NBC NY 30 Rock
Machine Control Project
System Description

Revision History

03/29/10	Final draft
05/10/10	Added logging description. Added PBUS ADDR column to PCR MACHINE SELECTION GUI and changed numbering of TD Panel ports. Added browser and Java RTE minimum version. Modified PLAY key functionality with GANG ON. Added DC21 minimum RAM and CF Card size. Added ON-PST tally.
05/20/10	Per agreed upon changes: Changed PCR SYSTEM CONFIGURATION description. Changed PCR DEVICE ASSIGNMENT description. Changed PRODUCTION SWITCHER INTERFACE description. Updated layout of PCR Machine Selection GUI. Changed cue point description to support only the 8 devices assigned to the CP20 Device Select keys. Changed DL USP description to support connection to two DC21s.
05/24/10	Fixed Tally mapping description on page 12, top of page, to include CP20 devices.

The proposed machine control system is based upon DNF's Flex Control Network®, off-the-shelf products with the addition of NBC specific functionality.   The operation of the Flex Control Network DC21 Device Controller and CP20 Control Panel will be modified to provide the requested functionality described below. The USP-16-KeyServer Universal Switch Panel will require no change in operation.

The machine control system has two primary configurations. The Production Control Room Configuration is located in each production control room and is comprised of four (4) USP-16s one (1) DC21, and one (1) CP20.   The Device Location Configuration is located in each Playback Room as well as other NBC designated areas. This configuration is comprised of one (1) DC21 and one (1) USP-16. These configurations will be described in greater detail later in this document.

The Production Control Room (PCR) equipment will communicate with the Device Location (DL) equipment over NBC's Ethernet infrastructure using TCP/IP and/or UDP protocols. Both PCR and DL equipment support configuration and diagnostic access from an off-the-shelf web browser using HTTP protocol. The DL may contain more than one controlled device, typically a VTR-like device. One PCR may communicate with multiple DLs. One DL may communicate with multiple PCRs.   One controlled device within a DL may only be controlled from one PCR. Although the standard Flex Control Network system supports shared control as a standard feature, NBC requested functionality will prevent more than one PCR from controlling a device.

All device control assignments are controlled by the USP-16 in the Device Location. The operator at that location can assign control over a specific device to any PCR and can terminate that control at any time, without any restraints.

In the PCR, the CP20 control panel is the central component of the PCR equipment configuration. (See the Functional Network Topology diagram on the next page.) In the DL, the DC21 is the central component.
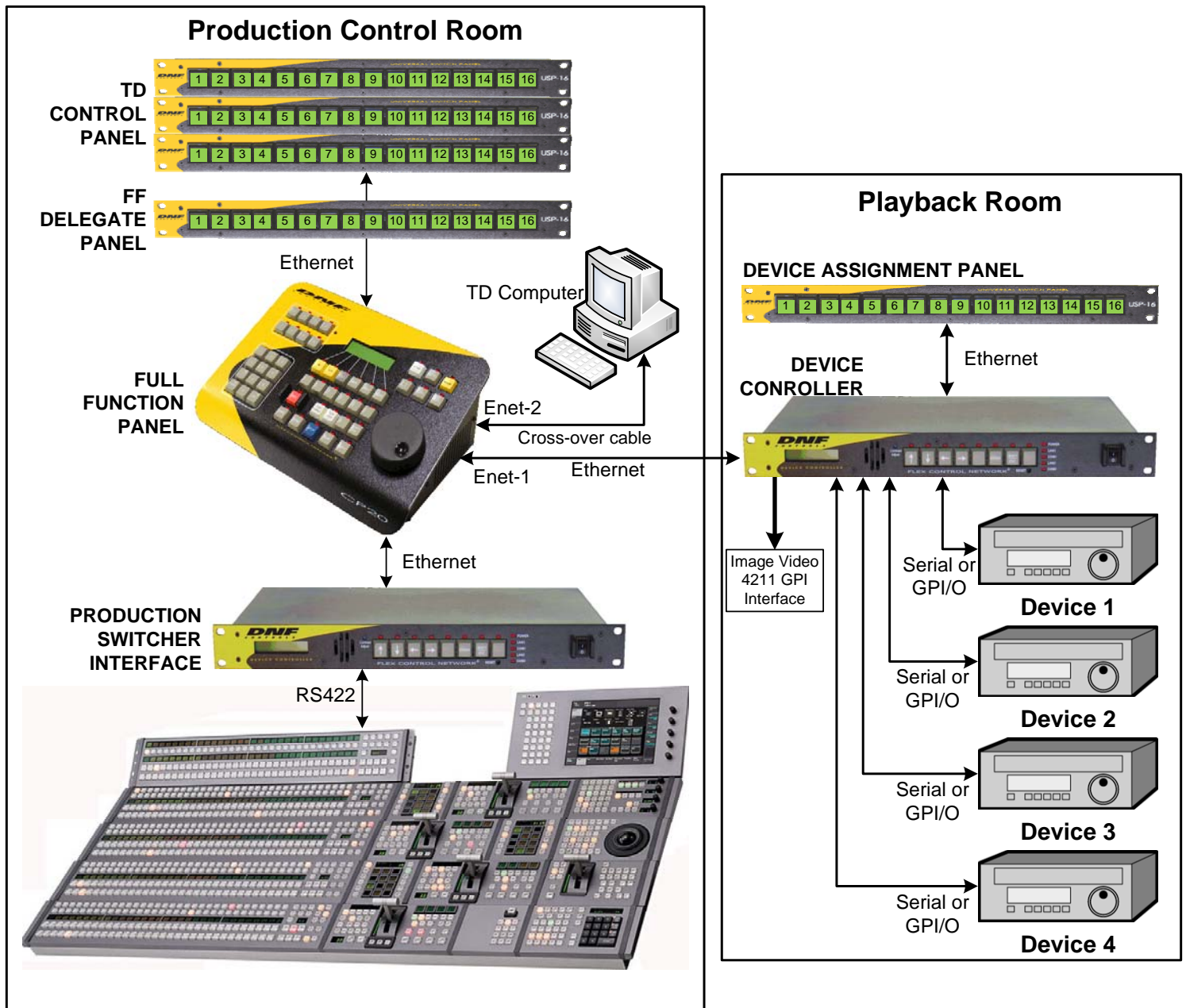
In the PCR, the CP20 is responsible for communicating with each DL DC21 assigned to the PCR. The CP20 is also responsible for responding to the TD Control Panel's USP key presses, as well as updating its LCD keys. The CP20 communicates with the DC21 connected to the production switcher to receive tally and PBUS data. The CP20 and TD Control Panel can provide simultaneous control over their assigned devices. Pressing the PLAY keys on the TD panel will not delay, effect, or otherwise interfere with keys pressed on the CP20. The CP20 will respond to TD Control Panel key presses used for normal operation regardless of its current mode.

In the DL, the DC21 is responsible for communicating with each PCR that has been assigned control over one of the devices connected to the DC21. The DC21 is also responsible for responding to the Control Assignment Panel's USP key presses, as well as updating its LCD keys.

The device names, 4 characters maximum, will be assigned in their associated DC21's Protocol Assignment Table and the PCR/ Device Name file. The PCR names, 2 characters maximum, will be assigned in the PCR/ Device Name text file that resides in the CP20s and DC21.

Similar devices connected to one DC21 will roll frame accurately when gang rolled. Similar devices connected across multiple DC21s will roll frame accurately when gang rolled and a common LTC signal is connected to the CP20 and DC21s. Otherwise, devices will roll within 1 -2 frames of each other.

FUNCTIONAL NETWORK TOPOLOGY

Production Control Room

TD CONTROL PANEL

FF DELEGATE PANEL

Ethernet

TD Computer

FULL FUNCTION PANEL

Enet-2

Cross-over cable

Enet-1   Ethernet

Ethernet

PRODUCTION SWITCHER INTERFACE

RS422

Playback Room

DEVICE ASSIGNMENT PANEL

DEVICE CONTROLLER

Ethernet

Image Video 4211 GPI Interface

Serial or GPI/O

Device 1

Serial or GPI/O

Device 2

Serial or GPI/O

Device 3

Serial or GPI/O

Device 4

FLEX CONTROL NETWORK® DESCRIPTION

The *DNF* Flex Control Network is designed for the time-critical, chaotic, and pressure-filled environments of television broadcast, live production, and event production. It provides easy-to-use, precise, reliable, and dependable control of VTR's, video servers, routers, and other devices used in the production and broadcast environment.

The *DNF* Flex Control Network real-time machine control products are designed to:

- Provide flexible, easy to configure, real-time machine control systems

- Support a wide range of video, audio, and graphic devices and their proprietary control protocols

- Provide real-time, point-to-point or shared device control among multiple control points

- Provide the ability to change devices and control protocols while minimizing control system obsolescence

- Provide a common control interface, which masks device protocol differences and idiosyncratic behavior

- Provide modular design, which allows control points and devices to be added, removed, and changed as needed without resetting or rebooting system

- Minimize single points of failure and provide redundant control

The *DNF* Flex Control Network employs distributed control architecture. Each Flex component, control panel or device controller, utilizes embedded control system technology and contains the necessary intelligence to operate independently and as part of a larger system. There is no central, managing component whose proper operation is required for the whole control system to function successfully. System reset is not required to add components, disconnect components, change components, or replace failed components.

In the event of a component failure, only that specific component is affected, while all other system components continue to function normally. In the event of a control point failure, another control point may easily take control of the required device or devices to stay on air. In the event of a device controller failure, the affected control point may quickly take control of standby devices to stay on air. Additionally, system maintenance and incremental upgrades may be done one component at a time, with no detrimental effect to the rest of the system.

Flex Control Network's two major components are its Control Panel (CP) and Device Controller (DC). The DC is responsible for the actual control of a video tape recorder, digital disc recorder, video server, router, graphic device, audio device or other device. It is located near the controlled device and is connected via GPI, RS232, RS422, and Ethernet interface.   The DC communicates using the controlled device's native control protocol, to provide basic and extended control capabilities. Each DC may be configured individually to provide different levels of control, Basic or Advanced. The control configuration, control protocol and interface may be easily changed when a controlled device is changed.

The Control Panel is the user interface and connects to the Device Controller. The Control Panel does not directly connect to or control devices. The CP provides a familiar, tactile, control surface with function keys, an easy-to-read LCD display, and a high quality jog/shuttle wheel with electro-mechanical detents. DNF also offers an optional T-bar and VGA interface for the Control Panel. The CP automatically supports the level of control associated with the Device Controller with which it is communicating.

The Flex components are interconnected over a 10/100 Ethernet local area network, wide area network, virtual private network, or similar network (provided by NBC) that supports bi-directional TCP/IP and UDP traffic. One CP may be connected to multiple DCs. One DC may be connected to multiple CPs. Each component has its own single, external power supply, which requires a 120v AC power source. Also, each component has its own embedded web server for system setup, configuration, and in some cases control. All setup and configuration data is saved in non-volatile memory in the Flex component. Some setup and configuration data may be copied to a computer for distribution or backup. Commonly available web browsers, such as Microsoft Internet Explorer or Mozilla Firefox may be used.

The DNF Flex Control Panel and Device Controller communicate using an abstracted, universal control protocol. The CP sends commands to the DC, which translates them into the controlled device's native protocol. Status from the device is translated into the universal control protocol and is then forwarded to the CP. All communication between the CP and DC is event driven; thereby minimizing bandwidth usage and reducing communication latencies normally associated with high bandwidth usage.

Flex Control Network's design allows incremental changes to be made to the machine control system as required, with minimal impact to the whole system. New control protocols may be added to the Device Controller, additional control points or devices may be added.

The Control Panel and Device Controller each support an event logging feature that logs all defined actions—key presses on CP, device command and communication errors on DC. Each log entry includes a date and a timestamp, as well as a description of the action. If house LTC is connected, the timestamp includes house LTC time of day time. Seven one day logs are maintained, one log file for each day of the week. At midnight, based upon the unit's internal clock, the current day's log is closed and the next day's log is opened. On the 8th day, the oldest day's log file is deleted and replaced with a new empty file. The data in the log file is in standard comma delimited format, (CSV, Comma-Separated-Value). This file can be uploaded to a computer and viewed with any text editor. The log contents may also be imported into a spreadsheet or database program for viewing or statistical analysis. There is no user intervention necessary to start the logging feature, as it is always active.

PCR/ DEVICE NAME LIST

A text file containing the names of all Production Control Rooms (PCR) and Device Location (DL) devices resides on each CP20 and DC21.   The DL DC21 uses this list to display the names of PCR on the PCR SELECTION key, on the DL USP-16. The CP20 uses this list to display the list of available devices in the Machine Selection column of the TD MACHINE SELECTION GUI.

The PCR/ Device Name List is a comma delimited text file (csv) created using Microsoft Excel or other similar application. The list file is maintained by NBC personnel and distributed to all CP20s and DC21s whenever it is changed.   The updated file is downloaded into the CP20 or DC21 using the unit's web interface.

File contents:

LOCATION	NAME	CP20/ DC20 NAME	IP ADDRESS	CONTROL CHANNEL
PCR	1A	CP20 PCR-1A	192.168.100.123	N/A
PCR	2A		192.168.100.122	N/A
PCR	2B		192.168.100.121	N/A
PCR	2E		192.168.100.120	N/A
DL	D123	RM123 5TH FLOOR	192.168.100.120	1
DL	B053	PROFILE CH1	192.168.100.104	4
DL	D003	CRISPIN #4	192.168.100.111	2
DL	D011		192.168.100.103	1
DL	B053		192.168.100.117	2
DL	B052		192.168.100.101	3

LOCATION: PCR or DL

NAME: PCR (2 character) or device (4 character) name

CP20/ DC20 NAME: The name assigned to the CP20 or DC21 unit

IP ADDRESS: PCR   CP20 IP Address

DL   DC21 IP Address

CONTROL CHANNEL: PCR does not apply

DL   DC21 control channel

This list of PCRs are displayed on the DL USP PCR SELECT key in sorted order— first digit ascending, 2nd character ascending. The devices are displayed in the TD Machine Assignment GUI in sorted order— first character ascending, 3 digit number ascending.

NOTE- Changes to this list will not be effect existing device assignments. Changes will be recognized after the current assignments are released and then re-assigned.

PRODUCTION CONTROL ROOM SYSTEM DESCRIPTION

The Production Control Room (PCR) is comprised of four (4) USP-16s, one (1) DC21 Device Controller, and one (1) CP20 Control Panel. (See the Production Control Room Configuration diagram below.) The PCR can control a total of 24 devices—16 assigned to the sixteen TD Control Panel key columns and 8 assigned to the eight CP20 Device Select keys.

Each USP-16-KeyServer connects to the local CP20. The USP communicates with and is controlled by the CP20. Three of the USPs function as the TD Control Panel. The fourth USP functions as the FFP control delegation panel.

The DC21 Device Control connects to the local production switch and monitors production switcher status to identify when a TD Control Panel device is selected on the production switcher as PGM or PST.   The DC21 also connects to the production switcher's Peripheral Bus providing production switcher control over devices connected to DL DC21s.

INTERCONNECTION

The USP-16-KeyServer units connect to the PCR CP20 over an Ethernet link running UDP. Each USP communicates all key presses directly to the CP20 as well as receives LCD display text and color commands from the CP20. (The USP configuration web pages found on the standard USP are not available on the KeyServer units. All USP configurations are handled by the CP20.)

The DC21 connects to the PCR production switcher using an RS422 serial interface to monitor PGM and PST status. The DC21 connects to the PCR CP20 over an Ethernet link running TCP/IP. The DC21 communicates only with the CP20. It does not communicate directly with the devices assigned to the TD control panel.

The PCR CP20 connects to all DC21 control channels assigned to the TD Control Panel and its Device Select keys over an Ethernet link running TCP/IP.   The CP20 communicates with the assigned DC21 channel to control and monitor status of the attached device.

The USPs, DC21, and CP20 all connect to the NBC supplied Ethernet Machine Control Access Switch located in or near the control room.   There is one Ethernet connection between each unit and the Ethernet switch. Connector Enet-1 is used on the CP20 and DC21. Connector Enet is used on the USPs.   Each unit supports a static IP address, subnet mask, and gateway address.

Each USP, DC21, and CP20 is powered from its own, DNF supplied, external power supply.

TD CONTROL PANEL

The TD Control Panel is comprised of four (4) stacked USP panels. Each key column controls one device. The TD Control Panel can control a total of 16 devices.   Devices are assigned to the TD Control Panel key columns using a dedicated computer in the production control room. The device assignment process is described later in this document.

Each key column provides the following functionality:
> Gang Group selection
> Gang On/ Off
> Play control & device status
> Full Function Panel control delegation

PLAY KEY

The PLAY key provides play transport control over the assigned device. Press the PLAY key to cause the assigned device to go into play mode.   If GANG OFF is selected, the PLAY key controls only the assigned device. If GANG ON is selected, the PLAY key controls the assigned device and the other Gang Group members.

The PLAY key also provides device control status information. The display is formatted for two rows of four characters each. The top line of the display shows the assigned device's 4 character name. The second line and key backlight tally device status as follows:

Key Color	Control Status	Key Legend
Dark	TD key column not assigned to device	Column Number
Steady Green	TD key column is connected to and has control over assigned device	"PLAY" Play status "STOP" Stop status "----" Not Play or Stop status
Steady Amber	TD key column does NOT have control over assigned device. It is connected to another control location. Or, there is no communication with assigned DC21 or assigned device	Name of PCR location that has control over assigned device "ERR"

GANG GROUP SELECTION KEY

The GANG GROUP SELECTION key assigns the device to one of six gang groups, A – F. Each key press toggles through the available gang groups.

IE: GANG A ➔ GANG B ➔ GANG C ➔ GANG D ➔ GANG E ➔ GANG F ➔ GANG A

The key displays the currently selected gang group. The display is formatted for one row of three characters.

A controlled device may be a member of one and only one group at a time. A second gang group assignment for a device will automatically clear the previous assignment. A gang group may contain 2 to 16 devices at one time. A total of 6 separate gangs are supported.

Key Color	Control Status	Key Legend
Dark	No device assigned	No legend
Steady Green	TD key column is assigned to indicated gang group	"A", "B", "C", "D", "E", or "F"

The gang group can be controlled by a Group GPI, one GPI per group.   Activate the GPI to gang roll the associated group. No means is provided to gang roll a group directly from the TD control panel.

GANG ON/OFF KEY

Use the GANG ON/OFF key to temporarily remove a controlled device from its assigned gang group. Each key press toggles between gang ON and gang OFF. The key displays the current GANG state—ON or OFF. The display is formatted for one row of three characters.

Key Color	Control Status	Key Legend
Dark	No device assigned	No legend
Steady Green	The assigned device will roll when the gang group GPI is activated	"ON"
Steady Red	The assigned device is temporarily removed from the gang group and will NOT roll when the gang group GPI is activated.	"OFF"

FULL FUNCTION PANEL DELEGATE KEY

Use the FF DELEGATE key to temporarily assign control of the assigned device to the CP20 Full Function Panel (FFP). While controlled by the CP20, the device can also be controlled from the TD control panel. Only the selected device is controlled by the FFP, regardless of its gang group assignment and gang enable/disable status.
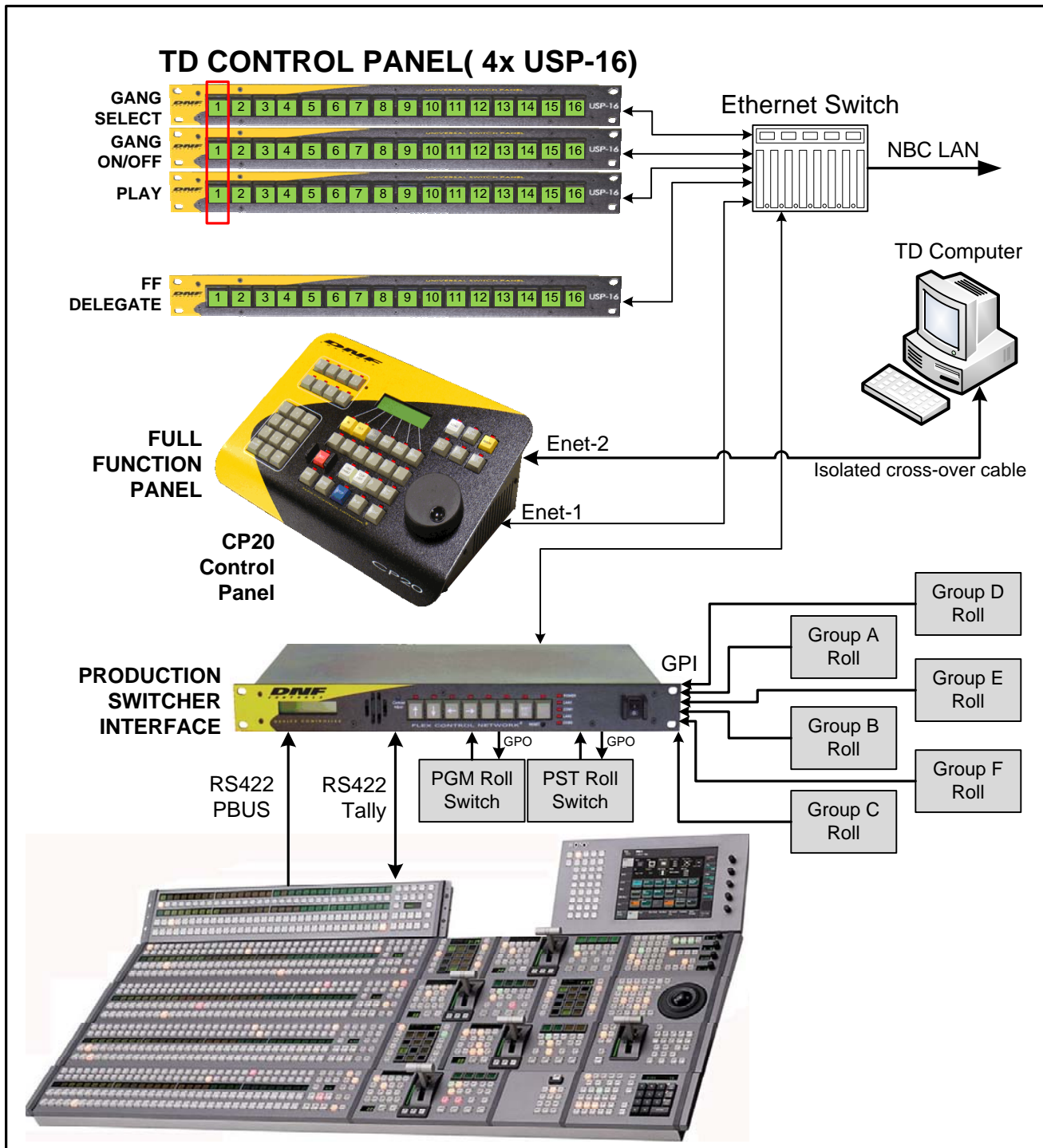
The FF DELEGATE assignment overrides the current device selection on the CP20. Press the FF DELEGATE key to toggle device control ON/ OFF to the FFP. The key's display shows the current state—ON or OFF. The display is formatted for two rows of four characters each. More than one device may be assigned to the CP20 at one time. Press any CP20 Device select key to clear all FF DELEGATE keys and enable Device Select key operation.

NOTE- Production switcher PBUS Recall commands will continue to operate normally and control the devices assigned in the recalled cue point. FF DELEGATE assignments will not be affected.

Key Color	Control Status	Key Legend
Dark	No device is assigned	No legend
Steady Amber	TD key column does NOT have control over assigned device. It is connected to another control location. Or, there is no communication with assigned DC21 or assigned device	4 character device mnemonic and "OFF" text.
Steady Green	The device is controlled only by the TD control panel	4 character device mnemonic and "OFF" text.
Steady Red	The device is controlled by the Full Function Panel and the TD control panel.	4 character device mnemonic and "ON" text.

When multiple devices are selected on the Delegate panel, the CP20's 4 line LCD display will show the status of the lowest numbered device.

PRODUCTION CONTROL ROOM CONFIGURATION

TD CONTROL PANEL(4x USP-16)

GANG SELECT

GANG ON/OFF

PLAY

Ethernet Switch

NBC LAN

FF DELEGATE

TD Computer

FULL FUNCTION PANEL

CP20 Control Panel

Enet-2

Enet-1

Isolated cross-over cable

PRODUCTION SWITCHER INTERFACE

GPI

Group D Roll

Group A Roll

Group E Roll

Group B Roll

Group F Roll

Group C Roll

GPO

GPO

PGM Roll Switch

PST Roll Switch

RS422 PBUS

RS422 Tally

PRODUCTION SWITCHER INTERFACE

The PCR DC21 connects to the Production Control Room production switcher to identify when a TD control panel device is selected on the production switcher as PGM or PST. The DC21 does NOT control the state of the production switcher.

The DC21 monitors specific source numbers on the production switcher per its Tally Selection configuration. When a monitored source is selected on the PGM or PST bus, the CP20 causes the associated device's DL DC21 channel ON-AIR or ON-PST tally is be activated, indicating that the connected device is in use. When a device is no longer selected, the CP20 causes the ON-AIR or ON-PST tally to be de-activated. If more than one monitored source is selected on the PGM bus, directly or indirectly, all of the associated device ON-AIR tallies are activated. If more than one monitored source is selected on the PST bus, directly or indirectly, all of the associated device ON-PST tallies are activated.

Additionally, when a monitored source is selected on the PGM bus, the NBC PGM Roll button is tallied and enabled to roll the associated device. If more than one monitored source is selected on the PGM bus, then all of the associated devices will be rolled by a press of the NBC PGM Roll button. Additionally, when the associated device's Gang On/Off status is ON, then all device gang members are also rolled. A GPO on the DC21 controls the on/off state of the NBC PGM Roll button tally. The Roll button is assumed to provide a momentary, non-latching, switch closure.

When a device is selected on the PST bus, the NBC PST Roll button is tallied and enabled to roll the device. If more than one device is selected on the PST bus, directly or indirectly, all will be rolled when the NBC PST Roll button is pressed. Additionally, when the associated device's Gang On/Off status is ON, then all device gang members are also rolled. A GPO on the DC21 controls the on/off state of the NBC PST Roll button tally. The Roll button is assumed to provide a momentary, non-latching, switch closure.

For example, TD Control Panel Column assignments are:

Column	Device Name	Gang Select	Gang On/Off	Switcher Src
1	D121	A	ON	1
2	D122	A	OFF	2
3	D123	A	ON	3
4	C411	A	ON	4
5	C412	B	ON	5

Switcher source #3 is selected on the PST bus

The PST Roll button's tally is turned on

The TD presses the PST Roll button

All devices in Gang Select A—D121, D123, & C411, except D122 roll

Device D122 does not roll because it is temporarily removed from the gang.

C412 does not roll because it is not a member of Gang A

The PCR DC21 connects to the production switcher over an RS422 serial interface. The DC21 connects to an RS422 serial port on the Sony switcher running MVS Serial Tally protocol. The DC21 connects to an RS422 serial port on the Evertz SC-1000 running its native control protocol. The control channel in the DC21's Protocol Assignment Table is configured for Sony MVS Serial Tally protocol or Evertz SC1000 RCP-T01 control protocol.

The PCR Machine Selection GUI is used by the TD to map production switcher source numbers to TD control panel devices 1 – 16 and CP20 devices 1 – 8.   The DC21 is responsible for monitoring the selected sources. If the connection between the CP20 and DC21 is lost, the CP20 is responsible for re-establishing a connection to the DC21. and re-configuring the list of monitored PGM and PST sources.

PERIPHERAL BUS

The production switcher's Peripheral Bus (PBUS) is used to control devices assigned to the FFP or TD Control Panel. Using PBUS control protocol, the production switcher can trigger a specific device to Play, Recue, Stop, Play Loop, and other transport functions. PBUS can also be used to load designated clips on one or more devices, and then roll them.

PBUS commands control the specific devices assigned to the command from the production switcher. Only the assigned device is controlled by the PBUS command regardless of its gang group assignment and gang On/ Off status.

NOTE- Evertz Quartz does not support PBUS.

FULL FUNCTION PANEL

The CP20 Control Panel functions as the Full Function Panel (FFP) providing full transport control over selected devices.   (See the CP20 User Manual for a complete list of supported functions.) It controls a total of 24 devices, 16 devices assigned to the TD Control Panel, and 8 devices assigned to the CP20's Device Select keys.

The FF DELEGATE key on the TD Control Panel temporarily assigns control of the assigned device to the CP20 Full Function Panel (FFP). While controlled by the CP20, the device can also be controlled from the TD control panel. Only the selected device is controlled by the FFP, regardless of its gang group assignment and gang On/ Off status.

The FF DELEGATE assignment overrides the Device Select keys on the CP20. Press any CP20 Device select key to clear all FF DELEGATE keys and re-enable Device Select key operation.

The CP20 supports individual or ganged control of devices assigned to its Device Select keys. Ganged control can be configured as Permanent or Temporary in the CP20's Setup Menu. Permanent and Temporary only apply to devices assigned to the CP20's Device Select keys. It does not apply to devices assigned to the TD Control Panel. Temporary gangs are automatically cleared when any Device Select key is pressed. Permanent gangs are maintained until cleared by the user.

> For example, assume CP20 devices #1, #2, #3, & #4 are ganged together. Using Temporary, the gang is automatically cleared when device #5 is selected. Using Permanent, the gang is maintained when device #5 is selected. Pressing Device Select keys 1, 2, 3 or 4 will re-display the gang of devices #1, #2, #3, and #4.

CUE POINTS

The FFP supports 1000 cue points per assigned device. Each cue point supports the 8 devices assigned to the Device Select keys on the CP20. The cue point does not support the devices assigned to the TD panel. A cue point can be used to MARK or LEARN device metadata for later recall/ cueing.   A cue point does not support both MARK and LEARN in the same cue point

The MARK function saves the selected device's current time or IN and OUT points (Setup Menu configurable) into the current cue point. If the device is assigned to a gang on the TD Control Panel and the gang is ON, then the time for all members of the gang will be saved into their respective locations in the cue point. If the device is assigned to a gang on the CP20, then the time for all members of the gang will be saved into their respective locations in the cue point.

MARKing a cue point overwrites any existing metadata for the device and device gang members. MARKing does not save the gang assignment metadata in the cue point.

The LEARN function is similar to the EMEM or SNAPSHOT function on a production switcher. LEARN captures the metadata for the selected device and its gang members, and the gang assignments into the cue point. Additionally, LEARN saves the playback mode— Normal, 2 Point Loop, 3 Point Loop, and Loop Iteration Count. (Refer to the CP20 User Manual for further information.) All existing data, for all devices, in this cue point is overwritten. If a device is not a member of the gang, its cue point data is cleared. Use the CP20 Device Select keys to select devices.

Recalling a MARKed cue point affects the currently selected device and its current gang members, if gang is ON. The device is cued to the MARKed time. All other devices are unaffected.

Recalling a LEARNed cue point affects only the devices saved in the cue point. The currently selected device on the CP20 or TD Control Panel is ignored. The LEARNed gang state is restored on the affected devices. If the device is a current member of a gang, that membership is cleared and the device is assigned to the restored gang. Like MARK, the device is cued to the saved IN point time.

The whole list of CP20 cue points can be saved in a file on the CP20 and transferred to a computer, for archival or distribution, using the web interface. A cue point file can be restored replacing all existing cue point data for all cue points, for all devices, with the file contents.

DEVICE ASSIGNMENT

Control over a DL DC21 connected device is controlled exclusively by the operator using the USP-16 connected to the DL DC21. After control is granted to the PCR, the same operator may terminate control at any time for any reason. The PCR has no means to gain control, maintain control, or over-ride control by another PCR or other control location. If a device is assigned to the PCR, the PCR may control it by assigning it to a TD Control Panel key column or CP20 Device Select key.

The PCR MACHINE SELECTION web page consists of two frames-- the Home page of the CP20 web interface and a web page from the PCR DC21. It is used to assign devices to the 16 TD Control Panel key columns and 8 Device Select keys on the CP20. This web page is accessed using any off-the-shelf web browser running on a computer with access to the machine control LAN. No password is required to view or modify this page. (A password will be required to modify all other web pages.)

This web page is also used to save and restore show specific machine selection configurations and show specific cue point lists. A show specific machine selection file can be saved on the CP20 and transferred to a computer, and then restored at a future time. A show specific cue point file can be saved on the CP20 and transferred to a computer, and then restored at a future time.

PCR MACHINE SELECTION GUI

	PCR MACHINE SELECTION						PCR TALLY SELECTION			
	CONTROL PORT	MACHINE SELECTION	PBUS ADDR	CURRENT STATUS	REGISTRATION STATUS	REFRESH STATUS	SWR TALLY	CONTROL PORT		
CP20	PORT-01	NONE		CONNECTED	CONNECTED		1	PORT-01	CP20	
	PORT-02	NONE		CONNECTED	ERROR	RELEASE ALL MACHINES	2	PORT-02		
	PORT-03	DPS-03		CONNECTED	CONNECTED		3	PORT-03		
	PORT-04	DPS-08		CONNECTED	CONNECTED		44	PORT-04		
	PORT-05	DPS-07		CONNECTED	CONNECTED		20	PORT-05		
	PORT-06	DPS-01		OFFLINE	-	SAVE MACHINE SELECTION	6	PORT-06		SAVE TALLY SELECTION
	PORT-07	DPS-11		OFFLINE	-		7	PORT-07		
	PORT-08	NONE		-	-		8	PORT-08		
TD CONTROL PANEL	PORT-01	DPS-09		SDO-1A	-	RESTORE MACHINE SELECTION FILE	9	PORT-01	TD CONTROL PANEL	RESTORE TALLY SELECTION FILE
	PORT-02	DPS-10		SDO-2A	-		21	PORT-02		
	PORT-03	DPS-12		SDO-2B	-		22	PORT-03		
	PORT-04	DPS-12		SDO-2E	-		23	PORT-04		
	PORT-05	DPS-13		SDO-2K	-		30	PORT-05		
	PORT-06	BSC-51		CONNECTED	CONNECTED		31	PORT-06		
	PORT-07	BSC-52		CONNECTED	CONNECTED		33	PORT-07		
	PORT-08	BSC-53		CONNECTED	CONNECTED		34	PORT-08		
	PORT-09	NONE		-	-	SAVE CUE POINTS	35	PORT-09		
	PORT-10	NONE		-	-		36	PORT-10		
	PORT-11	NONE		-	-	RESTORE CUE POINT FILE	37	PORT-11		
	PORT-12	NONE		-	-		38	PORT-12		
	PORT-13	NONE		-	-		39	PORT-13		
	PORT-14	NONE		-	-		40	PORT-14		
	PORT-15	NONE		-	-		41	PORT-15		
	PORT-16	NONE		-	-	SWR TALLY ONLINE	42	PORT-16		
SUBMIT							SUBMIT			

PORT: (Read only)   The first 8 control ports are assigned to the CP20 Device Select keys. The remaining control ports are assigned to the TD Control Panel.

MACHINE SELECTION: Drop down menu of all controllable devices. This list is from the PCR/ Device Name file stored in the CP20..

SWR TALLY: Static drop down menu, 1 – 80, of production switcher source input numbers. Select the source number that corresponds to the assigned device.

CURRENT STATUS: (Read only)
Connected- CP20 is successfully connected to DL DC21

Offline- CP20 is not able to connect to DC DC21

PCR Name- device is currently assigned to named PCR and not available

REGISTRATION STATUS: (Read only)
OKAY- The CP20 is successfully registered to receive device status updates and production switcher PST & PGM status updates

ERROR- The CP20 encountered an error registering for device or production switcher status updates for the assigned device.

SUBMIT Link: Save the machine selections and update the DL DC21 connections.

REFRESH STATUS Link: Refresh the connection and registration status for all assigned devices.

RELEASE ALL MACHINES Link: Set all machine selections to NONE.   Prompt "Are you sure ?" to confirm user action.

SAVE MACHINE SELECTION Link: Save current machine selections to new file on CP20. Prompt for file name. Use right mouse click "Save target as…" to copy file to computer.

RESTORE MACHINE SELECTION FILE Link: Restore all machine selections from file saved on CP20. Use file transfer utility to transfer file from computer to CP20.

SAVE CUE POINTS Link: Save all cue points to new file on CP20. Prompt for file name. Use right mouse click "Save target as…" to copy file to computer.

RESTORE CUE POINT FILE Link: Restore all cue points from file saved on CP20. Use file transfer utility to transfer file from computer to CP20.

SWR TALLY ONLINE: (Read only) Tally indicates communication status with production switcher DC21.   GREEN- OKAY.   RED- ERROR

SAVE TALLY SELECTION: Save all tally selections to a new file on DC21. Prompt for file name. Use right mouse click "Save target as…" to copy file to computer.

RESTORE TALLY SELECTION FILE: Restore all tally selections from file saved on DC21. Use file transfer utility to transfer file from computer to CP20.

TALLY SELECTION SUBMIT: Save the tally selections and update the DC21 for monitored sources.

SYSTEM CONFIGURATION
The Production Control Room CP20 and DC21 are configured using an off-the-shelf web browser. (Sun JAVA 6 Standard Edition or later is required to run some configuration applets.)   Web browsers Firefox 3.0 and Internet Explorer 7 are supported as well as other common web browsers.

The CP20 contains all show specific device assignments for itself and the TD Control Panel.   It also contains the show specific cue points.   The device assignment configuration and cue point data can be saved individually in files on the CP20 and transferred to a computer for archival and distribution, using the appropriate links on the TD Machine Selection web page.

The show specific switcher tally assignments are contained in the PCR DC21. The tally assignment configuration can be saved individually in files on the DC21 and transferred to a computer for archival and distribution, using the appropriate links on the TD Machine Selection web page.

 Stored device assignment files, cue point files, and switcher tally assignments files can be selected and restored onto the CP20 and DC21using the appropriate links on the TD PCR MACHINE SELECTION web page.

The PCR USPs are configured and controlled by the CP20. There is no show specific configuration for the USP. Configuration is only required at time of installation.

DEVICE LOCATION SYSTEM DESCRIPTION

The Device Location (DL) is comprised of one (1) DC21 Device Controller and one (1) USP-16 Universal Switch Panel. The DC21 connects to and controls a total of 4 devices over a GPIO (Virtual VTR) or RS422 serial interface. (See the Device Location Configuration Parallel and Serial Interface diagrams below.) The DC21 with Basic Control software license supports Sony BVW serial control protocol and Virtual VTR control protocol.   NBC may purchase a Clip Control software license for control protocols VDCP and Odetics. Other VTR-like control protocols may be purchased as needed.

The USP-16-KeyServer connects to the DC21, over an Ethernet link, and is controlled by it. The USP serves as a hardware GUI for the DC21 for Device Assignment. One USP can connect to a total of two DC21s to control channel assignment for two channels on each DC21.

The Device Location operator uses the USP/ DC21 combination to grant exclusive control over a connected device to one and only one Production Control Room (PCR) at a time. Also, the operator uses the USP/DC21 to stop PCR control over a connected device at any time.

Each device connected to the DC21 may be controlled by the same or different PCR. Each device's name, 4 characters maximum, is assigned in the DC21's Protocol Assignment Table, Channel Label field.

The DC21 is configured with a minimum of 128MB RAM and 1GB Compact Flash Card.

INTERCONNECTION

The DC21's Protocol Assignment Table is used to assign a control protocol to each of its four control channels. The DC21 will support Sony and Virtual VTR control protocols. One control protocol may be assigned to all ports or each port may be assigned a different protocol.

The Virtual VTR control protocol uses three (3) dry GPOs to control Stop and Play on the controlled device as well as provide an ON-AIR Tally GPO. (The GPO's mode of operation is configured as Latching or Momentary by NBC using the DC21's GPO Configuration Table.) The DC21 receives three (3) GPIs from the controlled device for Stop, Play and Avail status. The Stop and Play GPIs are latched "ON" when the corresponding status is active on the device. The Stop and Play GPIs are latched "OFF" when the device is not in Stop or not in Play, respectively. The Avail status, generated by NBC, is latched "ON" when the device is available for control and latched "OFF" when the device cannot be controlled by the DC21.

Sony BVW control protocol uses an RS422 serial port to control and monitor the attached VTR, DDR, or Video Server. For serially controlled devices, DC21 GPOs representing device status— Record, Play, Stop, Rewind, Ffwd, Stop/Pause, and Avail—will be provided to Image Video. Each GPO will latch ON when the associated status is active and latch OFF when the associated status is not active. The device status to GPO mapping will be performed by NBC using the DC21's Event Monitor Table. Initially, "Avail" will be defined by the state of communication between the DC21 and device. Avail is active when the DC21 is able to successfully communicate with the connected device and not active when it is not able to communicate with the device.

Note that GPOs will be used for both Virtual VTRs and providing serial device status to Image Video. Assignment of Virtual VTR protocol in the Protocol Assignment Table will cause the associated GPIs and GPOs to be disconnected from serial status GPO assignments and used for controlling and statusing the Virtual VTR device.   When a Virtual VTR is unassigned on a channel, the previous serial status GPO assignments will not be restored.

The DC21 GPOs are dry, isolated, relay contact closures. The DC21 GPIs are isolated, opto-isolators. Each GPI can be configured for WET or DRY operation. Under WET mode of operation, NBC need only provide a contact closure to ground to activate a GPI.

To minimize GPO assignment conflicts, Virtual VTRs will be mapped to GPIOs as follows:

Virtual VTR	GPI Range	GPO Range
1	1 – 8	1 – 8
2	9 – 16	9 – 16
3	17 – 24	17 – 24
4	25 - 32	25 - 32

NBC must adhere to these GPIO ranges when assigning GPOs to serial device statuses to minimize assignment conflicts.

The DC21 and USP connect to the NBC supplied Ethernet Machine Control Access Switch located in or near the Device Location.   There is one Ethernet connection between the DC21, connector Enet-1, and the Ethernet switch and the USP, connector Enet, and the Ethernet switch.

The DC21 and USP each support a static IP address, subnet mask, and gateway address. Both are powered from their own, DNF supplied, external power supplies

NBC will connect facility Time of Day LTC and Black Burst signals to the connectors on the DC21.

DEVICE ASSIGNMENT

The DL operator grants control over a DC21 connected device to a PCR using the DL USP-16. The control grant does not require an initiating PCR request for control. The operator can grant control to a PCR at any time. Likewise, using the USP, the operator can terminate PCR control at any time without first requiring the PCR to release control.

The PCR can try to control any device by establishing a connection to the associated DC21 control channel. If the device has not been assigned to the PCR, the control attempt fails. The PCR can continue to try to gain control. When the requested device is finally assigned to the PCR, the next control attempt will succeed, giving the PCR control over the device.

The order of DL's control delegation and PCR's control connection is not critical. Only when DL has delegated control to a PCR and that PCR has established a control connection to the DC21, and only then, will the PCR gain control over a device.

The device assignments are maintained in non-volatile memory on the DC21 and will survive DC21 power down and reboot.

When the Ethernet connection between PCR and DC21 is lost, the DC21 will maintain the grant of control to the PCR. It is the responsibility of the PCR's control interface (typically CP20 control panel) to re-connect to the DC21 control channel.

Each DL USP-16 connects to one DC21 and controls and monitors device assignment of that DC21's four connected devices.   More than one USP may be connected to one DC21 to provide an operator/ supervisor control configuration. The USP to DC assignment is performed at the DC21.

Four contiguous USP keys are assigned to a controlled device, starting from the left most key—DEVICE ID, ON-AIR TALLY, PCR SELECTION, and REMOTE ON/OFF.

DEVICE ID KEY

This key displays the four character DC20 Channel Label associated with the controlled device. The display is formatted for two rows of four characters each.

The key's backlight is GREEN when the DC21 can successfully monitor attached serial or Ethernet (future) devices, or the AVAIL input is active on Virtual VTR devices.

The key's backlight is FLASHING RED when the DC21 can not successfully monitor the attached serial or Ethernet device, or the AVAIL input is not active on Virtual VTR devices.

The key's backlight is DARK when the Protocol Assignment Table entry for this control channel is configured as "Unassigned".

ON-AIR TALLY KEY

This key is a tally only key. Pressing the key will not affect the controlled device or its control assignment. The key text always displays "ON AIR". The display is formatted for two rows of four characters each.

The key's backlight is RED when the device is selected on the PCR production switcher's PGM bus. The backlight is DARK at all other times.

PCR SELECTION KEY

This key displays the two character name of a PCR in the PCR/ DEVICE NAME LIST, in the DC21. Each key press causes the next PCR name in the list to be displayed. When the end of the list is reached, the next key press displays the first PCR name in the list. PCR selection is disabled when REMOTE is set to ON. PCR selection is re-enabled with REMOTE is set to OFF. The display is formatted for one row of three characters.

The key's backlight is GREEN when REMOTE is ON and the assigned PCR has established an Ethernet connection tot the DC21 control channel.

The key's backlight is AMBER when REMOTE is OFF. It is also AMBER when REMOTE is ON and the assigned PCR has not yet established an Ethernet connection to the DC21 control channel.

The key's backlight is FLASHING RED when REMOTE is ON, the PCR has established an Ethernet connection to the DC21 control channel, and the Ethernet connection is then lost. The backlight will continue to flash red until the PCR re-establishes an Ethernet connection or REMOTE is set to OFF.

REMOTE ON/OFF KEY

This key displays ON when the selected PCR is given control over the associated connected device. The key displays OFF when no PCR is permitted control over the device. Each key press toggles between ON and OFF. The display is formatted for one row of three characters.

The key's backlight is GREEN when remote is ON.

The key's backlight is AMBER when remote is OFF.

NOTE- All USP keys will be dark when its Ethernet connection to the DC21 is lost. The keys will reflect current device assignment status when the Ethernet connection is re-established.
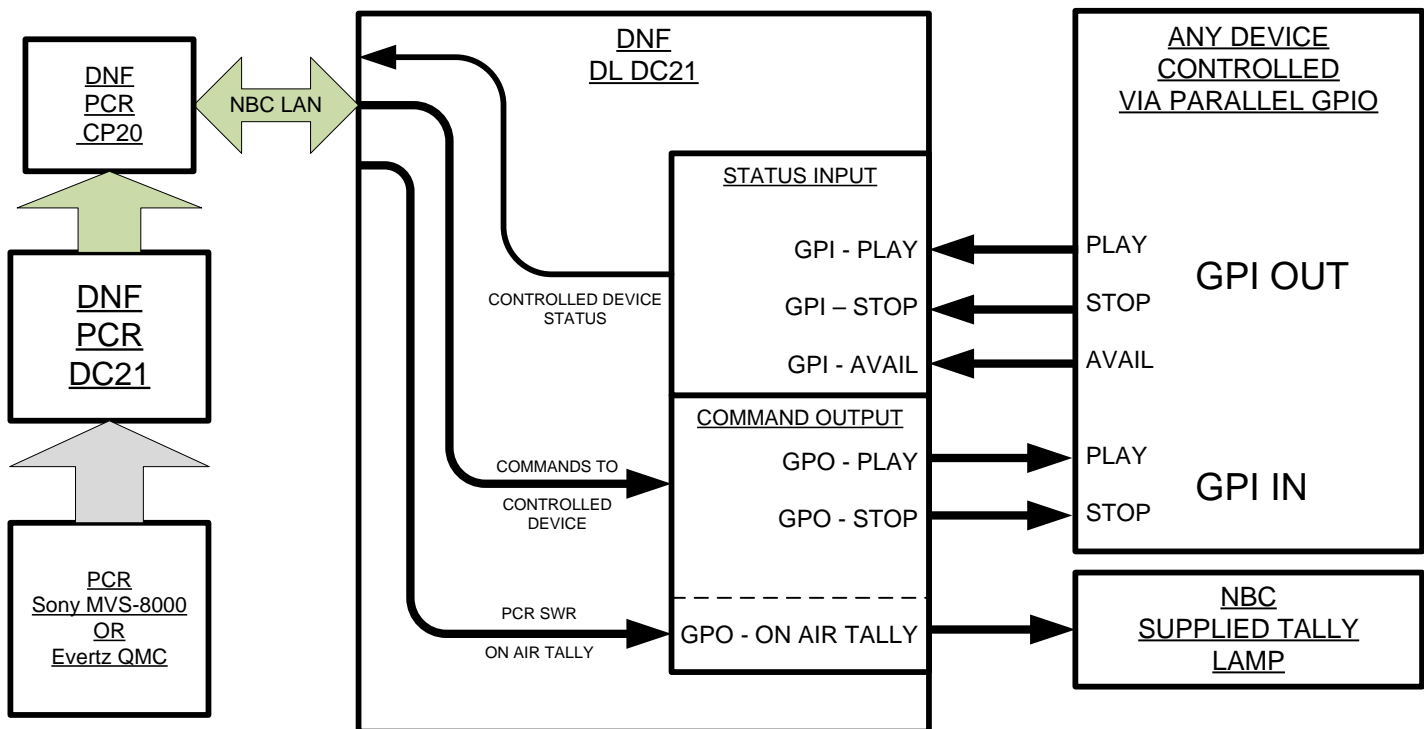
SYSTEM CONFIGURATION

The DL DC21 is configured using an off-the-shelf web browser running on a 3rd party computer. (Sun JAVA 6 Standard Edition or later is required to run some configuration applets.) The current configuration can be viewed at all times. An Engineering password is required to change the configuration.

All configuration data is stored in non-volatile storage on the DC21. The DC21 configuration can be saved in a file on the DC21 and copied to an external computer using the web browser. DC21 configuration can be restored from a saved file on the DC21 or external computer.
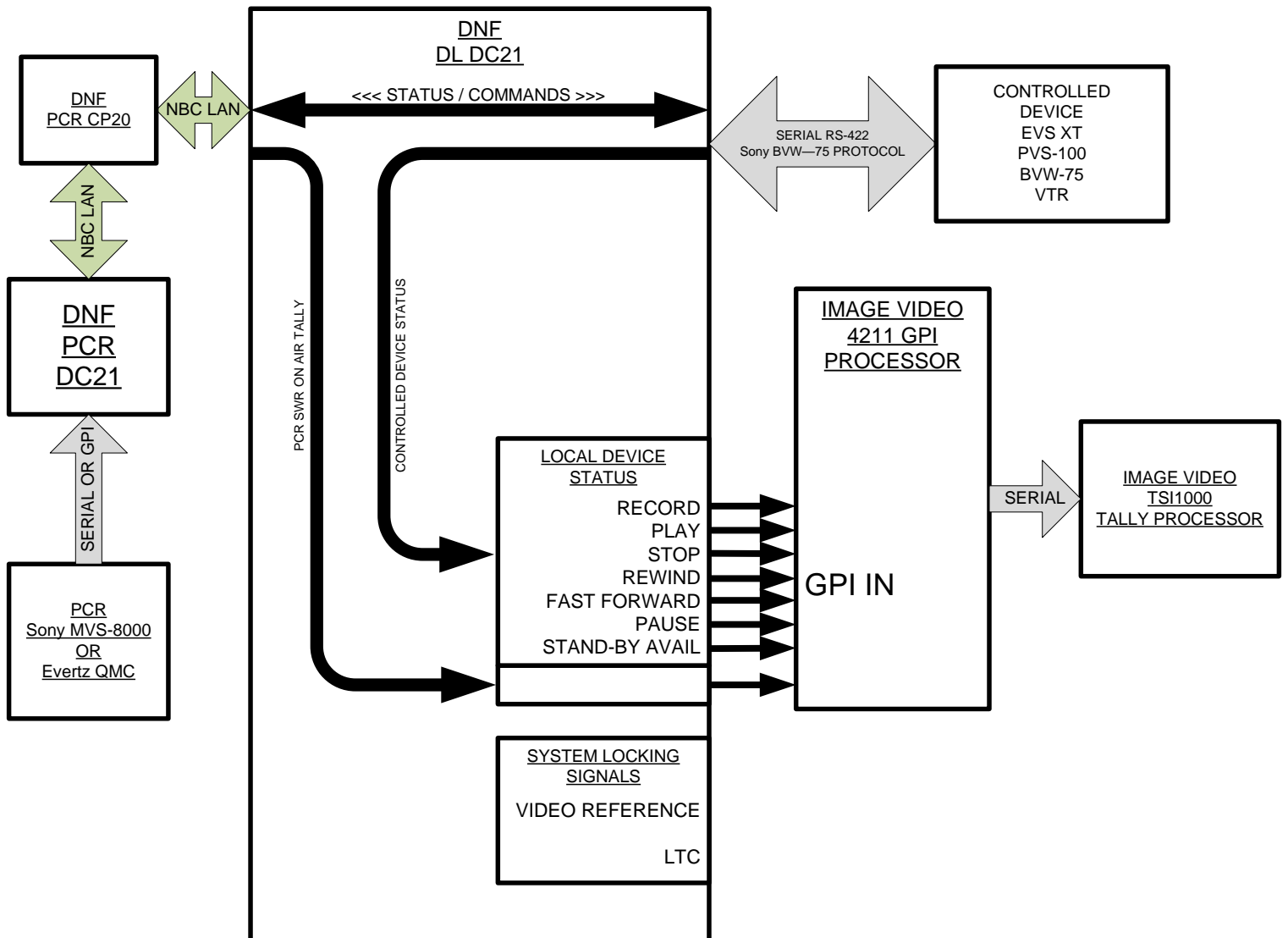
The USP-16 connects to and communicates solely with the DC21. Configuration of IP address, subnet mask, and gateway address is only required at time of installation. There is no show specific configuration for the USP. Its key color and legends are controlled by the DC21.
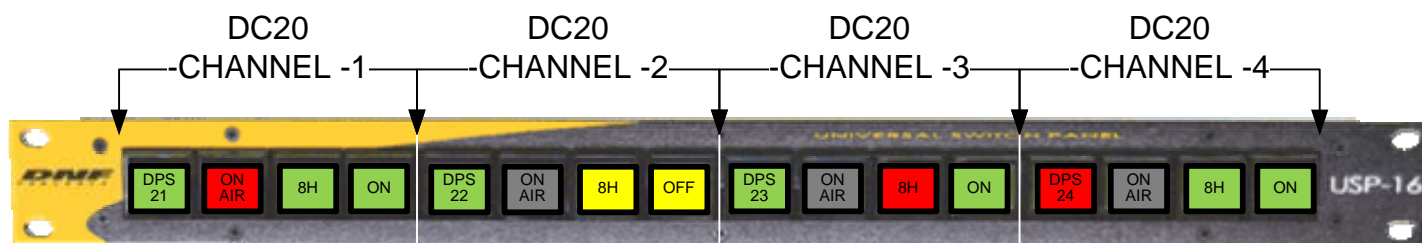
.**Device Location Configuration**

NBC PARALLEL ONLY PORT CONCEPT

NBC SERIAL PORT CONCEPT

DNF
DL DC21

<<< STATUS / COMMANDS >>>

DNF
PCR CP20

NBC LAN

NBC LAN

DNF
PCR
DC21

SERIAL OR GPI

PCR
Sony MVS-8000
OR
Evertz QMC

SERIAL RS-422
Sony BVW—75 PROTOCOL

CONTROLLED
DEVICE
EVS XT
PVS-100
BVW-75
VTR

PCR SWR ON AIR TALLY

CONTROLLED DEVICE STATUS

IMAGE VIDEO
4211 GPI
PROCESSOR

LOCAL DEVICE
STATUS

RECORD
PLAY
STOP
REWIND
FAST FORWARD
PAUSE
STAND-BY AVAIL

GPI IN

SERIAL

IMAGE VIDEO
TSI1000
TALLY PROCESSOR

SYSTEM LOCKING
SIGNALS

VIDEO REFERENCE

LTC

DEVICE LOCATION USP-16 CONFIGURATION

DEVICE ID	ON-AIR TALLY	PCR SELECTION	REMOTE ON/OFF
Displays 4 character DC20 Channel Label	Static text: "ON" "AIR"	Displays PCR name. Press the key to step through the list of PCR names.	Static text: "ON" or "OFF"
Backlight Colors:	**Backlight Colors**:	PCR selection disabled when Remote= ON.	**Backlight Colors**:
GREEN: DC20 able to control and monitor attached device.	**RED**: Device is selected on the PCR production switcher's PGM bus.	**Backlight Colors**:	**GREEN:** Remote= ON. Select PCR allowed control over device.
FLASHING RED: DC20 is NOT able to control or monitor device.	**DARK**: Device is NOT selected on the PGM bus.	**GREEN:** Connected to PCR (Remote= ON)	**AMBER**: Remote= OFF. No PCR allowed control over device.
DARK: No device assigned.		**AMBER**: Remote= ON: Awaiting PCR connection Remote= OFF: Not assigned to PCR.	
		FLASHING RED: Lost connection to PCR. (Remote= ON)	

EQUIPMENT LIST

LOCATION	QUANTITY	MODEL NUMBER	REQUIRED OPTIONS
Production Control Room	1	CP20 Control Panel	None
	1	DC21 Device Controller	Sony MVS Tally Protocol Quartz RCP-T01 Protocol PBUS Protocol
	4	USP-16- KeyServer	None
Device Location			
	1	DC21 Device Controller	Clip Control License
	1	USP-16- KeyServer	None