show.

# Kp-300 Operator Controls

The Kp-300 has just a small number of operator controls. Most of these have LEDs that can be lit under program control, or indicate their current status.

## A) E-Stop Button/Keyswitch

These two switches are wired in series. Opening either one will cause an [E-Stop](#) and [HPU Stop event](#) on the Kp-300. The beginning of any E-Stop event stops the HPU (if there is one), disables the [Blocking Valve output](#) and triggers the Smart Brick System to play the E-Stop Show through the [Blue 'E-Stop' Input](#) to the Smart Brick Brain. Calling up the E-Stop show sets the ['E-Stop Show Running'](#) output from the Smart Brick System (this must be programmed into the motion profile of the E-Stop show). This resets the first of the two E-Stop latches on the Kp-300. At this point you can start the HPU and any shows that have been enabled in the motion control profile of the E-Stop Show.

The E-Stop switch has a red mushroom-style cap. Once pushed, the button latches in the E-Stopped position. To release the cap, it is rotated clockwise. The [E-Stop button](#) has a spare set SPDT set of contacts available for your use. Users of Moog electric motion bases can use this switch closure for the hardware E-Stop input they require.

The [Keyswitch](#) is typically used to lock unauthorized users from starting the HPU or running shows with motion. The Keyswitch can be turned to one of two positions. The key can be removed in either of these two positions.

The show can be run without motion while the keyswitch is turned off or the [E-Stop button](#) has been pushed in. If you want to disallow shows to be run at all if there is an E-Stop condition present, you can use the [DipSwitch #3](#), [DipSwitch #4](#) or [DipSwitch #5](#) to disallow running shows if there is an error condition.

## B) Log Belts Button

Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System is active. When this input is active, the safety inputs can be logged by either pressing the [Log Belts button](#) or activating the [Remote Log Belts Input](#) by pressing [Remote Log Belts Button\(s\)](#) attached to it. If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this



input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.

Input logging actually takes place at the instant that the [Log Belts Button](#), [Remote Log Belts Input](#), or [Show Pause Reset Input](#) are released. The LED next to the [Log Belts Button](#) will light whenever the seat belts are being logged.

## **C) Show Start Buttons**

### *(Eight Buttons)*

The Kp-300 has been designed to support up to eight shows which can be directly accessed. If more shows are needed, these [Show Start Buttons](#) can be bypassed with a Kp-100 or Kp-200 to allow access to the Smart Brick System's 255 show capacity.

Which shows are available to the user (which of these eight [Show Start Buttons](#) are enabled), is controlled as a function of the motion profile running on the Smart Brick System. Enabling a [Show Start Buttons](#) just requires setting the appropriate [Show Start Button Enable Inputs](#) in the motion profile. Any or all of the [Show Start Buttons](#) can be enabled/disabled at any time. The [Show Start Button LEDs](#) next to these buttons are also controlled as part of the motion profile. This allows the [Show Start Button LEDs](#) to be programmed on, off or flashing as desired at any point in time.

Typically the [Show Start Buttons](#) are programmed as active during the E-Stop and Load/Unload shows. During the main shows, typically none of them are enabled. If any are enabled, then the user can jump directly out of the currently running show and into the one(s) that have been enabled. This is sometimes used to enable a 'park' show that brings the motion base home without having to do anything as drastic as an E-Stop. Any show that is enabled while another show is running will be enabled even during a show pause. Make sure that if you are using this technique, that the show that is jumped into has the [Show Pause Reset Input](#) set for at least a few frames at the beginning. Otherwise the new show will begin running, but the Show Pause functions of the Kp-300 won't be reset (the [Show Pause LED](#) will remain lit, and the next Show Pause event will be ignored). At the end of the pulse on the [Show Pause Reset Input](#), the Kp-300 will check for an outstanding Show Pause condition. If one still persists, then the new show will be paused.

If shows must be run in a certain order, you can program this into the motion profile stored on the Smart Brick System. An example of this would be a motion base that has separate entrance and exit doors. The main shows all lead into a show that leaves the exit doors opened<sup>6</sup>. The only show that is enabled for the operator is a short show that closes the exit doors (and maybe turns off the cabin lights) so that the system is ready to be parked or loaded with the next group of riders. The operator would start this show once he confirmed that the cabin was clear. At the end of this show another show is enabled that opens the entrance door (and turns on the cabin lights). The operator would call this up when it is time to load the next batch of riders. At the end of this short show, the main shows are enabled for the operators. One of these would be started once all the riders were safely seated (and the belts logged, if needed). All of these short shows can have accompanying audio and/or video if it has been programmed on whatever audio/image source is being used.

The Br-ANA Analog Output Smart Brick can be configured to do an Ease In whenever the Smart Brick System jumps from one show to another. This makes it safe for you to configure the system to jump between shows as described above.

## D) HPU Start Button

This Button is used to set the latch on the Kp-300 that turns on the [HPU Run Output](#). This is an optional feature. If you don't want the HPU to be started and stopped remotely, just don't use this button.

The [HPU Start Button](#) parallels the [Remote HPU Start Input](#) from the Smart Brick System. If the HPU is being forced off by a [HPU Stop Buss](#) error or a [Remote HPU Stop Input](#) from the Smart Brick System, the [HPU Start Button](#) can not override them.

Any of the 'stop' inputs take precedence over any of the 'start' inputs. You can use an active [Remote HPU Stop Input](#) in the motion profile stored on the Smart Brick System to keep the operator or [Remote HPU Start Input](#) from starting the HPU.

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<sup>6</sup> If the motion base has exit doors that must be operated only when the operator deems it safe, all the main shows can leave only the button to jump to a short show that opens the doors for the operators.



## E) HPU Stop Button

This Button is used to reset the latch on the Kp-300 that turns on the [HPU Run Output](#). This is an optional feature. If you don't want the HPU to be started and stopped remotely, just don't use this button.

The [HPU Stop Button](#) parallels the [Remote HPU Stop Input](#) from the Smart Brick System.

## F) Show Pause Button

This button is used to set the latch on the Kp-300 that sends a pause command to the Smart Brick Brain through the [Green 'Pause' Output](#). This latch can also be set by any error condition that has been configured to start a Show Pause event. If the [Show Pause Reset Output](#) from the Smart Brick System is active, then the Show Pause latch can not be set by either this button or an error condition.

When a show is paused, the Kp-300 sends a signal to the Smart Brick Brain through its [Green 'Pause' Output](#). The Smart Brick Brain input must be configured to pause the currently running show on a closure on this input<sup>7</sup>. When a show is 'continued', the signal is dropped on the [Green 'Pause' Output](#) to the Smart Brick Brain. This input must be configured to continue the currently running show on an opening on this input.

Once a show has been paused, the only two ways to 'continue' a show are to:

- a) Send an active signal from the Smart Brick System to the Kp-300's [Show Pause Reset Input](#).
- b) Once the condition that caused the Show Pause has been removed, the operator can press the [Show Continue button](#).

## G) Show Continue Button

This button is used to reset the latch on the Kp-300 that sends a pause command to the Smart Brick Brain through the [Green 'Pause' Output](#). This latch can also be set by any error condition that has been configured to start a Show Pause event.

When a show is paused, the Kp-300 sends a signal to the Smart Brick Brain through its [Green 'Pause' Output](#). The Smart Brick Brain input must be configured

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<sup>7</sup> In some applications, you may want to call up a different show using this input, instead of pausing the current show.

to pause the currently running show on a closure on this input<sup>8</sup>. When a show is 'continued', the signal is dropped on the [Green 'Pause' Output](#) to the Smart Brick Brain. This input must be configured to continue the currently running show on an opening on this input.

Once a show has been paused, the only two ways to 'continue' a show are to:

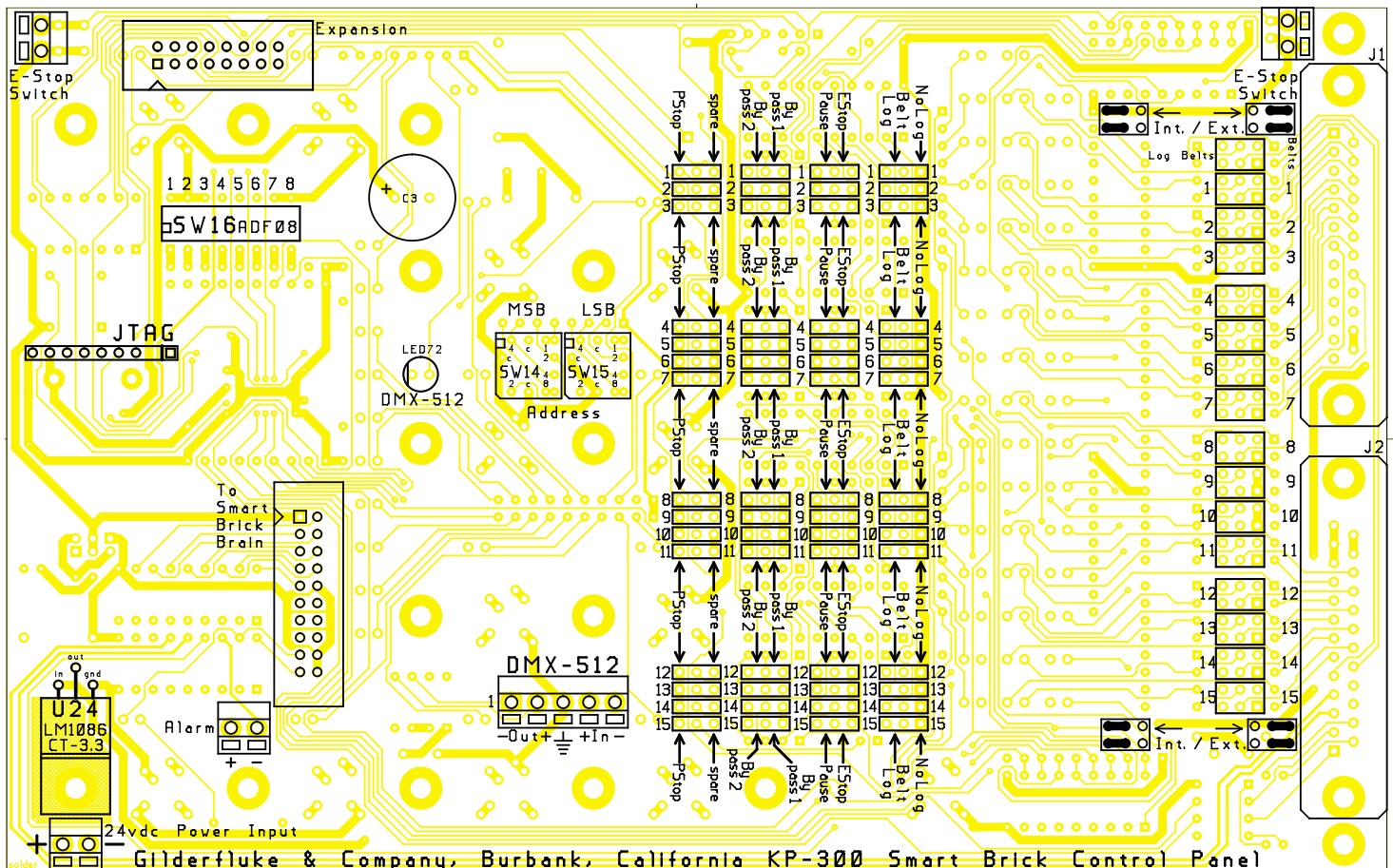
- a) Send an active signal from the Smart Brick System to the Kp-300's [Show Pause Reset Input](#).
- b) Once the condition that caused the Show Pause has been removed, the operator can press the [Show Continue button](#).

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<sup>8</sup> In some applications, you may want to call up a different show using this input, instead of pausing the current show.

# Kp-300 Jumper Configuration

There are about seventy-five jumpers that must be set on the Kp-300 before it can be used. Not to worry though, each of the fifteen safety inputs has only five options that you can choose. There is also one jumper that globally affects the E-Stop latches. The jumpers are located on the back of the printed circuit board that is used in the Kp-300<sup>9</sup>. If larger quantities of Kp-300s are to be ordered, we can provide them with jumpers already in the desired positions or permanently soldered into place so that they can not be easily moved.



## Kp-300 PCB (Rear View)

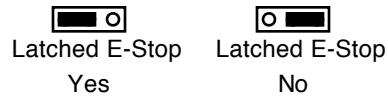
The jumpers for all the error inputs are arranged in a series of horizontal rows. As you can see, the number of the input is shown next to the row which it configures. The function of each jumper position is also silkscreened next to the jumpers. We would rec-

<sup>9</sup> We can build Kp-300s with the jumpers on the front of the printed circuit board to restrict access if so desired. Please contact the factory if you would be interested in such a modification.

ommend that you document the final positions of all jumpers by marking them on the drawing above (or a copy of it) The jumpers are:

## A) Latched E-Stop

This is the only jumper that is not related to the fifteen individual safety inputs.



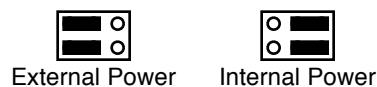
In the 'Yes' position, if a show is started while there is an E-Stop condition still present, the Kp-300 will not allow you to enable the [Blocking Valve Output](#) until the show has finished, even if the E-Stop input is cleared. This allows you to safely run test shows without movement after an E-Stop<sup>10</sup>.

If this jumper is in the 'No' position, if a show is started while there is an E-Stop condition still present, the Kp-300 will allow you to enable the [Blocking Valve Output](#) once the E-Stop input is cleared. This means that the movement may be enabled by the [Blocking Valve Output](#) part way through a show when the E-Stop condition is cleared.

## B) Internal/External Power

*(One set of jumpers for each safety input and one set for the [Remote Log Belt Input](#))*

*Sixteen sets of jumpers in total*



The fifteen Safety Inputs and one [Remote Belt Log Input](#) are optically isolated to 1500 volts. This jumper sets whether the optoisolators use the same power as the Kp-300 or if you must provide them with an external source of 24 vdc power. Use the Internal Power if you are going to be attaching these inputs to a simple switch closures. Use the External setting if you are using a device that provides power.

When possible try to use external power. When doing so, a high voltage spike on an externally powered input line cannot get into the Kp-300 and damage it.

<sup>10</sup> Assuming that the [Blocking Valve Output](#) is used in the installation.

## C) Seat Belt Logging

*(One jumper for each safety input)*

The fifteen Safety Inputs can be set to be 'Logged' either manually or automatically.



Once an input which is open (green LED is not on) has been logged, it will be ignored until it is logged as active again. This feature is typically used (as its name implies) to log seat belt inputs. A seat which is unoccupied will be logged so that it can't cause an E-Stop or Pause if it changes state during the show. A yellow LED indicates an input which has been logged.

The jumper for an input should be placed in the Log Belts position if it is to be logged. The jumper should be placed on the No Logging position if it is not to be logged.

Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System 1/3 J6 is active. When this input is active, the safety inputs can be logged by either pressing the [Log Belts button](#) or activating the [Remote Log Belts Input](#) by pressing [Remote Log Belts Button\(s\)](#) attached to it.

If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.

Input logging actually takes place at the instant that the [Log Belts Button](#), [Remote Log Belts Input](#), or [Show Pause Reset Input](#) are released. The LED next to the [Log Belts Button](#) will light whenever the seat belts are being logged.

## D) E-Stop Buss

## E) Show Pause Buss

*(One jumper for each safety input)*

Any or all of the fifteen Safety Inputs can be set to trigger either an E-Stop or Show Pause.



By moving the jumper to the E-Stop position, an input will trigger an E-Stop show when it opens. Moving it to the Show Pause position will cause an input to pause the show when it opens. If this input is not being used for either an E-Stop or Show Pause, it should be removed.

Any condition that triggers an E-Stop will set two latches on the Kp-300 and turn on a flashing red LED for the input that triggered the error condition. The first of these latches stops the HPU (if there is one) and triggers the Smart Brick System to play the E-Stop Show through the [Blue 'E-Stop' Input](#) to the Smart Brick Brain. Calling up the E-Stop show sets the '[E-Stop Show Running](#)' output from the Smart Brick System (this must be programmed into the motion profile of the E-Stop show). This resets the first of the two E-Stop latches on the Kp-300. At this point you can start the HPU and any shows that have been enabled in the motion control profile of the E-Stop Show.

Starting the next show will reset the second E-Stop latch in the Kp-300. This will turn off the red LED indicator for the input that triggered the E-Stop and enable the Kp-300's pause functions (because it has the [Show Pause Reset Input](#) programmed active, the E-Stop show cannot be paused).

When a Show Pause occurs, it turns on a flashing red LED to indicate the input that caused the error condition. A Show pause can also be initiated by pressing the '[Show Pause](#)' button. Initiating a Show Pause sets a latch on the Kp-300 that tells the Smart Brick System to pause the current show through a signal on the [Green 'Pause' Output](#) to the Smart Brick Brain<sup>11</sup>. This latch can be reset by using the '[Show Continue](#)' button (but only if the condition that caused the pause has been cleared) or the [Show Pause Reset Input](#) from the Smart Brick System. This tells the Smart Brick System to continue the current show through a signal on the [Green 'Pause' Output](#) to the Smart Brick Brain

Clearing the Kp-300 Show Pause latch will stop the red LED that indicates the input which caused the Show Pause from flashing, but not turn it off. The LED will be turned off only when:

- a) The next show is started
- b) Another input triggers an E-Stop or Pause condition

The Show Pause Reset output from the Smart Brick System can be programmed to be active during any show that you don't want to be able to

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<sup>11</sup> In some applications, you may want to call up a different show using this input, instead of pausing the current show.



'Pause'. Typically this is done during the E-Stop and Load/Unload shows to prevent these shows from being paused.

## F) Bypass Buss One

## G) Bypass Buss Two

*(One jumper for each safety input)*

The fifteen Safety Inputs can be temporarily disabled from causing a Show Pause or E-Stop from the motion profile programmed into the Smart Brick System.



To keep an input from triggering a Show Pause/E-Stop when [Bypass Buss #1](#) is active, move the jumper to the middle and left two pins. To keep an input from triggering a Show Pause/E-Stop when [Bypass Buss #2](#) is active, move the jumper to the middle and right two pins. If this feature is not to be used on an input, remove the jumper altogether.

Typical examples of the use of the [bypass buss](#) are:

- a) **HPU Startup/Shutdown:** If the HPU is started and stopped as part of the motion profile, there will usually be a time just after it is started and a time after it is stopped where any HPU pressure sensors inputs will need to be bypassed. Do this by programming the [Bypass Buss](#) you are using and [Remote HPU Start Input](#) to be active at the beginning of the show. The [Bypass Buss](#) needs to be active for the time it takes for the HPU to build up pressure. If the pressure doesn't come up during the time allotted, the Kp-300 will automatically trigger an error condition (either E-Stop or Show Pause, as configured).

If the HPU is to be turned off at the end of the show, then the [Bypass Buss](#) which is being used would be programmed active along with a pulse on the [Remote HPU Stop Input](#). This allows the HPU to be stopped without triggering an error condition. If configured to trigger an E-Stop, the [Bypass Buss](#) may also need to be programmed active during the E-Stop and Load/Unload shows so that the HPU's low pressure won't trigger an error during these shows when the HPU is off.

- b) **Door Sensors:** If the door or floor mat sensors inputs are set to

trigger an E-Stop, they will need to be bypassed during the E-Stop and Load Unload shows. This is because although you want these inputs to trigger an error while the motion base is in motion, you don't want this to trigger an E-Stop when someone opens the doors for the passengers to be loaded and unloaded.

- c) **Electric Motion Bases and other Installations that don't use the Kp-300 [Blocking Valve Output](#):** If you don't want to allow shows to be run if there is an E-Stop condition present, you can configure one of the two [bypass busses](#) to momentarily (for just one frame) bypass all the possible error inputs at the very start of all shows<sup>12</sup>. At the end of the [bypass buss](#) pulse, any error conditions that remain will trigger the E-Stop to keep even the video and audio from running. This technique should be used in applications that don't use the [Blocking Valve Output](#). Typical of these are most electric motion base installations.

If you are using the Seat Belt Logging features of the Kp-300, be sure you don't configure the Kp-300 to bypass any inputs that are to be logged during the time during which they need to be logged. Bypassing an input will convince the Kp-300 that the inputs are in the 'safe' position, and so they will not be logged as 'unoccupied'.

The Show Pause functions are usually disabled during the E-Stop and Load/Unload shows by the [Show Pause Reset Input](#) from the Smart Brick System. Inputs that trigger a Show Pause are usually not needed during the E-Stop and Load/Unload shows anyway, so there is no need to bypass them separately during these shows.

## H) HPU-Stop Buss

*(One jumper for each safety input)*

Any or all of the fifteen Safety Inputs can be set to force the HPU off, regardless of the E-Stop and Show Pause busses.



When the jumper for an input is set to the HPU Stop position, the HPU cannot be started until this error condition is reset. This jumper is normally used only on inputs that are also configured to trigger an E-Stop.

<sup>12</sup> This technique is flexible enough that you can even leave it out of any maintenance shows that you want to be able to run without motion.



Although any E-Stop error will stop the HPU, as soon as the E-Stop show has started running the HPU can be restarted. By using this jumper in addition to the E-Stop jumper, the HPU cannot be restarted until the error condition is cleared. A typical example of this feature's use is on the input used for the HPU oil level sensor. If the oil level is low, the Kp-300 will E-Stop the system and not allow the HPU to be restarted until some more oil is added to the system.

# DipSwitch settings on the Kp-300 (v3.0+)

## (EIGHT POSITION DIPSWITCH)

The DipSwitch is used to select several options on the v3.0+ Kp-300s:

### A) DipSwitch #1: [HPU Stopped LED](#) Internal/External

OFF = [HPU Stopped LED](#) controlled by an external switch

ON = [HPU Stopped LED](#) controlled internally

If your HPU has a switch that closes when the HPU is not running, you should wire this switch to the [HPU Stopped Input](#) pins #1 and #14 on the J2 connector. If your HPU doesn't have a 'stopped' switch output, or you don't even have a HPU in your application, turning this switch on will light the ['HPU stopped' LED](#) when the Kp-300 thinks the HPU shouldn't be running. Unlike the [HPU Running Input](#), the [HPU Stopped Input](#) is not used for any other purpose than lighting this LED.

### B) DipSwitch #2: [HPU Running LED](#) Internal/External

OFF = [HPU Running LED](#) controlled by an external switch

ON = [HPU Running LED](#) controlled internally

If your HPU has a switch that closes when the HPU is not running, you should wire this switch to the [HPU Running Input](#) pins #2 and #15 on the J2 connector. If your HPU doesn't have a 'stopped' switch output, or you don't even have a HPU in your application, turning this switch on will light the ['HPU Running' LED](#) when the Kp-300 thinks the HPU shouldn't be running.

### C) DipSwitch #3: E-Stop Disables Show Starts

OFF = Does nothing

ON = E-Stop Buss disables new show starts

When on, this DipSwitch will keep any shows from being started When the [E-Stop buss](#) is active (the [E-Stop Buss LED](#) is lit) using the ['Show Start' buttons](#), even if the ['Show Start' Enables](#) are active.

### D) DipSwitch #4: HPU-Stop Disables Show Starts

OFF = Does nothing

ON = HPU-Stop Buss disables new show starts

When on, this DipSwitch will keep any shows from being started When the [HPU-Stop buss](#) is active (the [HPU-Stop Buss LED](#) is lit) using the '[Show Start](#)' buttons, even if the '[Show Start](#)' Enables are active.

#### **E) DipSwitch #5: Pause Buss Disables Show Starts**

OFF = Does nothing

ON = Pause Buss disables new show starts

When on, this DipSwitch will keep any shows from being started When the [Show Pause buss](#) is active (the [Show Pause Buss LED](#) is lit) using the '[Show Start](#)' buttons, even if the '[Show Start](#)' Enables are active.

#### **F) DipSwitch #6: E-Stop Triggers [Alarm Output](#)**

OFF = Does nothing

ON = E-Stop Triggers Alarm Output

When on, when the [E-Stop buss](#) is active (the [E-Stop Buss LED](#) is lit), the [alarm output](#) will be active too. The [alarm output](#) can be attached to a buzzer, bell or other annunciator to give an audible/visual indication of an error condition.

#### **G) DipSwitch #7: HPU-Stop Triggers [Alarm Output](#)**

OFF = Does nothing

ON = HPU-Stop Triggers Alarm Output

When on, when the [HPU-Stop buss](#) is active (the [HPU-Stop Buss LED](#) is lit), the [alarm output](#) will be active too. The [alarm output](#) can be attached to a buzzer, bell or other annunciator to give an audible/visual indication of an error condition.

## **H) DipSwitch #8: Pause Buss Triggers [Alarm Output](#)**

OFF = Does nothing

ON = Pause Buss Triggers [Alarm Output](#)

When on, when the [Show Pause buss](#) is active (the [Show Pause Buss LED](#) is lit), the [alarm output](#) will be active too. The [alarm output](#) can be attached to a buzzer, bell or other annunciator to give an audible/visual indication of an error condition.

# DMX-512 Address Selection on the Kp-300 (v3.0+)

## (TWO HEXADECIMAL DIPSWITCHES)

To support the DMX-512 input, the v3.0+ Kp-300 adds a two position rotary DipSwitch which is used to set the DMX-512 address

The DMX-512 addressing is zero-based, HEXadecimal numbering.

Valid addresses between 00h and FFh. We typically set the Kp-300 to an address of 00h thru 02h, and then address the motion base legs and outputs for starting the videos, lights and '4d' effects starting at 03h.

The Kp-300 requires DMX-512 that includes GilderChecksums. If receiving DMX-512 without valid checksums, the [DMX-512 Receive LED](#) on the back of the Kp-300 will not flash and only the [Show Start Button LEDs](#) will follow the incoming the DMX-512. The signals like the [Show Start Button Enable Inputs](#), blocking valve enable, and automatic [HPU start/stop](#) will not work when the GilderChecksums are invalid.

## Sample Shows

Although the Kp-300 has no microcontroller on it of any kind, the Smart Brick System does. Whether or not the Smart Brick System is mounted on the back of the Kp-300 or remotely, the configuration for the Smart Brick Brains and motion profiles are identical. The Kp-300 must be used with Smart Brick Brains with firmware revisions of 1.13 or later.

When used with a Kp-300, the Smart Brick System is always playing one show or another. Besides the 'main' shows that actually move the motion base, there are a handful of 'utility' shows you will need to program (usually three). These are used to prepare the motion base for the next show (turning on or off lights, opening and closing doors, etc.), flashing the indicator LEDs on the front of the Kp-300 to indicate what the next options available to the operator are, and to enable and disable the [Show Start Buttons](#) to allow or disallow the operators to start only certain selected shows. Strictly speaking, most of the utility shows can be as short as a frame or two. This would limit your flexibility as far as flashing the LEDs on the Kp-300 in artistic patterns, so most are two or three seconds long.

In the following sample shows, all twenty-four digital outputs that go to the Kp-300, as well as all six analog axis that move the motion base are displayed. It is on these twenty-four digital outputs that there must be a small amount of simple 'housekeeping' programmed in for the control system to work. These Pc•MACs screen shots and the sample shows available from [www.gilderfluke.com](http://www.gilderfluke.com) show you what needs to be done. In most cases you will be able to use the sample shows as a template, and just modify the length to suit your actual shows.

The most basic configuration requires at least the following shows:

### **A) E-Stop Show1**

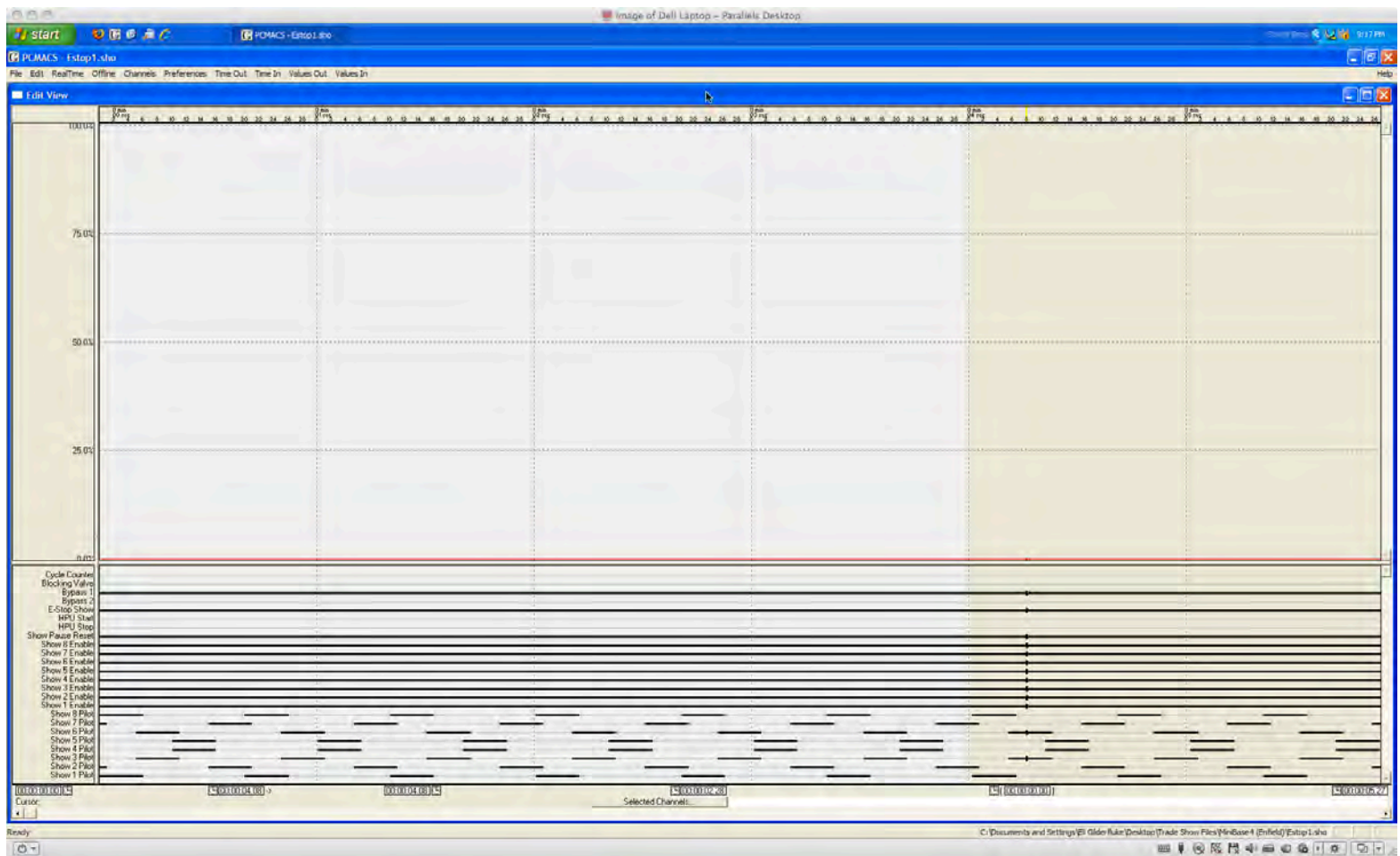
### **B) E-Stop Show2**

These are the shows that are called on power up or on any E-Stop event. The only reason for having two E-Stop shows is so that the first one that plays (at power-up or when an E-Stop is triggered) will call up the traditional 'run for your life' video. At the end of the first E-stop show, the Smart Brick typically jumps to the second E-Stop show. The second E-Stop Show loops back on itself until the operator starts a new show. The two shows are normally identical, except for the first show having the video trigger in it.

The E-Stop shows must:

- a) The motion base is programmed with all axis at the parked positions. This can be seen in the upper, analog data pane. All the analog channels are down along the bottom '0%' line in the E-Stop and Load/Unload Shows.
- b) Disable the [Blocking Valve Output](#) to the Kp-300. This will park a hydraulic Motion base (the hardware on the Kp-300 will have actually turned off the output before this). The 'Blocking Valve' output is 'off' through all four seconds of this show.
- c) Turn on the '[E-Stop Show Running](#)' Output to the Kp-300. If you don't do this, you won't be able to restart the HPU to get yourself out of the E-Stop event. The 'E-Stop Show' output is 'on' through the entire show.
- d) Turn on any of the [Bypass Outputs](#) that are needed to recover from the E-Stop event. In this application, the 'Bypass 1' is used during the E-Stop and Load/Unload shows to keep the doors being opened and people walking in and out from triggering additional E-Stops.
- e) Flash the [Show Start Button LED\(s\)](#) for whatever show(s) you want the operator to be able to call up next. This is so the operator knows which show options are available. We typically program them in a chase pattern during the E-Stop and Load/Unload shows, lighting only the valid show selections. The eight 'Show Pilot' outputs are shown doing a simple circular chase pattern.
- f) Whenever a [Show Start Button LED](#) is programmed to indicate that a [Show Start Buttons](#) is valid, it is also necessary to actually enable the corresponding [Show Start Button Enable Input](#) from the Smart Brick System to make the [Show Start Buttons](#) active. If this is not done, then the [Show Start Buttons](#) will remain inactive. All eight 'Show Enables' are 'on' through the show, so all eight Show Start Buttons are enabled.
- g) The '[Show Pause Reset](#)' is 'on' through the show to reset any potential 'pauses'.
- h) The '[Bypass 2](#)', '[HPU Start](#)', '[HPU Stop](#)' and '[Cycle Counter](#)' are not used during the E-Stop show.
- i) Open any cabin doors as needed to allow the passengers to be evacuated.

- j) Turn on/off any lights as needed to allow the passengers to be evacuated.
- k) On at least the first iteration of this show you will need to stop the image/audio playback for the show and start the traditional 'run for your lives' video message<sup>13</sup>.
- l) (optional) Sound an alarm an audio/visual alert can be attached to any spare digital outputs from the Smart Brick System to alert the



operators of an E-Stop event.

- m) If you are controlling a Moog electric motion base: We typically program in a 'Moog Park' and 'Moog Reset' commands instead of the 'Moog E-Stop' command you might expect<sup>14</sup>. This is because the

<sup>13</sup> Optionally, you may want to start an audio/video message playing on the first iteration.

<sup>14</sup> The E-Stop wires into the Moog PC can be connected to the spare terminals on the Kp-300's E-Stop Button so that it can park the motion base no matter what.



Moog E-Stop command requires that the PC under the Moog motion base be rebooted before the motion base will move again. This is a little too drastic for our tastes. The Moog Park will just move the motion base home if it is engaged. The Moog Reset will reset any minor error conditions in the PC under the motion base. If the Moog motion base isn't in either of these conditions, these commands won't do anything.

### C) Load/Unload Show

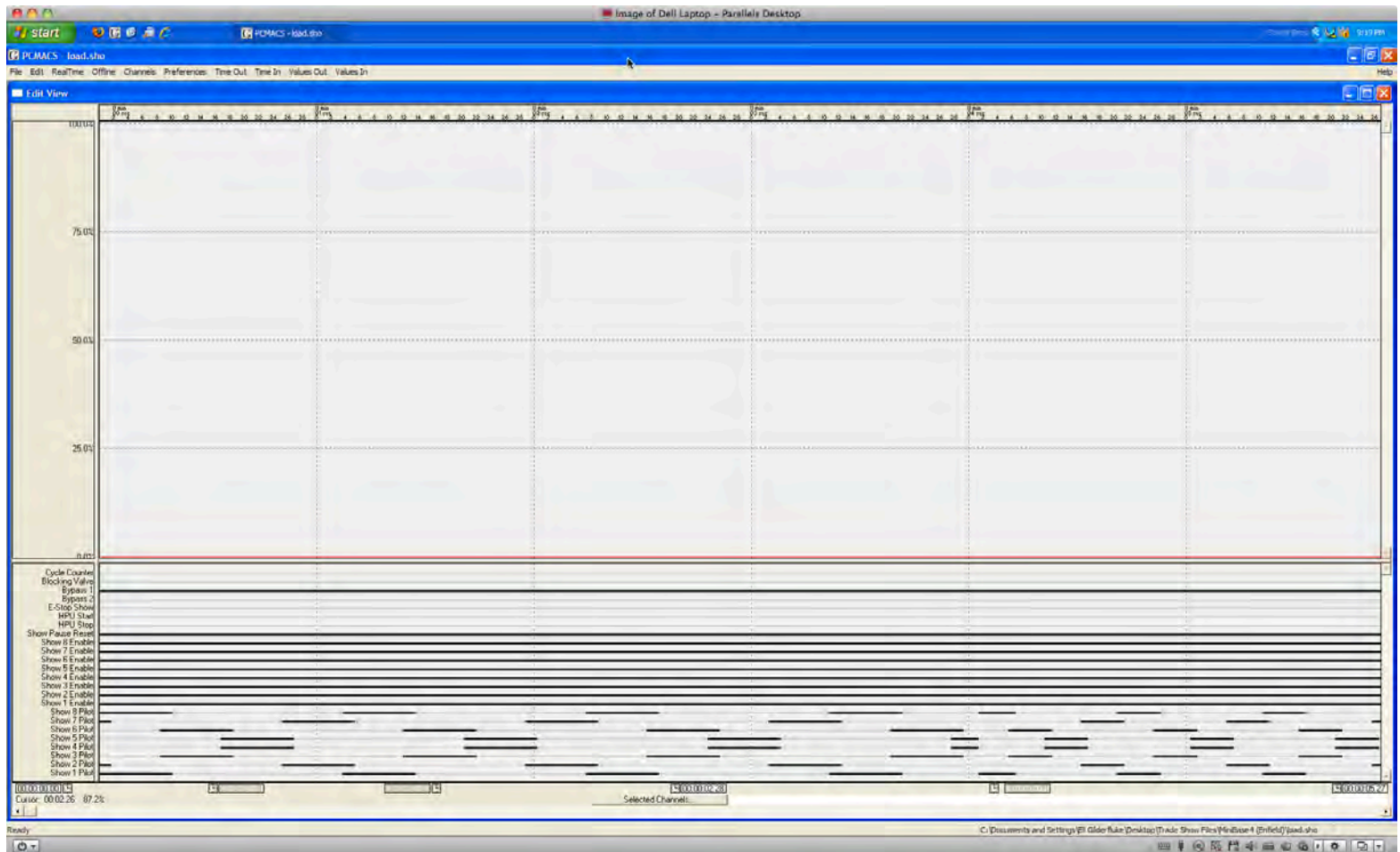
This is the show that all the main shows jump to at their ends. It loops to flash the [Show Start button Enable LEDs](#) until the next show is selected and started. You can see that this show is identical to the E-Stop show, except the 'E-Stop Show' output which was 'on' throughout the E-Stop Shows, is off through the Load/Unload show.

The Load/Unload show must:

- a) The motion base is programmed with all axis at the parked positions. This can be seen in the upper, analog data pane. All the analog channels are down along the bottom '0%' line.
- b) Disable the [Blocking Valve Output](#) to the Kp-300. This will park a hydraulic Motion base (the hardware on the Kp-300 will have actually turned off the output prior to this). The 'Blocking Valve' output is 'off' through all four seconds of the show.
- c) Turn on the '[E-Stop Show Running](#)' Output to the Kp-300. If you don't do this, you won't be able to restart the HPU to get yourself out of the E-Stop event. The 'E-Stop Show' output is 'on' through the show.
- d) Turn on any of the [Bypass Outputs](#) that are needed to recover from the E-Stop event. In this application, the 'Bypass 1' is used during the E-Stop and Load/Unload shows to keep the doors being opened and people walking in and out from triggering additional E-Stops. 'Bypass 2' is unused in this application.
- e) Flash the [Show Start Button LED\(s\)](#) for whatever show you want the operator to be able to call up next. This is so the operator knows which show options are available. We typically program them in a chase pattern during the E-Stop and Load/Unload shows, lighting

only the valid show selections. The eight 'Show Pilot' outputs are shown doing a simple circular chase pattern.

- f) Whenever a [Show Start Button LED](#) is programed to indicate that a [Show Start Buttons](#) is valid, it is also necessary to actually enable the corresponding [Show Start Button Enable Input](#) from the Smart Brick System to make the [Show Start Buttons](#) active. If this is not done, then the [Show Start Buttons](#) will remain inactive. All eight 'Show Enables' are 'on' through the show, so all eight Show Start



Buttons are enabled.

- g) The '[Show Pause Reset](#)' is 'on' through the show to reset any potential 'pauses'.
- h) The '[Bypass 2](#)', '[HPU Start](#)', '[HPU Stop](#)' and '[Cycle Counter](#)' are not used during the Load/Unload show.
- i) (optional) Open any cabin doors as needed. Sometimes cabin doors are manually operated, sometimes they are automated. If

they are automated they usually need to be programmed to open (or stay open) during the Load/Unload time.

- j) (optional) Turn on/off any lights as needed.
- k) (optional) You may want to start a visual/audio message to the motion base passengers during the Load/Unload show.
- l) (optional) Sound an alarm or an audio/visual alert can be attached to any spare digital outputs from the Smart Brick System to alert the operators of a Load/Unload show. It can even be used to warn people standing on the outside of automated exit doors that they may need to move out of the way.
- m) If you are controlling a Moog electric motion base: We typically program in a 'Moog Park' and 'Moog Reset'. The Moog Park will just move the motion base home if it is engaged. The Moog Reset will reset any minor error conditions in the PC under the motion base. If the Moog motion base isn't in either of these conditions, these commands won't do anything.

## D) Main Shows

*(Up to 252 shows)*

These are the shows that are called up by the operator pressing one of the eight [Show Start Buttons](#). Most (if not all) are the actual shows that contain the motion profile for the motion base<sup>15</sup>.

In most cases, there will be a slight delay programmed into the main shows before the ride motion begins. This gives time for safety warnings, doors to close, ramps to retract, and to move the base up to the desired 'starting' position. When programming your shows, it is never a good idea to have the audio/video playback triggered on the very first frame of the show. It is usually better to wait at least one frame or more before the trigger occurs.

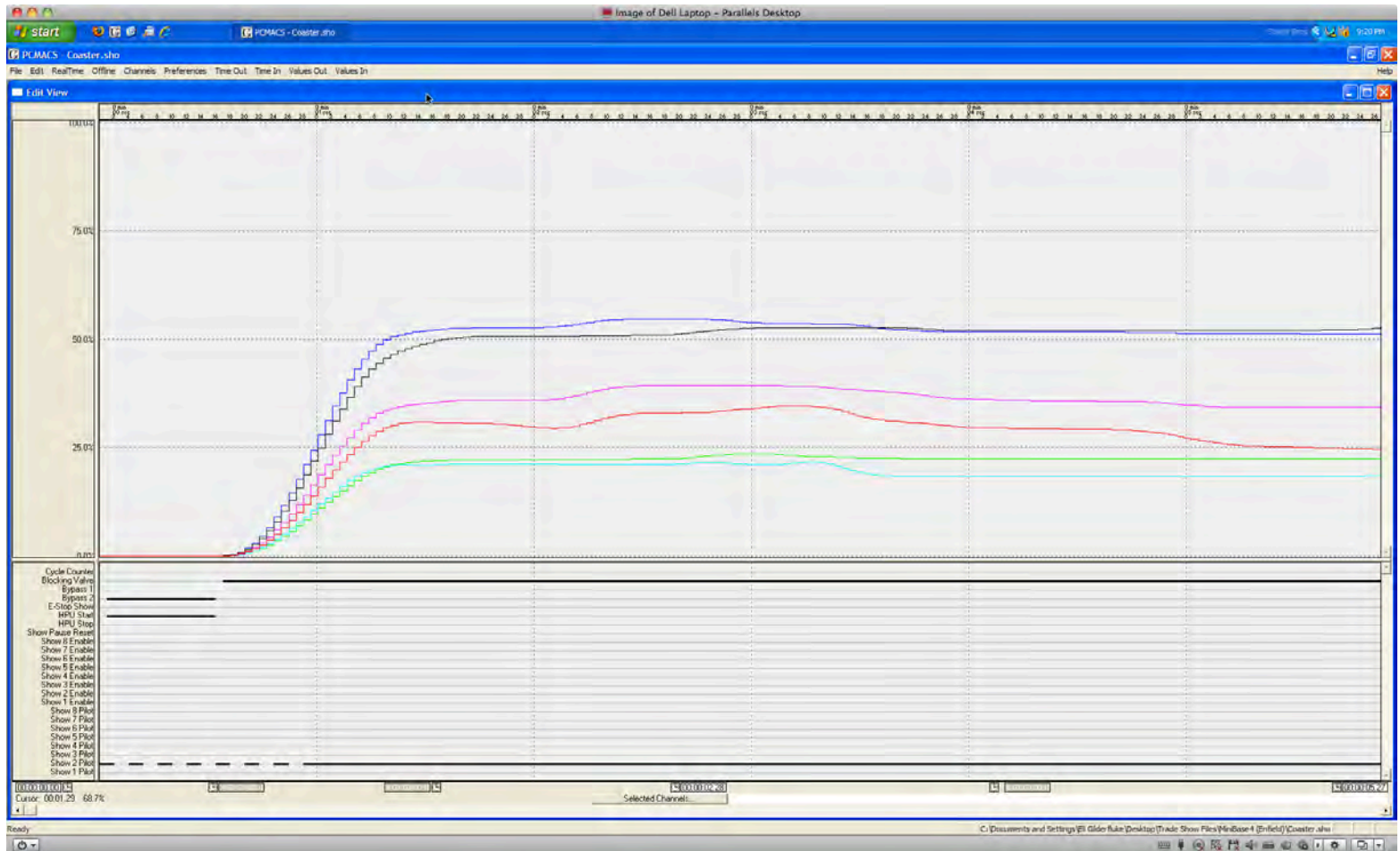
The Main Shows must:

- a) The motion base is programmed with all axis at the starting and ending at the parked positions. In between, the motion profile for the ride is programmed.

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<sup>15</sup> One or more shows may be used as additional 'utility' shows. These may be used for separate unload, preload or load shows that are called started by the operators. You may also want to use one of these eight shows as a 'park' show that can be called up from any of the main shows.

- b) Enable the [Blocking Valve Output](#) to the Kp-300 just before motion start. Disable it just after motion end. This will enable a hydraulic Motion base so that it is able to start moving. This is usually done just before the movement is to start. It is then disabled again just after the movement is ended. Removing the [Blocking Valve Output](#) will cause a hydraulic motion base to park itself.



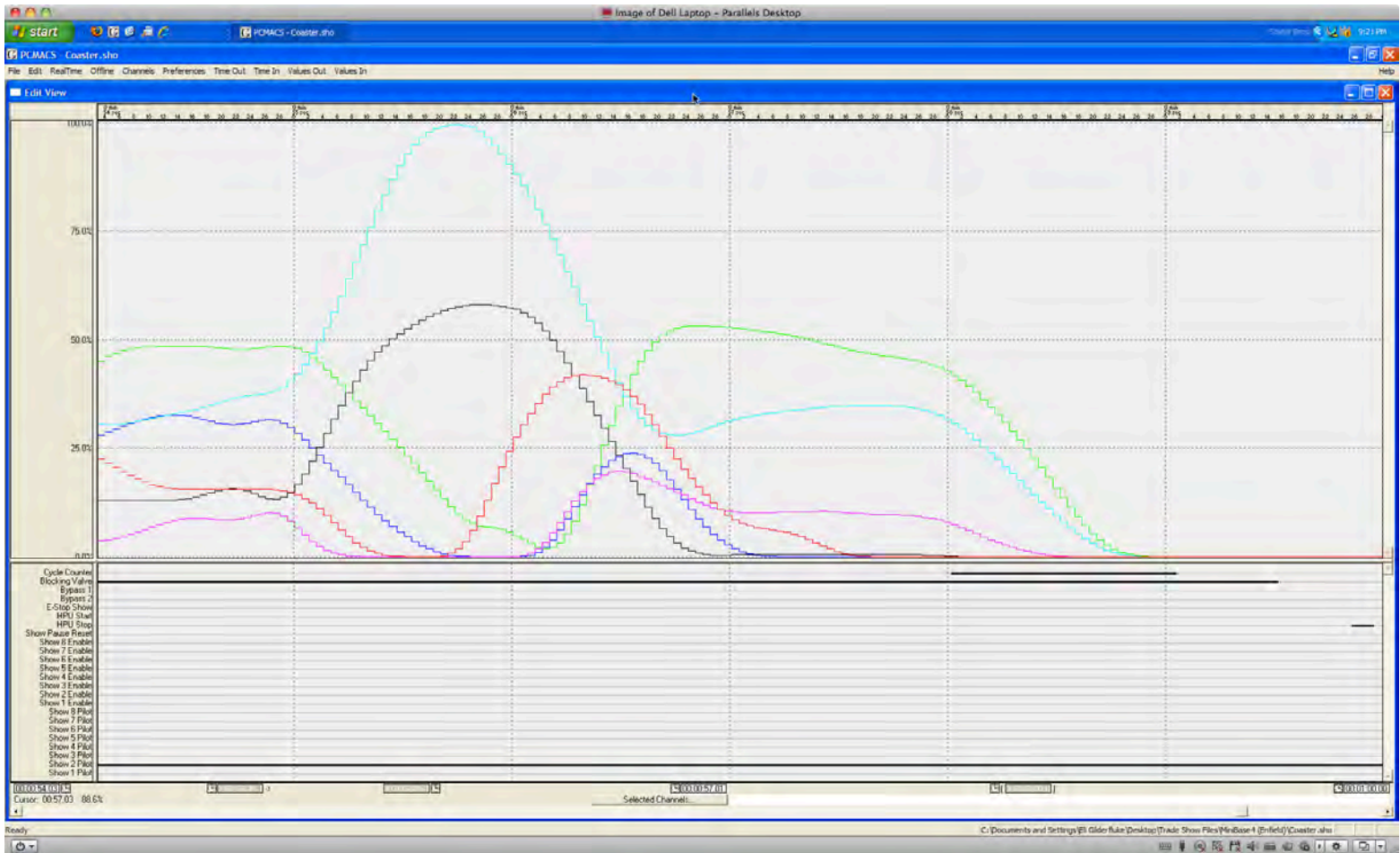
## Beginning of 'Main' Show

Normally you 'fly' the motion base to as close to 'parked' as you can get before removing the [Blocking Valve Output](#).

- c) Turn OFF the Show Pause Reset Output at show start. Normally this is 'off' throughout the show. While it is off, it is possible to 'pause' the show. If you don't want anyone pausing the show at the beginning or end of the show (before and after the time the base is moving, you can extend the 'Show Pause Reset' into the show at the ends if desired. It can remain on until just before the



motion base is going to start moving, a hair before the [Blocking Valve Output](#) is programmed ON. This output is turned back ON as soon as the motion base has stopped moving, as soon as it is safe for the riders to unbuckle their seat belts and start getting ready to leave the capsule.



## End of 'Main' Show

To automatically log seat belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged. If automatic seat belt logging is being used, then the Seat belts will be logged when this output is turned off.

d) (optional) If you are using the [Remote HPU Start Input](#) features:

Program a [Remote HPU Start Input](#) into the show data. When the HPU is started as part of the motion profile, there will usually be a time just after it is started where any HPU pressure sensors inputs will need to be bypassed. In this case, you can see 'Bypass 2' being used for this at the start of the show. The [Bypass Buss](#) needs to be active for the time it takes for the HPU to build up pressure. If the pressure sensor doesn't come up during the time allotted, the Kp-300 will automatically trigger an error condition.

- e) (optional) If you are using the [Remote HPU Stop Input](#) features: If the HPU is to be turned off at the end of the show, then the same [Bypass Buss](#) which is being used for turning on the HPU will need to be programmed active along with a pulse on the [Remote HPU Stop Input](#). This allows the HPU to be stopped without triggering an error condition. If configured to trigger an E-Stop, the [Bypass Buss](#) may also need to be programmed active during the E-Stop and Load/Unload shows so that the HPU's low pressure won't trigger an error during these shows when the HPU is off.
- f) Turn off the [Show Start Button LEDs](#). We typically program them in a chase pattern during the E-Stop and Load/Unload shows, lighting only the valid show selections. Once a show has started, we typically program all but the selected [Show Start Button LEDs](#) off, and flash the selected show LED a few times before turning it on through the rest of the show. If any other show selection is valid while another show is running, we then flash it discretely throughout the show that is running. In this case, no other shows can be started during this 'Main' show.

Whenever a [Show Start Button LED](#) is programmed to indicate that a show select [Show Start Buttons](#) is valid, it is also necessary to actually enable and/or disable the corresponding [Show Start Button Enable Input](#).

- g) Enable/Disable the [Show Start Button Enable Input](#) for whatever show(s) you want the operator to be able to call up next. Typically there aren't any during the Main shows. If there is one, then it is probably a show that has been written to 'park' the motion base without having to E-Stop the system.
- h) Just before the ride comes to an end, pulse the '[Cycle Counter](#)'

so that the ride is added to the running count.

- i) After the '[Cycle Counter](#)' has been pulsed, and all the motion base axis have returned to the 0% position, the 'Blocking Valve' Enable is turned back off. This disables all movement on the motion base.
- j) (optional) Close any cabin doors as needed at show start. Open them again at show end. Sometimes cabin doors are manually operated, sometimes they are automated. If they are automated, they usually need to be programmed to close (or stay closed) during the Main Shows, and then opened again at the shows' end. Kp-300 safety switches are normally used to monitor the safe positions of ramps and doors, and pause and/or E-Stop if a ramp or door leaves the 'safe' position.
- k) (optional) Turn on/off any lights as needed.
- l) Start the audio/video for the motion base.
- m) If you are controlling a Moog electric motion base, you will need to program in a Moog Engage command at the start of the show. The motion base will receive this, and move into the start position. Note that the command signals to the Moog motion base must be in the EXACT right values, or the motion base will enter an error mode instead of the 'engaged' mode. This process takes a few seconds, so allow for it in the timing of your show programming. At the end of a Moog motion base show, you will need to issue a Moog Park command after flying the base to as close to the parked position as you can get.
- n) At the end of the main shows, they all typically jump to a common Load/Unload show. This will loop back on itself and is programmed to flash the appropriate [Show Start Button LEDs](#) and turn on the appropriate [Show Start Button Enable Input](#).

## AutoDownloading Shows for a Kp-300

Once you have your shows programmed using Pc•MACs and ready to download to the Br-Brain4, AutoDownloading them is simple.

- 1) **Target Device:** By default, Pc•MACs will have selected your 'target' device. This will probably be a Br-Brain4.
- 2) **Shows In Device:** Use the 'Add' button to add all of your shows to



the list of shows that are to go into the AutoDownload. The order is unimportant, but we usually put the E-Stop and Load/Unload shows at the top of the list, and all the 'Main' shows after. You can use the promote/demote buttons to put the shows in any order you prefer.

Once all the shows are in the list in the order you would like, select the shows one at a time to set what happens at the end of each:

- a) 'E-Stop 1' jumps immediately to 'E-Stop 2'
  - b) 'E-Stop 2' jumps immediately to 'E-Stop 2' so it will loop on itself
  - c) All the 'Main' shows jump immediately to the 'Load/Unload' show at their ends.
  - d) The 'Load/Unload' show jumps immediately to 'Load/Unload' so it will loop on itself while waiting for the next show to be started
  - e) **All** shows need to be set to '**CAN** be stepped on'
- 3) **Power Up Options:** Start 'E-Stop1' show on startup
  - 4) **Input Actions:** Assuming you are AutoDownloading to a Br-Brain4, you will have ten inputs to set up:
    - a) **Input 0:** Closure = "Start" Main Show #1, Opening: "Not used"
    - b) **Input 1:** Closure = "Start" Main Show #2, Opening: "Not used"
    - c) **Input 2:** Closure = "Start" Main Show #3, Opening: "Not used"
    - d) **Input 3:** Closure = "Start" Main Show #4, Opening: "Not used"
    - e) **Input 4:** Closure = "Start" Main Show #5, Opening: "Not used"
    - f) **Input 5:** Closure = "Start" Main Show #6, Opening: "Not used"
    - g) **Input 6:** Closure = "Start" Main Show #7, Opening: "Not used"
    - h) **Input 7:** Closure = "Start" Main Show #8, Opening: "Not used"
    - i) **Input Green:** Closure = "Pause Show", Opening: "Continue Show"
    - j) **Input Blue:** Closure = "Start" E-Stop 1, Opening: "Not used"
  - 5) **Device Serial Address:** This will default to the serial address of your target device, and you should leave this set there.
  - 6) **First Channel:** This will default to the first channel in your site file (this is shown next to the where you enter the address in the parentheses), or the settings on the last AutoDownload. Unless you have added or removed channels from your site file since the last AutoDownload using this site file, you should let Pc•MACs set this for you.
  - 7) **Last Channel:** This will default to the last channel in your site file (this is shown next to the where you enter the address in the paren-

theses), or the settings on the last AutoDownload. Unless you have added or removed channels from your site file since the last AutoDownload using this site file, you should let Pc•MACs set this for you.

- 8) **Build AutoDownload File:** Give the file a name (it defaults to the name of the first show in the AutoDownload list) and point Windows to where you would like it to be saved.

**Save As AutoDownload 1.1**

Temporary Device Setup

Target Device:

Show Order in Device

At the end of Estop1,

Next show is  This show  be stepped on

For sequencer  take the following actions:

Power-Up Options

On startup,  First show is

Input Actions

For input:   
A closure    
An opening

Show Length: 00:04.00 = 120  
Brick Start: 00:00.00 = 0  
Brick End: 00:03.29 = 119  
Total Shows 11 FrameRate = 30

Global Options

Device Serial Address:   
First Channel: (0)   
Last Channel: (11)

The Br-Brain4 will find and use the first AutoDownload file it finds on the flash card, so the flash card should have only one AutoDownload file on it. Delete all AutoDownload files from the flash card, and then drag-n-drop the new AutoDownload file from your PC onto it. Insert the card into the front of the Br-Brain4, and

(assuming it is not getting realtime updates from Pc•MACs through the serial port or DMX-512), the Br-Brain4 will read in the AutoDownload file and begin running your shows.

## Accessing More Than Eight Shows on a Kp-300

Although there are only eight [Show Start Buttons](#), the control system has a capacity for 255 shows. With a minimum of three 'utility' shows (E-Stop1, E-Stop2 and Load/Unload), that leaves a room for up to 253 'main' shows.

To access more than eight shows, you simply assign more than one show to each button. The Br-Brain4 has a 'playlisting' feature. You can assign a range of shows to a single [Show Start Button](#). Each time you press a 'playlisted' button, it will play another show from the playlist. You have the option of telling the Br-Brain4 to play the shows in the playlist sequentially, or in random order.

In a typical installation, you will divide your shows by 'categories'. i.e.:

- 1) Plays all the space rides in random order.
- 2) Plays all the undersea shows in sequential order.
- 3) Plays all the runaway mine train shows in random order.
- 4) Plays all the rollercoaster shows in sequential order.
- 5) Plays a specific space show.
- 6) Plays a specific undersea show.
- 7) Plays a specific runaway mine train show.
- 8) Plays a specific rollercoaster show.

To set up a playlist in Pc•MACs during the AutoDownload process. Everything is set as described above, except instead of selecting the 'Start' command for the input, you just select either the 'Sequential from List' or 'Random from List'. You can then enter the range of shows for the playlist to include.

## Delayed 'HPU Off'

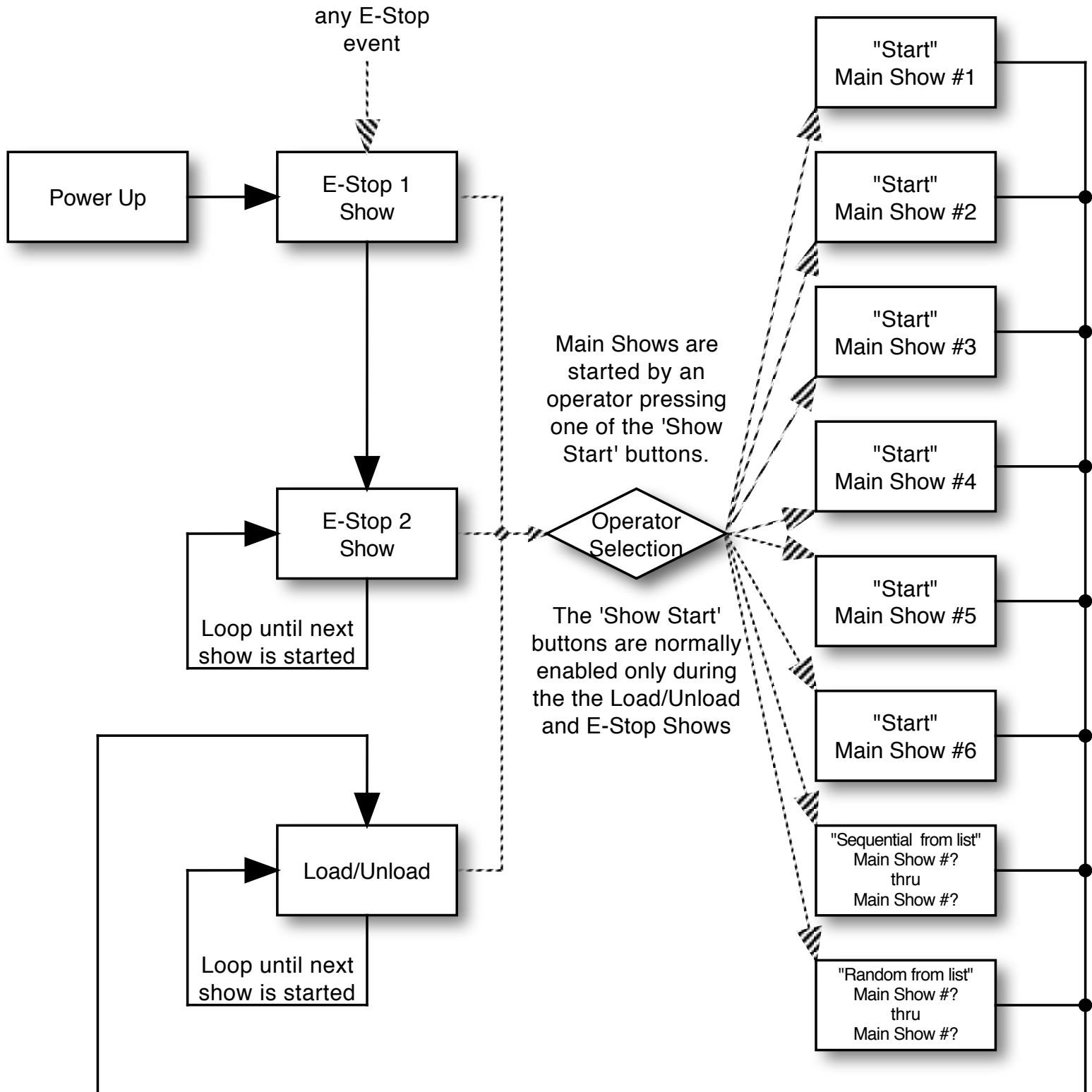
You can program [Remote HPU Start Input](#) to start the HPU at the beginning of every show, and [Remote HPU Stop Input](#) to turn the HPU back off at the end of every show.

Having the [Remote HPU Start Input](#) in every show won't hurt anything. If the operator has forgotten to start the HPU manually, then it will automatically be started with the show. A common situation is that you don't want the HPU to turn off between every show when you have a steady stream of customers lined up. One way to save electricity, and still save the wear and tear of having the HPU cy-

cling on and off between every show is to use an extended load/unload show to turn off the HPU if the ride isn't restarted within a certain period of time.

To do this, just make a new extended length load/unload show. The length of the show and the delay is up to you. If you want to wait five minutes before the HPU automatically cycles off, then make this show five minutes long. To do this:

- 1) Remove any '[Remote HPU Stop Input](#)' commands from all of your regular show files.
- 2) Open your normal Load/Unload show.
- 3) Move all the channels to the Offline Editing Window.
- 4) Click anywhere on the screen that is not on an output channel.
- 5) Press <Control+A to 'select all'.
- 6) Under the File menu, select 'Save as Macro...'. Point Windows to where you want to save it, give your Macro a name 'Load-Unload' and click 'OK'.
- 7) Under the File menu, select 'new Show'. Make it the desired length, and select the same site file you are using for all of your shows. 'Sync' should be left set to 'internal'. Click 'OK'.
- 8) Open the Offline Editing Window. If all of your channels aren't already being displayed (a leftover effect from step #3 above), move them all to the OffLine editing window.
- 9) Click anywhere on the screen that is not on an output channel.
- 10) Press <Control+A to 'select all'.
- 11) Under the file menu, select 'Insert Multiple Macros....'. Select the macro you created in step #6 above. Set the number of times to insert to '9999'. Pc•MACs will fill in the entire show with this macro.
- 12) Go to the end of the show, and draw in a little blip on the '[Remote HPU Stop Input](#)' output.
- 13) If you need to, also draw in the '[Bypass 2](#)' to match.
- 14) When you build your AutoDownload, set all the 'Main' shows to jump immediately to this new 'Long Load/Unload' show. At the end of the 'Long Load/Unload' show, jump immediately to the regular 'Load/Unload' show. At it's end, it jumps back to itself, just like normal.



**Kp-300 Smart Brick Show Flow Diagram**



## Kp-300 Connections

There are only four connectors on the Kp-300 (v1.n & v2.n) or seven connections (v3.0+) version Kp-300.

Prior to the v3.0 revision, a separate digital output card (typically a Br-ZBR Z-Brick) was used to control the Kp-300. It uses a thirty position insulation displacement connector to connect to the digital outputs of the Z-Brick.

The v3.0+ Kp-300s incorporate the DMX-512 decoding found on the Z-Bricks into the Kp-300 itself. By connecting via DMX-512, this eliminates the need for the 30 position ribbon cable and separate Z-Brick. The DMX-512 is brought in/out through a five position screw terminal. To support the DMX-512 input, the Kp-300 adds an LED that flashes on each update via the DMX-512, a two position rotary DipSwitch which is used to set the DMX-512 address (zero-based HEXadecimal numbering, valid addresses between 00h and FFh), and a connector for the Kp-300 expansion, which can be used to add more inputs and outputs to the Kp-300. The Kp-300 requires DMX-512 that includes GilderChecksums. If receiving DMX-512 without valid checksums, the LED on the back of the Kp-300 will not flash and only the [Show Start Button LEDs](#) will follow the incoming the DMX-512. The signals like the [Show Start Button Enable Inputs](#), blocking valve enable, and automatic [HPU start/stop](#) will not work if the GilderChecksums are invalid.

The remaining connectors on the Kp-300s go to the Smart Brick System, and two are used to control the HPU and attach the fifteen safety inputs. If the Smart Brick System is mounted on the back of the Kp-300, then these two cables need only be run a few inches to their destinations.

### **A) Digital Inputs to the Kp-300 (v1.n & v2.n)**

(30 Position Ribbon Cable Connector)

### **B) DMX-512 Input to the Kp-300 (v3.0+)**

(Five Position Screw Terminal)

Whether the data is coming into the Kp-300 through a ribbon cable from a Z-Brick, or through the DMX-512 network, this connection is used to attach twenty-four digital outputs from the Smart Brick System. These control the many of the indicator LEDs and features of the Kp-300.

On the v1.n & v2.n Kp-300 Kp-300s, the 30 position ribbon cable also provides the Kp-300 its 24 vdc operating power from the Smart Brick Sys-

tem. The v3.0+ Kp-300 has a separate pair of screw terminals for attaching the 24 vdc supply.

Not surprisingly, the inputs to the Kp-300 are all compatible with the digital outputs on all of our animation control systems. In most cases the digital outputs will be coming from a Z-Brick.

The digital output from all Gilderfluke & Co, animation systems is called a 'J6' connector. It defines a forty position insulation displacement (IDS) connector and forty wire ribbon cable. In this case, the Kp-300 needs only twenty-four of the thirty-two outputs in a J6 cable. That is why the Kp-300 connector is a thirty wire '1/3 J6', The remaining eight outputs on the J6 cable can be used for any other purposes:

Wire #	Color	Bit #	Description
1	Brown		Ground
2	Red	Bit 7	<a href="#">Show Start Button #8 LED Input</a> To Kp-300
3	Orange	Bit 6	<a href="#">Show Start Button #7 LED Input</a> To Kp-300
4	Yellow	Bit 5	<a href="#">Show Start Button #6 LED Input</a> To Kp-300
5	Green	Bit 4	<a href="#">Show Start Button #5 LED Input</a> To Kp-300
6	Blue	Bit 3	<a href="#">Show Start Button #4 LED Input</a> To Kp-300
7	Violet	Bit 2	<a href="#">Show Start Button #3 LED Input</a> To Kp-300
8	Gray	Bit 1	<a href="#">Show Start Button #2 LED Input</a> To Kp-300
9	White	Bit 0	<a href="#">Show Start Button #1 LED Input</a> To Kp-300
10	Black		+ 24 Vdc Supply
11	Brown		Ground
12	Red	Bit 7	<a href="#">Show Start Button #8 Enable Input</a> To Kp-300
13	Orange	Bit 6	<a href="#">Show Start Button #7 Enable Input</a> To Kp-300
14	Yellow	Bit 5	<a href="#">Show Start Button #6 Enable Input</a> To Kp-300
15	Green	Bit 4	<a href="#">Show Start Button #5 Enable Input</a> To Kp-300
16	Blue	Bit 3	<a href="#">Show Start Button #4 Enable Input</a> To Kp-300
17	Violet	Bit 2	<a href="#">Show Start Button #3 Enable Input</a> To Kp-300
18	Gray	Bit 1	<a href="#">Show Start Button #2 Enable Input</a> To Kp-300
19	White	Bit 0	<a href="#">Show Start Button #1 Enable Input</a> To Kp-300
20	Black		+ 24 Vdc Supply
21	Brown		Ground
22	Red	Bit 7	<a href="#">Show Cycle Counter Input</a> To Kp-300
23	Orange	Bit 6	<a href="#">Blocking Valve Input</a> To Kp-300
24	Yellow	Bit 5	<a href="#">Bypass Buss #1 Input</a> To Kp-300
25	Green	Bit 4	<a href="#">Bypass Buss #2 Input</a> To Kp-300
26	Blue	Bit 3	<a href="#">E-Stop Show Running Input</a> To Kp-300
27	Violet	Bit 2	<a href="#">Remote HPU Start Input</a> To Kp-300
28	Gray	Bit 1	<a href="#">Remote HPU Stop Input</a> To Kp-300
29	White	Bit 0	<a href="#">Show Pause Reset Input</a> To Kp-300
30	Black		+ 24 Vdc Supply



## 1. Show Start Button LED Inputs

### *Eight Inputs to Kp-300*

These inputs control the LEDs that are next to each of the eight [Show Start Buttons](#). They are controlled directly by the motion control profile stored in the Smart Brick System. This allows the LEDs to be programmed on, off or flashing as desired at any point in time. They are programmed to indicate which shows are available to the operator, or to indicate which show is already running. We typically program them in a chase pattern, lighting only the valid show selections. Once a show has started, we typically program all but the selected [Show Start Button LEDs](#) off, and flash the selected show LED a few times before turning it on through the rest of the show. If any other show selection is valid while another show is running, we then flash it discretely throughout the show that is running.

Whenever a [Show Start Button LED](#) is programmed to indicate that a [Show Start Buttons](#) is valid, it is also necessary to actually enable the corresponding [Show Start Button Enable Input](#) from the Smart Brick System to make the [Show Start Buttons](#) active. If this is not done, then the [Show Start Buttons](#) will remain inactive.

## 2. Show Start Button Enable Inputs

### *Eight Inputs to Kp-300*

These inputs actually enable the [Show Start Buttons](#) on the front of the Kp-300 for starting shows. This allows the motion profile to be programmed to allow or disable different shows being played.

The Kp-300 has been designed to support up to eight shows which can be directly accessed. If more shows are needed, these [Show Start Buttons](#) can be bypassed with a Kp-100 or Kp-200 to allow access to the Smart Brick System's 255 show capacity.

Which shows are available to the user (which of these eight [Show Start Buttons](#) are enabled), is controlled as a function of the motion profile running on the Smart Brick System. Any or all of these [Show Start Buttons](#) can be enabled at any time. The LEDs next to these [Show Start Buttons](#) are also controlled as part of the motion profile. This allows the LEDs to be programmed on, off or flashing as desired at any point in time.

Typically the [Show Start Buttons](#) to call up all the shows that are loaded into Smart Brick System are programmed as active during the E-Stop and Load/Unload shows. During the main shows, typically none of them are enabled. If any are enabled, then the user can jump directly out of the currently running show and into the one(s) that have been enabled. This is sometimes used to enable a 'park' show that brings the motion base home without having to do anything as drastic as an E-Stop. Any show that is enabled while another show is running will be enabled even during a show pause. Make sure that if you are using this technique, that the show that is jumped into has the [Show Pause Reset Input](#) set for at least a few frames at the beginning. Otherwise the new show will begin running, but the Show Pause functions of the Kp-300 won't be reset (the pause LED will remain lit, and the next Show Pause event will be ignored). At the end of the pulse on the [Show Pause Reset Input](#), the Kp-300 will check for an outstanding Show Pause condition. If one still persists, then the new show will be paused.

If shows must be run in a certain order, you can program this into the motion profile stored on the Smart Brick System. An example of this would be a motion base that has separate entrance and exit doors. The main shows all lead into a show that leaves the exit doors opened<sup>16</sup>. The only show that is enabled for the operator is a short show that closes the exit doors (and maybe turns off the cabin lights) so that the system is ready to be parked or loaded with the next group of riders. The operator would start this show once he confirmed that the cabin was clear. At the end of this show another show is enabled that opens the entrance door (and turns on the cabin lights). The operator would call this up when it is time to load the next batch of riders. At the end of this short show, all the possible main shows are enabled for the operators. One of these would be started once all the riders were safely seated (and the belts logged, if needed). All of these short shows can have accompanying audio and/or video if it has been programmed video player.

The Br-ANA Analog Output Smart Brick can be configured to do an Ease In whenever the Smart Brick System jumps from one show to

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<sup>16</sup> If the motion base has exit doors that must be operated only when the operator deems it safe, all the main shows can leave only the button to jump to a short show that opens the doors enabled for the operators.

another. This makes it safe for you to configure the system to jump between shows as described above.

If you need show start switches that are external to the Kp-300, just attach up to eight momentary switches between the eight [Show Start Show Start Button Enable Input](#) and the Show Select Outputs from the Kp-300. Any closure of these switches will be treated exactly as if the operator had pressed the [Show Start Buttons](#) on the front of the Kp-300. You can even add [Show Start Button LEDs](#) to these [Show Start Buttons](#) by attaching LEDs (with suitable resistors) in parallel with the [Show Start Button LEDs](#). You can also attach a Kp-100 or Kp-200 to the Show Select Outputs if you need to access more than eight shows from the Kp-300. Please contact the factory for details on how this is done.

### **3. Show Cycle Counter Advance Input to Kp-300**

This input is programmed in the motion control profile stored in the Smart Brick System to advance the Show Cycle Counter. The count on the LCD counter will advance by one if the Kp-300 is not currently in any type of E-Stop condition and the HPU is running, as indicated by 24 vdc being received on the [HPU Running Input](#).

The Show Cycle Count Advance Input pulse is typically programmed to take place towards the end of the motion base program. This lets a show which is aborted for any reason (or run without the HPU turned on) not be counted.

The LCD module that displays the current show cycle count permanently stores the count each time it is advanced. The count will be retained even if power is removed from the Kp-300. Please contact the Gilderfluke & Co. factory if you need a resettable cycle counter.

### **4. Blocking Valve Input to Kp-300**

A blocking valve is a secondary digital valve that 'blocks' the normal servo valves on a hydraulic motion base. These valves are always installed so that they only allow the servos to operate the motion base when power is applied them. Orifices (usually fixed) allow the oil to drain out of the cylinders so that gravity will lower the motion base when power is removed. This so that if there is a power failure or any other error condition, the motion base will park itself safely. In most

motion base applications, the power is removed from the blocking valves during the Load/Unload times so that there is no possibility of the motion base moving while riders are walking in and out.

This input is used for motion profile stored in the Smart Brick System to request that the blocking valve attached to the motion base be turned 'on' to allow the motion base to move. Unless the Kp-300 is receiving an active [HPU Running Input](#) and the Kp-300 is not in an E-Stop condition, the [Blocking Valve Input](#) from the Smart Brick System will not be passed through to the [Blocking Valve Output](#).

## **5. Bypass Buss #1 Input to Kp-300**

## **6. Bypass Buss #2 Input to Kp-300**

These inputs are used by the motion control profile to bypass some or all of the Safety inputs which have been configured to create an E-Stop or Show Pause. Typical examples of the use of the [bypass buss](#) are:

- a) HPU Startup/Shutdown: If the HPU is started and stopped as part of the motion profile, there will usually be a time just after it is started and a time after it is stopped where any HPU pressure sensors inputs will need to be bypassed. Do this by programming the [Bypass Buss](#) you are using and [Remote HPU Start Input](#) to be active at the beginning of the show. The [Bypass Buss](#) needs to be active for the time it takes for the HPU to build up pressure. If the pressure doesn't come up during the time allotted, the Kp-300 will automatically trigger an error condition (either E-Stop or Show Pause, as configured).

If the HPU is to be turned off at the end of the show, then the [Bypass Buss](#) which is being used would be programmed active along with a pulse on the [Remote HPU Stop Input](#). This allows the HPU to be stopped without triggering an error condition. If configured to trigger an E-Stop, the [Bypass Buss](#) may also need to be programmed active during the E-Stop and Load/Unload shows so that the HPU's low pressure won't trigger an error during these shows when the HPU is off.

- b) Door Sensors: If the door or floor mat sensors inputs are set to trigger an E-Stop, they will need to be bypassed during the

E-Stop and Load Unload shows. This is because although you want these inputs to trigger an error while the motion base is in motion, you don't want this to trigger an E-Stop when the doors are opened for the passengers to be loaded and unloaded.

- c) Electric Motion Bases and other Installations that don't use the Kp-300 [Blocking Valve Output](#): If you don't want to allow shows to be run if there is an E-Stop condition present, you can configure one of the two [bypass busses](#) to momentarily (for just one frame) bypass all the possible error inputs at the very start of all shows<sup>17</sup>. At the end of the [bypass buss](#) pulse, any error conditions that remain will trigger the E-Stop to keep even the video and audio from running. This technique should be used in applications that don't use the [Blocking Valve Output](#). Typical of these are most electric motion base installations.

If you are using the Seat Belt Logging features of the Kp-300, be sure you don't configure the Kp-300 to bypass any inputs that are to be logged during the time during which they need to be logged. Bypassing an input will convince the Kp-300 that the inputs are in the 'safe' position, and so they will not be logged as 'unoccupied'.

The Show Pause functions are usually disabled during the E-Stop and Load/Unload shows by the [Show Pause Reset Input](#) from the Smart Brick System. Inputs that trigger a Show Pause are usually not needed during the E-Stop and Load/Unload shows anyway, so there is no need to bypass them separately during these shows.

### 3) E-Stop Show Running input to Kp-300

This input is used by the motion control profile to indicate that an E-Stop Show is running. The [E-Stop Show Running](#) output is normally only programmed active during the E-Stop Show, and is used reset one of the Kp-300's onboard latches to allow the HPU to be started and the E-Stop conditions to be cleared.

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<sup>17</sup> This technique is flexible enough that you can even leave it out of any maintenance shows that you want to be able to run without motion.

#### 4) Remote HPU Start Input to Kp-300

This input is used by the motion control profile on the Smart Brick System to commands the HPU to start. This is an optional feature. If you don't want the HPU to be started and stopped automatically, just don't use it.

The [Remote HPH Start Input](#) parallels the [HPU Start button](#) on the front of the Kp-300. If the HPU is being forced off by a [HPU Stop Buss](#) error, the [HPU Start button](#) or [Remote HPU Start Input](#) cannot override the error.

Any of the 'stop' inputs take precedence over any of the 'start' inputs. You can use an active [Remote HPU Stop Input](#) in the motion profile stored on the Smart Brick System to keep the operator or [Remote HPU Start Input](#) from starting the HPU.

#### 5) Remote HPU Stop Input to Kp-300

This input is used by the motion control profile on the Smart Brick System to commands the HPU to stop. This is an optional feature. If you don't want the HPU to be started and stopped automatically, just don't use it.

The [Remote HPH Start Input](#) parallels the [HPU Start button](#) on the front of the Kp-300. If the HPU is being forced off by a [HPU Stop Buss](#) error, the [HPU Start button](#) or [Remote HPU Start Input](#) cannot override the error.

Any of the 'stop' inputs take precedence over any of the 'start' inputs. You can use an active [Remote HPU Stop Input](#) in the motion profile stored on the Smart Brick System to keep the operator or [Remote HPU Start Input](#) from starting the HPU.

#### 6) Show Pause Reset Input to Kp-300

This input is used by the motion control profile on the Smart Brick System to reset or disable the Kp-300 Show Pause functions. This is normally programmed active only during the E-Stop and Load/Unload shows.

Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System is active. When this input is active, the safety inputs can be logged by either pressing the [Log Belts Button](#) or activating the [Remote Log Belts Input](#) by pressing the [Remote Log Belts Button\(s\)](#) attached to it.

If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.



Input logging actually takes place at the instant that the [Log Belts Button](#), [Remote Log Belts Input](#), or [Show Pause Reset Input](#) are released. The LED next to the [Log Belts Button](#) will light whenever the seat belts are being logged.

## **G) 24 vdc Power Input to the Kp-300 (v3.0+ Only)**

### **(TWO POSITION SCREW TERMINAL)**

Connect the regulated 24 vdc used to power the Kp-300 to these two terminals. The Kp-300 usually shares power with the Smart Brick System that runs it.

## **H) Kp-300 Expansion for the Kp-300 (v3.0+ Only)**

### **(16 POSITION RIBBON CABLE CONNECTOR)**

The Kp-300 can be used to add up to fifty-six additional optically isolated inputs, and up to fourteen additional outputs. It can be factory programmed to control entry ramps and bridges for motion bases, addition seat belt and occupancy sensors.

## **I) ‘Alarm’ Output (v3.0+ Only)**

### **(TWO POSITION SCREW TERMINAL)**

This output provides a 24 vdc signal when [DipSwitch #6](#), [DipSwitch #7](#) or [DipSwitch #8](#) are switched on to give an alarm on the activation of the [E-stop Buss](#) ([E-Stop Buss LED](#) is lit), [HPU-Stop Buss](#) ([HPU-Stop LED](#) is lit), or [Pause Buss](#) ([Show Pause Buss LED](#) is lit). This can be used to drive an audio annunciator like a Sonalert module directly (up to 24 vdc at 150 ma continuous). Heavier loads (like an alarm bell) will require a solid state relay between this output and the bell.



# Kp-300 Outputs to Smart Brick Brain

## (20 POSITION RIBBON CABLE CONNECTOR)

This connector is used to send messages and show requests from the Kp-300 to the Smart Brick Brain. More information on these connection can be found in the Smart Brick System manual sections on the Rack Mounted Smart Brick Brain:

Wire #	Color	Bit #	Description
1	Brown	n/a	Ground
2	Red	Bit 7	<a href="#">Show Select Output #8</a>
3	Orange	Bit 6	<a href="#">Show Select Output #7</a>
4	Yellow	Bit 5	<a href="#">Show Select Output #6</a>
5	Green	Bit 4	<a href="#">Show Select Output #5</a>
6	Blue	Bit 3	<a href="#">Show Select Output #4</a>
7	Violet	Bit 2	<a href="#">Show Select Output #3</a>
8	Gray	Bit 1	<a href="#">Show Select Output #2</a>
9	White	Bit 0	<a href="#">Show Select Output #1</a>
10	Black	n/a	+ 24 vdc Supply to Smart Brick Brain 1/4 J6 Input
11	Brown	n/a	(not used on Kp-300)
12	Red	n/a	(not used on Kp-300)
13	Orange	n/a	(not used on Kp-300)
14	Yellow	n/a	(not used on Kp-300)
15	Green	n/a	(not used on Kp-300)
16	Blue	n/a	(not used on Kp-300)
17	Violet	Pause	<a href="#">- Green 'Pause' Output to Smart Brick Brain</a>
18	Gray	Pause	<a href="#">+ Green 'Pause' Output to Smart Brick Brain</a>
19	White	E-Stop	<a href="#">- Blue 'E-Stop' Output to Smart Brick Brain</a>
20	Black	E-Stop	<a href="#">+ Blue 'E-Stop' Output to Smart Brick Brain</a>

### 1) Show Select Outputs from Kp-300

These outputs are used to tell the Smart Brick Brain which show it should play. They can only be activated if the corresponding [Show Start Enable Inputs](#) have been activated by the program stored in the Smart Brick System.

If you need show start switches that are external to the Kp-300, just attach up to eight momentary switches between the eight [Show Start Enable Inputs](#) and the Show Select Outputs from the Kp-300. Any closure of these switches will be treated exactly as if the operator had pressed the [Show Start Buttons](#) on the front of the Kp-300. You can even add [Show Start Button LEDs](#) to these external [Show Start Buttons](#) by attaching LEDs (with suitable resistors) in parallel with the [Show Start Button LEDs](#). You can also attach a Kp-100 or Kp-200 to the Show Select Outputs if you need to access more than eight shows from the Kp-300. Please contact the factory for details on how this is done.

## 1) Green 'Pause' Output from Kp-300

This output is activated when there is a Show Pause event on the Kp-300. This event causes the [Pause Buss](#) to go active, which causes the [Show Pause Buss LED](#) to be lit. The Green 'Pause' Output from Kp-300 is used to tell the Smart Brick Brain to initiate a Show Pause through its [Green 'Pause' Output](#). The Smart Brick Brain input must be configured to pause the currently running show on a closure on this input<sup>18</sup>. When a show is 'continued', the signal is dropped on the [Green 'Pause' Output](#) to the Smart Brick Brain. This input must be configured to continue the currently running show on a opening on this input.

Once a show has been paused, the only two ways to 'continue' a show are to:

- a) Send an active signal from the Smart Brick System to the Kp-300's [Show Pause Reset Input](#).
- b) Once the condition that caused the Show Pause has been removed, the operator can press the [Show Continue button](#).

## 2) Blue 'E-Stop' Output from Kp-300

This output is activated when there is an E-Stop event on the Kp-300. It is used to tell the Smart Brick Brain to start playing the E-Stop show. The Smart Brick Brain must be configured to select and start the E-Stop show when it receives a closure on this input.

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<sup>18</sup> In some applications, you may want to call up a different show using this input, instead of pausing the current show.

# J1 Inputs to the Kp-300

## (FEMALE DB-25 CONNECTOR)

This connector is used for the first ten Error Inputs to the Kp-300.

J1:1 (-), 14 (+):	Error Input to Kp-300 #1
J1:2 (-), 15 (+):	Error Input to Kp-300 #2
J1:3 (-), 16 (+):	Error Input to Kp-300 #3
J1:4 (-), 17 (+):	Error Input to Kp-300 #4
J1:5 (-), 18 (+):	Error Input to Kp-300 #5
J1:6 (-), 19 (+):	Error Input to Kp-300 #6
J1:7 (-), 20 (+):	Error Input to Kp-300 #7
J1:8 (-), 21 (+):	Error Input to Kp-300 #8
J1:9 (-), 22 (+):	Error Input to Kp-300 #9
J1:10 (-), 23 (+):	Error Input to Kp-300 #10
J1: 11, 12, 13:	Ground
J1: 24, 25:	+ 24 vdc

Each of the error inputs are optoisolated and can be configured to be run from the same 24 vdc supply as the Kp-300, or from an external source of 24 vdc. All of these inputs 'fail safe'. This is to say that they are triggered by an opening, and would also be triggered if the wires running to them broke open. Each input can be configured to cause the following on opening:

- a) E-Stop
- b) Pause a running show
- c) Force off the HPU as long as it is opened.

Other jumpers allow these inputs to be logged as temporarily inactive, or bypassed temporarily from the motion control profile stored on the Smart Brick System.

The 24 vdc supply and ground lines can be used to power sensors or other devices. They are wired in parallel with the 24 vdc connector on J2. Between them, they are PTC fused for 1 amp of current.

# J2 Inputs & Outputs to the Kp-300

## (MALE DB-25 CONNECTOR)

This connector contains the remaining five Error Inputs, as well as the [HPU Run Output](#) signal that turns the HPU on and off and the [Remote Log Belts Input](#).

J2:1 (-), 14 (+):	<a href="#">HPU Stopped Input</a> to Kp-300 (24 vdc from HPU)
J2:2 (-), 15 (+):	<a href="#">HPU Running Input</a> to Kp-300 (24 vdc from HPU)
J2:3 (-), 16 (+):	<a href="#">Blocking Valve Output</a> (24 vdc, 150ma output)
J2:4 (-), 17 (+):	<a href="#">HPU Run Output</a> (24 vdc, 150ma output)
J2:5 (-), 18 (+):	<a href="#">Remote Belt Log Button</a> (24 vdc optoisolated input)
J2:6 (-), 19 (+):	Error Input to Kp-300 #15
J2:7 (-), 20 (+):	Error Input to Kp-300 #14
J2:8 (-), 21 (+):	Error Input to Kp-300 #13
J2:9 (-), 22 (+):	Error Input to Kp-300 #12
J2:10 (-), 23 (+):	Error Input to Kp-300 #11
J2: 11, 12, 13:	Ground
J2: 24, 25:	+ 24 vdc

### 1) HPU Stopped Input to Kp-300

This input is used to light the [HPU Stopped LED](#). This LED shows that the Hydraulic Power Unit (HPU) is not running. Unlike the [HPU Running Input](#), this input is not used for any other purpose than lighting the [HPU Stopped LED](#).

This input should be fed 24 vdc from the HPU controller whenever the HPU is not running.

To help keep shows from being started when the HPU has been started by its local Hand/Off/Auto switch, the [HPU Stopped Input](#) and [HPU Running Input](#) signals are often routed through the 'Auto' position on the switch. If the switch isn't in the 'Auto' position, the [HPU Stopped](#) and [HPU Running LEDs](#) won't light and the [Blocking Valve output](#) won't be enabled.

If there is no HPU in your application, or there is no 'stopped' output from your HPU, you can turn on [DipSwitch #1](#). The '[HPU Stopped](#)' LED will then light whenever the Kp-300 thinks that the HPU is not running.

### 2) HPU Running Input to Kp-300

This input is used to light the [HPU Running LED](#) and qualify the [Show Cycle Counter](#) and [Blocking Valve Output](#). This signal normally comes from the HPU. The [HPU Running LED](#) lights to show that the Hydraulic Power Unit (HPU) is running.

This input should be fed 24 vdc from the HPU controller whenever the HPU is running. Unless this signal is received by the Kp-300, the [Blocking Valve Output](#) will never turn on and the Show Cycle Counter will not advance.

To help keep shows from being run when the HPU has been started by its local Hand/Off/Auto switch, the [HPU Stopped Input](#) and [HPU Running Input](#) signals are often routed through the 'Auto' position on the switch. If the switch isn't in the 'Auto' position, the [HPU Stopped LED](#) and [HPU Running LED](#) won't light and the Blocking valve won't be enabled.

If there is no HPU in your application, or there is no 'running' output from your HPU, you can turn on [DipSwitch #2](#). The '[HPU Running](#)' LED will then light whenever the Kp-300 thinks that the HPU is not running.

### 3) Blocking Valve Output from Kp-300

A blocking valve is a secondary digital valve that blocks the normal servo valves on a hydraulic motion base. These valves are always installed so that they only allow the servos to operate the motion base when power is applied them. Orifices (usually fixed) allow the oil to drain out of the cylinders so that gravity and/or remaining accumulator pressure will lower the motion base when power is removed. This so that if there is a power failure or any other error condition, the motion base will park itself safely. In most motion base applications, the power is removed from the blocking valves during the Load/Unload times so that there is no possibility of the motion base moving while riders are walking in and out.

This output is used to control the blocking valve attached to the motion base. The output capacity of this output is 150 ma. at 24 vdc. Since the solenoid valves used for blocking valves usually draw far more current than this, a solid state relay will most likely be required on this output. If you are using one of Gilderfluke's 'Electronic Blocking Valves', you will not need to use a relay.

The blocking valve is programmed from the motion profile stored on the Smart Brick System. Unless the Kp-300 is receiving an active [HPU Running Input](#) and the Kp-300 is not in an E-Stop condition, the [Blocking Valve Input](#) from the Smart Brick System will not be passed through to the [Blocking Valve Output](#).

### 4) HPU Run Output from Kp-300

This output from the Kp-300 is turned on when the operator presses the [HPU Start Button](#) or the motion profile in on the Smart Brick System has the [Remote HPU Start Input](#) programmed active. This output can not be turned on if the [Remote HPU Stop Input](#) from the Smart Brick System is active or there is an active

error input which has been configured to force the HPU off. If the HPU is running, on the beginning of any E-Stop event, this output will be forced off.

This output normally goes to the start relay on the HPU. When it is active, the HPU should begin running. The capacity of this output is 150 ma continuous at 24 vdc. Some applications may require a relay be added on this output if it controls the motor contactors directly and it draws too much current.

If there is no HPU in your application, you may want to connect this output to the [HPU Running Input](#). By doing this, any HPU Start command will be echoed right back to the Kp-300 as a [HPU Running Input](#). If you want to get really fancy, you can connect a small relay to the [HPU Start output](#), and use the contacts to turn on the and off both the [HPU Stopped Input](#) and [HPU Running Input](#) as though there were a HPU attached.

## 5) Remote Log Belts Input to Kp-300

This input is usually attached to one or more [Remote Log Belts Button\(s\)](#) located inside the ride vehicle cabin. This forces the operators to actually go into the cabin and count the heads of the riders before logging any seats as unoccupied. Unlike the fifteen Error Inputs, this signal needs to be wired to normally open switch(s). This is because the open (inactive) condition of this input is a safer way to fail than would be a failure into active mode.

Seat belts can be logged at any time that the [Show Pause Reset Input](#) from the Smart Brick System is active. When this input is active, the safety inputs can be logged by either pressing the [Log Belts Button](#) or activating the [Remote Log Belts Input](#) by pressing [Remote Log Belts Button\(s\)](#) attached to it. If you want to automatically log belts from the motion profile, just set the [Remote Log Belts Input](#) for Internal Power and attach the two wires for this input together so it is always active. Whenever the [Show Pause Reset Input](#) is programmed active, the inputs that are set to be logged will automatically be logged.

Input logging actually takes place at the instant that the [Log Belts Button](#), [Log Belts Remote Input](#), or [Show Pause Reset Input](#) are released. The LED next to the [Log Belts Button](#) will light whenever the seat belts are being logged.

## 6) Error Inputs Eleven Through Fifteen

*(Five Inputs)*

The five error inputs are identical to the ten found on J1. Because of their proximity to the controls that are going to the HPU, any error signals from level sen-

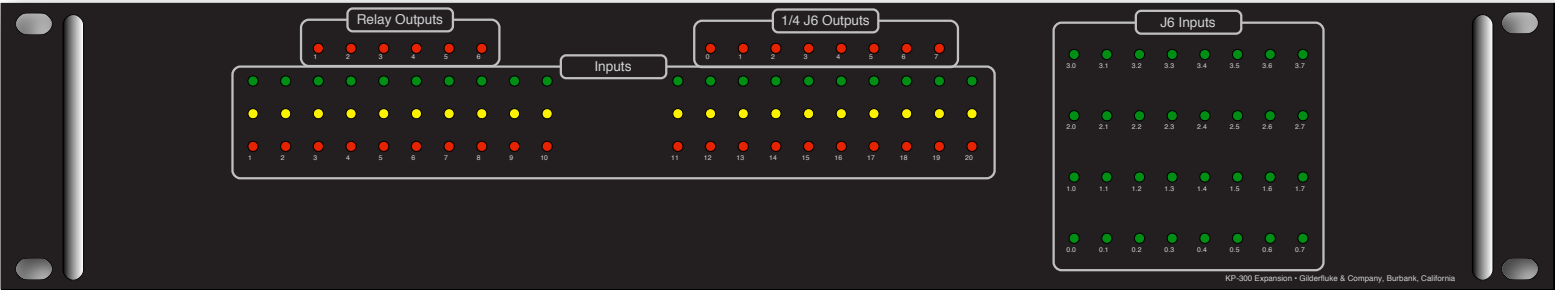
sors, over temperature warnings, and other sensors on the HPU are often wired to these inputs.

Each of these error inputs are optoisolated and can be configured to be run from the same 24 vdc supply as the Kp-300, or from an external source of 24 vdc. All of these inputs 'fail safe'. This is to say that they are triggered by an opening, and would also be triggered if the wires running to them broke open. Each input can be configured to cause the following on opening:

- a) E-Stop
- b) Pause a running show
- c) Force off the HPU as long as it is opened.

Other jumpers allow these inputs to be logged as temporarily inactive, or bypassed temporarily from the motion control profile stored on the Smart Brick System.





# Kp-300 Expansion

The Kp-300 Expansion is a 3.5" (2U), 19" rack mounted panel that can be used to add additional inputs and outputs to those found on the standard Kp-300:

- 1) Eight medium current (1/4 J6 pinout)
- 2) Six High current optoisolated outputs (Six 2 position screw terminals)
- 3) Sixteen uncommitted optoisolated inputs (two DB-25 females)
- 4) Thirty-two optoisolated inputs (one J6 male header)
- 5) Sixteen uncommitted Red indicator LEDs
- 6) Sixteen uncommitted Yellow indicator LEDs

Unlike the Kp-300, the Kp-300 Expansion must be factory configured for your application. The Kp-300 Expansion has a large CPLD on it, so it is possible to configure it for some very complex logic. It can be configured to control ramps and doors, provide the logic for occupancy sensors and seat belts, or just about anything else you can think of.

## 1) Eight Medium Current Outputs

### (10 POSITION 1/4 J6 SHROUDED MALE HEADER)

These eight outputs can each sink 150 ma of current at 24 vdc, or a total of 1.1 amps on all eight outputs. Whatever you are controlling should be connected between the +24 vdc Supply Output on pin #10, and the output pin (#2 through #9).

Wire #	Color	Bit #	Description
1	Brown		Ground
2	Red	Bit 7	Output #8 From Kp-300 Expansion
3	Orange	Bit 6	Output #7 From Kp-300 Expansion
4	Yellow	Bit 5	Output #6 From Kp-300 Expansion
5	Green	Bit 4	Output #5 From Kp-300 Expansion
6	Blue	Bit 3	Output #4 From Kp-300 Expansion
7	Violet	Bit 2	Output #3 From Kp-300 Expansion
8	Gray	Bit 1	Output #2 From Kp-300 Expansion
9	White	Bit 0	Output #1 From Kp-300 Expansion
10	Black		+ 24 Vdc Supply

## 2) Six High Current Optoisolated Outputs

### (SIX 2 POSITION SCREW TERMINALS)

These six optoisolated outputs can each sink one amp of current each, or a total of 1.1 amps on all eight outputs. Whatever you are controlling should be connected between the two pins of the screw terminals. The polarity is shown on the PCB.

## 3) J1 Inputs To The Kp-300 Expansion

### (TWO FEMALE DB-25 CONNECTORS)

One connector is used for the first ten Inputs to the Kp-300 Expansion.

J1:1 (-), 14 (+):	Error Input to Kp-300 Expansion #1
J1:2 (-), 15 (+):	Error Input to Kp-300 Expansion #2
J1:3 (-), 16 (+):	Error Input to Kp-300 Expansion #3
J1:4 (-), 17 (+):	Error Input to Kp-300 Expansion #4
J1:5 (-), 18 (+):	Error Input to Kp-300 Expansion #5
J1:6 (-), 19 (+):	Error Input to Kp-300 Expansion #6
J1:7 (-), 20 (+):	Error Input to Kp-300 Expansion #7
J1:8 (-), 21 (+):	Error Input to Kp-300 Expansion #8
J1:9 (-), 22 (+):	Error Input to Kp-300 Expansion #9
J1:10 (-), 23 (+):	Error Input to Kp-300 Expansion #10
J1: 11, 12, 13:	Ground
J1: 24, 25:	+ 24 vdc

The other connector is used for the second ten Inputs to the Kp-300 Expansion.

J1:1 (-), 14 (+):	Error Input to Kp-300 Expansion #11
J1:2 (-), 15 (+):	Error Input to Kp-300 Expansion #12
J1:3 (-), 16 (+):	Error Input to Kp-300 Expansion #13
J1:4 (-), 17 (+):	Error Input to Kp-300 Expansion #14
J1:5 (-), 18 (+):	Error Input to Kp-300 Expansion #15
J1:6 (-), 19 (+):	Error Input to Kp-300 Expansion #16
J1:7 (-), 20 (+):	Error Input to Kp-300 Expansion #17
J1:8 (-), 21 (+):	Error Input to Kp-300 Expansion #18
J1:9 (-), 22 (+):	Error Input to Kp-300 Expansion #19
J1:10 (-), 23 (+):	Error Input to Kp-300 Expansion #20
J1: 11, 12, 13:	Ground
J1: 24, 25:	+ 24 vdc

Each of the error inputs are optoisolated and can be configured to be run from the same 24 vdc supply as the Kp-300 Expansion, or from an external source of 24 vdc. All of these inputs 'fail safe'. This is to say that they are triggered by an opening, and would also be triggered if the wires running to them broke open.

The 24 vdc supply and ground lines can be used to power sensors or other devices. They are PTC fused for 1.1 amp of current.

#### 4) Thirty-two Optoisolated Inputs To The Kp-300 Expansion

##### (40 POSITION J6 SHROUDED MALE HEADER)

This connector is used for thirty-two more optically isolated Inputs to the Kp-300 Expansion. You must provide power to this input on the '+24 vdc Supply' pins, and ground the inputs to the same power supply to make them active.

Wire #	Color	Bit #	Description
1	Brown		Ground
2	Red	Bit 7	Error Input #8 To Kp-300 Expansion
3	Orange	Bit 6	Error Input #7 To Kp-300 Expansion
4	Yellow	Bit 5	Error Input #6 To Kp-300 Expansion
5	Green	Bit 4	Error Input #5 To Kp-300 Expansion
6	Blue	Bit 3	Error Input #4 To Kp-300 Expansion
7	Violet	Bit 2	Error Input #3 To Kp-300 Expansion
8	Gray	Bit 1	Error Input #2 To Kp-300 Expansion
9	White	Bit 0	Error Input #1 To Kp-300 Expansion
10	Black		+ 24 Vdc Supply
11	Brown		Ground
12	Red	Bit 7	Error Input #16 To Kp-300 Expansion
13	Orange	Bit 6	Error Input #15 To Kp-300 Expansion
14	Yellow	Bit 5	Error Input #14 To Kp-300 Expansion
15	Green	Bit 4	Error Input #13 To Kp-300 Expansion
16	Blue	Bit 3	Error Input #12 To Kp-300 Expansion
17	Violet	Bit 2	Error Input #11 To Kp-300 Expansion
18	Gray	Bit 1	Error Input #10 To Kp-300 Expansion
19	White	Bit 0	Error Input #9 To Kp-300 Expansion
20	Black		+ 24 Vdc Supply
21	Brown		Ground
22	Red	Bit 7	Error Input #24 To Kp-300 Expansion
23	Orange	Bit 6	Error Input #23 To Kp-300 Expansion
24	Yellow	Bit 5	Error Input #22 To Kp-300 Expansion
25	Green	Bit 4	Error Input #21 To Kp-300 Expansion
26	Blue	Bit 3	Error Input #20 To Kp-300 Expansion
27	Violet	Bit 2	Error Input #19 To Kp-300 Expansion
28	Gray	Bit 1	Error Input #18 To Kp-300 Expansion
29	White	Bit 0	Error Input #17 To Kp-300 Expansion
30	Black		+ 24 Vdc Supply
31	Brown		Ground
32	Red	Bit 7	Error Input #32 To Kp-300 Expansion
33	Orange	Bit 6	Error Input #31 To Kp-300 Expansion
34	Yellow	Bit 5	Error Input #30 To Kp-300 Expansion

35	Green	Bit 4	Error Input #29 To Kp-300 Expansion
36	Blue	Bit 3	Error Input #28 To Kp-300 Expansion
37	Violet	Bit 2	Error Input #27 To Kp-300 Expansion
38	Gray	Bit 1	Error Input #26 To Kp-300 Expansion
39	White	Bit 0	Error Input #25 To Kp-300 Expansion
40	Black		+ 24 Vdc Supply

## Kp-300 Installation/Best Practices

The Kp-300 is an operator panel, and with the addition of the Br-Brain4 and card cage on its back, it can be the entire control system for a motion base or other attraction. For motion bases, the Kp-300 is often mounted on a pedestal adjacent to the entrance to the attraction. Pre-made pedestals are available from several 19" rack manufacturers. You usually want to place the pedestal in a location where the operator can see the doors and guest as they enter and exit the attraction. For museum shows and other types of animated shows, the Kp-300 can be mounted on the operator's console, or in a 19" rack somewhere in a back room.

Because of the cable to the LCD on the front of the Kp-300 to the Br-Brain4, the Br-Brain4 is almost always mounted as close as possible to the Kp-300. This is usually in the card cage mounted on the back of the Kp-300.

The cards that provide the analog outputs (usually a Br-ANA or DAC-Quad) and digital outputs (usually a br-ZBR Z-Brick, Pb-DMX/nn, Br-miniBrick8, or other card) for the motion base can also be mounted right on the back of the Kp-300, but depending on your installation, this may not be the most advantageous place to mount these other cards.

Whether the other cards are mounted right on the back of the Kp-300 or a mile away, they are all networked together via a single DMX-512 cable (a small shielded, twisted pair of wires, connected point-to-point between all the devices on the network). This means that these other cards can just as easily be mounted close to whatever they are controlling. An example of this would be in a 3-DOF motion base. A small box under the base near to the rams could hold a DAC-Quad and EFB-Quad to control the base's rams. For controlling the video playback in the capsule, the dimmers for the lights, Pb-DMX/32 for the 4D effects and video players can be located right in the capsule. Instead a dozens of cables running into the capsule, all that is need is a DMX-512 cable and the cable for power.

The two main connectors on the Kp-300 for the safety inputs, HPU control and blocking valves are through two standard DB-25 connectors ([J1](#) and [J2](#)). Typically you will use a pair of off-the-shelf DB-25 male/female cables plugged into the back of the Kp-300, with standard DB-25 to screw terminals adapters (one male for [J1](#), one female for [J2](#)) under the base for breaking out the wires and connecting to the [blocking valves](#) (typically through a solid state relay), [HPU power](#) circuitry (again, through a solid state relay) and [HPU running](#) and [HPU stopped outputs](#) and any door, seatbelt and other safety switches. Unused inputs must be jumpered so that they don't cause error conditions.



## HEXadecimal to Decimal to Percentage

The following chart shows decimal, HEXadecimal, and a few percentage equivalents to aid you when you need to convert between numbering bases:

decimal	HEX	ASCII	%	decimal	HEX	ASCII	%	decimal	HEX	ASCII	%	decimal	HEX	ASCII	%
00	00	null	0	64	40	@	25%	128	80	(null)	50%	192	C0	(@)	75%
1	01	soh/^A		65	41	A		129	81	(soh)		193	C1	(A)	
2	02	stx/^B		66	42	B		130	82	(stx)		194	C2	(B)	
3	03	etx/^C		67	43	C		131	83	(etx/)		195	C3	(C)	
4	04	eot/^D		68	44	D		132	84	(eot)		196	C4	(D)	
5	05	eng/^E		69	45	E		133	85	(eng)		197	C5	(E)	
6	06	ack/^F		70	46	F		134	86	(ack)		198	C6	(F)	
7	07	bell/^G		71	47	G		135	87	(bell)		199	C7	(G)	
8	08	bs/^H		72	48	H		136	88	(bs)		200	C8	(H)	
9	09	ht/^I		73	49	I		137	89	(ht)		201	C9	(I)	
10	0A	lf/^J		74	4A	J		138	8A	(lf)		202	CA	(J)	
11	0B	vt/^K		75	4B	K		139	8B	(vt)		203	CB	(K)	
12	0C	ff/^L		76	4C	L		140	8C	(ff)		204	CC	(L)	
13	0D	cr/^M		77	4D	M		141	8D	(cr)		205	CD	(M)	
14	0E	so/^N		78	4E	N		142	8E	(so)		206	CE	(N)	
15	0F	si/^O		79	4F	O		143	8F	(si)		207	CF	(O)	
16	10	dle/^P		80	50	P		144	90	(dls)		208	D0	(P)	
17	11	dc1/^Q		81	51	Q		145	91	(dc1)		209	D1	(Q)	
18	12	dc2/^R		82	52	R		146	92	(dc2)		210	D2	(R)	
19	13	dc3/^S		83	53	S		147	93	(dc3)		211	D3	(S)	
20	14	dc4/^T		84	54	T		148	94	(dc4)		212	D4	(T)	
21	15	nak/^U		85	55	U		149	95	(nak)		213	D5	(U)	
22	16	syn/^V		86	56	V		150	96	(syn)		214	D6	(V)	
23	17	etb/^W		87	57	W		151	97	(etb)		215	D7	(W)	
24	18	can/^X		88	58	X		152	98	(can)		216	D8	(X)	
25	19	em/^Y		89	59	Y		153	99	(em)		217	D9	(Y)	
26	1A	sub/^Z		90	5A	Z		154	9A	(sub)		218	DA	(Z)	
27	1B	ESC		91	5B	[		155	9B	(ESC)		219	DB	([	
28	1C	FS		92	5C	\		156	9C	(FS)		220	DC	(\)	
29	1D	GS		93	5D	]		157	9D	(GS)		221	DD	(])	
30	1E	RS		94	5E	^		158	9E	(RS)		222	DE	(^)	
31	1F	VS		95	5F	`		159	9F	(VS)		223	DF	(`)	
32	20	SP	12.5%	96	60	`	37.5%	160	A0	(SP)	62.5%	224	E0	(`)	87.5%
33	21	!		97	61	a		161	A1	(!)		225	E1	(a)	
34	22	"		98	62	b		162	A2	(")		226	E2	(b)	
35	23	#		99	63	c		163	A3	(#)		227	E3	(c)	
36	24	\$		100	64	d		164	A4	(\$)		228	E4	(d)	
37	25	%		101	65	e		165	A5	(%)		229	E5	(e)	
38	26	&		102	66	f		166	A6	(&)		230	E6	(f)	
39	27	'		103	67	g		167	A7	(')		231	E7	(g)	
40	28	(		104	68	h		168	A8	(())		232	E8	(h)	
41	29	)		105	69	i		169	A9	(())		233	E9	(i)	
42	2A	*		106	6A	j		170	AA	(*)		234	EA	(j)	
43	2B	+		107	6B	k		171	AB	(+)		235	EB	(k)	
44	2C	,		108	6C	l		172	AC	(,)		236	EC	(l)	
45	2D	-		109	6D	m		173	AD	(-)		237	ED	(m)	
46	2E	.		110	6E	n		174	AE	(.)		238	EE	(n)	
47	2F	/		111	6F	o		175	AF	(/)		239	EF	(o)	
48	30	0		112	70	p		176	B0	(0)		240	F0	(p)	
49	31	1		113	71	q		177	B1	(1)		241	F1	(q)	
50	32	2		114	72	r		178	B2	(2)		242	F2	(r)	
51	33	3		115	73	s		179	B3	(3)		243	F3	(s)	
52	34	4		116	74	t		180	B4	(4)		244	F4	(t)	
53	35	5		117	75	u		181	B5	(5)		245	F5	(u)	
54	36	6		118	76	v		182	B6	(6)		246	F6	(v)	
55	37	7		119	77	w		183	B7	(7)		247	F7	(w)	
56	38	8		120	78	x		184	B8	(8)		248	F8	(x)	
57	39	9		121	79	y		185	B9	(9)		249	F9	(y)	
58	3A	:		122	7A	z		186	BA	(:)		250	FA	(z)	
59	3B	;		123	7B			187	BB	(;)		251	FB	(;)	
60	3C	<		124	7C			188	BC	(<)		252	FC	(<)	
61	3D	=		125	7D	l		189	BD	(=)		253	FD	(l)	
62	3E	>		126	7E	~		190	BE	(>)		254	FE	(~)	
63	3F	?		127	7F	del		191	BF	(/)		255	FF	(del)	100%