STP 11-25L13-SM-TG

Soldier's Manual and Trainer's Guide

MOS 25L

CABLE SYSTEMS INSTALLER-MAINTAINER

SKILL LEVELS 1, 2, AND 3

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Skill Levels 1, 2, and 3

CONTENTS

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Preface

This publication is for skill levels 1, 2, and 3 Soldiers holding military occupational specialty (MOS) 25L and for trainers and first-line supervisors. It contains standardized training objectives, in the form of task summaries, to train and evaluate Soldiers on critical tasks that support unit missions during wartime. Trainers and first-line supervisors should ensure Soldiers holding MOS 25L skill levels 1, 2, and 3 have access to this publication. It should be made available in the Soldier's work area, unit learning center, and unit libraries.

This publication applies to the Active Army, the Army National Guard (ARNG)/Army National Guard of the United States (ARNGUS), and the United States Army Reserve (USAR).

The proponent for this publication is the Signal School. Send comments and recommendations on Department of the Army (DA) Form 2028 (Recommended Changes to Publications and Blank Forms) directly to Commander, US Army Signal Center and Fort Gordon, ATTN: ATZH-DTM-I, Fort Gordon, Georgia 30905-5074.

This publication is available on the General Dennis J. Reimer Training and Doctrine Library for viewing and downloading. The World Wide Web (WWW) address is http://www.train.army.mil/.

Unless this manual states otherwise, masculine pronouns do not refer exclusively to men.

> **NOTE: Information contained in this publication is subject to change as new equipment is added to the Army inventory and revisions in policy and doctrine are made.**

Chapter 1
Introduction

1-1. GENERAL. The Soldier training publication (STP) identifies the individual military occupational specialty (MOS) and training requirements for Soldiers in various specialties. Another source of STP task data is the General Dennis J. Reimer Training and Doctrine Digital Library at http://www.train.army.mil/. Commanders, trainers, and Soldiers should use the STP to plan, conduct, and evaluate individual training in units. The STP is the primary MOS reference to support the self-development and training of every Soldier in the unit. It is used with the Soldier's Manual of Common Tasks, Army Training and Evaluation Programs (ARTEPs), and Field Manual (FM) 7-0, *Training the Force*, to establish effective training plans and programs that integrate Soldier, leader, and collective tasks. This chapter explains how to use the STP in establishing an effective individual training program. It includes doctrinal principles and implications outlined in FM 7-0. Based on these guidelines, commanders and unit trainers must tailor the information to meet the requirements for their specific unit.

1-2. TRAINING EQUIPMENT. Every Soldier, noncommissioned officer (NCO), warrant officer, and officer has one primary mission—to be trained and ready to fight and win our nation's wars. Success in battle does not happen by accident; it is a direct result of tough, realistic, and challenging training.

a. Operational Environment

(1) Commanders and leaders at all levels must conduct training with respect to a wide variety of operational missions across the full spectrum of operations; these operations may include combined arms, joint, multinational, and interagency considerations, and span the entire breadth of terrain and environmental possibilities. Commanders must strive to set the daily training conditions as closely as possible to those expected for actual operations.

(2) The operational missions of the Army include not only war, but also military operations other than war (MOOTW). Operations may be conducted as major combat operations, a small-scale contingency, or a peacetime military engagement. Offensive and defensive operations normally dominate military operations in war along with some small-scale contingencies. Stability operations and support operations dominate in MOOTW. Commanders at all echelons may combine different types of operations simultaneously and sequentially to accomplish missions in war and MOOTW. These missions require training since future conflict will likely involve a mix of combat and MOOTW, often concurrently. The range of possible missions complicates training. Army forces cannot train for every possible mission; they train for war and prepare for specific missions as time and circumstances permit.

(3) Our forces today use a train-alert-deploy sequence. We cannot count on the time or opportunity to correct or make up training deficiencies after deployment. Maintaining forces that are ready now, places increased emphasis on training and the priority of training. This concept is a key link between operational and training doctrine.

(4) Units train to be ready for war based on the requirements of a precise and specific mission; in the process they develop a foundation of combat skills that can be refined based on the requirements of the assigned mission. Upon alert, commanders assess and refine from this foundation of skills. In the train-alert-deploy process, commanders use whatever time the alert cycle provides to continue refinement of mission-focused training. Training continues during time available between alert notification and deployment, between deployment and employment, and even during employment as units adapt to the specific battlefield environment and assimilate combat replacements.

b. How the Army Trains the Army

(1) Training is a team effort and the entire Army—Department of the Army (DA), major Army commands (MACOMs), the institutional training base, units, the combat training centers (CTCs), each individual Soldier and the civilian workforce—has a role that contributes to force readiness. DA and MACOMs are responsible for resourcing the Army to train. The Institutional Army, including schools, training centers, and NCO academies, for example, train Soldiers and leaders to take their place in units in the Army by teaching the doctrine and tactics, techniques, and procedures (TTP). Units, leaders, and individuals train to standard on their assigned critical individual tasks. The unit trains first as an organic unit and then as an integrated component of a team. Before the unit can be trained to function as a team, each Soldier must be trained to perform their individual supporting tasks to standard. Operational deployments and major training opportunities, such as major training exercises, CTCs, and ARTEPs provide rigorous, realistic, and stressful training and operational experience under actual or simulated combat and operational conditions to enhance unit readiness and produce bold, innovative leaders. The result of this Army-wide team effort is a training and leader development system that is unrivaled in the world. Effective training produces the force—Soldiers, leaders, and units—that can successfully execute any assigned mission.

(2) The Army Training and Leader Development Model (Figure 1-1) centers on developing trained and ready units led by competent and confident leaders. The model depicts an important dynamic that creates a lifelong learning process. The three core domains that shape the critical learning experiences throughout a Soldiers and leaders time span are the operational, institutional, and self-development domains. Together, these domains interact using feedback and assessment from various sources and methods to maximize warfighting readiness. Each domain has specific, measurable actions that must occur to develop our leaders.

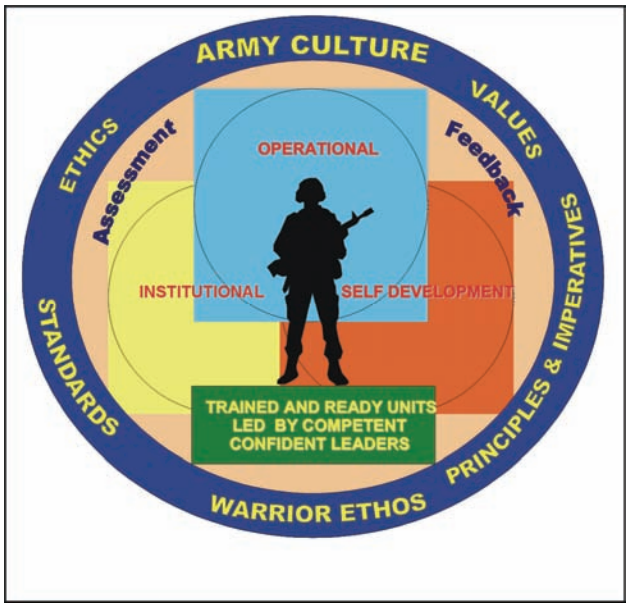

Figure 1-1. Army Training and Leader Development Model

(3) The operational domain includes home station training, CTC rotations, and joint training exercises and deployments that satisfy national objectives. Each of these actions provides foundational experiences for Soldier, leader, and unit development. The institutional domain focuses on educating and training Soldiers and leaders on the key knowledge, skills, and attributes required to operate in any environment. It includes individual, unit and joint schools, and advanced education. The self-development domain, both structured and informal, focuses on taking those actions necessary to reduce or eliminate the gap between operational and institutional experiences.

(4) Throughout this lifelong learning and experience process, there is formal and informal assessment and feedback of performance to prepare leaders and Soldiers for their next level of responsibility. Assessment is the method used to determine the proficiency and potential of leaders against a known standard. Feedback must be clear, formative guidance directly related to the outcome of training events measured against standards.

c. Leader Training and Leader Development.

(1) Competent and confident leaders are a prerequisite to the successful training of units. It is important to understand that leader training and leader development are integral parts of unit readiness. Leaders are inherently Soldiers first and should be technically and tactically proficient in basic Soldier skills. They are also adaptive, capable of sensing their environment, adjusting the plan when appropriate, and properly applying the proficiency acquired through training.

(2) Leader training is an expansion of these skills that qualifies them to lead other Soldiers. As such, doctrine and principles of training require the same level of attention of senior commanders. Leader training occurs in the Institutional Army, the unit, the CTCs, and through self-development. Leader training is just one portion of leader development.

(3) Leader development is the deliberate, continuous, sequential, and progressive process, grounded in Army values, that grows Soldiers and civilians into competent and confident leaders capable of decisive action. Leader development is achieved through the lifelong synthesis of the knowledge, skills, and experiences gained through institutional training and education, organizational training, operational experience, and self-development. Commanders play the key roll in leader development that ideally produces tactically and technically competent, confident, and adaptive leaders who act with boldness and initiative in dynamic, complex situations to execute mission-type orders achieving the commander's intent.

d. Training Responsibility. Soldier and leader training and development continue in the unit. Using the institutional foundation, training in organizations and units focuses and hones individual and team skills and knowledge.

(1) **Commander Responsibility**.

(a) The unit commander is responsible for the wartime readiness of all elements in the formation. The commander is, therefore, the primary trainer of the organization and is responsible for ensuring that all training is conducted in accordance with (IAW) the STP to the Army standard.

(b) Commanders ensure STP standards are met during all training. If a Soldier fails to meet established standards for identified MOS tasks, the Soldier must retrain until the tasks are performed to standard. Training to standard on MOS tasks is more important than completion of a unit-training event such as an ARTEP. The objective is to focus on sustaining MOS proficiency—this is the critical factor commanders must adhere to when training individual Soldiers units.

(2) **NCO Responsibility**.

(a) A great strength of the US Army is its professional NCO Corps who takes pride in being responsible for the individual training of Soldiers, crews, and small teams. The NCO support channel parallels and complements the chain of command. It is a channel of communication and supervision from the Command Sergeant Major (CSM) to the First Sergeants (1SGs) and then to other NCOs and enlisted personnel. NCOs train Soldiers to the non-negotiable standards published in STPs. Commanders delegate authority to NCOs in the support channel as the primary trainers of individual, crew, and small team training. Commanders hold NCOs responsible for conducting standards-based, performance-oriented, battle-focused training and providing feedback on individual, crew, and team proficiency. Commanders define responsibilities and authority of their NCOs to their staffs and subordinates.

(b) NCOs continue the Soldierization process of newly assigned enlisted Soldiers, and begin their professional development. NCOs are responsible for conducting standards-based, performance-oriented, battle-focused training. They identify specific individual, crew, and small team tasks that support the unit's collective mission essential tasks; plan, prepare, rehearse, and execute training; and evaluate training and conduct after action reviews (AARs) to provide feedback to the commander on individual, crew, and small team proficiency. Senior NCOs coach junior NCOs to master a wide range of individual tasks.

(3) **Soldier Responsibility**. Each Soldier is responsible for performing individual tasks identified by the first-line supervisor based on the unit's mission essential task list (METL). Soldiers must perform tasks to the standards included in the task summary. If Soldiers have questions about tasks or which tasks in this manual they must perform, they are responsible for asking their first-line supervisor for clarification, assistance, and guidance. First-line supervisors know how to perform each task or can direct Soldiers to appropriate training materials, including current FMs, technical manuals (TMs), and Army regulations (ARs). Soldiers are responsible for using these materials to maintain performance. They are also responsible for maintaining standard performance levels of all Soldier's Manual of Common Tasks at their current skill level and below. Periodically, Soldiers should ask their supervisor or another Soldier to check their performance to ensure that they can perform the tasks.

1-3. BATTLE-FOCUSED TRAINING. Battle focus is a concept used to derive peacetime training requirements from assigned and anticipated missions. The priority of training in units is to train to standard on the wartime mission. Battle focus guides the planning, preparation, execution, and assessment of each organization's training program to ensure its members train as they are going to fight. Battle focus is critical throughout the entire training process and is used by commanders to allocate resources for training based on wartime and operational mission requirements. Battle focus enables commanders and staffs at all echelons to structure a training program that copes with non-mission-related requirements while focusing on mission essential training activities. It is recognized that a unit cannot attain proficiency to standard on every task whether due to time or other resource constraints. However, unit commanders can achieve a successful training program by consciously focusing on a reduced number of METL tasks that are essential to mission accomplishment.

a. Linkage between METL and STP. A critical aspect of the battle focus concept is to understand the responsibility for and the linkage between the collective mission essential tasks and the individual tasks that support them. For example, the commander and the CSM/1SG must jointly coordinate the collective mission essential tasks and supporting individual tasks on which the unit will concentrate its efforts during a given period. This task hierarchy is provided in the task database at the Reimer Digital Library. The CSM/1SG must select the specific individual tasks that support each collective task to be trained. Although NCOs have the primary role in training and sustaining individual Soldier skills, officers at every echelon remain responsible for training to established standards during both individual and collective training. Battle focus is applied to all missions across the full spectrum of operations.

b. Relationship of STPs to Battle-focused Training. The two key components of any STP are the Soldier's manual (SM) and trainer's guide (TG). Each gives leaders important information to help implement the battle-focused training process. The trainer's guide relates Soldier and leader tasks in the MOS and skill level to duty positions and equipment. It states where the task is trained, how often training should occur to sustain proficiency, and who in the unit should be trained. As leaders assess and plan training, they should rely on the trainer's guide to help identify training needs.

(1) Leaders conduct and evaluate training based on Army-wide training objectives and on the task standards published in the Soldier's manual task summaries or in the Reimer Digital Library. The task summaries ensure that trainers in every unit and location define task standards the same way and trainers evaluate all Soldiers to the same standards.

(2) Figure 1-2 shows how battle-focused training relates to the trainer's guide and Soldier's manual. The left column shows the steps involved in training Soldiers and the right column shows how the STP supports each of these steps.

BATTLE-FOCUS PROCESS	STP SUPPORT PROCESS
Select supporting Soldier tasks	Use TG to relate tasks to METL
Conduct training assessment	Use TG to define what Soldier tasks to assess
Determine training objectives	Use TG to set objectives
Determine strategy; plan for training	Use TG to relate Soldier tasks to strategy
Conduct pre-execution checks	Use SM task summary as source for task performance
Execute training; conduct AAR	Use SM task summary as source for task performance
Evaluate training against established standards	Use SM task summary as standard for evaluation

Figure 1-2. Relationship of Battle-Focused Training and STP

1-4. TASK SUMMARY FORMAT. Task summaries outline the wartime performance requirements of each critical task in the SM. They provide the Soldier and the trainer with the information necessary to prepare, conduct, and evaluate critical task training. As a minimum, task summaries include information the Soldier must know and the skills that he must perform to standards for each task. The format of the task summaries included in this SM is as follows:

a. Task Number. A 10-digit number identifies each task or skill. This task number, along with the task title, must be included in any correspondence pertaining to the task.

b. Task Title. The task title identifies the action to be performed.

c. Conditions. The task conditions identify all the equipment, tools, references, job aids, and supporting personnel that the Soldier needs to use to perform the task in wartime. This section identifies any environmental conditions that can alter task performance, such as visibility, temperature, or wind. This section also identifies any specific cues or events that trigger task performance, such as a chemical attack or identification of a threat vehicle.

d. Standards. The task standards describe how well and to what level the task must be performed under wartime conditions. Standards are typically described in terms of accuracy, completeness, and speed.

e. Training and Evaluation. The training evaluation section identifies specific actions, known as performance steps, which the Soldier must do to successfully complete the task. These actions are in the evaluation guide section of the task summary and are listed in a GO/NO GO format for easy evaluation. For some tasks, the training and evaluation section may also include detailed training information in a training information outline and an evaluation preparation section. The evaluation preparation section indicates necessary modifications to task performance in order to train and evaluate a task that cannot be trained to the wartime conditions. It may also include special training and evaluation preparation instructions to accommodate these modifications, and any instructions that should be given to the Soldier before evaluation.

f. References. This section identifies references that provide more detailed and thorough explanations of task performance requirements than those given in the task summary description.

g. Warnings. Warnings alert users to the possibility of immediate personal injury or damage to equipment.

h. Notes. Notes provide a supportive explanation or hint that relates to the performance standards.

1-5. TRAINING EXECUTION. All good training, regardless of the specific collective, leader, and individual tasks being executed, must comply with certain common requirements. These include adequate preparation, effective presentation and practice, and thorough evaluation. The execution of training includes preparation for training, conduct of training, and recovery from training.

a. Preparation for Training. Formal near-term planning for training culminates with the publication of the unit-training schedule. Informal planning, detailed coordination, and preparation for executing the training continue until the training is performed. Commanders and other trainers use training meetings to assign responsibility for preparation of all scheduled training. Preparation for training includes selecting tasks to be trained, planning the conduct of the training, training the trainers, reconnaissance of the site, issuing the training execution plan, and conducting rehearsals and pre-execution checks. Pre-execution checks are preliminary actions commanders and trainers use to identify responsibility for these and other training support tasks. They are used to monitor preparation activities and to follow up to ensure planned training is conducted to standard. Pre-execution checks are a critical portion of any training meeting. During preparation for training, battalion and company commanders identify and eliminate potential training distracters that develop within their own organizations. They also stress personnel accountability to ensure maximum attendance at training.

(1) Subordinate leaders, as a result of the bottom-up feed from internal training meetings, identify and select the individual tasks necessary to support the identified training objectives. Commanders develop the tentative plan to include requirements for preparatory training, concurrent training, and training resources. At a minimum, the training plan should include confirmation of training areas and locations, training ammunition allocations, training simulations and simulators availability, transportation requirements, Soldier support items, a risk management analysis, assignment of responsibility for the training, designation of trainers responsible for approved training, and final coordination. The time and other necessary resources for retraining must also be an integral part of the original training plan.

(2) Leaders, trainers, and evaluators are identified, trained to standard, and rehearsed prior to the conduct of the training. Leaders and trainers are coached on how to train, given time to prepare, and rehearsed so that training will be challenging and doctrinally correct. Commanders ensure that trainers and evaluators are not only tactically and technically competent on their training tasks, but also understand how the training relates to the organization's METL. Properly prepared trainers, evaluators, and leaders project confidence and enthusiasm to those being trained. Trainer and leader training is a critical event in the preparation phase of training. These individuals must demonstrate proficiency on the selected tasks prior to the conduct of training.

(3) Commanders, with their subordinate leaders and trainers, conduct site reconnaissance, identify additional training support requirements, and refine and issue the training execution plan. The training plan should identify all those elements necessary to ensure the conduct of training to standard. Rehearsals are essential to the execution of good training. Realistic, standards-based, performance-oriented training requires rehearsals for trainers, support personnel, and evaluators. Preparing for training in Reserve Component (RC) organizations can require complex pre-execution checks. RC trainers must often conduct detailed coordination to obtain equipment, training support system products, and ammunition from distant locations. In addition, RC pre-execution checks may be required to coordinate Active Component assistance from the numbered Armies in the continental United States (CONUSA), training support divisions, and directed training affiliations.

b. Conduct of Training. Ideally, training is executed using the crawl-walk-run approach. This allows and promotes an objective, standards-based approach to training. Training starts at the basic level. Crawl events are relatively simple to conduct and require minimum support from the unit. After the crawl stage, training becomes incrementally more difficult, requiring more resources from the unit and home station, and increasing the level of realism. At the run stage, the level of difficulty for the training event intensifies. Run stage training requires optimum resources and ideally approaches the level of realism expected in combat. Progression from the walk to the run stage for a particular task may occur during a one-day training exercise or may require a succession of training periods over time. Achievement of the Army standard determines progression between stages.

(1) In crawl-walk-run training, the tasks and the standards remain the same; however, the conditions under which they are trained change. Commanders may change the conditions, for example, by increasing the difficulty of the conditions under which the task is being performed, increasing the tempo of the task training, increasing the number of tasks being trained, or by increasing the number of personnel involved in the training. Whichever approach is used, it is important that all leaders and Soldiers involved understand in which stage they are currently training and understand the Army standard.

(2) An AAR is immediately conducted and may result in the need for additional training. Any task that was not conducted to standard should be retrained. Retraining should be conducted at the earliest opportunity. Commanders should program time and other resources for retraining as an integral part of their training plan. Training is incomplete until the task is trained to standard. Soldiers will remember the standard enforced, not the one discussed.

c. Recovery from Training. The recovery process is an extension of training, and once completed, it signifies the end of the training event. At a minimum, recovery includes conduct of maintenance training, turn-in of training support items, and the conduct of AARs that review the overall effectiveness of the training just completed.

(1) Maintenance training is the conduct of post-operations preventive maintenance checks and services (PMCS), accountability of organizational and individual equipment, and final inspections. Class IV, Class V, Training Aids Devices Simulators and Simulations (TADSS) and other support items are maintained, accounted for, and turned-in and training sites and facilities are closed out.

(2) AARs conducted during recovery focus on collective, leader, and individual task performance, and on the planning, preparation, and conduct of the training just completed. Unit AARs focus on individual and collective task performance, and identify shortcomings and the training required to correct deficiencies. AARs with leaders focus on tactical judgment. These AARs contribute to leader learning and provide opportunities for leader development. AARs with trainers and evaluators provide additional opportunities for leader development.

1-6. TRAINING ASSESSMENT. Assessment is the commander's responsibility. It is the commander's judgment of the organization's ability to accomplish its wartime operational mission. Assessment is a continuous process that includes evaluating individual training, conducting an organizational assessment, and preparing a training assessment. The commander uses his experience, feedback from training evaluations, and other evaluations and reports to arrive at his assessment. Assessment is both the end and the beginning of the training management process. Training assessment is more than just training evaluation, and encompasses a wide variety of inputs. Assessments include such diverse systems as training, force integration, logistics, and personnel, and provide the link between the unit's performance and the Army standard. Evaluation of training is, however, a major component of assessment. Training evaluations provide the commander with feedback on the demonstrated training proficiency of Soldiers, leaders, battle staffs, and units. Commanders cannot personally observe all training in their organization and, therefore, gather feedback from their senior staff officers and NCOs.

a. Evaluation of Training. Training evaluations are a critical component of any training assessment. Evaluation measures the demonstrated ability of Soldiers, commanders, leaders, battle staffs, and units against the Army standard. Evaluation of training is integral to standards-based training and is the cornerstone of leader training and leader development. STPs describe standards that must be met for each Soldier task.

(1) All training must be evaluated to measure performance levels against the established Army standard. The evaluation can be as fundamental as an informal, internal evaluation performed by the leader conducting the training. Evaluation is conducted specifically to enable the individual undergoing the training to know whether the training standard has been achieved. Commanders must establish a

climate that encourages candid and accurate feedback for the purpose of developing leaders and trained Soldiers.

(2) Evaluation of training is not a test; it is not used to find reasons to punish leaders and Soldiers. Evaluation tells Soldiers whether or not they achieved the Army standard and, therefore, assists them in determining the overall effectiveness of their training plans. Evaluation produces disciplined Soldiers, leaders, and units. Training without evaluation is a waste of time and resources.

(3) Leaders use evaluations as an opportunity to coach and mentor Soldiers. A key element in developing leaders is immediate, positive feedback that coaches and leads subordinate leaders to achieve the Army standard. This is a tested and proven path to develop competent, confident adaptive leaders.

b. Evaluators. Commanders must plan for formal evaluation and must ensure the evaluators are trained. These evaluators must also be trained as facilitators to conduct AARs that elicit maximum participation from those being trained. External evaluators will be certified in the tasks they are evaluating and normally will not be dual-hatted as a participant in the training being executed.

c. Role of Commanders and Leaders. Commanders ensure that evaluations take place at each echelon in the organization. Commanders use this feedback to teach, coach, and mentor their subordinates. They ensure that every training event is evaluated as part of training execution and that every trainer conducts evaluations. Commanders use evaluations to focus command attention by requiring evaluation of specific mission essential and battle tasks. They also take advantage of evaluation information to develop appropriate lessons learned for distribution throughout their commands.

d. AAR. The AAR, whether formal or informal, provides feedback for all training. It is a structured review process that allows participating Soldiers, leaders, and units to discover for themselves what happened during the training, why it happened, and how it can be done better. The AAR is a professional discussion that requires the active participation of those being trained. FM 7-0 provides detailed instructions for conducting an AAR and detailed guidance on coaching and critiquing during training.

1-7. NCO SELF-DEVELOPMENT AND THE SOLDIER'S MANUAL.

a. Self-development is one of the key components of the leader development program. It is a planned progressive and sequential program followed by leaders to enhance and sustain their military competencies. It consists of individual study, research, professional reading, practice, and self-assessment. Under the self-development concept, the NCO, as an Army professional, has the responsibility to remain current in all phases of the MOS. The SM is the primary source for the NCO to use in maintaining MOS proficiency.

b. Another important resource for NCO self-development is the Army Correspondence Course Program (ACCP). Soldiers can access the ACCP online at http://www.atsc.army.mil/accp/aipdnew.asp.

c. General Dennis J. Reimer Training and Doctrine Digital Library is an additional resource for NCO self-development. This electronic library is the single repository of approved Army training and doctrine information. Soldiers can access the library online at http://www.train.army.mil/.
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d. Unit learning centers are valuable resources for planning self-development programs. They can help access enlisted career maps, training support products, and extension training materials, such as FMs and TMs. It is the Soldier's responsibility to use these materials to maintain performance.

1-8. TRAINING SUPPORT. This manual includes the following appendixes and information that provide additional training support information.

(a) Appendix A, DA Form 5164-R (Hands-on Evaluation). This appendix contains the instructions for using DA Form 5164-R and a completed sample form for NCOs to use during evaluation of Soldiers' manual tasks.

(b) Appendix B, DA Form 5165-R (Field Expedient Squad Book). This appendix contains the instructions for using DA Form 5165-R and a completed sample form for NCOs to use during evaluation of Soldiers' manual tasks.

(c) Glossary. The glossary is a single comprehensive list of acronyms, abbreviations, definitions, and letter symbols.

(d) References. This section contains two lists of references, required and related, which support training of all tasks in this SM. Required references are listed in the conditions statement and are required for the Soldier to do the task. Related references are materials that provide more detailed information and a more thorough explanation of task performance.

1-9. FEEDACK. Recommendations for improvement of this STP are requested. Feedback will help to ensure that this STP answers the training needs of units in the field.

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Chapter 2
Trainer's Guide

2-1. GENERAL. The MOS Training Plan (MTP) identifies the essential components of a unit-training plan for individual training. Units have different training needs and requirements based on differences in environment, location, equipment, dispersion, and similar factors. Therefore, the MTP should be used as a guide for conducting unit training and not a rigid standard. The MTP shows the relationship of an MOS skill level between duty position and critical tasks. These critical tasks are grouped by task commonality into subject areas.

The MTP's Subject Area Codes list subject area numbers and titles used throughout the MTP. These subject areas are used to define the training requirements for each duty position within an MOS.

The Duty Position Training Requirements table identifies the total training requirement for each duty position within an MOS and provides a recommendation for cross training and train-up/merger training.

- **Duty Position column**. This column lists the duty positions of the MOS, by skill level, which have different training requirements.
- **Subject Area column**. This column lists, by numerical key, the subject areas a Soldier must be proficient in to perform in that duty position.
- **Cross Train column**. This column lists the recommended duty position for which Soldiers should be cross-trained.
- **Train-up/Merger column**. This column lists the corresponding duty position for the next higher skill level or MOSC the Soldier will merge into on promotion.

The Critical Task List table lists, by general subject areas, the critical tasks to be trained in an MOS and the type of training required (resident, integration, or sustainment).

- **Subject Area column**. This column lists the subject area number and title.
- **Task Number column**. This column lists the task numbers for all tasks included in the subject area.
- **Title column**. This column lists the task title for each task in the subject area.
- **Training Location column**. This column identifies the training location where the task is first trained to Soldier training publications standards. If the task is first trained to standard in the unit, the word "Unit" will be in this column. If the task is first trained to standard in the training base, it will identify, by brevity code (ANCOC, BNCOC, etc.), the resident course where the task was taught. Figure 2-1 contains a list of training locations and their corresponding brevity codes.

UNIT	Trained in the Unit
AIT	Advanced Individual Training
BNCOC	Basic NCO Course
ANCOC	Advanced NCO Course
ASI	Additional Skill Identifier

Figure 2-1. Training Locations

- **Sustainment Training Frequency Column**. This column indicates the recommended frequency at which the tasks should be trained to ensure Soldiers maintain task proficiency. Figure 2-2 identifies the frequency codes used in this column.

BA	- Biannually
AN	- Annually
SA	- Semiannually
QT	- Quarterly
MO	- Monthly
BW	- Biweekly
WK	- Weekly

Figure 2-2. Sustainment Training Frequency Codes

- **Sustainment Training Skill Level Column**. This column lists the skill levels of the MOS for which Soldiers must receive sustainment training to ensure they maintain proficiency to Soldier's manual standards.

2-2. SUBJECT AREA CODES.

Skill Level 1

1 Navigate
2 Cable and Equipment
3 Multiplexers
4 Telephone Sets
5 Telephone Maintenance Truck
6 Local Area Network (LAN)/Wide Area Network (WAN) Substation
7 Communications Security (COMSEC)
8 Conduit

Skill Level 2

9 Cable and Equipment Supervision
10 Telephone Sets Supervision
11 LAN/WAN Substation Supervision

Skill Level 3

12 Cable and Equipment Inspection
13 Telephone Maintenance Truck Inspection
14 Telephone Sets Inspection
15 Multiplexer Inspection
16 LAN/WAN Substation Inspection
17 Computer Technology
18 Navigation
19 Mobile Subscriber Equipment (MSE)
20 Antenna Installation

2-3. CRITICAL TASK LIST.

MOS TRAINING PLAN
25L13
CRITICAL TASKS

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
Skill Level 1				
Subject Area 1. Navigate				
113-610-2044	Navigate Using the AN/PSN-11	AIT	SA	1-3
Subject Area 2. Cable and Equipment				
113-588-2002	Perform Cable Marking Procedures	AIT	AN	1-3
113-588-2003	Install Connectors on Copper Cable	AIT	AN	1-3
113-588-2004	Perform a Splice on a Plastic Sheath, Plastic Insulated Cable	AIT	AN	1-3
113-588-2005	Install AC/DC Power Source for Communications Equipment	UNIT	AN	1-3
113-588-2006	Install Cable/Wire Systems	AIT	SA	1-3
113-588-2010	Recover Cable/Wire System	AIT	SA	1-3
113-632-4001	Install Commercial Fiber Optic Terminators/Connectors	AIT	AN	1-3
113-632-4002	Splice Commercial Fiber Optic Cable	AIT	SA	1-3
113-574-3006	Perform Unit Level Maintenance (ULM) on Telephone Test Set TS-3647/G	AIT	AN	1-3
113-574-3010	Perform Unit Level Maintenance (ULM) on Electrical Cable Test Set AN/GTM-12	AIT	SA	1-3
113-574-3011	Perform Unit Level Maintenance (ULM) on Test Set TS-4117()/G	AIT	SA	1-3
113-588-0005	Troubleshoot Telephone Cable WD-1( )/TT or WF-16/U	UNIT	SA	1-3
113-588-0016	Troubleshoot CX-11230A/G Cable System	AIT	SA	1-3
113-588-0018	Troubleshoot 26-Pair Cable CX-4566/G	AIT	SA	1-3
113-588-1002	Set Poles	UNIT	AN	1-3
113-588-1074	Install Aerial Cable Splicing Equipment	AIT	AN	1-3
113-588-1075	Install Underground Cable Splicing Equipment	AIT	AN	1-3
113-588-1106	Install a Connector on a Stranded Flexible Coaxial Cable	AIT	AN	1-3
113-588-1107	Install Underground Cable System	AIT	AN	1-3
113-588-1108	Install a CAD-6 Buried Distribution Terminal	AIT	AN	1-3
113-588-3005	Perform Unit Level Maintenance (ULM) on Reel Unit RL-31()	AIT	SA	1-3
113-588-4022	Repair Plastic-Sheathed Cable	AIT	AN	1-3
113-588-8001	Perform Pole Rescue Operation	UNIT	AN	1-3
113-588-9008	Make a Coaxial Cable Splice	AIT	SA	1-3
113-632-5001	Troubleshoot Fiber Optic Transmission System (FOTS) Cable System	AIT	SA	1-3
113-632-5002	Troubleshoot Fiber Optic Cable	AIT	SA	1-3

CRITICAL TASKS

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
Subject Area 3. Multiplexers				
113-606-0105	Troubleshoot Multiplexer TD-1233(P)/TTC or Multiplexer-Combiner TD-1234(P)/TTC	AIT	SA	1-3
113-606-0106	Troubleshoot Line Termination Unit (LTU) CV-4180( )	UNIT	SA	1-3
113-606-1001	Install Multiplexer TD-1233(P)/TTC or Multiplexer-Combiner TD-1234(P)/TTC	AIT	SA	1-3
113-606-1002	Install Line Termination Unit (LTU) CV-4180( )	UNIT	SA	1-3
113-606-3090	Perform Unit Level Maintenance (ULM) on Multiplexer TD-1233(P)/TTC or Multiplexer-Combiner TD-1234(P)/TTC	UNIT	SA	1-3
113-606-3091	Perform Unit Level Maintenance (ULM) on Line Termination Unit (LTU) CV-4180( )	UNIT	SA	1-3
Subject Area 4. Telephone Sets				
113-600-1001	Install Secure Digital Telephone STU-III/STE	UNIT	SA	1-3
113-628-1001	Install Voice Over Internet Protocol (VoIP) Telephone	UNIT	SA	1-3
113-600-0011	Troubleshoot KY-68	AIT	AN	1-3
113-600-1012	Install Telephone Set TA-312/PT	UNIT	SA	1-3
113-600-1016	Install Digital Nonsecure Voice Terminal (DNVT)	AIT	SA	1-3
113-600-1017	Install Telephone Set TA-838/TT	AIT	SA	1-3
113-600-1022	Install KY-68	AIT	QT	1-3
113-600-3017	Perform Unit Level Maintenance (ULM) on Telephone Set TA-312/PT	UNIT	QT	1-3
113-600-3020	Perform Unit Level Maintenance (ULM) on Telephone Set TA-838/TT	AIT	SA	1-3
Subject Area 5. Telephone Maintenance Truck				
113-588-0007	Perform Preventive Maintenance Checks and Services (PMCS) on Telephone Maintenance Truck	UNIT	AN	1-3
113-588-2007	Operate Telephone Maintenance Truck	UNIT	SA	1-3
Subject Area 6. LAN/WAN Substation				
113-583-1001	Perform Soldering Techniques	UNIT	AN	1-3
113-583-1002	Install Cable Rack and Wire Way	UNIT	AN	1-3
113-583-1003	Install Distribution Frames	UNIT	AN	1-3
113-583-1004	Install Anchoring Devices	UNIT	AN	1-3
113-583-1007	Interpret Engineering Installation Package (EIP)	UNIT	SA	1-3
113-583-1008	Perform Marking Site Layout	AIT	AN	1-3
113-583-1009	Install Local Area Network/Wide Area Network (LAN/WAN) Substation Distribution System	AIT	SA	1-3
113-583-2001	Operate Hand and Power Tools	UNIT	AN	1-3
113-588-0001	Troubleshoot Local Area Network/Wide Area Network (LAN/WAN) Substation Distribution System	AIT	SA	1-3
113-588-0020	Determine Cable Depth Using the 2273 Advanced Cable and Fault Locator	AIT	AN	1-3

CRITICAL TASKS

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
113-588-0021	Locate Cable Faults Using a Time Domain Reflectometer (TDR) Test Set	AIT	AN	1-3
113-588-6008	Maintain a Communications Systems Installation Record (CSIR)	UNIT	SA	1-3
Subject Area 7. COMSEC				
113-609-1002	Install Trunk Encryption Device	UNIT	SA	1-3
113-609-2002	Operate Trunk Encryption Device	UNIT	SA	1-3
113-609-3001	Maintain Trunk Encryption Device	UNIT	SA	1-3
Subject Area 8. Conduit				
113-583-1010	Install Conduit	UNIT	AN	1-3
Skill Level 2				
Subject Area 9. Cable and Equipment Supervision				
113-588-7005	Supervise Recovery of Cable/Wire Systems	UNIT	SA	2-3
113-588-7006	Supervise Troubleshooting of Cable/Wire Systems	UNIT	SA	2-3
113-588-7012	Supervise Installation of Cable/Wire Systems	UNIT	SA	2-3
113-632-9014	Supervise Splicing of Commercial Fiber Optic Cable	UNIT	SA	2-3
113-574-7014	Supervise Unit Level Maintenance (ULM) on Test Sets	UNIT	AN	2-3
113-606-7026	Supervise Installation of Multiplexers	UNIT	SA	2-3
113-606-7027	Supervise Troubleshooting of Multiplexers	UNIT	SA	2-3
113-606-7028	Supervise Unit Level Maintenance (ULM) on Multiplexers	UNIT	SA	2-3
Subject Area 10. Telephone Sets Supervision				
113-600-7042	Supervise Installation of KY-68	UNIT	SA	2-3
113-600-7043	Supervise Troubleshooting of KY-68	UNIT	SA	2-3
Subject Area 11. LAN/WAN Substation Supervision				
113-588-7003	Supervise Installation of Local Area Network/Wide Area Network (LAN/WAN) Substation Distribution System	UNIT	SA	2-3
113-588-7007	Supervise Troubleshooting of Local Area Network/Wide Area Network (LAN/WAN) Substation Distribution System	UNIT	SA	2-3
Skill Level 3				
Subject Area 12. Cable and Equipment Inspection				
113-588-7001	Inspect Installation of AC/DC Power Source for Communications Equipment	BNCOC	AN	3
113-588-7002	Supervise Basic Safety in Cable Systems Installation	BNCOC	AN	3
113-588-7008	Inspect Installation of Cable/Wire Systems	BNCOC	SA	3
113-588-7009	Inspect Recovery of Cable/Wire Systems	BNCOC	SA	3
113-588-7011	Inspect Troubleshooting of Cable/Wire Systems	BNCOC	SA	3
113-632-9009	Inspect Operation of Fiber Optic Cable Test Set	BNCOC	SA	3
113-632-9012	Inspect Splicing of Fiber Optic Cable Assembly (FOCA) CX-13295( )/G	BNCOC	SA	3
113-574-9001	Inspect Unit Level Maintenance (ULM) on Test Sets	BNCOC	AN	3
113-588-5007	Plan a Telephone Cable Line	BNCOC	AN	3
113-588-6001	Inspect Existing Cable Lines	BNCOC	AN	3

CRITICAL TASKS

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
113-588-6007	Prepare a Detailed Cable Route Map	BNCOC	SA	3
113-588-7075	Inspect Poles	UNIT	SA	3
Subject Area 13. Telephone Maintenance Truck Inspection				
113-588-7108	Inspect Preventive Maintenance Checks and Services (PMCS) of Telephone Maintenance Truck	UNIT	AN	3
Subject Area 14. Telephone Sets Inspection				
113-600-7045	Inspect Installation of KY-68	ANCOC	SA	3
113-600-7046	Inspect Troubleshooting of KY-68	BNCOC	SA	3
Subject Area 15. Multiplexer Inspection				
113-606-7029	Inspect Installation of Multiplexers	BNCOC	SA	3
113-606-7030	Inspect Troubleshooting of Multiplexers	BNCOC	SA	3
113-606-7031	Inspect Unit Level Maintenance (ULM) on Multiplexers	BNCOC	SA	3
Subject Area 16. LAN/WAN Substation Inspection				
113-613-4003	Verify Engineering Installation Package (EIP)	BNCOC	SA	3
113-632-7002	Inspect Installation of Local Area Network/Wide Area Network (LAN/WAN) Substation Distribution System	BNCOC	SA	3
113-632-9007	Inspect Installation of Commercial Fiber Optic Cable Terminators/Connectors	BNCOC	SA	3
113-632-9010	Inspect Repair of Fiber Optic Cable Assembly (FOCA) CX-13295( )/G	BNCOC	SA	3
113-632-9011	Inspect Splicing of Commercial Fiber Optic Cable	BNCOC	SA	3
113-632-9013	Inspect Troubleshooting of Local Area Network/Wide Area Network (LAN/WAN) Substation Distribution System	BNCOC	SA	3
Subject Area 17. Computer Technology				
113-580-7128	Supervise the Configuration of an AIS to Operate on a Network	BNCOC	AN	3
Subject Area 18. Navigation				
113-610-7005	Implement Land Navigation Skills Using Global Positioning Systems	BNCOC	SA	3
Subject Area 19. Mobile Subscriber Equipment				
113-611-6006	Lead Restoration of Transmission Link Within a Network	BNCOC	AN	3
113-593-1040	Establish Site Layout for Transmission Systems	BNCOC	AN	3
Subject Area 20. Antenna Installation				
113-588-1086	Install Pressurized Cable System	ASI	AN	3
113-596-1024	Install Parabolic Antenna	ASI	AN	3
113-596-1027	Install AB-216/U Tower	ASI	AN	3
113-596-1040	Install Pressurized Transmission Lines	ASI	AN	3
113-596-1080	Install Self-Support Tower	ASI	AN	3
113-596-1081	Remove Self-Support Tower	ASI	AN	3
113-596-1082	Install Spira-Cone High Frequency (HF) Antenna	ASI	AN	3
113-596-1083	Remove Spira-Cone High Frequency (HF) Antenna	ASI	AN	3
113-596-1084	Remove AB-216/U Tower	ASI	AN	3

CRITICAL TASKS

Task Number	Title	Training Location	Sust Tng Freq	Sust Tng SL
113-596-1086	Remove Broadband Dipole High Frequency (HF) Antenna	ASI	AN	3
113-596-3010	Maintain Rotatable Log Periodic Antenna	ASI	AN	3
113-596-3011	Maintain Delta-Matched Doublet Antenna	ASI	AN	3
113-596-3012	Maintain Fixed Log Periodic Antenna	ASI	AN	3
113-596-3014	Maintain Rhombic Antenna	ASI	AN	3
113-596-3015	Maintain Parabolic Antenna	ASI	AN	3
113-596-3016	Maintain Yagi Antenna	ASI	AN	3
113-596-3018	Maintain AB-216/U Tower	ASI	AN	3
113-596-3021	Maintain Self-Support Tower	ASI	AN	3
113-596-3047	Maintain Spira-Cone High Frequency (HF) Antenna	ASI	AN	3
113-596-3049	Maintain Broadband Dipole High Frequency (HF) Antenna	ASI	AN	3
113-596-4005	Maintain Coaxial Cable for Antenna Systems	ASI	AN	3
113-596-4008	Maintain Pressurization Equipment	ASI	AN	3

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Chapter 3

MOS/Skill Level Tasks

Skill Level 1

Subject Area 1: NAVIGATE

NAVIGATE USING THE AN/PSN-11
113-610-2044

Conditions: Given a requirement; operational precision lightweight global positioning system receiver (PLGR) AN/PSN-11; battery, lithium, storage, BA-5800/U; COMSEC device KYK-13/TSEC or AN/CYZ-10; initialization, setup, and waypoint information; and TM 11-5825-291-13.

***Note*:** This task is performed in a tactical or nontactical situation. Supervision and assistance are available.

Standards: Initialized and loaded the PLGR with COMSEC variables, entered setup and waypoint information, receiver acquired four satellites, and user successfully navigated to five waypoints within 60 minutes.

Performance Steps

1. Enter or verify correct setup displays.
   a. Select setup mode.
   b. Select setup units.
   c. Select setup magnetic variation type.
   d. Select elevation hold mode, time reference and error display format.
   e. Select setup datum and automatic OFF timer.
   f. Select setup data port
   g. Select setup automark.
2. Enter crypto keys.
3. Enter and verify initialization displays.
   a. Initialize position.
   b. Initialize time and date.
   c. Initialize track and ground speed.
   d. Initialize user-defined datum (page 1), if necessary.
   e. Initialize user-defined datum (page 2), if necessary.
   f. Initialize crypto key, if necessary.
4. Enter, edit, or review waypoint data.
   a. Copy waypoints.
   b. Determine distance between waypoints.
   c. Calculate a new waypoint.
   d. Clear waypoints.
   e. Define a mission route.

Performance Steps

5. Check status displays to ensure acquisition of four satellites.
6. Navigate to five waypoints.

Evaluation Preparation: Setup: For this evaluation, prepare equipment and ensure equipment is operational. Provide sufficient initialization, setup, and waypoint data information to the Soldier so that the PLGR can be used to navigate. Prepare a navigation course.

Brief Soldier: Tell the Soldier all performance measures (PMs) must be accomplished within 60 minutes.

Performance Measures	GO	NO-GO
1. Entered or verified correct setup displays.	____	____
2. Entered crypto keys.	____	____
3. Entered and verified initialization displays.	____	____
4. Entered, edited, or reviewed waypoint data.	____	____
5. Checked status displays to ensure acquisition of four satellites.	____	____
6. Navigated to five waypoints.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5825-291-13	

Subject Area 2: CABLE AND EQUIPMENT

PERFORM CABLE MARKING PROCEDURES
113-588-2002

Conditions: Given cable, tags, manual label marker, and mechanical portable label maker, Training Circular (TC) 24-20, engineering installation package (EIP), appropriate operation order (OPORD) and ANSI/TIA/EIA-606-A.

Standards: Labeled the cable correctly in accordance with OPORD, EIP, TC 24-20 and ANSI/TIA/EIA-606-A.

Performance Steps

1. Mark cables.
   a. Marking cables is necessary to identify them during installation and to aid in troubleshooting after the installation is complete. Identifying cables is also necessary for future planning and system upgrades.
   b. Temporarily marking cables can be done for the cable running process, and then replaced with permanent labels once the cables are terminated.
   c. Cables will be marked at both ends with two separate permanent identifications (labels). These labels are not to be removed.
      (1) The first marker (label) "TO" will be placed within 12 inches of the connector and will indicate the bay, equipment shelf, terminal block, or position as defined in the cable running list (CRL).
      (2) The second marker (label) "FROM" will be placed within 2 inches of the first marker and will have the connection information of the opposite end of the cable as defined in the EIP.
      (3) Cables and labels will be placed so they can be easily read.
   d. The Bradymarker XC Label Printer, or equivalent, is recommended for the printing adhesive labels. Detailed instructions for the operation of these label printers are provided with each printer.

Performance Measures	GO	NO-GO
1. Marked cables.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
ANSI/TIA/EIA-606-A	

INSTALL CONNECTORS ON COPPER CABLE
113-588-2003

Conditions: Given tools, materials, radio frequency (RF) connectors, and copper cables.

Standards: Installed RF connectors, tested cable after connectors were installed, and knew the elements of the RF cable.

Performance Steps

1. Identify the elements of the RF coaxial cable.
    a. RF cable is a transmission line (coaxial) that consists of a center conductor and an outer conductor separated by a dielectric.
    b. The characteristic impedance of most coaxial cables is between 50 and 100 ohms; however, special purpose coaxial cables may have impedance values outside this range.
    c. The following should be considered before cable and connector components are selected:
        (1) Frequency: Although primarily designed for RFs, video, and LANs, some systems use coaxial cable for digital transmission.
        (2) Power level / peak voltage: Coaxial cable can support higher frequencies (point-to-point wiring) and has the flexibility and economy for many systems.
        (3) Losses and degradation: Losses and degradation can include reflected signals, signal attenuation, phase delay, and other impairments.
    d. Identify elements of an RF cable:
        (1) Center conductor:
            (a) Flexible and semirigid cables use solid or stranded copper wire, copper braid wire, or a tubular copper conductor. It can be made of copper-clad steel, silver (high temp), and tin or nickel-plated. Other materials such as aluminum and Nichrome are also used for special purpose cables.
            (b) Rigid cables can have a center conductor similar to those used in flexible and semirigid; however, special purpose rigid cables are have a center conductor that is constructed from non-flexible materials, requiring special procedures for handling and installation.
        (2) The dielectric is used to physically and electrically separate the center conductor from the outer conductor. Dielectric materials may be solid, semisolid or tape wrapped around the center conductor. Dielectric materials used are:
            (a) Air: Used primarily in certain size flexible and semiflexible cables.
            (b) Polyethylene: Used mostly where temperatures will not exceed 80 degrees centigrade.
            (c) Foamed polyethylene: Semiflex helix, in sizes from 1/2 inch to 1-5/8 inches.
            (d) Teflon (DuPont): Can withstand temperatures from -80 to 250 degrees.
            (e) Neoprene: Also known as Polytetrafluoroethylene.
        (3) The outer conductor: Acts as the return or shield.
            (a) Flexible and semirigid cables usually have outer conductors of copper braid wire to permit flexibility.
            (b) Rigid cables have an outer conductor that consists of hard drawn seamless copper tubing.
        (4) The jacket or sheathing: Flexible and semirigid cables have an outer sheathing used to protect the cable from abrasion and from harmful chemicals. Common jacket materials are synthetic rubber, polyethylene, and synthetic resin. The jacket color may identify the type of cable.
        (5) Armor: Armor is used when greater protection for the cable is required. Armor can be made of braided wires (aluminum or galvanized steel).
        (6) Moisture Seals: The armor is sometimes rubber coated for moisture proofing.

Performance Steps

2. Identify the classifications of RF cable:
   a. These categories are based on the temperature range, operating voltage, and the attenuation stability.
   b. RF cable is classified into three categories: Flexible, semiflexible, and rigid.
      (1) Flexible RF cable is the most versatile and widely used. It consists of a center conductor, a low-loss solid or semisolid dielectric and one or more braided outer conductors with a waterproof covering (jacket).
      (2) Semiflexible cable can be formed into moderate bends during the installation, but require precise care and handling. It can use three forms of dielectric: air, continuous solid (polyethylene), or semisolid foam.
      (3) Rigid RF cable is a special application for permanent installation, where ruggedness, low attenuation, and high power are the prime considerations. Rigid sections, fittings, and accessories cannot be bent or formed in any manner. It must be installed with care and precision, being careful not to deform or dent it.

3. Identify the types of RF Cable: The use of RF cable can suppress unwanted noise (electromagnetic interference (EMI) and radio frequency interference (RFI)).
   a. Coaxial cable is RF cable that has a center and outer conductor separated from each other by a dielectric, with both conductors capable of carrying signal currents. It normally has a black jacket.
      (1) The outer braid is the return.
      (2) In cases of potential interference, shielded cable should be used.
      (3) Grounded coaxial can pass high data rates (from 20 kHz to 5 GHz), but is subject to ground loops as well as magnetic and radiated noise.
      (4) Ungrounded coaxial substantially lowers the interference.
   b. Twinax cable is a two-conductor, twisted balanced wire lines having specific impedance, with a braid shield around both wires. It normally has a blue jacket.
      (1) Twinax provides protection against capacitive fields and ground loops.
      (2) Twinax is limited to approximately 15 MHz, since it has high transmission losses above this range. Twinax is used in analog and digital signal transmission.
   c. Triax is an RF cable with an additional outer copper braid that acts as a shield to protect the enclosed conductors. It normally has a yellow jacket.
      (1) Triax is improved because the outer copper braid is grounded, which protects the signal from noise, improving the "signal-to-noise" ratio.
      (2) Triax cable can be used as ungrounded coaxial cable.
   d. Quadrax is an RF cable that has a balanced, twisted pair, with two separate insulated braids over the center conductors. It normally has an orange jacket.
      (1) In some applications, the inner braid can be used for direct current (DC) control voltages. Quadrax cable can also be used to provide additional EMI suppression by connecting both shields to earth ground at one point if separate equipment ground is not available.
      (2) Quadrax shields can be ungrounded to provide ground loop isolation.

4. Identify the general installation procedures for RF cable: There are many methods and procedures used to install RF cable. For specific types, refer to the manufacturer's specifications.
   a. Separation of cable: Separate cables a distance twice the diameter of the largest cable to avoid interference. To minimize interference, separate RF cables from power and ground, plus separate low power RF cables from high power RF cables.
   b. Temperature: Avoid installing cables in high temperature areas, if this is not possible use Teflon jacketed cable.
   c. Length: The interconnecting cable is the longest transmission path. The following should be considered when installing RF cable:
      (1) Use as short a length as possible to lessen attenuation.
      (2) Use as few sections as possible to keep connections to a minimum and avoid excess attenuation.

Performance Steps

(3) When connecting to slide mounted equipment, allow sufficient slack to permit unrestricted movement of the equipment.

d. Minimum bending radius: The minimum RF cable bending radius is 10 times the diameter of the cable.

e. Vibration: To reduce vibration damage, wrap friction tape around the cable starting at the clamp nearest the equipment and wrapping the cable 3 to 4 inches toward the equipment.

f. Abrasion: The following should be considered for prevention of abrasion to the cable jacket.
   (1) Use only preformed cable straps.
   (2) Do not dent or damage rigid cable; it will alter the electrical characteristics of the cable.
   (3) Protect the cables with rubber grommets, sleeves, or tape where they may be subject to abrasion.

g. To detect cable faults, check it on the reel, before installation with a Megger. The standard 500 volt Megger is the only equipment needed to test the cable for proper insulation properties.

h. Check the CRL in the EIP for cable designations. Do not use cable lengths given in the CRL, these lengths were for planning and may not reflect the actual length needed. Measure and cut cables, then place 2 cable tags at each end (to and from). Cable tags are NEVER removed.

5. Running and securing RF cable: All cables should be installed to allow proper access for repairs and replacement. When cables are secured to mast or towers, start from the top and work down. Avoid bending and do not exceed the maximum pulling (loading) tension.
   a. Cables should be secured by size as follows:
      (1) Outside cables, 1-5/8 inches in diameter or less should be secured every 3 feet.
      (2) Outside cables, over 1-5/8 inches in diameter should be secured every 5 feet.
      (3) Smaller cables should be secured at intervals of 18 inches.
      (4) Inside cables are secure as signal cable, but do not use a Chicago power tie.
   b. Pull cables directly from the spools by placing the spool on a cable stand. Ensure all cables are identified and always have a spool attendant to prevent the cable from tangling and causing undue stress on the cable.
   c. Avoid pulling more than 100 feet of cable at one time. If pulling more than 100 feet cannot be avoided, station a person at least every 100 feet to help route the cable.
   d. Cables must not be subjected to unnecessary tension or excessive heat.
   e. Do not bundle cables tightly.

6. Identify RF connectors: There are many types and applications of RF connectors, always install the connectors designed for the type of cable being used.
   a. Connectors are designed specifically for the outside diameter of the cable (to fit in the barrel of the connector shell) and the inner contact diameter. This relationship of the diameters and the dielectric between them will determine the characteristic impedance of the connector.
   b. Connectors are designed so that current flows through them unchanged. Connectors are selected to match the RF cable that has the same impedance value, maximum peak voltage rating, and frequency limitations.
   c. Connectors employ either screw-on or bayonet style couplings and can be crimp-on or soldered.
      (1) Crimping is normally used when speed of attachment is important or where it is impossible to solder. Crimping requires a special crimp tool to install the connector to the cable. Repair requires a new connector.
      (2) Soldering requires a good soldered connection, which requires tinning the connector and the use of flux. Do not use acid flux on electronic parts or connections. Do not overheat the connector or damage to the dielectric may occur.

7. Assemble an RF connector: These instructions are for the Trompeter, 70 Series, "Wrench Crimp," concentric, Twinax, connector using 250 Diameter Twinax cable, but can generally be applied to other types of connector assemblies.
   a. Prepare the work area, gather all the tools needed, and heat the soldering iron to operating temperature.

Performance Steps

b. Lay out the parts of the connector in the order of assembly and perform an inventory according to the manufacture's part list. Ensure all parts are accounted for.
c. Place the clamping nut over the cable, with the threaded portion toward the end of the cable.
d. Butt and strip the outer jacket from the cable according to manufacturer's specifications (about 1-1/2 to 2 inches). Nicking or cutting the braid or the inner conductor may cause electrical noise in the cable. A cable-stripping template for each type of connector will speed cable preparation. Sometimes templates are supplied by the manufacturer.
e. Use a wire brush or the hook end of spudger to comb the braid from the butt out, until it is smooth. Comb small portions at a time and take the time to make it even all around. Fold the braid back over the cable butt and untangle all crossover strands of braid.
f. Cut the fillers (separators) even with the cable butt.
g. Place the cone over the center conductors and into the cable butt, between the wire braid and the center of the cable. Considerable force may be required to seat the cone flush with the cable butt. The clamping nut will not fit into the connector body if the cone is not seated all the way into the cable butt.
h. Comb the wire braid back over the cone base and trim it, using flush cutters (Nippy Cutters), even with the bottom edge of the cone.
i. Place the insulating washer over the center conductors and on top of the cone.
j. Strip the white or silver (secondary) conductor flush with the cone insulator (or as close as possible). Strip small portions at a time and do not nick the conductor.
k. Twist the strands together and pull the secondary conductor to the side. Temporarily place the slotted insulator on the Blue or Copper (Primary or Center) conductor, with the slotted side (down) toward the cable butt. Mark the primary conductor even with the top of the slotted insulator.
l. Remove the slotted insulator and strip the primary (Blue or Copper) conductor to the mark. Place the slotted insulator on the primary (center) conductor again to check the stripped length, if necessary remove the insulator and strip the conductor to the correct length. The insulation will stretch, so don't strip off too much and do not knick the conductor.
m. Place the slotted insulator on the primary (center) conductor. The conductor's insulation should touch the bottom of the slotted insulator. Twist the strands of the center conductor and tin it lightly with 60/40 rosin core solder. Use flux, but don't use too much solder.
n. Place the center pin next to the stripped primary conductor to measure the length of the conductor. Cut the conductor the even with the inside shoulder of the pin. The conductor should touch the inside bottom of the pin and the pin must touch the slotted insulator.
o. Place the pin on the center (primary) conductor. The conductor must be visible in the pin's inspection hole and it must touch the slotted insulator. Sweat-solder the pin to the conductor through the inspection hole. Use plenty of flux to avoid a cold solder joint. Do not get solder on the outside of the pin and do not overheat.
p. Place the pin dielectric over the center pin.
q. Place the inner shield (outer conductor) over the assembly. Align one of the slots in the shield with the secondary conductor. Wrap the secondary conductor CLOCKWISE around the base (inside the grove) of the inner shield. Cut the conductor at approximately 270 degrees around the shield. The secondary conductor must not be above the rim of the grove in the shield.
r. Sweat-solder the secondary conductor to the shield in two places. Solder the end of the conductor and a point opposite. Do not allow solder to enter the slots of the inner shield, or it will short the primary and secondary conductors.
s. Place the body of the connector over the assembly, slide the clamp nut up to the body, and thread the clamp nut into the connector body.
t. Use a thin wrench (such as Trompeter wrench) on the body and a suitable wrench (adjustable or open end) on the clamp nut to tighten the connector. Turn the clamp nut to tighten, hold the body and cable stationary while turning the nut. Do not over tighten.
u. Visually inspect the connector. Conduct a continuity test to see if any of the conductors or the shield is shorted. When the opposite end of the cable is finished, test the cable with an appropriate RF or bit error rate tester (BERT).

Performance Steps

8. Test fabricated RF cable: Cable defects may not be visible, but can be detected with proper testing. The two primary pieces of test equipment used to test RF cable assemblies are the Megger and BERT.
   a. The Megger can to test for continuity, dielectric strength (breakdown), and shorts with or without connectors.
   b. The Data Transmission Test Set (DTTS) Model 604M, is one of the BERTs. It consists of a transmitter and receiver that operate independent of one another. The DTTS constructs error free data patterns and compares them on a bit-by-bit basis to detect errors induced by the cable or connectors. Refer to the manufacture's instructions for the test set you are using.
9. Inspect RF cable and assemblies: The following quality control checks should be followed throughout the installation.
   a. Inspect and test the cable for damage or defects before installation.
   b. When required, secure the cable in the same manner as signal cable.
   c. Observe the minimum-bending radius at all times.
   d. Butting and stripping should be done IAW the connector manufacturer's specifications. Use a template to speed the process.
   e. Place permanent cable tags on cables as prescribed.

Performance Measures	**GO**	**NO-GO**
1. Identified the elements of RF coaxial cable.	____	____
2. Identified the classifications of RF cable.	____	____
3. Identified the types of RF cable.	____	____
4. Identified the general installation procedures for RF cable.	____	____
5. Ran and secured RF cable.	____	____
6. Identified RF connectors.	____	____
7. Assembled an RF connector.	____	____
8. Tested and fabricated RF cables.	____	____
9. Inspected RF cables and assemblies.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer’s Manuals	
MIL-STD-188-124B (3)	

PERFORM A SPLICE ON A PLASTIC SHEATH, PLASTIC INSULATED CABLE 113-588-2004

Conditions: Given a pre-installed cable system, a VS-3 hand tool, picabonds, muslin, B-polyethylene tape, paper taper, and Manufacture's Manual.

Standards: Spliced the cable and restored communications.

Performance Steps

1. Make cable splice.
   a. Identify one cable pair to splice from first cable using color code.
   b. Identify the corresponding cable pair to splice from second cable using color code.
   c. Insert the tip conductor of the first cable completely into wire support, leaving slack in the conductor.
   d. Repeat the above procedure for the tip conductor from the second cable.
   e. Insert a connector into the VS-3 hand tool.
   f. Hold tool steady and close the handle unit until the ratchet releases and handles open.
   g. Remove the crimped connector from the tool.
   h. Gauge the crimped connection.
   i. Perform visual inspection of connections.
   j. Correct improper connections.
   k. Repeat performance steps 1a through 1h to splice remaining conductors and/or pairs.
   l. Wrap conductor with muslin.
   m. Wrap splice with two half-lapped layers of polyethylene tape.
   n. Secure splice with paper tape.

2. Perform a bridge splice.

Note: The first bank of a bridge splice is always started from the "Y" side of the splice. The starting point is measured 1/3 inch of the splice opening and measured from the sheath butt. Splice the cable in banks leaving a 1/4-inch space between each bank.

   a. Prepare splice opening.
   b. Repeat performance steps 1a through 1b (see above).
   c. Insert the tip conductor from the main cable into the wire support below the guide pin.
   d. Insert the tip conductor from the bridge cable into the wire support above the guide pin.
   e. Repeat performance steps 1e through 1n (see above).

3. Perform a butt splice.

Note: Never put more than one conductor at one time when clear capping. This could cause shorts in a working cable system.

   a. Identify method of splicing.
      (1) Straight method.
      (2) Loop method.
   b. Select two pair in the top cable and two pair in the bottom cable.
   c. Separate each pair.
   d. Position the hand tool on the splice opening and insert conductors individually into VS-3 hand tool.
   e. Place each conductor of each pair into the hand tool and crimp the connector on them individually.
   f. Clear cap 4 pair in each cable using the stagger-cut method.
   g. Perform visual inspection of connections.

Performance Steps
h. Wrap conductors with muslin. i. Wrap the splice with polyethylene tape. j. Secure with paper tape.

Performance Measures	GO	NO-GO
1. Made cable splice.	____	____
2. Performed a bridge splice.	____	____
3. Performed a butt splice.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacture's Manual	

INSTALL AC/DC POWER SOURCE FOR COMMUNICATIONS EQUIPMENT
113-588-2005

Conditions: Given tools, material, and alternating current (AC)/DC wiring, and the EIP.

Standards: Installed AC/DC wiring in compliance with the National Electric Code and the EIP.

Performance Steps

1. Install AC wire through conduit.
    a. Prior to pulling conductors through conduit, consult the drawing for the correct connection, size and number of conductors needed.
    b. Short runs may be pulled from the spool or box. Temporarily mark the conductor ends for identification.
    c. The ends of long runs should be temporarily marked at the box or spool, then after being run through the conduit, marked at the spool again before cutting.
    d. Pull all conductors through the conduit before terminating and toward the distribution box when possible.
        (1) Feed the fish tape through the appropriate conduit run.
        (2) Strip 12 inches of insulation off each conductor.
        (3) Use one conductor as a pole and wrap the other conductors around the pole.
        (4) Create an eyelet on the pole conductor by looping the wire back and wrapping about six wraps on itself.
        (5) Fasten the eyelet on the hook end of the fish tape.
        (6) Feed the fish tape through the appropriate conduit run.
2. Identify wiring boxes and electrical devices.
    a. The total number of splices per box depends on the size of the box and number and size of conductors.
        (1) The handy and octagon boxes can have three splices per box with a maximum of four conductors per splice.
        (2) The 4 x 4 and junction boxes can have four splices per box with a maximum of four conductors per splice.
    b. Identify the types of splices:
        (1) The "in-the-middle" splice is commonly used to connect receptacles or lights in series.
            (a) Measure and cut conductors "A" and "C" 6 inches from the edge of the box.
            (b) Cut, strip and attach a 6-inch piece of wire (conductor B) to the device. Strip 2 inches of insulation from the other end of the conductor.
            (c) Place conductors side by side lining up the edges of insulation using needle nose pliers. Lock a pair of hemostats behind the needle nose pliers.
            (d) Evenly trim the conductors to 2 inches. Then using a pair of lineman pliers twist the bare ends of the conductors in a CLOCKWISE direction so the conductors wrap evenly.
            (e) After twisting, trim the conductors for the proper sized wire nut. At least 1/16 inch of insulation must be inside the wire nut.
        (2) The "stand-alone" splice is used when the conductor does not terminate to a device in the box.
            (a) Measure and cut the conductors 6 inches from the edge of the box and strip off 2 inches of insulation.
            (b) Cut an 8-inch piece of wire and strip 2 inches of insulation from one end.
            (c) Using needle nose pliers place the conductors side by side lining up the edges of the insulation.
            (d) Evenly trim the bare conductors to 2 inches.

Performance Steps

(e) Using lineman pliers, twist the bare conductors CLOCKWISE. The conductors should wrap evenly and be free of nicks.
(f) After twisting the conductors, trim to fit the correct sized wire nut.
(g) Install the wire nut with at least 1/16 inch of insulation inside.

(3) The "jumper splice" is used for distributing a single conductor that requires more than one splice.
(a) If a conductor is to terminate to a device in the box, refer to the wiring procedure for an "in-the-middle" splice. If no conductors terminate to a device in the box, refer to the wiring procedure for "stand-alone" splice.
(b) Measure and cut the conductors 6 inches from the edge of the box and strip off 2 inches of insulation.
(c) Cut a piece of wire long enough to allow the wire nut of each splice to be dressed on opposite sides of the box. Strip 2 inches of insulation from each end.
(d) Using needle nose pliers place the conductors side by side lining up the edges of the insulation.
(e) Evenly trim the bare conductors to 2 inches and twist together with lineman pliers.
(f) Trim the splice to fit the proper sized wire nut.
(g) Treat the second splice the same as the first using the jumper conductor to link the two together.
(h) Dress splices and close the box.

c. Identify the two methods of mounting electrical boxes:
(1) Surface mounted boxes are mounted to the surface of the wall.
(2) Flush mounted boxes are mounted flush with the surface of the wall.
(3) All boxes WILL be grounded.

d. Terminate a conductor to a device:
(1) Measure and cut the conductor 6 inches from the edge of the box.
(2) Strip 2 inches of insulation from the end of the conductor.
(3) Make a 270-degree hook (form a question mark) on the wire to be terminated.
(4) Complete the termination by placing the conductor under the screw in a CLOCKWISE direction and tighten.

e. Perform quality control checks on device terminations:
(1) Shiners (bare wire) cannot extend more than 1/16 of an inch past the termination and is measured from the base of the terminal or the head of the screw.
(2) Conductor insulation cannot be under the head of the screw.
(3) The conductor must wrap CLOCKWISE around the screw (in the direction the screw tightens) between 270 and 360 degrees.
(4) The bare conductor must stay hidden under the head of the screw.
(5) Pigtails are the end of the conductor and cannot stick out from under the head of the screw.

f. Wire a single-pole-single-throw toggle switch.
(1) Only hot conductors are wired to switches.
(2) One side of the switch is connected to the source (A) and the other side is connected to the device (B).
(3) The neutral conductor is never connected to switches. It is routed from the distribution panel neutral buss directly to the device, through the conduit.
(4) The ground conductor is usually not connected to switches except in special cases.

g. Wire a double-throw switch:
(1) The source (A, hot, L-1) is connected to the switch (B) with a black colored conductor.
(2) The device (D) is connected to the L-1 side of the switch (C) with a hot (L-1), black colored conductor.
(3) The source (E, hot, L-2) is connected to the L-2 (hot) side of the switch (F) with a black colored, conductor temporarily marked L-2.
(4) The L-2 (hot) side of the device (H) is connected to the L-2 (hot) side of the switch (G) with a black colored conductor temporarily marked L-2.

Performance Steps

(5) The neutral conductor is connected to the designated neutral buss bar position at the distribution panel and routed directly to the device through the conduit. The neutral is never connected to a switch.
(6) The ground conductor is connected to the designated position on the ground buss bar at the distribution panel and routed through the conduit, following the rules for grounding for of all devices on that branch circuit.

h. Wire a three-way switch:
(1) The first terminal is wired to source (A) (hot circuit breaker).
(2) Both traveler terminals (B and D) of the first switch are connected to the next switch traveler terminals (C and E) with a hot conductor (red).
(3) The common terminal (F) of the second switch is connected to the hot terminal of the device to be controlled.
(4) The neutral conductor is connected to the designated position on the neutral buss bar at the distribution panel and routed through the conduit to all devices requiring neutral connection for that branch circuit.
(5) The ground conductor is terminated to the designated position on the ground buss bar at the distribution panel and routed through the conduit following the grounding rules.

i. Wire a four-way switch network:
(1) Connect the common terminal (A) of a three-way switch to the designated circuit breaker (source).
(2) Connect one of the traveler terminals (B) of this switch to one of the traveler terminals (C) of a four-way switch using a hot conductor (black).
(3) Connect the other side of the three-way switch traveler terminal (D) to the other traveler terminal of the four-way switch (E) using a hot conductor (red).
(4) Connect one of the opposite traveler terminals (F) of the four-way switch to one of the traveler terminals of a second three-way switch (G) with a hot conductor (black).
(5) Connect the last traveler terminal of the four-way switch (H) to the other traveler terminal of the second three-way switch (I) with a hot conductor (red).
(6) Connect the common terminal of the second three-way switch (J) to the device.
(7) The neutral conductor is connected to the designated position on the neutral buss bar of the distribution panel and routed through the conduit to all devices requiring neutral in that branch circuit.
(8) The ground conductor is terminated to the designated position on the ground buss bar of the distribution panel and routed through the conduit following all grounding rules.

j. Wire a 120 volts AC (V AC) duplex receptacle with one or both receptacles switched.
(1) Connect the common (brass) terminal of a single-throw switch (for a switched circuit) with a (black) insulated conductor from the source (circuit breaker or splice from a previous circuit).
(2) Tab #1 (B) on the receptacle for the two brass terminals must be "broken" (removed) when switching only one receptacle and a second hot wire must be ran from the source to the receptacle. Tab #1 (B) must be "unbroken" (intact) when switching both receptacles.
(a) Connect the other common (brass) terminal on the switch to the common (brass) terminal (A) on the duplex receptacle.
(b) If only one receptacle is to be switched, ensure the tab (B) is broken, then connect the second hot wire from the source to the second (brass) terminal (C) on the receptacle to provide unswitched power.
(c) If both receptacles are to be switched, ensure the tab (B) is unbroken (intact) to provide the second receptacle switched power. A second hot wire is not needed in this case.
(3) The silver terminal screw (D) on the receptacle must be connected to the neutral conductor (white or gray), which originates at a neutral buss bar or a splice from a previous circuit and goes directly to the receptacle.
(4) The silver tab (E) must stay intact ("unbroken") regardless of being switched or unswitched to provide neutral for the second silver terminal (F) on the second receptacle.

Performance Steps

(5) The green ground terminal (G) on the receptacle is required to be connected with the green insulated conductor. This conductor originates at the ground buss or a splice from a previous outlet.
(6) Each conductor that requires a splice will use the "in-the-middle" splice and the ground will use the "stand-alone" splice. Refer to "grounding rules".

k. Wire a 120/240 V AC duplex receptacle. Both receptacles unswitched.
(1) The source (L-1) that originates from the circuit breaker or a previous outlet splice is connected to the brass terminal screw (C) on the receptacle.
(2) The Tab (B) must be "unbroken" to provide the 120 V AC to the first receptacle terminal (A).
(3) The source (L-2) is connected to the opposite brass terminal (F) to provide the second leg for the 240 V AC receptacle. This conductor must be identified as "L-2."
(4) The silver terminal screw (D) is connected to the neutral (white or gray) insulated conductor originating at the neutral buss bar or a splice from a previous outlet. Only the 120 V AC receptacles require the neutral conductor.
(5) No Tab should exist at the neutral terminal (E). If there is a Tab between terminal screws “D” and “F”, it must be removed or it will cause a direct short.
(6) The green terminal screw (G) is connected to the green insulated conductor, which originates at the ground buss bar or a splice from a previous outlet.
(7) All thru-box wiring will require "in-the-middle" splice. For the ground conductors refer to "grounding rules."

l. Wire a 120/240 V AC duplex receptacle switched.
(1) The brass terminal screw (A) is used to terminate the "switched" (L-1, black) insulated conductor. This conductor originates at the "switched" side of a single-throw switch or a switching network.
(2) Tab (B) must be "broken" when switching the 120 V AC receptacles.
(3) The other brass terminal screw (C) is used to terminate the "unswitched" (L-1, black) insulated conductor. This conductor originates at the splice point of the source conductor that feeds the single-throw switch or a switching network. This will be an "in-the-middle" splice used to connect these conductors.
(4) The silver terminal screw (D) is used to terminate the neutral (white or gray) insulated conductor. This conductor originates at the neutral buss bar or a splice from a previous outlet.
(5) There must be NO Tab (E) at this location. A tab would cause a direct short between terminals "D" and "F" on the receptacle.
(6) The brass terminal screw (F) is used to terminate the "unswitched" (L-2, black) insulated conductor. This conductor originates at a circuit breaker, a double-throw switch, or a splice of a previous outlet. This conductor must be identified as L-2.
(7) Green terminal screw (G) is used to terminate the ground (green) insulated conductor. This conductor originates at the ground buss bar or a splice from a previous outlet.
(8) The "in-the-middle" splice will be used in thru-box wiring for each conductor. When splicing the ground conductor, refer to the "grounding rules."

m. Wiring a 120 V AC basic incandescent light fixture switched or unswitched.
(1) The brass terminal screw (A) is used to terminate the (black) insulated conductor. This conductor originates at a circuit breaker, a single-throw switch, a switching network, or a splice.
(2) The silver terminal screw (B) is used to terminate the neutral (white or gray) insulated conductor. This conductor originates at the neutral buss bar or a splice.
(3) The thru-box wiring will use the "in-the-middle" splice. When splicing the ground conductor, refer to the "grounding rules".

n. Dress and terminate conductors in a distribution panel:
(1) Conductors inside the distribution panel must be routed the most direct path, taking into consideration the following:
(a) Never cross feeder paths with branch circuit conductors.

Performance Steps

(b) Always dress the conductors to the back of the panel, staying tight to the back along the corners to the breakout point. Bend the conductors 90 degrees, staying tight against the back of the panel.
(c) Dress the conductors along the back, working toward the termination point and in a way that prevents them from touching the buss bars.
(d) When the conductor reaches the termination point, bend it 90-degrees to lift the conductor from the back of the panel toward the termination point.
(e) At the point where the conductor is level with the terminal, bend it 90-degree toward the terminal, so that it will feed straight into the terminal.

(2) Terminate conductors: Always wire the distribution panel last.
(a) Always connect conductors in the order of their color. Connect green first, white (or gray) second and black (hot) last.
(b) Connect all grounds first (green insulated conductors).
(c) Connect all neutrals (white or gray insulated conductors) second.
(d) Connect all hot (black insulated conductors) last.
(e) Trim excess but leave enough to place in the terminal.
(f) Place the conductor in or next to the terminal and mark the point to strip the conductor of insulation.
(g) Using strippers, strip the insulation from the mark to the end of the wire.
(h) Place the conductor in the terminal and tighten the set screw.

3. Label a distribution panel.
a. Label the panels as designated by the site drawings (floor plan item number).
b. If no guidance was provided, a standard that can be used is room number and alphabetical designator (example: "4A" would be room "4" panel "A," the next panel in the same room would be "4B" and so on).
c. Place labels on the top center portion of the inner and outer panels using 3/4 inch characters.
d. Label group designations: (Example: 120/240 V AC 60 Hz 3 Phase).
(1) Designate the highest voltage provided by this panel.
(2) AC (alternating current) abbreviation identifies the type of current.
(3) The designator 60 Hz identifies the frequency provided by this panel.
(4) The designation 3 Phase identifies the phase relationship of the panel.
(5) Label the inner and outer panels, centered on the distribution panel number, using 3/8-inch characters.
e. Label number circuit breakers (designations). If not provided by the manufacturer, label the circuit breakers using 3/16-inch characters.
f. The equipment/circuit designation for equipment bays or common house/commercial wiring will be labeled on the inner panel adjacent to the circuit breakers, using 3/16-inch characters, when designation card holders are not furnished.
(1) Label the inner panel for equipment bay designations:
(a) Label with the room number if the distribution panel is not located in the same room as the bay or equipment.
(b) Label with the bay number of the bay or cabinet.
(c) Label with the equipment/power strips using an abbreviated term; make annotations on the site drawings, if needed.
(d) Label with the common receptacle outlets provided at the front and inside of each bay. Use an abbreviated term.
(2) Label AC circuit designations for common house/commercial wiring.
(a) Label using the room number the circuit supplies.
(b) Label using the type of device or equipment, such as lights, receptacles, or bay number.
(3) Use the designation card holders, when available, labeling the equipment/circuit designations on the individual cards provided.

Performance Steps

4. Identify AC safety.
   a. General safety.
      (1) It takes very little current to kill; as little as 100 milliamperes for two seconds can be deadly.
      (2) The path the current takes through your body will determine the extent of the injuries.
   b. AC safety practices:
      (1) Avoid putting your heart in the path of current flow (put one hand in your pocket).
      (2) Always, wear approved rubber soled boots and use insulated tools.
      (3) Never work on energized circuits.
      (4) Turn off the power, remove fuses, turn off circuit breakers and check the work site with a meter.
      (5) Post danger sign on the distribution panel and put your personal safety lock on the panel.
      (6) Use a light grip on tools, don't slip and hit a hot terminal.
      (7) Avoid working in damp or wet locations.
      (8) Always do neat work, well-dressed wires are less likely to short and cause a hazard.
      (9) Always use a ground fault interrupter when working outside and whenever possible inside. A ground fault interrupter has an internal circuitry, which monitors the current, and if it detects a difference of five milliamperes, it will cut off the circuit within two milliseconds.
      (10) Milliamperes (.001 amp) EFFECT

1	Can just feel it.
5	Can't let go.
20 - 50	Possibly fatal.
60 & up	Probably fatal.

5. Identify DC power.
   a. The big advantage of DC power systems is that when the commercial power is lost the batteries will continue to provide power to the equipment for a limited time.
   b. A DC power system can be made up of rectifier-charger, battery bank, converter, inverter, and a power distribution system, plus redundant equipment for higher reliability.
   c. Commercial AC power is converted to DC power using rectifiers to charge the battery bank and supply DC power. DC power can be converted back to AC power using inverters for equipment that requires AC to operate.
   d. DC power sources and related equipment can be a serious source of RF noise.
      (1) DC power systems are electrical noisy, because of the inductive circuitry and from switching sizable currents.
      (2) DC power systems must be adequately filtered and any internally generated noise must be isolated from the communications equipment and the signal reference subsystem of the facility.

6. Identify DC power wiring color code.
   a. Single voltage arrangement: BLACK = HOT, WHITE = RETURN, YELLOW = REFERENCE.
   b. Dual voltage arrangement: RED = PLUS, BLACK = HOT, WHITE = COMMON RETURN, YELLOW = REFERENCE.

7. Install battery racks.
   a. Install cells and racks IAW manufacturer’s instructions and the EIP.
   b. Protective coatings will not be removed from the racks and any bare metal will be re-touched with corrosive resistant paint.
   c. Absolyte battery systems do not require battery racks. Supports are part of the battery module. The accessories include installation hardware and operating instructions.
   d. The Absolyte battery system can be bolted to the floor, wall or both and can be built for earthquake protection. A maximum horizontal stack height of 8 modules is recommended for seismic applications and ten modules for non-seismic applications.

Performance Steps

8. Install batteries.
   a. The recommended equipment for battery installation is:
      Forklift or portable boom crane.
      Torpedo level (plastic).
      Plywood straight edge 1/2" x 4" x 48".
      Torque wrenches.
      Vinyl electrical tape.
      Paper wipes.
      Scouring pads.
      Box wrenches (metric).
      Ratchet set (metric).
      Line cord.
      Chalk line.
      Hammer drill (floor anchoring).
   b. Use a hand operated crane to lift or move cells. Lead-acid cells are extremely heavy even when not filled with acid.
   c. Inspect all cells for cracks, chips, debris, broken or warped components, and other signs of damage.
   d. All terminals, interconnecting straps, and bolts will be coated with "NO-OX-ID," grease at each terminating point.
   e. The positive cell terminal connections will be made first, then the negative, to reduce the chance of an accident.
   f. The flooded cell type battery requires preparation of electrolyte. Always pour ACID INTO WATER slowly (PAWS), NEVER water into acid. Electrolyte is available in premixed solutions, which is safer.
   g. Cells may be connected and arranged in series, parallel or series-parallel, to provide the correct voltage and current.
   h. All equipment will be wired to a circuit breaker. Under no conditions will connections be made until all testing for continuity and shorts have been completed.
   i. Flooded cell-type batteries are required to be located in a separate area.
   j. To stack Absolyte modules horizontally, you must perform a tip-over procedure. The module/base assembly (with I-beam) should be tipped over first.

CAUTION

Do not attempt to perform tip-over of module manually as serious personal injury and module damage may result.

   k. Install four lifting shackles and two lifting straps.
   l. Absolyte module assemblies are identified with a circular label located on one of the module ends. Identification codes are as follows: S = Standard Assembly, R = Reversed Assembly, SD = Standard Assembly with Dummy, RD = Reversed Assembly with Dummy. Consult layout-wiring diagram for proper location in assembly of battery system. Assemblies can be rotated 180 degrees for proper polarity location.
   m. To anchor Absolyte batteries, position module/base assembly in desired location. Mark floor through I-beam holes and remove module/base assembly. Install anchoring devices and reposition module/base assembly over anchors. Check the assembly for level in both axes and level using the shims provided. Torque nuts to 47 Newton-Meters (35 feet-pounds).
   n. The Absolyte battery system is supplied with a terminal plate assembly for the positive and negative terminations, to provide the proper connection to the operating equipment and module terminals. Do not connect load cables directly to module terminals; it may compromise the battery system performance as well as the integrity of cell post seals.

Performance Steps

o. Cells may be connected and arranged in series, parallel or series-parallel, to provide the correct voltage and current.
p. All terminals, interconnecting straps, and bolts will be coated with "NO-OX-ID" grease at each terminating point.
q. Mix acid and water to make electrolyte for the flooded cell battery:
(1) Prior to mixing electrolyte or filling cells, mix a solution of baking soda and water. Mix one gallon of water per box of baking soda to use to neutralize electrolyte (acid) spills.
(2) When preparing electrolyte for flooded cell type batteries, always POUR ACID INTO WATER SLOWLY (PAWS), NEVER water into acid.

CAUTION

If this procedure is not followed, an extremely violent chemical reaction will take place and could seriously injure anyone nearby.

(3) Acid mixed with water produces hydrogen gas, which is highly explosive. This means no sparks near the area and adequate of ventilation must be provided.
(4) Electrolyte is available in premixed solutions, which is safer.

9. Identify placement and numbering of cells.
a. When installing flooded cells, the lowest numbered cells will be placed in the lower racks.
(1) Tiered racks are filled from the lowest level first, working from the center to the outside.
(2) Stepped racks are filled by installing a cell on each step, starting with the lowest step, then working toward the highest step.
b. Once the cells are placed in the racks, cell alignment must be done.
(1) Stretch a piece of twine between the first cell terminal and the last cell terminal of each row. Ensure the twine is on the same side of all terminals, and then align the batteries.
(2) Without tightening the straps, space each cell the length of the strap, starting at the center and work towards the ends of each row.
c. Absolyte batteries may be arranged vertically (50A and 90A for float applications) or horizontally (50A, 90A and 100A). Horizontal configurations are preferred.
d. A minimum of 36 inches of aisle space must be maintained adjacent to the battery bank.
e. When the application voltage requires, a dummy cell will replace a live cell in an Absolyte module.
f. DC wiring must use the gauge and type of wire called for in the EIP. There should NOT be more than one splice per circuit on the hot side and NO splices on the return.
g. Battery performance is based on the output at the battery; therefore, the shortest connection to the equipment will result in maximum performance (lowest voltage drop).

10. Install connectors.
a. The crimp connector is used on multistranded cable only.
(1) Mark the cable and remove the correct amount of insulation.
(2) The insulation should be flush against the connector, with 1/8 inch of bare conductor visible on the other side.
(3) Crimp the connector onto the cable.
b. The set screw connector can be used on stranded or solid conductor cable. Cable preparation is the same as the crimp connector.

11. Identify safety precautions.
a. The installation of batteries will be constantly supervised and the supervisor will not physically participate in the installation.
b. A minimum of three people will be present while work is being performed on batteries.
c. A safety briefing will be given each day before work starts. Personnel must be aware of how to react to an accident involving battery acid.

Performance Steps

d. Batteries can produce hydrogen gas, which is highly explosive. Care must be taken to prevent build-up of static charge. Before making contact with a cell, discharge static electricity by touching a grounded surface. Adequate ventilation must be provided (exhaust fan) to prevent dangerous levels of hydrogen gas from building up.
e. Acid must be mixed with water, POUR ACID INTO WATER SLOWLY (PAWS) and stir, NEVER pour water into acid.
f. Prior to mixing electrolyte or filling cells with electrolyte, mix one box of baking soda to one gallon of water.
g. If anyone gets electrolyte in their eyes, follow these steps:
   (1) Close both eyes to keep eye movement minimized. This will allow the eyes to naturally wash while the victim is being escorted to the eye washstand. DO NOT rub eyelids.
   (2) Flush eyes with water for at least 15 minutes, and seek medical attention.
h. All battery rooms must have a working eyewash and shower installed before batteries can be installed. If not provided, a large bathtub filled with a baking soda and water solution is acceptable.
i. Proper safety gear (face shield, gloves, aprons, etc.) must be worn while working around batteries.
j. A 3 to 5 gallon container of baking soda solution will be available to neutralize any acid splashed.
k. Always, follow manufacturer's instruction during a battery installation and inspect all batteries prior to filling and installing. Observe all safety requirements and recommendations.

Performance Measures	GO	NO-GO
1. Installed AC wire through conduit.	____	____
2. Identified wiring boxes and electrical devices.	____	____
3. Labeled a distribution panel.	____	____
4. Identified AC safety.	____	____
5. Identified DC power.	____	____
6. Identified DC power wiring color code.	____	____
7. Installed battery racks.	____	____
8. Installed batteries.	____	____
9. Identified placement and numbering of cells.	____	____
10. Installed connectors.	____	____
11. Identified safety precautions.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
MIL-HDBK-419A	
MIL-STD-188-124B (3)	
TB 385-4	
The National Electric Code (NEC)	

INSTALL CABLE/WIRE SYSTEMS
113-588-2006

Conditions: Given cable or wire; reel unit RL-31( ) (can be vehicle mounted); marline cord; drive hooks (installed on poles); tool equipment TE-21 and TE-33; existing poles or trees; lance poles; A-frames; stakes; shovel; hammer; gloves; tags; grease pencil; system diagram; team of Soldiers; TC 24-20, TM 11-3895-202-13, TM 11-5805-201-12, TM 11-6110-201-12P, TM 11-3895-209-14, TM 11-5995-208-10, TM 11-5805-701-12, TM 11-5805-702-12, TM 11-5805-703-14, TM 11-5805-706-12, TM 11-5805-707-12, and TM 11-6110-243-14P.

Standards: Installed cable or wire correctly.

Performance Steps

1. Install reel unit RL-31( ) for ground or flatbed use. (Refer to TM 11-3895-202-13.)
2. Install cable or wire on surface. (Refer to TC 24-20.)
3. Install cable or wire aerial.
   a. Install cable or wire on poles or trees. (Refer to TC 24-20.)
   b. Install terminal A-frame(s). (Refer to TC 24-20.)
      (1) Install intermediate A-frame(s). (Refer to TC 24-20.)
   c. Install aerial telephone cable road crossing. (Refer to TC 24-20.)
4. Bury cable or wire when appropriate. (Refer to TC 24-20.)

Performance Measures	GO	NO-GO
1. Installed reel unit RL-31( ) for ground or flatbed use.	____	____
2. Installed cable or wire on surface.	____	____
3. Installed cable or wire aerial.	____	____
4. Buried cable or wire when appropriate.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-3895-202-13	
TM 11-3895-209-14	
TM 11-5805-201-12	
TM 11-5805-702-12	
TM 11-5805-703-14	
TM 11-5805-706-12	
TM 11-5805-707-12	
TM 11-5995-208-10	
TM 11-6110-201-12P	
TM 11-6110-243-14P	

RECOVER CABLE/WIRE SYSTEM
113-588-2010

Conditions: Given reel unit RL-31( ) (can be vehicle mounted); tool equipment TE-21 and TE-33; wire or cable; pre-installed cable or wire reels; empty; hammer HM-1; shovel; gloves; eye protection; cargo truck M35A2, 2 1/2-ton or equivalent; team of Soldiers; TC 24-20, TM 11-3895-202-13, TM 11-3895-209-14, and TM 11-5995-208-10.

Standards: Recovered the cable or wire system.

Performance Steps

1. Disconnect cable from terminal equipment. (Refer to TC 24-20.)
2. Lower aerial cable to ground.
3. Recover buried field cable. (Refer to TC 24-20.)
4. Remove tags, ties, and stakes from cable or wire system. (Refer to TC 24-20.)
5. Recover field cable using reel unit RL-31( ).

Performance Measures	GO	NO-GO
1. Disconnected cable from terminal equipment.	____	____
2. Lowered aerial cable to ground.	____	____
3. Recovered buried field cable.	____	____
4. Removed tags, ties, and stakes from cable or wire system.	____	____
5. Recovered field cable using reel unit RL-31( ).	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-3895-202-13	
TM 11-3895-209-14	
TM 11-5995-208-10	

INSTALL COMMERCIAL FIBER OPTIC TERMINATORS/CONNECTORS 113-632-4001

Conditions: Given a section of fiber optic cable, connectors (straight tip (ST), subminiature version A (SMA), biconical, hot-melt), splicer's hand tools, cleaving tools, polishing adapter, lapping film, microscope, curing oven, safety glasses, ANSI/TIA/EIA 568B/569A cabling standard, and manufacture's manual.

Note: Let Soldier know that assistance is available.

WARNING

Be very careful when disposing of fiber ends. The fiber creates slivers that can cause injury. Always wear safety glasses when working with optical fibers.

CAUTION

Do not touch bare fibers with fingers, as oil from skin can weaken the fiber by making it brittle.

Standards: Terminated the fiber optic connector to the fiber optic cable as indicated by manufacture's manuals and retained a reading level of no more than 1 decibel (dB) loss per connector.

Performance Steps

1. Inventory and clean connector parts.
   a. Inspect and inventory connector package.
   b. Clean connector with a dry, lint free cloth.
2. Prepare cable and fiber.
   a. Slip the strain relief boot/tube onto the buffered fiber.
   b. Strip buffer to specified length as per connector.
   c. Clean fiber with lint free cloth and alcohol.
3. Prepare epoxy.
   a. Mix the two components until epoxy is a uniform blue color.
   b. Load the syringe with epoxy.
   c. Attach the epoxy dispensing tip.
4. Crimp connectors.
   a. Insert epoxy into the connector.
   b. Apply epoxy to the outer jacket and fiber.
   c. Thread the connector onto the fiber.
   d. Examine the epoxy bead.

Note: The epoxy bead height should be 2 to 4 fiber diameters above the ceramic tip. If not additional epoxy must be applied around the base to build the bead to the proper height.

   e. Crimp the connector onto the cables outer jacket.
   f. Install the load adapter onto the connector.
   g. Secure the strain relief boot.

Performance Steps

5. Cure proxy.
   a. Heat oven to the proper temperature.
   b. Place connector into one of the oven's ports.
   c. Allow 20 minutes for curing time or specified time as per connector.
   d. Remove connector from oven and place in the curing stand to cool for at least 5 minutes.
6. Cleave fiber ends.
   a. Remove the load adapter (allow the connector to cool to room temperature before cleaving).
   b. Cleave the fiber end.
   c. Check the fiber end.

Note: The fiber should not protrude from the epoxy bead more than one fiber diameter.

7. Polish fiber.
   a. Prepare polishing surface using a lint free cloth dampened with alcohol.
   b. Prepare the polishing adapter using a lint free cloth moistened with alcohol.
   c. Polish fiber (refer to manufacture's manual).
8. Test fiber connector and cable.

Performance Measures		GO	NO-GO
1.	Inventoried and clean connector parts.	____	____
2.	Prepared cable and fiber.	____	____
3.	Prepared epoxy.	____	____
4.	Crimped connectors.	____	____
5.	Cured proxy.	____	____
6.	Cleaved fiber ends.	____	____
7.	Polished fiber.	____	____
8.	Tested fiber connector and cable.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manual	
TB 385-4	

SPLICE COMMERCIAL FIBER OPTIC CABLE
113-632-4002

Conditions: Given a section of fiber-optic cable, splicer's hand tools, cleaving tools, polishing adapter, reagent alcohol, microscope, mechanical splice workstation equipment, Norland optical adhesive, Fiberlok 2501 assembly tool, fiber optic fusion splicer, safety glasses, and manufacture's manuals.

Standards: Inspected the fiber-optic cable as indicated by manufacture's manuals and restored communications.

Performance Steps

1. Identify splicing technique.
   a. Norland ultra violet curing (UVC) optical splice.
   b. AMP optimate mechanical fiber-optic splice.
   c. Fusion splice.
   d. Fiberlok optical splice.
2. Set up workstation and equipment according to splicing technique.
3. Prepare fiber cable according to splicing technique.
4. Splice fiber cable according to splicing technique.

Performance Measures		GO	NO-GO
1.	Identified splicing technique.	____	____
2.	Set up workstation and equipment according to splicing technique.	____	____
3.	Prepared fiber cable.	____	____
4.	Spliced fiber cable according to splicing technique.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON TELEPHONE TEST SET TS-3647/G 113-574-3006

Conditions: Given telephone test set TS-3647/G, a 4-inch flat-tip screwdriver, dust brush and cleaning rags, cable CX-11230A/G, TD-1218/G or TD-1219/G, TD-1233(P)/TTC or TD-1234(P)/TTC, ground wire, DA Form 2404 (Equipment Inspection and Maintenance Worksheet), DA Form 2408-14 (Uncorrected Fault Record), TM 11-5805-703-14 and DA Pam 750-8.

Standards: Performed ULM, completed DA Form 2404 and DA Form 2408-14, and the telephone test set was operational; or evacuated the defective test set to a higher maintenance level.

Performance Steps

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks. (Refer to TM 11-5805-703-14.)
   a. Clean, wash, and dust.
   b. Check for frayed cables.
   c. Store unused items.
   d. Cover unused receptacles.
   e. Check for loose nuts, bolts, and screws.

Note: A ground wire should be attached from ground lug on front panel of the cable orderwire unit (COU) to equipment being tested and remain in place while equipment is operating.

3. Perform ULM. (Refer to TM 11-5805-703-14.)
   a. Check COU batteries for operational readiness.
   b. Check handset cradle, handset grommet, push-to-talk (PTT) switch, and handset cable.

CAUTION

Caution should be taken when connecting a COU to an operational cable system. Minor errors might be produced causing interruption in data.

4. Check COU operation with a pulse restorer. (Refer to TM 11-5805-703-14.)
5. Check COU operation with a remote multiplexer combiner (RMC) or remote loop group multiplexer (RLGM). (Refer to TM 11-5805-703-14.)
6. Complete DA Form 2404 and DA Form 2408-14. (Refer to DA Pam 750-8.)

Performance Measures		GO	NO-GO
1.	Initiated DA Form 2404.	____	____
2.	Performed routine checks.	____	____
3.	Performed ULM.	____	____
4.	Checked COU operation with a pulse restorer	____	____
5.	Checked COU operation with an RMC or RLGM.	____	____
6.	Completed DA Form 2404 and DA Form 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-5805-703-14	

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON ELECTRICAL CABLE TEST SET AN/GTM-12
113-574-3010

Conditions: Given telephone test set AN/GTM-12, a 4-inch flat-tip screwdriver, dust brush and cleaning rags, DA Form 2404, Form 2408-14, TM 11-6625-3292-12 and DA Pam 750-8.

Standards: Performed ULM, completed DA Form 2404 and DA Form 2408-14, and the telephone test set was operational; or evacuated the defective test set to a higher maintenance level.

Performance Steps

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks. (Refer to TM 11-6625-3292-12.)
   a. Clean, wash, and dust.
   b. Check for frayed cables, broken connectors, or bent pins.
   c. Inspect case and cover for visible damage.
   d. Inspect battery pack for damaged connectors, torn plastic, broken wires, or missing Velcro fastener.
   e. Check spare fuse pack to ensure that it contains two of each fuse rated 1/2, 1, and 2 amps.
   f. Tighten loose screws.
3. Complete DA Form 2404 and DA Form 2408-14. (Refer to DA Pam 750-8.)

WARNING

Do not use ungrounded extension cords when operating the AN/GTM-12 with AC power. The AN/GTM-12 is equipped with a three-wire AC power cord that grounds the instrument front panel and case when connected to a grounded AC outlet.

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks.	____	____
3. Completed DA Form 2404 and DA Form 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA form 2408-14	
DA Pam 750-8	
TM 11-6625-3292-12	

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON TEST SET TS-4117()/G 113-574-3011

Conditions: Given test set TS-4117( )/G (with battery), pencil, DA Form 2404, DA Form 2408-14, DA Pam 750-8, and TM 11-6625-3227-13&P.

Standards: Performed ULM, completed DA Form 2404 and DA Form 2408-14, and the test set was operational; or evacuated the defective test set to a higher maintenance level.

Performance Steps

(Refer to TM 11-6625-3227-13&P for performance steps 2 through 11.)

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks. (Check for loose nuts, bolts, and screws.)
3. Check transit case.
4. Check handset.
5. Check reference cable assembly.
6. Check fiber optic loopback connector.
7. Check switch actuator assembly.
8. Check case top O-ring.
9. Check front panel.
   a. OSM display.
   b. Nameplate.
   c. Maintenance orderwire (MOW) connector.
   d. Battery cover.
   e. Audible alarm.
   f. Fiber Optic Cable Assembly (FOCA) test facility (FTF) connector.
   g. MOW communications facility (MCF) connector.
   h. Dust covers and lanyards.
10. Check battery.
11. Check optical strength meter (OSM) display.
12. Complete DA Form 2404 and DA Form 2408-14. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks. (Checked for loose nuts, bolts, and screws.)	____	____
3. Checked transit case.	____	____
4. Checked handset.	____	____
5. Checked reference cable assembly.	____	____
6. Checked fiber optic loopback connector.	____	____
7. Checked switch actuator assembly.	____	____

Performance Measures	GO	NO-GO
8. Checked case top O-ring.	____	____
9. Checked front panel.	____	____
10. Checked battery.	____	____
11. Checked OSM display.	____	____
12. Completed DA Form 2404 and DA Form 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-6625-3227-13&P	

TROUBLESHOOT TELEPHONE CABLE WD-1( )/TT OR WF-16/U
113-588-0005

Conditions: Given a telephone cable, installed (with fault); telephone set TA-312/PT, operational (three each, with six BA-30s); tool equipment TE-33; electrical/friction tape; lineman's gloves; two assistants; TC 24-20 and TM 11-5805-201-12.

Standards: Located and repaired a line fault and restored communications.

Performance Steps

(Refer to TC 24-20 for all performance steps, unless otherwise indicated.)

1. Verify telephone cable trouble exists.
2. Test line for trouble and identify fault. (Refer to TM 11-5805-201-12.)
   a. Open.
   b. Short.
   c. Ground.
   d. Crossed circuit.
3. Localize fault.
4. Locate fault.
5. Repair fault.
6. Retest telephone cable.
7. Restore communications.

Evaluation Preparation: Setup: Ensure the telephone cable is installed and connected to the field phones.

Brief Soldier: Tell the Soldier that the cable must be tested for operation.

Performance Measures (Refer to TC 24-20 for all performance steps, unless otherwise indicated.)	**GO**	**NO-GO**
1. Verified that telephone cable trouble exists.	____	____
2. Tested line for trouble and identified fault.	____	____
3. Localized fault.	____	____
4. Located fault.	____	____
5. Repaired fault.	____	____
6. Retested telephone cable.	____	____
7. Restored communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-5805-201-12	

TROUBLESHOOT CX-11230A/G CABLE SYSTEM
113-588-0016

Conditions: Given pre-installed, low-speed cable driven modem MD-1023; pre-installed, high-speed cable driver modem MD-1024; pre-installed, COU C-10716; pre-installed, field cable CX-11230A/G; a pulse form restorer TD-1218 or TD-1219; telephone test set TS-3647/G; battery BA-30 or BA-3030, six each; ground rod MX-148/G; ground strap; stakes; HM-1 hammer; eye protection; and TM 11-5805-703-14.

Standards: Tested and restored the cable system.

Performance Steps

(Refer to TM 11-5805-703-14 for all performance steps.)

1. Ground the TS-3647/G.
2. Prepare the TS-3647/G.
   a. Install batteries.
   b. Check batteries.
3. Connect test set to the cable system at the TD-1218 or TD-1219 pulse form restorer.
4. Perform orderwire operation.
5. Perform test procedures.
   a. Locate fault.
   b. Repair fault.
6. Retest the cable system.
7. Secure test set.
8. Restore the cable system.

Performance Measures	GO	NO-GO
1. Grounded the TS-3647/G.	____	____
2. Prepared the TS-3647/G.	____	____
3. Connected test set to the cable system at the TD-1218 or TD-1219 pulse form restorer.	____	____
4. Performed orderwire operation.	____	____
5. Performed test procedures.	____	____
6. Retested the cable system.	____	____
7. Secured test set.	____	____
8. Restored the cable system.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-703-14	TM 11-5805-701-12
	TM 11-5805-702-12
	TM 11-5995-208-10

TROUBLESHOOT 26-PAIR CABLE CX-4566/G 113-588-0018

Conditions: Given a faulty cable, AN/GTM-12, tools, DA Form 2404, and TM 11-6625-3292-12.

Standards: Repaired the faults and reestablished communications.

Performance Steps

(Refer to TM 11-6625-3292-12 for all performance steps.)

1. Inspect the physical appearance of the cable.
   a. Breaks in cable where pairs might be showing so that possible weather conditions could damage and affect the performance.
2. Perform troubleshooting procedures with the AN/GTM-12 by testing the CX-4566/G 26-pair cable.

Note: Perform the following three tests in the order stated.
(1) Continuity-pairs (CONT P).
(2) Insulation Resistance (IR).
(3) Cross talk (X TALK).

3. Perform conductor continuity measurement: Pair Test.

CAUTION

To avoid damage to the test set or other equipment, ensure that the first cable you intend to test is disconnected from any load, power source, or wiring. Never use the AN/GTM-12 to test a cable that is connected to anything other than an approved shorting block.

   a. Connect adapter cable W100 to connector J100.
   b. Connect the cable to be tested to the U-185B/G connector on adapter cable W100.
   c. Turn on the test set.
   d. Set CABLE LENGTH switch to the length of the cable under test. If testing multiple connected cables, set the switch to the combined length.
   e. Set the AUTO/SINGLE switch to AUTO.
   f. Set the FUNCTION switch to CONT P.

Note: The AN/GTM-12 sequentially tests each wire pair for open circuits. If the test proceeds through pair 26 and the END light illuminates for approximately 20 seconds, then the cable under test has no open conductors. If the AN/GTM-12 detects a conductor break (open circuit), the test will stop, the fault light will illuminate, and the broken wire pair will be identified in the display.

   g. Press and release the ADVANCE switch.
   h. Observe the flashing TEST light (and the advancing circuit numbers in the display window if the test set is powered in the AC or DC mode as the test sequences through each wire pair.

Note: If a fault is detected, record the number of the defective wire pair. If the END light illuminates for approximately 20 seconds, skip to step j.

   i. Repeat steps g and h until the END light illuminates.
   j. Disconnect the Shorting Block P.

Performance Steps

4. Perform IR test.
   a. Connect adapter cable W100 to connector J100.
   b. Connect the cable to be tested to the U-185B/G connector on adapter cable W100.
   c. Turn on the test set.
   d. Set the AUTO/SINGLE switch to AUTO.
   e. Set the FUNCTION switch to IR (10M).
   f. Press and release the ADVANCE switch.
   g. Observe the flashing TEST light and, if the test set is powered in the AC or external DC mode, the advancing circuit numbers in the display window as the test scans forward: A01, A02, A03, etc.

Note: If the scan halts, note the displayed conductor number. If the scan advances through B26 and the END light illuminates for approximately 20 seconds, skip the remaining steps.

   h. Press and release the ADVANCE switch.

Note: Record the defective conductors shown in the display.

   i. Repeat steps f through h until the test sequence advances through B26 and the END light illuminates.
   j. Set the FUNCTION switch to IR (0.1M), and repeat steps f through h.

Note: Conductors that test faulty at the 10M threshold but pass the 0.1M threshold should be examined to determine the cause of low resistance; e.g. moisture and/or dirt on the cable hocks, and appropriate corrective action taken.

5. Perform X TALK test.

CAUTION

To avoid damage to the test set or other equipment, ensure that the cable that you intend to test is disconnected from any load, power source, or wiring. Never use the AN/GTM-12 to test a cable that is connected to anything other than an approved shorting block.

Note: The setup for X TALK is the same as for IR except the FUNCTION switch position.

   a. Connect adapter cable W100 to connector J100.
   b. Connect the cable to be tested to the U-185B/G connector on adapter cable W100.
   c. Turn on the test set.
   d. Set the AUTO/SINGLE switch to AUTO.
   e. Set the FUNCTION switch to X TALK.

Note: The stimuli are applied in turn to the wire pair displayed on the left starting with pair 01, while the higher numbered pairs are displayed on the right. They are being scanned for a response (cross talk).

   f. Press and release the ADVANCE switch.
   g. Observe the flashing TEST light and, if the test set is powered in the AC or external DC mode, the advancing circuit numbers in the display window 01 01, 01 02, 01 26, 02 02, 02 03, etc. to 24 26, 25 25, 25 26, 26 26.

Performance Steps

Note: If the test sequence stops and the FAULT light illuminates, record the numbers of the defective wire pairs as shown in the display window. If the test sequence proceeds through 25 26 and the END light illuminates, skip the remaining steps.

h. Repeat steps e and f until the test sequence proceeds through 25 26 and the END light illuminates.

Performance Measures	GO	NO-GO
1. Inspected the physical appearance of the cable.	____	____
2. Performed troubleshooting procedures with the AN/GTM-12 by testing the CX-4566/G 26-pair cable.	____	____
3. Performed Conductor Continuity Measurement: Pair Test.	____	____
4. Performed IR test.	____	____
5. Performed X TALK test.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
TM 11-6625-3292-12	

SET POLES
113-588-1002

Conditions: Given a 30-foot pole, pike poles, and pole supports; digging tools LC-17, LC-18, and LC-19; digging bar; tamping bar LC-3; protective headgear; measuring tape or ruler; carrying hook and cant hooks; anchor and anchor rod; expanding rod AH-1; guy strand; strand grip(s) (2 each); strand clamp or automatic locking device; chain hoist; handline; tool equipment TE-21 and TE-33; shovel; bolt cutter; eyebolt; telephone maintenance truck; and a team of seven Soldiers.

Standards: Prepared and set a pole in the ground and installed one anchor and one guy line.

Performance Steps

WARNING

A safety briefing is a must. Soldiers working or involved in lifting heavy objects must wear protective headgear and take safety precautions.

(Performance steps 1 and 2 can be performed with the use of a telephone maintenance truck.)

1. Dig holes for pole and anchor.
2. Raise pole and set in hole.
3. Face, straighten, and center pole.
4. Backfill and tamp the earth around pole.
5. Install anchor.
6. Backfill and tamp the earth firmly around anchor.
7. Attach guy to pole.
8. Attach guy to anchor rod.
9. Tighten guy.

Performance Measures	GO	NO-GO
1. Dug hole for pole and anchor.	____	____
2. Raised pole and set in hole.	____	____
3. Faced, straightened, and centered pole.	____	____
4. Backfilled and tamped the earth around pole.	____	____
5. Installed anchor.	____	____
6. Backfilled and tamped the earth firmly around anchor.	____	____
7. Attached guy to pole.	____	____
8. Attached guy to anchor rod.	____	____
9. Tightened guy.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
TM 9-2320-289-20P	

INSTALL AERIAL CABLE SPLICING EQUIPMENT
113-588-1074

Conditions: Given tool equipment TE-21, manila rope, 1/2-inch diameter; aerial handline; extension ladder; slack puller; wire clamps; gloves; splicing platform; cable car; splicer's umbrella; wrench; pliers; splicer's scissors; FM 11-372-1, FM 11-372-8, and TC 24-20.

Note: This task is performed during daylight hours. It should NOT be performed under adverse weather conditions. Supervision and assistance are available.

Standards: Positioned the splicing equipment and made all safety checks.

Performance Steps

WARNING

Installer should be careful when erecting aerial splicing equipment, to prevent coming in contact with power lines or power attachments.

1. Check pole for defect.
2. Check suspension strand for tension. (Refer to FM 11-373-1.)
3. Climb pole, if required. (Refer to TC 24-20.)

WARNING

Installer should look both up and down at all times while climbing a pole. This will protect him from climbing into attachments on the pole and from climbing over the top of the pole. Installer should visually check to ensure that the snap engages the D-ring. Installer should NOT depend on the sound of the keeper snapping to indicate that the snap hook has engaged.

4. Set up ladder, if required.

WARNING

Installer should NOT move the foot of the ladder after the ladder is lashed to the strand.

5. Remove aerial cable rings or lashing wire, if required.
6. Terminate cable lashing wire.

Performance Steps

7. Make proper slack in cable using the slack puller.

> **WARNING**
>
> **Installer should NOT use the slack puller on a rusty, pitted strand. Such a strand is likely to be broken by the slack puller. Installer should substitute a chain hoist equipped with strand grips for the puller.**

8. Set up other splicing equipment, if required (Refer to FM 11-372-1.).
   a. Splicing platform.
   b. Splicer's tent.
   c. Cable car.
   d. Splicer's umbrella.

Note: An aerial handline should be used when setting up splicing equipment.

Evaluation Preparation: Setup: None.

Brief Soldier: Tell the Soldier that he is graded only on his assigned portion of the task.

Performance Measures	**GO**	**NO-GO**
1. Checked pole for defect.	____	____
2. Checked suspension strand for tension.	____	____
3. Climbed pole, if required.	____	____
4. Set up ladder, if required.	____	____
5. Removed aerial cable rings or lashing wire, if required.	____	____
6. Terminated cable lashing wire.	____	____
7. Made proper slack in cable using the slack puller.	____	____
8. Set up other splicing equipment, if required.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
FM 11-372-1	
FM 11-372-8	
TC 24-20	

INSTALL UNDERGROUND CABLE SPLICING EQUIPMENT
113-588-1075

Conditions: Given ventilator/blower, electrical, AC/DC, 115-V, 60-cycle, 1-HP; generator set, 3-kilowatt (kW) gas engine, 60-Hz, 1-3 HP, 120/208-V, SKD TAC utility; fire extinguisher, carbon dioxide, with rubber nozzle, charge, WHLD 50 lb; manhole cover hooks; carbon monoxide detector; flags; warning signs; and barricades.

Note: This task is performed outside a manhole during daylight hours. Supervision and assistance are available.

Standards: Made all safety checks, tested manhole atmosphere, and ventilated the manhole completely.

Performance Steps

1. Place warning devices.
   a. Barricades.
   b. Flags or flagmen.
   c. Warning signs.
2. Remove manhole cover.
3. Test manhole atmosphere.
   a. Oxygen deficiency.
   b. Carbon monoxide.
4. Ventilate manhole, if required.
   a. Artificial.
   b. Natural.

Evaluation Preparation: Setup: None.

Brief Soldier: Tell the Soldier that he is graded only on his assigned portion of the task.

Performance Measures	GO	NO-GO
1. Placed warning devices.	____	____
2. Removed manhole cover.	____	____
3. Tested manhole atmosphere.	____	____
4. Ventilated manhole, if required.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

INSTALL A CONNECTOR ON A STRANDED FLEXIBLE COAXIAL CABLE 113-588-1106

Conditions: Given a section of coaxial cable, connector, hand tool set, solder, soldering iron, knife or tubing cutter, clean damp cloth, safety glasses, and a Manufactures Manual.

Note: Let Soldier know assistance is available.

Standards: Installed the connector on the coaxial cable without deficiencies.

Performance Steps

WARNING

Remove all jewelry for this task. Notify Soldier of safety concerns while operating a soldering iron.

1. Inventory connector parts.
2. Cut cable end.
3. Place nut, washer, and gasket on cable.
4. Remove outer jacket.
5. Place braid clamp on cable.
6. Cut braid and dielectric.
7. Cut and tin inner conductor.
8. Place contact on cable.
9. Position gasket, washer, and nut.
10. Install assembly.

Performance Measures	GO	NO-GO
1. Inventoried connector parts.	____	____
2. Cut cable end.	____	____
3. Placed nut, washer, and gasket on cable.	____	____
4. Removed outer jacket.	____	____
5. Placed braid clamp on cable.	____	____
6. Cut braid and dielectric.	____	____
7. Cut and tin inner conductor.	____	____
8. Placed contact on cable.	____	____

Performance Measures	GO	NO-GO
9. Positioned gasket, washer, and nut.	____	____
10. Installed assembly.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

INSTALL UNDERGROUND CABLE SYSTEM
113-588-1107

Conditions: Given manhole rail guard, barricades with warning lights, warning signs, warning flag, flag and warning light stand, rodding and duct cleaning equipment, winch-operated chains, construction vehicle with winch, rope, cable reel, cable trailer, reel jacks, cable lubrication, cable feeder, pulling eye, pulling line, cable grip, duct tape, core-hitch eye, cable guide, loading coil and apparatus cases, duct shields, water activated cement, cable sheave and shackle, atmosphere tester, manhole cover hooks, ventilator, and water pump, and United States Air Force (USAF) Technical Order (TO) 31-10-3.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Let Soldier know that assistance is available.

Standards: Installed the underground cable system, terminated cable if used and restored communications or sealed cable ends if not used.

Performance Steps

WARNING

There are numerous safety precautions to take into consideration with this task.

1. Conduct pre-installation activities.
   a. Position safety equipment in proper locations.
   b. Pump water from manholes.
   c. Perform atmosphere test prior to entering in manholes.
   d. Ventilate manholes.
   e. Rod and clean ducts.
   f. Test duct alignment.
   g. Prepare cable reel and pulling apparatus.
   h. Attach pulling line to the cable.
   i. Install a cable grip on 25 pairs.
2. Install cable system.
   a. Attach cable guide.
   b. Lubricate cable.
   c. Pull cable through manholes.
   d. Repeat performance steps 1a through 2c for each manhole.
3. Terminate cable.
   a. Install a tip cable on a main distribution frame (MDF) using distribution rings.
4. Conduct post-installation activities.
   a. Seal a cable using a B end cap.
   b. Tie and bond cable.
   c. Place underground load coil cases.
   d. Seal ducts.

Performance Measures	GO	NO-GO
1. Conducted pre-installation activities.	____	____
2. Installed cable system.	____	____
3. Terminated cable.	____	____
4. Conducted post-installation activities.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required
USAF TO 31-10-3

Related

INSTALL A CAD-6 BURIED DISTRIBUTION TERMINAL
113-588-1108

Conditions: Given a CAD-6 distribution terminal, a ground rod, ground connector, mounting stake, a shovel, engineer specifications, and manufacturer's manual.

Note: Supervision and assistance are available.

Standards: Installed the CAD-6 terminal according to engineer specifications.

Performance Steps

1. Determine CAD-6 terminal location using engineer specifications.
2. Prepare location - dig section of earth in an 8 x 8 square and 16 inches deep.
3. Remove covers of the CAD-6 terminal.
   a. Separate upper and lower front covers.
   b. Unlock the divider plate and swing it open.

Note: DO NOT use the divider plate to lift or carry the cable closure.

4. Install mounting stake.
5. Install grounding rod - place ground rod on the right side of the back plate assembly.
6. Secure back plate assembly.
   a. Mount the back plate assembly to the stake.
   b. Install #6 ground wire on the right side of back plate assembly.
7. Install grounding connector.
   a. Clean an area 1 1/2 times the size of connector on grounding rod.
   b. Install #6 ground wire on the right side of back plate assembly.
8. Ground CAD-6 terminal.

Performance Measures	GO	NO-GO
1. Determined CAD-6 terminal location using engineer specifications.	____	____
2. Prepared location - dug section of earth in an 8 x 8 square and 16 inches deep.	____	____
3. Removed covers of the CAD-6 terminal.	____	____
4. Installed mounting stake.	____	____
5. Installed grounding rod - placed ground rod on the right side of the back plate assembly.	____	____
6. Secured back plate assembly.	____	____
7. Installed grounding connector.	____	____
8. Grounded CAD-6 terminal.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON REEL UNIT RL-31() 113-588-3005

Conditions: Given reel unit RL-31( ); lint-free cloth and brush; flat-tip screwdriver; grease, automotive, and artillery (GAA); oil, lubricating, preservative, special (PL special); adjustable wrench; initiated DA Form 2404; DA Form 2408-14; DA Pam 750-8; and TM 11-3895-202-13.

Standards: Performed ULM, completed DA Form 2404 and DA Form 2408-14, and the reel unit was operational; or evacuated the defective equipment to a higher maintenance level.

Performance Steps

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks.
   a. Cleaning.
   b. Preservation.
   c. Dusting.
   d. Washing.
   e. Stowing unused items.
   f. Checking for loose nuts and bolts.
3. Check mission essential equipment (for completeness).
4. Check lubrication.
5. Check brake unit.
6. Complete DA Form 2404 and DA Form 2408-14. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks.	____	____
3. Checked mission essential equipment (for completeness).	____	____
4. Checked lubrication.	____	____
5. Checked brake unit.	____	____
6. Completed DA Form 2404 and DA Form 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-3895-202-13	

REPAIR PLASTIC-SHEATHED CABLE
113-588-4022

Conditions: Given aluminum tape, asbestos blanket for heat shield, cable clamps, carding brush, channel pulling tool, chipping knife, E-pressure flange, friction tape, hammer, heat gun, heat-shrinkable split sleeve, lash wire clamp, metal channel lengths, neoprene tape, P-compound and B-compound, propane torch, retaining clip, 5-inch; rubber cement, shave hook, skinning knife, slack puller (if required), splice case, splicing kit, heat-shrinkable sleeve; steel strap, tabbing shears, and vinyl tape.

Note: Supervision and assistance are available.

Standards: Repaired the plastic-sheathed cable and sealed the damaged section.

Performance Steps

1. Repair minor sheath damage to aerial, buried, and underground plastic-sheathed cable, if required.
   a. Repair plastic cable sheath.
   b. Repair filled plastic cable.
   c. Repair plastic sheath on pressurized cable.
2. Perform a section replacement on a 25 pair plastic-sheath, plastic insulated cable, if required.
   a. Select the location for the new cable installation.
   b. Install new cable section temporarily.
   c. Remove all hardware from preexisting cable.
   d. Secure the new cable section.
   e. Make splice opening.
   f. Install shield bond clamp and install bond braid.
   g. Install end plate on new section of cable.
   h. Seal splice temporarily.
   i. Establish talk circuit.
   j. Half-tap splice in new cable.
   k. Wrap finished splice.
3. Repair plastic-sheathed aerial, buried, and underground cable with major damage, if required.
   a. Open cable.
   b. Dry conductors.
   c. Repair conductors.
   d. Repair cable sheath.
   e. Wrap core.

Note 1: When cable core is filled, repair operations should be accomplished, if possible, without removing the filling compound. The compound is removed only from those cable conductors which need repairing.

Note 2: When the cable core is filled, the cable core is replaced in the sheath without wrapping.

Note 3: If the cable is pressurized, a pressure plug must be installed before the cable sheath is opened. This is to prevent loss of pressure.

4. Close cable.
   a. Clean sheath and apply cement.
   b. Apply tapes.

Performance Steps

Note: Cable damage that has excessive injury to the sheath may require the removal of a portion of the plastic sheath. These cables may be closed by the use of a splice case or closure.

5. Repair cable terminals in plastic-sheathed cable.
   a. Repair strand-mounted terminals.
   b. Repair distribution terminals.
   c. Repair cross-connect terminals.
6. Repair cable pedestals.
7. Locate and repair pressurization leaks.

Evaluation Preparation: Setup: None.

Brief Soldier: Tell the Soldier to observe safety precautions concerning open flames, propane gas, and other pressurized gases.

Performance Measures	GO	NO-GO
1. Repaired minor sheath damage to aerial, buried, and underground plastic-sheathed cable, if required.	____	____
2. Performed a section replacement on a 25 pair plastic-sheath, plastic insulated cable.	____	____
3. Repaired plastic-sheathed aerial, buried, and underground cable with major damage, if required.	____	____
4. Closed cable.	____	____
5. Repaired cable terminals in plastic-sheathed cable.	____	____
6. Repaired cable pedestals.	____	____
7. Located and repair pressurization leaks.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturers' Manual	

PERFORM POLE RESCUE OPERATION
113-588-8001

Conditions: Given a simulated victim (on pole), tool equipment TE-21, one drive hook or large flat-tip screwdriver, one knife TL-29, safety equipment, first-aid kit, one rope of sufficient length, and FM 4-25.11.

Standards: Safely rescued the simulated victim from the pole and gave first aid.

Performance Steps

1. Plan rescue.
2. Climb pole.
3. Install drive hook or screwdriver above victim.
4. Wrap the rope twice around the drive hook or screwdriver and secure loose end of the rope to both D-rings of victim's belt.
5. Perform artificial respiration on victim while on top of pole (if needed).
6. Cut the victim's strap (simulate).
7. Lower victim to the ground.
8. Descend pole.
9. Treat victim for shock. (Refer to FM 4-25.11.)

Evaluation Preparation: Setup: Have the Soldier ensure sufficient rope is available to complete this task.

Brief Soldier: Tell the Soldier that he must wear rubber gloves throughout the rescue operation. When handling energized wires, the Soldier should use only one hand if possible. If the voltage exceeds 15,000 volts, the Soldier must NOT attempt the rescue until the circuit is definitely broken.

Performance Measures	GO	NO-GO
1. Planned rescue.	____	____
2. Climbed pole.	____	____
3. Installed drive hook or screwdriver above victim.	____	____
4. Wrapped the rope twice around the drive hook or screwdriver and secured loose end of the rope to both D-rings of victim's belt.	____	____
5. Performed artificial respiration on victim while on top of pole (if needed).	____	____
6. Cut the victim's strap (simulate).	____	____
7. Lowered victim to the ground.	____	____
8. Descended pole.	____	____
9. Treated victim for shock.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
FM 4-25.11	

MAKE A COAXIAL CABLE SPLICE
113-588-9008

Conditions: Given paper tape; cotton tape; vinyl tape; measuring tape; scotch tape; electrical tape; muslin material; polyethylene tape; No. 5 Transflex tubing; tinned-copper sleeves, No. 16; paper clip or test clip; lead sleeve (if required); rosin core solder; soldering iron; carding brush; hammer; pliers; chipping knife; cutting tool; slitting tool; shears; cable stripper; splicer's scissors; gloves; test boards; cotton sleeves; cable bonding clamp; bond wire or textile-insulated wire; and FM 11-372-1.

Note: Cables were installed, leaving approximately 5 feet on both ends for splicing. Supervision and assistance are available.

Standards: Spliced and soldered video cable with no errors.

Performance Steps

(Refer to FM 11-372-1 for all performance steps.)

1. Prepare cables for splice opening.
   a. Install temporary supports.
   b. Install cable supports.
   c. Measure for lead-sleeve splice.

2. Open cable.
   a. Open lead-sheathed cable.
      (1) Remove cable sheath (slitting required).

> **CAUTION**
>
> Make sure the chipping knife does NOT cut the core wrapping paper or damage the conductors.

      (2) Prepare sheath ends to protect conductors.
         (a) Rotate cable, if required.
         (b) Butt cable with two-paper wrapping and with four-paper wrapping.
         (c) Install temporary bonds.
      (3) Remove layer shields. (Exposes conductors.)
   b. Open polyethylene-covered cable (non-isolated).
      (1) Remove cable sheath.
      (2) Remove metal sheath.
      (3) Cut tabs.
      (4) Install inner-sheath clamps.
      (5) Install temporary bonding.

> **CAUTION**
>
> Gloves should be worn when removing metal sheath.

   c. Open polyethylene-covered cable (isolated).
      (1) Remove cable sheath.
      (2) Remove metal sheath, except two strips.
      (3) Fold back and tape metal strips.

Performance Steps

(4) Install inner-sheath clamps.

> **CAUTION**
>
> Gloves should be worn when removing metal sheath.

3. Expose conductors.
   a. Separate binding groups.
   b. Mark binding groups (color code).
4. Prepare conductors for splicing by drying out wet cable using heat gun method.

> **CAUTION**
>
> Desiccant should NOT be used on plastic- or rubber-insulated conductors.

5. Splice video cable.
   a. Regular shield cable.
      (1) Straight splice.
      (2) Butt splice.
      (3) Regular shield cable spliced to terminal stub.
   b. Flexible shield cable.
      (1) Flexible shield cable only.
      (2) Splice to paper-insulated cable.
   c. Regular shield video cable spliced to other cables.
      (1) Nonflexible shield.
      (2) Flexible shield.

Evaluation Preparation: Setup: None.

Brief Soldier: Tell the Soldier that he will be graded only on his assigned portion of the task.

Performance Measures	GO	NO-GO
1. Prepared cables for splice opening.	____	____
2. Opened cable.	____	____
3. Exposed conductors.	____	____
4. Prepared conductors for splicing by drying out wet cable using heat gun method.	____	____
5. Spliced video cable.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
FM 11-372-1	

TROUBLESHOOT FIBER OPTIC TRANSMISSION SYSTEM (FOTS) CABLE SYSTEM 113-632-5001

Conditions: Given the FOTS terminal, two each; FOCA CX-13295( )/G; test set TS-4117( )/G (with battery); assistants; TM 11-6625-3227-13&P, TM 11-6020-200-10, TM 11-6020-200-23&P, DA Form 2404, DA Form 2407, and DA Pam 750-8.)

Standards: Identified and repaired faults and established communications.

Performance Steps

1. Test the FOTS for proper operation.
2. Verify all switch and control settings and equipment controls.
3. Troubleshoot the FOCA using the TS-4117( )/G from either end. (Refer to TM 11-6625-3227-13&P and TM 11-6020-200-10.)
4. If outside of limits, have shelter operator check the fiber optic modem (FOM); if within limits, proceed to the next connector until fault is found.
5. Replace the FOCA as needed.
6. Reestablish communications.
7. Maintain the FOCA CX-13295( )/G.
   a. Visually inspect cable for burned, broken, loose, or missing connectors, splices, and physical damage to cable. (Refer to TM 11-6020-200-23&P.)
   b. Perform FOCA attenuation testing procedures using the TS-4336/G.
   c. Determine malfunction of the FOCA.
   d. Perform FOCA fault location procedures using the TS-4336/G.
   e. Repair the CX-13295( )/G using cable repair kit MK-2495/G (if required).
   f. Perform final operational test to verify normal operation of the FOCA.
8. Complete applicable blocks on DA Form 2404 and DA Form 2407. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Tested the FOTS for proper operation.	____	____
2. Verified all switch and control settings and equipment controls.	____	____
3. Troubleshot the FOCA using the TS-4117( )/G from either end.	____	____
4. If outside of limits, had shelter operator check the FOM; if within limits, proceeded to the next connector until fault was found.	____	____
5. Replaced the FOCA as needed.	____	____
6. Reestablished communications.	____	____
7. Maintained the FOCA CX-13295( )/G.	____	____
8. Completed applicable blocks on DA Form 2404 and DA Form 2407.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2407	
DA Pam 750-8	
TM 11-6020-200-10	
TM 11-6020-200-23&P	
TM 11-6625-3227-13&P	

TROUBLESHOOT FIBER OPTIC CABLE
113-632-5002

Conditions: Given a pre-installed Fiber Optic Cable System, loss test set/power meter, optical fault finder, optical TDR, or equivalent test sets, and connectors.

Standards: Identified and repaired faults and established communications.

Performance Steps

1. Ensure there is no equipment problem before checking fiber cable.
2. Conduct a visual inspection of cable.
   a. Inspect for breaks.
   b. Check for kinks.
   c. Check for loose connections.
3. Replace faulty connectors as needed.
4. Test cable.
   a. Conduct continuity test using loss test set/power meter or equivalent.
   b. Test for faults and excess attenuation using optical fault finder or equivalent.
   c. Test for reflection and fiber defects using optical TDR or equivalent.
   d. Test for dB/kilometer (km) using optical TDR or equivalent.
   e. Identify connector loss/splice loss using optical TDR or equivalent.
5. Isolate fault.
6. Repair fiber optic cable.
7. Test cable.
8. Restore service

Performance Measures	GO	NO-GO
1. Ensured there is no equipment problem before checking fiber cable.	____	____
2. Conducted a visual inspection of cable.	____	____
3. Replaced faulty connectors as needed.	____	____
4. Tested cable.	____	____
5. Isolated fault.	____	____
6. Repaired fiber optic cable.	____	____
7. Tested cable.	____	____
8. Restored service.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
ANSI/TIA/EIA-568B	
ANSI/TIA/EIA-569A	
Manufacturer's Manuals	

Subject Area 3: MULTIPLEXERS

TROUBLESHOOT MULTIPLEXER TD-1233(P)/TTC OR MULTIPLEXER-COMBINER TD-1234(P)/TTC
113-606-0105

Conditions: Given multiplexer TD-1233(P)/TTC or multiplexer-combiner TD-1234(P)/TTC; cable CX-11230A/G; telephone set(s) TA-838/TT or equivalent; DNVT TA-1042 or equivalent; telephone cable WF-16/U; power cord; batteries BA-30 or BA-3042 for TA-838/TT or equivalent; assorted circuit card assembly (CCA) cards; TC 24-20, TM 11-5805-650-12, TM 1-5805-706-12, TM 11-5805-707-12, and TM 11-5995-208-10.

Standards: Corrected the fault and reestablished communications.

Performance Steps

(Refer to TM 11-5805-706-12 for the TD-1233(P)/ TTC and to TM 11-5805-707-12 for the TD-1234(P)/TTC for all performance steps.)

1. Check all CCA switches for correct configuration.
2. Determine the trouble.
3. Initiate self-test.
4. Localize fault.
5. Correct fault or replace defective equipment.
6. Reestablish communications.

Performance Measures	GO	NO-GO
1. Checked all CCA switches for correct configuration.	____	____
2. Determined the trouble.	____	____
3. Initiated self-test.	____	____
4. Localized fault.	____	____
5. Corrected fault or replaced defective equipment.	____	____
6. Reestablished communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-5805-650-12	
TM 11-5805-706-12	
TM 11-5805-707-12	
TM 11-5995-208-10	

TROUBLESHOOT LINE TERMINATION UNIT (LTU) CV-4180( )
113-606-0106

Conditions: Given a pre-installed LTU CV-4180( ) and TM 11-5805-783-13&P.

Standards: Preformed troubleshooting procedures, identified the problems, took corrective action, and reestablished communications.

Note: To properly troubleshoot the LTU as a stand-alone unit, it must first be taken off-line. This is accomplished by turning off the LTU and setting the Group Modem Cable Length to position 5 so that the group modem function is internally looped back. Also, the LTU must be connected to a trunk encryption device (TED) or have the TED bypass cable installed (TED red cable connected from J1-J4 on the rear panel.)

Performance Steps

1. Verify that trouble exists.
2. Verify that the LTU has power.
3. Conduct pre-troubleshooting checks.
   a. Check that the Master/Slave switch on the TIMTG CCA is in the slave position.
   b. Check that the TIMBT CCA functional configuration switch is set to 2.
   c. Check that the front panel Group Modem Cable Length rotary switch is set to position 5 (loopback).
   d. Check that the power cable connectivity and the corresponding jumper positions have been set on TB1 (located on backside of front panel).
4. Conduct troubleshooting procedures. (Refer to TM 11-5805-783-13&P).
5. Identify malfunctions.
6. Correct malfunctions.
   a. Check that the power cable connectivity and the corresponding jumper positions have been set on TB1 located on backside of front panel.
7. Reestablish communications.

Performance Measures	GO	NO-GO
1. Verified that the trouble existed.	____	____
2. Verified that the LTU had power.	____	____
3. Conducted pre-troubleshooting checks.	____	____
4. Conducted Troubleshooting procedures.	____	____
5. Identified malfunctions.	____	____
6. Corrected malfunctions.	____	____
7. Reestablished communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
TM 11-5805-783-13&P	

INSTALL MULTIPLEXER TD-1233(P)/TTC OR MULTIPLEXER-COMBINER TD-1234(P)/TTC 113-606-1001

Conditions: Given multiplexer TD-1233(P)/TTC and multiplexer-combiner TD-1234(P)/TTC; cable CX-11230A/U; power cords; assorted circuit card assembly (CCA) cards, TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Powered up all equipment and the system was green.

Performance Steps

1. Connect the ground, power cables, and the CX-11230A/U.
2. Check all CCA switches for correct configuration.
3. Turn power on for equipment.
4. Check for fault light(s) on the TD-1233(P)/TTC, TD-1234(P)/TTC, and CCAs.
5. Turn equipment power off properly.

Performance Measures	GO	NO-GO
1. Connected the ground, power cables, and the CX-11230A/U.	____	____
2. Checked all CCA switches for correct configuration.	____	____
3. Turned power on for equipment.	____	____
4. Checked for fault light(s) on the TD-1233(P)/TTC, TD-1234(P)/TTC, and CCAs.	____	____
5. Turned all equipment power off.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-706-12	
TM 11-5805-707-12	

INSTALL LINE TERMINATION UNIT (LTU) CV-4180( )
113-606-1002

Conditions: Given an LTU CV-4180( ); LTU cabling set; cable CX-11230A/G; cable CX-4566/G; telephone set(s) TA-954/TT or equivalent; DNVT TA-1042 or equivalent; telephone cable WF-16/U; power cord; batteries BA-30 or BA-3042 for TA-838/TT or equivalent; assorted CCA cards; J-1077 box; OPORD or a System Planner Document (SPD); TC 24-20, and TM 11-5805-783-13&P.

Standards: Installed LTU and established communications.

Performance Steps

1. Verify location of the LTU.
2. Install LTU.
3. Configure rear panel.
   a. Install power cord.
   b. Install cabling to rear panel connectors as required in OPORD or SPD.
   c. Install CCAs in correct ports according to OPORD or SPD.
   d. Set the TIMBT CCA function switch to appropriate setting.
4. Set initial switch settings on front panel.
   a. Turn power switch to ON.
   b. Set the Test Select switch to Operate.
   c. Set Group Modem switches to appropriate settings.
   d. Set digital voice orderwire (DVOW) switches to appreciate settings.
5. Identify faults in built-in test equipment (BITE) fault readings.
6. Correct faults (if any).
7. Install J-1077 terminal box(es).
8. Terminate cabling from rear panel to distant end as required by OPORD or SPD.
9. Terminate WF-16 from J-1077 to distant end as required by OPORD or SPD.
10. Establish communications.

Performance Measures	GO	NO-GO
1. Verified location of the LTU.	____	____
2. Installed LTU.	____	____
3. Configured rear panel.	____	____
4. Set initial switch settings on front panel.	____	____
5. Identified faults in BITE fault readings.	____	____
6. Corrected faults (if any).	____	____
7. Installed J-1077 terminal box(es).	____	____
8. Terminated cabling from rear panel to distant end as required by OPORD or SPD.	____	____

Performance Measures	GO	NO-GO
9. Terminated WF-16 from J-1077 to distant end as required by OPORD or SPD.	____	____
10. Established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
SPD	TM 11-3895-202-13
TC 24-20	TM 11-5805-201-12
TM 11-5805-783-13&P	
UNIT OPORD	

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON MULTIPLEXER TD-1233(P)/TTC OR MULTIPLEXER-COMBINER TD-1234(P)/TTC
113-606-3090

Conditions: Given multiplexer TD-1233(P)/TTC and multiplexer-combiner TD-1234(P)/TTC, flat-tip screwdriver, dust brush and cleaning rags, cleaning solvent (Trichlorotrifluoroethane), DA Form 2404, DA Form 2408-14, DA Pam 750-8, TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Performed ULM, completed DA Forms 2404 and 2408-14, and the equipment was operational; or evacuated the defective equipment to a higher maintenance level.

Performance Steps

WARNING

Trichlorotrifluoroethane fumes can cause severe irritation or injury. Provide ventilation whenever it is used.

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks on the TD-1233(P)/TTC or the TD-1234(P)/TTC.
3. Power on.
4. Perform BITE test.
5. Complete DA Forms 2404 and 2408-14. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks on the TD-1233(P)/TTC or TD-1234(P)/TTC.	____	____
3. Powered on.	____	____
4. Performed BITE test.	____	____
5. Completed DA Form 2404.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-5805-706-12	
TM 11-5805-707-12	

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON LINE TERMINATION UNIT (LTU) CV-4180( )
113-606-3091

Conditions: Given an LTU CV-4180( ), dust brush, cleaning rags, cleaning solvent (Ttrichlorotrifluoroethane), DA Form 2404, DA Form 2408-14, DA Pam 750-8, and TM 11-5805-783-13&P.

Standards: Performed ULM, completed DA Form 2404 and DA Form 2408-14, and the equipment was operational; or evacuated the defective equipment to a higher maintenance level.

Performance Steps

WARNING

Trichlorotrifluoroethane fumes can cause severe irritation or injury. Provide ventilation whenever it is used. Do not use solvent near heat or open flame.

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks on the LTU.
   a. Check for damaged or frayed cables.
   b. Store items not in use.
   c. Cover unused receptacles.
   d. Check for loose nuts, bolts, and screws.
   e. Remove dust and loose dirt with clean, soft, lint-free cloth.
   f. Remove grease, fungus, and ground in dirt with a solution of water and mild detergent and a dampen cloth.
   g. Remove dirt from plugs and connectors with a soft brush.
   h. Remove grease from external cables with clean cloth soaked in trichlorotrifluoroethane.
3. Turn power switch on.
4. Perform BITE test.
   a. Pass (equipment is operational).
   b. Fail.
5. Complete DA Forms 2404 and 2408-14. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks on the LTU.	____	____
3. Turned power switch on.	____	____
4. Performed BITE test.	____	____
5. Completed DA Forms 2404 and 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-5805-783-13&P	

Subject Area 4: TELEPHONE SETS

INSTALL SECURE DIGITAL TELEPHONE STU-III/STE
113-600-1001

Conditions: Given secure terminal equipment (STE) telephone, encryption card, tactical or commercial phone line, C block or 4-pin connector, flat-tip or Phillips screwdriver, snips, and pliers TL-13A, DA Pam 25-16, and the Manufacture's Manual.

Standards: Programmed and installed the STE telephone and established communications.

Performance Steps

1. Identify location requirements.
2. Install cord connections.
   a. Handset connection.
   b. Terminal connection.
   c. Telephone line connection.
3. Install power connector.
4. Install software configuration in accordance with the manufacture's manual.
5. Establish communications.

Performance Measures	GO	NO-GO
1. Identified location requirements.	____	____
2. Installed cord connections.	____	____
3. Installed power connector.	____	____
4. Installed software configuration in accordance with the manufacture's manual.	____	____
5. Established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Pam 25-16	
Manufacture's Manual	

INSTALL VOICE OVER INTERNET PROTOCOL (VOIP) TELEPHONE
113-628-1001

Conditions: Given CAT-V cable, crimper, two RJ-45 connectors, Cisco VoIP phone, and internet protocol (IP) phone case.

Standards: Installed the telephone set and established communications.

Performance Steps

1. Identify location requirements.
2. Install cord connections.
   a. CAT-V telephone line connection. (Straight through cable.)
3. Program the telephone IAW the Cisco telephone manual.
4. Establish communications.

Performance Measures	GO	NO-GO
1. Identified location requirements.	____	____
2. Installed cord connections.	____	____
3. Programmed the telephone IAW the Cisco telephone manual.	____	____
4. Established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

TROUBLESHOOT KY-68
113-600-0011

Conditions: Given DSVT TSEC/KY-68, telephone cable WF-16/U, multiplexer TD-1233(P)/TTC, multiplexer-combiner TD-1234(P)/TTC, radio repeater set AN/TRC-138A, radio terminal set AN/TRC-173, radio repeater set AN/TRC-174, radio terminal set AN/TRC-175, BA-1372 (1 each), TM 11-5810-329-10, TM 11-5820-864-12-1, TM 11-5820-865-12-1, TM 11-5820-926-12-1, and TM 11-5820-931-12-1.

Note: The unkeyed DSVT TSEC/KY-68 is classified CONFIDENTIAL. It should be handled properly. The DSVT TSEC/KY-68 is loaded with variables for the PMs.

Standards: Performed troubleshooting procedures, identified problems, took corrective action, and reestablished communications.

Performance Steps

1. Verify that the trouble exists.
2. Verify that the KY-68 is getting power. (Refer to TM 11-5810-329-10.)
3. Troubleshoot the DSVT TSEC/KY-68 system. (Refer to TM 11-5810-329-10.)
4. Identify malfunction(s).
5. Take corrective actions. (Refer to TM 11-5810-329-10.)
6. Reestablish communications.

Performance Measures	GO	NO-GO
1. Verified that the trouble existed.	____	____
2. Verified that the KY-68 was getting power.	____	____
3. Troubleshot the DSVT TSEC/KY-68 system.	____	____
4. Identified malfunction(s).	____	____
5. Took corrective actions.	____	____
6. Reestablished communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-329-10	AR 25-55
TM 11-5820-864-12-1	AR 380-40
TM 11-5820-865-12-1	DA Pam 25-380-2
TM 11-5820-926-12-1	TB 380-41
TM 11-5820-931-12-1	TM 11-5810-292-13&P

INSTALL TELEPHONE SET TA-312/PT
113-600-1012

Conditions: Given a telephone set, TA-312/PT; battery, BA-30 or BA-3030 (2 each); tool equipment TE-33; installed telephone cable WD-1( )/TT; tags; grease pencil; TM 11-5805-201-12; and TC 24-20.

Standards: Install the telephone set and establish communications.

Performance Steps

1. Install the TA-312/PT on a desk, pole, or tree.
2. Set the selector switch for proper service.
3. Connect the telephone cable to the TA-312/PT.
4. Install the power source.
   a. Connect the external batteries when required.
   b. Install the batteries in telephone set.

Note: PMs 4a and 5 may be used if the telephone operator must have his/her hand free during operation.

5. Connect the external headset when required.

Note: Deicing the screen may be used to prevent the transmitter from icing during extreme cold weather.

6. Install/remove deicing screen when required.
7. Establish communications.

Evaluation Preparation: Setup: Ensure that the telephone cable is laid.

Brief Soldier: Tell the Soldier that he/she must complete an outgoing call.

Performance Measures	GO	NO-GO
1. Installed the TA-312/PT on a desk, pole, or tree.	____	____
2. Set the selector switch for the proper service.	____	____
3. Connected the telephone cable to the TA-312/PT.	____	____
4. Installed the power source.	____	____
5. Connected the external headset, when required.	____	____
6. Installed/removed the deicing screen when required.	____	____
7. Established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-5805-201-12	

INSTALL DIGITAL NONSECURE VOICE TERMINAL (DNVT)
113-600-1016

Conditions: Given telephone cable WF-16/U or WD-1( )/ TT, DNVT TA-954/TT, DNVT TA-1042A/U, tool equipment TE-33, screwdriver, TD-1233(P)/TTC or TD-1234(P)/TTC, TB 11-5805-780-15, TM 11-5805-735-12, TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Installed the telephone set and established communications.

Performance Steps

(Refer to TM 11-5805-735-12 for TA-945/TT and TB 11-5805-780-15 for TA-1042A/U for all performance steps, unless otherwise indicated.)

WARNING

Voltage as high as +56V DC may be present on telephone cables. To avoid injury, only handle the telephone cables and binding posts to which telephone cables are attached by the insulated areas.

1. Mount the DNVT.
2. Make bit rate select change.

Note: If the bit rate marked on the writing pad of the TA-954/TT or TA-1042A/U is incorrect for a particular application, it must be changed.

3. Connect telephone cable.
4. Turn on proper channel card on the TD-1233(P)/TTC or the TD-1234(P)/TTC. (Refer to TM 11-5805-706-12 or TM 11-5805-707-12.)
5. Establish communications.

Evaluation Preparation: Set up: Ensure the telephone cable is laid and connected to the switching equipment. Prepare the DNVT for common battery mode of operation.

Brief Soldier: Tell the Soldier he must complete an outgoing call.

Performance Measures	GO	NO-GO
1. Mounted the DNVT.	____	____
2. Made bit rate select change.	____	____
3. Connected telephone cable.	____	____
4. Turned on proper channel card on the TD-1233(P)/TTC or the TD-1234(P)/TTC.	____	____
5. Established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TB 11-5805-780-15	
TM 11-5805-706-12	
TM 11-5805-707-12	
TM 11-5805-735-12	

INSTALL TELEPHONE SET TA-838/TT
113-600-1017

Conditions: Given telephone set TA-838/TT; telephone cable WF-16/U or WD-1( )/TT; battery BA-42 (Type C), four each, or battery BA-3042/U, four each; tool equipment TE-33; screwdriver; and TM 11-5805-650-12.

Standards: Installed the telephone set and established communications.

Performance Steps

(Refer to TM 11-5805-650-12 for performance steps 1 through 5.)

1. Install batteries.
2. Perform pre-installation checks.
   a. Select mode switch position.
   b. Check side tone.
3. Mount telephone set on desk or vertical mount.
4. Determine if switchboard connections are 4-wire or 2-wire.
5. Connect WF-16/U to telephone.
6. Establish communications.

Evaluation Preparation: Setup: Ensure the telephone cable is laid and connected to the appropriate switching equipment or another TA-838/TT.

Brief Soldier: Tell the Soldier which mode of operation and type of installation must be performed.

Performance Measures	GO	NO-GO
1. Installed batteries.	____	____
2. Performed pre-installation checks.	____	____
3. Mounted telephone set on desk or vertical mount.	____	____
4. Determined if switchboard connections were 4-wire or 2-wire.	____	____
5. Connected WF-16/U to telephone.	____	____
6. Established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-650-12	

INSTALL KY-68
113-600-1022

Conditions: Given a DSVT TSEC/KY-68, telephone cable WF-16/U, loaded device KYK-13/TSEC, KYK-15, CYZ-10 battery BA-5372, TD-1233(P)/TTC or TD-1234(P)/TTC, TM 11-5805-706-12, TM 11-5805-707-12, TM 11-5810-292-13&P, and TM 11-5810-329-10.

Note: The DSVT TSEC/KY-68 is classified equipment. It should be handled properly.

Standards: Installed the DSVT, loaded variables, and established secure communications.

Performance Steps

1. Install battery.

   Note: Replace battery BA-1372 or BA-5372 every six months.

2. Install the DSVT TSEC/KY-68 using telephone cable WF-16/U to connect to the TD-1233(P)/TTC or the TD-1234(P)/TTC.
3. Ground the DVST TSEC/KY-68.
4. Load variables into the DSVT TSEC/KY-68.
   a. KYK-13/TSEC.
   b. KYK-15/15A.
   c. AN/CYZ-10.
5. Operate the DSVT TSEC/KY-68 to initiate an outgoing secure call.

Performance Measures	GO	NO-GO
1. Installed battery.	____	____
2. Installed the DSVT TSEC/KY-68 using telephone cable WF-16/U to connect to the TD-1233(P)/TTC or the TD-1234(P)/TTC.	____	____
3. Grounded the DSVT TSEC/KY-68.	____	____
4. Loaded variables into the DSVT TSEC/KY-68.	____	____
5. Operated the DSVT TSEC/KY-68 to initiate an outgoing secure call.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-292-13&P	AR 25-55
TM 11-5810-329-10	AR 380-40
TM 11-5805-706-12	DA Pam 25-380-2
TM 11-5805-707-12	TB 380-41

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON TELEPHONE SET TA-312/PT 113-600-3017

Conditions: Given telephone set TA-312/PT, battery BA-30 (two each), tool equipment TE-33, lint-free cloth and brush, cleaning compound trichlorotrifluoroethane, DA Form 2404, DA Form 2408-14, DA Pam 750-8, and TM 11-5805-201-12.

Standards: Performed ULM, completed DA Form 2404 and DA Form 2408-14, or evacuated defective telephone set to a higher maintenance level.

Performance Steps

WARNING

Trichlorotrifluoroethane fumes are toxic. Provide ventilation whenever it is used.

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks. (Refer to TM 11-5805-210-12.)
   a. Clean, dust, and wash.
   b. Check for frayed cables.
   c. Store unused items.
   d. Cover unused receptacles.
   e. Check for loose nuts, bolts, and screws.
3. Check telephone set TA-312/PT.
   a. Batteries.
   b. Binding posts.
   c. Battery compartment.
4. Check case, telephone set.
5. Check handset.
6. Complete DA Forms 2404 and 2408-14. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks. (Refer to TM 11-5805-201-12.)	____	____
3. Checked telephone set TA-312/PT.	____	____
4. Checked case, telephone set.	____	____
5. Checked handset.	____	____
6. Completed DA Forms 2404 and 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required

DA Form 2404
DA Form 2408-14
DA Pam 750-8
TM 11-5805-201-12

Related

PERFORM UNIT LEVEL MAINTENANCE (ULM) ON TELEPHONE SET TA-838/TT 113-600-3020

Conditions: Given an operational telephone set TA-838/TT, screwdriver, clean cloth, DA Form 2404, DA Form 2408-14, DA Pam 750-8, and TM 11-5805-650-12.

Standards: Preformed ULM, completed DA Form 2404 and DA Form 2408-14, and the telephone set was operational; or evacuated the defective telephone set to a higher maintenance level.

Performance Steps

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks. (Refer to TM 11-5805-650-12.)

> **CAUTION**
>
> Do not use solvents to clean any part of the telephone set.

   a. Clean, dust, and wash.
   b. Check for frayed cables.
   c. Store unused items.
   d. Cover unused receptacles.
   e. Check for loose nuts, bolts, and screws.

3. Check telephone set TA-838/TT.
   a. Binding posts.
   b. Battery compartment.
   c. Carrying sling and tie-down strap.
   d. Operational capabilities.
   e. Urgent maintenance work order.
4. Check completeness.
5. Check handset retaining spring.
6. Complete DA Form 2404 and DA Form 2408-14. (Refer to DA Pam 750-8.)

Evaluation Preparation: Setup: Have another TA-838/TT perform the operational test.

Brief Soldier: Tell the Soldier that maintenance and an operational test must be performed on the TA-838/TT.

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks.	____	____
3. Checked telephone set TA-838/TT.	____	____
4. Checked completeness.	____	____

Performance Measures	GO	NO-GO
5. Checked handset retaining spring.	____	____
6. Completed DA Form 2404 and DA Form 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-5805-650-12	

Subject Area 5: TELEPHONE MAINTENANCE TRUCK

PERFORM PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) ON TELEPHONE MAINTENANCE TRUCK
113-588-0007

Conditions: Given utility telephone maintenance truck, on-vehicle equipment tools, DA Form 2404, DA Form 2408-14, DA Pam 750-8, and the appropriate maintenance allocation chart (MAC).

Standards: Performed maintenance, completed DA Form 2404 and DA Form 2408-14, and the maintenance vehicle was operational; or evacuated to higher echelon maintenance.

Performance Steps

1. Initiate DA Form 2404. (Refer to DA Pam 750-8.)
2. Perform routine checks.
3. Perform operator maintenance. (Refer to the appropriate MAC.)
4. Complete DA Form 2404 and DA Form 2408-14. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Initiated DA Form 2404.	____	____
2. Performed routine checks.	____	____
3. Performed operator maintenance.	____	____
4. Completed DA Form 2404 and DA Form 2408-14.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	

OPERATE TELEPHONE MAINTENANCE TRUCK
113-588-2007

Conditions: Given an operator and a utility telephone maintenance truck.

Standards: Leveled the telephone maintenance truck, operated derrick, and moved boom to work position.

Performance Steps

1. Position truck on solid, level ground as close as possible to the work area.
2. Engage parking brake and chock the wheels.
3. Engage power take-off (PTO).
4. Lower the outriggers.
5. Operate derrick and move boom to work position.

Performance Measures	GO	NO-GO
1. Positioned truck on solid, level ground as close as possible to the work area.	____	____
2. Engaged parking brake and chocked the wheels.	____	____
3. Engaged PTO.	____	____
4. Lowered the outriggers.	____	____
5. Operated derrick and moved boom to work position.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

Subject Area 6: LAN/WAN SUBSTATION

PERFORM SOLDERING TECHNIQUES
113-583-1001

Conditions: Given a soldering iron, solder, flux (rosin), material, and notes.

Standards: Identified quality of soldered electrical terminations.

Performance Steps

1. Identify a soldering termination.
    a. Electrical termination: The connection of an electrical conductor to various fixed terminals usually by one of two methods—soldering or mechanical.
    b. Soldered termination: A mechanical connection between wire and terminal, which are bonded by applying solder.
    c. Mechanical: The process of joining a wire and a terminal by external pressure.
    d. Soldering: The process of joining two metals (wire and terminal) by heat transfer, using a low temperature cohesive alloy.
    e. Solder: The solder used in electronics is an alloy usually made with 60 percent tin and 40 percent lead.
        (1) The greater the tin content the lower temperature required to liquefy the solder.
        (2) When soldering conductors use a rosin core solder. Never use acid core solder on electrical connections.
    f. Flux (rosin): This is a chemical cleaning agent that promotes wetting of metals and helps prevent oxidation.
        (1) Reliable solder connections can only be accomplished with clean surfaces. Flux removes oxides, which must melt at a lower temperature, so it can do its job before the actual soldering process.
        (2) Available in liquid or paste form. Flux disintegrates when heated and usually dissipates during the soldering process.
    g. Oxidation: This is the chemical corrosion of metal that takes place quickly at temperatures above 750 degrees Fahrenheit.

2. Identify types of soldering irons.
    a. Soldering irons come in various sizes and capacity ratings (wattage) to suit requirements for size, gauge, and type of terminals and conductors.
        (1) Sixty to one hundred watt irons are suitable for most conductor terminations and electrical applications.
        (2) The speed of soldering required along with the solder melting temperature. The 60/40-alloy solder melts around 374 degrees Fahrenheit.
    b. Clean the tip of the soldering iron before using, by heating it and wiping it on a damp sponge.
    c. To properly perform a temperature test, place solder on the tip, when solder melts, the iron is at its working temperature.

3. Identify different soldering iron tips.
    a. Screwdriver shaped soldering tips are used for most electrical applications.
    b. Pencil point shaped tips are used for light duty.
    c. Pyramid shaped tips are for heavy duty.
    d. Chisel shaped tips are for special applications.
    e. Tinning the soldering iron tip cleans the tip by applying flux and a light coat of solder, which retards oxidation and aids in heat transfer.

Performance Steps

4. Identify soldering aids.
   a. A soldering fork is used to form wires.
   b. A soldering iron holder is used for safety, temperature control and convenience. When not in use, the iron should be kept in a holder, with its tip clean and coated with a small amount of solder.
   c. The solder bag is used for protection from solder splash and serves as a receptacle for debris, which helps keep the work area clean.
   d. A damp sponge is used to remove excess solder from the iron tip and help keep it clean.

5. Make a solder connection.
   a. Solder shall be applied to the connection when the temperature reaches the point where solder will readily melt.
   b. The connection shall have a smooth, bright appearance with solder covering the top of the conductor and a concave slope flowing down between the terminal and the lower half of the conductor.
   c. Identify unacceptable soldered connections (faults):
      (1) There will be no solder on the opposite side of the pin, unless it has been indicated that both sides are to be soldered.
      (2) The insulation of the wire should not be burned and should not be in the soldered connection.
      (3) Too much solder can cover faults, which may not make a good connection.
      (4) Not enough solder.
      (5) No spikes on the solder.
      (6) Let the soldered connection cool naturally or a cold solder connection may occur.

6. Identify methods of soldering.
   a. The roll-n-wipe method is used on larger surfaces such as terminal pins.
      (1) Place the edge of the tip of the soldering iron on the terminal.
      (2) When the terminal is hot enough to melt solder, apply the solder under the tip and roll the tip over the terminal. Immediately remove the solder and soldering iron from the terminal with the same rolling motion.
   b. The sweat method applies heat and solder to the area until the solder melts, wicking solder through the connection. This is the preferred method for soldering splices, tubular pins and small terminals.
      (1) Heat the connection with the tip of the soldering iron and apply the solder to the other side. When the solder melts, remove the soldering iron.
      (2) Avoid moving the connection until it has cooled.
   c. The wipe-on method is used for inaccessible areas only:
      (1) When using this method, apply flux to the connection first.
      (2) Apply solder to the tip of the iron and wipe the solder on the connection.

7. Identify the six basic steps of quality soldering.
   a. Heat the connection not the solder.
   b. Apply the solder to the terminal.
   c. Remove the solder allowing no excess solder to remain.
   d. Remove the heat. Do not burn insulation on wires.
   e. Allow the connection to cool.
   f. Inspect.

8. Identify safety requirements for soldering.
   a. Solder used in electronics contains 40 percent lead and requires good ventilation at the work area. Never solder directly over the work piece.
   b. Wear safety goggles when soldering or desoldering.
   c. Keep the work area clear of debris.
   d. Use soldering iron holder to eliminate burns.

Performance Steps

e. Never flick solder from the soldering iron, wipe solder from the tip.
f. Inspect the soldering iron for defects (frayed cord, cracked handle).
g. Never solder a live circuit.

Performance Measures	GO	NO-GO
1. Identified a soldering termination.	____	____
2. Identified types of soldering irons.	____	____
3. Identified different soldering iron tips.	____	____
4. Identified soldering aids.	____	____
5. Made a solder connection.	____	____
6. Identified methods of soldering.	____	____
7. Identified the six basic steps of quality soldering.	____	____
8. Identified safety requirements for soldering.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	
TB 385-4	

INSTALL CABLE RACK AND WIRE WAY
113-583-1002

Conditions: Given straight splicing clamp, corner clamp, corner braces, edge clamp, hanger clips "J" bolt, rack feet, wireway (cable duct), tools, material and references.

Standards: Installed cable rack or wireway in accordance with engineering plans.

Performance Steps

1. Identify cable rack and wireway.
   a. A cable rack is a ladder-like assembly used wherever exposed cable is acceptable. It consists of two parallel side members called "stringers" and cross straps that are welded at regular intervals. It comes in widths from 5 to 24 inches and lengths from 10 to 20 feet.
   b. A cable rack shall be used in full stock lengths wherever possible.

2. Plan installation of cable rack and wireway.
   a. Cable racks and wireways shall be installed in accordance with the EIP and applicable drawings.
   b. Existing equipment, building structures and future expansion must be considered during engineering and installation.
   c. Cable racks should be installed before any other equipment is installed at new sites.
   d. Cable racks must have proper clearance to provide cable service to equipment and to eliminate any difficulty running and securing cables in the future.
   e. Installing cable racks close to pipes, radiators, windows, doors or anything that could damage the cables should be avoided.

3. Identify cable rack hardware.
   a. Straight splicing clamp:
      (1) Straight clamps are used to join lengths of cable rack or to attach feet to the end of a rack.
      (2) The spacing requirement between the ends of the stringers is 3/8-inch minimum to 5/8-inch maximum and the space should be equal on both sides of the bolt.
      (3) A maximum of one splice is allowed between cable rack supports.
   b. Corner clamps:
      (1) These clamps are used to end a run, make turns, form "T" intersections and for horizontal offsets.
      (2) The maximum gap between the rack and the end of the stringer is 1/8 inch.
   c. Corner braces: These are used for bracing and when cables require a gradual turn at intersections.
   d. Edge clamps: These 90 and 45-degree edge clamps are used for vertical offsets to change vertical direction (inside and outside bends).
      (1) Cable racks that form a 90-degree vertical turn, with a turn radius of 6 inches or less, can be joined by two sets of 90-degree edge clamps.
      (2) To form a 90-degree vertical turn, with a turn radius of more than 6 inches, four sets of 45-degree edge clamps can be used to join the cable rack.
   e. Hanger clips: Used to secure threaded rod to the cable rack stringer.
   f. The "J" bolt: Used to mount rack to framing bar or channel.
   g. Rack feet: Used to attach rack ends to walls or the floor.

4. Identify the types of support.
   a. Overhead cable rack support (direct and indirect mounting):
      (1) Overhead support uses the permanent building structural members or securing devices installed at the time the cable rack was installed. The site must be laid out and marked on the floor where the equipment will be installed.

Performance Steps

(2) Overhead indirect support: Spacing often makes it impractical to support cable racks with threaded rods attached directly to the ceiling.
(3) Securing a threaded rod to a wooden ceiling joist with loads of more than 300 pounds requires drilling a hole through the joist. A load of less than 300 pounds can be secured with a threaded rod attached to a bracket and two 3/8 inch by 2 inch long (minimum) lag screws.
(4) Direct overhead support is established when the support rods can be anchored directly into the ceiling.
(5) Other attachments used with threaded rods are; "I" beam clamps, "U" shaped brackets, and drive pins. Check to make sure the maximum load is not exceeded.

WARNING

Never drill holes through an "I" beam to attach anchoring devices; it could weaken the structure.

(6) For greater strength, a 5/8-inch threaded rod is recommended for all cable rack installations.
(7) Special hangers for a single threaded rod may be used to support cable racks up to 15 inches in width. Racks wider than 15 inches require two threaded rods.
(8) Cable racks may be supported directly from the ceiling using threaded rods by one of two methods. Two threaded rods are required if the width of the cable rack is 20-inches or more. Support of 12-and 15-inch cable racks may be provided by a short length of lipped channel fastened flush against the ceiling by one securing device in the center of the channel and a pair of threaded rods attached.
(9) Unless unavoidable, threaded rods should not be bent to provide an offset. If no other means is practicable, bends are permissible: however, they shall not exceed 20 degrees and the offset distance shall not be more than 4-inches.
(10) When splicing threaded rod is necessary, the ends of the threaded rod will be butted together inside the splice coupling, so the ends can be seen through the sight hole.

b. Floor or equipment cable rack support:
(1) Metal support channel on top of equipment cabinets, frames, relay racks or bays can be used to support cable rack.
(2) Cable rack that goes down to the floor is supported by cable rack feet attached to the ends of the stringers with straight clamps.
(3) When a vertical cable rack passes through a floor to another level, the cable rack must be secured to each floor it passes through to prevent overloading the lowest support.

c. Vertical (Wall) cable rack support.
(1) Vertical building structural members, such as walls or columns, can be used to support rack.
(2) If prefabricated brackets are unavailable, steel angles braced by threaded rod may be used.
(3) Framing bar can support a load up to three feet past its last support.
(4) If necessary, the framing bar may be extend to the wall and supported with a wall-mounted bracket.

d. Mutual cable rack:
(1) Used to support a cable rack perpendicular or parallel to another cable rack.
(2) The maximum of 18 inches between the two racks is allowed.
(3) The load capacity of the upper rack supports must be enough to bear the additional load of the lower rack.
(4) The upper cable rack hanger clips, with hex nuts, are used to adjust the required space between racks.

Performance Steps

5. Install supporting material.
    a. Lipped channel (Unistrut is a brand name) can be square or rectangular, made of 12, 14, or 16 gauge steel alloy and comes in 10-foot or 20-foot lengths. It can be used with a 5/8 inch threaded rod to support cable rack or duct.
        (1) The open side of slotted channel has two 90-degree bends. These edges are the clamping ridges designed to position and lock a special nut, commonly called a spring nut. One side of the nut has two grooves that engage the clamping ridges and the other side has a spring to keep it in place. When the nut is drawn tight against the clamping ridges, the grooves in the nut securely bridge the sides of the channel together.
        (2) The ends of spliced channels should be butted together; however, in no case shall the space exceed 1/8 inch.
        (3) Cable racks may be supported by a lipped channel trapeze.
    b. Framing bar may be used instead of a lipped channel except where the channel must mount directly to the ceiling. Framing bars require a minimum of 2-inches between the ceiling and the top of the bar.
    c. Channel may also be used for rack support.
        (1) Channel comes in 20-foot lengths and measures 2 inches by 9/11 of an inch.
        (2) All rules for Unistrut and framing bar apply to channel.
        (3) The use of channel for rack support is limited to short runs and light loads.
    d. A maximum of one splice between supports is permitted for cable rack, threaded rod, lipped channel, channel, or framing bar.

6. Identify safe load capacities.

7. Reduce cable rack.
    a. Cut cable rack squarely.
    b. Measure and mark the length of cable rack to be cut.
    c. Cut the stringers at the marks with a hand hacksaw or a power hacksaw.
    d. If the cable rack must be cut at the junction of the stringers and a cross strap, remove the cross strap by cutting as close to the stringer as possible without cutting the stringer.
    e. File off all burrs on the ends of the stringer.

8. Ground bond cable rack.
    a. Cable rack will be strapped (bonded) at all junctions and splices with 12 American wire gauge (AWG) or larger, solid or stranded, wire on the outside of the stringer to ensure a continuous electrical connection.
    b. After all cable rack sections have been strapped, bond the cable rack to the equipotential plane or inner ground ring 2 feet from each end and at intervals of 50 feet along the run.
    c. The cable rack must also be bonded to the fault protection bus bar in the nearest AC distribution panel with 6 AWG green insulated wire.

9. Install wireway (cable duct).
    a. Duct is used where physical protection of cables and conductors is required.
    b. Wireway or duct is available with or without knockouts, in lengths of 1 foot, 2 feet, 3 feet, 4 feet, 5 feet, and 10 feet.
    c. Duct runs are hung in place using tray supports at 5-foot intervals. Where a duct run terminates, it shall be supported within 1 foot of the end.
    d. Universal hanger can be used to mount duct to the ceiling, walls or floor.
    e. Duct can be supported using a trapeze style support made with Unistrut or similar material.
    f. Wireway may be supported in a combination of approved methods.

10. Identify restrictions of wireway.
    a. Power cables:
        (1) Cannot exceed 600 volts.

Performance Steps

(2) The total number of conductors cannot exceed 20 percent of the cross sectional area, or contain more than 30 conductors, at any given point.
(3) The wireway must not be filled more than 75 percent of its cross sectional area, where taps and splices are made.

b. Communications cable:
(1) The total number of conductors cannot exceed 30 percent of the cross sectional area at any one point and there is no restriction on the number of conductors.
(2) Communications cable splices and taps have the same restrictions as power splices and taps.

11. Install wireway couplings.
a. Couplings must be secured on at least three sides with screws and star washers. The screw heads should always be on the inside of wireway.
b. Always tighten screws/nuts as tightly as possible to give maximum mechanical rigidity and electrical continuity.
c. Fittings and hardware for wireway: All unused openings must be sealed.
(1) Closing plates are used to seal the ends of ducts or fittings.
(2) Telescope fittings or slip-fittings provide a means to adjust the length of straight connections from ½ inch to 11 ½ inches.
(3) End fittings connect duct to panels and cabinets. Cutting a hole and drilling mounting holes to match the end fitting can result in a solid connection free of rough edges.
(4) Elbows are available in 22 ½, 45, and 90 degree bends and attach with a connector or coupling.
(5) Tee fittings are available to branch standard sections of duct.
(6) Junction boxes have four openings that can be coupled with connectors. Unused openings are sealed with closing plates.
(7) Pull boxes (large junction box) has six openings, two sides with one opening each and two sides with two openings each. Pull boxes are used when several ducts are spliced together at a junction.
(8) Reducer fittings are available to connect different sizes of duct together. The standard reducer sizes are 4" X 4" duct to 2 - 1/2" x 2 - 1/2", 6" X 6" to 4" X 4", 8" X 8" to 6" X 6," and 12" X 12" to 8" X 8" duct.
(9) Transposition sections permit the wireway to be rotated 90 degrees and continue the "lay-in" feature.
(10) Partitions or barriers can be installed inside the duct to separate power and communication cables.
d. Wireway and duct, whether used for signal or power conductors, must be made electrically continuous by bonding together all sections. Wireway must have a grounding strap installed at each junction and splice. Connect all sections and lids using straps fabricated from 12 AWG (or larger), solid or stranded, green, insulated, copper wire.
(1) All wireway or duct will be bonded to the fault protection subsystem at power panels.
(2) One continuous green wire can be used for bonding the wireway.
(3) Bond all sections, including lids, with straps fabricated from 12 AWG (or larger), solid or stranded, green insulated wire. Star washers will be used to provide a good bond.
(4) When all sections have been strapped, the duct is bonded to ground not more than 2 feet from each end of the run and every 50 feet along the run, using #6 AWG green wire.

Note: Only one ground point for each lid is required.

Performance Measures	**GO**	**NO-GO**
1. Identified cable rack and wireway.	____	____
2. Planned installation of cable rack and wireway.	____	____

Performance Measures	GO	NO-GO
3. Identified cable rack hardware.	____	____
4. Identified the types of support.	____	____
5. Installed supporting material.	____	____
6. Identified safe load capacities.	____	____
7. Reduced cable rack.	____	____
8. Grounded bond cable rack.	____	____
9. Installed wireway (cable duct).	____	____
10. Identified restrictions of wireway.	____	____
11. Installed wireway couplings.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
The National Electric Code (NEC)	

INSTALL DISTRIBUTION FRAMES
113-583-1003

Conditions: Given a MDF, intermediate distribution frame (IDF) or combined distribution frame (CDF), tools and notes.

Standards: Installed a distribution frame.

Performance Steps

1. Identify the purpose of distribution frames.
    a. Distribution frames are necessary to protect and support the cable, cross-connects, and the ground buss bar.
    b. Distribution frames provide a point of permanent termination for outside and inside cables.
    c. Distribution frames provide temporary connection (cross-connects) between outside and inside cables to and from fixed equipment.

2. Identify the construction of a distribution frame.
    a. Distribution frames are normally made of an open metal framework of steel with cross members that form vertical and horizontal arms.
    b. Frames require a minimum clearance of 36 inches from the sides and ends for maintenance.
    c. Components of a frame:
        (1) Floor angle - Attaches to the floor and supports the verticals (uprights). The length of each angle depends on the number of verticals it mounts and may require several floor angles to complete a frame.
        (2) Top angle - Secures the top of the verticals (uprights).
        (3) Verticals (uprights) - Are the basic support framework and are fastened on 8-inch centers.
        (4) Diagonal brace - A brace welded to the protector-mounting bar and the vertical angle for support.
        (5) Reinforcing stud - Supports the vertical side.
        (6) Transverse arm - Welded to vertical angle and used to support cable.
        (7) Jumper ring bar - Three steel bars extending the length of the frame to attach jumper rings.
        (8) Jumper ring - Used to guide the cross-connects (jumper wire) from vertical to horizontal.
        (9) Terminal block mounting bar - Used only on the horizontal side to support terminal blocks.
        (10) Terminal blocks - Used to terminate cable.
        (11) Guard rail support - Protects the terminal blocks from damage by ladders or other equipment.
        (12) End guard - Protects the ends of the frame.
        (13) Finishing bar - A flat, finish bar that increases the strength of the frame and protects personnel from sharp ends of the bars.
        (14) Grounding buss bar - A flat, copper bar that is attached to the station ground.

3. Install a distribution frame.
    a. The first step is to inspect the floor plan, which should show the location of equipment and significant features of the building.
    b. Install angles:
        (1) Angles for distribution frames are furnished in the required lengths.
        (2) Floor angles are placed on vertical face lines as shown on floor plans. When two or more angles are required, fasten each angle loosely until an entire line has been installed. Angles must be level with each other, to build up the low spots on the floor use light metal shims the width of the floor angle and at least 4 inches long.

Performance Steps

(3) To level high spots, cut out floor covering or the floor itself. The maximum level deviation allowable between two floor angles is an 1/8 inch and the entire length of a row cannot exceed a 3/8 inch deviation from level.

c. Frame verticals (uprights):
(1) After installing the floor angles, install the vertical angles at each end.
(2) Secure the end verticals with nuts and bolts to the top angle.
(3) Install all the remaining intermediate verticals.
(4) Check the horizontal and vertical planes with a plumb line and a level before tightening the assembly.
(5) Install the permanent bracing before removing the temporary bracing.

d. Continue frame installation: After the floor angels and verticals have been assembled, continue as follows:
(1) Before mounting a ground buss bar to the frame, the paint must be removed at the point of contact of each vertical (bonding) and a thin coating of petroleum jelly applied to the contact surface. Secure the ground buss bar at each vertical upright.
(2) The jumper ring bars are fastened in place at the bottom, the fifth, and the top of the frame using jumper rings on each vertical. Ensure that the offset end of each jumper ring bar is toward the growing end of the frame. Jumper rings are installed on each shelf and each vertical.
(3) Install the terminal block mounting bars on the front of the transverse arms. Make certain that the offset end of each mounting bar is toward the growing end of the frame.
(4) Install the guardrail supports and the front, rear, and end guardrails.
(5) After the entire framework has been installed, tighten all nuts and bolts and retouch any portion of the framework where the paint has been marred.

e. Install terminal blocks: Components of a terminal block are the fanning, mounting and clamping strips.
(1) Vertical terminal block: The left side of a vertical block is the cable or permanent side. The right side is the temporary or maintenance side. Pin count is from front to back and rows are counted from top to bottom.
(2) Horizontal terminal block: The top of a horizontal block is the temporary or maintenance side and the bottom of the block is the cable or permanent side. Pin count is from front to back and rows are counted left to right.

4. Identify types of distribution frames.
a. The MDF:
(1) The purpose and function of the MDF is to enable the greater part of the wiring in a dial central office to be permanent.
(2) The MDF is generally located directly above the cable vault or near an outside frame.
(3) The vertical side of an MDF terminates the outside cable from the cable vault. The vertical side of the MDF has protector blocks, which provide electrical protection and termination points for cross connects. Verticals on an MDF are counted from the permanent end to the growing end and start with the number "1." The protector blocks are identified by cable number and pair counts.
(4) The horizontal side of an MDF mounts terminal blocks, which provide termination points for cables that run to and from the IDF or circuit concentration frame bay. There are no protector blocks on the horizontal side of the MDF.
(5) The horizontally mounted terminal blocks extend from one end of the frame to the other and each level or row is known as a shelf. When lettering the horizontal side of an MDF, the shelves are lettered alphabetically from the bottom to the top starting with "A" and skipping I and O. To identify a terminal block on the horizontal side, start with the shelf letter, then the vertical upright (e.g. "B5").

b. IDF.
(1) The purpose and function of the IDF is to provide a neat and flexible point of termination for inside cable and cross-connects.

Performance Steps

(2) The IDF has no protector devices and all equipment, patch panels, and tie cables from the MDF will appear on the IDF. This is also the main work area for most wiring changes and in-house troubleshooting.
(3) The ideal location for an IDF is parallel to the MDF and near the equipment it is serving.
(4) The vertical side of the IDF terminates the cable from the horizontal side of the MDF.
(a) The vertical side of the IDF mounts terminal blocks that are bolted to mounting clips. The terminal block assignment drawings show the size and placement of terminal blocks that are mounted from the bottom to the top. The mounted blocks cannot be out of alignment more than 1/8 inch per foot, nor more than 1/4 inch over the entire row.
(b) The vertical terminal blocks of an IDF are lettered alphabetically from bottom to top and the verticals are numbered from the permanent end starting with "01." Identification of a vertical block will be listed with the number first and the letter second (e.g. 03D).
(5) The horizontal side of an IDF terminates cable from the equipment and patch panels.
(a) The horizontal terminal blocks are mounted on the terminal mounting bars. Terminal block assignment drawings show the size and placement of the terminal blocks to be mounted. The terminal blocks cannot be out of alignment more than 1/8 inch per foot, nor more than 1/4 inch over the entire length.
(b) To count horizontal shelves and terminal blocks on an IDF, use the same method as on the horizontal side of the MDF.

c. CDF:
(1) The purpose of a CDF is to combine the functions of an MDF and an IDF.
(2) The location of the MDF portion of a CDF is usually directly over the cable vault and at a right angle to the equipment.
(3) The MDF portion of a CDF mounts protector blocks on the vertical side and terminal blocks on the horizontal side. The IDF portion mounts terminal blocks on the vertical and horizontal sides.
(a) The count on the vertical side of a CDF starts at the point where both frames join, the MDF portion is counted starting with 1 to the growing end and the IDF portion is counted starting with 01 to the growing end.
(b) When counting the horizontal side of a CDF, the shelves of both frames are lettered from the bottom to the top. To identify a particular horizontal terminal block, the letter is first then the number, (starting with "A1" for the MDF and "A01" for the IDF).

Performance Measures	**GO**	**NO-GO**
1. Identified the purpose of distribution frames.	____	____
2. Identified the construction of a distribution frame.	____	____
3. Installed a distribution frame.	____	____
4. Identified types of distribution frames.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

INSTALL ANCHORING DEVICES
113-583-1004

Conditions: Given a drill, drill bit, rotary hammer, hammer, star drill, hand chuck, 6-foot folding ruler, screwdrivers, adjustable wrench, and material.

Standards: Identified types of anchors needed and installed various types of anchoring devices.

Performance Steps

1. Locate hole for drilling.
    a. Bases that detach from equipment can be used as a template by placing the base in position and marking the mounting holes.
    b. Templates can be made when installing several of the same type of equipment.
    c. Measuring:
        (1) Measure from the baseline and mark the mounting holes from center-to-center at each end of the lineup.
        (2) Snap a chalk line between these points.
        (3) Determine the distance between each mounting hole and mark each hole along the chalk line. Always measure center-to-center of the holes to be drilled.
    d. Check the accuracy before drilling by drawing lines through the center points of each hole. The lines should extend a minimum of 3 inches beyond the center point of the hole.

2. Drill holes in masonry or concrete:
    a. Holes in masonry or concrete shall be deep enough to permit the shields or anchors to be fully inserted in the hole. Where plaster covers the surface, the hole shall be deep enough to permit the shield or anchor to be installed flush with the concrete, not the plaster.
    b. Drilling is a two person operation, with the operator concentrating on drilling while the assistant helps to keep the drill perpendicular to the surface and monitors safety.
    c. The size and type of anchor determines the diameter of the hole.
    d. Tape can be wrapped around the shank of the drill bit to serve as a depth guide.
    e. When drilling hollow tile, limit the pressure to prevent breaking the tile.
    f. Anchor spacing requirements have been established by the manufacturers.

3. Install various types of anchors:
    a. Self-drilling expansion shield.
        (1) Insert the correct size chuck into the impact drill, so the anchor shield can be used to drill the hole.
        (2) Set the control on the impact drill to the hammer position. Center the tool over the hole and operate the tool on impact until the teeth of the anchor have penetrated the surface marking the position of the hole.
        (3) Turn the control to rotation/hammer position and drill the hole into the concrete. Stop when the bottom of the chuck is approximately a 1/16 inch from the surface.
        (4) Remove the anchor and clean the debris with a blow bulb.
        (5) Turn the control to the hammer position and place an expander wedge into the bottom of the anchor. Insert the anchor with expander into the hole.
        (6) With the impact drill in the hammer mode, hammer the anchor until it is flush with the surface. Cover the holes with tape if they are not to be used immediately.
    b. Two element non-drilling expansion anchor.
        (1) Drill the correct depth and diameter hole for the anchor.
        (2) Clean out the hole with a blow bulb and insert the anchor by tapping lightly with a hammer until flush with the surface.

Performance Steps

(3) Use the set tool to set the anchor by striking several blows with a hammer forcing the shield down over the cone to expand the shield.

c. Bolt and stud type anchor.
   (1) To install the bolt stud anchor, drill the correct depth and diameter hole for the anchor. The hole must accommodate the bolt head with lead sleeve.
   (2) Clean out the hole with a blow out bulb, then insert the anchor and tap it lightly with a hammer until the anchor is flush with the surface.
   (3) Remove the nut from the bolt and insert the anchor in the hole until the bolt head bottoms. It may be necessary to lightly tap with a hammer.

d. Single element expansion anchor.
   (1) To install the single element expansion anchor, drill the correct depth and diameter hole for the anchor.
   (2) Clean out the hole with a blow out bulb, then insert the anchor and tap it lightly with a hammer until the anchor is flush with the surface.
   (3) Remove the nut from the bolt and insert the anchor in the hole until the bolt head bottoms. It may be necessary to lightly tap with a hammer.

e. Hammer driven anchors.
   (1) Locate and drill the hole to the correct diameter and depth. Single element anchors require the anchor fit snugly in the hole.
   (2) Blow the hole out and insert the shield through the mounting hole in the fixture and into the hole just drilled. Tap lightly until the flange rests against the fixture.
   (3) Insert the nail into the expansion shield and drive the nail until it is firmly seated. Do not hammer the nail after it has been seated, this will loosen the anchor and reduce the holding power.

f. Wood screw anchors.
   (1) Installation of the wood screw anchor requires a pre-drilled hole corresponding to the diameter of the anchor before expansion and the depth equal to the length of the expansion shield plus the tip of the screw.
   (2) Insert the shield into the drilled hole and tap lightly until the head is flush with the mounting surface.
   (3) Insert the screw through the mounting hole of the fixture and into the expansion shield.

g. Machine bolt anchor.
   (1) Installation of the machine bolt anchor requires a pre-drilled hole corresponding to the diameter of the anchor before expansion and the depth equal to the length of the expansion shield plus the tip of the screw.
   (2) Insert the shield into the drilled hole and tap lightly until the head is flush with the mounting surface.
   (3) Insert the screw through the mounting hole of the fixture and into the expansion shield.

h. Lag screw anchor.
   (1) Installation of the lag screw anchor requires a pre-drilled hole corresponding to the diameter of the anchor before expansion and the depth equal to the length of the expansion shield plus the tip of the screw.
   (2) Insert the shield into the drilled hole and tap lightly until the head is flush with the mounting surface.
   (3) Insert the screw through the mounting hole of the fixture and into the expansion shield.

i. Toggle bolt anchor.
   (1) Drill a hole the size that will accommodate the folded toggle.
   (2) Remove the bolt from the toggle and insert bolt through the mounting hole of the fixture.
   (3) Replace toggle on the bolt. The flop over toggle should be screwed onto the bolt only far enough to assure attachment to allow gravity to activate the flop over mechanism.
   (4) Insert toggle bolt into drilled hole.

Performance Steps

(5) Hold the attachment against the mounting surface and pull the bolt outward, holding the toggle against the inside bearing surface, and tightening the bolt by hand until flush with the mounting surface. You should be able to tighten the bolt without the toggle turning. Do not over tighten. The toggle will need to be shifted to center before tightening fully.

j. Crimp type or molly screw anchors.

(1) Drill a hole the same size as the outside diameter of the anchor.

(2) Thread the anchor onto the mounting screw, then insert the anchor into the mounting hole and tighten to expand the anchor holding it in place.

(3) Once the anchor is installed, the mounting screw can be removed without disturbing the anchor and mounting fixture can be attached. The crimp type anchors have less strength than toggle bolts when subjected to a pulling force from the wall.

Performance Measures	**GO**	**NO-GO**
1. Located hole for drilling.	____	____
2. Drilled holes in masonry or concrete.	____	____
3. Installed various types of anchors.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

INTERPRET ENGINEERING INSTALLATION PACKAGE (EIP)
113-583-1007

Conditions: Given material and an EIP.

Standards: Interpreted an EIP and successfully converted fractions and decimals.

Performance Steps

1. Identify the EIP numbering.
    a. The first character identifies the major command responsible for preparing the EIP.
        (1) E - Europe
        (2) C – continental United States (CONUS)
        (3) K - Far East
    b. The second character (number) depicts the calendar year in which the EIP was initiated.
    c. The third and fourth characters (letters) identify the functional element.
        (1) SV - Voice
        (2) TS - Satellite
        (3) SD - Data
        (4) TR - Radio
        (5) SS - Secure Voice/Army Airfields
        (6) TI - Transmission
    d. The last three characters (numbers) identify the chronological order of each command's EIP beginning with 001 each calendar year.

2. Identify the parts of an EIP.
    a. The Cover Page: Includes the project title, project number, organizational data, date, and distribution statement.
    b. The Signature Page: Includes the project title, project number, distribution statement, directorate and command name, and the signature lines for the project team leader and installing activity.
    c. The Disclaimer Page: Changes, distribution, and disposition instructions.
    d. Identify the format of the EIP:
        (1) Paragraph One (1.0) General: The Project Overview.
        (2) Paragraph Two (2.0) Installation Team Responsibilities.
        (3) Paragraph Three (3.0) Points of Contact (POC).
        (4) Paragraph Four (4.0) Appendices.
            (a) Lists and briefly describes appendices that are required for the project.
            (b) The appendices are identified alphabetically.
    e. Describe appendices used in the EIP.
        (1) Installation steps and instructions.
            (a) Lists the specific steps to install and/or uninstall equipment.
            (b) The sequence of installation steps and any special instructions that must be followed to keep the facility operational during the installation.
            (c) Installation steps will refer to drawings as much as possible.
            (d) If an on-site engineer is provided, it will be stated within this appendix.
        (2) Sequence of installation.
            (a) Conducts an inventory of the Bill of Materials (BOM) and commences installation.
            (b) The floor layout is made IAW the floor plan drawing.
            (c) All overhead work is installed.
            (d) All equipment racks, cabinets, and frames installed and aligned.
            (e) Install, identify, and mark equipment in cabinets.
            (f) Prepare cable tags and run and secure cables.
            (g) Butt, strip, fan, and terminate cables at equipment and frame.

Performance Steps

(h) Test and verify cable terminations.
(i) Cutover plan coordinated with users and cross-connects installed.
(j) Operational test conducted (QC/QA) and site clean up (touch-up) conducted.
(k) EIP and drawings updated (red-lined).
(l) Installation complete.

(3) The BOM list will be by alpha, National Stock Number (NSN), and Standard Material List (SML). Special tools and test equipment will be included.
(a) Major Item BOM (MIBOM) consists of major end items.
(b) Installation BOM (IBOM) consists of all the materials required to install the MIBOM.
(c) Upon completion of a project, the Operations and Maintenance (O&M) Command will sign for the MIBOM.

(4) Project Concurrence Memorandum (PCM).
(a) The PCM describes the project, site impact, responsibilities, scope, schedule, suspense dates, agreements and project concurrence from all responsible agencies.
(b) Additional attachments and enclosures will be referenced by the appropriate paragraph.

(5) CRL.

(6) Identify drawings:
(a) The drawing index will be the first page of the appendix for drawings.
(b) Standard drawings are drawings used by installers at all communications-electronics (C-E) facilities to install specific equipment or systems.

(7) Standard drawing numbering system consists of eleven characters assigned by the CMO.
(a) Part 1. First three positions are always "STD" for standard drawings.
(b) Part 2. Position 4 is a one-position separator, a hyphen to separate parts 1 & 3.
(c) Part 3. Two positions for the major function code, which uses a two-letter code to describe the drawing function.
(d) One position that is a separator, a hyphen to separate parts 3 & 5.
(e) Four positions used for a four digit drawing number. EXAMPLE: STD - MW - 1234

(8) Site Specific Drawings:
(a) The first sheet in the set of drawings will be the drawing index.
(b) All drawings will be as complete and self-sufficient as possible.
(c) “A" or "B" size drawings will be included for reference and three sets of D size drawing (22" X 34") for use by the installation team.

(9) Define type of drawings:
(a) Master drawings: The original drawing from which all other copies are made.
(b) Reproducible drawings: A copy of the master that is sufficient quality that it can be used to make Blue-Line copies.
(c) Blue-Line drawings: The hard copy of a master or revised drawing (working copy).
(d) As-Built (red-lined) drawings: These drawings reflect the actual installation (after completion) of a specific project or site.
(e) Plant-In-Place: These drawings reflect the current configuration of an operating facility.

(10) Identify site specific drawing numbering system: Configuration item identification number (CIIN) is made up of fourteen characters.
(a) Part 1. The first five positions: The first two characters are a country designation and the next three characters identity the site.
(b) Part 2. Position six: It identifies the major function code (type of site).
(c) Part 3. Position seven: It is a hyphen used to separate the alphabetical characters of parts 2 and 4.
(d) Part 4. Positions eight and nine: These positions indicate type of drawing, two letters that identify the function of the drawings.
(e) The last five positions: These positions are a numeric sequence beginning with 90001. If the master drawing has been revised, the "1" will change to a two (2) or whatever revision number applies. EXAMPLE: PJ214E-DI90001

Performance Steps

3. Identify minor and major drawing changes.
    a. Minor changes are changes that do not alter the specified floor plan, major equipment list, violate a mandatory standard, effect the intended operational capability, the required testing or the end result.
    b. Major changes are changes that will alter equipment layout, operation mode, require using different equipment or the deleting equipment. The project engineer must approve any major change.
    c. Marking changes on the drawing: Marking or red-lining drawings will be done in the following colors.
        (1) Yellow: All items to be deleted will be high lighted in yellow.
        (2) Red: All items to be added will be in red.
        (3) Blue or Black: Are instructions or explanations of changes to the drafts person and will not be part of the drawing.
    d. Disposition of drawings on completion of the installation:
        (1) The Installation team leader will correct all three sets of installation drawings showing the result of the completed EIP.
        (2) One set of drawing will be left on site and the other two will be returned to the project engineer.

4. Perform validation and testing:
    a. Testing will be preformed IAW the test plan in the EIP.
    b. The sequence of testing will be included in the EIP and may require some tests before, during and after the installation.
    c. The required test equipment should be listed in the EIP.
    d. Test procedures that provide details and minimum allowable results (test specifications) will be included in the EIP.
    e. Technical Acceptance Recommendations (TAR) will be provided in the EIP. The TAR is conducted by the engineer or the engineer's representative with the O & M Command representative.

Performance Measures	GO	NO-GO
1. Identified the EIP numbering.	____	____
2. Identified the parts of an EIP.	____	____
3. Identified major and minor drawings changes.	____	____
4. Performed validation and testing.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

PERFORM MARKING SITE LAYOUT
113-583-1008

Conditions: Given the engineering installation package (EIP) floor plan, tools, chalk in various colors, chalk line and reel, grease pencils, felt tip markers, transparent tape, 24-inch level, 16-ounce plum bob, 6-foot folding ruler, carpenters square, stepladders, steel and linen measuring tapes, fabricated compasses, material, and notes.

Standards: Stated and performed the methods needed for marking site layout, for preparing the installation of equipment in accordance with the EIP.

Performance Steps

1. Identify the purpose of marking site layout.
    a. Equipment must be installed in a facility exactly as shown on the floor plan drawings.
    b. Installers must draw lines on the floors, walls, or ceilings indicating the location of equipment to be installed.

2. Identify marking site layout terms.
    a. Reference line:
        (1) A straight line in between two or more predetermined points, parallel to the longest unbroken wall in a room.
        (2) All measurements for equipment layout markings will be made from the reference line.
    b. Baseline: The line on which the equipment is placed.
        (1) Equipment may sit in front of, center on, or behind the baseline.
        (2) Centerline (CL) usually indicates the centerline on floor plan drawings.
        (3) Baselines may be laid parallel or perpendicular to the reference line.

3. Prepare for marking site layout.
    a. Verify that the dimensions and reference points on the drawings match the room.
    b. When possible, lay out and mark an entire room before moving the equipment and installation materials into the room.
    c. Use a chalk line.
        (1) Make sure it is sufficiently coated with chalk.
        (2) Stretch the line taut, extending the ends a minimum of 6 inches past intersecting lines or the end of the equipment line up.
        (3) The chalk line should be snapped at the approximate center, in increments of 10 to 15 feet.
        (4) To avoid "bouncing", snap the chalk line along the edge of a square.
        (5) To preserve chalked lines, retrace them with a grease pencil or a marking crayon sharpened to a fine point. To protect the lines place transparent tape over them.
    d. Fabricate compasses to draw arcs required for laying out the site.

4. Draft a reference line.
    a. The level and square method:
        (1) Place a carpenter's framing square upright with the short side end butted against the longest unbroken wall so the long side is parallel to the wall.
        (2) Place a level against the long side of the square and adjust the square until it is level, keeping the short side end against the wall.
        (3) Mark the point of contact on the floor at the bottom inner edge of the square. This mark should be 14 inches from the wall (length of the short end of the square).
        (4) Repeat this procedure at least three times to establish a reference line 14 inches from the wall.

Performance Steps

b. The Plumb Bob Method:
   (1) Place the long side of a framing square against the wall approximately 3 feet above the floor. Plumb the square with a level.
   (2) Drop a plumb line from the short side of the square and mark this point on the floor. The plumb bob must be hung from the exact same point on the square each time.
   (3) Mark the floor at a minimum of three locations, one near each end of the wall, and the third near the center. More marks are more accurate and have a better chance detecting deviations in the wall.

c. Mark the line. After marking the points using one of the methods given, stretch a chalk line to intersect the greatest number of points.

5. Draft the baseline. Since it is not practical to draw a line of considerable length at a right angle to another, using a carpenter's square, the following methods may be used to mark a true 90-degree angle.
   a. The 3-4-5 Method: Any multiple of these basic numbers can be used (for example: 6-8-10 or 9-12-15). It is the best method for confined areas. This method can be used to establish a line at a right angle to another and to extend lines beyond obstructions.
      (1) Refer to the EIP drawings to determine where the line is to be located and mark it on the reference line or baseline as point 1.
      (2) From point 1, measure 4 feet (or a multiple) along the reference or baseline and make a second mark. Refer to this mark as point 2.
      (3) Using a 3-foot fabricated compass (or a multiple length), swing an arc perpendicular (90 degrees) from point 1.
      (4) Using a 5-foot fabricated compass (or a multiple length), swing an arc from point 2 intersecting the arc from point 1. Refer to this mark as point 3.
      (5) Snap a chalk line through point 1 and point 3 (90 degrees from the reference line or baseline).
   b. The Linear Bisection Method: Also called the geometrical bisection method.
      (1) Refer to the drawings to determine where the right angle is to be located and mark it on the reference line or baseline as point 1.
      (2) Measure along the line an equal distance on either side of point 1 and mark these points as A and A1.
      (3) Use a fabricated compass to swing arcs from points A and A1 at 90 degrees to the reference or baseline, above and below point 1. Mark the points where the arcs intersect as B and B1.
      (4) Snap a chalk line though marks B, B1, and point 1. If these three points are not directly in line, recheck all measurements and make necessary corrections.

6. Draft extended lines beyond obstructions.
   a. Bisecting Arcs: This method can be used to make a baseline parallel to the reference line and to extend lines beyond an obstruction.
      (1) Mark three points, equal in length, as A, B, and C on the reference line. Lengths A-B and B-C must be of equal distance.
      (2) Using a fabricated compass long enough to clear the obstruction, swing intersecting arcs from points A and B, and then swing intersecting arcs from B and C.
      (3) Snap a chalk line through these two points (points where A and B intersected and where B and C intersected). Make sure the chalk line is long enough to go past the obstruction.
      (4) Repeat these steps going from the projected line back to the original line (opposite direction) to continue the original line on the other side of the obstruction. Use the exact same measurements and compass length. The new points are indicated as A1, B1, and C1.
      (5) Snap a chalk line through the second set of points to extend the original reference line past the obstruction.

Performance Steps

b. Tangents of Arcs. This is the quickest method to extend a line around an obstruction.
   (1) Using a fabricated compass with a radius long enough to clear the obstruction, swing at least two 90 degree arcs from the line to be extended. Do not intersect the arcs they need to be 90 degrees from the original line.
   (2) Snap a chalk line at the apex (the very top) of each arc long enough to extend past the obstruction.
   (3) Repeat the above steps using the same compass length in the reverse direction. Snap a chalk line the same as before to extend the original line on the other side of the obstruction.

c. Right Angles Method. This method uses 90-degree angles to extend a line past an obstruction.
   (1) Use either the 3-4-5 or the linear bisection method to lay at least 2 lines, at a right angle (perpendicular to) to the line to be extended (original line). Be sure the lines are long enough to clear the obstruction.
   (2) Measure an equal distance along each perpendicular (90 degrees to the original) line and make a mark.
   (3) Snap a chalk line through both points A. This temporary line will be used to extend the original line. Be sure it clears the obstruction.
   (4) Repeat the steps above, marking perpendicular lines from the temporary line in the opposite direction and on the other side of the obstruction. Make sure the exact same measurements are used for points A1 as for points A. Snap a chalk line through points A1 to extend the original line on the other side of the obstruction.

7. Draft an overhead layout.
   a. Using the methods previously described, lay out the lines or points for ceiling locations on the floor.
   b. Transfer the lines and points from the floor to the ceiling using a plumb bob and a square. Wrap the free end of the plumb line around the long side of a carpenter's square and lower the plumb bob to the floor.
   c. Hold the square against the ceiling and adjust as necessary to align the plumb bob to the reference mark on the floor.
   d. When the plumb bob is aligned with the mark on the floor, mark the point where the plumb bob line contacts the ceiling.
   e. If space and height will permit, a scaffold or maintenance platform can be used to speed up the process.

8. Draft a wall layout. The points and lines to install equipment on walls are also marked using a plumb bob and level.
   a. Determine the distance (check EIP) of the side of the equipment to be installed from a wall or other reference point. Measure and mark this point on the floor in line with the wall location. If obstructions prevent marking the location on the floor, the point may be marked on the wall at the approximate height of the equipment.
   b. Determine the distance from the floor to the bottom (or center as applicable) of the equipment and mark it on the wall.
   c. Plumb a line on the mark made denoting the side of the equipment and make additional marks on the wall to provide reference for vertical alignment.
   d. Align a level on the mark made vertically denoting the lower edge of the equipment and draw a reference line to be used for locating purposes.
   e. The procedures outlined above may also be used for vertical and horizontal alignment of conduit. For long runs, it is more accurate and practical to snap a chalk line.

9. Determine the level of the floor. Equipment racks must be installed as level as possible. For this reason floors must be checked for level before equipment is installed.
   a. Twine and Block Method:
      (1) Obtain a length of twine not longer than ten feet long.

Performance Steps

(2) Attached each end of the twine to blocks of wood, of even height, and place them on line with the proposed equipment lineup.
(3) Stretch the twine taut and use a third block of wood or a ruler to determine the high spots.
(4) For more than one high spot, use a ruler to determine the highest point.

b. Chalk Line Method:
(1) Use a "heavily chalked" chalk line no longer than 10 feet.
(2) Hold the line tight against the floor at one end of the proposed lineup.
(3) Drag one end of the line back and forth across the floor. This will leave chalk on the high spots and the low spots will be clear.

c. The Level and Straightedge Method:
(1) A straight 2 X 4 can be used or a straight length of metal, laid on the section of the floor where the equipment is to be installed.
(2) Move the straightedge over the entire area. Use a level on top of the straightedge.
(3) Look for gaps under the straightedge indicating low spots. High spots can be detected using the level.

Performance Measures	GO	NO-GO
1. Identified the purpose of marking site layout.	____	____
2. Identified marking site layout terms.	____	____
3. Prepared for marking site layout.	____	____
4. Drafted a reference line.	____	____
5. Drafted the Baseline.	____	____
6. Drafted extended lines beyond obstructions.	____	____
7. Drafted an overhead layout.	____	____
8. Drafted a wall layout.	____	____
9. Determined the level of the floor.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

INSTALL LOCAL AREA NETWORK/WIDE AREA NETWORK (LAN/WAN) SUBSTATION DISTRIBUTION SYSTEM
113-583-1009

Conditions: Given CAT-5 , D-814 impact tool with 110 blade, RJ-45 crimp tool, RJ-45 connectors, work area outlet connector with RJ-45 jack, jacket stripper, splicer scissors (snips), tape measure (feet/metric) and small flat tip screwdriver, engineering drawings, and Manufacturer's Manual.

Standards: Terminated the CAT-5 cable using the appropriate configurations and all cabling passed test requirements.

Performance Steps

1. Conduct pre-installation procedures.
   a. Identify, remove and/or mark any hazards before installation at each location.
   b. Select the cable support method to be used and complete all necessary preparations.
   c. Tie back any existing loose cables to avoid entanglements.
   d. Select the installation method, (raising or lowering) and set up the associated hardware (shoes, sheaves, supports, winch and other needed equipment).
   e. Set up safety measures such as perimeters, cones, reels, and sheave blocks.
   f. Use the rolling hitch knot to raise and lower heavy backbone cable.
   g. Test cable and annotate results.

Note: Before starting the cable installation, make sure enough cable is available for the entire cable installation. If the cable installation was previously engineered, then follow the engineer's statement of work. Locate the footage numbers at both ends of the cable and subtract the numbers. The results of the subtracted footage numbers indicate the length of available cable.

2. Install cable.
   a. Route the cable through predetermined path.
   b. Pull enough additional cable to ensure that 24 inches of cable will be available at the work area outlet.
   c. Install a tip cable on a MDF using distribution rings.
   d. Test cable and annotate results.

3. Terminate cable in work area.
   a. Inventory work area parts.
   b. Prepare cable for termination.
   c. Prepare and position conductors for termination.
   d. Terminate conductors using the D-814 impact tool with 110 blade.

CAUTION

Ensure the impact setting is adjusted to low impact. Also ensure the outlet connector is located on a solid surface.

   e. Secure outlet connector.
   f. Test cable, repair faults, and annotate results.

4. Terminate cable in telecommunications closet.
   a. Prepare cable by managing slack.
   b. Locate which side of the equipment the cable will terminate on.
   c. Form the cable to the desired terminating block.

Performance Steps

d. Prepare cable for termination.
e. Terminate conductors using the D-814 tool with 110 blade.
f. Terminate conductors on a 700 series MDF terminal using the wire wrap method.
g. Test cable, repair faults if required and annotate results.

5. Fabricate a CAT-5 unshielded twisted pair (UTP) patch cord if required.
   a. Inventory parts.
   b. Remove jacket.
   c. Untwist all the cable pairs to the ringed jacket.
   d. Align conductors from left to right according to the T568A or the T568B terminating configuration.
   e. Position conductors into rear of RJ-45 plug.
   f. Insert the front of the plug into the RJ-45 slot of the crimping tool and squeeze handle fully.
   g. Ensure conductors and jacket are fully seated and crimped.
6. Test cable for faults.

Performance Measures	**GO**	**NO-GO**
1. Conducted pre-installation procedures.	____	____
2. Installed CAT-5 UTP cable.	____	____
3. Terminated cable in work area.	____	____
4. Terminated cable in telecommunications closet.	____	____
5. Fabricated a CAT-5 UTP patch cord if required.	____	____
6. Tested cable for faults.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
AR 380-5	
Manufacturer's Manuals	

OPERATE HAND AND POWER TOOLS
113-583-2001

Conditions: Given reciprocating saw, band saw, rotary hammer, Greenlee hydraulic punch driver, manufactures operating instructions, and notes.

Standards: Operated the most common power tools used in C-E installation tasks.

Performance Steps

1. Observe safety rules while operating power tools.
   a. Always, wear safety goggles.
   b. Always, wear hearing protection when operating power tools.
   c. KEEP HANDS AWAY from the work area.
   d. Be aware of your surroundings and position the tools electrical cord so that it is not a tripping hazard and is clear of the work area.
   e. Do not wrap the cord around your arm or wrist.
   f. Wear a dust mask or respirator while sawing, grinding, sanding or drilling.
   g. Do not put the tool down until it has completely stopped.
   h. Make sure the tools safety guards are in place and in good working order.
   i. Everyone in close proximity of the operation should also wear safety equipment.
   j. Always secure the material to be worked in a vice, never hold the material to be cut by hand.
   k. Do not run the tool while carrying it or holding it at your side.

2. Operate the reciprocating saw.
   a. Secure material to be cut in a vice or clamp.
   b. Some reciprocating saws have a speed control lever. Select the appropriate setting for your application.
   c. Place the hinged foot against the material to be cut.
   d. Squeeze the trigger to turn the tool on and release the trigger to turn off the tool.
   e. Do not apply pressure when the saw is close to cutting through.
   f. The reciprocating saw can be used with different blades for different types of material. Match the blade to the material being cut.

3. Operate the band saw.
   a. Clamp the stock.
   b. Make the cut.
   c. Release the clamp and remove the stock.

4. Operate the rotary hammer (impact hammer).
   a. Hold the tool by the insulated gripping surfaces when the possibility of contacting hidden live electrical wires exists. Do not drill into walls or blind areas where live electrical wiring may exist.
   b. Always, use the side handle for maximum control over torque and kickback reaction.
   c. Use thick cushioned gloves to limit the vibration caused by the hammer-drill action.
   d. Squeeze the trigger to turn the tool on and release the trigger to turn off the tool.
   e. This tool is equipped with a variable speed dial that controls the impact rate and the rotating speed. Generally, the control should be set to around 5 or 6 for concrete and about 4 for brick. The operator can adjust the impact and rotating speed according to the actual application.
   f. The selector lever allows the tool to be set for drilling and hammering or hammering only.
   g. Drilling is a two-person operation. The operator should concentrate on drilling the hole while the assistant helps to keep the drill perpendicular and acts as a safety.
   h. Do not use dull or damaged bits as they have a tendency to bind in the material.
   i. Mark the location where the anchoring device is to be installed.
   j. Center the bit or self-drilling anchor over the hole and operate the tool on hammer only until the surface has been penetrated marking the position.
   k. Place the selector on drilling/hammering and drill to the desired depth.

Performance Steps

l. Remove the tool from the hole and clean the hole with a blow out bulb.
m. Use care in removing the bit after drilling, as the bit may be very hot.
n. A hammer driven star bit can be used to brake up aggregate, when necessary.
o. Install the anchoring device according to the manufacture's instructions.

5. Operate the Greenlee hydraulic punch driver.
   a. Locate the center where the hole will be punched and mark it with a hammer and center punch.
   b. Using a standard drill, drill a 1/8-inch hole pilot hole. Enlarge the hole with a 3/8-inch drill, this process is usually more accurate and will prevent the drill bit from wandering.
   c. Install the 3/8-inch draw stud and the 1/2-inch conduit die.
   d. Insert the draw stud with die into the pilot hole and thread the 1/2-inch conduit punch on the draw stud until tight. Ensure that the draw stud threads are fully engaged in the punch.
   e. Close the control knob by turning clockwise and pump the driver lever until the punch has completely penetrated the material.
   f. Remove the driver from the hole and release the draw stud by turning the control knob counterclockwise. Remove the punch, die, and draw stud.
   g. Install the 3/4-inch draw stud, then select the punch and die for the desired size hole.
   h. Repeat steps d through f.

Performance Measures	GO	NO-GO
1. Observed safety rules while operating power tools.	____	____
2. Operated reciprocating saw.	____	____
3. Operated the band saw.	____	____
4. Operated the rotary hammer (impact hammer).		
5. Operated Greenlee hydraulic punch driver.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	
The National Electric Code (NEC)	
TB 385-4	
TM 9-243	

TROUBLESHOOT LOCAL AREA NETWORK/WIDE AREA NETWORK (LAN/WAN) SUBSTATION DISTRIBUTION SYSTEM
113-588-0001

Conditions: Given a preexisting LAN or WAN, ohmmeter, spectrum analyzer, time domain reflectometer, loss test set/power meter, optical faultfinder, network documents, and Manufacture Instructional Booklets.

Standards: Identified and repaired faults and reestablished communications.

Performance Steps

1. Gather network type information using network documents.
2. Make visual inspection checks of network.
3. Turn off equipment to other networks.
4. Test cable according to type.
   a. Metallic cable - ohmmeter, spectrum analyzer or time domain reflectometer.
   b. Fiber optic cable - loss test/power meter, optical fault finder, or optical time domain reflectometer.
5. Annotate test results on the appropriate network documentation.
6. Identify fault.
7. Isolate fault.
8. Repair fault.
9. Maintain an engineering installation drawing.
10. Maintain LAN/WAN system.
    a. Conduct periodic systems test.
    b. Annotate appropriate network records.

Performance Measures	GO	NO-GO
1. Gathered network type information using network documents.	____	____
2. Made visual inspection checks of network.	____	____
3. Turned off equipment to other networks.	____	____
4. Tested cable according to type.	____	____
5. Annotated test results on the appropriate network documentation.	____	____
6. Identified fault.	____	____
7. Isolated fault.	____	____
8. Repaired fault.	____	____
9. Maintained an engineering installation drawing.	____	____
10. Maintained LAN/WAN system.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
AR 380-5	
Manufacturer's Manuals	

DETERMINE CABLE DEPTH USING THE 2273 ADVANCED CABLE AND FAULT LOCATOR 113-588-0020

Conditions: Given a pre-installed buried cable section, a 2273 advanced cable and fault locator, orange-communication cable flags, batteries, manufactures manual.

Note 1: This task is performed during daylight hours. It should not be performed under adverse weather conditions.

Note: 2: Never connect ground to water pipe of services in the area. The return signal may mislead the trace.

Standards: Identified and annotated the location, marking, and depth of an existing buried cable.

Performance Steps

1. Test batteries.
   a. Test batteries in transmitter.
   b. Test batteries in receiver.
2. Isolate cable shield.
3. Install ground rod.
4. Place transmitter in proper location.
5. Attach transmitter clips to the ground rod (black clip) and to the cable shield (red clip).
6. Adjust test set controls/switches.
   a. Set transmitter controls/switches.
   b. Set receiver controls/switches.
7. Trace and mark cable path.
8. Determine cable depth.
9. Turn off test set.
10. Disconnect equipment.
    a. Disconnect transmitter.
    b. Disconnect receiver.

Performance Measures	GO	NO-GO
1. Tested batteries.	____	____
2. Isolated cable shield.	____	____
3. Installed ground rod.	____	____
4. Placed transmitter in proper location.	____	____
5. Attached transmitter clips to the ground rod (black clip) and to the cable shield (red clip).	____	____
6. Adjusted test set controls/switches.	____	____
7. Traced and mark cable path.	____	____

Performance Measures	GO	NO-GO
8. Determined cable depth.	____	____
9. Turned off test set.	____	____
10. Disconnected equipment.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

LOCATE CABLE FAULTS USING A TIME DOMAIN REFLECTOMETER (TDR) TEST SET 113-588-0021

Conditions: Given a pre-installed cable section, a 1503 TDR, paper, pen/pencil, and Manufacture's Manual.

Note: This task is performed during daylight hours. It should NOT be performed under adverse weather conditions

Standards: Measurements were within + 25 feet of the evaluators readings for each fault reading taken.

Performance Steps

1. Perform operations check.
   a. Set controls.
2. Locate short.
   a. Connect the test cables to cable connector.
   b. Connect the test cables to the tip and ring of good pair.
   c. Set controls.
   d. Disconnect the test cable from good pair.
   e. Connect the test cables to the tip and ring of the shorted pair.
   f. Measure and record the distance to the fault.
3. Locate crosses.
   a. Connect the test cable to the tip and ring of only ONE pair involved in the cross.
   b. Measure and record the distance to the fault.
4. Locate grounds.
   a. Connect the test cable to the tip and ring of a pair containing ground.
   b. Measure and record the distance to the fault.
5. Locate opens.
   a. Connect the test cable to the tip and ring of a pair containing an open.
   b. Measure and record the distance to the fault.

Performance Measures	GO	NO-GO
1. Performed operations check.	____	____
2. Located short.	____	____
3. Located crosses.	____	____
4. Located grounds.	____	____
5. Located opens.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

MAINTAIN A COMMUNICATIONS SYSTEMS INSTALLATION RECORD (CSIR) 113-588-6008

Conditions: Given a CSIR, an engineering change request/authorization (ECRA) scenario, colored pencils, and a symbols and explanation booklet.

Note: Supervision and assistance are available.

Standards: Correctly annotated proposed changes from the ECRA on the CSIR using the correct color pencil to mark changes.

Performance Steps

1. Identify proposed change(s) requested.
2. Annotate proposed change(s).
   a. Verify appropriate symbol.
   b. Select appropriate colored pencil.
   c. Annotate change(s) on CSIR.
3. Submit CSIR to engineer team chief.

Performance Measures	GO	NO-GO
1. Identified proposed change(s) requested.	____	____
2. Annotated proposed change(s).	____	____
3. Submitted CSIR to engineer team chief.	____	____

Evaluation Guidance Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

Subject Area 7: COMSEC

INSTALL TRUNK ENCRYPTION DEVICE
113-609-1002

Conditions: Given a KG-94A, or KG-194A and image understanding architecture (IUA), connection cables, power source, CV-4180A( ), and other associated equipments.

Standards: Installed the TED and it is ready to activate.

Performance Steps

1. Install power cable on interface adapter unit.
2. Install TED Black Cable (W-10).
   a. W10 cable install from J4 on CV-4180A( ) to TED J4.
3. Install TED Red Cable (W11).
   a. W11 cable install from J1 on CV-4180A( ) to TED J2.

Performance Measures	GO	NO-GO
1. Installed power cable on interface adapter unit.	____	____
2. Installed TED Black Cable (W-10).	____	____
3. Installed TED Red Cable (W11).	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-365-10	

OPERATE TRUNK ENCRYPTION DEVICE
113-609-2002

Conditions: Given a KG-94A, or KG-194A and IUA connection cables, KYK-13, power source, operation order (OPORD), and other associated equipment that has been previously installed.

Standards: Operated TED in accordance with published OPORD.

Performance Steps

1. Turn power on.
2. Perform lamp test.
3. Loaded COMSEC.
   a. Attach KYK-13 with fill cable to fill port on KG-94A or KG-194A.
   b. Turn KYK-13 mode switch to on.
   c. Turn function switch on KG to load.
   d. Press and release the actuate switch on the KG.
   e. Parity lamp on KYK-13 will blink.
   f. Parity LED on KG will light, power on and alarm LED will stay on.
   g. Turn the mode switch on KYK-13 to off and remove from KG.
   h. RESYNC - Green LED lights to show that synchronization between the local and remote units has occurred.

Performance Measures	GO	NO-GO
1. Turned power on.	____	____
2. Performed lamp test.	____	____
3. Loaded COMSEC.	____	____

Evaluation Guidance Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-365-10	
UNIT OPORD	

MAINTAIN TRUNK ENCRYPTION DEVICE
113-609-3001

Conditions: Given a KG-94A, or KG-194A and image understanding architecture (IUA), connection cables, power source, and other associated equipment that has been previously installed.

Standards: Maintained trunk encryption device (TED) in accordance with preventive maintenance checks and services (PMCS) procedures.

Performance Steps

1. Check fill battery.
2. Check lamps.
3. Check equipment surface.
4. Check controls switches.

Performance Measures	GO	NO-GO
1. Checked fill battery.	____	____
2. Checked lamps.	____	____
3. Checked equipment surface.	____	____
4. Checked controls switches.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-365-10	

Subject Area 8: CONDUIT

INSTALL CONDUIT
113-583-1010

Conditions: Given conduit, conduit cutting tools, reamer, round/flat file, condulets, utility boxes, couplers, conduit connectors, mechanical/manual or hydraulic bender, material, and notes.

Standards: Measured, bent, and installed conduit using approved installation methods as defined in the National Electric Code handbook and the Phase III engineering installation package (EIP).

Performance Steps

1. Identify the purpose of conduit.
    a. Conduit is a tubular raceway that protects insulated conductors.
    b. Lengths of conduit can be connected to boxes, conduit bodies, and equipment to form a distribution system.

2. Identify types of conduit.
    a. Conduit can be made of aluminum, polyvinyl chloride (PVC) [plastic], copper alloy, or steel. Steel provides the best grounding and shielding from EMI and is the only conduit used in C-E facilities.
    b. Rigid Conduit (Thick wall):
        (1) Galvanized steel rigid conduit is used in outside plant installation where excessive dampness is present or when the conduit must be embedded in concrete.
        (2) Non-galvanized steel rigid conduit is used for general interior work.
        (3) Support is required every 10 feet and within 3 feet of any box, cabinet or fitting.
        (4) The characteristics of rigid conduit are:
            (a) It is moisture proof, fireproof, and can withstand severe mechanical damage.
            (b) Conduit is measured by inside diameter and normally comes in 10-foot lengths.
            (c) There is no limit on the voltage that conductors can carry inside rigid conduit.
            (d) Lengths come threaded on both ends and must be rethreaded if cut.
    c. Electrical Metallic Tubing (EMT or Thin wall):
        (1) EMT cannot be threaded; therefore, it uses fittings that do not require threads to attach to the conduit.
        (2) EMT is approved for both concealed and exposed work in dry locations.
        (3) The characteristics of EMT are:
            (a) It comes in 10-foot lengths with inside diameters that range from 1/2 inch to 2 inches.
            (b) The voltage of conductors inside EMT is limited to 600 volts.
            (c) EMT cannot be used outside of buildings, in battery rooms, or in excessively damp areas.
        (4) Support is required every 10-feet and within 3 feet of any box, cabinet or fitting.
    d. Flexible Conduit:
        (1) Flexible conduit is normally used where movement or vibration is experienced, such as the connection to motors, rectifiers, or where it is impractical to use other types of conduit.
        (2) Flexible conduit may be run a maximum of 6 feet.
        (3) The characteristics of flexible conduit are:
            (a) Flexible conduit is made from a strip of steel that is spirally wound and interlocked on itself.
            (b) It comes on a reel with inside diameters ranging from 3/8 inch to 3 inches and must be cut to length.
            (c) Flexible conduit must be supported every 4-1/2 feet and within 12 inches of any box, cabinet or fitting.

Performance Steps

(d) Conductor voltage inside the flexible conduit is limited to 600 volts.
(e) Flex conduit cannot be used outdoors, in wet areas, underground, embedded in concrete, in battery rooms, hazardous locations, or in such areas where flammable or corrosive vapors are present.

e. Liquid-Tight Flexible Conduit (LTF):
(1) When used with liquid-tight box connectors, the conductors are protected from water and excessive dampness.
(2) The total length of the run will not exceed 6 feet.
(3) The characteristics of LTF are:
(a) LTF is a steel flex conduit with a covering made of PVC plastic.
(b) Conductor voltage inside the flexible conduit is limited to 600 volts.
(c) The size and support requirements are the same as flexible conduit.
(d) LTF can be used anywhere except it cannot be embedded in concrete.

3. Identify rules for conduit Installation.
a. All conduit runs will be mechanically and electrically continuous.
b. All joints between sections of conduit fittings and boxes shall be thoroughly cleaned to remove dust, grease, oil, moisture, nonconductive finishes, corrosive materials, and then firmly tightened.
c. Conduit will run vertically or horizontally on walls, floors, ceilings, and in equipment cabinets.
d. Conduit can be run beneath cable rack, under false floors, and in false ceilings.
e. Conduit will be bent to conform to walls and equipment fittings.
f. A pull box will take the place of an elbow or bend in a conduit run, when there is more than the equivalent of 4 quarter bends (360 degrees total) including those bends located immediately at the outlet or fitting.
g. Communications cables and power conductors cannot occupy the same conduit distribution system.
h. A physical and electrical separation is required between conduits containing RED unencrypted "clear" data or RED power conductors, from conduit containing BLACK encrypted / secure data or power conductors.
i. Conduit running from a BLACK area to a RED area may require a piece of PVC conduit placed in the run to break the electrical connection between the RED and BLACK areas.

4. Identify conduit cutting tools.
a. A pipe cutter is a tool that consists of a handle and a sharp edged wheel that is forced inward by a screw that is tightened as the tool is rotated around the conduit.
b. The conduit or tube cutter is a lightweight hand tool that works the same as a pipe cutter. Do not use this type of cutter to cut rigid conduit, it is designed for EMT and tubing only.
c. A hacksaw can be used to cut any type of conduit and is normally used to cut flex or liquid-tight flex conduit.
d. A portable band saw is an electric, heavy duty, saw that can cut all types of metal conduit.

5. Cut conduit.
a. Always place rigid and EMT conduit in a vise for cutting, reaming and filing. Pad the jaws with wood or cardboard to protect the conduit.
b. The pipe or conduit cutter is the preferred tool for cutting conduit.
(1) Place the cutter over the conduit, centering it on the rollers, and adjust the cutting wheel inward until it makes contact.
(2) Tighten the cutter just enough to score the conduit on the first turn.
(3) Rotate the cutter around the conduit one turn, and then tighten about a 1/4 of a turn for each rotation until the conduit has been cut.
c. Cut the conduit using a Hacksaw:
(1) Place the conduit in a vise as described above.
(2) Select the proper hacksaw blade: Use a fine tooth blade when cutting thin material, such as EMT and a coarser blade for thick material, such as Rigid.

Performance Steps

(3) Cut the material using a steady, full-length stroke and light pressure.
(4) Cutting flex conduit using a hacksaw: The spiral construction of flex conduit makes it necessary to cut it at an angle so only one section of the steel strip is cut through.
(5) Cut LTF straight through with a hacksaw supporting it firmly.

d. Ream the conduit:
(1) Place the reamer on the end of the conduit and rotate it to remove the burrs.
(2) After reaming, rigid conduit must be threaded.
(3) The same procedure is used for reaming EMT conduit.

6. Identify conduit bodies.
a. Conduit bodies can be used to change direction or for branching.
b. They provide access (pull points) for easy installation, splices, taps or removal of cable.
c. They are used to connect sections of conduit and are required for every 360 degrees of bend.
d. The covers are either clamp on or are held in place with screws.
e. Elbow (L) bodies are used to make 90-degree turns (to determine the type, hold the body by the short hub, as you would a pistol, and look at the large opening). The four types of conduit bodies are:
(1) LL - Open on the left.
(2) LR - Open on the right.
(3) LB - Open on the back.
(4) L - Open on both sides.
f. Tee (T) type conduit bodies: There are two types used to extend a vertical conduit run from a horizontal run.
(1) T - Opening is 90 degrees (top) from the short hub.
(2) TB - The opening is 180 degrees (opposite or back) from the short hub.

7. Identify utility boxes.
a. These boxes are used in conduit runs to house electrical devices such as switches, outlets or as junction boxes.
b. They are normally made of sheet metal and come in a variety of sizes and shapes.
(1) Square boxes (4" X 4") are used as junction boxes, single or double gang switch outlet boxes and come with or without knockouts for various sizes of conduit.
(2) Handy boxes (2" X 4") are used as switch boxes, outlet boxes, or pull points and come with or without knockouts.
(3) Octagon boxes, come in various sizes, are used to mount light fixtures, switches, outlets, junction boxes, and come with or without knockouts.
c. Utility box covers come in three types: blank, switch, and outlet.
d. Cast boxes are made of cast iron or aluminum and are used for electrical devices in areas where electrical magnetic protection (EMP), EMI or RFI shielding is needed or in areas where weather protection is required.
(1) The access holes are threaded to accept rigid conduit or an EMT box connector.
(2) The three types of cast box covers (blank, switch and outlet) have rubber gaskets to provide a watertight seal.

8. Install conduit boxes and bodies.
a. Boxes can be mounted with the box cover flush with the surface or with the box exposed.
b. Conduit bodies must be rigidly supported by the attached conduit.
c. All unused openings must be closed and a cover must be used on all utility boxes after the wiring has been installed and verified.

9. Identify conduit couplings.
a. Threaded couplings are used only with rigid conduit to connect lengths together.
b. Threadless couplings join conduit lengths by compression rings or setscrews.

Performance Steps

(1) Install the compression ring coupling by placing a gland nut, then a compression ring over the end of each piece of tubing. Place a threaded coupling over the end of one section, then place the second section into the coupling. Tighten each section's gland nut to squeeze the compression rings and lock the two sections together.
(2) Install the setscrew type by inserting each section of conduit into the coupling and tighten the setscrews.
(3) Transition assemblies are special couplings used to connect flex to rigid or EMT conduit. One side is threaded (rigid only) or an EMT compression type coupling (for EMT) and the other side is a flex fitting.

10. Install box connectors.
    a. Threaded box connectors use locknuts on each side, with a bushing over the end of the conduit providing protection for conductors.
        (1) To install a box connector in a conduit body, place the small threaded end of the connector into the hole on the conduit body and tighten.
        (2) To install a box connector in a utility box, put the small threaded end of the connector body into one of the knockout holes in the box and secure with a locknut.
    b. To install EMT conduit on a box connector, place the gland nut and compression ring over the end of the conduit, slide the conduit into the connector and tighten the gland nut and ring onto the connector body.
    c. To install threadless box connectors, place a gland nut and compression ring over the end of the conduit and tighten.
    d. Install flexible conduit connectors:
        (1) There are two types of connectors used on flexible conduit: one is internal and the other is external.
        (2) To install the internal box connector on flex conduit requires screwing it into the spiral part of the flex conduit. This connector covers the cut end of the flexible conduit to protect the conductors from sharp edges.
        (3) The external box connector is secured to the flex conduit with a built in clamp. The cut end of the conduit must be pushed as far as possible into the connector to protect the conductors from damage.
    e. Install liquid-tight box connectors:
        (1) LTF connectors consist of seven parts: compression nut, gland ring, steel-grounding ferrule, connector body, O-ring shield, O-ring assembly and locknut.
        (2) Slide the compression nut and gland ring over the conduit.
        (3) Slide the steel-grounding ferrule onto the end of the conduit.
        (4) Place the body over the steel grounding ferrule and finger tighten the compression nut.
        (5) Place the O-ring shield and O-ring over the end of the body.
        (6) Place the small threaded end of the body into the liquid tight box and tighten the locknut.

11. Install pipe clamps or conduit hangers.
    a. Pipe straps or clamps support conduit runs and holds the conduit against flat surfaces, such as walls, ceilings or floors.
    b. Clamps are available with one or two mounting holes, in various sizes of stamped steel for EMT or cast iron for rigid.
    c. Conduit hangers are used to attach conduit to the ceiling or wall and are made for various sizes of conduit.

12. Remove knockouts to install conduit.
    a. They are built-in to the boxes in different sizes, as either single or concentric. Concentric knockouts permit selection of hole sizes, depending on conduit requirements.
    b. Remove knockouts by striking a sharp blow with a hammer and twisting it off with a pair of pliers. File any sharp edges before installing conduit.

13. Identify conduit bends.
    a. The major bends:

Performance Steps

(1) Offset - Two equal bends in opposite directions, example: two bends of 22-1/2 degrees are used to change direction of travel.
(2) Saddle - Three bends: the A bend of 45 degrees and the B and C bend of 22-1/2 degrees each is used to clear an obstacle on a surface.
(3) Angles - Used to change the direction of travel in a run.

b. The minor bends:
(1) Regular 90 degree - Used to change direction of travel by 90 degrees.
(2) Stub 90 degree - Used in a confined area to change the direction of travel by 90 degrees.

14. Identify types of conduit benders.
a. The three types of conduit benders are manual, hydraulic, and mechanical:
b. The type used depends on the type and size of conduit to be bent.
c. There are two types of manual benders, one for EMT and the other for rigid conduit.
d. The one-shot bender is a manual bender:
(1) Used mainly with EMT, but can be used for rigid. It is called the one-shot because a full 90 degrees bend can be made in a single motion.
(2) It consists of two parts, the bender head and the detachable handle.
(3) The bender head forward part is called the TOE. The rear or back part is the HEEL. The bender also has conduit alignment and degree markings on the head.
(4) The arrow mark is used for offsets, B and C bends of a saddle, angle bends and Stub 90 degree bends.
(5) The rim notch mark is used only for the A bend of the saddle.
(6) The star mark is used for the regular 90-degree bends only.
(7) The degree marks are for 22 degrees, 30 degrees, 45 degrees, and 60 degrees and are on the heel of the bender.
(8) The one-shot conduit bender bends one size of EMT and it can bend the next smaller size rigid (e.g. 3/4-inch EMT bender will bend 1/2-inch rigid).
e. Hickey bender is a manual bender used mainly to bend rigid conduit.
f. Mechanical benders:
(1) Used to bend the same conduit sizes as the hydraulic bender.
(2) Mechanical benders use an electric motor and gearbox to apply force.
g. Hydraulic benders:
(1) Hydraulic benders are used to bend EMT larger than 1-inch and rigid conduit larger than 3/4-inch.
(2) The hydraulic bender consists of a hand operated pump and a hydraulic ram, with hoses and various sizes of shoes and rails.

15. Bend conduit.
a. Conduit bending is a two-person operation. One person aligns the conduit while the other uses the bender.
b. Conduit is always bent on a hard, flat surface.
c. When marking conduit, use a grease pencil and mark it completely around the conduit at the point of the bend.
d. The start of the conduit, where the installer makes the first bend is called the committed end of the conduit. The other end is the non-committed end.
e. An offset consists of two bends of equal degrees in opposite directions.
f. All bends start with marking a 2-inch constant completely around the conduit.
g. Bending offsets:
(1) Mark the conduit:
(a) Measure 2-inches from the end of the conduit and mark, with a grease pencil, all the way around the conduit. This is the 2-inch constant used with 1/2-inch EMT only.
(b) Measure the offset depth from the surface of the wall to the edge of the box connector. If the measurement is a fraction, round it off to the nearest whole number.

Performance Steps

(2) Determine the desired degree of bend: Bends of 22-1/2 degrees are preferred because pulling wires through shallow bends is easier.
(3) Align the 2-inch constant mark with the arrow on the bender and bend the conduit the desired number of degrees.
(4) Turn the conduit 180 degrees and align the second mark with the arrow and bend to the same number of degrees as the first bend.
(5) Check the offset by sliding the conduit into the box connector. When placed against a flat surface the 2-inch constant should be parallel to the surface.
(6) The offset should not be doglegged. This can occur if the conduit was not turned exactly 180 degrees before making the second bend or if the handle of the bender was not pulled straight back when making the bend.

h. Bend a saddle:
(1) A saddle requires three bends. The A bend (first bend) is aligned with the rim notch on the bender and is bent to 45 degrees. The B and C bends are bent on the arrow and are bent to 22-1/2 degrees.
(2) Measure from the committed end to the center of the obstacle to be cleared.
(3) Starting at the committed end, measure and mark the same distance on the conduit.
(4) Measure the saddle depth: the distance from the surface the obstacle is against to the top of the obstacle. Round off fractions to the nearest whole number.
(5) Rotate the conduit 180 degrees and place it in the bender aligning the B mark with the arrow and the TOE towards the A bend. Bend the conduit 22-1/2 degrees then move the bender to the C mark on the conduit with the toe towards the A bend, align with the arrow and bend the conduit 22-1/2 degrees.
(6) To bend the saddle, align the A mark on the conduit with the rim notch of the bender and bend to 45 degrees.
(7) Check the saddle bend.
(a) The center of the A bend should be over the exact center of the obstacle.
(b) The saddle may be flush against the obstacle or up to a maximum of 1/2-inch away.
(c) The B and C bends must rest on the surface the obstacle is attached to.

i. Perform angle bends:
(1) Measure and mark the conduit where you want the angle.
(2) Align the conduit with the arrow on the bender and bend the required number of degrees.
(3) Angle bends must be aligned with other bends already in the run.

j. Perform right angle or 90-degree bend:
(1) The two types of 90-degree bends are the regular 90 degrees and the stub 90 degrees. They are measured differently and bent on different marks. There are two methods of determining where to mark on the conduit for bending a regular 90-degree bend.
(2) The 90-degree bend:
(a) Measure from a reference point to the point where the bend is to be made.
(b) Hold the conduit in place, keeping it level and against the surface, measure from the reference point the same distance along the conduit.
(c) Draw an arrow on the conduit approximately 8 inches away from the mark towards the noncommitted end and pointing in the direction the conduit will be bent.
(d) Place the conduit in the bender with the bender TOE pointing toward the noncommitted end of the conduit and the arrow that was drawn on the conduit pointing up. Align the mark with the star and bend to 90 degrees.
(3) The telescopic method requires two installers and a straight piece of conduit.
(a) Hold the conduit level against the surface and put a piece of straight conduit into the box connector where the bend is to terminate.
(b) Make sure both pieces of conduit are plumb and mark on the outside where the two pieces intersect.
(c) Draw an arrow on the conduit, as a reminder as which way to bend, towards the noncommitted end and pointing in the direction of the bend.

Performance Steps

(d) Place the conduit in the bender with the bender TOE pointing toward the noncommitted end and the arrow that was drawn on the conduit pointing up. Align the mark with the star and bend it 90 degrees.
(e) If the conduit must be bent with the bender toe pointed towards the committed end, you must compensate for the gain that will occur.
(f) Check the bend with a framing square or level to ensure that it is exactly 90 degrees.

(4) Stub 90-degree bends are used where space is limited.
(a) The distance from the end of the conduit to the back of the 90-degree bend is called the stub length or simply the stub. Part of this length is made up of the bender take up and the rest is the constant.
(b) The size of the take-up and the constant depends on the type and size of the conduit. For 1/2-inch EMT the take-up is always 5-inches and the constant is always 2-inches.
(c) Mark a 2-inch constant at the end of the conduit. This is the only mark you make.
(d) Align the mark with the arrow and bend to 90 degrees. Check for accuracy in the same manner as the regular 90-degree bend.

k. The kick out is a bend used with the stub 90 degrees in place of the offset.
(1) Place the bender on the conduit just before the bend, between the stub 90 degrees and the committed end of the conduit. The toe should point towards the stub 90 degrees.
(2) Slide the bender up the conduit toward the stub 90 degrees until it begins to bind on the stub.
(3) Back the bender off about an 1/8-inch and mark the conduit along the toe of the bender. This mark will allow the bender to be placed in the original position, in case the "kick out" has to be adjusted.
(4) Bend the conduit and check the kick out depth.

l. A back-to-back 90-degree bend is two adjacent 90 degree bends that are bent as described above. If one of the bends is a stub 90 degrees, make it first.

16. Measure conduit runs.
a. The installer should determine the total length of the conduit run before making any bends. The total length is the distance of the run plus any shrinkage and minus any gains.
b. The formula for measuring conduit for a particular run is:
Rough Horizontal Length (RHL) + Rough Vertical Length (RVL) = Total Rough Length (TRL) + Shrinkage - Gain = Final length
c. All measurements are made on the outside of the conduit run. Fractions will be calculated to a 16th of an inch, until the final length is determined.
d. Determine the RHL:
(1) Measure from the outside of the utility box to a horizontal reference point. (Example: 17 - 8/16" from the wall.)
(2) Measure from the outside edge of the run to the same reference point. (Example: 42 - 15/16" from the wall).
(3) Subtract the smaller from the larger measurement to get the RHL. (Example: 42 - 15/16" -- 17 - 8/16" = 25 - 7/16" is the RHL.)
e. Determine the RVL:
(1) Measure from the top of the last utility box to a vertical reference point. (Example: 36 -6/16" from the ceiling).
(2) Measure from the top (outside) of the horizontal part of the run to the same reference point. (Example: 12 - 4/16" from the ceiling.)
(3) Subtract the smaller measurement from the larger to get the RVL. (Example: 36 - 6/16" – 12 - 4/16" = 24 - 2/16" is the RVL.)
f. Determine the TRL: Add the RVL and the RHL to get the TRL (Example: 25 - 7/16" + 24 -2/16" = 49 9/16" is the TRL.)
g. Determine the total shrinkage of the run:

Performance Steps

(1) In the example, there are two offset bends that result in shrinkage, offsets A and B. Using Table 9-1 to determine the shrinkage for each. (Example: 1-3/4" = 3/8 or 6/16" shrinkage and 3-7/16" = 9/16" shrinkage.)

(2) Add all the shrinkages:

OFFSET DEPTH	SHRINKAGE
A = 1-12/16"	6/16"
B = 3-7/16"	9/16"

6/16" + 9/16" = 15/16" (Total Shrinkage)

(3) Add the total shrinkage to the TRL 49-9/16" TRL + 15/16" (shrinkage) = 49-24/16."

h. Determine the total gain of the run:

(1) Only 90 degree bends have gain and in this example there is one 90 degree bend.

(2) Subtract the gain from the previous total: TRL 49-24/16" - Gain of 2-10/16" = 47-14/16" or 47-7/8 inches. This is the total length of the conduit run.

i. Measure total length for back-to-back 90degree bends.

(1) The total length of back-to-back 90 degree bends is measured the same except 14 inches must be added to the RVL. Refer back to the stub 90 degree, the 2-inch constant and 5-inch bender take-up comes to a total of 7-inches. The two 90 degree bends; therefore, will require an additional 14 inches (7" + 7" = 14").

(2) Calculate all shrinkage and gains. The formula for back-to-back 90 degree bends will then be: RHL + RVL + 14 inches = TRL) + Shrinkage - Gain = Final length.

(3) In the example:

(a) RHL = 34-6/16" - 7-4/16" = 27-2/16."

(b) RVL = 35-8/16" - 14" = 21-8/16."

(c) TRL = 27-2/16" (RHL) + 21-8/16" (RVL) + 14" = 62-10/16."

(d) Shrinkage from Table 9-1 for offset "C" of one inch equals 3/16 inch, plus offset "D" of half inch is 0, for a total of 3/16 inch shrinkage.

(e) The gain for 1/2" conduit is 2-5/8 inches, times two bends equal, 5-2/8" or 5-4/16" total gain.

(f) Final length = 62-10/16 + 3/16" Shrinkage - 5-4/16" Gains = 57-9/16."

Performance Measures	GO	NO-GO
1. Identified the purpose of conduit.	____	____
2. Identified types of conduit.	____	____
3. Identified rules for conduit Installation.	____	____
4. Identified conduit cutting tools.	____	____
5. Cut conduit.	____	____
6. Identified conduit bodies.	____	____
7. Identified utility boxes.	____	____
8. Installed conduit boxes and bodies.	____	____
9. Identified conduit couplings.	____	____
10. Installed box connectors.	____	____
11. Installed pipe clamps or conduit hangers.	____	____
12. Removed knockouts to install conduit.	____	____
13. Identified conduit bends.	____	____

Performance Measures	GO	NO-GO
14. Identified types of conduit benders.	____	____
15. Bent conduit.	____	____
16. Measured conduit runs.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
The National Electric Code (NEC)	

Skill Level 2

Subject Area 9: CABLE AND EQUIPMENT SUPERVISION

SUPERVISE RECOVERY OF CABLE/WIRE SYSTEMS
113-588-7005

Conditions: Given a telephone cable or wire line, pre-installed; reel unit RL-31( ) (can be vehicle mounted); empty reel; tool equipment TE-33; gloves; an assistant, as required; and TC 24-20

Standards: Supervised the recovery the telephone cable or wire.

Performance Steps

(Refer to TC 24-20 for all performance steps.)

1. Coordinate disconnection of telephone cable from terminal equipment.
2. Verify removal of all wire tags and position line along the side of the recovery route.
3. Supervise the removal of cable from all aerial constructions.
4. Ensure removal of buried wire.
5. Supervise the recovery of telephone cable.

Performance Measures	GO	NO-GO
1. Coordinated disconnection of telephone cable from terminal equipment.	____	____
2. Verified removal of all wire tags and positioned line along the side of the recovery route.	____	____
3. Supervised the removal of cable from all aerial constructions.	____	____
4. Ensured removal of buried wire.	____	____
5. Supervised the recovery of telephone cable.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-3895-202-13	
TM 11-5995-208-10	

SUPERVISE TROUBLESHOOTING OF CABLE/WIRE SYSTEMS
113-588-7006

Conditions: Given an individual(s) a telephone cable or wire line, pre-installed; reel unit RL-31( ) (can be vehicle mounted); tool equipment TE-33; gloves; test equipment; assistant, as required; and TC 24-20.

Standards: Supervised troubleshooting the cable/wire system, identifying the problem, correcting the fault(s), and reestablishing communications.

Performance Steps

1. Verify that trouble exists.
2. Supervise troubleshooting the cable/wire system.
3. Ensure malfunction(s) are identified.
4. Ensure corrective actions are taken.
5. Supervise the reestablishment of communications.

Performance Measures	GO	NO-GO
1. Verified that the trouble exists.	____	____
2. Supervised troubleshooting the cable/wire system.	____	____
3. Ensured malfunction(s) are identified.	____	____
4. Ensured corrective actions are taken.	____	____
5. Supervised the reestablishment of communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-3895-202-13	
TM 11-5995-208-10	

SUPERVISE INSTALLATION OF CABLE/WIRE SYSTEMS
113-588-7012

Conditions: Given telephone cable CX-1230, CX-4566, CX-13295, WD-1/TT or WF-16/U, a cable team, tools, equipment, TC 24-20, TM 11-3895-202-13, TM 11-5805-201-12, and TM 11-5995-208-10.

Standards: Supervised the procedures for installing a cable system.

Performance Steps

1. Spot check the pre-installation checks on the telephone cable and wire.
2. Coordinate the installation of the surface cable and wire.
3. Verify that the installation of the aerial telephone cable or wire road crossing was to standard in accordance with TC 24-20.
4. Inspect the installed buried telephone cable or wire crossing.
5. Perform operational test. (Refer to TC 24-20)
6. Ensure that communications were established.

Performance Measures	GO	NO-GO
1. Spot checked the pre-installation checks on the telephone cable and wire.	____	____
2. Coordinated the installation of the surface cable and wire.	____	____
3. Verified that the installation of the aerial telephone cable or wire road crossing was to standard in accordance with TC 24-20.	____	____
4. Inspected the installed buried telephone cable crossing.	____	____
5. Performed operational test.	____	____
6. Ensured that communications were established.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	
TM 11-3895-202-13	
TM 11-5805-201-12	
TM 11-5995-208-10	

SUPERVISE SPLICING OF COMMERCIAL FIBER OPTIC CABLE
113-632-9014

Conditions: Given a cable team, section of fiber optic cable, splicer's hand tools, cleaving tools, polishing adapter, reagent alcohol, microscope, mechanical splice workstation equipment, Norland optical adhesive, Fiberlok 2501 assembly tool, fiber optic fusion splicer, safety glasses, and manufacture instructional manuals.

Standards: Detected a failure, isolated and restored to an operational state.

Performance Steps

1. Verify that the trouble exists.
2. Supervise troubleshooting the fiber cable in accordance with the user manual.
3. Ensure malfunction(s) are identified.
4. Ensure corrective actions are taken.
5. Supervise the reestablishment of communications.

Performance Measures	GO	NO-GO
1. Verified that the trouble exists.	____	____
2. Supervised troubleshooting the fiber cable in accordance with the user manual.	____	____
3. Ensured malfunction(s) are identified.	____	____
4. Ensured corrective actions are taken.	____	____
5. Supervised the reestablishment of communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

SUPERVISE UNIT LEVEL MAINTENANCE (ULM) ON TEST SETS 113-574-7014

Conditions: Given telephone test sets AN/GTM-12, TS-3647/G, or TS-4117( )/G, 4-inch flat-tip screwdriver, dust brush, cleaning rags, DA Form 2404, DA Form 2408-14, DA Pam 750-8, TM 11-6625-3292-12, TM 6625-3227-13&P, and TM 11-5805-703-14.

Standards: Supervised individuals performing ULM, completed DA Form 2404 and DA Form 2408-14, and the telephone test set was operational; or evacuated defective test set to a higher maintenance level.

Performance Steps

1. Ensure that DA Form 2404 and DA Form 2408-14 are available. (Refer to DA Pam 750-8.)
2. Supervise routine checks.
   a. Clean, wash, and dust.
   b. Check for frayed cables, broken connectors, or bent pins.
   c. Inspect case and cover for visible damage.
   d. Inspect battery case or power source for broken wires or damaged connectors.
   e. Tighten loose screws.
3. Verify that DA Form 2404 and DA Form 2408-14 have been completed. (Refer to DA Pam 750-8.)

Note: Ensure to read all WARNINGS and NOTES applied to each test set in their designated TM.

Performance Measures	GO	NO-GO
1. Ensured that DA Form 2404 and DA Form 2408-14 were available.	____	____
2. Supervised routine checks.	____	____
3. Verified that DA Form 2404 and DA Form 2408-14 have been completed.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-5805-703-14	
TM 11-6625-3227-13&P	
TM 11-6625-3292-12	

SUPERVISE INSTALLATION OF MULTIPLEXERS
113-606-7026

Conditions: Given a cable team/squad, multiplexer TD-1233(P)/TTC and multiplexer-combiner TD-1234(P)/TTC, cable CX-11230A/U, power cords, assorted circuit card assemblies (CCAs), TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Supervised that all equipment was powered up and the system was Green.

Performance Steps

1. Verify connection of the ground, power cables, and CX-11230A/U.
2. Check all CCA switches for correct configuration.
3. Ensure power is on for equipment.
4. Check for fault light(s) on TD-1233(P)/TTC, TD-1234(P)/TTC, and CCAs.
5. Ensure power is turned off properly.

Performance Measures	GO	NO-GO
1. Verified connection of the ground, power cables, and CX-11230A/U.	____	____
2. Checked all CCA switches for correct configuration.	____	____
3. Ensured power was on for equipment.	____	____
4. Checked for fault light(s) on TD-1233(P)/TTC, TD-1234(P)/TTC, and CCAs.	____	____
5. Ensured power was turned off properly.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-706-12	
TM 11-5805-707-12	

SUPERVISE TROUBLESHOOTING OF MULTIPLEXERS
113-606-7027

Conditions: Given individual(s), multiplexer TD-1233(P)/TTC or multiplexer-combiner TD-1234(P)/ TTC, cable CX-11230A/G, telephone set(s) TA-838/TT or equivalent, DNVT, TA-1042 or equivalent, telephone cable WF-16/U, power cord; batteries BA-30 or BA-3042 for TA-838/TT or equivalent; assorted circuit card assemblies (CCAs); TC 24-20; TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Supervised that the individual(s) corrected the fault and reestablished communications.

Performance Steps

(Refer to Troubleshooting Flowcharts in TM 11-5805-706-12 for the TD-1233(P)/TTC and to TM 11-5805-707-12 for the TD-1234(P)/TTC for all performance steps.)

1. Verify that all CCA switches are in the correct configuration.
2. Verify that the problem has been determined.
3. Ensure that the self-test has been initiated.
4. Verify that the fault has been localized.
5. Ensure the fault has been corrected or the defective equipment has been replaced.
6. Verify that communications have been reestablished.

Performance Measures	GO	NO-GO
1. Verified that all CCA switches were in the correct configuration.	____	____
2. Verified that the problem had been determined.	____	____
3. Ensured that the self-test had been initiated.	____	____
4. Verified that the fault had been localized.	____	____
5. Ensured the fault had been corrected or the defective equipment had been replaced.	____	____
6. Verified that communications had been reestablished.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	TM 11-5805-384-12
TM 11-5805-706-12	TM 11-5805-650-12
TM 11-5805-707-12	TM 11-5805-703-14
	TM 11-5995-208-10

SUPERVISE UNIT LEVEL MAINTENANCE (ULM) ON MULTIPLEXERS
113-606-7028

Conditions: Given individual(s), multiplexer TD-1233(P)/TTC and multiplexer-combiner TD-1234(P)/TTC, flat-tip screwdriver, dust brush and cleaning rags, trichlorotrifluoroethane, DA Form 2404, DA Form 2408-14, DA Pam 750-8, TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Supervised that the individual(s) performed ULM, completed DA Form 2404 and DA Form 2408-14, and the equipment was operational; or evacuated the defective equipment to a higher maintenance level.

Performance Steps

1. Ensure that DA Form 2404 is initiated. (Refer to DA Pam 750-8.)
2. Verify that routine checks on the TD-1233(P)/TTC or the TD-1234(P)/TTC have been performed.
3. Verify that the power is on.
4. Ensure that the BITE test is performed.
5. Verify that DA Form 2404 and DA Form 2408-14 have been completed. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Ensured that DA Form 2404 was initiated.	____	____
2. Verified that routine checks on the TD-1233(P)/TTC or the TD-1234(P)/TTC had been performed.	____	____
3. Verified that the power was on.	____	____
4. Ensured that the BITE test was performed.	____	____
5. Verified that DA Form 2404 and DA Form 2408-14 had been completed.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 11-5805-706-12	
TM 11-5805-707-12	

Subject Area 10: TELEPHONE SETS SUPERVISION

SUPERVISE INSTALLATION OF KY-68
113-600-7042

Conditions: Given a cable team, a digital subscriber voice terminal (DSVT), TSEC/KY-68, telephone cable WF-16/U, variable loading device, battery BA-1372, multiplexing unit, TM 11-5810-292-13&P, TM 11-5810-329-10, TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Team Chief verified that cable team members had placed a secure call for the originating station to a receiving station.

Performance Steps

1. Verify the installation of battery.

   Note: Replace battery BA-1372 or BA-5372 every six months.

2. Coordinate the installation of the DSVT TSEC/KY-68 using telephone cable WF-16/U to connect to the TD-1233(P)/TTC or the TD-1234(P)/TTC.
3. Spot check the grounding of the DVST TSEC/KY-68.
4. Supervise loading variables into the DSVT TSEC/KY-68.
   a. KYK-13/TSEC.
   b. KYK-15/15A.
   c. AN/CYX-10.
5. Supervise the operation of the DSVT TSEC/KY-68 to initiate an outgoing secure call.

Performance Measures	GO	NO-GO
1. Verified the installation of battery.	____	____
2. Coordinated the installation of the DSVT TSEC/KY-68 using telephone cable WF-16/U to connect to the TD-1233(P)/TTC or the TD-1234(P)/TTC.	____	____
3. Spot checked the grounding of the DVST TSEC/KY-68.	____	____
4. Supervised loading variables into the DSVT TSEC/KY-68.	____	____
5. Supervised the operation of the DSVT TSEC/KY-68 to initiate an outgoing secure call.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-706-12	DA Pam 25-380-2
TM 11-5805-707-12	TB 380-41
TM 11-5810-292-13&P	
TM 11-5810-329-10	

SUPERVISE TROUBLESHOOTING OF KY-68
113-600-7043

Conditions: Given a digital subscriber voice terminal (DSVT) TSEC/KY-68, telephone cable WF-16/U, multiplexer TD-1233(P)/TTC, multiplexer combiner TD-1234(P)/TTC, radio repeater set AN/TRC-138A, radio terminal set AN/GRC-173, radio repeater set AN/TRC-174, radio terminal set AN/TRC-175, battery BA-1372 (1 each), TM 11-5810-329-10, TM 11-5820-864-12-1, TM 11-5820-865-12-1, TM 11-5820-926-12-1, and TM 11-5820-931-12-1.

Note 1: The unkeyed DSVT TSEC/KY-68 is classified CONFIDENTIAL. It should be handled properly.

Note 2: The DSVT TSEC/KY-68 is loaded with variables for the PMs.

Standards: Performed troubleshooting of the DSVT TSEC/KY-68, identified the problem, corrected the fault(s), and reestablished communications in accordance with the PMs.

Performance Steps

1. Verify that the trouble exists.
2. Verify that the KY-68 is getting power. (Refer to TM 11-5810-329-10.)
3. Supervise troubleshooting the DSVT TSEC/KY-68 system. (Refer to TM 11-5810-329-10.)
4. Ensure malfunction(s) are identified.
5. Ensure corrective actions are taken. (Refer to TM 11-5810-329-10.)
6. Supervise the reestablishment of communications.

Performance Measures	GO	NO-GO
1. Verified that the trouble existed.	____	____
2. Verified that the KY-68 was getting power.	____	____
3. Supervised troubleshooting the DSVT TSEC/KY-68 system.	____	____
4. Ensured malfunction(s) were identified.	____	____
5. Ensured corrective actions were taken.	____	____
6. Supervised the reestablishment of communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-329-10	AR 380-40
TM 11-5820-864-12-1	DA Pam 25-380-2
TM 11-5820-865-12-1	TB 380-41
TM 11-5820-926-12-1	TM 11-5810-292-13&P
TM 11-5820-931-12-1	

Subject Area 11: LAN/WAN SUBSTATION SUPERVISION

SUPERVISE INSTALLATION OF LOCAL AREA NETWORK/WIDE AREA NETWORK (LAN/WAN) SUBSTATION DISTRIBUTION SYSTEM
113-588-7003

Conditions: Given a minimum of two computers, network interface cards (NICs), Ethernet cables 802.3 (10 base 2 or 10 base T), a communications software package with software reference manuals, approved user code and/or password (as required), transceiver, router, established plan/layout, and user request.

Standards: Supervised the installation of a LAN/WAN and that data can be sent and received between system computers.

Performance Steps

1. Supervise preparation of site and equipment.
   a. Check LAN client requirements.
   b. Check LAN transmission type.
   c. Ensure all equipment is on hand.
   d. Ensure personnel follow manufacturer's reference manual(s).
   e. Oversee installation of the NIC.
   f. Verify that installation of data communications system will not violate personal computer (PC) maintenance contracts.
2. Ensure personnel connect specified cables to the NIC.
3. Ensure personnel connect the data communications systems starting with one PC connecting to the router.
4. Repeat step 3 for other PC(s).
5. Oversee start of hyper terminal session.
6. Ensure personnel configure the hyper terminal software according to communications software reference manuals.
7. Ensure personnel configure router and its interfaces.

Performance Measures	GO	NO-GO
1. Supervised preparation of site and equipment.	____	____
2. Ensured personnel connect specified cables to the NIC.	____	____
3. Ensured personnel connect the data communications systems starting with one PC connecting to the router.	____	____
4. Repeated step 3 for other PC(s).	____	____
5. Oversaw start of hyper terminal session.	____	____
6. Ensured personnel configure the hyper terminal software according to communications software reference manuals.	____	____
7. Ensured personnel configure router and its interfaces.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
AR 25-2	
Manufacturer's Manuals	

SUPERVISE TROUBLESHOOTING OF LOCAL AREA NETWORK/WIDE AREA NETWORK (LAN/WAN) SUBSTATION DISTRIBUTION SYSTEM
113-588-7007

Conditions: Given a pre-existing LAN or WAN substation distribution system, ohmmeter spectrum analyzer, TDR, loss test set/power meter, optical fault finder, network documents, and manufacturer's instruction booklets.

Standards: Performed troubleshooting of a pre-existing LAN or WAN substation distribution system, identified the problem, corrected the fault(s), and reestablished communications.

Performance Steps

1. Verify that the trouble exists.
   a. Ensure Soldiers visual inspect the cable.
   b. Ensure Soldiers test the cable according to type.
2. Identify fault.
3. Isolate fault.
4. Repair fault.
5. Restore communications.

Performance Measures	GO	NO-GO
1. Verified that the trouble exists.	____	____
2. Identified fault.	____	____
3. Isolated fault.	____	____
4. Repaired fault.	____	____
5. Restored communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
AR 25-2	
Manufacturer's Manuals	

Skill Level 3

Subject Area 12: CABLE AND EQUIPMENT INSPECTION

INSPECT INSTALLATION OF AC/DC POWER SOURCE FOR COMMUNICATIONS EQUIPMENT
113-588-7001

Conditions: Given installed AC or DC circuit, proper test equipment, the National Electric Code (NEC), and the engineering installation package (EIP).

Standards: Correctly inspected for correct installation of AC/DC circuits in accordance with the NEC and the EIP.

Performance Steps

1. Inspect AC power distribution system.
    a. Inspect line feeders from service pole to service entry panel (SEP).
    b. Inspect branch feeders from SEP to the distribution panel.
    c. Inspect single phase 3-wire and feeder color code.
        (1) L-1- Hot - Black
        (2) L-2 - Hot - Black

Note: L-2 must be temporarily marked to distinguish L-1 from L-2.

        (3) Neutral - White or Gray
        (4) Ground - Green
    d. Inspect three phase four-wire branch feeder code.
        (1) L-1 - Hot - Black
        (2) L-2 - Hot - Black

Note: Conductor should be permanently marked at each end with red colored tape.

        (3) L-3 Hot - Black

Note: Conductor should be permanently marked at each end with blue colored tape.

        (4) Neutral - White or Gray
        (5) Ground - Green
    e. Inspect SEP.
        (1) Inspect that the neutral and protective ground feeder buss are both terminated at the SEP.
        (2) Inspect that the protective ground feeder originates at the common buss of the SEP.
2. Inspect the distribution panel.
    a. Inspect panel arrangement of the buss bars.
        (1) Single phase.
            (a) L-1 leg serves circuit breakers 1 & 2, 5 & 6, 9 & 10 etc.
            (b) L-2 leg serves circuit breakers 3 & 4, 7 & 8, 11 & 12 etc.
        (2) Three phase.
            (a) L-1 leg serves circuit breakers 1 & 2, 7 & 8, 13 & 14, etc.
            (b) L-2 leg serves circuit breakers 3 & 4, 9 & 10, 15 & 16, etc.
            (c) L-3 leg serves circuit breakers 5 & 6, 11&12, 17&18, etc.
    b. Inspect the ground buss bar to ensure it is properly bonded to the panel chassis.

Performance Steps

c. Inspect neutral buss bar to ensure it is insulated from the panel chassis and the protective ground.
d. Inspect the numbering of the circuit breakers.

Note: Circuit breakers are counted from left to right and top to bottom and visualized as if mounted in the vertical position regardless of how it is actually mounted.

3. Inspect the branch circuits.
   a. Ensure no smaller than 14 AWG.
   b. Ensure conductors are only used in one branch circuit or device.
   c. Inspect for compliance with NEC and MIL-STD 188-124B on the number of conductors in a conduit.
   d. Check the branch circuit color code for single phase AC.
      (1) L-1 - Hot - Black
      (2) L-2 - Hot - Black
      (3) Neutral - White or Gray
      (4) Ground - Green
   e. Check the branch circuit color code for three phase AC.
      (1) Phase A - Black
      (2) Phase B - Red
      (3) Phase D - Blue
      (4) Neutral - White or Gray
      (5) Ground - Green
   f. Ensure conduit and boxes are not used as protective ground circuit in branch circuit.

Note: When terminating 240 V AC, single-phase, 3-wire, where the hot conductors are all black, the L-2 conductor must be identified at the terminating location a label.

4. Inspect electrical devices.
   a. Inspect circuit protection devices.
      (1) Ensure correct type of fuse is in use.
         (a) Plug type has lowest amperage rating (0-30).

Note: There are four types: standard, time delay, S-type, and circuit breaker.

         (b) Cartridge fuses increase in amperage rating with size.

Note 1: This does not eliminate the possible replacement with the wrong amperage.

Note 2: There are two types: ferrule contact (30-60 amps) and knife blade contact (60+ amps).

      (2) Inspect circuit breakers for correct function.

Note: Three types of circuit breakers: single pole, double-pole, and triple-pole.

      (3) Inspect the ground fault circuit interrupter (GFCI) if used. Must be used within 6 feet of any water source. One can control more than one receptacle.
   b. Inspect receptacles.
      (1) Inspect rating for correct amperage and voltage.
      (2) Inspect that receptacles do not have lower amperage rating than the branch circuit it is installed with.
      (3) Inspect receptacles for mounting with ground screw in up position.
      (4) Inspect receptacle color codes.
         (a) The BRASS colored screw is used for HOT.
         (b) The SILVER colored screw is used for NEUTRAL.
         (c) The GREEN colored screw is used for GROUND.

Performance Steps

c. Inspect switches.
   (1) Check general use switches for correct operation.
   (2) Check single-throw switches for correct operation.
   (3) Check three-way switches for correct operation.
   (4) Check four-way switches for correct operation. (Used with three-way switches to provide additional control point.)
   (5) Check double-throw switches for correct operation. (Usually located at or near the entry panel to control power source or polarity changes.)

d. Inspect that incandescent light fixtures prevent contact with HOT terminal.

5. Inspect wiring in the conduit.
   a. Check wiring diagrams (drawings) for correct connection, size, and number of connectors.
   b. Check for proper identification markings on boxes, spools, and conductors.

6. Inspect wiring boxes and electrical devices.
   a. Check that number of splices per box does not exceed maximum.
   b. Check for correct type of splice.

7. Inspect for correct grounding rule use.

8. Inspect for correct mounting of electrical boxes.

9. Inspect for correct termination conductor on the device.

10. Inspect for correct performance of quality control checks.

11. Inspect for correct switch installation.
   a. Check single-pole-single-throw toggle switch installation.
      (1) Ensure only hot conductors are wired to switches.
      (2) Check that one side of switch is connected to source and the other side is connected to the device.
      (3) Check that neutral conductor is NEVER connected to switches.
      (4) Check that the ground conductor is properly connected to the device.
   b. Check double-throw switch installation.
      (1) Check that the hot (L-1, L-2) is connected to the switch with black colored conductor.
      (2) Check that the device is connected to the L-1 side of the switch with a black colored conductor.
      (3) Check that the neutral conductor is connected to the designated neutral buss bar position at the distribution panel and routed directly to the device through the conduit.
      (4) Check that the ground conductor is connected to the designated position on the ground buss bar at the distribution panel and routed through the conduit.
   c. Check three-way switch installation.
      (1) Check that the first terminal is wired to the source.
      (2) Check that both traveler terminals of the first switch traveler terminals with a hot connector.
      (3) Check that the common terminal of the second switch is connected to hot terminal of the device to be controlled.
      (4) Check that the neutral conductor is connected to the designated position on the neutral buss bar at the distribution panel and routed through the conduit to all devices requiring neutral connection for that branch circuit.
      (5) Check the ground conductor to ensure it is terminated to the designated position on the ground buss bar at the distribution panel and routed through the conduit following all of the grounding rules.
   d. Check four-way switch network.
      (1) Check connection of the common terminal of a three-way switch to the designated circuit breaker.
      (2) Check connection of the traveler terminals for correctness.

Performance Steps

(3) Check for correct connection of the common terminal of the second three-way switch to the device.
(4) Check the neutral conductor for connection to the designated position on the neutral buss bar of the distribution panel and routed through the conduit to all devices requiring neutral in the branch circuit.
(5) Check the ground conductor for correct termination to the designated position on the ground buss bar of the distribution panel and routed through the conduit following all grounding rules.

e. Check wiring of 120 V AC duplex receptacles with one or both receptacles switched.
(1) Check for connection of the common terminal of single-throw switch with an insulated conductor from the source.
(2) Check that TAB #1on the receptacle for the two brass terminals is broken (removed) when switching only one receptacle.

Note: TAB #1 must be intact when switching both receptacles.

(a) Check connection of the other common terminal on the switch to the common terminal on the duplex receptacle.
(b) Check for broken tab if only one receptacle is to be switched. Then connect the second hot wire from the source to the second terminal on the receptacle to provide unswitched power.
(c) Check that tab is unbroken if both receptacles are to be switched.
(3) Check that silver terminal screw is connected to the neutral conductor.
(4) Check that the silver tab is intact regardless of being switched or unswitched to provide neutral for the second silver terminal on the second receptacle.
(5) Check that the green ground terminal in connected with the green insulated conductor.

f. Check wiring of a 120/240 V AC duplex receptacle. (both receptacles unswitched)
(1) Ensure that the source (L-1) that originates from the circuit breaker or a previous outlet splices connected to the brass terminal screw on the receptacle.
(2) Check that the TAB is unbroken which provides 120 V AC to the first receptacle terminal.
(3) Check the source (L-2) to ensure it is connected to the opposite brass terminal to provide the second leg for the 240 V AC receptacle.

Note: This receptacle MUST be identified as L-2.

(4) Check the silver terminal screw for connection to the neutral insulated conductor originating at the neutral buss bar or a splice form a previous outlet. Only the 120 V AC receptacle requires the neutral conductor.
(5) Check to ensure there is no tab at the neutral terminal. If there is a tab, it must be removed.
(6) Check the green terminal screw for connection to the green insulated conductor.

g. Check wiring of 120/240 V AC duplex receptacle. (switched)
(1) Check that the brass terminal screw is used to terminate the switched conductor.
(2) Check that the TAB is broken.
(3) Check that the other brass terminal screw is used to terminate the unswitched insulated conductor.
(4) Check that the silver terminal screw is used to terminate the neutral insulated conductor.
(5) Check that there is NO tab at the silver terminal screw.
(6) Check that the brass terminal screw is used to terminate the unswitched insulated conductor.
(7) Check that the green terminal screw is used to terminate the ground insulated conductor.

12. Inspect the dress and terminate conductors in a distribution panel.
a. Check that the conductors are routed in the most direct path.
(1) Check that feeder paths are never crossed with branch circuit conductors.
(2) Check that conductors are dressed to the back of the panel.

Performance Steps

(3) Check that when conductor reaches the termination point it is bent 90-degrees to lift the conductor from the back of the panel toward the termination point.

13. Inspect that the distribution panel is correctly labeled.
14. Inspect for evidence that AC safety measures were used during installation.
15. Inspect DC power.
    a. Check DC power components for correctness.
        (1) Check that each rectifier-charger has the capacity to assume full load if one fails.
        (2) Check for correct inverters.
        (3) Check the station battery bank (if available) for correct filters for removing AC components (ripple) from the DC voltage.
        (4) Check the DC power distribution system to ensure it consists of conductors, buss bars, circuit breakers, filters, control panels, and fuse panels.
        (5) Check the converter (if required) for conversion to 48 Volts direct current (VDC) into other DC voltages.
16. Inspect the DC power wiring color code for correctness.
    a. Single voltage arrangement:
        (1) Check that black = HOT
        (2) Check that white = RETURN
        (3) Check that yellow = REFERENCE
    b. Dual voltage arrangement:
        (1) Check that red = PLUS
        (2) Check that black - HOT
        (3) Check that white = COMMON RETURN
        (4) Check that yellow = REFERENCE
17. Inspect the battery racks for correct installation IAW the EIP and that the protective coating was not removed from the racks.
18. Inspect battery storage areas for proper safety measures.
19. Inspect the basic design of DC power system for full capability.
    a. Check that each rectifier-charger is capable of assuming full load.
    b. Check for minimum voltage level to insure function of the DC powered equipment.
    c. Check for uninterruptible power supply (UPS) to provide power to equipment and subsystems in the event of a loss of primary power.
20. Inspect the work site for basic safety precautions.
    a. Check that supervisor does not participate in battery installation and constantly supervises.
    b. Check that a minimum of three personnel are present for any battery work.
    c. Check for evidence of safety briefings conducted daily. (Standing operating procedures (SOPs), sign-in rosters, etc.)
    d. Check for presence of eye wash area.
    e. Check for the presence of proper safety gear. (Face shield, gloves, apron, etc.)

Performance Measures	**GO**	**NO-GO**
1. Inspected AC power distribution system.	____	____
2. Inspected the distribution panel.	____	____
3. Inspected the branch circuits.	____	____
4. Inspected electrical devices.	____	____

Performance Measures	GO	NO-GO
5. Inspected wiring in the conduit.	____	____
6. Inspected wiring boxes and electrical devices.	____	____
7. Inspected for correct grounding rule use.	____	____
8. Inspected for correct mounting of electrical boxes.	____	____
9. Inspect for correct termination conductor on the device.	____	____
10. Inspected for correct performance of quality control checks.	____	____
11. Inspected for correct switch installation.	____	____
12. Inspected the dress and terminate conductors in the distribution panel.	____	____
13. Inspected that the distribution panel is correctly labeled.	____	____
14. Inspected for evidence that proper AC safety measures were used during installation.	____	____
15. Inspected DC power.	____	____
16. Inspected the DC power wiring color code for correctness.	____	____
17. Inspected the battery racks for correct installation in accordance with the EIP and that the protective coating was not removed from the racks.	____	____
18. Inspected the battery storage areas for proper safety measures.	____	____
19. Inspected the basic design of the DC power system for full capability.	____	____
20. Inspected the work site for basic safety precautions.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
AR 25-2	
Manufacturer's Manuals	
The National Electric Code (NEC)	

SUPERVISE BASIC SAFETY IN CABLE SYSTEMS INSTALLATION
113-588-7002

Conditions: Given a requirement for cable/wire installation; a team of Soldiers equipped with cable/wire, engineering installation package (EIP), cable route maps, and tools, MIL-STDs, LOIs, OPORDs, TMs, DA pamphlets and forms.

Note: This task is performed in a tactical or nontactical environment.

Standards: Supervised the installation of cable/wire systems in accordance with cable/wire diagrams and the EIP.

Performance Steps

1. Review the EIP and installation diagrams, equipment, and facility requirements for safety issues.
2. Supervise inspection of equipment.
   a. Take measures to control/eliminate any safety hazards.
   b. Review maintenance records for any hazards.
3. Supervise inspection of facility.
   a. Take measures to control/eliminate any safety hazards.
   b. Review maintenance records for any hazards.
4. Supervise cable installation performance to standard.
5. Fill out and submit any required safety reports as necessary.

Evaluation Preparation: Prior to testing: Have a team (minimum of two) of cable systems installer-maintainers available to install cable. Have all equipment reference material and forms available for use.

Brief Soldier: Tell the Soldier you will be evaluating him/her on their ability to supervise basic safety using the risk management process.

Performance Measures	GO	NO-GO
1. Reviewed EIP and installation diagrams, equipment, and facility requirements for safety issues.	____	____
2. Supervised inspection of equipment.	____	____
3. Supervised inspection of facility.	____	____
4. Supervised cable installation performance to standard.	____	____
5. Filled out and submitted any required safety reports as necessary.	____	____

Evaluation Guidance: Score the Soldier GO if all the PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are performed correctly.

References

Required	Related
AR 25-2	
Manufacturer's Manuals	

INSPECT INSTALLATION OF CABLE/WIRE SYSTEMS
113-588-7008

Conditions: Given a requirement for cable/wire systems installation using WD-1/TT, WF-16/U, or standard cable systems.

Standards: Inspected the installed procedures in accordance with TC 24-20, TM 11-3895-202-13, TM 11-5805-201-12, and manufacturer's reference material.

Performance Steps

1. Inspect pre-installation checks on the cable and wire system.
   a. Inspect reconnaissance findings.
   b. Inspect construction order.
   c. Inspect line route map.
   d. Inspect results of wire electrical test.
2. Inspect the installation of surface cable/wire.
   a. Inspect for appropriate slack (20 percent) along the line.
   b. Inspect ties.
      (1) Made at ground level.
      (2) Off the road and road shoulder.
      (3) Out of major traffic area inside buildings/offices.
3. Inspect the installation of aerial cable/wire road crossing was to standard in accordance with TC 24-20.
   a. Inspect that lines are tied securely at both ends of the aerial span.
   b. Inspect for 6 inches of sag for every 25 feet of span length.
   c. Inspect for minimum of 18 feet clearance over primary roads and 14 feet clearance over secondary roads.
4. Inspect installed buried cable/wire crossing.
   a. Inspect tagging.
      (1) Tag is approximately 6 inches from stake.
      (2) All lines are tagged at road, railroad, bridge, and aerial crossings.
      (3) Lines are tagged when wire changes construction technique (for example: surface to underground or surface to aerial).
   b. Inspect for enough slack/excess to replace existing wire.
5. Inspect operational test results.
   a. Ensure tests are completed on each reel/cable prior to installation.
      (1) As each new reel/cable is placed in service.
      (2) Before terminating to equipment.
   b. Ensure all test are within tolerance.
6. Inspect established communications.

Performance Measures	GO	NO-GO
1. Inspected the pre installation checks on the cable and wire system.	____	____
2. Inspected the installation of surface cable/wire.	____	____
3. Inspected the installation of aerial cable/wire road crossing.	____	____
4. Inspected the installed buried cable/wire crossing.	____	____

Performance Measures	GO	NO-GO
5. Inspected operational test results.	____	____
6. Inspected established communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
AR 25-2	
TC 24-20	
TM 11-3895-202-13	
TM 11-5805-201-12	
Manufacturer's Manuals	

INSPECT RECOVERY OF CABLE/WIRE SYSTEMS
113-588-7009

Conditions: Given a reeling machine RL-207/G, vehicle-mounted; tool equipment TE-21; tool equipment TE-33; field wire, field cable CX-11230 A/G, pre-installed; reels RC-453/G, reel equipment RL-31, CE-11, empty; telephone test set; hammer HM-1; shovel; gloves; eye protection; cargo truck M-1078, 2 1/2 ton light medium tactical vehicle; TC 24-20; TM 11-5995-208-10; TM 11-3895-203-15, 11-3895-202-13,and TM 11-3895-209-14.

Note: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in a chemical, biological, radiological, and nuclear (CBRN) environment.

Standards: Correctly inspected the recovery of the system.

Performance Steps

1. Inspect the recovery of wire or aerial field cable CX-11230 A/G.
    a. Wire.
        (1) Inspect wire to ensure all tags are removed.
        (2) Inspect wire to ensure all ties are untied.
        (3) Inspect serviceability of recovered wire.
            (a) Passes physical tests.
            (b) Passes electrical tests.
            (c) No more than 4 splices per 1/2 mile.
    b. Cable CX-11230 A/G.
        (1) Inspect all tags are removed.
        (2) Inspect for serviceability and cleanliness.
2. Inspect the recovery of buried wire or field cable CX-11230 A/G.
    a. Wire.
        (1) Inspect wire to ensure all tags are removed.
        (2) Inspect wire to ensure all ties are untied.
        (3) Inspect serviceability of recovered wire.
            (a) Passes physical tests.
            (b) Passes electrical tests.
            (c) No more than 4 splices per 1/2 mile.
    b. Cable CX-11230 A/G.
        (1) Inspect all tags are removed.
        (2) Inspect for serviceability and cleanliness.
3. Inspect the disconnection of connectors and replacement of the cap assembly on connectors.
4. Inspect the removal of pulse form restorers and tags.

Performance Measures	**GO**	**NO-GO**
1. Inspected the recovery of wire or aerial field cable CX-11230 A/G.	____	____
2. Inspected the recovery of buried wire or field cable CX-11230 A/G.	____	____
3. Inspected the disconnection of connectors and replacement of the cap assembly on connectors.	____	____

Performance Measures	GO	NO-GO
4. Inspected the removal of pulse form restorers and tags.	____	____
5. Inspected the recovery of field cable using reeling machine RL-207/G.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TC 24-20	TM 11-5805-701-12
TM 11-3895-202-13	TM 11-5805-702-12
TM 11-3895-203-15	TM 11-5805-703-14
TM 11-3895-209-14	TM 9-2320-209-10-1
TM 11-5995-208-10	

INSPECT TROUBLESHOOTING OF CABLE/WIRE SYSTEMS 113-588-7011

Conditions: Given an individual to perform the task on the FOTS terminal, two each; FOCA CX-13295( )/G; test set TS-4117( )/G (with battery); assistants; TM 11-6020-200-10, and TM 11-6625-3227-13&P.

Standards: Correctly inspected all identified and repaired faults and checked for reestablished communications in accordance with TMs.

Performance Steps

1. Inspect the testing procedures used to determine if trouble exists.
2. Inspect troubleshooting methods for the wire/cable IAW TMs.
3. Inspect the malfunctions that were identified.
4. Inspect to ensure corrective actions were taken.
5. Inspect the reestablishment of communications.

Performance Measures	GO	NO-GO
1. Inspected the testing procedures used to determine if trouble existed.	____	____
2. Inspected troubleshooting methods for the wire and cable IAW TMs.	____	____
3. Inspected the malfunctions that were identified.	____	____
4. Inspected to ensure corrective actions were taken.	____	____
5. Inspected the reestablishment of communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-6020-200-10	
TM 11-6625-3227-13&P	

INSPECT OPERATION OF FIBER OPTIC CABLE TEST SET 113-632-9009

Conditions: Given a fiber optic test set, team of cable installers, an EIP, section of cable to be inspected, DA form 2404 or computer generated DA-Form 5988-E (Equipment Inspection Maintenance Worksheet (EGA), and DA Pam 750-8.

Note: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in an CBRN environment.

Standards: Inspected operation of fiber optic test set.

Performance Steps

1. Inspect ULM on identified fiber optic test set.
   a. Inspect for appropriate TMs.
   b. Inspect completed maintenance forms.
2. Verify operation of test set.
   a. Check the TRANSMIT ADJUST knob clockwise to ensure a number greater than -30 on the digital display.
      (1) If -30 or greater, continue.
      (2) If less than -30, have Soldier clean connectors and retry until acceptable level is noted.
   b. Check the digital display for optical power level available to the RECEIVE port.
      (1) Greater than -30 means the test set is functioning correctly.
      (2) Less than -30 have Soldier clean and retry.

Note: Test set display must be zeroed at each test location prior to measuring attenuation so that test results are accurate.

3. Verify reference point of the ATTENUATION MODE.
4. Verify the results of cable test are recorded correctly.

Performance Measures	GO	NO-GO
1. Inspected ULM on identified fiber optic test set.	____	____
2. Verified operation of test set.	____	____
3. Verified the reference point of the ATTENUATION MODE.	____	____
4. Verified the results of the cable test were recorded correctly.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 5988-E	
DA Pam 750-8	

INSPECT SPLICING OF FIBER OPTIC CABLE ASSEMBLY (FOCA) CX-13295( )/G 113-632-9012

Conditions: Given a cable team with a section of fiber optic cable, splicer's hand tools, cleaving tools, polishing adapter, reagent alcohol, microscope, mechanical splice workstation equipment, Norland optical adhesive, Fiberlok 2501assembly tool, fiber optic fusion splicer, safety glasses, and manufacture instructional manuals.

Standards: Inspected the fiber optic cable for proper operation after splicing as indicated by manufacture instructional manuals and verified communications were restored.

Performance Steps

1. Inspect splicing technique used.
   a. Norland UVC optical splice.
   b. AMP optimate mechanical fiber optic splice.
   c. Fusion splicer.
   d. Fiberlok optical splice.
2. Inspect set up of workstation and equipment according to splicing technique.
3. Test operation of fiber cable for correct tolerance and operation.
4. Check for reestablishment of communications.

Performance Measures	GO	NO-GO
1. Inspected splicing techniques. a. Norland UVC optical splice. b. AMP optimate mechanical fiber optic splice. c. Fusion splicer. d. Fiberlok optical splice.	____	____
2. Inspected set up of workstation and equipment according to splicing technique.	____	____
3. Tested fiber optic cable for correct tolerance and operation.	____	____
4. Checked for reestablishment of communications.	____	____

Evaluation Guidance: Score the Soldier a GO is all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

INSPECT UNIT LEVEL MAINTENANCE (ULM) ON TEST SETS 113-574-9001

Conditions: Given a telephone test set, flat-tip screwdriver, DA Form 2404 or computer generated DA Form 5988-E, and DA Pam 750-8.

Note: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in an NBC environment.

Standards: Correctly inspected the ULM.

Performance Steps

1. Inspect ULM on identified test set.
2. Complete DA Form 2404 or computer generated DA Form 5988-E. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Inspected ULM on identified test set.	____	____
2. Inspected completed DA Form 2404 or computer generated DA Form 5988-E.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 5988-E	
DA Pam 750-8	

PLAN A TELEPHONE CABLE LINE
113-588-5007

Conditions: Given grid map sheets covering the area of operations, coordinates of all terminal points, protractor, FM 3-25.26, and TC 24-20.

Standards: Walked the line and verified the data on the telephone cable layout.

Performance Steps

1. Perform map reconnaissance. (Refer to TC 24-20.)
2. Plot the coordinates of all terminal points. (Refer to TC 24-20.)
   a. Select primary and alternate routes.
   b. Identify difficult terrain areas.
   c. Identify crossings.
3. Estimate amount of wire required. (Refer to FM 3-25.26.)
   a. Compute map distance. (Refer to FM 3-25.26.)
   b. Estimate amount of wire required. (Refer to TC 24-20.)
4. Estimate crossing/construction materials required. (Refer to TC 24-20.)
5. Estimate amount of time required.
6. Determine personnel requirements in accordance with personnel assets.
7. Conduct ground reconnaissance. (Refer to TC 24-20.)

Performance Measures	GO	NO-GO
1. Performed map reconnaissance.	____	____
2. Plotted the coordinates of all terminal points.	____	____
3. Estimated amount of wire required.	____	____
4. Estimated crossing/construction materials required.	____	____
5. Estimated amount of time required.	____	____
6. Determined personnel requirements in accordance with personnel assets.	____	____
7. Conducted ground reconnaissance.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
FM 3-25.26	
TC 24-20	

INSPECT EXISTING CABLE LINES
113-588-6001

Conditions: Given vehicle (with driver), notebook, pencil, and DA Form 2407.

Standards: Inspected and noted any defects noticed on the drive through, and (if required) prepared and submitted DA Form 2407 to repair crew or a higher maintenance level for correction.

Performance Steps

1. Check for broken sections in the cable.
2. Check for disconnected cable or pulse restorers.
3. Check aerial and buried road crossings.
4. Check for proper sag at aerial road crossings.
5. Check for missing or defective cutting rings.
6. Check for creeping cable.
7. Check insulated joints and cable bonds.
8. Check for tree growth along cable route.
9. Check cable terminals and terminal boxes.
10. Check cables for bowing.
11. Check for dancing cable.
12. Check suspension strand.

Performance Measures	GO	NO-GO
1. Checked for broken sections in the cable.	____	____
2. Checked for disconnected cable or pulse restorers.	____	____
3. Checked aerial and buried road crossings.	____	____
4. Checked for proper sag at aerial road crossings.	____	____
5. Checked for missing or defective cutting rings.	____	____
6. Checked for creeping cable.	____	____
7. Checked insulated joints and cable bonds.	____	____
8. Checked for tree growth along cable route.	____	____
9. Checked cable terminals and terminal boxes.	____	____
10. Checked cables for bowing.	____	____
11. Checked for dancing cable.	____	____
12. Checked suspension strand.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
DA Form 2407	

PREPARE A DETAILED CABLE ROUTE MAP
113-588-6007

Conditions: Given map sheet(s) covering the area of operations, coordinates of all termination points, protractor graphic training aid (GTA) 5-2-10, overlay sheet, a completed wire plan with all changes annotated, FM 3-25.26, FM 24-1, TC 24-20, and FM 1-02.

Standards: Annotated terminal points, line routes, construction symbols, and all marginal information on the overlay.

Performance Steps

1. Place the overlay material over the map area to be annotated. (Refer to FM 3-25.26.)
2. Secure material to the map.
3. Register the material to the map.
4. Plot the position of the terminal using authorized military symbols. (Refer to FM 3-25.26, FM 1-02, and FM 24-1.)
5. Plot line routes and construction symbols. (Refer to FM 3-25.26, FM 24-1, and TC 24-20.)
6. Enter marginal information. (Refer to FM 3-25.26.)
7. Turn into company operations.

Performance Measures	GO	NO-GO
1. Placed the overlay material over the map area to be annotated.	____	____
2. Secured material to the map.	____	____
3. Registered the material to the map.	____	____
4. Plotted the position of the terminals using authorized military symbols.	____	____
5. Plotted line routes and construction symbols.	____	____
6. Entered marginal information.	____	____
7. Turned into company operations.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
FM 1-02	
FM 24-1	
FM 3-25.26	
TC 24-20	

INSPECT POLES
113-588-7075

Conditions: Given a notebook, pencil, flat-tip screwdriver, 2-pound hammer, lag wrench, pole, and shovel.

Standards: Verified the pole as sound, or notified operations of the requirement for replacement.

Performance Steps

1. Visually inspect the pole.
   a. Obvious rot.
   b. Cracks.
   c. Broken hardware.
2. Inspect poles below ground.
3. Calculate proper pole depth.
4. Check poles for defects.
   a. Hollow hearts.
   b. Internal rot.
   c. Exposed pockets.
5. Check guy wires and anchor.
6. Record information from inspections and preserve it as permanent record.

Performance Measures	GO	NO-GO
1. Inspected the pole visually.	____	____
2. Inspected poles below ground.	____	____
3. Calculated proper pole depth.	____	____
4. Checked poles for defects.	____	____
5. Checked guy wires and anchor.	____	____
6. Recorded information from inspections and preserved it as permanent record.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

Subject Area 13: TELEPHONE MAINTENANCE TRUCK INSPECTION

INSPECT PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS) OF TELEPHONE MAINTENANCE TRUCK
113-588-7108

Conditions: Given utility telephone maintenance truck, DA Form 2404, DA Form 2408-14, DA Pam 750-8, a Soldier performing PMCS, and TM 9-2320-269-10.

Standards: Inspector observed PMCS performance and annotated on DA Form 2404, if required.

Performance Steps

1. Review license of the operator.
2. Ensure TM 9-2320-269-10, DA Form 2404 and DA Form 2408-14 are available.
3. Observe actual PMCS performances by the operator.
4. Inspect DA Form 2404 for operator entries.
5. Sign DA Form 2404 if fault actually exists.

Performance Measures	GO	NO-GO
1. Reviewed license of the operator.	____	____
2. Ensured TM 9-2320-269-10, DA Form 2404 and DA Form 2408-14 were available.	____	____
3. Observed actual PMCS performances by the operator.	____	____
4. Inspected DA Form 2404 for operator entries.	____	____
5. Signed DA Form 2404 if fault actually existed.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Form 2408-14	
DA Pam 750-8	
TM 9-2320-269-10	

Subject Area 14: TELEPHONE SETS INSPECTION

INSPECT INSTALLATION OF KY-68
113-600-7045

Conditions: Given digital subscriber voice terminal (DSVT) TSEC/KY-68, telephone cable WF-16/U, loaded device KYK-13/TSEC, and TM 11-5810-329-10.

Note 1: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in an CBRN environment.

Note 2: The DSVT TSEC/KY68 is classified equipment. It should be handled properly.

Standards: The DSVT TSEC/KY-68 had been secured, and the DSVT was operating properly.

Performance Steps

1. Direct the installation of battery BA-1372.
2. Direct the installation and grounding of the DSVT TSEC/KY-68.
3. Direct the loading of variables into the DSVT using the KYK-13/TSEC.
4. Direct the operation of the DSVT TSEC/KY-68.

Performance Measures	GO	NO-GO
1. Directed the installation of battery BA-1372.	____	____
2. Directed the installation and grounding of the DSVT TSEC/KY-68.	____	____
3. Directed the loading of variables into the DSVT using the KYK-13/TSEC.	____	____
4. Directed the operation of the DSVT TSEC/KY-68.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-329-10	

INSPECT TROUBLESHOOTING OF KY-68
113-600-7046

Conditions: Given digital subscriber voice terminal (DSVT) TSEC/KY-68, telephone cable WF-16/U, multiplexer TD-1233(P)/TTC, multiplexer-combiner TD-1234(P)/TTC, radio repeater set AN/TRC-138A, radio terminal set AN/GRC-173, radio repeater set AN/TRC-174, radio terminal set AN/TRC-175, TM 11-5810-329-10, TM 11-5820-864-12-1, TM 11-5820-865-12-1, TM 11-5820-926-12-1, and TM 11-5820-931-12-1.

Note 1: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in an NBC environment.

Note 2: The DSVT TSEC/KY68 is classified equipment. It should be handled properly.

Standards: Directed troubleshooting of the DSVT TSEC/KY-68, identifying problems, and correcting the fault(s).

Performance Steps

1. Direct the troubleshooting of the DSVT TSEC/KY-68 system.
2. Direct the identification of fault(s) on the DSVT TSEC/KY-68 system.
3. Direct the corrective actions of fault(s) on the DSVT TSEC/KY-68 system.

Performance Measures	GO	NO-GO
1. Directed the troubleshooting of the DSVT TSEC/KY-68 system.	____	____
2. Directed the identification of fault(s) on the DSVT TSEC/KY-68 system.	____	____
3. Directed the corrective actions of fault(s) on the DSVT TSEC/KY-68 system.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5810-329-10	
TM 11-5820-864-12-1	
TM 11-5820-865-12-1	
TM 11-5820-926-12-1	
TM 11-5820-931-12-1	

Subject Area 15: MULTIPLEXER INSPECTION

INSPECT INSTALLATION OF MULTIPLEXERS
113-606-7029

Conditions: Given multiplexer TD-1233(P)/TTC, multiplexer-combiner TD-1234(P)/TTC, field cable CX-11230( )/G, telephone set TA-341( )/TT, ground rod MX-148/G, ground strap, power supply cord, system diagram, COU C-10716, flat-tip screwdriver, TM 11-5805-706-12, and TM 11-5805-707-12.

Note: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in an NBC environment.

Standards: Inspected the installation of the TD-1233(P)/TTC or TD-1234(P)/TTC.

Performance Steps

1. Inspect the programming of the circuit card by system diagram.
2. Inspect for proper connection of the power supply cord.
3. Inspect for proper connection of the field cable to the TD-1233(P)/TTC (group) or TD-1234(P)/TTC (high).

Performance Measures	GO	NO-GO
1. Inspected the programming of the circuit card by system diagram.	____	____
2. Inspected for proper connection of the power supply cord.	____	____
3. Inspected for proper connection of the field cable to the TD-1233(P)/TTC (group) or TD-1234(P)/TTC (high).	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-706-12	TC 24-20
TM 11-5805-707-12	

INSPECT TROUBLESHOOTING OF MULTIPLEXERS
113-606-7030

Conditions: Given multiplexer TD-1233(P)/TTC, multiplexer-combiner TD-1234(P)/TTC, COU C-10716, field cable CX-11230( )/G, telephone set TA-341( )/TT, telephone set TA-838/TT, digital subscriber voice terminal (DSVT) TSEC/KY-68, telephone cable WF-16/U, power cord, TM 11-5805-706-12, and TM 11-5805-707-12.

Note: This task is performed in a tactical or nontactical situation, under all weather conditions; it may be performed in an NBC environment.

Standards: Inspected the troubleshooting of the TD-1233(P)/TTC or TD-1234(P)/TTC and verified that the fault had been identified and located.

Performance Steps

1. Direct the use of the TD-1233(P)/TTC or TD-1234(P)/TTC troubleshooting flowcharts. (Refer to TM 11-5805-706-12 for the TD-1233(P)/TTC or TM 11-5805-707-12 for the TD-1234(P)/TTC.)

Performance Measures	GO	NO-GO
1. Directed the use of the TD-1233(P)/TTC or TD-1234(P)/TTC troubleshooting flowcharts.	———	———

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5805-706-12	TC 24-20
TM 11-5805-707-12	TM 11-5805-384-12
	TM 11-5805-650-12
	TM 11-5805-703-14
	TM 11-5995-208-10

INSPECT UNIT LEVEL MAINTENANCE (ULM) ON MULTIPLEXERS 113-606-7031

Conditions: Given a TD-1233(P)/TTC or TD-1234(P)/TTC with ULM already performed, DA Form 2404, DA Pam 750-8, TM 11-5805-706-12, and TM 11-5805-707-12.

Standards: Verified that the TD-1233(P)/TTC or TD-1234(P)/TTC passed the self-test and verified that fault were annotated on DA Form 2404.

Performance Steps

1. Inspect ULM in accordance with TM maintenance chart. (Refer to TM 11-5805-706-12 for the TD-1233(P)/TTC or TM 11-5805-707-12 for the TD-1234(P)/TTC.)
2. Inspect completed DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Inspected ULM in accordance with TM maintenance chart.	____	____
2. Inspected completed DA Form 2404.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Pam 750-8	
TM 11-5805-706-12	
TM 11-5805-707-12	

Subject Area 16: LAN/WAN SUBSTATION INSPECTION

VERIFY ENGINEERING INSTALLATION PACKAGE (EIP)
113-613-4003

Conditions: Given necessary material and EIP in the current operating environment.

Standards: Verify correct interpretation of an EIP while balancing operational risks with user quality of service.

Performance Steps

1. Inspect the EIP.
   a. Verify the EIP numbering for accuracy.
   b. Verify the cover page includes the correct project title, organizational data, date, and distribution statement.
2. Review the installation steps and instructions.
   a. Review sequence of installation steps and special instructions.
   b. Review BOM.
   c. Review the PCM.
   d. Review drawings.
      (1) Verify any specific equipment requirements.
      (2) Verify standard drawing numbering system.
      (3) Verify site specific drawings.
   e. Review drawings changes if needed.
      (1) Verify minor changes and any required testing.
      (2) Verify any major changes that alter equipment layout.
   f. Review the CRL.
   g. Inspect the marking of any drawing changes.
   h. Inspect the design of the network link.
      (1) Verify equipment requirements and available references.
      (2) Verify termination diagrams and requirements for compatibility.
      (3) Verify correct power source and current requirements for all equipment.
   i. Inspect the installation of the network link.
      (1) Verify the correct equipment is used in accordance with applicable references and requirements.
      (2) Verify correct termination in accordance with diagrams and references.
      (3) Verify correct voltage and current for each piece of equipment.
3. Inspect validation and testing results.
   a. Verify that testing was performed in accordance with the test plan in the EIP.
   b. Review sequence of testing to ensure compliance with EIP.
   c. Verify that correct testing equipment is listed in the EIP.

Performance Measures	GO	NO-GO
1. Inspected the EIP.	____	____
2. Reviewed the installation steps and instructions.	____	____
3. Inspected validation and testing results.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
TM 11-5805-706-12	
TM 11-5805-707-12	

INSPECT INSTALLATION OF LOCAL AREA NETWORK/WIDE AREA NETWORK (LAN/WAN) SUBSTATION DISTRIBUTION SYSTEM 113-632-7002

Conditions: Given an installed LAN/WAN Substation Distribution System with D-814 impact tool with 110 blade, RJ-45 crimp tool, RJ-45 connectors, work area outlet connector with RJ-45 jack, jacket stripper, splice scissors (snips), tape measure (feet/metric), small flat tip screwdriver, and engineering drawings.

Standards: Inspected the installed system, inspected the 4 pair CAT-5 UTP cable to ensure it was terminated using appropriate configurations, and inspected all cabling to ensure it passed the test requirements.

Performance Steps

1. Inspect pre-installation procedures.
   a. Ensure all hazards are identified and removed.
   b. Check for correct cable support method.
   c. Check tying of loose cables.
   d. Check for correct installation method for associated hardware (shoes, sheaves, supports, winch, and other needed equipment).
   e. Check for use of safety equipment such as perimeters, cones, reels, and sheave blocks.
   f. Check for use of rolling hitch knot for raising and lowering heavy backbone cable.
   g. Check for cable test and ensure results are annotated correctly.
2. Inspect installation procedures.
   a. Check for routing of cable IAW EIP and cable route maps.
   b. Check for installation of tip cable on MDF using distribution rings.
   c. Check for cable test and ensure results are annotated correctly.
3. Inspect cable terminations.
   a. Check for correct part use.
   b. Check terminating conductors for correct installation.
   c. Check for secure outlet connector.
   d. Check for cable test and ensure results are annotated correctly.
4. Inspect cable termination in telecommunications closet.
   a. Check for appropriate slack.
   b. Check for termination of conductors on a 700 series MDF terminal.
   c. Check for cable test and ensure results are annotated correctly.
5. Inspect cable testing.
   a. Review testing procedures.
   b. Review test result annotations for correctness.

Performance Measures	GO	NO-GO
1. Inspected pre-installation procedures.	____	____
2. Inspected installation procedures.	____	____
3. Inspected cable terminations.	____	____
4. Inspected cable termination in telecommunications closet.	____	____
5. Inspected cable testing.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passes. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show the Soldier what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

INSPECT INSTALLATION OF COMMERCIAL FIBER OPTIC CABLE TERMINATORS/CONNECTORS
113-632-9007

Conditions: Given a section of fiber optic cable, connectors (ST, SMA, bi-conical, hot-melt), splicer's hand tools, cleaving tools, polishing adapter, lapping film, microscope, curing oven, safety glasses, ANSI/TIA/EIA 568B/569A cabling standard, and manufacture instructions.

Standards: Inspected the termination of the fiber optic connector to the fiber optic cable as indicated by manufacture instruction booklets and observed a reading level of no more than 1 db loss per connector.

Performance Steps

1. Supervise the cleaning of connector parts.
2. Supervise the preparation of cable and fiber.
3. Supervise the preparation of epoxy.
4. Inspect for crimp connectors.
5. Inspect for cure proxy.
6. Supervise the assembly connector parts on table.
7. Inspect cleave fiber ends.
8. Inspect polish fiber.
9. Inspect the testing of fiber connector and cable.

Performance Measures	GO	NO-GO
1. Supervised the cleaning of connector parts.	____	____
2. Supervised the preparation of cable and fiber.	____	____
3. Supervised the preparation of epoxy.	____	____
4. Inspected for crimp connectors.	____	____
5. Inspected for cure proxy.	____	____
6. Supervised the assembly connector parts on table.	____	____
7. Inspected cleave fiber ends.	____	____
8. Inspected polish fiber.	____	____
9. Inspected the testing of fiber connector and cable.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
ANSI/TIA/EIA 568B	
ANSI/TIA/EIA 569A	
FM 11-50	
Manufacturer's Manuals	

INSPECT REPAIR OF FIBER OPTIC CABLE ASSEMBLY (FOCA) CX-13295( )/G 113-632-9010

Conditions: Given a CX-13295()/G FOCA with at least one splice, retermination or replacement completed and a TS-4335/G.

Standards: Inspected the repair of the FOCA and determined if the repair was correct and within acceptable tolerances.

Performance Steps

1. Inspect repair of cable.
2. Test cable with test set TS-4335/G.
   a. Ensure when connecting cables that fiber optic connector is mated to another fiber optic connector.

   Note: If the local end of the FOCA does not have a washer between the bend limiter and adapter bushing, the fiber-under-test is the same color as the lead connected to the TRANSMIT port. If the local end of the FOCA does have a washer between the bend limiter and adapter bushing, the fiber-under-test is not the same color as the lead connected to the TRANSMIT port.

   b. Record results in accordance with DA Pam 750-8.
3. Check attenuation level for acceptance.
   a. Check for maximum of 3.0 dB for a 300-meter FOCA.
   b. Check for maximum of 3.75 dB for a 1000-meter FOCA.
   c. Record results in accordance with DA Pam 750-8.

Performance Measures	GO	NO-GO
1. Inspected repair of cable.	____	____
2. Tested the cable with test set TS-4335/G.	____	____
3. Checked attenuation level for acceptable levels.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Pam 750-8	

INSPECT SPLICING OF COMMERCIAL FIBER OPTIC CABLE
113-632-9011

Conditions: Given a wire/cable team with a section of fiber optic cable with faults, splicer's hand tools, cleaving tools, polishing adapter, reagent alcohol, microscope, mechanical splice work station equipment, Norland optical adhesive, Fiberlok 2501 assembly tool, fiber optic fusion splicer, test set, safety glasses, and manufacture instructional manuals.

Standards: Inspected the splicing of fiber optic cable for proper operation after splicing as indicated by manufacture instructional manuals and verified restored communications.

Performance Steps

1. Inspect splicing technique used.
   a. Norland ultraviolet curing (UVC) optical splice.
   b. AMP optimate mechanical fiber optic splice.
   c. Fusion splicer.
   d. Fiberlok optical splice
2. Inspect set up of work station and equipment according to splicing technique.
3. Test operation of fiber cable for correct tolerance and operation.
4. Check for reestablishment of communications.

Performance Measures	GO	NO-GO
1. Inspected splicing technique used.	____	____
2. Inspected set up of work station and equipment according to splicing technique.	____	____
3. Tested fiber optic cable for correct tolerance and operation.	____	____
4. Checked for reestablishment of communications.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manual	

INSPECT TROUBLESHOOTING OF LOCAL AREA NETWORK/WIDE AREA NETWORK (LAN/WAN) SUBSTATION DISTRIBUTION SYSTEM
113-632-9013

Conditions: Given a pre-existing LAN or WAN substation distribution system, ohmmeter spectrum analyzer, Time Domain Reflectometer (TDR), loss test set/power meter, optical fault finder, network documents, and manufacturer's instruction booklets.

Standards: Supervisor verified that faults were identified, repaired, and communications reestablished.

Performance Steps

1. Inspect network type Information gathered using network documents.
2. Inspect visually for missing terminations, kinked cable, blown fuses, and loose connections.
3. Inspect that equipment is off to other networks.
4. Inspect testing of cable:
   a. Metallic cable - use ohmmeter, spectrum analyzer, or TDR.
   b. Fiber optic cable - use loss test/power meter, optical fault finder, or optical TDR.
5. Inspect that test results were annotated on appropriate network documentation.
6. Inspect fault identification.
7. Inspect fault isolation.
8. Inspect fault repair.
9. Inspect engineering installation drawing for correctness.
10. Inspect maintenance on LAN/WAN system.
    a. Inspect for periodic testing procedures.
    b. Inspect records for proper recording of network status.

Performance Measures	GO	NO-GO
1. Inspected network type Information gathered using network documents.	____	____
2. Inspected visually for missing terminations, kinked cable, blown fuses, and loose connections.	____	____
3. Inspected to ensure that equipment is off to other networks.	____	____
4. Inspected testing of cable.	____	____
5. Inspected annotated test results on appropriate Network Documentation.	____	____
6. Inspected fault identification.	____	____
7. Inspected fault isolation.	____	____
8. Inspected fault repair.	____	____
9. Inspected engineering installation drawing for correctness.	____	____
10. Inspected maintenance on LAN/WAN system.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

Subject Area 17: COMPUTER TECHNOLOGY

SUPERVISE THE CONFIGURATION OF AN AIS TO OPERATE ON A NETWORK 113-580-7128

Conditions: Given an Automated Information System (AIS), trained Soldier, Windows Operating System, twisted pair cable, and configuration information.

Standards: Configured the AIS to properly operate on network as indicated by green light on NIC indicator.

Performance Steps

1. Ensure Soldier powers on AIS.
2. Ensure Soldier clicks on network neighborhood or network places.
3. Ensure Soldier selects properties.
4. Ensure Soldier selects transmission control protocol (TCP)/Internet protocol (IP).
5. Ensure Soldier appropriately configures all tabs.
6. Ensure Soldier saves configurations.
7. Ensure Soldier reboots AIS.

Performance Measures	GO	NO-GO
1. Ensured Soldier powered on AIS.	____	____
2. Ensured Soldier clicked on network neighborhood or network places.	____	____
3. Ensured Soldier selected properties.	____	____
4. Ensured Soldier selected TCP/IP.	____	____
5. Ensured Soldier added appropriate configurations on all tabs.	____	____
6. Ensured Soldier saved configurations.	____	____
7. Ensured Soldier rebooted AIS.	____	____

References

Required

ISBN 0072122269

Related

Subject Area 18: NAVIGATION

IMPLEMENT LAND NAVIGATION SKILLS USING GLOBAL POSITIONING SYSTEMS 113-610-7005

Conditions: Given a requirement, an operational global positioning system (GPS) receiver, compatible batteries, appropriate COMSEC device, waypoint information, and related TMs.

Standards: Initialized the GPS; loaded with COMSEC variables, waypoints and entered setup information; and Soldier successfully navigated to 5 points in 30 minutes or less.

Performance Steps

1. Inspect, inventory equipment for completeness and perform operator PMCS on GPS (refer to correct TM for system).
2. Place GPS into operation.
   a. Turn on GPS and await self-test.
   b. Enter fill.

   Note: Only GPS loaded with crypto variable keys should be used for combat operations. Without crypto keys, GPS cannot compensate for selective availability (SA) errors, cannot read encrypted signals, and has no protection against spoofing. Not having crypto keys loaded could result in mission failure.

   Note: Installing crypto keys does not create a classified GPS. When classified mission data (waypoints) is stored, the GPS is classified at the same level as the classified mission data.

   c. Observe display for acquisition of satellites for time and position/location.
3. Enter waypoints.
4. Navigate using GPS 5 points within 30 minutes.
5. Perform shut-down procedures.
   a. Turn off GPS.
   b. Store GPS.

Performance Measures	GO	NO-GO
1. Inspected, inventoried equipment for completeness and performed operator PMCS on GPS (used correct TM for equipment).	____	____
2. Placed GPS into operation.	____	____
3. Entered waypoints.	____	____
4. Navigated successfully using GPS to 5 points correctly.	____	____
5. Performed shut-down procedures.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

Subject Area 19: MOBILE SUBSCRIBER EQUIPMENT

LEAD RESTORATION OF TRANSMISSION LINK WITHIN A NETWORK
113-611-6006

Conditions: Given an established link with an unknown fault between the originating equipment and terminating terminal.

Standards: Identified link outage through fault isolation and restored or reported and unrepairable fault to the transmission supervisor.

Performance Steps

1. Identify the fault.
   a. Interpret cable route maps and engineering installation package (EIP).
   b. Check subscriber faults to ensure failure is due to non-link fault.
   c. Inspect fault isolation results for correctness.
2. Direct troubleshooting of cable/wire network link.
3. Direct repair of cable/wire fault.
4. Confirm test to verify repair.
5. Verify system/link status.
6. Report system/link status to SCC or transmission chief.

Performance Measures	GO	NO-GO
1. Identified the fault.	____	____
2. Directed troubleshooting of cable/wire network link.	____	____
3. Directed repair of cable/wire fault.	____	____
4. Confirmed testing which verified repair.	____	____
5. Verified system/link status.	____	____
6. Reported system/link status to SCC or transmission chief.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

ESTABLISH SITE LAYOUT FOR TRANSMISSION SYSTEMS
113-593-1040

Conditions: Given a team packet/operations order (OPORD) with an 8-digit grid coordinate location for a transmission system and one or more of the following in accordance with unit SOP: TM 11-5820-1022-13-1 (AN/TRC-191V), TM 11-5820-864-12-1 (AN/TRC-174), TM 11-5820-865-12-1 (AN/TRC-173), TM 11-5820-926-12-1 (AN/TRC-138), TM 11-5820-934-13-1-1 (AN/TRC-170V), and/or TM 11-5820-1023-13-1 (AN/TRC-190V).

Standards: Selected a site within 100 meters of the 8-digit grid coordinate and conformed to transmission systems requirements.

Performance Steps

1. Plot proposed site on map.
   a. Plot in and out routes on map.
   b. Plot all required line of sight (LOS) radio shots.
2. Perform site reconnaissance.

   Note: Site reconnaissance should be done before moving transmission team to the site; however, the tactical situation may not allow this.
3. Select site within 100 meters of 8-digit grid coordinate given in team packet/OPORD that provides:

   Note: Considerations are listed in order of importance.

   a. Site security.
   b. Site accessibility.
   c. Concealment from air and ground.
   d. Antenna location.
   e. Assemblage location.
4. Draw site plan showing:
   a. Position of all assemblages.
   b. Antenna location.
   c. Site defenses.
   d. Entrance to site.
   e. Emergency exit.

Performance Measures	GO	NO-GO
1. Plotted proposed site on map.	____	____
2. Performed site reconnaissance.	____	____
3. Selected site within 100 meters of 8-digit grid coordinate given in team packet/ OPORD.	____	____
4. Draw site plan showing.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
TM 11-5820-1022-13-1	
TM 11-5820-1023-13-1	
TM 11-5820-864-12-1	
TM 11-5820-865-12-1	
TM 11-5820-926-12-1	
TM 11-5820-934-13-1-1	

Chapter 4

Duty Position Tasks

ADDITIONAL SKILL IDENTIFIER (ASI) J2

Communications Cable and Antenna Systems Maintainer

Subject Area 20: ANTENNA INSTALLATION

INSTALL PRESSURIZED CABLE SYSTEM
113-588-1086

Conditions: Given conditions and standards required to install pressure bypass, install pressure plug, install pressure test, point, install contactor terminal, install transducer terminal, and install continuous-feed pressure system.

a. Install pressure bypass: Given OD copper, plastic, or lead tubing, 1/4 inch; wrench; bypass valve; soldering equipment; lashed cable supports; plastic tie-down straps; pressure test flanges; mounting brackets; plugs; wood; pipes, pipe straps; valve housing; drive anchor, 1 1/4 inches x 1/4 inch size; C-gauge; and soap solution.

b. Install pressure plugs: Given polyurethane compound, Rosalyn 164-compound or equivalent, C-compound, 4-ounce can; channeling pins; tie-down plastic straps, 7 inches long; plastic (vinyl) tape, 3/4 inch wide; plastic (vinyl) tape, 1 1/2 inches wide; hose clamp; injection fitting USF-1A; tabbing shears; splicer's scissors; knife; cable core depressor; chipping and sheathing knife; orange sticks; cable drill; carding brush; 3M, 4401-compound; injection gun; screwdriver; paper tape 1/2 inch wide; DR tape; B-sealing tape; Allen wrench, 3/16-inch; and small hammer.

c. Install pressure test point: Given stainless steel sealing clamps (hose clamps); vinyl tape; appropriate pressure tubing; appropriate pressure fittings; knife; wrench; tubing cutter; emery cloth; pipe joint compound; carding brush; cable drill; orange sticks; corrosion-resistant steel strip; metal shears; file; screwdriver; core depressor tool; muslin strips; split poly washer of correct diameter, four each; B-sealing tape; B-cord release compound; socket, 1/4-inch; torque wrench; DR tape; splicer's scissors; C-cement; splice case or lead sleeve; sleeve spreader; soldering torch or iron; sandpaper; Stearin flux; tubing rack; galvanized machine screws; tubing straps; pole or timber, 8-foot; galvanized pipe, 1 1/4-inch, 5-foot; pipe straps; and marker tags.

d. Install contactor terminal: Given aerial or underground contactor; screwdriver, 3-inch; open-end wrench, 1/4-inch; open-end wrench, 7/32-inch; C-pressure gauge; splicer's headset; battery, 4 1/2-volt; jumper cords and clips; cylinder of nitrogen (with regulator); pipe joint compound; C-flange; C-valve stem; file; copper tubing elbow; B-pressure cell; emery cloth; drill set, 3/8-inch; nylon or lead screw anchors; round-head galvanized wood screws, No. 10; tubing cutter; and small one-hole straps.

e. Install transducer terminal: This task is performed on aerial and underground cable. Given transducer, O-flange, pipe joint compound, F-valve, tie-down plastic straps, C-gauge, nitrogen cylinder, lead marker tag, wrench, cord, two-conductor, soap solution, polyethylene cable solution, bucket and brush, and pressure regulator.

f. Install continuous-feed pressure system: Given compressor-dehydrator, air dryer, SAE-30 non-detergent automotive or turbine oil, soap solution, bottled nitrogen gas (if required), appropriate tubing and fittings, one-hole clamps, appropriate wood screws, appropriate anchors, 3-wire 1/2-inch flexible BX conduit, wrench, and screwdriver.

Note: Supervision and assistance are available.

Standards: Installed the contactor terminal and the readings between the valve on the sleeve and contactor terminal are equal, installed the transducer terminal with a test desk reading within the 2.5-volt tolerance, and pressurized the cable and held constant pressure for 2 hours.

Performance Steps

1. Install bypass.
   a. Install aerial cable bypass.
   b. Install underground cable bypass.
   c. Install buried cable bypass.
2. Install pressure plug.
   a. Install pressure plug using the sheath injection method.
      (1) Prepare poly-sheathed cables.
      (2) Prepare lead-sheathed cables.
      (3) Prepare and inject plugging compound.

> **CAUTION**
>
> The 4401-compound should NEVER be mixed with the 185N-compound.

      (a) Mix compound.
      (b) Inject compound.
      (c) Install 3A pressure plug.
      (d) Install cable cap, if required.
   b. Install pressure plug using the pour method with type-9 closure.
      (1) Prepare cable.
      (2) Place horizontal plug, if required.
      (3) Place vertical plug, if required.
      (4) Install combination plug and insulating joint, if required.
      (5) Mix and pour compounds.

> **CAUTION**
>
> The 4401-compound should NEVER be mixed with the 185N-compound.

   c. Install pressure plug using the pour method with 8980-series closure.
      (1) Prepare cable.
      (2) Pour compound.

> **CAUTION**
>
> The 4401-compound should NEVER be mixed with the 185N-compound.

3. Install pressure test point.
   a. Reinforce cable.
   b. Install pressure test valves.
      (1) Install E-pressure flange on plastic-sheathed cable.

Performance Steps

(2) Install pressure fittings and test valves on lead-sheathed cable.
c. Install pressure tubing, fittings, and accessories.

4. Install contactor terminal.
   a. Install aerial contactor.
      (1) Modify aerial contactor.
      (2) Adjust aerial contactor.

5. Install transducer terminal.
   a. Install transducer on sleeve.
   b. Install transducer on splice case.
   c. Monitor transducer pressure.
      (1) Transducer monitoring.
      (2) Automatic transducer monitoring system.
   d. Test cable using pressure testing apparatus.

6. Install continuous-feed pressure system.
   a. Install compressor/air dryer unit.
      (1) Install refrigerant type 750 and 7,500 (standard cubic feet per day (SCFD) capacity air dryer.
      (2) Install refrigerant type 5,000 SCFD capacity compressor.
      (3) Make required inspections.
      (4) Start compressor unit.
      (5) Maintain end pressure.

   b. Adjust air outlet pressure.
   c. Install pole-mounted air dryer.
   d. Test cable pressure.
      (1) Install pressure-measuring equipment.
      (2) Flash-test for leaks.

Performance Measures	**GO**	**NO-GO**
1. Installed bypass.	____	____
2. Installed pressure plug.	____	____
3. Installed pressure test point.	____	____
4. Installed contactor terminal.	____	____
5. Installed transducer terminal.	____	____
6. Installed continuous-feed pressure system.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

INSTALL PARABOLIC ANTENNA
113-596-1024

Conditions: Given an engineering scheme, antenna materials (antenna blueprint scheme), tools and equipment listed in TM, and safety equipment.

Note: You will work under the supervision of a team/crew chief. Assistance is provided as required.

Standards: Installed the parabolic antenna.

Performance Steps

1. Inventory equipment.
2. Install antenna feed assembly to antenna reflector.
3. Attach guy wires to feed horn assembly and antenna radome assembly.
4. Adjust guy wire cable tension.
5. Assemble and attach frame mount to back of antenna reflector.
6. Attach elevation adjusting rod assemble and secure azimuth adjusting rod.
7. Install radome on reflector.
8. Raise antenna to desired mounting position.
9. Attach and secure antenna to support elements.

Note: Torque to 39 foot-pounds.

10. Attach azimuth mounting brackets to support elements.

Performance Measures	GO	NO-GO
1. Inventoried equipment.	____	____
2. Installed antenna feed assembly to antenna reflector.	____	____
3. Attached guy wires to feed horn assembly and antenna radome assembly.	____	____
4. Adjusted guy wire cable tension.	____	____
5. Assembled and attached frame mount to back of antenna reflector.	____	____
6. Attached elevation adjusting rod assembly and secured azimuth adjusting rod.	____	____
7. Installed radome on reflector.	____	____
8. Raised antenna to desired mounting position.	____	____
9. Attached and secured antenna to support elements.	____	____
10. Attached azimuth mounting brackets to support elements.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Manufacturer's Manuals	

INSTALL AB-216/U TOWER
113-596-1027

Conditions: Given an engineering scheme, tools and equipment, tower erection davit MX-1215/U, capstan E-12U, safety equipment, antenna safety manual, and construction vehicle (1/4 ton or above) M-876.

Note: This task is performed during daylight hours; it should NOT be performed under adverse weather conditions. You will work under the supervision of a team/crew chief. Assistance is provided as required.

Standards: Installed the AB-216/U tower.

Performance Steps

1. Install safety equipment.

Note: Safety climbing equipment must be installed either with the tower method or with the pole method. (Refer to antenna safety manual.)

2. Install tower.
   a. Identify tower location.
   b. Connect tower support base plates AB-206/U to foundation timbers.
   c. Assemble tower sections AB-208/U and AB-207/U.
   d. Install tower section AB-208/U.
   e. Connect triangular frame to tower section AB-208/U.
   f. Locate guy anchors.
   g. Install guy anchors using one of the following methods.
      (1) Manually.
      (2) Telephone maintenance truck M-876.
   h. Assemble davit MX-1215/U.
   i. Connect davit MX-1215/U to tower top horizontal member.
   j. Install snatch block and coupler to tower.
   k. Secure the hook on snatch block using the mouse method.
   l. Install ground on tower.
   m. Erect tower section using one of the following methods:
      (1) Manually.
      (2) Vehicle.
      (3) Capstan.
   n. Connect tower section to existing tower and transfer part, as required.
   o. Erect guys to desired guy level.
   p. Connect guys to tower.
   q. Install guy spacers and take up winch on anchors.
   r. Connect tension guy wire to tower.
   s. Install antenna support AB-296/G.
   t. Erect antenna support AB-296/G.
   u. Connect antenna support AB-296/G.

Performance Steps

3. Install ground obstruction marker.

> **CAUTION**
>
> Electrical equipment must be handled carefully when moving or installing it.

Note: Suggested method: davit MX-1215/U.

a. Install block and tackle to support.
b. Hoist davit MX-1215/U using block and tackle.
c. Attach davit MX-1215/U to tower.
d. Attach lamp socket and cable assembly to each obstruction light assembly.

> **CAUTION**
>
> Whenever the three-conductor cable passes through a feed-through connector, the rubber plug in the connector must have an oversized hole. In all unused feed-through connectors, the rubber must be replaced with a blank plug.

e. Install obstruction light assembly on tower.

Note: Use a tag line to hold the obstruction and cable assembly out from the tower at a safe distance to keep from damaging obstruction lights and cable assembly.

f. Assemble/attach beacon, platform, and cable assembly together.
g. Hoist beacon, platform, and cable assembly to top of tower.
h. Install beacon, platform, and cable assembly to tower.
i. Install automatic control equipment on tower.
j. Perform pre-operational checks.
k. Perform adjustment on control.

> **WARNING**
>
> **The circuit breaker lever must be placed in the OFF position before adjusting the position of the permanent magnet breaker.**

Note: It is recommended to make this adjustment in the early evening when the daylight intensity is approximately that at which the lights should come on each day.

Performance Measures	**GO**	**NO-GO**
1. Installed safety equipment.	____	____
2. Installed tower.	____	____
3. Installed ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Antenna Safety Manual	

INSTALL PRESSURIZED TRANSMISSION LINES
113-596-1040

Conditions: Given an engineering scheme, tools and equipment, pressurization material, and required safety equipment.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided, as required.

Standards: Installed the appropriate pressurization system, purged the line, and pressurized the cable.

Performance Steps

1. Install mechanical dehydrator/dehumidifier.
2. Install dehydration pump system.
3. Install dehydration nitrogen system for single transmission line.
4. Install dehydration nitrogen system for multiple transmission line.
5. Purge cable line.
6. Pressurize cable.

Note: If cable does NOT maintain correct air pressure, use soap, bucket, and brush and make a soapy solution and spread it around connections and fittings to locate air leaks. Check connections and fittings for looseness or damage. Replace as necessary.

Performance Measures	GO	NO-GO
1. Installed mechanical dehydrator/dehumidifier.	____	____
2. Installed dehydration pump system.	____	____
3. Installed dehydration nitrogen system for single transmission line.	____	____
4. Installed dehydration nitrogen system for multiple transmission line.	____	____
5. Purged cable line.	____	____
6. Pressurized cable.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

INSTALL SELF-SUPPORT TOWER
113-596-1080

Conditions: Given self-support tower, engineering scheme, tools and equipment, carrier rail material, tower erection davit MX 1215/U, safety equipment, block and tackle, FM 11-487-27, antenna safety manual, and engineer scheme.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Installed the self-support tower to include site selection, site survey, and base installation.

Performance Steps

1. Install safety equipment using tower method.

Note: Safety climbing equipment must be installed either with the tower method or with the pole method.

2. Install tower. (Refer to FM-11-487-27 and engineer scheme.)
   a. Identify tower location.
   b. Conduct inventory of equipment.
   c. Install tower base per engineer scheme.
   d. Assemble tower per engineer scheme.
   e. Erect tower per engineer scheme.
3. Install ground obstruction marker.

CAUTION

Electrical equipment must be handled carefully when moving or installing.

Note: Suggested method: davit MX-1215/U.

   a. Install block and tackle to support.
   b. Hoist davit MX-1215/U using block and tackle.
   c. Attach davit MX-1215/U to tower.
   d. Attach lamp socket and cable assembly to each obstruction light assembly.

Performance Steps

CAUTION

Whenever the three-conductor cable passes through a free through connector, the rubber plug in the connector must have an oversized hole. In all unused feed through connectors, the rubber must be replaced with a blank plug.

e. Install obstruction light assembly on tower.

Note: Use a tag line to hold the obstruction and cable assembly out from the tower at a safe distance to keep from damaging obstruction lights and cable assembly.

f. Assemble/attach beacon, platform, and cable assembly together.
g. Hoist beacon, platform, and cable assembly to top of tower.
h. Install beacon, platform, and cable assembly to tower.
i. Install automatic control equipment on tower.
j. Perform pre-operational checks.
k. Perform adjustment on control.

WARNING

The circuit breaker lever must be placed in the OFF position before adjusting the position of the permanent magnet breaker.

Note: It is recommended that this adjustment be made in the early evening when the daylight intensity is approximately that at which the lights should come on each day.

Performance Measures	**GO**	**NO-GO**
1. Installed safety equipment using tower method.	____	____
2. Installed tower. (Refer to FM-11-487-27 and engineer scheme.)	____	____
3. Installed ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Antenna Safety Manual	
FM 11-487-27	

REMOVE SELF-SUPPORT TOWER
113-596-1081

Conditions: Given self-support tower (installed), tools and equipment, safety equipment, block and tackle, and FM 11-487-27.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Disassembled the self-support tower including removing all installed equipment, tower braces, and structure pieces.

Performance Steps

(Refer to FM 11-487-27 for all performance steps.)

1. Remove all installed equipment.
2. Remove tower braces.
3. Lower braces to ground.
4. Store equipment as required.

Performance Measures	GO	NO-GO
1. Removed all installed equipment.	____	____
2. Removed tower braces.	____	____
3. Lowered braces to ground.	____	____
4. Stored equipment as required.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required
FM 11-487-27

Related

INSTALL SPIRA-CONE HIGH FREQUENCY (HF) ANTENNA 113-596-1082

Conditions: Given the spira-cone HF antenna, tools and equipment, antenna safety manual, and safety equipment.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. You will work as a team member to perform this task.

Standards: Installed the spira-cone HF antenna and assembled antenna curtains, erected mast, and anchored down-lead guys to anchor points.

Performance Steps

WARNING

The supervisor will brief Soldiers on climbing procedures and being watchful of falling objects.

1. Select site for antenna installation.
2. Inventory equipment.
3. Install base for antenna.
4. Install anchors.
5. Assemble mast section.
6. Install HF antenna curtains.
7. Install down-lead guys.

Performance Measures	GO	NO-GO
1. Selected site for antenna installation.	____	____
2. Inventoried equipment.	____	____
3. Installed base for antenna.	____	____
4. Installed anchors.	____	____
5. Assembled mast section.	____	____
6. Installed HF antenna curtains.	____	____
7. Installed down-lead guys.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required

Antenna Safety Manual

Related

REMOVE SPIRA CONE HIGH FREQUENCY (HF) ANTENNA
113-596-1083

Conditions: Given spira-cone HF antenna (installed), tools and equipment, and safety equipment.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Supervision and assistance are provided as required.

Standards: Removed the spira-cone HF antenna and removed the mast, antenna curtains, and down-lead guys.

Performance Steps

WARNING

The supervisor will brief Soldiers on climbing procedure and being watchful of falling objects.

1. Remove down-lead guys.
2. Lower HF antenna curtains.
3. Remove anchors.
4. Disassemble mast section.

Performance Measures	GO	NO-GO
1. Removed down-lead guys.	____	____
2. Lowered HF antenna curtains.	____	____
3. Removed anchors.	____	____
4. Disassembled mast section.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Manufacturer's Manuals	

REMOVE AB-216/U TOWER
113-596-1084

Conditions: Given tower AB-216/U, light set MK-221/G or MK-222/G, tower erection davit MX-1215/U, capstan E-12U, tools and equipment, safety equipment, and telephone maintenance truck M-876.

Note: This task is performed during daylight hours. It should NOT be performed under adverse weather conditions. Supervision and assistance are provided as required.

Standards: Removed tower AB-216/U and disassembled all guy wire assemblies, anchors, and equipment.

Performance Steps

1. Remove light set MK-221/G or MK-222/G.
2. Remove antenna support AB-296/U.
3. Lower antenna support AB-296/G.
4. Remove antenna support AB-296/G.
5. Remove tension guy wires from tower.
6. Remove guy spacer and take-up winch from anchors.
7. Remove guys from tower.
8. Remove tower section from existing tower and transfer parts, as required.
9. Lower tower section using one of the following methods:
   a. Manually.
   b. Vehicle.
   c. Capstan.
10. Remove hook from snatch block.
11. Remove davit MX-1215/U from top horizontal member.
12. Remove guy anchors using one of the following methods:
    a. Manually.
    b. Vehicle.
13. Remove anchors from position.
14. Remove triangular frame from tower section AB-208/U.
15. Remove ground from tower.
16. Remove tower section AB-208/U.
17. Disassemble tower sections AB-208/U and AB-207/U.
18. Remove tower support base plates AB-206/U from foundation timbers.

Performance Measures	GO	NO-GO
1. Removed light set MK-221/G or MK-222/G.	____	____
2. Removed antenna support AB-296/U.	____	____
3. Lowered antenna support AB-296/G.	____	____
4. Removed antenna support AB-296/G.	____	____
5. Removed tension guy wires from tower.	____	____
6. Removed guy spacer and take-up winch from anchors.	____	____
7. Removed guys from tower.	____	____
8. Removed tower section from existing tower and transferred parts, as required.	____	____
9. Lowered tower section using one of the three methods.	____	____
10. Removed hook from snatch block.	____	____
11. Removed davit MX-1215/U from top horizontal member.	____	____
12. Removed guy anchors using a vehicle or manually.	____	____
13. Removed anchors from position.	____	____
14. Removed triangular frame from tower section AB-208/U.	____	____
15. Removed ground from tower.	____	____
16. Removed tower section AB-208/U.	____	____
17. Disassembled tower sections AB-208/U.	____	____
18. Removed tower support base plates AB-206/U from foundation timbers.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required

Manufacturer's Manuals

Related

REMOVE BROADBAND DIPOLE HIGH FREQUENCY (HF) ANTENNA 113-596-1086

Conditions: Given broadband dipole HF antenna (installed), tools and equipment, safety equipment, and telephone maintenance truck M-876.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Removed the broadband dipole HF antenna and disassembled all support poles, guys, and anchors.

Performance Steps

WARNING

The supervisor will brief Soldiers on climbing procedure and being watchful of falling objects.

1. Remove support guys.
2. Lower support poles with dipole antenna.
3. Remove dipole from support poles.

Performance Measures	GO	NO-GO
1. Removed support guys.	____	____
2. Lowered support poles with dipole antenna.	____	____
3. Removed dipole from support poles.	____	____

Evaluation Guidance Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required
Manufacturer's Manuals

Related

MAINTAIN ROTATABLE LOG PERIODIC ANTENNA 113-596-3010

Conditions: Given a rotatable log periodic antenna (installed), variable standing wave ration (VSWR) testing equipment, multimeter, safety equipment, tool kit TK-115/G, tool equipment TE-33, block and tackle, engineers transit, open-end wrenches, DA Form 2404, DA Pam 750-8, and the antenna safety manual.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Inspected the antenna, lubricated the gearbox fittings, performed the VSWR test, and completed DA Form 2404.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.
   e. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

2. Maintain guyed supported tower.

CAUTION

The radio equipment must be disconnected before work is performed on the tower.

   a. Check tower for loose hardware.
   b. Check tower for rust.
   c. Inspect tower footing for loose hardware.
   d. Check to ensure that tower is plumb (tension guys as required).
   e. Check tower ground for corrosion and loose hardware.

Note: Reconnect radio equipment.

   f. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Maintain antenna.
   a. Check antenna boom and elements for corrosion.
   b. Inspect antenna boom and elements for loose hardware.

Note: It may be necessary to lower the antenna to tighten hardware or clean corrosion.

   c. Check insulators.
      (1) Element mounts for cracks.
      (2) Fiberglass tubes for cracks/breaks.

Performance Steps

d. Check lubrication of rotator gearbox.

Note: Oil should be replaced after 240 hours of operation.

e. Lubricate grease fitting on gearbox.

Note: The bearing should be lubricated every 3 months.

f. Check setscrews on motor flywheel for tightness.
g. Check slack on rotator chain.

CAUTION

Tightening the rotator mount bolts may cause tension on the chain.

Note: Reconnect the radio equipment.

h. Perform VSWR test.
i. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

4. Inspect ground obstruction marker.

WARNING

Do NOT damage the load contact relay when the relay contacts are cleaned.

a. Inspect obstruction lamps.
b. Check all interconnecting cables and connectors for cracks and breaks.
c. Check control assembly.
d. Clean obstruction components.
e. Check electron tube.
f. Adjust timer beacon as required.
g. Lubricate shaft bearing and cam.
h. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	**GO**	**NO-GO**
1. Inspected tower safety.	____	____
2. Maintained guyed supported tower.	____	____
3. Maintained antenna.	____	____
4. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	
Manufacturer's Manuals	

MAINTAIN DELTA-MATCHED DOUBLET ANTENNA
113-596-3011

Conditions: Given delta-matched doublet antenna (installed), carrier rail (installed), ground obstruction marker (installed), screwdriver set, pliers (common), VSWR testing equipment, wrench set, tool kit TK-21, tape measure, level, knife, safety equipment, DA Form 2404, DA Pam 750-8, FM 11-487-11, and the antenna safety manual.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Corrected the fault, obstruction lights were operational and completed the VSWR test.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.
   e. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

2. Maintain guyed supported tower.

CAUTION

The radio equipment must be disconnected before work is performed on the tower.

   a. Check tower for loose hardware.
   b. Check tower for rust.
   c. Inspect tower footing for loose hardware.
   d. Check to ensure that tower is plumb (tension guys as required).
   e. Check tower ground for corrosion and loose hardware.

Note: Reconnect radio equipment.

   f. Complete and submit DA 2404. (Refer to DA Pam 750-8.)

3. Maintain antenna.

CAUTION

The radio equipment must be disconnected before any work is performed on the antenna.

   a. Check antenna for loose hardware.
   b. Check for cracked, chipped, or broken insulator.
   c. Check elements for signs of deterioration (clean as required).

Performance Steps

d. Readjust antenna height and antenna curtain length.
e. Readjust antenna down-lead spacing and down-lead length.

Note: Reconnect radio equipment.

f. Perform VSWR test.
g. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

4. Inspect ground obstruction marker.

WARNING

Do NOT damage the load contact relay when the relay contacts are cleaned.

a. Inspect obstruction lamps.
b. Check all interconnecting cables and connectors for cracks and breaks.
c. Check control assembly.
d. Clean obstruction components.
e. Check electron tube.
f. Adjust timer beacon as required.
g. Lubricate shaft bearing and cam.
h. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	**GO**	**NO-GO**
1. Inspected tower safety devices.	____	____
2. Maintain guyed supported tower.	____	____
3. Maintained antenna.	____	____
4. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	
FM 11-487-11	
Manufacturer's Manuals	

MAINTAIN FIXED LOG PERIODIC ANTENNA
113-596-3012

Conditions: Given rotatable log periodic antenna (installed), VSWR testing equipment, multimeter, safety equipment, tool kit TK-115/G, tool equipment RE-33, block and tackle, engineers transit, open-end wrenches, DA Form 2404, DA Pam 750-8, and the antenna safety manual.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Inspected the antenna, lubricated the gearbox fittings, performed the VSWR test, and completed DA Form 2404. (Refer to DA Pam 750-8.)

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.
   e. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

2. Maintain guyed supported tower.

CAUTION

The radio equipment must be disconnected before work is performed on the tower.

   a. Check tower for loose hardware.
   b. Check tower for rust.
   c. Inspect tower footing for loose hardware.
   d. Check to ensure that tower is plumb (tension guys as required).
   e. Check tower ground for corrosion and loose hardware.

Note: Reconnect radio equipment.

   f. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Maintain antenna.
   a. Check antenna boom and elements for corrosion.
   b. Inspect antenna boom and elements for loose hardware.

Note: It may be necessary to lower the antenna to tighten hardware or clean corrosion.

   c. Check insulators.
      (1) Element mounts for cracks.
      (2) Fiberglass tubes for cracks/breaks.

Performance Steps

d. Check lubrication of rotator gearbox.

Note: Oil should be replaced after 240 hours of operation.

e. Lubricate grease fitting on gearbox.

Note: The bearing should be lubricated every 3 months.

f. Check setscrews on motor flywheel for tightness.
g. Check slack on rotator chain.

CAUTION

Tightening the rotator mount bolts may cause tension on the chain.

Note: Reconnect the radio equipment.

h. Perform VSWR test.
i. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

4. Inspect ground obstruction marker.

WARNING

The load contact relay should not be damaged when the relay contacts are cleaned.

a. Inspect obstruction lamps.
b. Check all interconnecting cables and connectors for cracks and breaks.
c. Check control assembly.
d. Clean obstruction components.
e. Check electron tube.
f. Adjust timer beacon as required.
g. Lubricate shaft bearing and cam.
h. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	**GO**	**NO-GO**
1. Inspected tower safety devices.	____	____
2. Maintained guyed supported tower.	____	____
3. Maintained antenna.	____	____
4. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	

MAINTAIN RHOMBIC ANTENNA
113-596-3014

Conditions: Given rhombic antenna (installed), multimeter, safety equipment, coffin hoist, tool equipment TE-21, tool equipment TE-87, engineers transit, block and tackle kit, open-end wrenches, screwdriver set, pliers, adjustable wrench, level, tape measure, DA Form 2404, DA Pam 750-8, FM 11-487-25, and the antenna safety manual.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. You will work under the supervision of a crew chief. Assistance is provided as required.

Standards: Corrected faults and completed DA Form 2404.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.

2. Maintain guyed supported tower.

CAUTION

The radio equipment must be disconnected before work is performed on the tower.

   a. Check tower for loose hardware.
   b. Check tower for rust.
   c. Inspect tower footing for loose hardware.
   d. Check to ensure that tower is plumb (tension guys as required).
   e. Check tower ground for corrosion and loose hardware.

Note: Reconnect radio equipment.

   f. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Maintain antenna.

CAUTION

The radio equipment must be disconnected before any work is performed on the antenna.

   a. Check for loose or broken elements.
   b. Check for defective insulators.
      (1) Cracked.
      (2) Chipped.

Performance Steps

(3) Broken.
c. Check connections for corrosion.
d. Check antenna for proper tension.
e. Check down lead for proper tension.
f. Check dissipation line.
(1) Proper tension.
(2) Proper grounding.
(3) Proper horn gap.
g. Test for impedance.
(1) Input.
(2) Terminating.

Note: Reconnect the radio equipment.

h. Complete and submit DA Form 2404. (Refer to DA Pam 750-8).

4. Inspect ground obstruction marker.

WARNING

Do NOT damage the load contact relay when the relay contacts are cleaned.

a. Inspect obstruction lamps.
b. Check all interconnecting cables and connectors for cracks and breaks.
c. Check control assembly.
d. Clean obstruction components.
e. Check electron tube.
f. Adjust timer beacon as required.
g. Lubricate shaft bearing and cam.

5. Fabricate harness 3-wire antenna.
a. Cut a section of 2.2 meters to a length of 7 feet.
b. Bend one end into an 8-inch oval loop.
c. Insert a 3/16-inch thimble into loop.
d. Tightly fit strand around thimble and secure it with seizing wire.
e. Unravel 2.2 meter strands close to thimble end and straighten them.
f. Select first wire of the serve and dress other six wires against mother strand.
g. Make wraps tight and cut off excess wire.

Note: Six-side harnesses are required to the rhombic antenna curtain.

6. Fabricate end harness 3-wire.

Note: Two-end harnesses are required for the rhombic antenna curtain.

a. Select a straight and even cross arm and cut two pieces 3 feet long.

Note: Treat the sawed areas with wood preservative.

b. Measure and mark the points for drilling.
c. Cut a 5/8-inch by 14-inch double arming bolt in half (file off the burrs of each side).
d. Attach the 3-bolt clamps of harness cross arm using the cut bolts.
e. Mount cross arm on top of harness strand clamps.
f. Adjust the 5/8-inch nuts holding harness strand to cross arm. Loosen enough to permit harness to adjust itself to line of antenna curtain.

Performance Steps

g. Install downed eyebolts into the 9/16-inch hole of cross arm.

Note: Do NOT tighten the nut fully. Allow the eyebolts to be free in the holes so that tension variations to the down lead wires can be made.

Performance Measures	**GO**	**NO-GO**
1. Inspected tower safety devices.	____	____
2. Maintained guyed supported tower.	____	____
3. Maintained antenna.	____	____
4. Inspected ground obstruction marker.	____	____
5. Fabricated harness 3-wire antenna.	____	____
6. Fabricated end harness 3-wire.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	
FM 11-487-25	

MAINTAIN PARABOLIC ANTENNA
113-596-3015

Conditions: Given parabolic antenna (installed), carrier rail (installed), ground obstruction marker (installed), screwdriver set, adjustable wrench, open-end wrench, knife, level tape measure, binoculars (field type), VSWR testing equipment, safety equipment, common pliers, tool equipment TE-87/U, DA Form 2404, and DA Pam 750-8.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Corrected the faults, checked the directional setting, performed the VSWR test, and completed DA Form 2404.

Performance Steps

CAUTION

The radio equipment must be disconnected before any work is performed on the antenna.

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.

2. Maintain antenna.
   a. Check parabolic antenna reflector.
   b. Check directional setting on the parabolic antenna (reset as required).
   c. Check feed assembly for dents or broken parts.

Note: Reconnect the radio equipment.

   d. Perform VSWR test.
   e. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Inspect ground obstruction marker.

WARNING

Do NOT damage the load contact relay when the relay contacts are cleaned.

   a. Inspect obstruction lamps.
   b. Check all interconnecting cables and connectors for cracks and breaks.
   c. Check control assembly.
   d. Clean obstruction components.
   e. Check electron tube.

Performance Steps

f. Adjust timer beacon as required.
g. Lubricate shaft bearing and cam.

Performance Measures	GO	NO-GO
1. Inspected tower safety devices.	____	____
2. Maintained antenna.	____	____
3. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Pam 750-8	

MAINTAIN YAGI ANTENNA
113-596-3016

Conditions: Given a Yagi antenna (installed), carrier rail (installed), ground obstruction marker (installed), screwdriver set, open-end wrench, knife, level tape measure, variable standing wave ratio (VSWR) testing equipment, signal generator, block and tackle set, safety equipment, 6-inch adjustable wrench, common pliers, tool equipment TE-21, DA Form 2404 and DA Pam 750-8.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Corrected the fault, performed the VSWR and the TDR test, and completed DA Form 2404.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.

2. Maintain antenna.

CAUTION

The radio equipment must be disconnected before any work is performed on the antenna.

   a. Check antenna element for looseness or bends.
   b. Check elements for deterioration.
   c. Check connector for corrosion.

Note: Reconnect radio equipment.

   d. Perform TDR test.
   e. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Inspect ground obstruction marker.

WARNING

Do NOT damage the load contact relay when the relay contacts are cleaned.

   a. Inspect obstruction lamps.
   b. Check all interconnecting cables and connectors for cracks and breaks.
   c. Check control assembly.
   d. Clean obstruction components.
   e. Check electron tube.

Performance Steps
f. Adjust timer beacon as required. g. Lubricate shaft bearing and cam.

Performance Measures	GO	NO-GO
1. Inspected tower safety devices.	____	____
2. Maintained antenna.	____	____
3. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Pam 750-8	

MAINTAIN AB-216/U TOWER
113-596-3018

Conditions: Given tower AB-216/U (installed), carrier rail (installed), ground obstruction marker (installed), screwdriver set, pliers, adjustable wrench, open-end wrench, knife, level, tape measure, tension meters, engineers transit, block and tackle, safety equipment, tool equipment TE-87, tool equipment TE-21, DA Form 2404, DA Pam 750-8, and the antenna safety manual.

Note: This task is performed during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Corrected the fault, inspected and lubricated the tower, and completed DA Form 2404.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.
   e. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

2. Maintain guyed-supported tower.

CAUTION

The radio equipment must be disconnected before work is performed on the tower.

   a. Check tower for loose hardware.
   b. Check tower for rust.
   c. Inspect tower footing for loose hardware.
   d. Check to ensure that tower is plumb (tension guys as required).
   e. Check tower ground for corrosion and loose hardware.

Note: Reconnect radio equipment.

   f. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Maintain tower.
   a. Check area around support timbers and base plates for proper drainage.
   b. Check tower section AB-208/U for leveling.
   c. Check for loose anchors.
   d. Check take-up winch.
   e. Check guy wire attachment.
   f. Check guy tension.
   g. Check for clogged drain holes in the vertical and horizontal tower members.
   h. Check tower for bent, damaged, or missing braces.
   i. Check ground rods.
   j. Lubricate davit assembly, snatch block, and capstan.

Performance Steps

k. Paint tower as needed.
l. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)
m. Lubricate davit assembly, snatch block, and capstan.

4. Inspect ground obstruction marker.

WARNING

Do NOT damage the load contact relay when the relay contacts are cleaned.

a. Inspect obstruction lamps.
b. Check all interconnecting cables and connectors for cracks and breaks.
c. Check control assembly.
d. Clean obstruction components
e. Check electron tube.
f. Adjust timer beacon as required.
g. Lubricate shaft bearing and cam.
h. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	**GO**	**NO-GO**
1. Inspected tower safety devices.	____	____
2. Maintained guyed-supported tower.	____	____
3. Maintained tower.	____	____
4. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	**Related**
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	

MAINTAIN SELF-SUPPORT TOWER
113-596-3021

Conditions: Given self-support tower (installed), tool equipment TE-21, tool equipment TE-27, ground obstruction marker, screwdriver set, pliers, adjustable wrench, open-end wrench, level, tape measure, knife, safety equipment, carrier rail installed, DA Form 2404, DA Pam 750-8, FM 11-487-27, and the antenna safety manual.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. You will work as a team member to perform this task.

Standards: Corrected the fault and completed DA Form 2404.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

   Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension
2. Inspect tower.
   a. Check base for signs of deterioration.
   b. Check for grounding.
   c. Check for loose braces.
   d. Check paint.
   e. Check structure for signs of deterioration.
   f. Record uncorrected faults on DA Form 2404. (Refer to DA Pam 750-8.)
3. Inspect obstruction lamps.

   WARNING

   Do NOT damage the load contact relay when the relay contacts are cleaned.

   a. Inspect obstruction lamps.
   b. Check all interconnecting cables and connectors for cracks and breaks.
   c. Check control assembly.
   d. Check obstruction components.
   e. Check electron tube
   f. Adjust timer beacon as required.
   g. Lubricate shaft bearing and cam.

Performance Measures	GO	NO-GO
1. Inspected tower safety devices.	____	____
2. Inspected tower.	____	____
3. Inspected ground obstruction marker.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	
FM 11-487-27	

MAINTAIN SPIRA-CONE HIGH FREQUENCY (HF) ANTENNA
113-596-3047

Conditions: Given spira-cone HF antenna, tools and equipment, carrier rail, ground obstruction marker, screwdriver set, pliers, open-end wrench, knife, level, tape measure, adjustable safety equipment, DA Form 2404, DA Pam 750-8, and the antenna safety manual.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Checked the spira-cone antenna including base antenna curtains and structure braces for signs of deterioration; checked down-lead guys and anchors for proper tension; and recorded uncorrected faults on DA Form 2404.

Performance Steps

1. Inspect tower safety devices.
   a. Check climbing belts for cuts, frays, and cracks.
   b. Check climbing sleeve bearing.
   c. Check locking pawl for cleanliness and excess wear.

Note: Ensure the radius of the locking edge does NOT exceed 1/16 inch when worn.

   d. Check the locking pawl spring for proper tension.

2. Inspect guys.

CAUTION

The radio equipment must be disconnected before work is performed on the tower.

   a. Check tower for loose hardware.
   b. Check tower for rust.
   c. Inspect tower footing for loose hardware.
   d. Check to ensure that tower is plumb (tension guys are required).
   e. Check tower ground for corrosion and loose hardware.

Note: Reconnect radio equipment.

   f. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

3. Inspect antenna.
   a. Check antenna base.
   b. Check down-lead guys.
   c. Check anchors.
   d. Check structure.
   e. Check antenna curtains.
   f. Record uncorrected faults on DA Form 2404. (Refer to DA Pam 750-8.)

Performance Steps

4. Inspect ground obstruction marker.

> **WARNING**
>
> **Do NOT damage the load contact relay when the relay contacts are cleaned.**

   a. Inspect obstruction lamps.
   b. Check all interconnection cables and connectors for cracks and breaks.
   c. Check control assembly.
   d. Clean obstruction components.
   e. Check electron tube.
   f. Adjust timer beacon as required.
   g. Lubricate shaft bearing and cam.

Performance Measures	GO	NO-GO
1. Inspected tower safety devices.	____	____
2. Inspected guys.	____	____
3. Inspected antenna.	____	____
4. Inspected ground obstruction marker.	____	____

Evaluation Guidance Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
Antenna Safety Manual	
DA Form 2404	
DA Pam 750-8	

MAINTAIN BROADBAND DIPOLE HIGH FREQUENCY (HF) ANTENNA
113-596-3049

Conditions: Given broadband HF antenna (installed), tools and equipment, safety equipment, DA Form 2404, and DA Pam 750-8.

Note: This task is performed at a fixed installation during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Performed maintenance; checked all support poles, coaxial cables, and antenna curtains for signs of deterioration; checked guys for tension; and recorded uncorrected faults on DA Form 2404.

Performance Steps

1. Check support pole for deterioration.
2. Check guys for tension.
3. Check antenna curtain for signs of deterioration.

WARNING

The supervisor will ensure the radio power is turned OFF before the Soldiers climb the broadband HF antenna.

4. Check coaxial cable for signs of deterioration.
5. Record uncorrected faults on DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Checked support pole for deterioration.	____	____
2. Checked guys for tension.	____	____
3. Checked antenna curtain for signs of deterioration.	____	____
4. Checked coaxial cable for signs of deterioration.	____	____
5. Recorded uncorrected faults on DA Form 2404.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Pam 750-8	

MAINTAIN COAXIAL CABLE FOR ANTENNA SYSTEMS
113-596-4005

Conditions: Given materials, tools, safety equipment, warning sign, and DA Form 2404, and DA Pam 750-8.

Note: This task is performed during daylight hours. It should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Performed the air pressure and electrical test on the cable, repressurized the cable, and recorded any uncorrected faults on DA Form 2404.

Performance Steps

1. Disconnect coaxial cable.

   Note: Place WARNING sign on transmitter.

2. Check air pressure in the coaxial cable.

   Note: Turn off pressurization equipment.

3. Repair coaxial cable.
4. Perform electrical test on cable.
5. Connect coaxial cable from antenna to radio equipment.
6. Repressurize cable.

   Note: Remove WARNING sign.

7. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Disconnected coaxial cable.	____	____
2. Checked air pressure in the coaxial cable.	____	____
3. Repaired coaxial cable.	____	____
4. Performed electrical test on cable.	____	____
5. Connected coaxial cable from antenna to radio equipment.	____	____
6. Repressurized cable.	____	____
7. Completed and submitted DA Form 2404.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Pam 750-8	

MAINTAIN PRESSURIZATION EQUIPMENT
113-596-4008

Conditions: Given tools and test equipment, mechanical dehydrator/dehumidifier (installed), hand pump/cylinder (installed), DA Form 2404, and DA Pam 750-8.

Note: This task is performed at a fixed installation during daylight hours and should NOT be performed under adverse weather conditions. Assistance is provided as required.

Standards: Tested the pressurization equipment and the pressure held for 2 hours; and recorded any uncorrected faults on DA Form 2404.

Performance Steps

1. Check low-pressure alarm for defects.
2. Check humidity assembly for defects.
3. Check air tank drain valve for defects.
4. Check dehydrator for evidence of fungus.

WARNING

Trichlorotrifluoroethane fumes are toxic. Thorough ventilation should be provided whenever it is used. It should NOT be used near an open flame. Trichlorotrifluoroethane is not flammable, but exposure of the fumes to an open flame converts the fumes to highly toxic, dangerous gases.

5. Clean the exterior of the dehydrator; remove rust, dirt, grease, and fungus.
6. Prepare equipment for repainting/refinishing.
7. Clean hand pump, as required, with clean, dry rag.
8. Lubricate hand pump shaft, as required, with a light coat of grease.
9. Check hand pump for loose connections; tighten as required.
10. Check air tubing line for loose connections; tighten/replace as required.
11. Check pressure gauge for proper reading.
12. Check cylinder for loose connections; tighten as required.
13. Replace nitrogen cylinder when it becomes empty.
14. Check pressure gauge for proper reading.
15. Complete and submit DA Form 2404. (Refer to DA Pam 750-8.)

Performance Measures	GO	NO-GO
1. Checked low-pressure alarm for defects.	____	____

Performance Measures	GO	NO-GO
2. Checked humidity assembly for defects.	____	____
3. Checked air tank drain valve for defects.	____	____
4. Checked dehydrator for evidence of fungus.	____	____
5. Cleaned the exterior of the dehydrator; removed rust, dirt, grease, and fungus.	____	____
6. Prepared equipment for repainting/refinishing.	____	____
7. Cleaned hand pump, as required, with clean, dry rag.	____	____
8. Lubricated hand pump shaft, as required, with a light coat of grease.	____	____
9. Checked hand pump for loose connections; tighten as required.	____	____
10. Checked air tubing line for loose connections; tighten/replace as required.	____	____
11. Checked pressure gauge for proper reading.	____	____
12. Checked cylinder for loose connections; tighten as required.	____	____
13. Replaced nitrogen cylinder when it becomes empty.	____	____
14. Checked pressure gauge for proper reading.	____	____
15. Completed and submit DA Form 2404.	____	____

Evaluation Guidance: Score the Soldier a GO if all PMs are passed. Score the Soldier a NO-GO if any PM is failed. If the Soldier fails any PM, show what was done wrong and how to do it correctly. Have the Soldier perform the PMs until they are done correctly.

References

Required	Related
DA Form 2404	
DA Pam 750-8	

APPENDIX A – DA Form 5164-R (Hands-On Evaluation)

A-1. Introduction.

This appendix provides a sample of DA Form 5164-R (see Figure A-1) for the tasks in this STP. DA Form 5164-R allows the trainer to keep a record of the performance measures a Soldier passes or fails on each task. Trainers should use the following instructions for using this form.

A-2. Prior to Evaluating the Soldier.

a. Obtain a blank copy of DA Form 5164-R, which you may locally reproduce on 8 1/2- by 11-inch paper. The form also can be downloaded from the U.S. Army Publishing Directorate at (http://www.apd.army.mil/forms).

b. Enter the task title and 10-digit task number from the Soldier's manual task summary in Chapter 3.

c. In column a, enter the number of each PM listed under the in the task summary.

d. In column b, enter the PM corresponding to the PM number in column a. (You may abbreviate this information if necessary.)

e. Enter the Evaluation Guidance statement from the Soldier's manual task summary just below the last PM.

f. Locally reproduce the partially completed form if you are evaluating more than one Soldier on the task or the same Soldier on more than one task.

A-3. During the Evaluation.

a. Enter the date just before evaluating the Soldier's task performance.

b. Enter the evaluator's name and the Soldier's name and unit.

c. For each PM in column b, enter a check in column c *(PASS)* or column d *(FAIL)*, as appropriate.

d. Compare the number of PMs the Soldier passes (and if applicable, which ones) against the task standard shown in the Evaluation Guidance statement. If the standard is met or exceeded, check the *GO* block under *STATUS*; otherwise check the *NO-GO* block.

HANDS-ON EVALUATION For use of this form, see STP 11-25S14-SM-TG; the proponent agency is TRADOC.		DATE 2 APR 2003	
TASK TITLE Perform System Shutdown for SEN System AN/TTC-48(V)		TASK NUMBER 113-625-2090	
ITEM a	PERFORMANCE STEP TITLE b	SCORE (Check One) PASS c	 FAIL d
1	Performed Operational Shutdown Procedures	☒ P	☐ F
2	Performed Storage Procedures	☒ P	☐ F
3	Performed Power Cabling Removal/Storage Procedures	☒ P	☐ F
4	Performed Subscriber Field Cable Removal/Storage Procedures	☒ P	☐ F
5	Performed Grounded Strap and ROD Removal Procedures	☐ P	☒ F
6	Secured the Shelter Door and All External covers	☒ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
		☐ P	☐ F
EVALUATOR'S NAME SFC Whitman		UNIT A CO 369th	
SOLDIER'S NAME SPC Anderson		STATUS ☐ GO	☒ NO GO

DA FORM 5164-R, SEP 1985 EDITION OF DEC 82 IS OBSOLETE APD PE v2.01

Figure A-1. Sample of a completed DA Form 5164-R

APPENDIX B - DA Form 5165-R (Field Expedient Squad Book)

B-1. Introduction.

This appendix provides a sample of DA Form 5165-R (see Figure B-1) for the tasks in this STP. DA Form 5165-R allows the trainer to keep a record of task proficiency for a group of Soldiers. Trainers should use the following instructions for using this form.

B-2. Prior to Evaluating the Soldier.

a. Obtain a blank copy of DA Form 5165-R, which you may locally reproduce on 8 1/2- by 11-inch paper. The form also can be downloaded from the U.S. Army Publishing Directorate at (http://www.army.mil/usapa/index.html.)

b. Enter the SM task number and abbreviated task title for the evaluated tasks in the appropriate column. Use additional sheets as necessary.

c. Locally reproduce the partially completed form if you are evaluating more than nine Soldiers.

B-3. During the Evaluation.

a. Enter the names of the Soldiers you are evaluating, one name per column, at the top of the form. You may add the names of newly assigned Soldiers if there are blank columns.

b. Under STATUS, record (*in pencil*) the date in the GO block if the Soldier demonstrated task proficiency to Soldier's manual standards. Keep this information current by always recording the most recent date on which the Soldier demonstrated task proficiency. Record the date in the NO GO block if the Soldier failed to demonstrate task proficiency to Soldier's manual standards. Soldiers who failed to perform the task should be retrained and re-evaluated until they can meet the standards. When that occurs, enter the date in the appropriate GO block and erase the previous entry from the NO GO block.

B-4. After the Evaluation.

a. Read down each column (GO/NO GO) to determine the training status of that individual. This will give you a quick indication on which tasks a Soldier needs training.

b. Read across the rows for each task to determine the training status of all Soldiers. You can readily see on which tasks to focus training.

c. Line through the training status column of any Soldier who departs from the unit.

FIELD EXPEDIENT SQUAD BOOK

For use of this form, see STP 10-92A10-SM-TG; the proponent agency is TRADOC.

SHEET 1 OF 3

USER APPLICATION: STP 21-1-SMCT Soldier's Manual of Common Tasks

SOLDIER'S NAME				
Murphy	Smith	Jones	Gray	

TASK NUMBER AND TITLE	STATUS																	
	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO	GO	NO-GO
071-326-0512 Estimate Range	5-17-04		5-17-04		5-17-04													
071-329-1001 Identify Terrain	4-3-04						4-20-04		4-20-04									
071-311-2018 Don/Doff Chem Suit	4-6-04		4-6-04		4-15-04				4-15-04									
078-920-1001 Armored Vehicles	5-8-04		5-8-04						5-8-04									
071-329-1002 Grid Coordinates																		
071-329-1003 Magnetic Azimuth																		
071-311-2001 Maint Rifle																		
071-503-1001 Maint M17-Series																		
031-503-1007 Determine																		
031-503-1009 MOPP Gear																		
081-831-1021 Buddy-Aid																		
081-831-1005 Prevent Shock																		
081-831-1009 Frostbite																		
071-332-0511 React to Flares																		
071-305-4407 Employ Hand Grenades																		
031-503-1023 Exchange MOPP Gear																		
081-831-1005 Prevent Shock																		

SAMPLE

DA FORM 5165-R, JUL 2005 PREVIOUS EDITIONS ARE OBSOLETE. APD V1.00

Figure B-1. Sample of a completed DA Form 5165-R

Glossary

SECTION I - ACRONYMS & ABBREVIATIONS

(O)	FOR OFFICIAL USE ONLY
(U)	Unclassified
(V)	version
1SG	First Sergeant
AAR	after action review
AC	alternating current
ACCP	Army Correspondence Course Program
AIS	Automated Information System
AIT	Advanced Individual Training
AKO	Army Knowledge Online
AMP/amp	ampere(s)
AN	Annually (frequency code)
ANCOC	Advanced Noncommissioned Officer Course
ANSI	American National Standards Institute
AR	Army Regulation; Army Reserve
ARNG	Army National Guard
ARNGUS	Army National Guard of the United States
ARTEP	Army Training and Evaluation Program
ASI	Additional Skill Identifier
ATTN/attn	attention
AWG	American Wire Gauge
BA	biannually (frequency code)
BERT	bit error rate tester
BITE	built-in test equipment
BNCOC	Basic Noncommissioned Officer Course
BOM	Bill of Material
BW	Biweekly (frequency code)
CAT	category
CB	common battery
CCA	circuit card assembly
CDF	combined distribution frame
CE	communications-electronics
CIIN	configuration item identification number
CMD	command
CMO	Civil Military Operations
COMM	communications
COMSEC	communications security
CONT P	continuity pair
CONUS	continental United States
CONUSA	the numbered Armies in the continental United States
COU	cable orderwire unit
CRL	cable running list
CSIR	Communications Systems Installation Record
CSM	Command Sergeant Major
CTC	Combat Training Center(s)
DA	Department of the Army
dB	decibel
DC	Direct Current; District of Columbia
DNVT	digital nonsecure voice telephone

DPAS	Digital Patch Access System
DSVT	digital subscriber voice terminal
DTG	date-time group
DTTS	Data Transmission Test Set
DVOW	digital voice orderwire
E	Europe
e.g.	for example
ECRA	engineering change request/authorization
EIA	Electronics Industries Alliance
EIP	Engineering Installation Package
EMI	electromagnetic interference
EMP	electrical magnetic protection
EMT	electrical metallic tubing
etc.	et cetera (and so forth)
FM	frequency modulation; field manual when used with a number
FOCA	fiber optic cable assembly
FOM	fiber optic modem
FOTS	fiber optic transmission system
FREQ/freq	frequency
FT	foot/feet
FTF	FOCA Test Facility
GAA	automotive and artillery
GFCI	ground fault circuit interrupter
GHz	gigahertz
GPS	Global Positioning System
GTA	Graphic Training Aid
HF	high frequency
HP	horse power
Hz	hertz
i.e.	that is
IAW	in accordance with
IBOM	Installation Bill of Material
ID	identification
IDF	intermediate distribution frame
IP	Internet protocol
IR	insulation resistance
IUA	image understanding architecture
kHz	kilohertz
KU	keyboard unit
kW	kilowatt
LAN	local area network
LOS	line of sight
LTF	liquid tight flexible conduit
LTU	line termination unit
MAC	maintenance allocation chart
MACOM	major Army command
MCF	Maintenance Orderwire (MOW) Communications Facility
MDF	main distribution frame
METL	mission essential task list
MHz	megahertz
MIBOM	major item bill of material
MIL-STD	Military Standard
MO	Monthly (frequency code)
MOOTW	military operations other than war
MOS	Military Occupational Specialty
MOW	maintenance orderwire

MSE	mobile subscriber equipment
MTP	MOS Training Plan
NBC	nuclear, biological, chemical
NCO	noncommissioned officer
NEC	National Electric Code
NIC	network interface card
No.	number
NSN	national stock number
OCONUS	outside Continental United States
O&M	Operations and Maintenance
OPORD	operation order
OSM	optical strength meter
PAM/Pam	pamphlet
PAWS	POUR ACID INTO WATER SLOWLY
PC	personal computer
PCM	Project Concurrence Memorandum
PLGR	Precision Lightweight Global Positioning System Receiver
PM	performance measure(s)
PMCS	preventive maintenance checks and services
POC	point(s) of contact
PTO	power take-off
PTT	push-to-talk
PVC	Polyvinyl Chloride
PWR	power
QT	Quarterly (frequency code)
RC	Reserve Component
RF	radio frequency
RFI	radio frequency interference
RHL	rough horizontal link
RLGM	remote loop group multiplexer
RMC	remote multiplexer combiner
RVL	rough vertical link
SA	semiannually (frequency code)
SCFD	standard cubic feet per day
SEP	service entry panel
SL	skill level
SM	Soldier's manual
SMA	subminiature version A
SOP	standing operating procedure
SPD	system planner document
ST	straight tip
STE	secure telephone equipment
STP	Soldier training publication
STU III	secure telephone unit – third generation
Sust	sustainment
TAC	tactical
TADSS	Training Aids Devices Simulators and Simulations
TAR	technical acceptance recommendation
TB	technical bulletin
TC	training circular
TCP	Transmission Control Protocol
TDR	Time Domain Reflectometer
TED	trunk encryption device
TG	trainer's guide
TI	Tactical Internet
TIA	Telecommunications Industry Association

TIM TG	Timing Generator/Auto Strapping Card
TIM BT	Built-In Test Equipment Card
TM	technical manual
TNG/Tng	training
TRL	total rough link
TSEC	telecommunications security
TSO	telecommunications service order
TTP	Tactics, Techniques, and Procedures
ULM	unit level maintenance
UNIT	trained in the unit (brevity code)
UPS	uninterruptible power supply
US	United States
USAR	United States Army Reserve
UTP	Unshielded Twisted Pair (Cat 5 network cabling)
UVC	ultra violet curing
V	volt(s)
V AC	volts alternating current
V DC	volts direct current
VoIP	Voice over Internet Protocol
VSWR	variable standing wave ratio
W	watt(s)
WAN	Wide Area Network
WK	Weekly (frequency code)
WWW	World Wide Web
X TALK	cross talk

SECTION II - TERMS

Additional skill identifier (ASI) or officer skill identifier (SI)
Identification of specialized skills that are closely related to, and are in addition to, those required by military occupational specialty or areas of concentration (officers). Specialized skills identified by the ASI or officer SI include operation and maintenance of specific weapons systems and equipment, administrative systems and subsystems, computer programming, procedures, installation management, analytic methods, animal handling techniques, and other required skills that are too restricted in scope to comprise military occupation specialty or AOC. (See AR 614-200 and DA Pam 611-21).

Army Training and Evaluation Program (ARTEP)
The US Army's collective training program. The ARTEP establishes unit training objectives critical to unit survival and performance in combat. They combine the training and the evaluation processes into one integrated function. The ARTEP is a training program and not a test. The sole purpose of external evaluation under this program is to diagnose unit requirements for future training.

common task
A critical task for which all Soldiers at a given skill level are accountable, regardless of their MOS.

duty position
The job a service member performs within the unit. DA Pam 611-21 has names of official duty positions for each MOS.

individual training
Training which the officer, NCO, or Soldier receives in the training base, units, on the job, or by self-study. This training prepares the individual to perform specified duties or tasks related to the assigned or next higher specialty code of MOS skill level and duty position.

MOS training plan (MTP)
The MTP is a guide for the conduct of individual training in units. The MTP is developed for each MOS/AOC and addresses all skill levels of an MOS/AOC and all duty positions. The MTP lists all MOS/AOC-specific and shared critical tasks for which the MOS/AOC is responsible. It will not include common tasks.

Ohm
The unit of resistance. One ohm is the value of resistance through which a potential difference of one volt will maintain a current of one ampere.

skill level (SL)
A number which denotes the level of qualification within the total MOS. Levels of qualification are identified by characters 0 through 5 in the position of the MOS code.

Sustainment training
The provision of instruction and opportunities for practice to insure that individual or collective task proficiency is maintained at a requisite level. The frequency will vary with individual and collective tasks, the role, location, and personnel fill of the unit, and the desires of the commander.

task summary (TS)
A statement of the task in an action-verb format plus all essential performance measures. A standard format fully describes the task for the Soldier in the field. It will accommodate any product or process task whether it is in fixed sequence, alternate sequence, or combination. The task summary is used both to train the Soldier to perform the task and to evaluate the Soldier's ability to perform the task (within testing constraints).

Technical manual (TM)
A publication which describes equipment, weapons, or weapons systems with instructions for effective use. It may include sections for instructions covering initial preparation for use and operational maintenance and overhaul.

Training Circular (TC)
TCs are publications (paper or computer-based) which provide a means to distribute unit or individual Soldier training information that does not fit standard requirements for other established types of training publications. TCs are part of the Armywide Doctrinal and Training Literature Program (ADTLP).

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References

REQUIRED PUBLICATIONS

Required publications are sources that users must read in order to understand or to comply with this publication.

Army Regulations

AR 25-2	Information Assurance. 24 October 2007
AR 380-5	Department of the Army Information Security Program. 29 September 2000
AR 614-200	Enlisted Assignments and Utilization Management. 27 June 2007

Department of Army Forms

DA Form 2404	Equipment Inspection and Maintenance Worksheet.
DA Form 2407	Maintenance Request.
DA Form 2408-14	Uncorrected Fault Record.
DA Form 5988-E	Equipment Inspection Maintenance Worksheet (EGA).

Department of Army Pamphlets

DA Pam 25-16	Security Procedures for the Secure Telephone Unit, Third Generation (STU-III). 1 April 1993
DA Pam 611-21	Military Occupational Classification and Structure. 22 January 2007
DA Pam 750-8	The Army Maintenance Management System (TAMMS) Users Manual. 22 August 2005

Field Manuals

FM 1-02	Operational Terms and Graphics. 21 September 2004
FM 11-372-1	Standard Installation Practices Outside Plant Cable Splicing. 15 July 1980
FM 11-372-8	Standard Installation Practices: Telephone Outside Plant Installation Drop and Block Wiring and Station Installation. 30 April 1975
FM 11-487-11	Standard Installation Practices: Delta-Matched Doublet Antenna. 31 January 1975
FM 11-487-25	Antenna Systems - HF Rhombic Antenna. 30 May 1977
FM 11-487-27	Installation Practices: Erection of Steel Towers. 15 March 1969
FM 24-1	Signal Support in the Air Land Battle. 15 October 1990
FM 3-25.26	Map Reading and Land Navigation. 18 January 2005
FM 7-0	Training the Force. 22 October 2002

Other Product Types

ANSI/TIA/EIA 568B	Commercial Building Telecommunications Cabling Standard.
ANSI/TIA/EIA 569-A	Commercial Building Standards for Telecommunications Pathways and Spaces
ANSI/TIA/EIA 606-A	Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
Antenna Safety Manual	Antenna Products Company Manual, Safety Climbing Equipment.
ISBN 0072122269	Networking: A Beginner's Guide by Bruce A. Hallberg. 22 December 1999

Manufacturer's Manuals	Manufacturer's manuals, issued with initial issue of equipment.
MIL-HDBK-419A	Grounding, Bonding, and Shielding for Electronic Equipments and Facilities. 29 December 1987
MIL-STD-188-124B (3)	Grounding, Bonding, and Shielding for Common Long-Haul Communications Systems including Ground-Based Communications-Electronics Facilities and Equipment. 1 February 1992
The National Electric Code	NFPA 70: National Electrical Code 10 January 2008
(NEC)	ISBN-10: 087765939; ISBN-13: 978-0877657934 (http://www.nfpa.org/)
SPD	System Planner Document
UNIT OPORD	Unit Operation Order (OPORD)
USAF TO 31-10-3	Air Force Communications Command (E-I Standard) – Standard Installation Practices -- Outside Plant Installation. 1 July 2007

Technical Bulletins

TB 11-5805-780-15	Warranty Program for Digital Non-Secure Voice Terminal with Digital Data Port TA-1042A/U (NSN 5805-01-318-8421). 1 July 2008
TB 385-4	Safety Requirements for Maintenance of Electrical and Electronic Equipment. 1 August 1992

Technical Manuals

TM 11-3895-202-13	Operator's, Organizational, and Direct Support Maintenance Manual for Reel Units RL-31, RL-31-B, RL-31-C, RL-31-D, and RL-31-E (NSN 3845-00-252-6896). 15 January 1986
TM 11-3895-203-15	Operator's, Organizational, and Direct Support, General Support and Depot Maintenance Manual for Reel Equipment, CE-11 (NSN 5805-00-407-7722). 11 April 1967
TM 11-3895-209-14	Operator's, Organizational, Direct Support and General Support Maintenance Manual for Reeling Machines, Cable, Engine-Driven, RL-207/G and RL-207A/G (NSN 3895-00-892-4583). 15 June 1986
TM 11-5805-201-12	Operator's and Unit Maintenance Manual for Telephone Sets, TA-312/PT (NSN 5805-00-543-0012) and TA-312A/PT (NSN 5805-01-217-7310). 1 August 1990
TM 11-5805-650-12	Operator's and Organizational Maintenance Manual for Telephone Set, TA-838/TT (NSN 5805-00-124-8678) (EIC: HJH) and TA-838A/TT (5805-01-125-5976) (EIC:HOR) . 25 January 1985
TM 11-5805-702-12	Operator's and Organization Maintenance Manual for Restorer, Pulse Form, TD-1219/G (NSN 5820-01-145-4939). 5 March 1985
TM 11-5805-703-14	Operator's, Organization, Direct Support and General Support Maintenance Manual for Test Set, Telephone, TS-3647/G (NSN 6625-01-145-2463). 16 September 1985
TM 11-5805-706-12	Operator's and Organizational Maintenance Manual for Multiplexer, TD-1233(P)/TTC (NSN 5820-01-145-2462). 14 January 1985
TM 11-5805-707-12	Operator's and Unit Maintenance Manual for Multiplexer-Combiner, TD-1234(P)/TTC (NSN 5820-01-145-2458) (EIC:HCQ). 14 January 1985
TM 11-5805-735-12	Combined Operation and Maintenance Instructions (Operator and Organizational Levels) Digital Non-Secure Voice Terminal, TA-954/TT, Part No. 23400-502 (NSN 5805-01-159-9691). 15 December 1983

TM 11-5805-783-13&P	Operator's, Unit, and Direct Support Maintenance Manual Including Repair Parts and Special Tools List for Line Termination Unit CV-4180(V)1/T (NSN 5895-01-339-1112), CV-4180(V)2/T 8595-01-339-1113), CV-4180 (5895-01-361-3887); CV-4180(V)4/T (5895-01-361-3888), CV-4180A(V)1/T (5895-01-392-0050), CV-4180A(2/T (5895-01-392-0045), CV-4180A(V)3/T (5895-01-392-0046). 15 November 1992
TM 11-5810-292-13&P	(O) Operator's, Unit and Direct Support Maintenance Manual for General Purpose Tape Reader KOI-18 (NSN 7025-01-026-9620), Electronic Transfer Device KYK-13 (NSN 5810-01-026-9616), Net Control Device KYX-15/15A (NSN 5895-01-026-9619) (NSN 5810-01-095-1312). 31 May 1989
TM 11-5810-329-10	(O) Operator's Manual for Digital Subscriber Voice Terminal TSEC/KY-68 (NSN 5810-01-082-8404). 3 June 1996
TM 11-5810-365-10	(O) Operator's Manual for Trunk Encryption Devices KG-94A (NSN 5810-01-213-8200), KG-194A (NSN 5810-01-283-1394), and Interface Adapter Unit (NSN 5810-01-280-4746). 3 January 1994
TM 11-5820-1022-13-1	Operator's, Unit, and Direct Support Maintenance Manual for Radio Access Unit AN/TRC-191A(V)1 (NSN 5820-01-301-2542) (EIC: HEG) and Radio Access Unit AN/TRC-191A(V)2 (5820-01-326-0711) (EIC: HEP) MSE. 1 February 1996
TM 11-5820-1023-13-1	Operator's, Unit, and Direct Support Maintenance Manual for Line-of-Sight Multichannel Radio Terminal AN/TRC-190(V)1 (NSN 5820-01-247-0981) (EIC: HHC), AN/TRC-190A(V)1(5895-01-310-2538) (EIC: HEF), AN/TRC-190(V)2 (5820-01-247-0979) (EIC: HHD), AN/TRC-190A(V)2 (5895-01-309-4649) (EIC: HEL), AN/TRC-190(V)3 (5820-01-247-0982) (EIC: HHE), AN/TRC-190A(V)3 (5895-01-310-2543) (EIC: HEH), AN/TRC-190(V)4 (5820-01-247-0980) (EIC: HHF), AN/TRC-190A(V)4 (5895-01-309-4651) (EIC: HEM). 1 March 1989
TM 11-5820-864-12-1	Operator's and Unit Maintenance Manual for Radio Repeater Set AN/TRC-174 (NSN 5820-01-161-9420), Vol I. 1 January 1989
TM 11-5820-865-12-1	Operator's and Unit Maintenance Manual for Radio Terminal Set AN/TRC-173 (NSN 5820-01-161-9422). 1 January 1989
TM 11-5820-926-12-1	Operator's and Unit Maintenance Manual for Radio Repeater Set AN/TRC-138A (NSN 5820-01-161-9419), Vol I. 1 January 1989
TM 11-5820-931-12-1	Operator's and Unit Maintenance Manual for Radio Terminal Set AN/TRC-175 (NSN 5820-01-161-9421). 1 January 1989
TM 11-5820-934-13-1-1	Combined Operation and Maintenance Instructions Chapters One through Six Organizational and Intermediate Radio Terminal Set AN/TRC-170(V)2, Part Number 951100-4.(NSN 5820-01-148-3977) 1 August 1985
TM 11-5825-291-13	Operations and Maintenance Manual for Satellite Signals Navigation Sets AN/PSN-11 (NSN 5825-01-374-6643) and AN/PSN-11(V)1 (5825-01-395-3513). 1 April 2001
TM 11-5995-208-10	Operator's Manual for Cable Assembly, Special Purpose, Electrical, CX-11230/G (1/4 Mile) (NSN 5995-00-133-9126), CX-11230/G (100 Foot) (5995-00-133-9127), CX-11230A/G (1320 Foot) (5995-01-121-6623), CX-11230A/G (100 Foot) (5995-01-125-6781) and CX-10734/G (5995-00-133-9125). 7 November 1983
TM 11-6020-200-10	Operator's Manual for Fiber Optic Cable Assemblies CX-13295/G (300M) (NSN 6020-01-220-5435) and CX-13295/G (1000M) (6020-01-208-1147). 15 March 1993

TM 11-6020-200-23&P	Unit and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Fiber Optic Cable Assemblies CX-13295/G (300M) (NSN 6020-01-220-5435) and CX-13295/G (100M) (6020-01-208-1147). 15 March 1993
TM 11-6110-243-14P	Operator's, Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tool Lists (including Depot Maintenance Repair parts and Special Tools) for Distribution Boxes J-2317/U (NSN 6110-00-937-4964). 8 September 1976
TM 11-6625-3227-13&P	Operator's, Unit, and Direct Support Maintenance Manual (Including Repair Parts and Special Tools List) for Optical Communications Test Set TS-4117/G (NSN 6625-01-189-8155). 15 May 1994
TM 11-6625-3292-12	General Support Maintenance Manual for Telephone Cable Test Set AN/GTM-12 (NSN 6625-01-304-6220). 27 February 1995
TM 9-2320-269-10	Operator's Manual for Truck, Telephone Maintenance, Utility; C/S; 36,000 GVW, 6x4 w/Winch, W/E, M876 (NSN 2320-00-000-0114). 4 April 1984
TM 9-243	Use and Care of Hand Tools and Measuring Tools. 12 December 1983.

Training Circulars

TC 24-20	Tactical Wire and Cable Techniques. 3 October 1988

RELATED PUBLICATIONS

Related publications are sources of additional information. They are not required in order to understand this publication.

Army Regulations

AR 25-55	The Department of the Army Freedom of Information Act Program. 1 November 1997
AR 380-40	(O) Policy for Safeguarding and Controlling Communications Security (COMSEC) Material (U). 30 June 2000

Department of Army Pamphlets

DA Pam 25-380-2	(O) Security Procedures for Controlled Cryptographic Items. 10 January 1991

Technical Bulletins

TB 380-41	(O) Security: Procedures for Safeguarding, Accounting, and Supply Control of COMSEC Material. 15 March 2006

Technical Manuals

TM 11-5805-384-12	Operator's and Organizational Maintenance Manual for Telephone Set, TA-341B/TT (NSN 5805-01-039-3499). 14 December 1982
TM 11-5805-650-12	Operator's and Organizational Maintenance Manual for Telephone Set, TA-838/TT (NSN 5805-00-124-8678) (EIC:HJH) and TA-838A/TT 5805-01-125-5976) (EIC: HOR) 25 January 1985
TM 11-5805-701-12	Operator's and Organizational Maintenance Manual for Restorer, Pulse Form, TD-1218/G (NSN 5820-01-145-4938). 5 March 1985
TM 11-5805-702-12	Operator's and Organizational Maintenance Manual for Restorer, Pulse Form, TD-1219/G (NSN 5820-01-145-4939). 5 March 1985

TM 11-5805-703-14	Operator's, Organization, Direct Support and General Support Maintenance Manual for Test Set, Telephone, TS-3647/G (NSN 6625-01-145-2463). 16 September 1985
TM 11-5810-292-13&P	(O) Operator's, Unit and Direct Support Maintenance Manual for General Purpose Tape Reader KOI-18 (NSN 7025-01-026-9620), Electronic Transfer Device KYK-13 (NSN 5810-01-026-9618), Net Control Device KYX-15/15A (NSN 5895-01-026-9619) (NSN 5810-01-095-1312). 31 May 1989
TM 11-5995-208-10	Operator's Manual for Cable Assembly, Special Purpose, Electrical, CX-11230/G (1/4 Mile) (NSN 5995-00-133-9126), CX-11230/G (100 Foot) (5995-00-133-9127), CX-11230A/G (1320 Foot) (5995-01-121-6623), CX-11230A/G (100 Foot) (5995-01-125-6781) and CX-10734/G (5995-00-133-9125). 7 November 1983
TM 9-2320-209-10-1	Operation, Installation and Reference Data Operator Level for 2 1/2-Ton, 6X6, M44A1 and M44A2 Series Trucks (Multifuel); Cargo: M35A1 W/O Winch (NSN 2320-00-542-5633) W/W (2320-00-542-5634), M35A2 W/O Winch (2320-00-077-1616) W/W (2320-00-077-1617), M35A2C W/O Winch (2320-00-926-0873) W/W (2320-00-926-0875), M36A2 W/O Winch (2320-00-077-1618) W/W (2320-00-077-1619); Tank, Fuel: M49A1C W/O Winch (2320-00-440-3349) W/W (2320-00-440-3346), M49A2C W/O Winch (2320-00-077-1631) W/W (2320-00-077-1632); Tank, Water: M50A1 W/O Winch (2320-00-440-8307) W/W (2320-00-440-8305), M50A2 W/O Winch (2320-00-077-1633) W/W (2320-00-077-1634) M50A3 W/O Winch (2320-00-937-4036) W/W (2320-00-937-5264); Van, Shop: M109A2 W/O Winch (2320-00-440-8313) W/W (2320-00-440-8308), M109A3 W/O Winch (2320-00-077-1636) W/W (2320-00-077-1637); Repair Shop: M185A2 W/O Winch (4940-00-987-8799) W/W (4940-00-987-8800), M185A3 W/O Winch (4940-00-077-1638) W/W (4940-00-077-1639); Tractor: M275A1 W/O Winch (2320-00-446-2479), M257A2 W/O Winch (2320-00-077-1640) W/W (2320-00-077-1641); Dump: M342A2 W/O Winch (2320-00-077-1643) W/W (2320-00-077-1644); Maintenance, Pipeline Construction: M756A2 W/W (2320-00-904-3277) and Maintenance, Earth Boring and Polesetting: M764 W/W (2320-00-937-5980). 26 September 1980
TM 9-2320-289-20P	Unit Maintenance Repair Parts and Special Tools List Including Depot Maintenance Repair Parts and Special Tools List for Truck, Cargo, Tactical, 1-1/4 Ton, 4X4, M1008 (NSN 2320-01-123-6827); Truck, Cargo, Tactical, 1-1/4 Ton, 4X4, M1008A1 (2320-01-123-2671); Truck, Utility, Tactical, 3/4 Ton, 4X4, M1009 (2320-01-123-2665); Truck, Ambulance, Tactical, 1-1/4 Ton, 4X4, M1010 (2310-10-123-2666); Truck, Shelter Carrier, Tactical, 1-1/4 Ton, 4X4, M1028 (2320-01-127-5077); Truck, Shelter Carrier W/PTO, Tactical, 1-1/4 Ton, 4X4, M1028A1 (2320-01-158-0820); Truck, Shelter Carrier W/PTO, Tactical, 1-1/4 Ton, Ton, 4X4, M1028A3 (2320-01-325-1937); Truck, Chassis, Tactical, 1-1/4 Ton, 4X4, M1031 (2320-01-133-5368)1 May 1992

Training Circulars

TC 24-20	Tactical Wire and Cable Techniques. 3 October 1988

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GEORGE W. CASEY, Jr
General, United States Army
Chief of Staff

Official:

JOYCE E. MORROW
Administrative Assistant to the
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