V100314

TekEzLink™ is a unique TCP/IP based protocol allowing for easy integration of AMX and Crestron type control systems. Utilization of this protocol allows the control system to control and monitor multiple video projectors in real time without polling or the resultant taxing of the control system's processor. Another of the benefits of using TekEzLink is the ability to change a video projector without having to modify the existing control system program. In addition, is possible for up to four separate controllers to be able to simultaneous connect to a TEK 2 using the TekEzLink.

This is all made possible by using Macros for control commands and a unique mapping of feedback data from the currently loaded TekMonitors drivers. The Macro commands are configured via TekManager through utilization of TekWizard or the TekManager properties window. The feedback commands are only configurable through TekWizard from the TekEzLink button on the Device page.

If you have ever placed 10 or more video projectors on a control system, you may have noticed the control system slowing down during polling causing the touchscreen buttons to lag. Sometimes you either have to remove all polling or slow it down to about 3 to 5 minute intervals in order to reduce the lag to acceptable limits. So if a projector feedback is required, like projector mute, there is going to be long response times causing user dissatisfaction.

Using TekMonitors at your displays creates a distributed processing system offloading the projector monitoring and control from the control system to the TekMonitors. This solves the issue with the control system slowing down or long delays for feedback. Even with 50 projectors on the control system, feedback will seem like real time. The control system manages the user interface and main logic, while the TekMonitors manage the video projectors.

Since TekEzLink can have up to 4 simultaneous connections, others systems can control the TekMonitors and get feedback at the same time. For example, if a user has an iPhone App that they want to use to control the projector, and Johnson Controls needs to monitor the occupancy sensor for HVAC or lighting control, having the extra connections makes this possible.

Creating TekEzLink feedback elements

Creating TekEzLink feedback elements is performed in TekWizard on the Device page. After you select the device driver(s), click-on the TekEzLink button and drag the items you want to monitor from the Commands list to the Feedback list. Each feedback element is assigned a number enumerated 1 through n. Use the Up, Down and Delete operation buttons to modify the list. Normally you only need the on state for feedback. For display power there are 3 states, Standby, Off and On. Using these three states you can create a warm up or cool down timer. You can use the Report button on the Finish page to display a list of these commands that can be used in external programs.
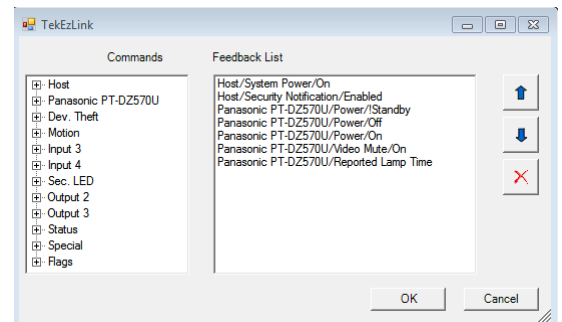

If you need to change the projector driver, you must make certain the Macros and the TekEzLink feedbacks match. Make certain you printout the old list as a reference. Then locate the command you want to replace and drag it into the Feedback list. Move this new command below the old command and then delete the old command. Do the same for all other commands that need to be replaced. After all of the commands are completed, a new list can be printed and compared against the old list for change accuracy. All enumeration values must match for the feedback commands.

Creating Status feedback and Virtual command elements

This feature provides a method to monitor control system usage information and to send virtual commands to the control system. The status information is sent to the TekMonitor by the control system using the TekEzLink protocol. This information is then stored by the TekMonitor and retrieved by TekManager, where it can then be placed in database event logs for later data analysis.

Status elements are created in TekWizard on the driver page by clicking on the Status/Ctrl button. Click-on the Add button at the top and select Status (Mutually Exclusive) and then name the button. At the bottom you can name and edit the elements. A Status commands is only displayed in TekManager as the name of the element selected.
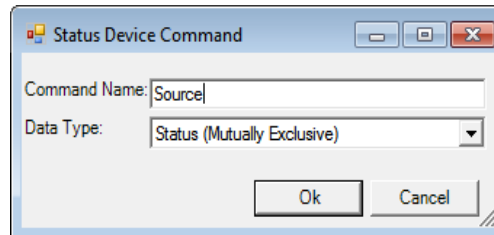
It is possible to copy elements or even copy from another template. This can be done by right-clicking on a command and selecting copy and paste. To copy from one template to another just open two TekManager programs.
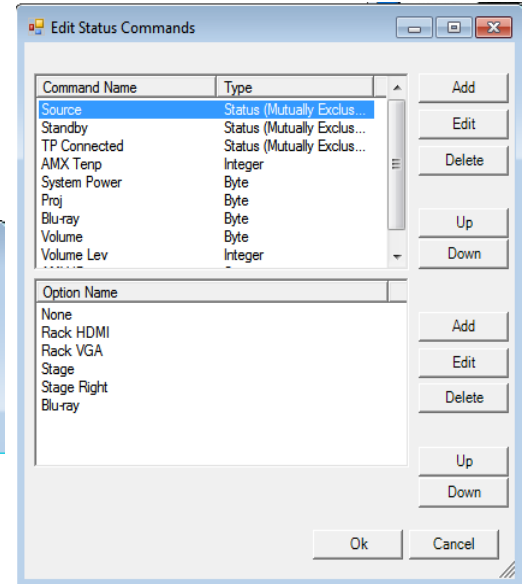
Virtual commands

These commands allow the TekMonitor to send and receive commands from the control system. Using virtual commands allows you to remotely control the control system with TekManager or TekEnterprise.

Types of virtual commands:
- Command Byte
- Integer
- String

Command Byte is similar to the Mutually Exclusive Status except buttons are created in TekManager allowing commands to be sent from TekManager to the control system. When received by the control system they can be converted to button push commands.

Integers are used for volume level or temperature values. These values can be viewed or sent by TekManager.

Strings are used to display information from the control system like IP address or help messages.

Communication Protocol

Open a TCP/IP connection using port 5075 in raw data format. All data is in ASCII format. The TEK 2 transmit data is terminated by a carriage return and line feed (\x0D\x0A). The control system data is terminated by a carriage return.

Once a connection is made, the control software responds by sending 'TEKVOX' space Name[CR]. The name can be the room name or control system name. This name is displayed in TekManager when the connection is active. It is possible to enable the requirement of the TekMonitor passcode to enable the connection of TekEzLink. When TekEzLink passcode is enable the control software responds by sending 'TEKVOX' ',' passcode space Name[CR].

Example:
Open TCP/IP Connection using port 5075
When control system detects online status or is connected send the following:
TekEzLink does not require passcode: TEKVOX AMX[CR]
TekEzLink requires passcode: TEKVOX,6373 AMX[CR]

The TEK 2 then responds with the following:
- A list of the Macro names starting with 'MACROS: ' + [CR][LF]
- A list of feedback command names starting with 'FEEDBACK:' + [CR][LF] and their enumerated values, or index value.
- A list of the current feedback values starting with 'STATUS:' + [CR][LF] and their index value ',' value.
- The last Status value ends with [CR][LF][CR][LF][LF].
- Any change in these feedback commands are then sent by the TEK 2 in the below format.
- [index value','] feedback value, [CR][LF]

Example:

In this example from the Feedback list you can link the Status values to the Feedback names.

As shown
- System is on (Index 01 = 1)
- Security is enabled (Index 02 = 1)
- Projector is off (Index 04 = 1)
- Projector Mute is off (Index 06 = 0)

Anytime there is a change of an item listed in the Feedback list the TekMonitor will seed a new status value. The control system software only needs to listen for the status vales by searching through the monitored indexes and then match to the received index. Once the index is found, use the received value to set the feedback.

```
Data sent by the TekMonitor once the connection is
established.

TEKVOX Name
MACROS:
1,Enable Security
2,Disable Security
3,Dev. Theft
4,Motion On (Open)
5,Motion Off (Closed)
6,System Off
7,Start
8,Proj Pwr
9,Source
10,Pwr. LED Off
11,Pwr. LED On
FEEDBACK:
01,Host/System Power/On
02,Host/Security/Notification/Enabled
03,Panasonic PT-DZ570UProjector/Power/Standby
04,Panasonic PT-DZ570UProjector /Power/Off
05,Panasonic PT-DZ570UProjector /Power/On
06,Panasonic PT-DZ570UProjector/Mute/On
STATUS:
01,1
02,1
03,0
04,1
05,0
06,0
 [CR][LF][LF]
```

Commands

Most of the communication performed by the control system to control a display is done using Macro commands. This is done to make control easier and in the future to make is easy to change out the display without having to change control software. To help create the Macros and Status commands for the control system a report can be generated on the Finish page in TekWizard.

Macros

Most commands can be handled by a Macro defined in the TEK 2. To send a Macro command use the following:

MACRO,#   # = 1-30 Example: Macro 1 "MACRO,1"\x0D
Do not forget the ","."

Email

Email is configured in TekWizard or in the Properties area. You can only select and Email value corresponding to a subject in the email list.

EMAIL,#   # = 1-5 Normal, 6-10 High Priority and 11-15 Security

Error

ERROR,#,String   # = 1-5

LOCATION - Returns "LOC," and the Location name
BUILDING - Returns "BUI," and the Building name
GROUP   - Returns "GRO," and the Group name
ROOM   - Returns "ROM," and the Room name
**TIME**   - Returns "TIM," and Time/Data (Hrs),(Min),(Sec),(Month),(Day),(Yr),(WeekDay)

Status Values

Status allow for usage monitoring of selected devices defined in the TEK 2. A Status values can only be sent from the control system to the TekMonitor. Status values are defined in TekWizard on the Device page in Status/Ctrl by setting a command name with option names. To send a Status command use the following:
DSCMD, Command Name Index, Option Value.
Example: Status value 1 (PC) on index 0 "DSCMD,0,1"\x0D

The first Command name has an index of 0 and the first Option name has a value of 0.
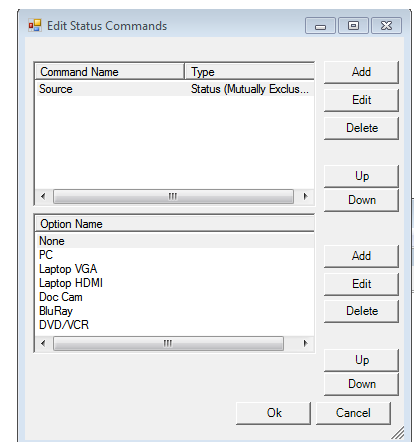
Byte Command

A Byte command is a direct command to control a port on a TEK 2. The Byte command is a hardware command that requires a port number, Index and value. See Command List below.
DBCMD, Port, Index, Value
Example: Turn on a display connected to TekSecurity
"DBCMD,2,0,2"\x0D

Integer

Integer commands are used to directly set an integer value in the TEK 2. To send an Integer command use the following:
DICMD, Port, Value. Example: Set Volume Left to 50 on Display 2 - "DICMD,3,4,50"\x0D

Command List

These commands can be set to the TekMonitor using TekEzLink instead of a Macro command.

Port values

Port	Name
0	System
2	TekSecurity COM
3	COM 2
28	TekSecurity DO-1
29	DO-2
30	DO-3

Description	Command
System Power	
Off	DBCMD,0,0,0
On	DBCMD,0,0,1
System Off Timer	
Stop	DBCMD,0,1,0
Run	DBCMD,0,1,1
Device 1 Power	
Off	DBCMD,2,0,1
On	DBCMD,2,0,2
Device 1 Mute	
Off	DBCMD,2,2,0
On	DBCMD,2,2,1
Device 1 Vol Level	
Level	DICMD,2,4,Level
Device 2 Power	
Off	DBCMD,3,0,1
On	DBCMD,3,0,2
Device 2 Mute	
Off	DBCMD,3,2,0
On	DBCMD,3,2,1
Device 2 Vol Level	
Level	DICMD,3,4,Level
Digital Output 2 = 29, 3 = 30	
Off	DBCMD,29,0,0
On	DBCMD,29,0,1
Pulse On	DBCMD,29,0,4

AMX Example

The AMX example code uses a module called TekEzLink_Mod.axs. This file handles the TekEzLink communication protocol. The commands for this module are located in TekEzLink.axi.
The demo program TEKVOX_AMX_TekEzLink_DEMO.apw can be located at
www.tekvox.com/software/TEKVOX_AMX_TekEzLink_DEMO.AXW

DEFINE_MODULE 'TekEzLink_Mod' mdlTekExLink(dvTek2, vdvTek2Cmds, vdvTek2Status, cServer, nSysPwrOnIndex, nDev1PwrIndexes, nDev1MuteOnIndex, nDev2PwrIndexes, nDev2MuteOnIndex, nWarmUpTime, nCoolDnTime, cName, cSysError)

Parameter definition

dvTek2	TCP/IP Port
vdvTek2Cmds	Virtual device to send commands named in TekEzLink.axi to the module.
vdvTek2Status	Virtual device to send feedback from the module to the main program.
cServer	The IP address of the TEK 2
nSysPwrOnIndex	Set to index location for Host/System Power/On listed in feedback for TekEzLink. Set to 0 if not used.
nDev1PwrIndexes	Assign as an array of 3 integers. Set to index location for Device 1 power listed in feedback for TekEzLink. Must set all 3 indexes (Standby, Off and On). Set all 3 to 0 if not used.
nDev1MuteOnIndex	Set to index location for Device 1 Mute On listed in feedback for TekEzLink. Set to 0 if not used.
nDev2PwrIndexes	Assign as an array of 3 integers. Set to index location for Device 1 power listed in feedback for TekEzLink. Must set all 3 indexes (Standby, Off and On). Set all 3 to 0 if not used.
nDev2MuteOnIndex	Set to index location for Device 2 Mute On listed in feedback for TekEzLink. Set to 0 if not used.
.	
nWarmUpTime	Set to how long the warm up timer needs to be.
nCoolDnTime	Set to how long the cool down timer needs to be.
cName	Set the name of the Module.
cSysError	Used to pass errors back to the main program. Set as an array size of at least 200.

Functions

SendTekByteStatusCmd (INTEGER nIndex, INTEGER nElement, INTEGER nTek2)
This function sets the element in the status at index location for a TekMonitor.
nIndex is the status location typically 0.
nElement is the position of the name start at 0.
nTek2 is the number for the TekMonitor.

SendTekByteCtrlCmd (INTEGER nIndex, INTEGER nVal, INTEGER nTek2)
This function sets the feedback element in the Byte Command at index location for a TekMonitor.

SendTekBitStatusCmd (INTEGER nIndex, INTEGER nElement, INTEGER nTek2)
This function sets the element in the bitwise Status at index location for a TekMonitor.

SendTekIntStatusCmd (INTEGER nIndex, INTEGER nVal, INTEGER nTek2)
This function sets the value for the Integer Status at index location for a TekMonitor.

SendTekStringCmd (INTEGER nIndex, CHAR cData[], INTEGER nTek2)
This function sets the string for the String Status at index location for a TekMonitor.

SendTekErrorCmd (CHAR cData[], INTEGER nTek2)
This function can send an Error string and be reported by TekManager.

SendTekMacro (INTEGER nMacro, INTEGER nTek2)
This is the most used function to control the TekMonitor. Set the Macro number to execute in the TekMonitor.

SendTekEmail (INTEGER nVal, INTEGER nTek2)
Use this function to send a predefined Email through a TekMonitor.

SendTekCmd (INTEGER nCmd, INTEGER nTek2)
This function sends a predefined list of commands to a TekMonitor.

Crestron Example

For Crestron there is a module called TekEzLink and allows you to set the IP address of the TekMonitor and the indexes for the defined TekEzLink feedbacks. Using the report generated by TekWizard enter the index into its matching name. Set all indexes that are not being used to 0. For indexes that do not have names in this module you can use the Extra listed ones. The Outputs signals are matched to top listed index and when a value is received that matches an index, the output signal will change. www.tekvox.com/software/TekEzLink_Demo_110314.zip

Inputs

STOP – Set high to stop the connection.
START – Set high to start the connection.
UPDATE_OUT – Set high to update the serial outputs.
ZAP – Resets the IP address back to the original address.
GET_TIME – Will get the time from the TekMonitor.
START_TX – Connect to START_TX_FB,
SET_IP_ADDRESS$ - Can be used to set a new IP address in non-volatile memory.
MACRO_VAL – Set an analog level to represent a macro number.
EMAIL_VAL – Set an analog level to represent an Email number.
DEV_STATUS_VAL[1-10] – Use to set the index value of a Status element.
DEV_CTRL_VAL[1-10] – Use to set the index value of a Byte command element.
DEV_INT_VAL[1-10] – Use to set the integer value of an index.
DEV_STRING_VAL[1-5] – Use to set the string of an index.
DEV_CMDS$[1-10] – Use to send special commands to a TekMonitor.

TekEzLink V6	
DEV_NAME	TekEzLink
IP_ADDRESS	192.168.1.10
CONNECT_ON_PGM_START	Yes
ENABLE_TIMER	Yes
SYS_ON_IDX	0d
SYS_OFF_SEC_IDX	1d
MOTION_ON_IDX	0d
SECURITY_ON_IDX	0d
DEV1_CONNECTED_IDX	0d
DEV1_STANDBY_IDX	0d
DEV1_OFF_IDX	0d
DEV1_ON_IDX	0d
DEV1_IN_START_IDX	2d
DEV1_IN_END_IDX	3d
DEV1_PIC_MUTE_ON_IDX	4d
DEV1_VOL1_IDX	0d
DEV1_VOL2_IDX	0d
DEV1_MUTE1_ON_IDX	0d
DEV1_MUTE2_ON_IDX	7d
DEV1_CH_IDX	0d
DEV1_EXTRA_1_IDX	0d
DEV1_EXTRA_2_IDX	0d
DEV1_EXTRA_3_IDX	0d
DEV1_EXTRA_4_IDX	0d
DEV1_EXTRA_5_IDX	0d
DEV1_EXTRA_VAL1_IDX	8d
DEV1_EXTRA_VAL2_IDX	0d
DEV1_EXTRA_VAL3_IDX	0d
DEV1_EXTRA_VAL4_IDX	0d
DEV1_EXTRA_VAL5_IDX	0d
DEV1_LAMP_HRS_IDX	9d
DEV1_WARM_UP_TIME	45d
DEV1_COOLDOWN_TIME	90d

Inputs (signals):
STOP
START
UPDATE_OUT
ZAP
SYS_OFF
SYS_ON
SYS_OFF_TIMER_STOP
SYS_OFF_TIMER_RUN
DEV1_OFF
DEV1_ON
DEV1_PIC_MUTE_TOG
DEV1_PIC_MUTE_OFF
DEV1_PIC_MUTE_ON

DEV2_OFF
DEV2_ON
DEV2_PIC_MUTE_TOG
DEV2_PIC_MUTE_OFF
DEV2_PIC_MUTE_ON

GET_TIME
GET_LOCATION
GET_BUILDING
GET_GROUP
GET_ROOM
ENABLE_TRACE
START_TX
SET_IP_ADDRESS$
MACRO_VAL
EMAIL_VAL
DEV_STATUS_VAL[1]
DEV_STATUS_VAL[2]
DEV_STATUS_VAL[3]

Outputs (signals):
SYS_OFF_FB
SYS_ON_FB
SYS_OFF_OS
SYS_ON_OS
MOTION_ON_FB
SECURITY_ON_FB
HOST_CONNECTED
DEV1_CONNECTED
DEV1_STANDBY_FB
DEV1_OFF_FB
DEV1_ON_FB
DEV1_PIC_MUTE_FB
DEV1_MUTE1_FB
DEV1_MUTE2_FB
DEV1_EXTRA_1_FB
DEV1_EXTRA_2_FB
DEV1_EXTRA_3_FB
DEV1_EXTRA_4_FB
DEV1_EXTRA_5_FB

DEV2_CONNECTED
DEV2_STANDBY_FB
DEV2_OFF_FB
DEV2_ON_FB
DEV2_PIC_MUTE_FB
DEV2_MUTE1_FB
DEV2_MUTE2_FB
DEV2_EXTRA_1_FB
DEV2_EXTRA_2_FB
DEV2_EXTRA_3_FB
DEV2_EXTRA_4_FB
DEV2_EXTRA_5_FB
START_TX_FB

Outputs

STATUS_STRING_OUT[1-5] – Strings can be sent by TekManager to these outputs when programmed into the status messages.

STATUS_CTRL_OUT[1-10] – Analog outputs can be sent by TekManager to these outputs when programmed into the status messages. Use these outputs with a Analog Equate to set a button.

STATUS_INT_OUT[1-5] – Analog outputs can be sent by TekManager to these outputs when programmed into the status messages. Use these outputs to set an integer value like a volume.

Inputs	Outputs
DEV_STATUS_VAL[4]	DEV1_IN_VAL
DEV_STATUS_VAL[5]	DEV1_VOL1_VAL
DEV_STATUS_VAL[6]	DEV1_VOL2_VAL
DEV_STATUS_VAL[7]	DEV1_CH_VAL
DEV_STATUS_VAL[8]	DEV1_LAMP_VAL
DEV_STATUS_VAL[9]	DEV1_EXTRA_VAL1
DEV_STATUS_VAL[10]	DEV1_EXTRA_VAL2
STATUS_CTRL_IN[1]	DEV1_EXTRA_VAL3
STATUS_CTRL_IN[2]	DEV1_EXTRA_VAL4
STATUS_CTRL_IN[3]	DEV1_EXTRA_VAL5
STATUS_CTRL_IN[4]	
STATUS_CTRL_IN[5]	DEV2_IN_VAL
STATUS_CTRL_IN[6]	DEV2_VOL1_VAL
STATUS_CTRL_IN[7]	DEV2_VOL2_VAL
STATUS_CTRL_IN[8]	DEV2_CH_VAL
STATUS_CTRL_IN[9]	DEV2_LAMP_VAL
STATUS_CTRL_IN[10]	DEV2_EXTRA_VAL1
STATUS_CTRL_IN[11]	DEV2_EXTRA_VAL2
STATUS_CTRL_IN[12]	DEV2_EXTRA_VAL3
STATUS_CTRL_IN[13]	DEV2_EXTRA_VAL4
STATUS_CTRL_IN[14]	DEV2_EXTRA_VAL5
STATUS_CTRL_IN[15]	IP_ADDRESS$
STATUS_INT_IN[1]	LOCATION$
STATUS_INT_IN[2]	BUILDING$
STATUS_INT_IN[3]	GROUP$
STATUS_INT_IN[4]	RM_NAME$
STATUS_INT_IN[5]	SYS_OFF_SEC$
STATUS_INT_IN[6]	DEV1_STANDBY_TIMER$
STATUS_INT_IN[7]	DEV2_STANDBY_TIMER$
STATUS_INT_IN[8]	DEV1_LAMP_HRS$
STATUS_INT_IN[9]	DEV2_LAMP_HRS$
STATUS_INT_IN[10]	STATUS_STRING_OUT[1]
STATUS_STRING_IN[1]	STATUS_STRING_OUT[2]
STATUS_STRING_IN[2]	STATUS_STRING_OUT[3]
STATUS_STRING_IN[3]	STATUS_STRING_OUT[4]
STATUS_STRING_IN[4]	STATUS_STRING_OUT[5]
STATUS_STRING_IN[5]	
DEV_CMDS$[1]	STATUS_CTRL_OUT[1]

Conclusion

Incorporating TekEzLink into your control software can help simplify your software and add a great method to control and monitor video projectors and other devices without a lot of software and protocol research. Including the TEK 2s into your system also gets you the TekManager software for free, allowing you to monitor and control hundreds of projectors throughout a campus. In addition, there are modules already provided by TEKVOX for both AMX and Crestron to speed up customer integration. When it is time to replace a projector, just load a new driver into the TEK 2 and your control system will be working with the new projector without any change to the existing program.