DIGITAL

CROSS-CONNECT

SYSTEM

AWARENESS

GUIDE

NOVEMBER, 1993

ACKNOWLEDGEMENTS

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Transport Systems Maintenance Guidelines

TRANSPORT SYSTEMS MAINTENANCE GUIDELINES

THE FIRST THING YOU NEED TO DO

A risk assessment must be made each time work activity is performed that may alter a stable environment. The assessment is intended to provide an understanding of the magnitude of a potential service impact. **Most** work activities performed by digital transport personnel have the potential to cause a service impact. Examples of work activities that mandate a risk assessment could be categorized as follows:

- Corrective Maintenance - repair

- Software Changes - generic upgrades/change outs
  Note: Contact meeting and Method of Procedure (MOP) required

- Hardware Changes - product change notices (PCNs)
  Note: Contact meeting and MOP required

- Growth Jobs - adding frames/network elements/network devices/fiber/copper
  Note: Contact meeting and MOP required

- Removal Jobs - removing frames/network elements/network devices/fiber/copper
  Note: Contact meeting and MOP required

- Customer Data Base Changes - setting up cross connects in the DCS/updating facility system records

- Installation Activity - Interoffice facilities/High Capacity Digital Services (i.e., HI-CAP) - new connects/disconnects/rearrangements

- Equipment Test Lists (i.e., maintenance routines) - performing scheduled preventative activities

WHAT IS A RISK ASSESSMENT?

When faced with a situation that requires an interruption or change to a stable environment, one should not rush into action. Sufficient time needs to be allocated to evaluate the possible service impacts that **could** result from the work activity. Key questions to ask yourself (or others) are as follows:

- Do I know what I am doing?

- Have I had the proper training to accomplish this task?

- Do I have the confidence to do this activity?

- Do I fully understand what impact I might cause to the network and or a specific customer?

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- Do I have all the necessary documentation at hand, and is it current?

- If a MOP is required, is it fail safe and has it been reviewed and signed off by the appropriate contacts?

- Do I have all the necessary test equipment and/or tools to do this job?

- Are all the right people involved; do I know who to call if I get into a trouble situation?

- Do I have the telephone numbers for these people?

o Has everyone that could be impacted by this activity been notified?

TO FURTHER ENSURE SUCCESS

If you don't feel comfortable with the situation for any reason, you should consult with someone who can help you in developing alternatives. This would start with your supervisor and could include your local technical support, Maintenance Engineering, and Electronic Systems Assistance Center (ESAC).

THE KEY THOUGHT IS NOT TO COMPROMISE A STABLE ENVIRONMENT WITHOUT HAVING A THOROUGH EVALUATION OF RISK AND RECOVERY. YOU NEED TO INCLUDE AS MANY GROUPS AS NECESSARY IN ORDER TO ACHIEVE THIS.

GOOD STUFF TO THINK ABOUT

The following examples represent a collection of ideas that should help your thought process in evaluating a situation:

Corrective Maintenance Activities - these endeavors typically have the potential of making a bad, or already risky situation worse. Before proceeding, a plan should be developed with consideration for the following:

- Impact the condition is presently having on service.

- Sensitivity to the appropriate time of day for maintenance actions that have a high service risk.

- Evaluation of possible alternatives.

- Availability of the vendor provided maintenance documentation.

- Availability of the proper tools, spare circuit packs, and a workable/tested recovery plan.

- Availability of technical support/expertise for advice and counsel - if needed.

- Any activity that causes a loss of redundancy (one controller/processor working, one controller/processor out of service). This situation requires a high confidence level that the active unit (controller/processor) does not have a history of instability and will successfully carry the load while maintenance is being performed on the out-of-service unit.

- A keen awareness that any switch to protection may cause up to a 50 ms hit (interruption) to service. A good understanding of the impact on service should be obtained prior to invoking a switch.

- The changing and or upgrading of the software that controls our system(s) has a high potential for affecting total system integrity. **A Contact Meeting and a MOP is**

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Mandatory. It is essential that you understand the process you will perform when changing/upgrading system software.

- The adding (growth) of new equipment to an existing environment constitutes two critical activities:

    1) When the equipment is electrically connected to power and communication bus feeds - at this point, it is possible for the new equipment to have an influence on the active system.

    2) When new equipment is integrated into the software - at this point, the added equipment is expected to be in a stable state. If the equipment is not stable, it can cause excessive automatic maintenance activity that can degrade service.

    3) A Contact Meeting and a MOP is Mandatory for either of these critical activities.
MORE GOOD STUFF

The following items are considered **Essential** practices:

- Vendor documented procedures must be followed when making any database changes.

- Periodically run database audits to find potential database errors and then correct them.

- Do not execute a command unless the expected result is known.

- Do not use software tools without Technical Support or ESAC assistance.

- Use wrist straps when installing, replacing, or handling circuit packs.

- Ensure that wrist straps are tested and that they perform their intended function.

- Maintain current back up tapes following standard tape back up procedures.

- All vendor recommended ETL's will be scheduled and completed in the recommended time frame(s).

- Ensure that the **Surveillance/Logging** channel is always operational.

- Ensure that the option which controls **Automatic Switching** to protection is set to allow the device to switch automatically.

- Properly label SS7 circuits at **all network points**, e.g., DCS systems.

- Only use the vendor approved documentation and tape drive cleaning kit to clean tape drive units in the DCS.

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- Where multiple DCS frames (of the same type and manufacturer) reside in the same building/floor make certain each machine has a unique physical label to ensure proper system identification.

- Do not leave the local office printer associated with the DCS on unless the office is staffed; if the printer runs out of paper it will be necessary to dispatch to clear the trouble.

- Always follow vendor documented procedures and use **extreme caution** when invoking the "copy-mem" message in the DCS. Note: an incorrect response to the "data validation" question could result in data corruption.

- Do not reenter a command to the DCS hoping that this time it will take- if a command is denied, follow documented error codes.

- Allow for completion of a command prior to entering the next command.

- Ensure a working FX line, which does not transverse the DCS, is available for external communicaitons.

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DO's and DON'Ts

The following is a collection of **Common Sense DO'S and DON'TS**. The list is not all inclusive, but should provide you with ample information to consider while performing your work function(s). Certain items in the list are not part of a DCS system but indirectly can cause problems with DCS systems if not properly attended to during installation and/or maintenance activities.

DO

All Systems (including DCS systems)

- create back up tapes before critical maintenance, provisioning, or growth operations.

- ensure that the surveillance link(s) are routed separately from the system and/or network that they surveil.

- replace a <u>replaced</u> circuit pack with the original if it does not correct or change a diagnostic failure.

- ensure maintenance and provisioning documents are kept current.

- use <u>standard</u> documentation for performing tasks - your school and personal notes may be out of date.

- monitor system performance during maintenance, provisioning, or growth activities.

- verify local alarms are in working order prior to beginning system growth activity.

- call the remote Control/Surveillance center prior to working on any transport element, before undertaking a potentially service affecting activity, or performing work that impacts the alarm circuitry.

- pay particular attention to the **last and /or recent** maintenance, provisioning, or growth activity that occurred prior to a system failure.

- work on common power distribution problems during light traffic, unless required for <u>service restoral.</u>

- train more than one person on existing, new, and changed technology and ensure that the knowledge obtained is utilized to build and maintain technical skills.

- keep system software **current.**

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- ensure that the replacement circuit pack <u>release/issue/revision</u> is equal to or higher than the one replaced, is backward compatible and, when applicable, a corresponding pack is in the other end of the circuit.

- follow all the vendor documented procedures for circuit pack replacement.

- use a **flash light** and inspect the channel, guide pins, and connector for damage before re-inserting a circuit pack.

- send defective circuit packs and tools for repair or replacement and include a description of the detected problem - provide a diagnostic failure printout when available.

<u>DO</u>

- keep suspect circuit packs <u>under strict control</u> until they have been tested, cleared and returned to service or shown to be defective and sent out to repair or replacement. **Never mix them with office spares**.

- leave office printer on while working on a network element.

- perform operational tests and observe TTY outputs/logs during and after critical work operations.

- follow vendor documented procedures for cleaning and replacing fan filters.

- perform routine maintenance of fan filters to avoid long term damage to the system due to lack of
  air flow.

- investigate and clear all alarms to ensure the system is in a stable state.

- investigate standing alarms to avoid masking customer troubles, the PCO should be contacted to investigate and resolve.

- take time to evaluate the situation before working on a unit with a standing alarm.

- use vendor specific documentation to perform trouble isolation or maintenance activity.

- call your next level of support if completion of trouble isolation procedures do not clear the trouble.

- maintain current vendor documentation, be sure to complete and mail the vendor registration card for the product.

TRANSPORT SYSTEMS MAINTENANCE GUIDELINES

- complete the **test and acceptance** procedures on all equipment prior to providing customer service.

Related Transport Systems (affecting potential health of DCS systems)

- ensure all CEVs, HUTs, outside plant cabinets, and any other remote equipment alarms are operational to the alarm center and remote alarm reporting is enabled.

- label all LSCIE terminated fiber cables.

- check the levels on the FOT's to ensure the loss is within budget if a fiber cable is replaced.

TRANSPORT SYSTEMS MAINTENANCE GUIDELINES

<u>DO NOT</u>

All Systems (including DCS systems)

- **TAKE SHORT CUTS ON APPROVED PROCEDURES.**

- **INHIBIT PRINTING/LOGGING OF TRAFFIC REPORTS OR OTHER ESSENTIAL SYSTEM STATUS MESSAGES, i.e. ASSERTS, AUDITS, THRESHOLDING, ALARMS, ETC.**

- **ARBITRARILY SWITCH TO PROTECTION.**

- **RESET THE SYSTEM WITHOUT CONSULTING ESAC.**

- **ROUTE SURVEILLANCE LINK(S) THROUGH THE SYSTEM BEING SURVEILLED.**

Related Transport Systems (affecting potential health of DCS systems)

- **EXCEED THE FIBER OPTIC BENDING RADIUS.**

- **EXCEED FIBER LENGTH MORE THAN TEN FEET.**

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TRANSPORT SYSTEMS MAINTENANCE GUIDELINES

In summary, we offer the following two (sets) of idea's to consider while performing your daily work operations:
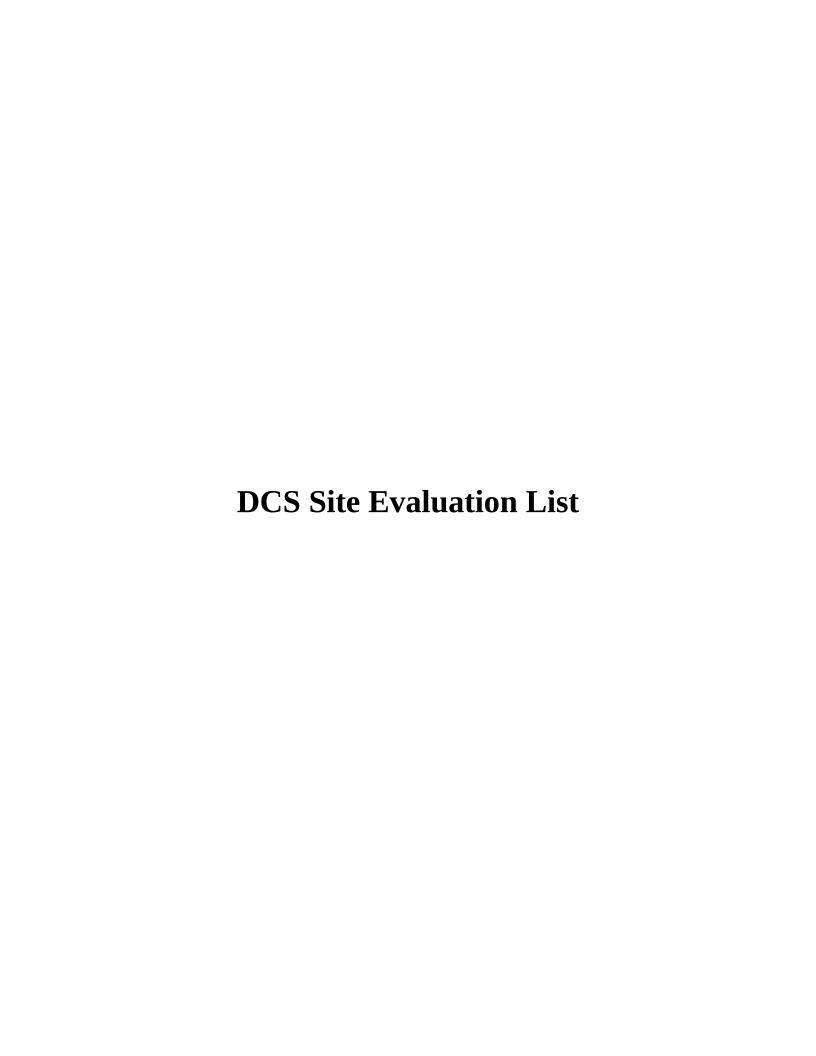

1. IN THE EVENT OF UNFORESEEN TROUBLES DURING WORK OPERATIONS

- Stop all work operations.

- Analyze the trouble and correct as soon as possible.

- If necessary, reverse prior work steps until trouble is cleared.

- If trouble can not be cleared and can not be located, contact the appropriate level of technical support or assistance **without delay.**

- <u>Do not</u> resume original work operation until the cause of the trouble is clearly known and corrected.

2. GET A SECOND QUALIFIED OPINION BEFORE

- Inhibiting the systems ability to perform audits.

- Inhibiting the systems ability to perform automatic system recovery, or maintenance actions.

- Unconditionally restoring any system component to service without allowing the system to first satisfactorily complete system diagnostics.

- Replacing any large amperage power distribution or power room fuses.

- Execution of recovery from disk or tape.

- Changing office, system, or global parameters.

- Impacting any components of the SS7 Network.

- Performing a "RESET".

- Initiating a restart/reboot of any controller.

- Establishing or invoking an "Alternate Map".

- Impacting any component of the Synchronization Network.

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- Removing any memory circuit packs.

- Before making your "Best Guess" in resolving any problem - make every effort to obtain documented information.

DCS Site Evaluation List

DCS SITE EVALUATION LIST

This information is provided as a foundation for conducting DCS site evaluations as part of an overall program for improving operations and maintenance practices. The following list of items may be used as a checklist to ensure that: (1) maintenance routines are being executed and (2) processes have been implemented to support orderly operations.   This checklist is intended to be used for all DCS systems, therefore, some categories and/or items may not be applicable to certain models and manufacturers of DCS systems.

FAN FILTERS

o   Check that air inlet vents for the fan are clean and not blocked.

o   Check that the fan filter is clean.

o   Check that the fan filter is installed with properly directed air flow.

o   Confirm that spare fan filters are available.

o   Confirm that personnel know when and how to change fan filters.

o   Confirm that personnel know how to order and obtain replacement & spare fan filters.

o   Confirm that fan filters are ordered (if applicable for the DCS).

MODEMS

o   Check that modems are physically secured (e.g. earthquake, vibration, etc.).

o   Check that connectors and cables for modems are physically secured.

o   Confirm that modems and associated cables are labeled with corresponding DCS administrative
port   IDs and frame IDs.

DOCUMENTATION

o   Check that the appropriate set of manuals is available and colocated with the user terminal.

o   Check that documentation issue is consistent with the software release.

o   Confirm that outdated/old manuals are discarded.

o   Confirm that training course manuals are not stored with standard product documentation.

o   Confirm that inappropriate message set manuals are not co-located with the DCS equipment.

o   Check that latest version of DCS company guidelines is available.

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CABLES/CONNECTORS

o   Check for proper termination of DCS connectors and cables.

o   Check that administrative port connections have been identified and recorded for reference.

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CABLES/CONNECTORS (cont.)

o   Check that administrative link cables are physically secured.

o   Check that all "in-service" administrative links are properly terminated at both ends.

SPARES MANAGEMENT

o   Confirm that the spares strategy and spares accessibility supports recovery objectives.

o   Inventory all spares (quantities and codes) and verify compliance with guidelines.

o   Confirm that personnel are aware of procedures for verifying hardware series numbers.

o   Check that all spares have been upgraded to the latest series number.

o   Confirm that personnel are aware of procedures to ensure spares are updated.

o   Confirm that personnel are aware of procedures for returning failed packs.

o   Return all failed or suspected failed circuit packs for repair.

o   Check that spare fuses of all types are available.

o   Confirm that personnel know how to order/obtain spare fuses.

TERMINALS/PRINTERS

o   Check that terminal and printer power is protected from interruption.

o   Check the physical condition of the terminal (e.g. CRT display, keyboard).

o   Check that instructions are available for programming terminals (e.g. function keys, attributes)
and   configuring printers (e.g. print quality).

o   Check for printers that jam paper.

o   Confirm that terminal and printer operation manuals are available.

o   Check that terminals and printers are physically secured (e.g. earthquake, vibration).

o   Check that cables and connectors for terminals and printers are physically secured.

o   Check readability of output from printers (e.g. worn ribbon).

o   Confirm that personnel know how to change printer ribbons, and order/obtain replacement
ribbons.

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o   Check that an adequate supply of printer paper is available.

o   Check that terminals & printers are labeled with corresponding frame IDs & administrative port IDs.

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ESD PRECAUTION

o Check that ESD straps are at the frame, in good condition and tested.

o Confirm that personnel use ESD straps in accordance with company guidelines.

o Check that spares are stored and handled with appropriate ESD protection.

o Check for the use of ESD circuit pack bags or equivalent ESD protection for transporting circuit packs between storage and the frame.

o Check that ESD cabinets are appropriately grounded.

SETTING OF OPTIONS

o Check that the settings used for programmable options are consistent with intended applications and company guidelines.

o Check for consistency of service affecting alarm thresholds per company guidelines.

o Check that company guidelines for setting of options are available and used by craft.

SECURITY

o Check that unique passwords are used.

o Check for automatic terminal logoff/time-out.

o Confirm that appropriate user permission levels are used.

o Confirm that appropriate I/O screening options are used.

o Confirm that disposal of printouts is in accordance with company guidelines.

o Confirm that disposal of outdated/old documentation is in accordance with company guidelines.

o Confirm that disposal of outdated/worn tapes is in accordance with proprietary material handling practices.

BACKUP

o Check for adequate coordination of removable backup media (e.g., tape), frame, terminal, printer and peripheral equipment for each system (i.e. color coding, frame ID labels).

o Check that backup media contents are in accordance with company guidelines.

o Check that a log is kept for tracking database backups which includes the backup dates and

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media IDs.

o   Confirm that the frequency of backup is consistent with the level of activity (e.g. cross connect changes) and specific applications (e.g. traffic types) carried by the DCS.

o   Confirm that a valid documented backup procedure is available and being used.

o   Confirm that appropriate techniques and methodologies are used for backup media storage and labeling.

TAPE ADMINISTRATION

o   Check that tape drive cleaning kits are available.

o   Confirm that personnel know when and how to use tape drive cleaning kits.

o   Confirm that personnel know how to order/obtain replacement/spare tape drive cleaning kits.

o   Confirm that personnel know when to discard worn tapes.

o   Confirm that outdated/old tapes are discarded.

o   Confirm that personnel know how to order/obtain replacement/spare tapes.

COVERS

o   Check that all removable covers are in place and secured.

LABELS/MARKINGS

o   Check that each frame has a "Frame ID" designation (physical label on the equipment).

o   Check that the terminal output contains the appropriate "Frame ID" that matches the "Frame ID" on the   provisioning document.

o   Confirm that individual frames can be distinguished in a multiple frame environment (i.e. color coding,   frame id labels).

LOCAL AND REMOTE ALARMS

o   Confirm that local and remote alarms are configured in accordance with applications and company   guidelines.

o   Confirm that the surveillance link does not tranverse the system.

SITE CONDITIONS

o   Confirm that equipment and surrounding areas are clean and free of debris (e.g., packing boxes).

o   Confirm that spare equipment, spare plugins, and test sets are secured and/or stored per company   guidelines.

o   Confirm that illumination in the work area is adequate.

o   Confirm that a chair for use with the terminal is available and in good working condition for extended   terminal work by the employee.

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COMMUNICATIONS

o   Check that the foreign exchange lines for use during emergency communications are in working order   and appropriately marked.

o   Confirm that at least one foreign exchange line is available that does not traverse the DCS.

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DCS Center Evaluation List

DCS CENTER EVALUATION LIST

This information is provided as a foundation for conducting DCS center evaluations as part of an overall program for improving operations and maintenance practices.

To Be Determined

Digital Services Training Track

DIGITAL SERVICES TRAINING TRACK -
FIELD TECHNICIAN

Core Training

o   Basic Electricity
o   Circuit Reading
o   T-1 Transmission Basics
o   Digital Cross-Connect Fundamentals
o   Digital Principles and Products
o   T-Carrier Patching
o   T-Berd 209/211 & 305 Test Sets
o   Installation Quality Operation
o   Using the 465 Oscilloscope
o   D4 Channel Banks
o   Customer Contact Skills

Administrative/Safety Training

o   Initial Defensive Driving
o   First Aid/CPR
o   Pacific Bell Safety Plan
o   Manhole Testing and Explosion Demo
o   Basis Van Driving (as required)
o   Advanced Van and Light Truck Driver
         Training (as required)
o   Refresher Defensive Driving (as
required)

Network Architecture Training

o   Data Communications Introduction
o   Data Communications Concepts
o   Data Communications Hardware and
         Controls
o   Data Communications
         Architectures/Topologies
o   Hi-Cap Digital Services Installation
and   Maintenance
o   Flexible Hi-Cap

Equipment Training

DCS
o   AT&T DACS IV Operations and
         Maintenance
o   AT&T DACS III Operations and
         Maintenance
o   AT&T DACS III & IV Facility
Trouble   Isolation
o   Tellabs Titan 5500 (as required)
o   DSC DEX-CS (as required)

Multiplexers (as required)
o   NEC RC-28D/DP
o   NEC 405 Operation and Maintenance
o   NEC 560 Operation and Maintenance
o   NEC 1.12 Operation and Maintenance
o   NTI FMT-150 Operation and
Maintenance
o   Alcatel DML-3X50 Operation and
         Maintenance
o   Alcatel LTS-1565D Operation and
         Maintenance
o   NTI FD-565 Operation and
Maintenance
o   AT&T DDM-1000 Operation and
         Maintenance
o   AT&T DDM-2000 Operation and
         Maintenance
o   NTI TransportNode Operation and
         Maintenance

Telemetry
o   Westronics Telemetry
o   Dantel Telemetry

Support Systems

o   Word Document
o   SORD Commands
o   Network Monitoring and Analysis
(NMA)   Facility Alarms

DIGITAL SERVICES TRAINING TRACK - FIELD TECHNICIAN

o   Switched Access Remote Testing System   (SARTS)

o   SARTS DS1 Testing

DIGITAL SERVICES TRAINING TRACK -
CUSTOMER SERVICES CENTER TECHNICAN/
MAINTENANCE CENTER TECHNICIAN

Core Training

o   Basic Electricity
o   T-1 Transmission Basics
o   Digital Cross-Connect Fundamentals
o   Digital Principles and Products
o   T-Carrier Patching
o   T-Berd 209/211 & 305 Test Sets
o   Installation Quality Operation
o   Reading Service Orders
o   Running Inside Wire
o   D4 Channel Banks
o   Customer Contact Skills

Administrative/Safety Training

o   Initial Defensive Driving
o   First Aid/CPR
o   Pacific Bell Safety Plan
o   Refresher Defensive Driving (as required)

Network Architecture Training

o   Data Communications Introduction
o   Data Communications Concepts
o   Data Communications Hardware and Controls
o   Data Communications Architectures/Topologies
o   Hi-Cap Digital Services Installation and   Maintenance
o   Flexible Hi-Cap

Equipment Training

DCS
o   AT&T DACS IV Operations and Maintenance
o   AT&T DACS III Operations and Maintenance
o   AT&T DACS III & IV Facility Trouble   Isolation (as required)
o   Tellabs Titan 5500 (as required)
o   DSC DEX-CS (as required)

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o   Alcatel LTS-1565D Operation and Maintenance
o   NTI FD-565 Operation and Maintenance
o   AT&T DDM-1000 Operation and Maintenance
o   AT&T DDM-2000 Operation and Maintenance
o   NTI TransportNode Operation and Maintenance

Telemetry
o   Westronics Telemetry
o   Dantel Telemetry

Support Systems

DIGITAL SERVICES TRAINING TRACK - CUSTOMER SERVICES CENTER TECHNICAN/ MAINTENANCE CENTER TECHNICIAN

o   Word Document
o   SORD Commands
o   Network Monitoring and Analysis
(NMA)   Facility Alarms
o   Switched Access Remote Testing
System   (SARTS)
o   SARTS DS1 Testing

DIGITAL SERVICES TRAINING TRACK - SUPERVISOR

Core Training

o   Basic Electricity
o   T-1 Transmission Basics
o   Digital Cross-Connect Fundamentals
o   Digital Principles and Products
o   T-Carrier Patching
o   T-Berd 209/211 & 305 Test Sets
o   Installation Quality Operation
o   D4 Channel Banks

Administrative/Safety Training

o   Initial Defensive Driving
o   First Aid/CPR
o   Pacific Bell Safety Plan
o   Refresher Defensive Driving (as required)

Network Architecture Training

o   Data Communications Introduction
o   Data Communications Concepts
o   Data Communications Hardware and Controls
o   Data Communications Architectures/Topologies
o   Hi-Cap Digital Services Installation and Maintenance
o   Flexible Hi-Cap

Equipment Training

DCS
o   AT&T DACS IV Operations and Maintenance
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o   AT&T DDM-2000 Operation and Maintenance
o   NTI TransportNode Operation and Maintenance

Telemetry (as required)
o   Westronics Telemetry
o   Dantel Telemetry

Support Systems

o   Word Document
o   SORD Commands

DIGITAL SERVICES TRAINING TRACK - SUPERVISOR

o   Network Monitoring and Analysis
(NMA)   Facility Alarms
o   Switched Access Remote Testing
System   (SARTS)
o   SARTS DS1 Testing