2M053, Module 5: Missile Support Base Maintenance and Materiel Management

This fifth module provides an in-depth look at the maintenance performed on base by the power, refrigeration, and electrical (PREL) shop. This encompasses a variety of support vehicles, battery reconditioning procedures, and the guidance and control liquid cooling system.

Lesson 1 provides a detailed look at the support vehicles used throughout the maintenance complex that a PREL technician would be responsible to troubleshoot, repair, and perform periodic maintenance inspections on. This lesson encompasses everything from the complex payload transporter to the simple maintenance support van. Lesson 2 explores the properties of emergency storage batteries and the procedures on reconditioning them. It also contains information about equipment items used by other work centers that PREL must maintain, such as the guided missile maintenance platform (GMMP) and hydraulic pipe pusher. This lesson ends with a look at the maintenance PREL performs using the brine chiller test stand (BCTS). This unit also explains how to prepare brine and sodium chromates solutions for use in the field. Lesson 3 presents information on the supply system, materiel management, and maintenance data collection. It also contains information on determining supply system priorities and the use of an illustrated parts breakdown technical order. The lesson concludes with step-by-step guidance on how to prepare several supply documents.

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Lesson 1. Support Vehicles

Main Points

1. Periodic Maintenance Semitrailer and Mechanical Maintenance Truck
    a. Periodic maintenance semitrailer auxiliary power unit and power distribution system
    b. Periodic maintenance semitrailer environmental control system
    c. Mechanical maintenance truck electrical, hoist, and rear lift gate systems
2. Transporter-Erector and Payload Transporter
    a. Transporter-erector auxiliary power unit and electrical and environmental control systems
    b. Payload transporter auxiliary power unit and electrical system
    c. Payload transporter semitrailer environmental control system

d. Payload transporter semitrailer hoist system

Many different vehicles are required to complete the mission of maintaining the intercontinental ballistic missile (ICBM) fleet; each is unique and serves a different purpose. As a facilities maintenance section (FMS) technician, you will have the opportunity to operate several of them. As a power, refrigeration, and electrical (PREL) shop technician you will have the opportunity to perform periodic maintenance inspections and troubleshooting procedures on many of them.

This lesson will break down several of the different support vehicles you will need to be familiar with. The first section will concentrate on the periodic maintenance semitrailer and the mechanical maintenance truck, or M-van. The second section will introduce you to the payload transporter (PT) and the transporter-erector (TE).

Click here to begin Lesson 1 of Module 5.

Periodic Maintenance Semitrailer and Mechanical Maintenance Truck

The periodic maintenance semitrailer is typically referred to as the periodic maintenance team (PMT) van (fig 1–1). It is used to store and transport parts, tools, and test equipment items that a PMT will need to perform periodic maintenance inspections at a missile alert facility (MAF) or launch facility (LF). Since a PMT performs maintenance on nearly every system on a site during periodic maintenance inspections, they require a vast array of items and a large support vehicle to store them.

Figure 1–1. Periodic Maintenance Trailer (PMT van).

Periodic Maintenance Semitrailer Auxiliary Power Unit and Power Distribution System

The PMT van serves as a home away from home for technicians in the missile field performing periodic maintenance inspections. As so, the trailer has areas for amenities such as a refrigerator, microwave, and other appliances requiring 120 volts alternating current (VAC) to operate. In addition to this, the trailer also has an environmental control unit (ECU), lighting, electrical outlets, and an additional heater for the rear compartment of the trailer. This lesson will focus on the trailer's site power cable and auxiliary power unit (APU) as well as the power distribution system. The illustrated parts breakdown (IPB) and operating instructions for the PMT trailer is Technical Order (TO) 36A9-8-56-1, *Periodic Maintenance Trailer*.

Periodic Maintenance Semitrailer Auxiliary Power Unit and Power Distribution System

Site Power Cable

The PMT van's site power cable (fig 1–2) is the primary method of supplying 120/208 VAC, 3-phase power to the PMT trailer. The five conductors inside the cable consist of three phases of 120 VAC power and two grounds.

One end of the power cable plugs into the source of power, which is typically the PMT bay where the trailer is parked when it is not dispatched, or the site power receptacle at a MAF or LF when it is dispatched to the missile field. The other end of the cable is connected to the site power receptacle located on the rear-driver's side of the trailer.

The transfer switch in the front compartment of the PMT van and the circuit breaker for the power supply must be in the OFF position when connecting or disconnecting the site power cable. The site power cable is stowed on a large reel in the rear of the PMT trailer. As a PREL shop technician, you will inspect the site power cable to ensure it has no major damage and that the conductors within the cable function correctly.

An additional dedicated ground wire provides an earth ground. It is used whenever the site power cable is being used to provide power to the PMT trailer. The ground wire is typically on a self-retracting spool with a large clip at either end. One end of the ground cable is attached to the ground stud located next to the site power cable receptacle on the PMT trailer, and the other end is attached to an approved ground point in the PMT bay, MAF, or LF.

Periodic Maintenance Semitrailer Auxiliary Power Unit and Power Distribution System

Auxiliary Power Unit

The APU (fig 1–3) is used whenever a source of site power is unavailable, which is typically when a team is driving to or from a MAF or LF. It consists of a diesel engine and generator that provide the same 120/208 3-phase VAC power that the site power cable provides. The generator has a 15-kilowatt (kW) (15,000 watt) capacity. The APU is located inside of a shroud on its own deck at the front of the PMT trailer. A 130-gallon fuel tank (located in the belly of the trailer) supplies fuel for the APU.

The APU is started by a technician manually; it uses a 12-volts direct current (VDC) starting system with a single battery similar to the one you might find on your own car or truck. The battery is located inside the battery box next to the APU and is charged by the APU's direct current (DC) alternator whenever the engine is operating.

As an FMS technician, you will perform pre-start checkouts and operate the APU. As a PREL shop technician, you will perform periodic maintenance inspections on the APU that include visual inspections as well as changing the oil and the oil/fuel/air filters. You will also perform troubleshooting actions and remove and replace the APU if necessary.

Click here to move forward in the lesson.

PMT Trailer Power Distribution System

The purpose of the power distribution system on the PMT trailer is to distribute the 120/208 VAC 3-phase power to lights, receptacles, and other components on the trailer. Major components of this system are the transfer switch and the power panel.

POWER TRANSFER SWITCH	POWER DISTRIBUTION PANEL	POWER DISTRIBUTION SCHEMATIC

The power transfer switch (fig 1–4) is located in the upper personnel compartment of the PMT trailer. Its purpose is to allow the user to select the source of power (site power cable or APU) that will be sent to the adjacent power distribution panel. The three selector positions are SITE, APU, and OFF, which are self-explanatory.

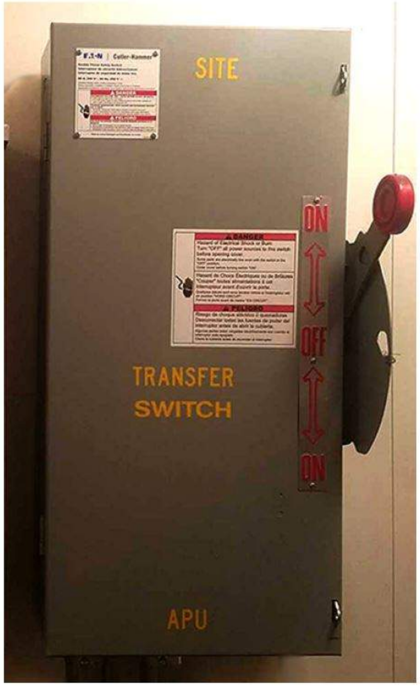


Figure 1–4. PMT van power transfer switch.

POWER TRANSFER SWITCH	POWER DISTRIBUTION PANEL	POWER DISTRIBUTION SCHEMATIC

The power distribution panel (fig 1–5) is located in the upper compartment of the trailer next to the power transfer switch.

This panel is responsible for distributing power to the many electrical loads of the PMT trailer that include the following:

- ECU
- Air Compressor Unit
- Rear Heater Unit

- Rear Electrical Outlets
- External Electrical Outlets
- Belly water tank heater
- Refrigerator and microwave
- Work bench electrical outlets
- Internal lights and external floodlights

The three phase motors in the ECU and the air compressor unit, if the semitrailer is equipped with one, are the only components that utilize 120/208 VAC, 3-phase power. The rear heater unit uses two phases of 120 VAC that meet in the center of a resistive element much like the launch tube-heating element you learned about in volume 4. The rest of the electrical loads on the semitrailer use only a single phase of 120 VAC.

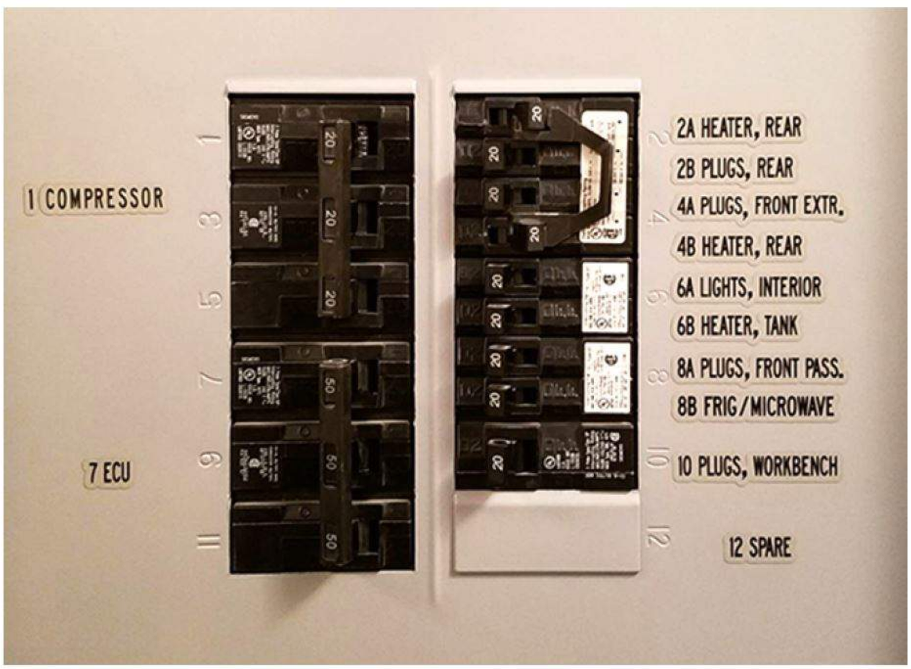


Figure 1–5. PMT van power distribution panel.

This power distribution schematic (fig 1–6) has been traced for you, with sources of power noted. It is relatively simple and the power distribution system for the PMT trailer is comprised of mostly electrical outlets and lights. Knowing this system will save you hours of troubleshooting headache as a PREL shop technician.

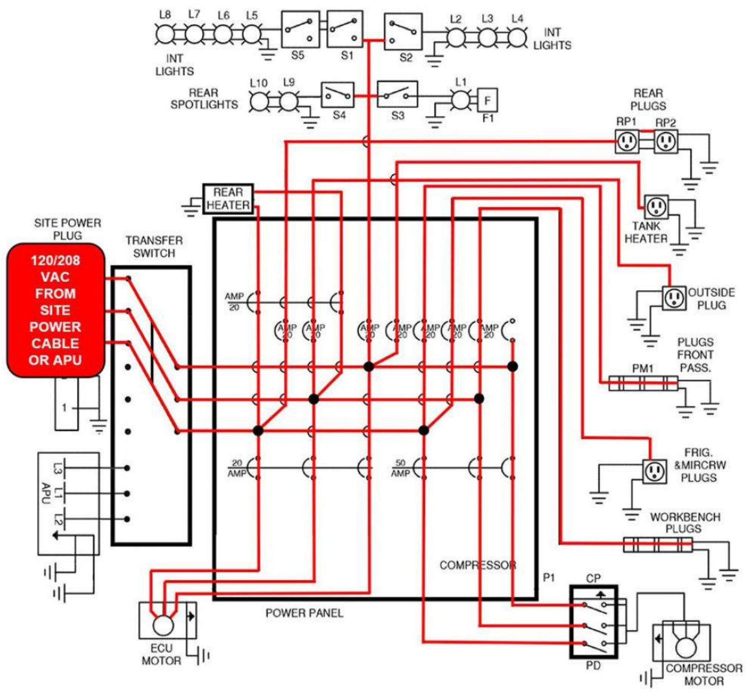


Figure 1–6. PMT van power distribution schematic.

Complete the content above before moving on.

Periodic Maintenance Semitrailer Environmental Control System

The PMT trailer serves as a PMT’s home away from home while they are dispatched into the missile field. Temperatures at the three missile wings can vary widely between the summer and winter months, so it is only fitting that the PMT trailer is equipped with an environmental control system (ECS).

Environmental Control System

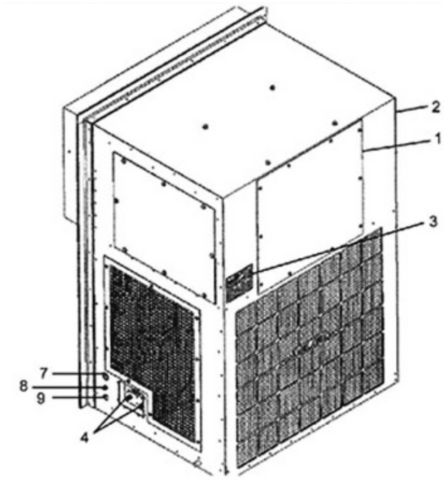
The PMT trailer requires an ECU for the comfort of occupants in the trailer. The ECU also protects liquids and sensitive calibrated equipment from extreme temperatures. The PMT trailer ECU (fig 1–7) is a commercially manufactured system that can remove 28,000 British thermal units (BTU) of heat per hour from the inside of the van compartment. In addition to cooling the interior of the trailer, the ECU can also provide 34,150 BTUs per hour of heating. The unique aspect of the PMT van ECU is that a technician controls the temperature inside the trailer by adjusting the thermostat.

The ECU contains a full refrigeration system similar to the MAF and LF brine chiller units, only much smaller.

A fan in the lower portion of the ECU blows air across condenser coil to eject heat into the air on the outside of the van when the ECU is in cooling mode. A blower motor in the upper portion of the unit blows air across the evaporator coil to push conditioned air into the rear compartment through ductwork that runs the entire length from the front to the rear of the trailer.

The same blower motor in the upper portion of the ECU is also responsible for moving air across a heating coil when the unit is set to HEAT.

A control panel is mounted inside the PMT van contains a four-position switch and an adjustable thermostat that cools, vents, heats and turns the system OFF.



1. **Panel Details**
2. **Chassis Details**
3. **Nameplate**
4. **Service/Access Valves**
5. **Return Air Grille / Filter**
6. **Supply Air Opening**
7. **Main Power Entry**
8. **Ground Stud**
9. **Control Power Supply**

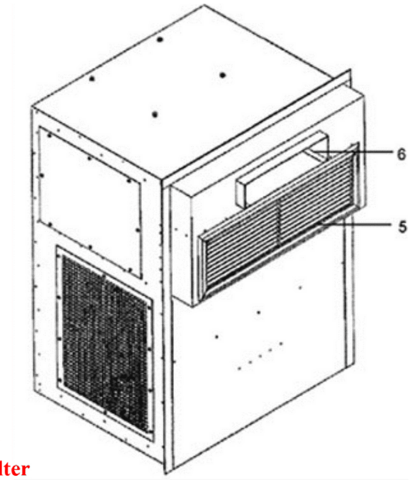


Figure 1–7. PMT Van ECU_2

Click each (+) to learn about the PMT van ECU panel.

COOL –

The cool function decreases the temperature inside of the PMT trailer to the temperature selected on the manual thermostat. When the temperature in the van is below the thermostat setting, the cooling cycle of the ECU stops. It will automatically start when the temperature is above the thermostat setting.

VENT –

The vent function disables the cooling and heating systems and enables the blower fan in the ECU. This will circulate ambient air throughout the ductwork in the trailer.

HEAT —

The heat function increases the temperature inside of the trailer to the temperature set on the manual thermostat. When the desired temperature level is achieved, the heating elements de-energize, and the blower fan continues to operate. If the temperature falls below the thermostat setting, the heating elements will once again energize to provide heat to the rear of the PMT trailer.

OFF —

This function simply turns the ECU off.

As a technician in FMS, you will only operate the ECU. However, as a technician in the PREL shop, you will perform periodic maintenance inspections, troubleshooting, and removal and replacement of the ECU if it becomes defective.

Figure 1–7. PMT Van ECU._3

Complete the content above before moving on.

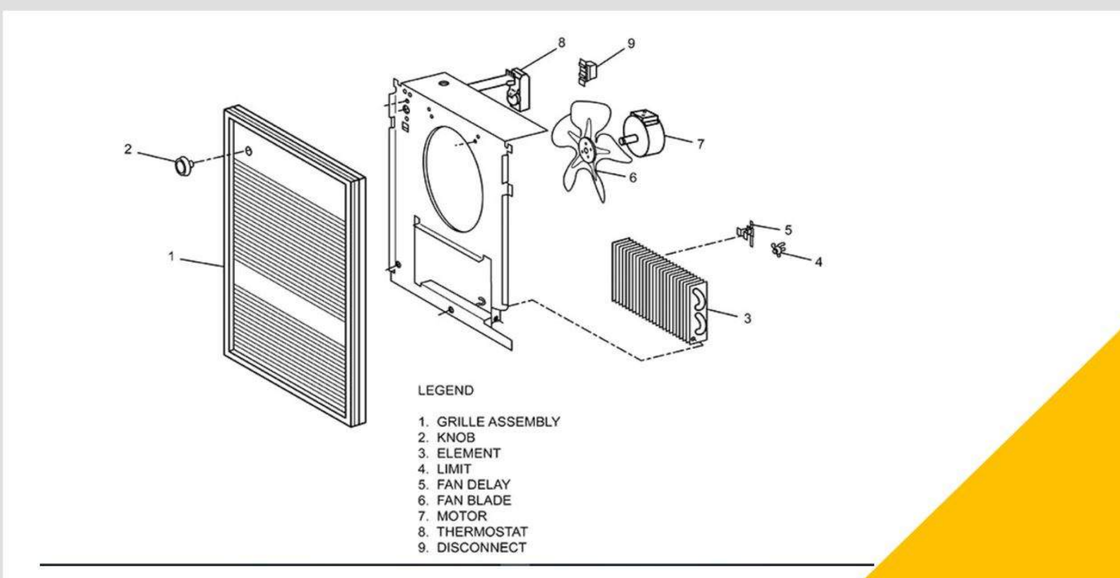


Figure 1–8. PMT Van Aft Heating System.

Aft Heating System

If the ECU is not functioning or is not needed to maintain a higher temperature inside the trailer, a heating system in the rear of the PMT van operates independently of the ECU. This 3-kW heater (fig 1–8) is located beneath the stairs leading to the upper compartment and can provide up to 12,000 BTUs per hour of heating for the rear of the PMT van. This heater operates on 208 VAC, 2-phase power—both phases meet at a resistive element in the center of the conductor to generate heat. This heater operates much like a space heater. It will not provide enough heat to maintain a high temperature in the back of the van. When operating without the ECU, this heater will maintain the rear compartment of the trailer at just above 40 degrees Fahrenheit (°F). It is used mainly to ensure test equipment and the water in the back of the van does not freeze when the ECU is not operating.

Mechanical Maintenance Truck Electrical, Hoist, and Rear Lift Gate Systems

The mechanical maintenance truck is commonly referred to as an "M-van." It is a jack-of-all-trades vehicle used by the electromechanical maintenance team (EMT), missile maintenance team (MMT), and facilities maintenance team (FMT) technicians alike. While it is primarily used by MMT to carry the support equipment needed to swap missile components in the field, you will dispatch to the field with this vehicle for jobs that require large pieces of equipment. As a PREL shop technician, you will perform periodic maintenance inspections on the M-van's hoist, site power cable, electrical system, and other portions of the vehicle.

Figure 1–9. Mechanical Maintenance Truck (M-van).

Description

The M-van (fig 1–9) is equipped with the following:

- Monorail hoist to raise and lower equipment and parts.
- Rear compartment heater.
- Electrically powered hydraulic rear lift gate.
- DC lighting located in the rear cargo compartment.
- Floodlights to illuminate work area behind rear compartment.

Click on each (+) sign and tab to learn about the mechanical maintenance truck electrical, hoist, and rear lift gate systems.

Electrical System (1)

The components inside the rear compartment (fig 1–10) of an M-van are not expected to be in a controlled environment, and it is for this reason that there are rear heaters, but no air conditioning, and therefore no real ECS. There is no APU to operate the M-van's electrical system, but it can operate using site power. Certain components in the M-van also utilize the DC electrical system.

Figure 1–10. M-van rear compartment.

Electrical System (2)

A site power cable stowed on a large cable reel in a side compartment (fig 1–11) of the M-van provides 120/208 VAC, 3-phase power to the components of the alternating current (AC) electrical system. The cable reel utilizes a spring-loaded, locking mechanism to prevent the cable from retracting automatically.

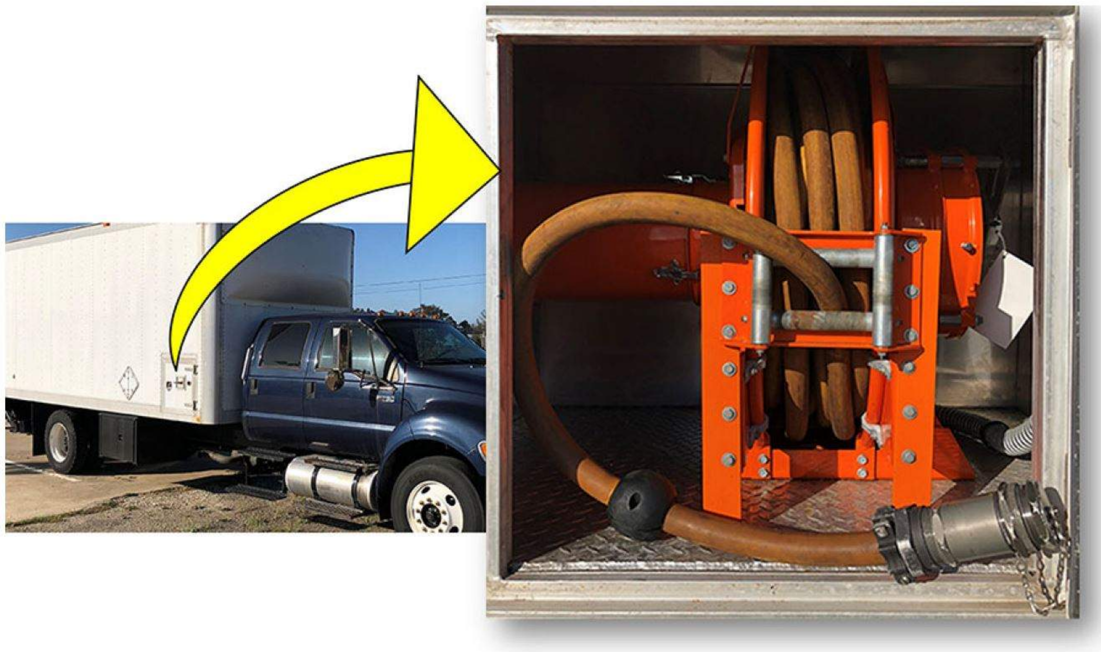


Figure 1–11. M-van site power cable.

Electrical System (3)

Once connected to a facility power source, power will be available to the M-van’s hoist, rear floodlights, power outlets, and heaters through the main circuit breaker panel (fig 1–12) in the rear compartment.

12 VDC is provided by the M-van’s engine starting batteries. This DC power system supplies power to the under-hood components and interior passenger compartment of the M-van just like a normal passenger vehicle, but also provides power to the DC lights in the rear compartment.

Figure 1–12. M-van power distribution panel.

HOIST

ELECTRICALLY POWERED HYDRAULIC REAR LIFT GATE

The M-van is equipped with an electrical chain hoist (fig 1–13) to aid in handling and lifting equipment in or out of the truck. The hoist rides on a single rail attached to the roof of the van body and is capable of extending out the back of the M-van.

NOTE: This hoist will only raise and lower—it must be manually rolled backward, forward along the monorail, and locked into place with quick release pins.

The hoist is capable of lifting up to 1,000 pounds and receives power from a 120 VAC circuit breaker in the M-van's main circuit breaker panel. The hoist is the primary reason that the M-van utilizes an AC power system.

Figure 1–13. M-van hoist.

HOIST

ELECTRICALLY POWERED HYDRAULIC REAR LIFT GATE

The rear end of the M-van is high off the ground making it difficult to load heavy objects into the rear cargo compartment if no AC power is available to power the hoist. To remedy this, the M-van is also equipped with a hydraulic rear lift gate (fig 1–14) powered by the M-van's batteries. It does not possess the same lifting capacity as the monorail hoist, but it easily tackles most routine maintenance tasks without the need to be connected to facility power.

As a PREL shop technician, you will perform periodic maintenance on the M-van hoist, AC and DC electrical systems, interior lights, and site power cable. You will also troubleshoot these components if they are not functioning properly.

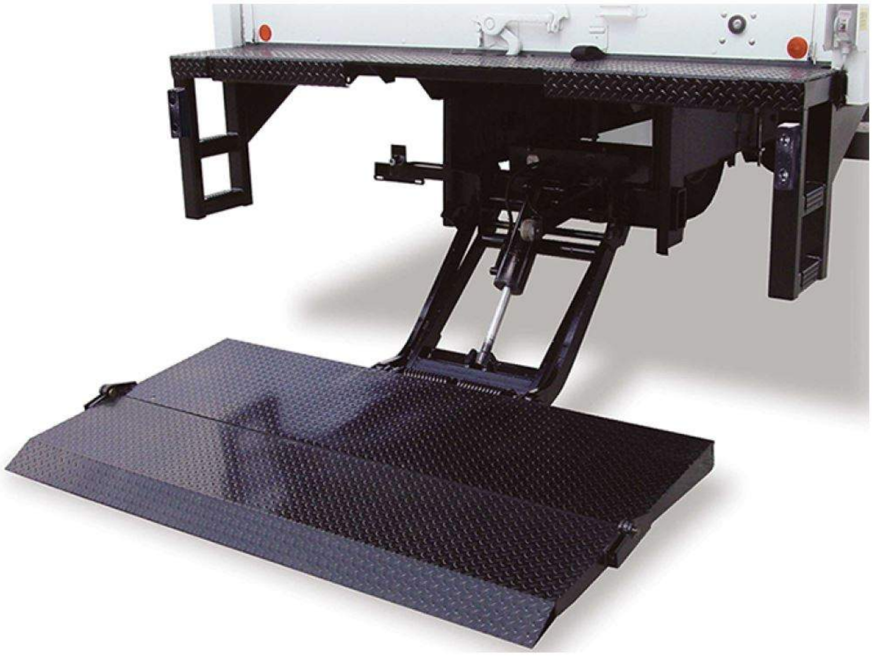


Figure 1–14. M-van hydraulic lift gate.

Complete the content above before moving on.

You have reached the self-test questions. Answer each question

before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the periodic maintenance semitrailer auxiliary power unit and power distribution system.

1. What position does the transfer switch in the front of the periodic maintenance trailer need to be set to prior to connecting the site power cable?

Type your answer here

SUBMIT

2. How is the periodic maintenance trailer APU started?

Type your answer here

SUBMIT

3. Where is the power distribution panel in the periodic maintenance trailer located?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the periodic maintenance semitrailer environmental control system.

1. How are the periodic maintenance trailer ECU cooling or heating functions controlled?

Type your answer here

SUBMIT

2. Explain the cool function of the periodic maintenance trailer ECU.

Type your answer here

SUBMIT

3. What other sources of heat exist on the periodic maintenance trailer besides the ECU?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the mechanical maintenance truck electrical, hoist, and rear lift gate systems.

1. What components on the mechanical maintenance truck use AC power?

Type your answer here

SUBMIT

2. Why must the hoist in the mechanical maintenance truck be moved backward and forward manually?

Type your answer here

SUBMIT

3. What source of power does the mechanical maintenance truck rear lift gate utilize?

Type your answer here

SUBMIT

Click on each tab before moving forward in the lesson.

The payload transporter is raised during an annual proofload test at Minot Air Force Base, North Dakota, April 2, 2019. A payload transporter is used to deliver and lower Minuteman III intercontinental ballistic missiles and components into silos. (U.S. Air Force graphic by Senior Airman Ashley Boster)

Transporter-Erector and Payload Transporter

The Minuteman III missile is transported to the LF and installed into the launch tube in several individual sections. The TE is a large maintenance vehicle used by MMT to install the first, second, and third stage boosters, which combine to form the downstage. The vehicle transports the downstage in the horizontal position and then stands it upright at the LF—hence the erector part of its name. After the downstage is installed in the missile silo, another MMT team will use the PT vehicle to install the missile guidance set, propulsion system rocket engine, and other components that complete the missile. This section will concentrate on the TE and PT APU and electrical and environmental control systems.

Transporter-Erector Auxiliary Power Unit and Electrical and Environmental Control Systems

The TE requires electricity to perform many of its functions just like most of the vehicles you have already read about, and it receives it from either facility power or from an APU. The TE (fig 1–15), consists of a semitrailer and the tractor that pulls it.

As you can see, the TE is a very interesting part of the ICBM vehicle fleet. It transports the missile downstage in the horizontal position and then utilizes a hydraulic system to erect the container and its hoist to lower the downstage into the missile silo.

Figure 1–15. Transporter-erector.

Auxiliary Power Unit

As a PREL technician, you will be responsible for performing periodic maintenance inspections on and troubleshooting the TE APU (fig 1–16). Unlike the PMT trailer, the TE's APU is mounted on the rear of the tractor that pulls the TE container. The APU provides 120/208 VAC, 3-phase power to the electrical loads within the TE container. The TE's hydraulic pump is physically driven by the APU.

The TE APU utilizes a preheating system that consists of electric preheater elements in the intake manifold which heat the air before it is drawn into the engine's cylinders. To start the APU in cold weather, hold the preheater toggle switch for 30 seconds prior to starting the engine.

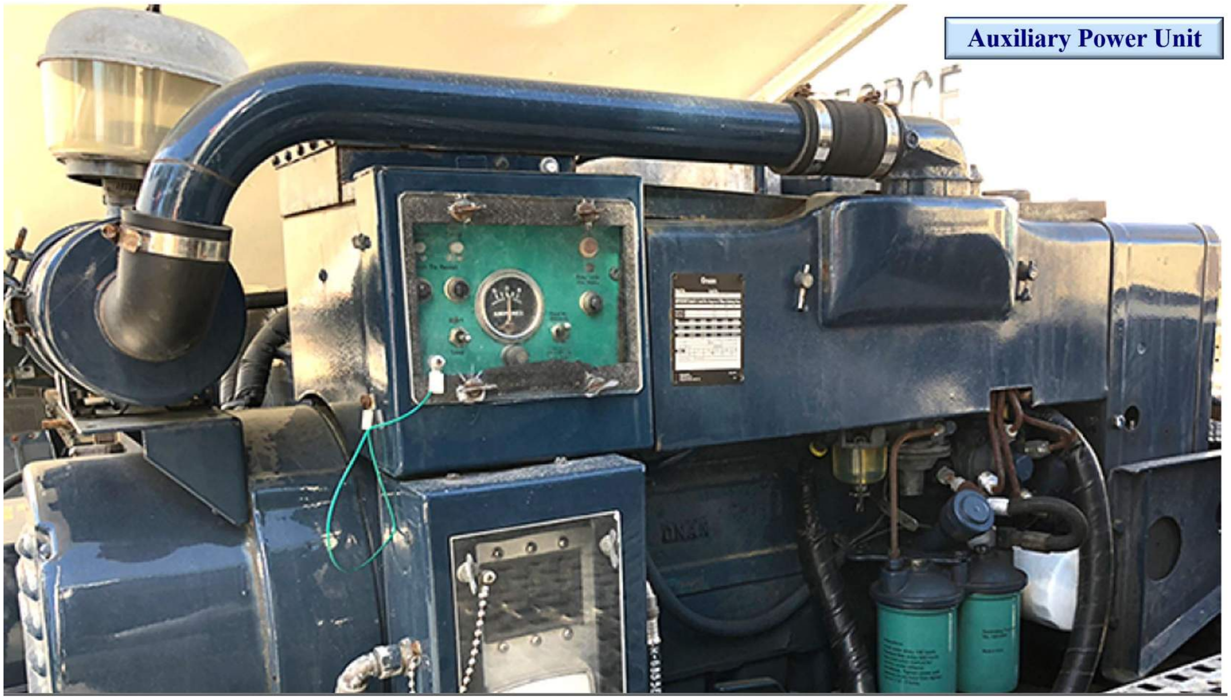


Figure 1–16. TE APU.

Container Electrical System

The electrical system for the inside of the TE container consists of interior lighting and electrical outlets. The interior lighting consists of four light fixtures in the left and right edges of the ceiling that operate on 120 VAC. A light switch at the rear of the container near the cargo doors controls the ceiling lights.

There are two 120 VAC service outlets—one in the rear and another in the forward areas of the container. The electrical lines that supply power to the ceiling lights and outlets run through conduits, under the foam insulation and along the walls of the container.

As a PREL technician, you will verify that all of these components are operating properly during periodic inspections and repair any items that do not operate correctly.

Environmental Control Unit

The TE ECU (fig 1–17) is bolted to the bogie assembly and does not move with the container when it erects. The ECU supplies hot or cold air through inflatable fabric ducting that runs the length of the container. The ECU can provide 20,000 BTUs of cooling per hour and 34,000 BTUs of heating per hour to keep the container between 60 and 100°F. The ECU can be operated in its normal location under the TE container, but during periodic maintenance inspections, the ECU is removed from the bogie assembly and connected to an external power source.

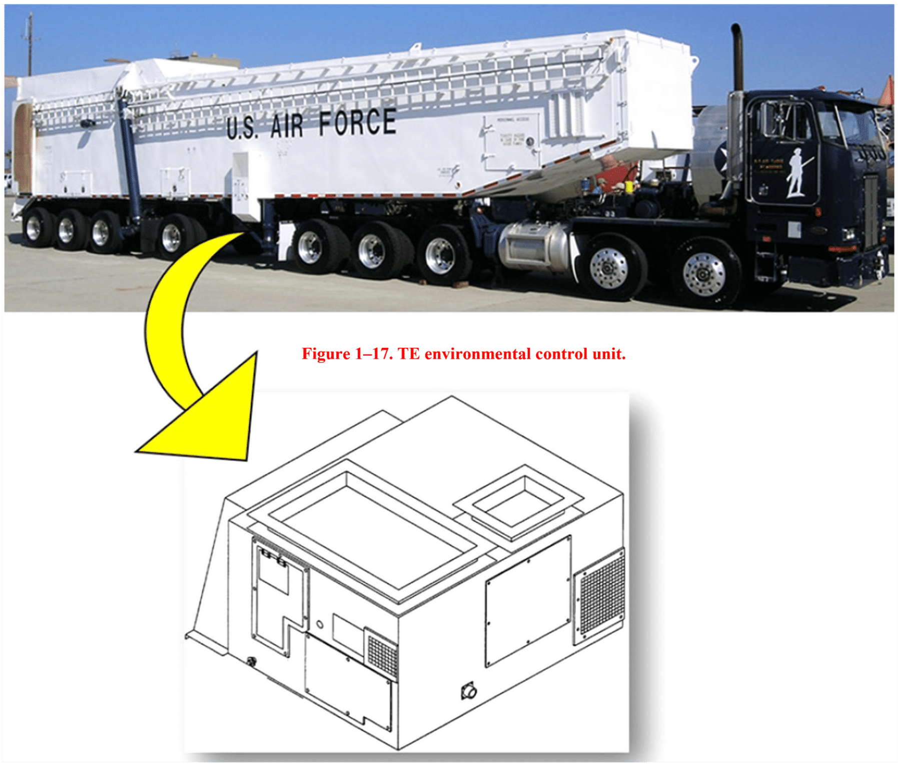


Figure 1–17. TE environmental control unit.

Container Heating

The ECU contains two banks of three (six total) electrical heater elements that are used to heat the air entering the container. A single thermostat controls both banks. One bank of heaters will energize when the temperature in the container drops to 72°F, and the second bank will energize if the temperature continues to drop to 68°F. All heater elements will be de-energized as a precaution if the temperature of the air flowing through the heater duct exceeds 150°F.

Click to continue on in the lesson.

ECU Control Panel

The ECU control panel is part of the ECU and contains the controls needed to operate it. There are circuit breakers installed to control power to the unit and a four-position switch S–1. Circuit breakers are installed to control power to the unit, and four position switch S–1 provides controls for OFF, AUTO, COOL, and HEAT.

OFF | AUTO | COOL | HEAT

This setting will shut the ECU down so no hot or cold air will be provided to the container regardless of the temperature.

OFF | AUTO | COOL | HEAT

This setting will cause the ECU to maintain the TE container between 60 and 100°F automatically. The ECU blower fan will operate continuously and hot or cold air will be added as needed. Regardless of the container temperature, if the outside air temperature is below 50°F, the ECU refrigeration system will not operate—only hot air will be provided.

OFF | AUTO | COOL | HEAT

In COOL mode, the heater circuits are disabled and cool air is provided regardless of the temperature inside or outside of the container. The 50°F low temperature thermostat is bypassed and power is applied directly to the condenser fan motor starter.

OFF	AUTO	COOL	HEAT

In HEAT mode, both heating elements are activated to provide heated air to the container regardless of the temperature inside the container, as previously described. The circuits that power the condenser fan and compressor motor starters will be open making cooling air unavailable.

The schematic for the TE ECU is found in TO 35E9-266-1T, *Commercial Manual Supplement Technical Manual*. The schematic (fig 1–18) has been traced with the selector switch set to COOL. This schematic looks much like a schematic from the MAF or LF ECS.

The unabridged schematic from the technical order has a legend you use to determine what contacts should be closed depending on which position selector switch S–1 is in. Once you have determined this, you can make a photocopy of the schematic and trace it out just like figure 1–18 above which will tell you exactly where power should be flowing depending on the mode selected.

The missile wing you are assigned to is likely to have only a few TEs, which means that you will not work on them often. Take the opportunities when periodic inspections are due or when troubleshooting is required to learn as much about the system as you can.

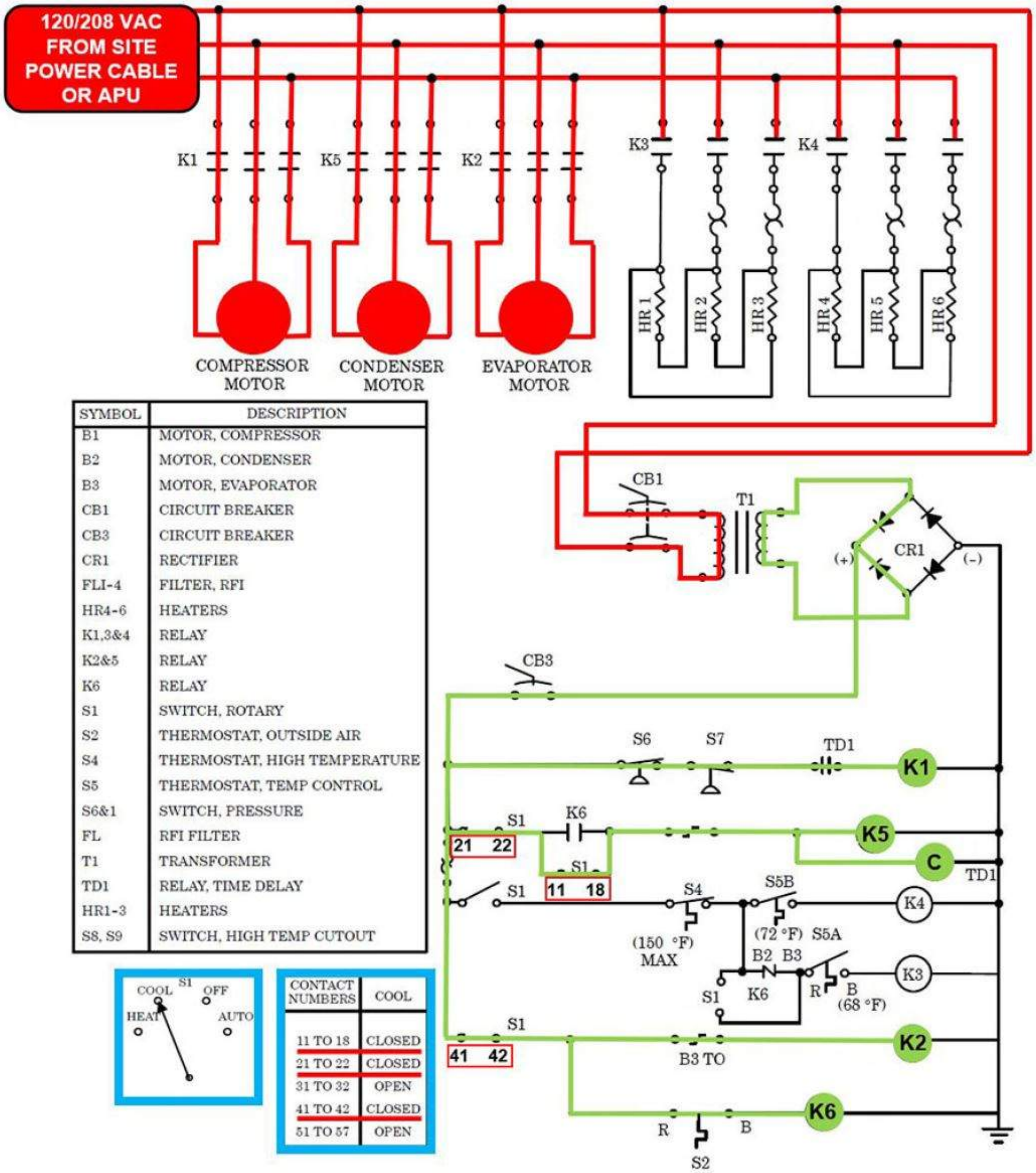


Figure 1–18. TE ECU Schematic in COOL Mode.

Complete the content above before moving on in the lesson.

Payload Transporter Auxiliary Power Unit and Electrical System

While other work centers and career fields maintain different parts of the PT (fig 1–19), maintenance of the electrical system belongs solely to the PREL shop. Because of the type of cargo that the PT carries to the missile field, it is important that the APU and electrical system be maintained properly.

Figure 1–19 Payload Transporter.

Electrical System

The PT trailer and PMT trailer electrical systems are very similar—the site power cable is the primary supply of 120/208 VAC, 3-phase power, and an APU on the back of the tractor is the secondary supply. The electrical subsystem is divided into AC and DC subsystems since the components of the semitrailer and tractor have different power requirements.

Auxiliary Power Unit

The APU (fig 1–20) provides power to the PT air conditioning unit (ACU) and hoist whenever the trailer is not connected to a facility power supply, which is typically when an MMT is driving to or from an LF. It consists of a diesel engine and generator that provide the same 120/208 VAC, 3-phase power as the site power cable. Just like the TE, the APU is located directly behind the cab of the tractor that pulls the PT trailer, and an additional cable very similar to a site power cable is needed to route power from the APU to the PT trailer.

The APU starts manually and uses a 12 VDC starting system that shares battery power with the PT tractor. This means that if the PT tractor batteries are too discharged to start the PT tractor's engine, the APU will not be able to start either.

An immersion heater is installed on the APU to keep the engine block warm during cold weather conditions. 120 VAC power is supplied to the heater through circuit breaker (CB)–15 in the power distribution panel assembly.

You will have no need to use the PT APU as an FMS technician. As a PREL shop technician, you will perform periodic maintenance inspections on the APU that include visual inspections as well as changing the oil and the oil/fuel/air filters. You will also perform troubleshooting actions, and even remove and replace the APU if it malfunctions.

Figure 1–20. PT APU.

Figure 1–20. PT APU.

PT APU Periodic Maintenance

As a PREL technician, you will use a type of technical order called a work card. This book specifies which periodic inspections must be accomplished, how often to accomplish them, and what shop or section will perform them.

One periodic inspection accomplished in the PREL shop is the pre-start checkout of the PT APU (fig 1–21) which includes the step of ensuring that the APU will operate under a load for at least 30 minutes. The purpose of running the APU under the load is to ensure that it is mission-ready and does not develop any mechanical issues or fails to hold the electrical load of the PT trailer while the ECS is operating. It is far better to detect these issues while the APU is in the bay rather than on a dispatch to the missile field.

CARD NO. 1-078	WORK AREA(S) 15	TYPE MECH RQR PREL	MECH NO.	CARD TIME 6:00	PUBLICATION NUMBER T.O. 21M-LGM30F-6WC-3	CHANGE NO.

MAN MIN	WORK AREA	WORK UNIT CODE SYS	WORK UNIT CODE SUB	SEMI-ANNUALLY (inspection requirements)	ELECTRICAL POWER	SERVICE	FIGURE	CARD NO. 1-078
				AUXILIARY POWER UNIT, PN APU001				
060		JH	CB0	1. INSPECT DRIVE BELT (REF. T.O. 35C2-3-518-2).				
015		JH	C00	2. INSPECT DRIVE BELT (REF. T.O. 35C2-3-518-2).				
015		JH	C00	3. INSPECT OIL LINES(REF. T.O. 35C2-3-518-2).				
015		JH	C00	4. INSPECT EXHAUST SYSTEM(REF. T.O. 35C2-3-518-2).				
030		JH	D00	5. TIGHTEN ALL TERMINAL CONNECTIONS IN CONTROLLER & BATTERY CHARGER (REF. T.O. 35C2-3-518-2).				
015		JH	CG0	6. DRAIN SECONDARY FUEL FILTER CONDENSATE (REF. T.O. 35C2-3-518-2).				
030		JH	000	7. CLEAN BATTERY CABLE CONNECTIONS (REF. T.O. 35C2-3-518-2).				
015		JH	CD0	8. INSPECT AIR FILTER FOR SERVICEABILITY, REPLACE IF NECESSARY (REF. T.O. 35C2-3-518-2).				
015		JH	C00	9. CLEAN AIR CLEANER RAIN CAP(REF. T.O. 35C2-3-518-2).				
030		JH	000	10. PERFORM APU EMERGENCY SHUTDOWN AND RESET (REF. T.O. 35C2-3-518-2).				
060		JH	000	11. CLEAN DIESEL, GENERATOR & ASSOCIATED COMPONENTS (REF. T.O. 35C2-3-518-2).				
045		JH	000	12. PERFORM PT APU PRE-START, OPERATION & SHUTDOWN (ENGINE MUST RUN UNDER LOAD FOR AT LEAST 30 MINUTES (REF. T.O. 35C2-3-518-2).				
015		JH	D00	8. INSPECT VOLTAGE REGULATOR & MOUNTING HARDWARE (REF. T.O. 35C2-3-518-2).				

CARD NO. 1-078	WORK AREA(S) 15	TYPE MECH RQR PREL	MECH NO.	CARD TIME 6:00	PUBLICATION NUMBER T.O.21M-LGM30F-6WC-3	CHANGE NO.

Figure 1–21. Work Card for PT APU.

AC Electrical Subsystem

Either the site power cable or the APU supplies 120/208 VAC, 3-phase power to the PT trailer and then routes that power to facility power switch S–1 located on the front of the PT trailer. When the facility power switch S–1 is set to ON, power flows to the PT power distribution assembly similar to the power distribution panel in the PMT trailer. The schematic (fig 1–22) has been simplified so that it will fit on one page. You can see that the schematic becomes very easy to interpret once the lines of power are traced out.

120/208 VAC, 3-phase power is supplied to the hoist and the ACU. We cover these systems in more detail in a later lesson. A single phase of 120 VAC is supplied to:

- Power receptacles
- Lights
- ECS control box
- APU immersion heater
- Tractor engine immersion heater
- Rear compartment battery charger

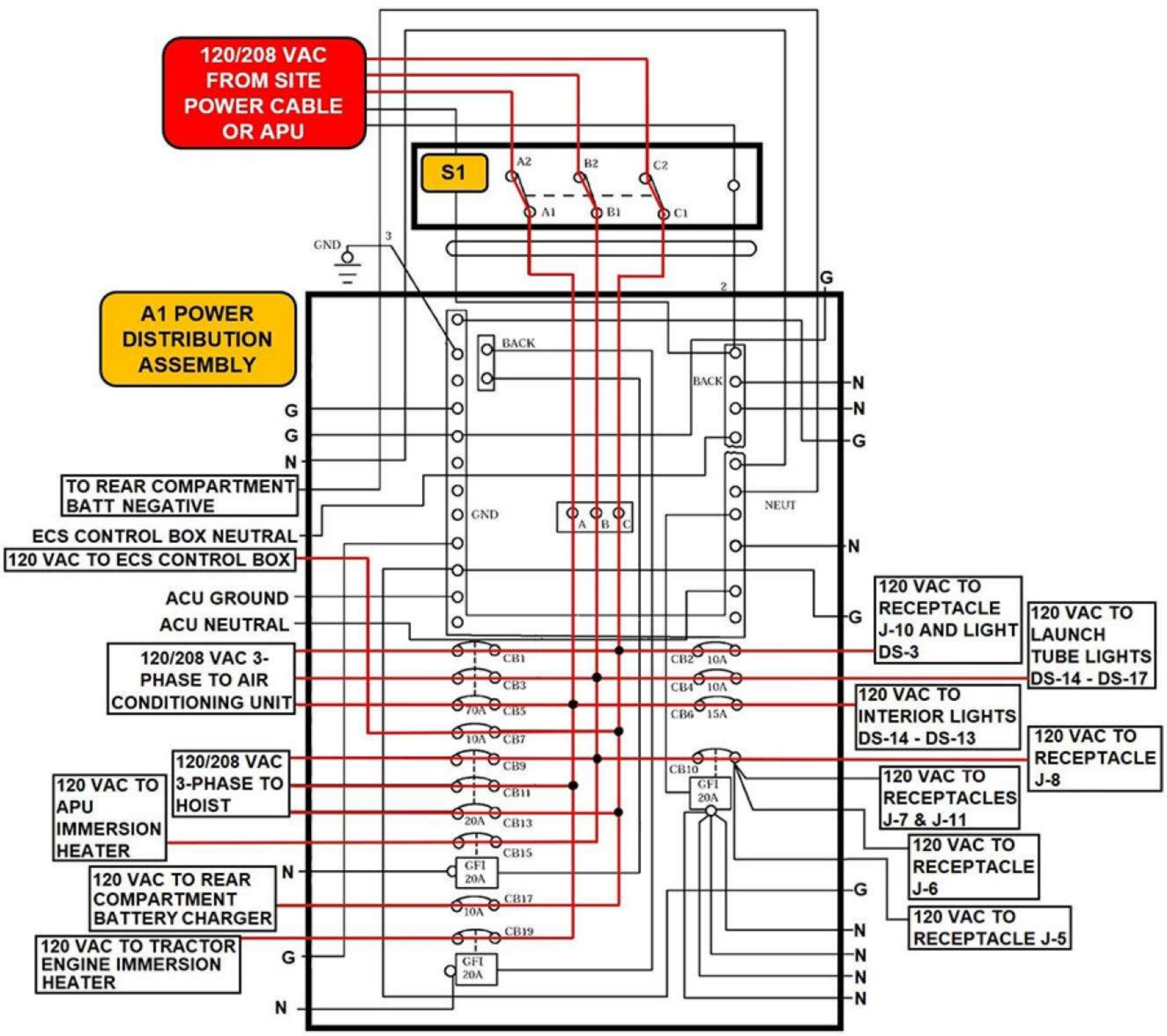


Figure 1–22. PT Trailer Electrical Schematic.

DC Electrical Subsystem

The DC electrical system consists of a single, maintenance-free 12 VDC battery mounted in the forward compartment of the PT trailer. This battery provides power through a 5-ampere circuit breaker to the ECS monitoring and intrusion alarm circuits and is charged by a battery charger which receives power from distribution panel circuit breaker CB–17 whenever 120 VAC power is supplied to the semitrailer. This system is needed because the temperature of the internal environment of the trailer must be monitored even if the trailer does not have site or APU power attached to it.

Payload Transporter Semitrailer Environmental Control System

The PT ECS controls the environment inside the semitrailer by providing heating, cooling, and ventilating functions, as needed. A controlled environment is critical for aerospace vehicle equipment that MMT transport to the LF. The integrity of these sensitive components could be compromised without this controlled environment.

Air Conditioning Unit

Even though it has a different name, the ACU (fig 1–23) is just like the ECU on the PMT van or TE. It is a self-contained unit consisting of two supply air blowers, a refrigerant subsystem, and a three-stage heating subsystem. The unit receives 120/208 VAC, 3-phase power from the power distribution assembly. 3-phase power is used to operate the refrigerant compressor, the three stages of the heating subsystem, the supply air blowers, and the condenser fans.

Figure 1–23. PT ACU.

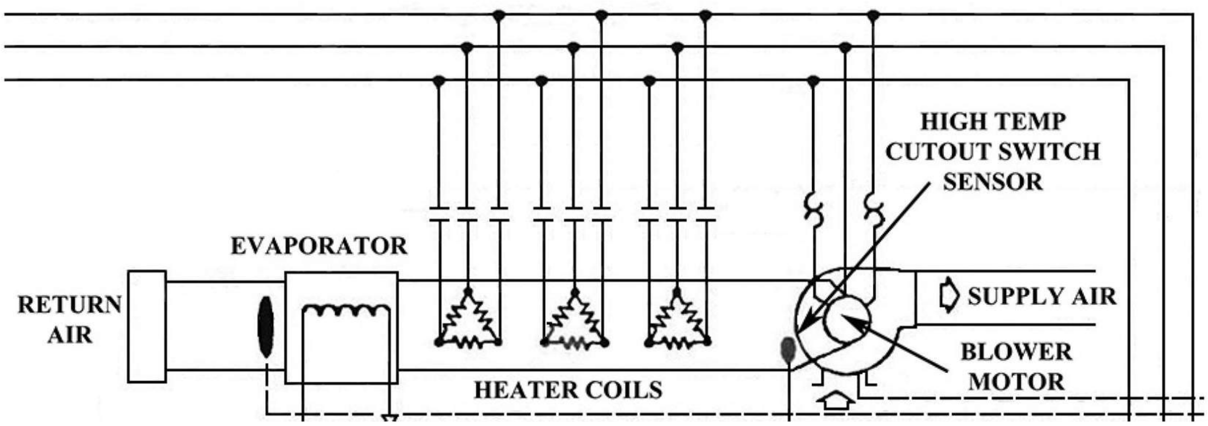


Figure 1–24. PT Trailer Heater Coils on Schematic.

Heating Subsystem

The ACU contains a three-stage heating unit, and each stage energizes to provide heat at a different temperature. The first stage operates when return air temperature falls to 70.5°F. If this stage alone cannot provide enough heat, the second stage will energize when the temperature falls to 68°F. Finally, the third stage energizes if the temperature falls to 65.5°F. The heating elements for all three stages are installed in the supply duct to the supply air blower (fig 1–24), so when the semitrailer needs to be heated, the supply air blower pulls the air across the heating elements and into the semitrailer.

If there is a malfunction with the blowers or the heater thermostats, the heating elements could overheat and burn up. A high temperature cutout switch (fig 1–24) is installed between the heating coils and the supply air blower to prevent this from occurring. If the temperature at the sensing bulb exceeds 120°F, the high temperature cutout switch opens to interrupt the circuit and remove power from the thermostats of the three heating elements to prevent equipment damage.

ECS Control Panel

The ECS control panel (fig 1–25) is mounted inside of a compartment with a swing-open door on the driver side of the PT trailer. The control panel is used to monitor and control ECS operation. 12 VDC power to illuminate the indicators on the ECS control panel is supplied by the battery in the forward compartment of the trailer.

Figure 1–25. PT ECS Control Panel.

Click on each icon below to learn about the different modes on the ECS mode control switch.

MODE CONTROL Switch

The ***MODE CONTROL*** switch allows a technician to set the mode of operation of the PT ECS. There are four switch positions.

LAMP TEST

Pushing the ***LAMP-TEST*** button will energize both indicator lights so that you can verify that the bulbs inside are functioning.

FAULT

The ECS control panel red ***FAULT*** indicator light to illuminate if the temperature inside the PT trailer is not between 50 and 80°F.

POWER ON

When the power switch is set to ON, 12 VDC power automatically energizes the green POWER-ON lamp. 12 VDC is applied to temperature sensor S–1.

Indicator Lamps and Temperature Sensor S–13

There are two indicator lamps on the ECS control panel—the green indicator light illuminates when power is applied to the ACU, and the red indicator light illuminates when the internal compartment of the PT trailer becomes too hot or too cold.

These indicator lamps are connected electrically to similar lamps inside the PT tractor cab that will alert a team traveling to the field if the temperature inside the PT trailer gets too hot or too cold.

On/Off Toggle Switch

On the bottom left of the ECS control panel is a POWER ON/OFF toggle switch, which when set to ON will supply 120 VAC to the ECS control panel and the ACU.

MANUAL COOL

In ***MANUAL COOL*** mode, the refrigerant system is energized directly and the semitrailer is cooled, regardless of the current temperature. Outside air temperature sensor S–16 is installed in the ACU to monitor the outside temperature.

The refrigerant compressor of the ACU will not operate if the outside air temperature is below 43.5°F; at this point outside air can be used to cool the interior of the trailer.

MANUAL HEAT

When the switch is set to ***MANUAL HEAT***, the thermostats that operate the heating stages are bypassed. This energizes the contactors for all three heating stages and provides heat to the semitrailer regardless of the temperature.

This will continue until another mode is selected or the temperature at the supply air blower exceeds 120°F, at which point the heating elements will be shut off regardless of the position the position of the mode selector switch.

AUTO

AUTO mode will cool or heat the semitrailer automatically as demanded by the thermostats and controls. All three stages of the heating system will be energized at 67.5°F as previously described.

At 72.5°F, the first stage heater de-energizes and the refrigeration subsystem will begin to operate to cool the semitrailer if the temperature exceeds 75°F, meaning that neither the heating nor the cooling subsystems are operating when the container is within this temperature range.

VENT

This mode disables both the heating and cooling systems of the ACU. The supply air blower will circulate a combination of outside air and air from the trailer.

Complete the content above before moving on.

Payload Transporter Semitrailer Hoist System

As a PREL technician, you will maintain the hoist system in the PT trailer. This hoist system is used primarily to emplace and remove aerospace vehicle equipment (AVE) components from the Minuteman III missile at the LF. The PT hoist system plays a vital role in the maintenance that your squadron accomplishes, so it is important that you understand how it operates so that you can maintain it effectively.

Hoist Description

The PT hoist assembly (fig 1–26) is a traveling, overhead lifting device with a maximum lifting capacity of 3,000 pounds. The hoisting assembly consists of one constant-speed and two variable-speed motors mounted to the hoist frame. These motors perform the following functions:

- Forward and reverse motion of the bridge assembly at two variable speeds.
- Left and right motion of the trolley assembly at a constant speed.
- Up and down motion the hoist at two variable speeds.

These motors are controlled through two pendants: the semitrailer control pendant and the launch tube control pendant. Both of these pendants are identical but operate differently depending on whether they are used from within the semitrailer or within the launch tube.

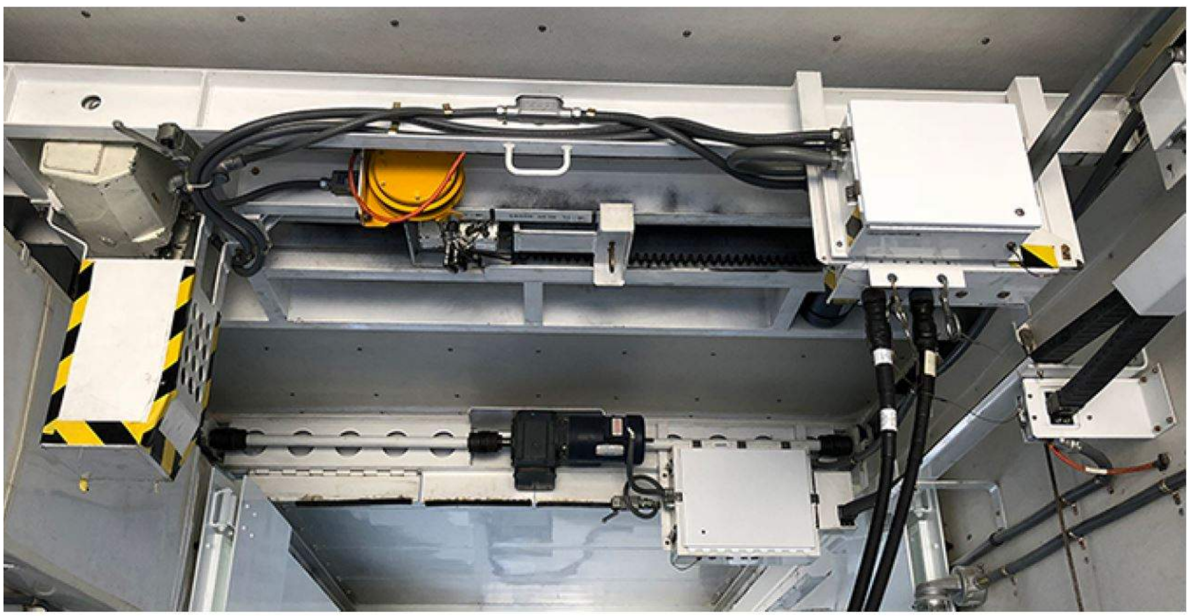


Figure 1–26. PT hoist.

Semitrailer Hoist Control Pendant

The PT semitrailer hoist control pendant (fig 1–27) contains eight pushbutton switches, one push-pull switch (STOP button), and one rotary selector switch (the SLOW/OFF/FAST button). The pushbutton switches control the different hoist motors to move the hoist laterally, horizontally, or vertically. The SLOW/OFF/FAST rotary switch controls the speed of the hoisting motor and supplies power to the pendant. Setting the switch to OFF disables all pendant functions, and in an emergency, pressing the STOP button disables all pendant functions, too. When this happens, two brakes are actuated to stop the movement of the chains used in the hoist. After the STOP button has been pressed in, a technician must pull the button back out and press the ON/RESET button to restore pendant operation. We will explore the INCH button in more detail shortly.

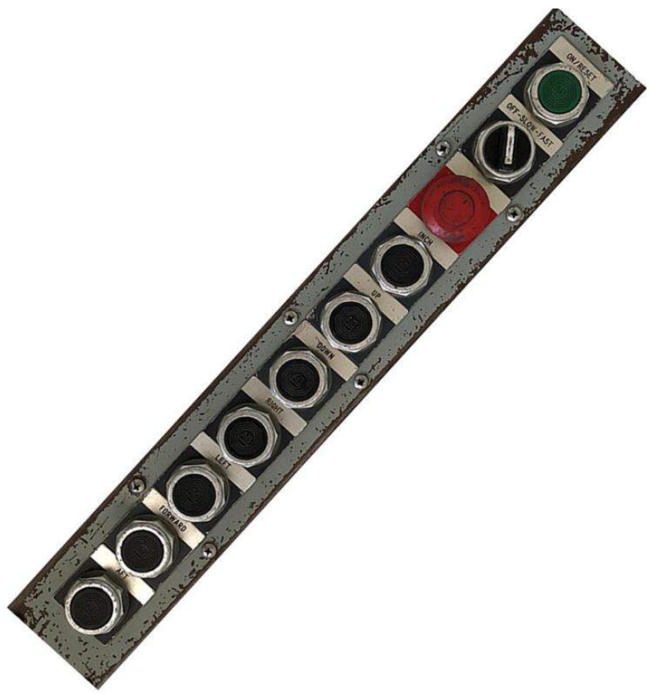


Figure 1–27. PT hoist control pendant.

Launch Tube Hoist Control Pendant

The only difference between the two pendants is when a technician in the launch tube sets the SLOW/OFF/FAST button to either SLOW or FAST, the semitrailer pendant is disabled by a pendant interlock relay. The only time the semitrailer pendant will operate is if the launch tube control pendant is set to OFF or is disconnected.

NOTE: The semitrailer pendant must be connected in order for the launch tube control pendant to operate.

Why do we need to separate pendants? Since the PT trailer is used to remove and replace missile components, it must be parked directly over the launch tube. Doors in the belly of the trailer open so missile components can be raised and lowered. Because of this, an MMT team will typically have one team of technicians inside the PT trailer and a second team of technicians inside the launch tube on a maintenance platform. The semitrailer control pendant is used by the team inside the trailer to maneuver missile components over and into the launch tube.

Once missile components are lowered far enough into the launch tube, the second set of technicians will use the launch tube control pendent to make very fine adjustments so that missile components fit together properly. The team inside the trailer could not do this very accurately with their pendent, and the team in the launch tube would not be able to maneuver components within the trailer. This is why two pendants are needed and why the launch tube pendant will always override the semitrailer pendant.

Hoist Brakes

The PT hoist is equipped with both an electric brake and a mechanical brake. The electrical brake is actuated when the brake solenoids lose power. For example, if a team was lowering a missile component, and power to the PT trailer suddenly failed, the load suspended on the hoist would instantly halt. Conversely, the brake releases when power is applied. The mechanical brake is actuated by the absence of torque on the motor shaft. The mechanical brake will halt hoist movement if an event causes the motor to stop with power still applied to the brake solenoids.

Both brakes are used during normal operation, but each brake is strong enough on its own to support the maximum rated load of the hoist.

Bridge Assembly

They provide forward and reverse motion of the hoist. With the back doors of the PT open, it can extend out of the rear of the semitrailer to hoist equipment at a dock or at ground level.

Payload Transporter Semitrailer Hoist System - Bridge Assembly

Trolley Assembly

The trolley is mounted on the bridge and is responsible for left and right movement of the hoist. The trolley motor is a constant speed motor that operates when the LEFT or RIGHT buttons are pressed on either pendant.

A time delay mechanism provides a one-second time delay between pushing the LEFT and RIGHT buttons. This is designed to prevent successive left-right-left hoist movements that could cause the load to sway back and forth.

Payload Transporter Semitrailer Hoist System - Trolley Assembly

Hoisting Unit

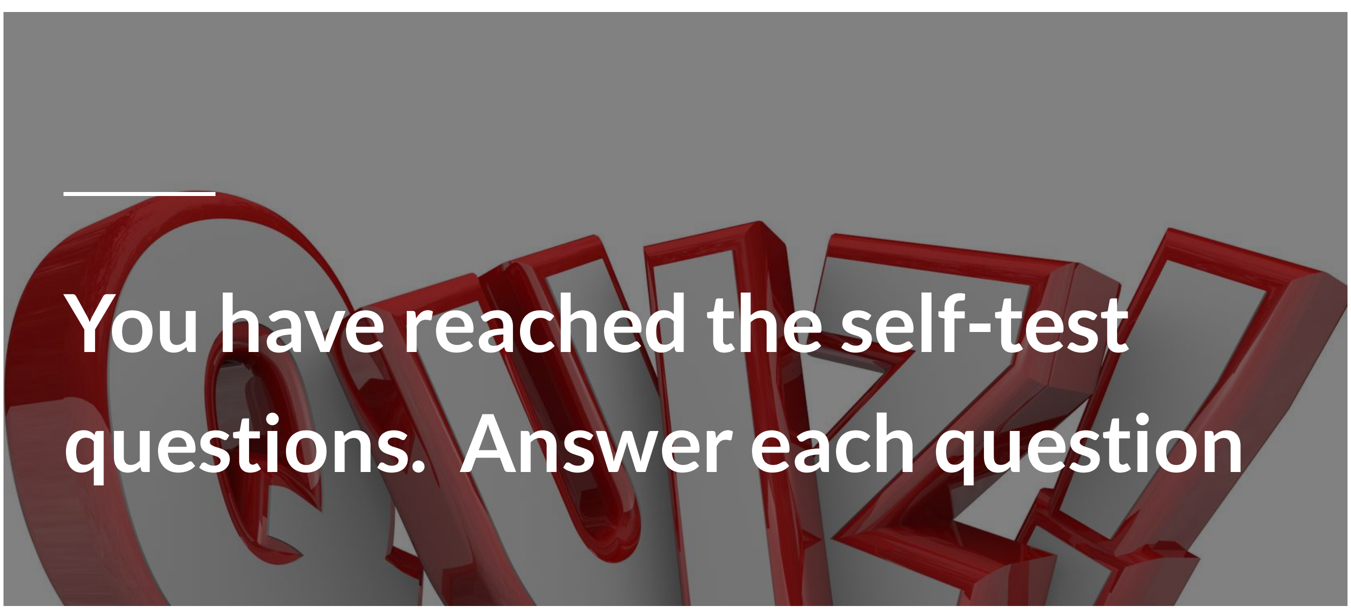
The hoisting unit is responsible for the actual lowering and raising of components. The hoisting motor is controlled by the UP or DOWN buttons on the pendants; it can operate in either slow or fast modes:

- SLOW mode allows a maximum load movement speed of 2 feet per minute.
- FAST mode allows a maximum load movement speed of 6 feet per minute.

The hoist motor is also equipped with an INCH button that will allow the user to make very small, precision movements of 0.030 inches (30 thousandths of an inch).

Payload Transporter Semitrailer Hoist System - Hoisting Unit

Complete the content above before moving on.



You have reached the self-test questions. Answer each question

before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the transporter-erector auxiliary power unit and electrical and environmental control systems.

1. What is the unique function of the TE?

Type your answer here

SUBMIT

2. At what temperature does the TE ECU maintain the container?

Type your answer here

SUBMIT

3. How many heaters does the TE ECU use to produce heated air?

Type your answer here

SUBMIT

4. What component is bypassed when the TE ECU selector switch is set to COOL?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the payload transporter auxiliary power unit and electrical system.

1. Where is the PT APU located?

Type your answer here

SUBMIT

2. What is the purpose of facility power switch S–1 on the PT?

Type your answer here

SUBMIT

3. How and when is the PT trailer 12 VDC battery charged for use in the DC power system?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the payload transporter semitrailer environmental control system.

1. Where is the PT ESC control panel located?

Type your answer here

SUBMIT

2. What type of power do the indicator lights in the PT ECS control panel use, and where does it come from?

Type your answer here

SUBMIT

3. How would a MMT in transit to a LF know if there was a fault with the PT ECS?

Type your answer here

SUBMIT

4. At what temperature range is neither the heating nor cooling subsystem of the PT operating?

- ○ - 65°F
- ○ - 75°F
- ○ + 85°F
- ○ - 50°F

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the payload transporter semitrailer hoist system.

1. What is the purpose of the rotary selector switch on the PT hoist control pendants?

Type your answer here

SUBMIT

2. What settings on the launch tube control pendant will allow the PT trailer control pendant to operate the hoist?

Type your answer here

SUBMIT

3. Briefly explain why two different PT hoist control pendants can be used.

Type your answer here

SUBMIT

This completes Lesson 1 of Module 5. You can find the answers to the self-test questions in the Module 5 table of contents.

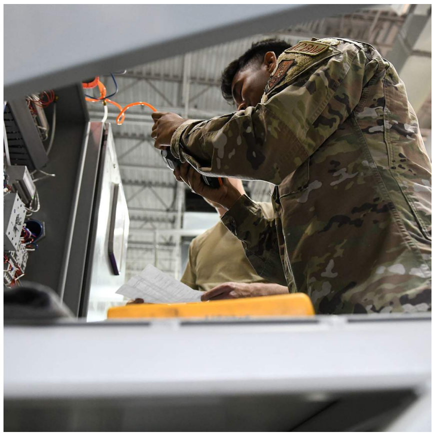
Lesson 2. Missile Support Base Maintenance

Main Points

1. Emergency Storage Battery Maintenance
    a. Function and operation of emergency storage batteries
    b. Reconditioning emergency storage batteries
2. Support Equipment Maintenance
    a. Function and operation of the guided missile maintenance platform
    b. Function and operation of the hydraulic pusher set
    c. Function and operation of the guidance section liquid cooler
    d. Function and operation of the portable air conditioner
3. Brine Chiller Support Base Maintenance
    a. Function and operation of the brine chiller test stand
    b. Preparing brine and sodium chromate solutions

You have seen that an incredible amount of effort and knowledge are required to maintain the Minuteman III ICBM fleet, but it takes more than just dispatches to the missile complex to make this all possible. 2M0X3 technicians in the PREL shop, located on the missile support base (MSB), are responsible for troubleshooting, repairing, and performing periodic maintenance inspections on certain components that are returned from MAFs and LFs as well as preparing certain chemicals.

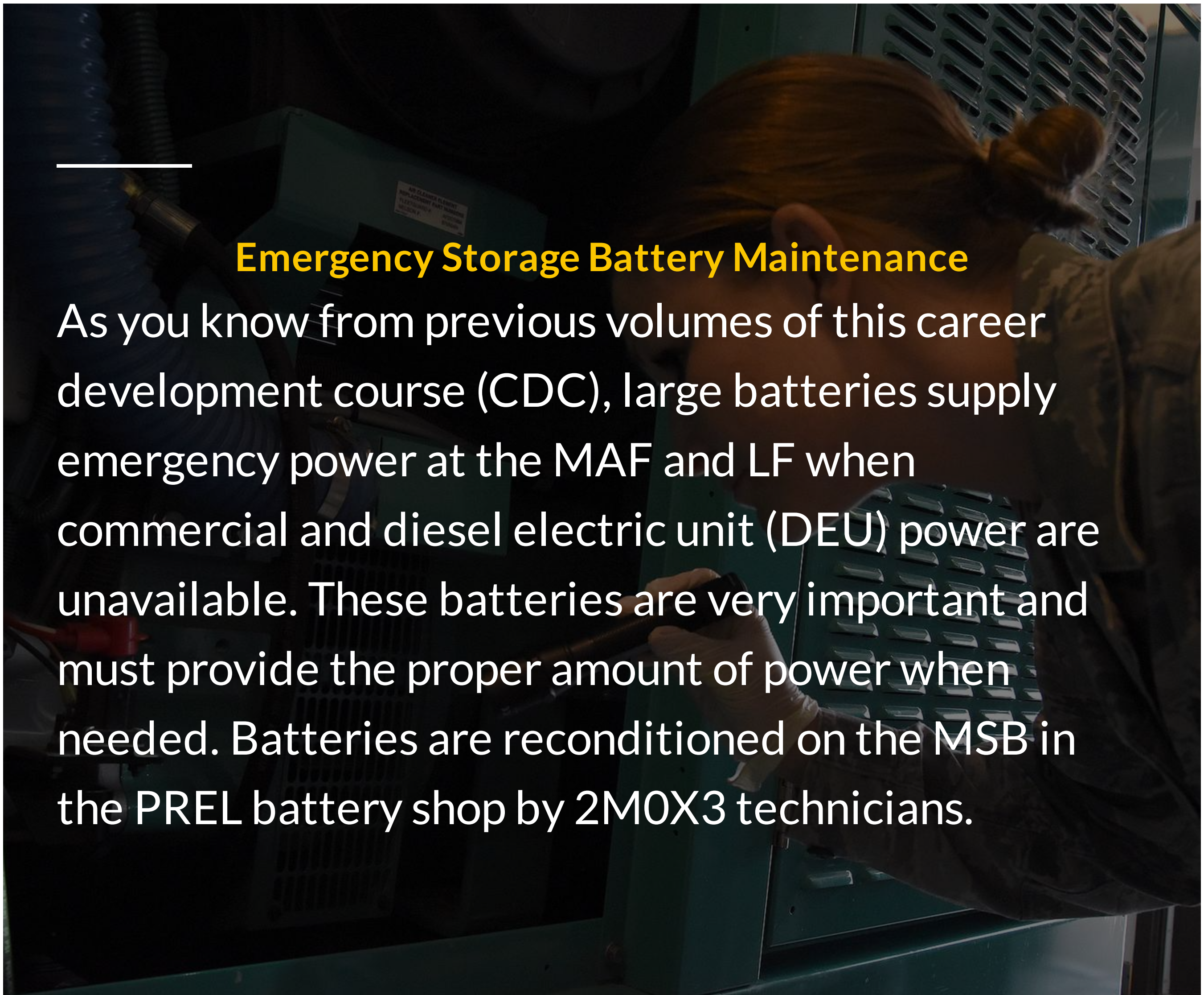
The electrical components of missile alert facility brine chiller are shown, which the power, refrigeration and electrical laboratory team participating in the 2021 Global Strike Challenge was tasked to repair July 26, 2021, at Malmstrom Air Force Base, MT. PREL is a facilities maintenance career field, which is a branch of missile maintenance that specializes in electrical and refrigeration troubleshooting and repair. (U.S. Air Force photo by Airman Elijah Van Zandt)



Senior Airman Nishit Macwan, 741st Maintenance Squadron power, refrigeration and electrical laboratory technician, troubleshoots a missile alert facility chiller during the 2021 Global Strike Challenge July 26, 2021, at Malmstrom Air Force Base, Mont. PREL Airmen are specialists in electrical and refrigeration troubleshooting and repair. (U.S. Air Force photo by Airman Elijah Van Zandt)

Senior Airman Nishit Macwan, 741st Maintenance Squadron power, refrigeration and electrical laboratory technician, troubleshoots a missile alert facility chiller during the 2021 Global Strike Challenge July 26, 2021, at Malmstrom Air Force Base, Mont. PREL Airmen are specialists in electrical and refrigeration troubleshooting and repair. (U.S. Air Force photo by Airman Elijah Van Zandt)

Click here to begin Lesson 2.



Emergency Storage Battery Maintenance

As you know from previous volumes of this career development course (CDC), large batteries supply emergency power at the MAF and LF when commercial and diesel electric unit (DEU) power are unavailable. These batteries are very important and must provide the proper amount of power when needed. Batteries are reconditioned on the MSB in the PREL battery shop by 2M0X3 technicians.

Function and Operation of Emergency Storage Batteries

Batteries are found in nearly every electronic device around you—from cellular phones and tablets to larger applications such as the battery in your car or truck. They are essential devices that allow a piece of electronic equipment to operate even when no electrical outlet or other power source is available.

Listed below are the basic understanding of how batteries function and why they must be reconditioned. Click on each (+) sign before

moving forward in the lesson.

Flooded Lead-Acid Battery Characteristics

In a later lesson, you will learn about reconditioning emergency storage batteries; however, you will need a basic understanding of how these batteries function in order to understand why they must be reconditioned.

The emergency storage batteries at a MAF or LF convert chemical energy into electrical energy, which is in turn utilized by the facility when primary power is unavailable. Several types of batteries produce energy from reactions between different metals and chemicals. The MAF and LF emergency storage batteries are the *flooded lead-acid* (fig 2–1) type because each cell of the of two lead plates (one negative and one positive) that are submerged in an acid solution called an *electrolyte*.

The energy produced by a flooded lead-acid battery is stored in the form of lead dioxide, lead, and sulfuric acid. Electrical energy is created as the lead and lead dioxide are converted into lead sulfate. This conversion is also reversible, which is what allows a battery to be recharged. *Supplying* electricity to a rechargeable lead-acid battery converts the lead sulfate back into lead dioxide and lead. For the remainder of the lessons on the MAF and LF emergency storage batteries, the flooded lead-acid type battery will simply be referred to as a "battery."

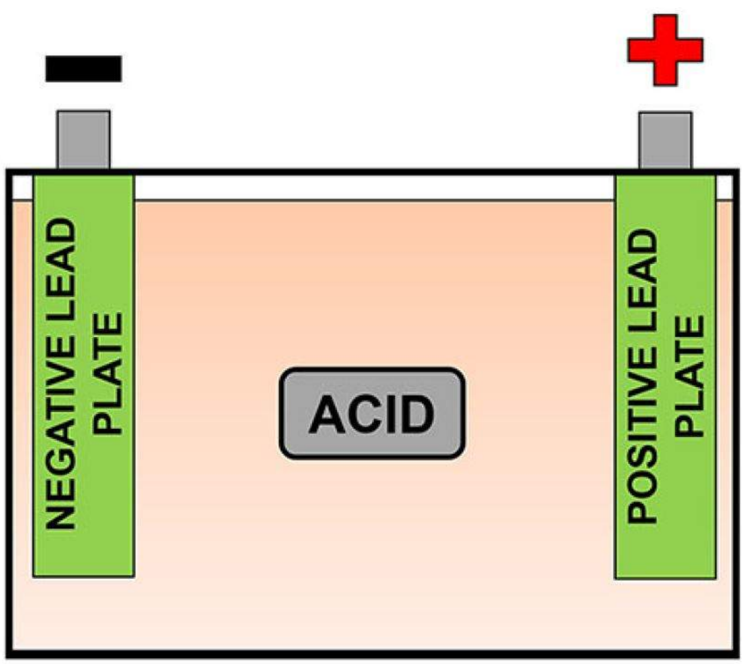


Figure 2–1. Basic parts of a flooded lead-acid battery.

MAF Emergency Storage Battery Characteristics

The MAF emergency storage battery (fig 2–2) is 31 inches tall, 18.5 inches wide, and 30.5 inches long and weighs 1,600 pounds. The positive and negative terminals are located on the long side of the battery. It has eight cells for a total nominal terminal voltage of 14-18 VDC and has a 635 ampere-hour (Ah) discharge rate, which means it will take roughly six hours until all cells are discharged to 1.75 VDC. As a comparison, a typical 12 VDC automobile battery can provide a constant 2.5 amperes (amp) for 20 hours, whereas the MAF emergency storage battery can provide a constant 30+ amps for 20 hours. You will not see as many MAF storage batteries come through the battery shop since there are only 15 MAFs in your missile complex.

Figure 2–2. MAF emergency storage batteries.

LF Emergency Storage Battery Characteristics

The LF emergency storage battery (fig 2–3) is 27.5 inches tall, 18.5 inches wide, and 30.5 inches long, and weighs 1,450 pounds. The positive and negative terminals are located on the short end of the battery. It has eight cells for a total nominal terminal voltage of 14-18 VDC and has a 600 Ah discharge rate, which means it will take roughly six hours until all cells are discharged to 1.75 VDC. You will spend the majority of your time in the PREL battery shop performing maintenance on LF storage batteries.

Figure 2–3. LF emergency storage batteries.

Battery Cell Characteristics (1)

Both the MAF and LF emergency storage batteries have a total eight cells each. Under normal usage circumstances, the cell of a battery is not completely discharged to zero volts. The desired voltage of a typical lead-acid cell is roughly 2 VDC, and the cell will provide this 2 VDC of power for a given amount of time. The idea is simple—a large cell will provide the 2 VDC for longer than a small cell will. Since the MAF and LF emergency storage batteries are extremely large and weigh as much as a small car, each of their cells will provide the nominal 2 VDC for a long time.

Since lead-acid battery cells typically provide 2 VDC of energy, each battery must contain eight cells in order to supply the necessary 14-18 VDC per battery. Two batteries are always paired together in series. When batteries are connected in series (fig 2–4), the negative terminal of one battery is connected to the positive terminal of its series mate, and amperage output remains constant while the voltage changes to the sum of the voltages of all of the batteries. An example of this is putting several batteries end-to-end in your flashlight. This means that the total voltage supplied to the electrical system at a MAF or LF ranges between 28 and 36 VDC.

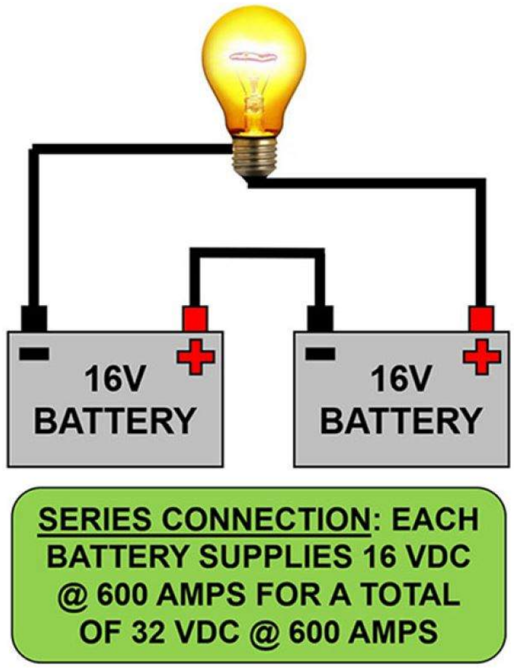


Figure 2–4. Batteries connected in series.

Battery Cell Characteristics (2)

The series sets of batteries are also connected in parallel, which forms a series-parallel configuration (fig 2–5). This means the battery set can provide a tremendous amount of power. When batteries are connected in parallel, all positive terminals are on the same circuit, and all negative terminals are on a separate common circuit. When batteries are connected in parallel, amperage increases, but voltage remains the same.

Each cell will discharge at roughly the same rate until it reaches 1.75 VDC, at which point the cell is considered discharged, and this rarely occurs under normal circumstances at a MAF or LF. The facility may be on emergency battery power for a few minutes or a few hours, but the battery charger will recharge the batteries once primary power is back online.

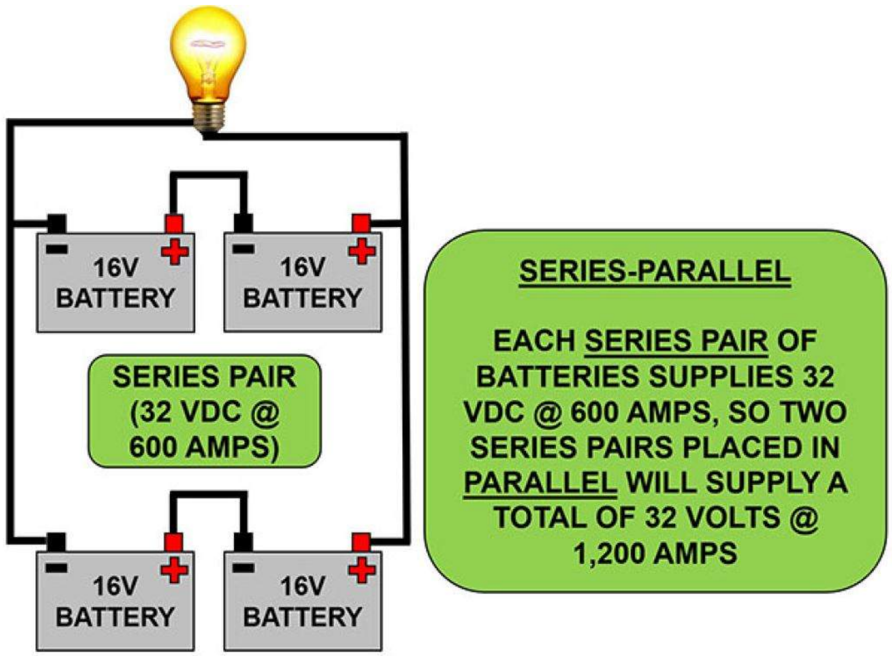


Figure 2–5. Batteries connected in series-parallel.

Click on each (+) sign before moving forward in the lesson.

Battery Charging

A battery is considered discharged once a certain portion of the stored chemical energy has been converted to electrical energy. Charging a battery is a reversal of the discharging process; electrical energy is converted back to chemical energy. Unfortunately, this is not a lossless process, and roughly 25 percent of the electrical energy put into a battery is lost through heat.

Battery Charging

Battery Gassing

Before we go any further on the subject of battery charging or discharging, you should be familiar with the term gassing. You learned earlier that the positive and negative plates of a lead-acid battery are submerged in an electrolyte made up of water and acid, and an electrical current must be applied to a battery in order to recharge it. When an electrical current is passed through water, some of the water molecules will separate into their base elements of hydrogen and oxygen.

In a flooded lead-acid battery, this release of hydrogen and oxygen is called gassing. Gassing occurs both when the battery is charging or discharging, and the amount of gassing increases if the battery is under a heavy charge or discharge cycle. This is the reason that combustible gas detector (GD)–1 is installed in the launcher equipment room (LER) at each LF—to detect any abnormal accumulation of the hydrogen gas produced when the emergency storage batteries are being charged.

The PREL battery shop has large battery chargers (fig 2–6) built specifically for the MAF and LF emergency storage batteries. Spare batteries stored in the battery shop are always kept fully charged and will rarely have low cell voltages. However, the battery shop will receive batteries that EMT have removed from MAFs and LFs in the missile field. When a battery has low cell voltage and needs to be charged, it is charged in three stages.

Figure 2–6. Storage battery charger.

Stage 1 – Constant Current Charge

The constant current charge is where the discharged battery set will regain roughly 70 percent of its charge. The battery set will draw high amperage from the charger and the battery voltage will slowly begin to rise.

Stage 2 – Topping Charge

The battery charger will switch to a topping charge once it senses that the charge of the battery set has reached the predetermined voltage. The battery draws less amperage during the topping charge because the battery set is already 70 percent charged, and this step is where the batteries regain the final 30 percent of their charge.

Stage 3 – Float Charge

The float charge is used after the battery has already been fully charged by stages 1 and 2, and only supplies enough current to overcome the internal losses of the battery. Reconditioned battery sets in the PREL battery shop will often be placed on a float charge until they are sent out to be installed at a MAF or LF.

Complete the content above before moving on in the lesson.

Equalization Charge

An equalization, or equalize charge, is when a lead-acid battery is purposefully overcharged at a voltage higher than that needed for a float charge. This type of charge corrects (equalizes) any voltage differences among the cells in the battery. Over time, the acid and water in the electrolyte begin to separate—the acid sinks to the bottom since it is heavier than the water. This uneven distribution of acid and water is what causes the voltage imbalances in the cells, and this is where, as a PREL battery shop technician, you will intentionally overcharge the batteries in order to cause them to gas.

As the water separates into oxygen and hydrogen gasses, these gasses form bubbles that rise toward the vent holes on the top of the battery. This is highly desirable because it mixes the electrolyte and evenly distributes the acid and water within the electrolyte when done properly.

Battery charging and reconditioning is a slow and deliberate process that takes many hours or even days to complete. For example, you will equalize charge a set of discharged batteries returned from a MAF or LF for 240 hours, and this time does not include all of the other maintenance and checks that must be performed.

Loss of Battery Capacity

Capacity is defined as the maximum amount of energy that a battery will produce while being discharged. A battery at full capacity will produce the rated amount of voltage and amperage based on the number of cells and the size of the battery. Batteries do not last forever, unfortunately, and over time, their capacity is permanently reduced by certain factors. This is why the battery in your car or truck must be periodically replaced.

Sulfation and grid corrosion are the two largest contributing factors to the permanent loss of capacity of a lead-acid battery. Click on each tab before moving forward in the lesson.

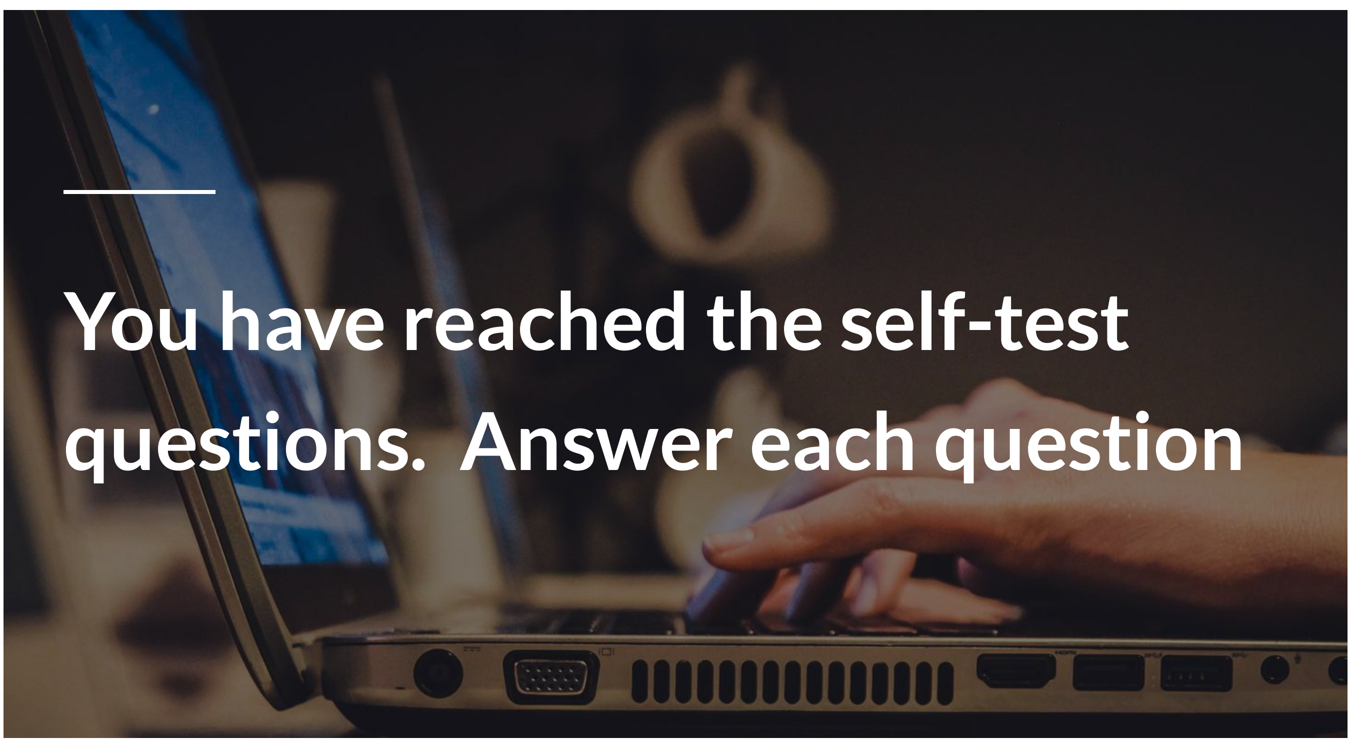
SULFATION | GRID CORROSION

Sulfation occurs when lead sulfate forms on the surface of the lead plates inside the lead-acid battery, and this naturally happens whenever the battery is being discharged. Under normal circumstances, an emergency storage battery will never remain in a discharged state for long before the battery charger energizes to recharge it. This state of charge causes the lead sulfate to dissolve back into the electrolyte. Sulfation only becomes a major issue when a battery remains in a discharged state for longer than necessary, causing the sulfate to crystalize and become permanent. Lead-acid batteries are not designed to have a partial charge. This is why MAF and LF batteries are always kept on a float charge under normal conditions.

SULFATION | **GRID CORROSION**

When a battery cell is charged at a voltage above 2.40 VDC for extended amounts of time, the oxygen produced by gassing corrodes the positive plate, and prolonged grid corrosion will eventually cause the plate to disintegrate and fall into the bottom of the battery. This type of grid corrosion (oxygen corrosion) is caused by prolonged overcharging. Since we need to periodically perform an equalize charge on the battery, which is an intentional overcharging of the battery set, some compromises must be made to ensure that the battery has the longest service life possible.

Complete the content above before moving on in the lesson.



You have reached the self-test questions. Answer each question

before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the function and operation of emergency storage batteries.

1. What chemical action occurs when electricity is supplied to a flooded lead-acid battery?

Type your answer here

SUBMIT

2. How are emergency storage batteries configured in order to provide the necessary 28-36 VDC required for the MAF and LF electrical loads?

Type your answer here

SUBMIT

3. What actions will increase the amount of gas produced by an emergency storage battery?

Type your answer here

SUBMIT

4. What actions occur during a topping charge?

Type your answer here

SUBMIT

5. What battery characteristic does the term capacity refer to?

Type your answer here

SUBMIT

Complete all self-test questions before moving forward in the lesson.

Reconditioning Emergency Storage Batteries

Typically, MAF and LF emergency storage batteries are returned from the missile field because they failed to pass a checkout or were removed for a site modification. New batteries may also arrive through the supply system. Regardless of the reason, all batteries will need to receive some type of maintenance, and TO 35M1-1-101, *Operation, Service, and Repair Instructions for Miscellaneous Systems*, covers where to begin depending on where the batteries came from and what state of charge they are in.

The procedures performed on the storage batteries will cover a wide range of tests, but the overarching objective is to improve cell voltage characteristics and ensure that the battery has enough capacity to perform its job at a MAF or LF if primary power is lost.

Air Force Technical Order Form 431, Battery Servicing Record

If you are assigned to the PREL battery shop, you will become very familiar with the Air Force Technical Order (AFTO) Form 431 (fig 2–7). This form is a cradle-to-grave record of all maintenance actions that occur on a battery from the time it shows up in the battery shop until it is loaded on a flatbed trailer and taken to the missile field.

BATTERY SERVICING RECORD

1. BASE	2. DATE-IN	3. CYCLE

4. RECEIVED FROM	5. PART NUMBER

6. SERIAL NUMBER	7. MATE SERIAL NUMBER

9. CORROSION INSPECTION

1	2	3	4	5	6	7	8

10. RESISTANCE READINGS

DATE	MEGOHMS	DATE	MEGOHMS

11. SPECIFIC GRAVITY CORRECTED ☐ YES ☐ NO

12. REMARKS

8. PROCEDURE	START			COMPLETION		
	TIME	DATE	INITIALS	TIME	DATE	INITIALS
CHARGE 1						
CORRECTION OF SPECIFIC GRAVITY						
DELAY						
DISCHARGE 1						
RECHARGE						
DELAY						
DISCHARGE 2						
RECHARGE						
EQUALIZE CHARGE 1						
FLOAT CHARGE 1						
EQUALIZE CHARGE 2						
FLOAT CHARGE 2						
OPEN CIRCUIT STORAGE						
OPEN CIRCUIT STORAGE						

13. SITE VOLTAGE READINGS

DATE	CHARGER VOLTAGE	CELL VOLTAGE							
		1	2	3	4	5	6	7	8

14. INITIAL CHARGE 1 HOURS	15 MINUTE CELL VOLTAGE CHECK	1	2	3	4	5	6	7	8

TIME		TEMP		TIME		TEMP	

15. DISCHARGE 1

TIME	TERM VOLTAGE	AMPS	AVERAGE AMP HOURS	CELL TEMP	CELL VOLTAGE							
					1	2	3	4	5	6	7	8

MEASURED AMP-HOUR CAPACITY	AVERAGE CELL TEMPERATURE	TEMPERATURE CORRECTED AMP-HOUR CAPACITY

16. EQUALIZE CHARGE [1] HOURS	15 MINUTE CELL VOLTAGE CHECK	1	2	3	4	5	6	7	8

TIME		TEMP		TIME		TEMP	

AFTO FORM 431, 19960601 ***(IMT-V1)***

Figure 2-7. AFTO Form 431

17.					DISCHARGE 2							
TIME	TERM VOLTAGE	AMPS	AVERAGE AMP HOURS	CELL TEMP	CELL VOLTAGE							
					1	2	3	4	5	6	7	8

MEASURED AMP-HOUR CAPACITY	AVERAGE CELL TEMPERATURE	TEMPERATURE CORRECTED AMP-HOUR CAPACITY

18.					FLOAT CHARGE 1							
TIME	DATE	CHARGER VOLTAGE	CELL VOLTAGE								WATER ADDED?	
			1	2	3	4	5	6	7	8	YES	NO
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐

19. EQUALIZE CHARGE 2 HOURS	15 MINUTE CELL VOLTAGE CHECK	1	2	3	4	5	6	7	8
TIME	TEMP	TIME	TEMP						

20.					FLOAT CHARGE 2							
TIME	DATE	CHARGER VOLTAGE	CELL VOLTAGE								WATER ADDED?	
			1	2	3	4	5	6	7	8	YES	NO
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐
											☐	☐

21. SPECIFIC GRAVITY CORRECTION				CELLS							
				1	2	3	4	5	6	7	8
TIME		TEMP									
TIME		TEMP									
TIME		TEMP									
TIME		TEMP									

22.					FINAL READINGS						
TIME	DATE	RESISTANCE (MEGOHMS)	CHARGER VOLTAGE	CELL VOLTAGE							
				1	2	3	4	5	6	7	8

23. DISPOSITION	24. DISPOSITION CERTIFICATION (*Signature and Grade*)

24. DESCRIBE HOW BATTERY FAILED

AFTO FORM 431, 19960601 ***(Reverse)***

Figure 2-7. AFTO Form 431

Click through the image of the AFTO Form 431 before moving forward in the lesson.

Receiving Batteries

As we mentioned earlier, batteries will either be removed from a MAF or LF or will be delivered through the supply system, and the procedures for processing each type are different. We will begin with a battery received through the supply system.

While processing batteries in the PREL battery shop (fig 2–8), you will notice that the MAF battery is referred to as "RN148" and the LF battery is referred to "RN145." This may be confusing at first, but it may be helpful to remember the difference between the batteries by thinking that 145 is the smaller number of the two, and the LF battery is the smaller of the two batteries. Therefore, RN145=LF and RN148=MAF.

Figure 2–8. Typical PREL Battery Shop.

Batteries Received Through the Supply System

Several preliminary steps are accomplished when a new battery is received through the supply system.

Batteries Received Through the Supply System

Vent Adapter Orientation

A figure in the technical order will provide you with a visual representation (fig 2–9) of how the spade shape of the vent adapters on the top of each battery indicate the orientation of each cell. Compare the vent adapter orientation of the battery to the figure in the technical order. If any of the vent adapters are not oriented correctly, generate a deficiency report (DR) and reject the battery.

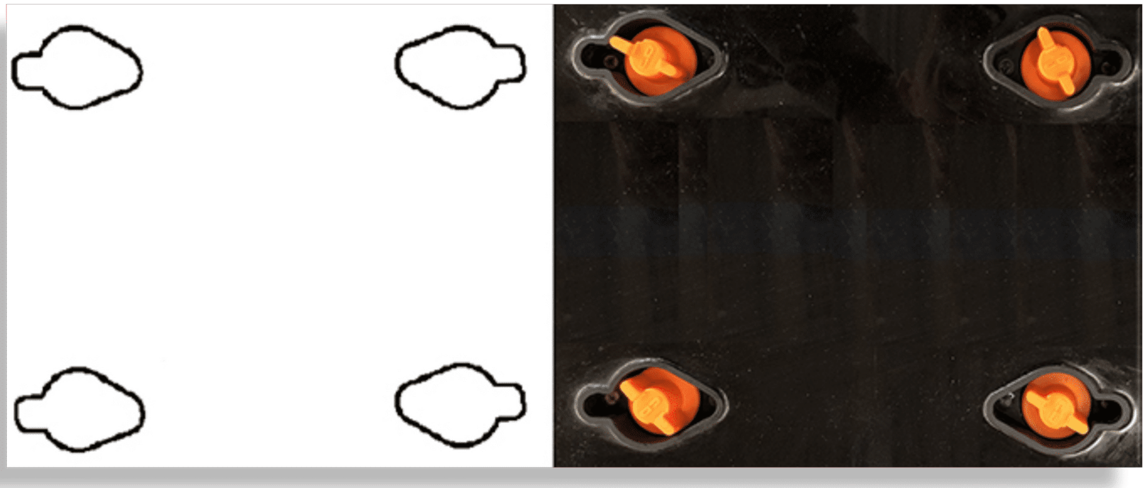


Figure 2–9. Storage battery vent adapter orientation.

Batteries Received Through the Supply System

Verification of Proper Cell Installation

This step verifies whether each cell was installed into the steel tray of the battery correctly during manufacturing. To accomplish this, remove each vent cap and use a flashlight to look through the electrolyte down to the bottom of each cell. There are small "teardrop" shaped holes in the bottom, or moss shield, of each cell must be facing the correct direction. Once again, if the teardrop shapes in the bottom of each cell do not match the figure in the technical order, reject the battery and generate a DR.

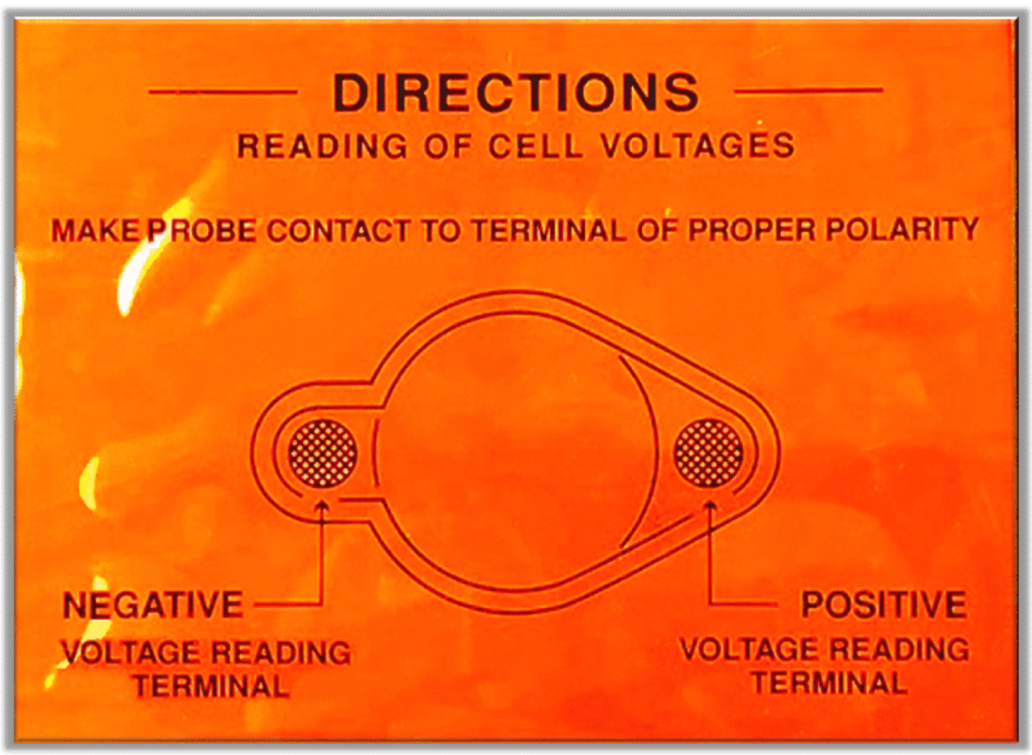
Batteries Received Through the Supply System

Verification of Proper Cell Polarity

In this step, you will use a multimeter to verify that the polarity of each cell is correct. Since batteries produce DC voltage, your multimeter will show a minus sign (-) if the positive lead is connected to the negative voltage test point of the cell and the negative lead is connected to the positive voltage test point. The actual voltage of the cell is irrelevant at this point; all you are verifying in this step is correct polarity. This may be difficult to visualize, so see figure 2–10 for an example.

You can see that the negative cell voltage test point should be in the semi-circular side of the "spade" shape, and the positive cell voltage test point should be in the tip of the spade. If your positive multimeter lead is connected to the battery positive test point, and the negative lead to the negative battery test point, but your meter displays a negative voltage, this indicates that the polarity of the cell is reversed. If so, generate a DR and reject the battery. Batteries that have arrived new through the supply system still require thorough testing.

At this point, you have performed the inspections for receiving batteries through the supply system, and the batteries either have passed f their inspections or been rejected. Batteries that have been rejected will be tagged as such, and you will typically place them in a separate area of the battery shop.



Complete the content above before moving on.

Batteries Received From the Field

If received batteries were removed from a MAF or LF, you must first verify their age by comparing the numbers on the battery data plate to the numbers in the battery age chart in your technical order. The purpose of this step is to determine if a battery is not worth reconditioning because it is too old. Figure 2–11 illustrates what action to take depending on the age of the battery.

You can see from the chart that certain battery ages will cause you to recondition or reject the battery, while certain ages between those two will warrant the possible reconditioning of the battery depending on if your unit is short on batteries. Batteries that are too old to be reconditioned are referred to as "age-outs." The final steps are to ensure all data plates are securely attached to batteries that will be reconditioned and annotate all applicable information on the AFTO Form 431 for each battery.

Battery Type	Age of Battery	Recondition	Recondition at the Discretion of the Unit	Reject
LF	0 to 21 years old	X		
MAF	0 to 16 years old	X		
LF	21 to 27 years old		X	
MAF	16 to 21 years old		X	
LF	28 years old or older			X
MAF	21 years old or older			X

Figure 2–11. Actions Taken Based on Age of Storage Battery.

Maintenance Preparation

During the maintenance preparation procedure, inspect the vent caps for cleanliness and inspect the top cover of the battery for damage and cracks. If cracks do exist in the top of the battery, use a plastic ruler to verify their size, and if within tolerance, repair the cracks with epoxy. Remove any grease from the main terminals of the battery using an alkaline (non-acidic) cleaner. The reason the grease must be removed is that it could cause the terminal nuts to be over-torqued, which could possibly cause the threaded terminal to break off the battery. Maintenance preparation is considered complete once all of these actions are accomplished.

Insulation Resistance Check

The purpose of this check is to ensure that the electrical portion of the battery—the cells, cell interconnectors, and the positive and negative terminals—are completely isolated from the outer metal casing of the battery. You will first use a multimeter to verify that there is less than one VDC between the positive battery terminal and the ground stud on the battery.

NOTE: The ground stud on the battery is not the same as the negative terminal.

If there is greater than 1 VDC between the positive battery terminal and the battery ground stud, clean the battery to ensure that the conductivity is not being caused by contaminates on the battery. Reject the battery if it has been cleaned and greater than 1 VDC still exists between the ground stud and positive terminal.

The next step of this process requires a piece of test equipment that we have not discussed yet called a megohmmeter or “megger.” The megger sends a high voltage/low current charge through the battery to measure resistance between the positive terminal and ground stud. You will send the charge for 60 seconds and the resistance reading displayed on the megger must be greater than five mega ohms. If the test fails, clean the battery again using the same procedures from the voltage test and retest. Reject the battery if the reading is still lower than five mega ohms.

Equalization Charge

We covered the purpose of an equalize charge in the last lesson, now we will cover the specifics of placing a battery on one. Check the electrolyte level of each cell using a dip tube (fig 2–12) that has been marked to indicate when a cell is full and when it needs more electrolyte added to it. Remove electrolyte with a squeeze bulb and place it into its own container if the level is too high.

The technical order will direct you take different actions depending on what stage the batteries are at—already on a float charge, preparing to float charge, or so forth. For an equalize charge, you will place a minimum of two and a maximum of ten series pairs of batteries into a row near the charger, connect all of the necessary cables, start the charger in EQUALIZE mode, and record the time the charge began.

After 15 minutes, measure and record all cell voltages; pay close attention, as the procedure can get a bit tricky at this point:

- If the battery is classified as a discharged battery rejected from a site, AND it has a cell voltage higher than 3 VDC, turn off the charger, add 50 milliliters (mL) of 1.400 specific gravity sulfuric acid, and turn the charger ON. Continue to observe the battery in order to determine if it is capable of drawing more than 10 amps within its 240-hour equalize charge cycle.
- If the battery is NOT classified as a discharged battery rejected from a site AND has a cell voltage higher than 3 VDC, turn off the battery charger, and disconnect all cables from the charger and the battery. Pour any electrolyte you pulled out of the battery back in and reject the battery. If applicable, you can re-mate the series mate of the rejected battery with another battery that lost its series mate at this stage.

After the first 15 minutes and every 15 minutes of the first hour, check the electrolyte level of each cell and remove electrolyte from any cell whose level is above the bottom of the vent tube. The reason that the electrolyte level must be checked so often is because battery temperature will rise and the electrolyte will gas severely during an equalize charge. The high temperature and gassing might cause the electrolyte level to rise and possibly overflow.

Measure and record the temperature of cell #3 of each battery until two consecutive cell readings are within 10°F of one another; once this happens, the batteries may be left unattended for the remainder of the charge. If any of the temperature readings exceed 115°F, record the remaining amount of time left on the charge and switch the battery charger OFF. Once the temperature of the cell in question has cooled to 95°F, switch the charger back ON and charge the batteries for the amount of time that remained before you shut the charger off.

Near the end of the charge, verify that the battery charger output is between 42.2 and 43.2 VDC. If the output is incorrect, the battery charger must be removed from service until it can be recalibrated.

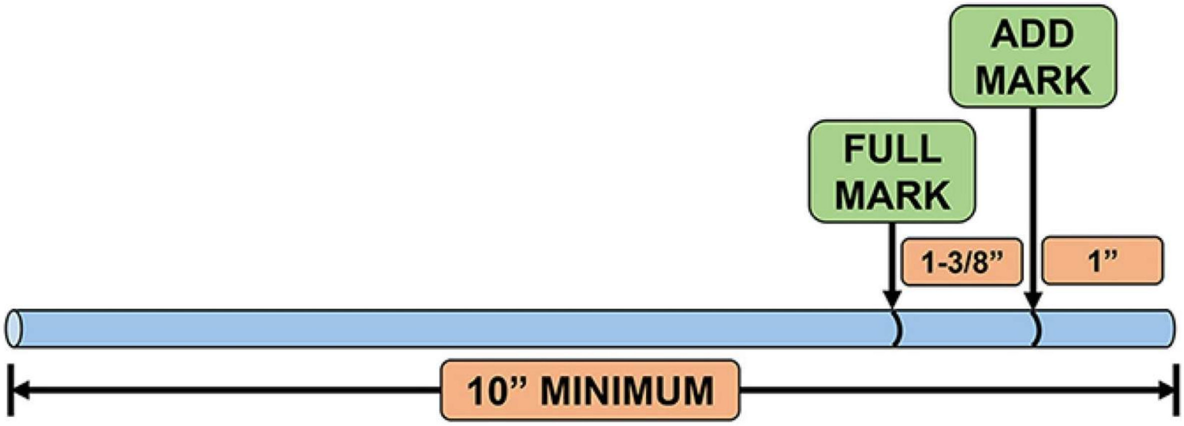


Figure 2–12. Storage Battery Electrolyte Level Dip Tube.

Initial Equalize Charge

Earlier in the lesson we mentioned that a battery that has been brought back from a MAF or LF in the missile field would undergo different maintenance depending on whether it was rejected from site (failed an inspection or test) or it was removed for a site modification. Another subset of factors that will alter the way a battery is processed is whether it is returned in a charged or discharged state.

Discharged Battery Rejected From Site

Remember that flooded lead-acid batteries should always be kept at a full charge, meaning that discharged batteries should be placed on a charge as soon as possible. You will perform battery receiving, maintenance preparation, and an insulation resistance check. Next, you will add 50 mL of sulfuric acid with a specific gravity of 1.400 to each cell and place a single series pair of batteries on an equalize charge for a maximum of 240 hours. 240 hours is the maximum amount of time the batteries will be on an equalize charge, but different situations will cause the batteries to be removed from the equalize charge early.

Battery is drawing 10 or more amps for 15 minutes

The battery charger has a built-in ammeter that displays how much amperage is being sent to the series pair of batteries. If they are able to sustain 10 or more amps for 15 minutes or longer, you will complete a 36-hour charge and then complete a certain portion of the procedure for charged batteries rejected from site, as directed by your technical order. You can assume that any batteries able to draw 10 amps from the charger for 15 minutes were not left in a discharged state for very long before the reconditioning process began.

Battery is drawing fewer than 10 amps

If a series pair of batteries is drawing fewer than 10 amps from the charger, it will be left on the equalize charge for five more days. You will check the amp meter on the battery charger periodically throughout each day and add 50 mL more of 1.400 specific gravity sulfuric acid to each cell that is above 3 VDC. You will of course need to turn the battery charger off prior to taking cell voltage readings to ensure they are accurate.

Any batteries that begin to draw 10 or more amps should be placed into a charged battery rejected from site status, and any batteries that are still not drawing 10 amps or more after the 240-hour charge you started earlier will be rejected. You can assume that batteries that reach this point in the process were left in a discharged state for too long before the reconditioning process began.

Click on each (+) sign before moving forward in the lesson.

Charged Battery Rejected From Site

Keep in mind these could be batteries that were returned from a MAF or LF or could be batteries that started out as discharged batteries rejected from site. To begin this procedure, you will again perform battery receiving, maintenance preparation, and insulation resistance check. The battery is then placed on an equalize charge for 24 hours. You will verify that the specific gravity of the electrolyte is between 1.210 and 1.225 just prior to the end of the charge. If the specific gravity is below 1.210, add 1.400 specific gravity sulfuric acid. 350 mL will increase the specific gravity approximately 0.010 or 10 points.

If the specific gravity is above 1.225, add distilled water. Note that no specific measurements have been established for the amount of distilled water that must be added to reduce the specific gravity.

The batteries will then remain on a float charge or open circuit for 12 hours, and then receive another insulation resistance check before they undergo their first discharge capacity test. The batteries are placed on another 24-hour equalize charge immediately following the discharge capacity test, and you will use the technical order to calculate how well the batteries performed during the discharge test. The batteries can score in one of three categories, all of which result in a different chain of events for the battery:

- Batteries that have HIGH capacity will be equalize charged and will not be discharge tested a second time.
- Batteries that have MID (middle) capacity will be equalize charged again and then undergo another discharge test.
- Batteries that have LOW capacity will be rejected.

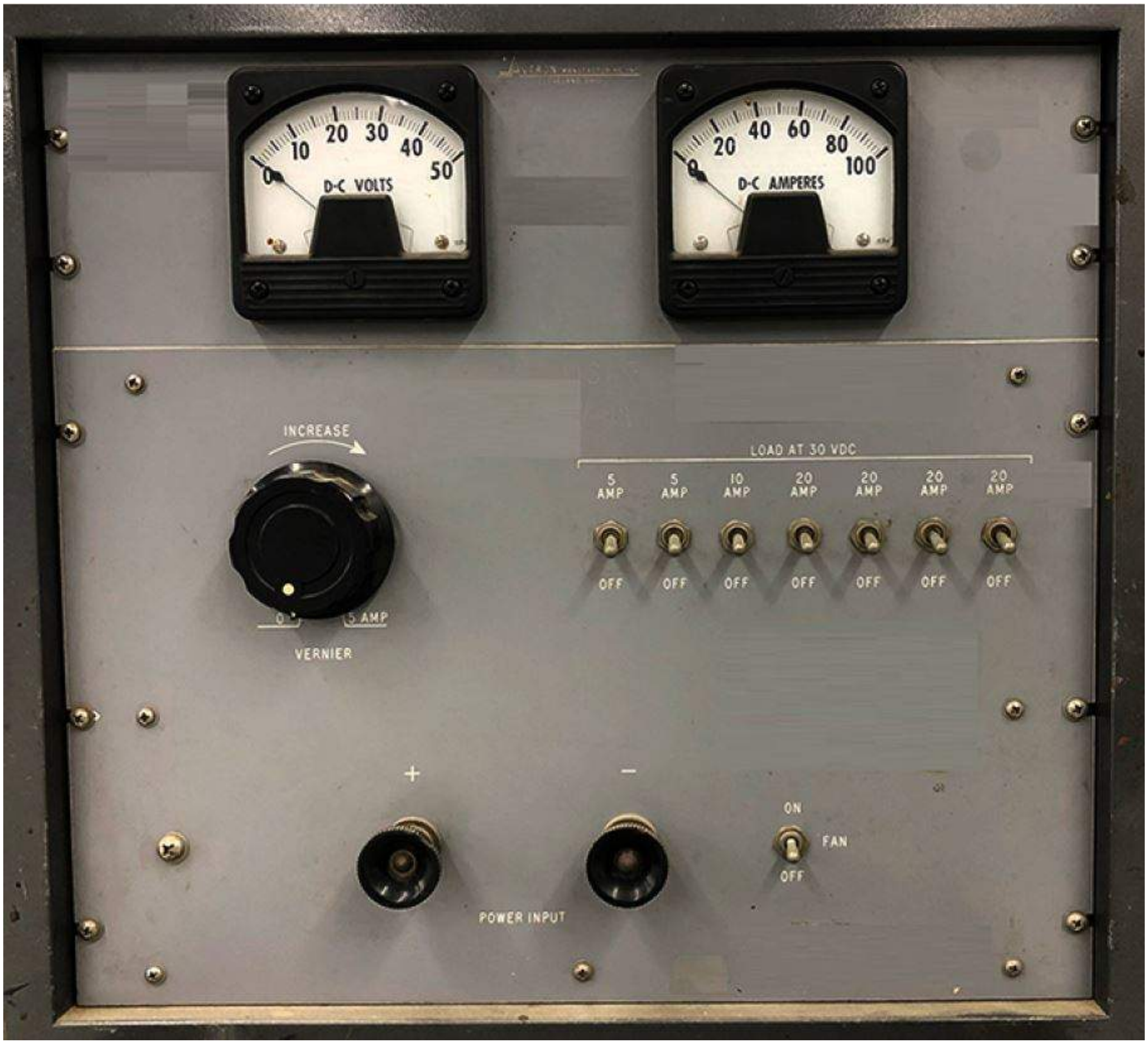


Figure 2–13. Storage Battery Load Bank.

Discharge Capacity Test

The discharge capacity test determines the ampere-hour capacity of a series pair of batteries, and as previously stated, the batteries are scored HIGH, MID, or LOW based on how well they performed. A team of PREL technicians will typically be committed to the battery shop for an entire day to perform this test since it can last for many hours. The batteries that are going to be tested need to have been on a float charge or open circuit for at least 12 hours prior to discharging them. You will need check the electrolyte level one final time prior to starting the test. Use a thermometer to check the temperature of cell #3 of both batteries in the series pair. The average you derive from the two temperature readings needs to be between 50 and 85°F. You will need to let the batteries warm or cool prior to discharging them if they are not within this range.

Connect the series pair of batteries to a load bank (fig 2–13), which is simply a set of resistive elements that provide an artificial 'load' for the batteries to discharge through. You will need to connect an ammeter to measure the amperage draw of the batteries and a multimeter to show the terminal voltage of the batteries. The load bank features different toggle switches as well as a Vernier (incremental) dial that will allow you to increase or decrease the load placed on the batteries.

MAF (RN148) Batteries

On the load bank, turn the fan on and set the following load switches to ON for a total of 95 amps:

- Four 20-amp load switches.
- One 10-amp load switch.
- One 5-amp load switch.

Finally, turn the load bank's Vernier load dial until the ammeter indicates 97 (±2) amps.

LF (RN145) Batteries

On the load bank, turn the fan on and set the load switches to ON for a total of 90 amps:

- Four 20-amp load switches.
- One 10-amp load switch.

Finally, turn the load bank's Vernier load dial until the ammeter indicates 92 (±2) amps. You will record the temperature and voltage of each cell, as well as the terminal voltage and current draw every hour until the batteries reach a terminal voltage of 28.5 VDC. Once this happens, you will record one final indication of all cell voltages and then wait until the terminal voltage drops to 28 VDC. At 28 VDC, you will record the current draw and the time, immediately turn the fan and load switches to OFF, and turn the Vernier load dial to zero. You will then place the discharged batteries on an equalize charge.

You will then perform the discharge capacity computation in the technical order to determine if the batteries had a HIGH, MID, or LOW discharge capacity and proceed accordingly.
Remember, batteries in the HIGH category will not receive a second discharge cycle; batteries in the MID category will receive a second discharge cycle, and batteries in the LOW category will be rejected.

Batteries that fall in the MID category during their first discharge will receive another discharge cycle and discharge capacity computations are calculated once again. MAF batteries with capacity less than 595 Ah and LF batteries with a capacity of less than 560 Ah after the second discharge test are rejected. Batteries that surpass these numbers will receive an equalize charge and proceed to the finishing steps.

Charged Batteries Removed For Site Modification

Charged batteries removed from a site as the result of a modification are in their own category, so it is pertinent to cover them before proceeding on to the finishing steps. The following is a list of basic procedures that you will perform on batteries in this category, and the results of these procedures will lead to the battery being returned to the inventory or the battery being classified as a charged battery rejected from site:

Charged batteries removed for site modification 1

Basic Procedures Performed On Batteries In This Category

1. Perform battery receiving.

2. Perform maintenance preparation.

3. Perform insulation resistance check.

4. Equalize charge for 12 hours.

5. Perform another insulation resistance check.

6. Check specific gravity of electrolyte.

7. Perform float charge cycles one and two. If cell voltages are not within tolerance, the battery moves to the charged batteries rejected from site category, and will begin the reconditioning process from that point. If the battery fails a second time, it is rejected. If it passes all checkouts, it is deemed serviceable and returned to the inventory.

Charged batteries removed for site modification 2

Finishing Steps

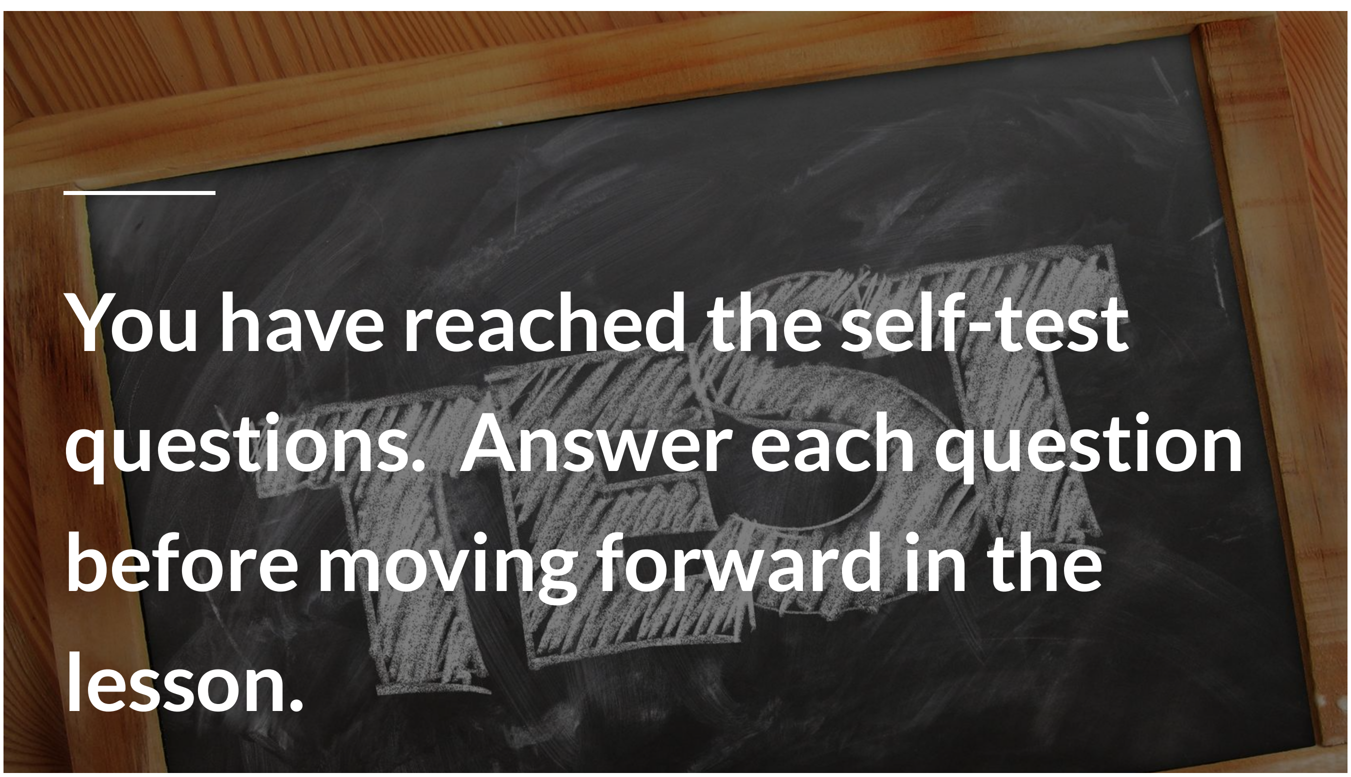
Finishing steps are performed on a series pair of batteries that have an adequate amount of discharge capacity. Finishing steps consist of the following:

1. Insulation resistance check.
2. Electrolyte level check.
3. Placed on a float charge.
4. Issue to the field as needed.

Batteries Left Without A Series Mate

What happens if only one battery of a series pair is rejected? Batteries that have been separated from their series mate are placed on a float charge and later mated with another battery that has similar cell voltage characteristics. Some batteries may sit for a long time before a mate becomes available, but this will not have any negative effect as long as the battery is maintained in a charged state.

Complete the content above before moving on.



You have reached the self-test questions. Answer each question before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the reconditioning emergency storage batteries.

1. What are the designators for the MAF and LF emergency storage batteries?

Type your answer here

SUBMIT

2. What action will you take if the vent adapter orientation is incorrect on an emergency storage battery received through the supply system?

Type your answer here

SUBMIT

3. How are the voltage test points oriented in the “spade” shape on the top of the emergency storage batteries?

Type your answer here

SUBMIT

4. What possible emergency storage battery damage could occur if grease is not properly cleaned from the threads of the positive and negative terminals?

Type your answer here

SUBMIT

5. What actions will you take with a discharged emergency storage battery that has been rejected from a site if it has a cell voltage above 3 VDC during an equalization charge?

Type your answer here

SUBMIT

6. What can you assume when a discharged emergency storage battery rejected from a site is able to draw 10 or more amps from the battery charger for 15 minutes or more?

Type your answer here

SUBMIT

7. When discharging a set of emergency storage batteries, when will you end the discharge cycle, and what actions will you take?

Type your answer here

SUBMIT

8. What will you do with an emergency storage battery that has lost its series mate?

Type your answer here

SUBMIT

Answer each question before moving on to the next section.

Support Equipment Maintenance

This section will focus on some support equipment that you will perform maintenance on as a technician in the PREL shop. The guided missile maintenance platform (GMMP) is used by MMT and FMT to perform maintenance in the launch tube at the LF. The hydraulic pipe pusher, or simply pipe pusher, is the device that MMT uses at the LF to slowly roll the launcher closure door away from the launch tube so that they can install or remove missile components.

The guidance section liquid cooling system is a rack at the LF that contains a small refrigeration system whose purpose is to send cool fluid to the guidance set of the missile. The portable air conditioner (PAC) is a somewhat large, but portable, heating and cooling system whose job is to ensure that the inside of the trailer where spare missile downstages are stored is maintained at a specified temperature. The PAC features its own built-in DEU, which is the same Onan® 4-cylinder diesel engine used on the TE tractor.

Tech. Sgt. Robert Richards, 341st Maintenance Operations Squadron mechanical and pneudraulics section team chief and team trainer, and Airman 1st Class Benjamin Vlietstra, 341st MOS power, refrigeration and electrical laboratory technician, look over a guided missile maintenance platform motor Jan. 21 at Malmstrom Air Force Base, Mont. All 17 of the 341st Missile Wing's GMMPs—also known as work cages—were available for service on Jan. 14, ensuring that missile maintenance in Minuteman III launch facilities stays on schedule. (U.S. Air Force photo/John Turner)

Function and Operation of the Guided Missile Maintenance Platform

Maintenance tasks must still be performed in the launch tube even when the Minuteman III missile is installed. This is no small task because two technicians must be together at all times in the launch tube, and there is not much room to maneuver. This lesson will focus on the piece of equipment that you will use in the field as an FMS technician and maintain as a PREL shop technician.

The GMMP provides MMT and FMT technicians with a platform to work from nearly anywhere in the launch tube. As an FMT technician in the field, you will use the GMMP primarily to gain access to the bottom of the launch tube to perform maintenance and troubleshooting procedures on the pump of sump pump system SP–102. As a technician in the PREL shop, you will perform periodic inspections on each GMMP twice a year. When necessary, you will also perform troubleshooting and repair procedures on the GMMP.

Click on each item below to learn about the GMMP components before moving forward in the lesson.

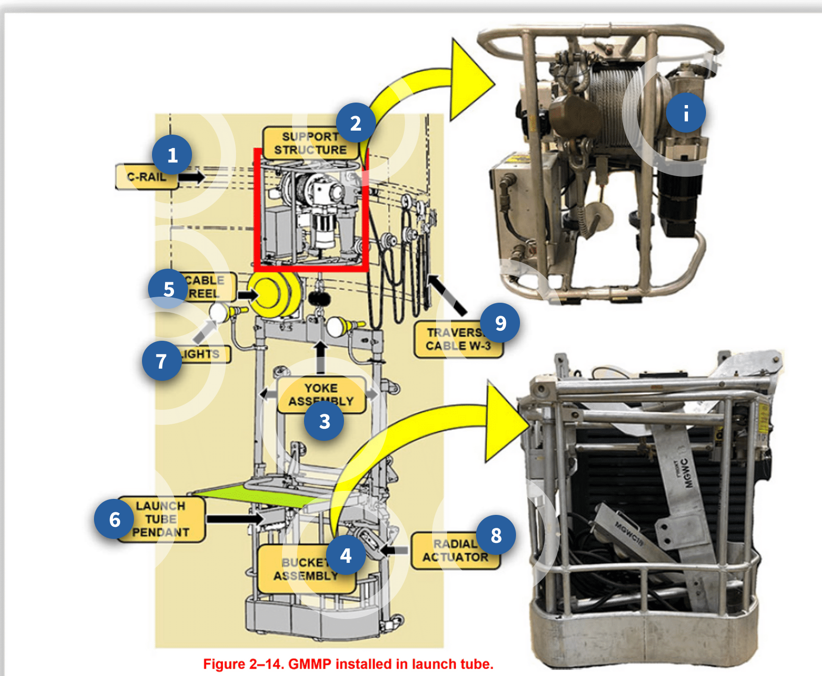


Figure 2–14. GMMP installed in launch tube.

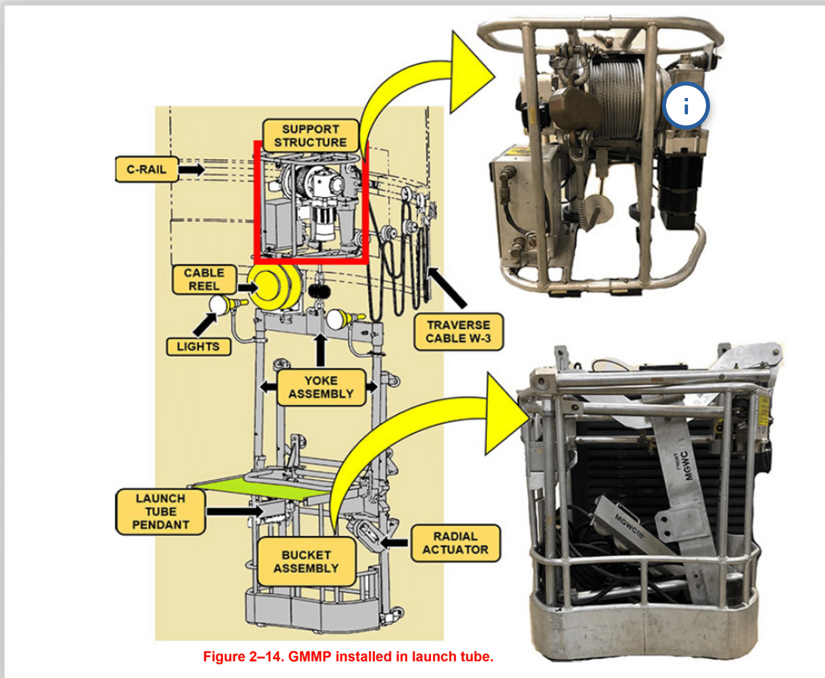


Figure 2–14. GMMP installed in launch tube.

GMMP Components

The two major components of the GMMP are the support structure and the bucket assembly. There are many additional parts required for the GMMP to operate correctly in the launch tube at the LF or at the GMMP work station in the PREL shop.

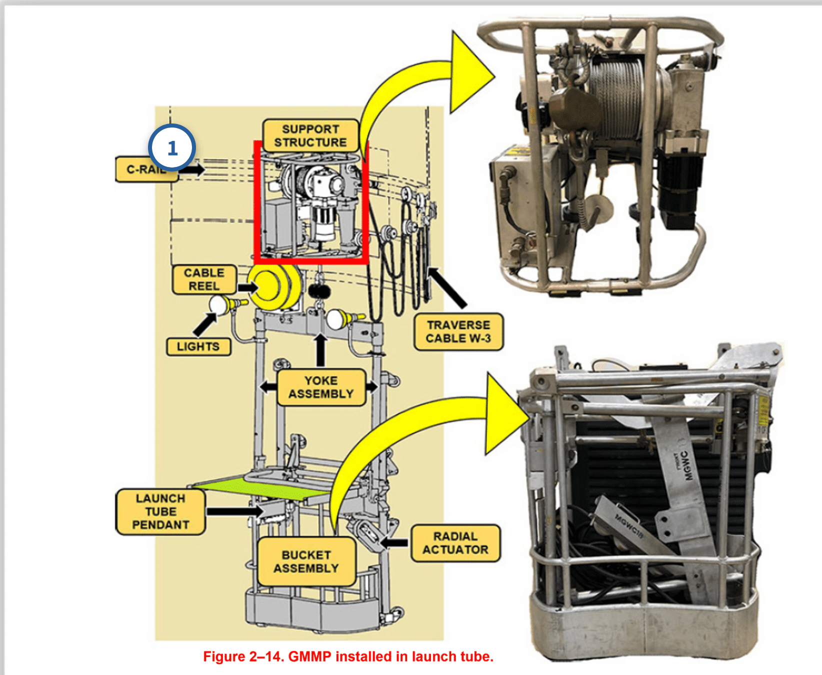


Figure 2–14. GMMP installed in launch tube.

Launch Tube C-Rail

You need to be familiar with the structure that supports the GMMP when it is in the launch tube. The C-rail (fig 2–14) is a steel rail that runs the entire circumference of the launch tube, and its purpose is to allow the GMMP's support structure to traverse (move left and right).

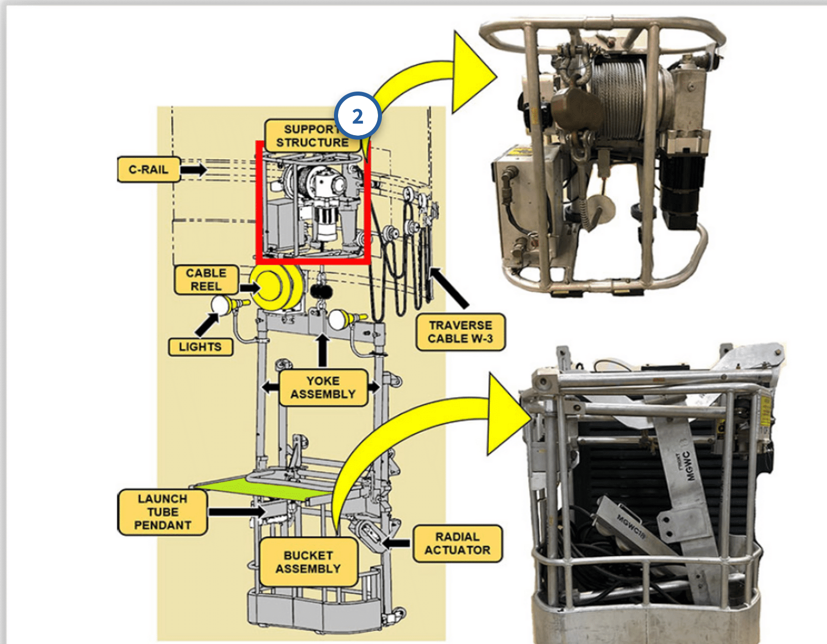


Figure 2–14. GMMP installed in launch tube.

Support Structure

The GMMP support structure (fig 2–14) is the assembly mounted on the C-rail in the launch tube and allows the GMMP to traverse left and right around the launch tube. The support structure houses the motor and wire rope that allows the bucket assembly to be lowered and raised to different depths in the launch tube.

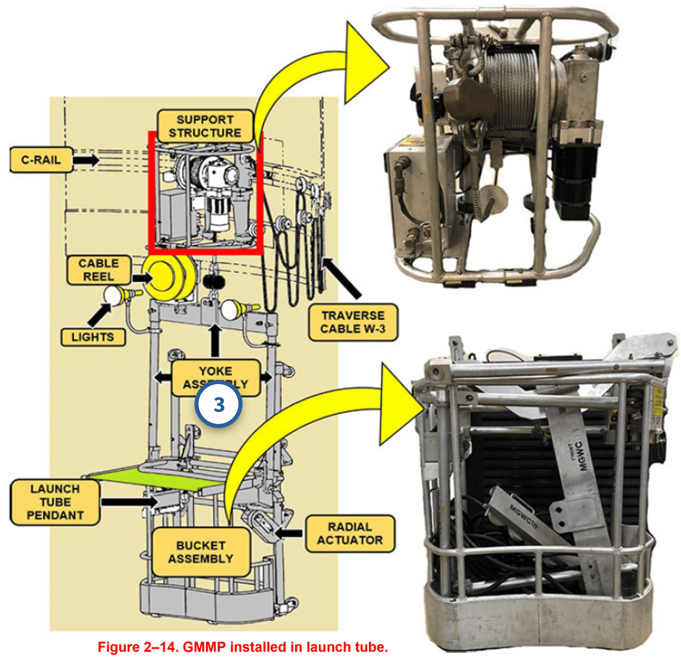


Figure 2–14. GMMP installed in launch tube.

Yoke

The yoke (fig 2–14) is shaped like an upside-down ‘V’ and is the component that provides the physical connection between the shackle, or hook, of the support structure and the bucket. The two ends connect to the bucket with quick release pins, and the other end connects to the hook of the support structure.

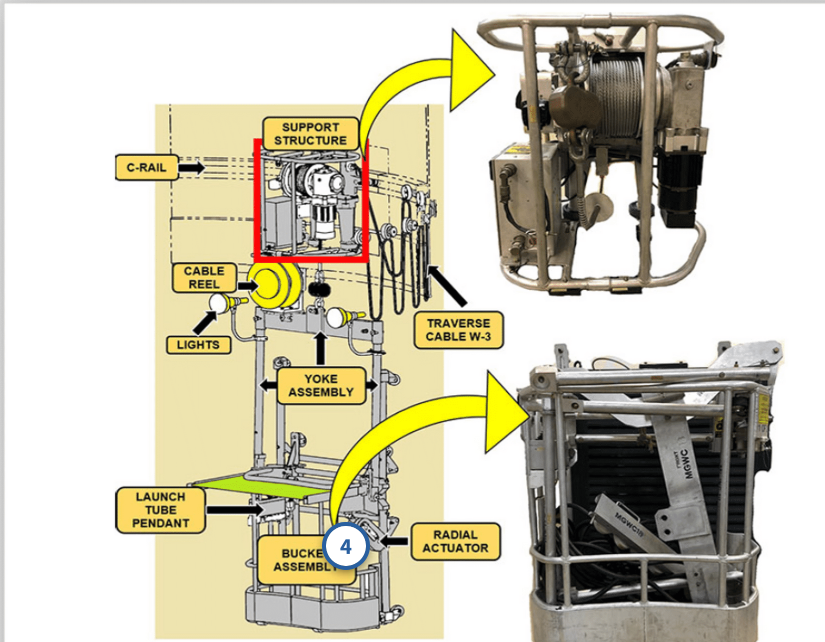


Figure 2–14. GMMP installed in launch tube.

Bucket

The bucket assembly (fig 2–14) is the component that is traversed, lowered, and raised by the support structure. This is where the technicians will physically stand while performing maintenance or being lowered to the bottom of the launch tube.

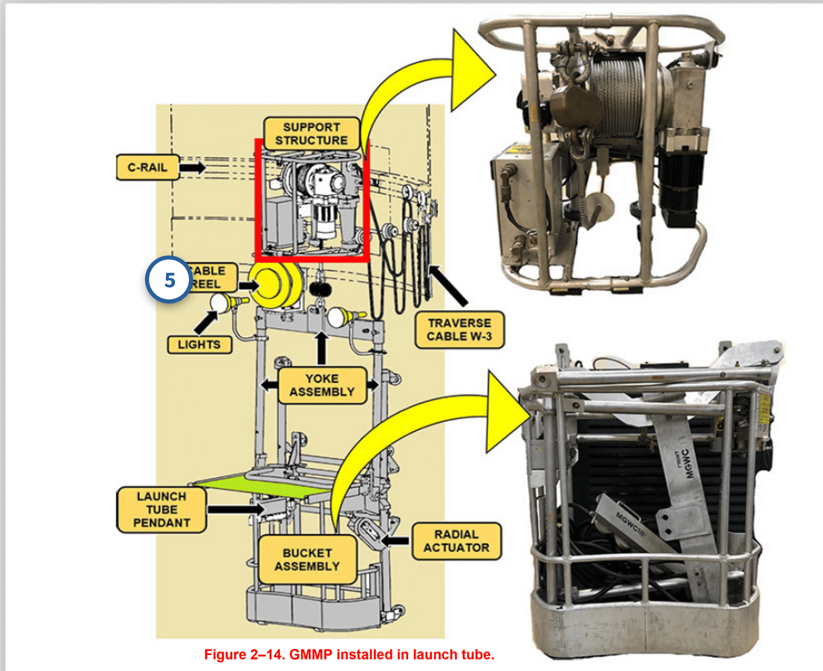


Figure 2–14. GMMP installed in launch tube.

Cable Reel

This is the large reel (fig 2–14) that houses the electrical cable that carries signals between the bucket assembly and the support structure. The cable reel is spring-loaded so that the cable is automatically retracted as the bucket moves upward toward the support structure.

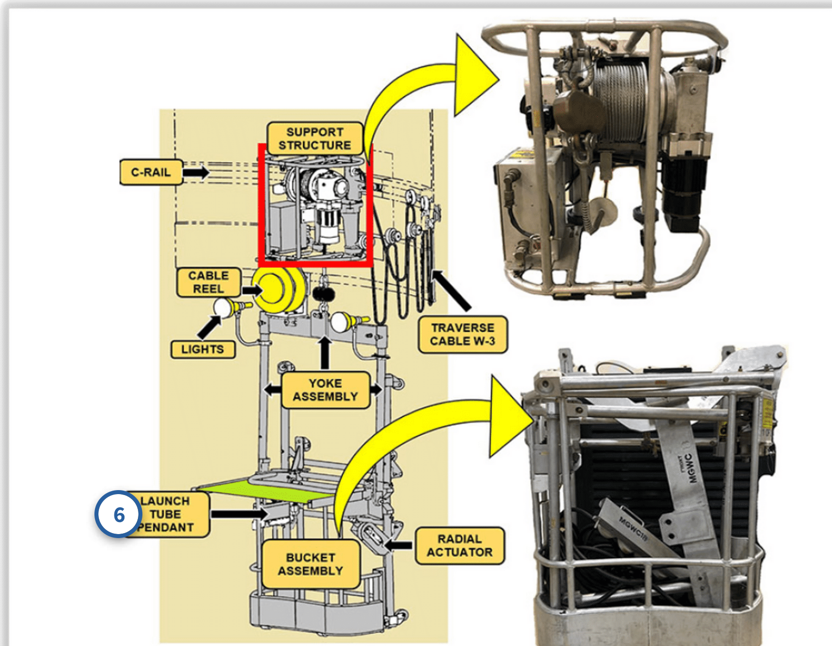


Figure 2–14. GMMP installed in launch tube.

Bucket pendant (Launch Tube Pendant)

The bucket pendant (fig 2–14) is mounted to the right side of the bucket and is used by a technician to traverse around as well as move up and down in the launch tube. The bucket pendant is usually called the cage pendant.

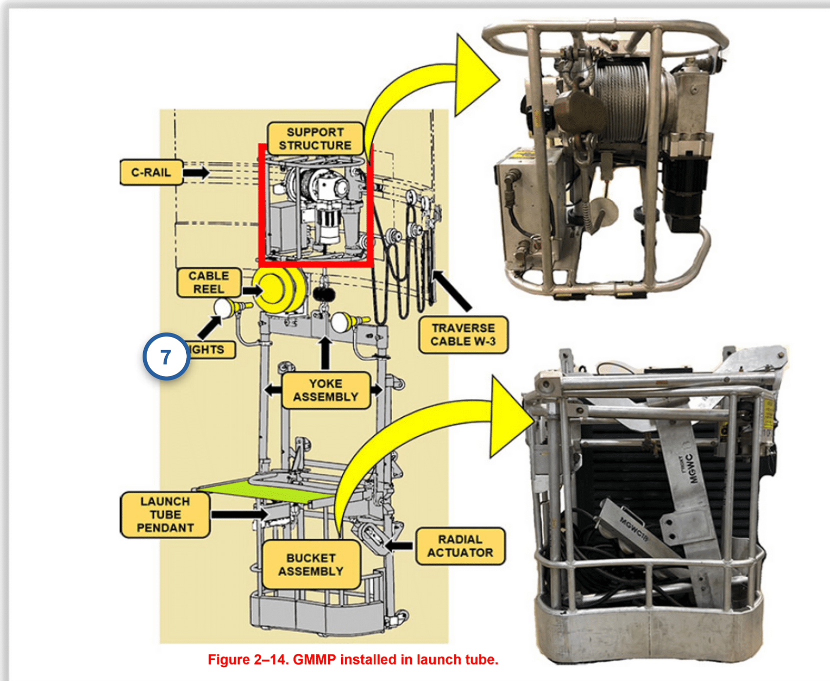


Figure 2–14. GMMP installed in launch tube.

Lights

There are two light fixtures (fig 2–14) mounted to the bucket whose purpose is to illuminate the work area for technicians inside the launch tube. The launch tube does not have any permanent light fixtures.

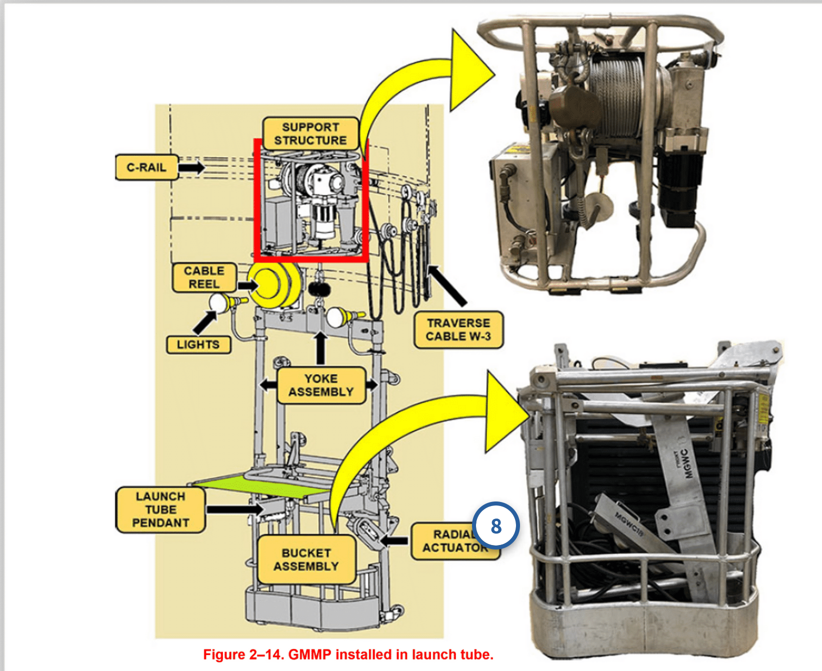


Figure 2–14. GMMP installed in launch tube.

Radial Actuator

The radial actuator (fig 2–14) allows a technician to move the GMMP bucket away from the wall of the launch tube in order to move closer to the missile. It is simply a hand-cranked mechanism that pushes rear legs outward in order to press the bucket away from the launch tube wall. A switch opens to disable GMMP movement whenever the radial actuator is extended.

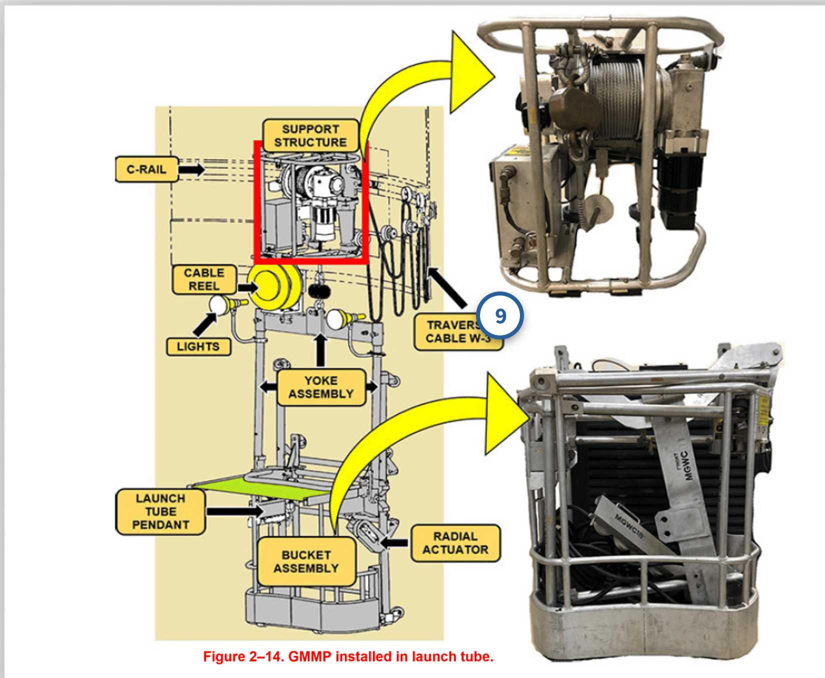


Figure 2–14. GMMP installed in launch tube.

Traverse Cable W3

Traverse cable W3 (fig 2–14) is the electrical connection between the GMMP power distribution box and the support structure. The cable hangs in loops supported by rollers that install into the C-rail. These loops allow the cable to extend as the support structure traverses counter-clockwise around the launch tube.

Figure 2–15. GMMP LER control pendant.

Figure 2–15. GMMP LER control pendant.

LER Control Pendant

The LER control pendant (fig 2–15) is similar to the bucket pendant and allows remote control of the GMMP for emplacement and removal as well as during emergency conditions. The LER pendant is connected to the GMMP's power distribution box by cable W2.

Figure 2–15. GMMP LER control pendant.

Cable W1

Cable W1 is connected between the power and communication distribution box in the upper LER and the GMMP power distribution box. There is a ground fault circuit interrupter in the center of the cable acts similar to a circuit breaker.

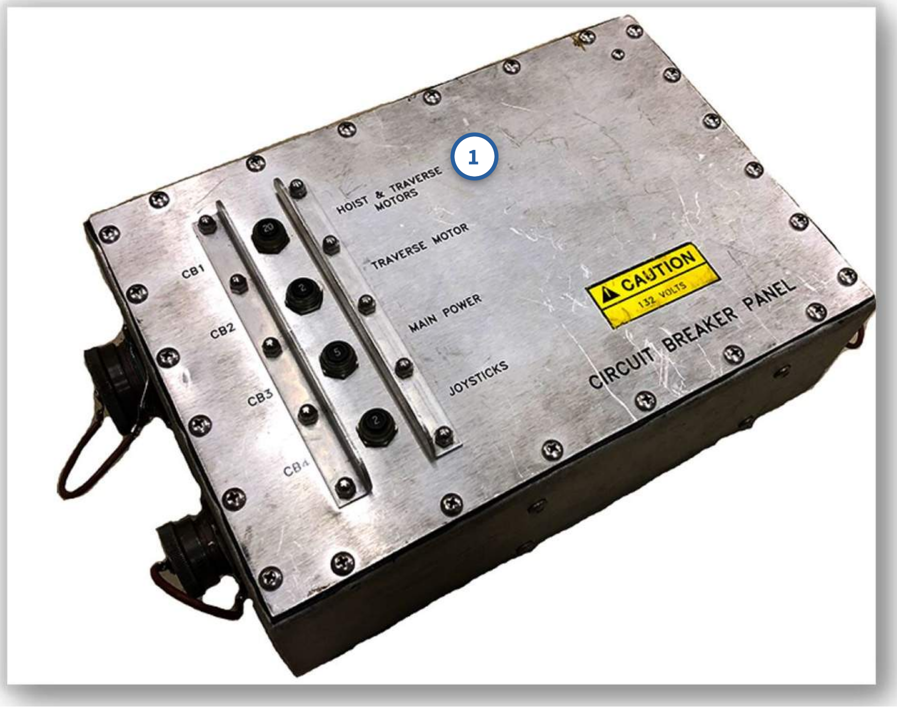
Figure 2–16. GMMP power distribution box.

Figure 2–16. GMMP power distribution box.

Power Distribution Box

The power distribution box (fig 2–16) contains four push-pull circuit breakers used during normal operation to provide over-current protection.

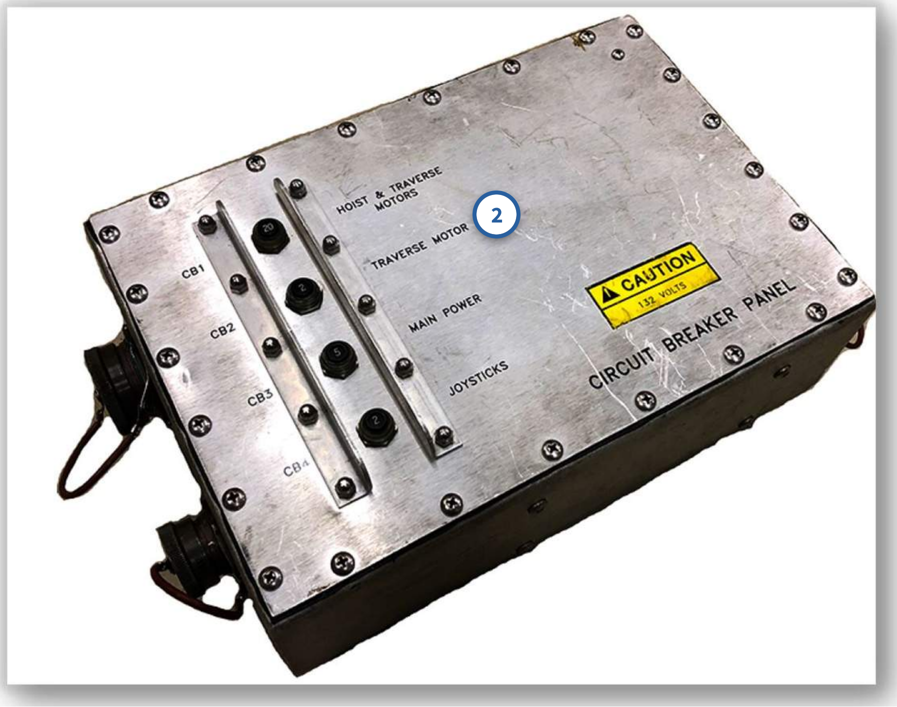
Figure 2–16. GMMP power distribution box.



HOIST & TRAVERSE MOTORS

CB–1 is a 20-amp circuit breaker that routes power to the GMMP hoist electrical system.

Figure 2–16. GMMP power distribution box.



TRAVERSE MOTOR

CB–4 is a 2-amp circuit breaker that routes power to the GMMP directional positioning circuitry.

Figure 2–16. GMMP power distribution box.

MAIN POWER

CB–3 is a 5-amp circuit breaker that routes power to the bucket assembly lights.

Figure 2–16. GMMP power distribution box.

JOYSTICK

CB–4 is a 2-amp circuit breaker that routes power to the GMMP directional positioning circuitry.

Click on each number before moving forward in the lesson.

How the GMMP works in the field

In order to fully understand the troubleshooting and maintenance of the GMMP as a technician in the PREL shop, you must first understand how the GMMP works at the LF.

The majority of the parts for the GMMP are transported in two silver boxes with casters (rollers) on the bottom. The bucket assembly is transported separately with the yoke, and several other parts are usually placed in the bottom of it. Therefore, when a team dispatches to the field with a GMMP, they will have two large silver boxes as well as the bucket assembly.

When a team arrives to the LF, they will lower all of the necessary parts of the GMMP into the LER using a manual hoist that connects to the personnel access hatch lid. While this is happening, a team in the LER is opening three hatches in the launch tube liner—one small door near the ceiling, which allows the support structure to be installed into the C-rail, and two larger doors in the upper LER allow for the bucket to be put into the launch tube.

Once the support structure and bucket are installed in the launch tube and all of the necessary electrical cables are connected (fig 2–17), the GMMP will be used to traverse clockwise and counterclockwise and move up and down in the launch tube. When maintenance is complete, the support structure and bucket are removed from the launch tube and all launch tube access doors are closed and bolted shut. All of the GMMP components are hoisted out of the LER and then they are put into their boxes topside for transport back to the MSB.

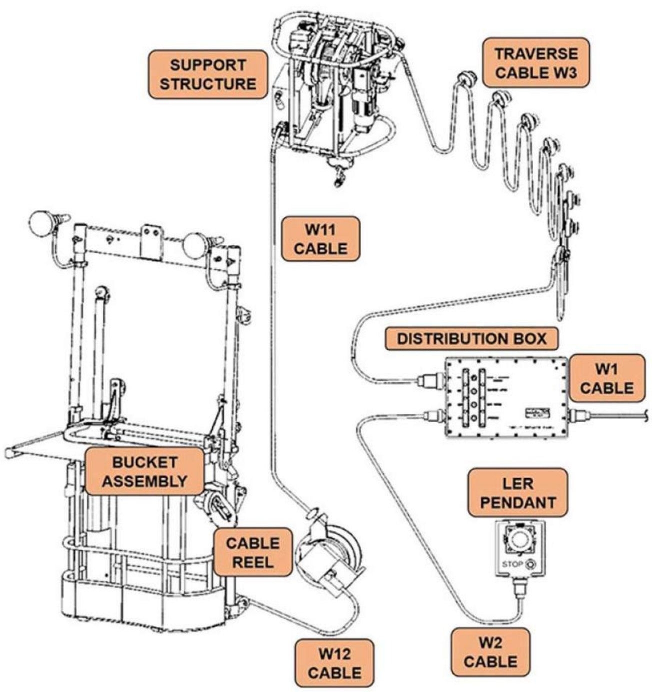


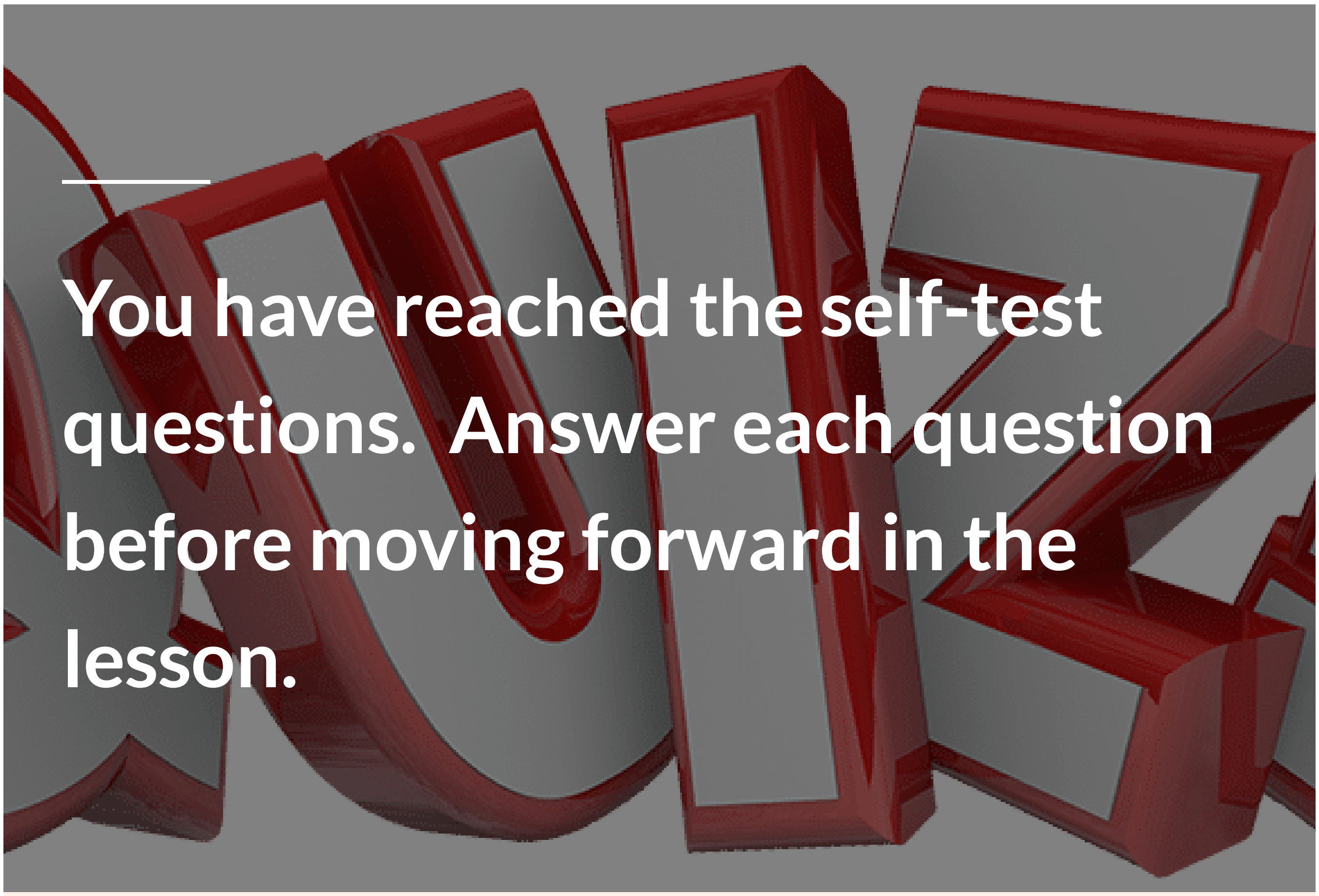
Figure 2–17. GMMP Fully Assembled.

How the GMMP works in the PREL shop

Every GMMP in the fleet will receive a semiannual (twice a year) inspection by the PREL shop and any GMMP that has malfunctioned will come through the PREL shop for troubleshooting. The PREL shop will have a workbench or area that supplies power to the GMMP just like the distribution box in the LER would on site.

You will not physically hang the support structure, but with all power cables connected and power applied, you have the ability to test the function of the entire GMMP. The GMMP interconnection schematic in TO 35A4-4-9-1, *Guided Missile Maintenance Platform*, is relatively easy to interpret, and you will use it extensively in your troubleshooting efforts.

Complete the content above before moving on.



KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the function and operation of the guided missile maintenance platform.

1. What is the purpose of the GMMP support structure?

Type your answer here

SUBMIT

2. What is the purpose of the GMMP cable reel?

Type your answer here

SUBMIT

3. What is cable W1 of the GMMP used for?

Type your answer here

SUBMIT

4. As a technician in the PREL shop, under what circumstances will you perform maintenance on the GMMP?

Type your answer here

SUBMIT

Answer each question before moving on to the next section.

Function and Operation of the Hydraulic Pusher Set

Figure 2–18. Hydraulic Pusher Set

Function and Operation of the Hydraulic Pusher Set

Ballistic devices in the LER will force the large 110-ton launcher closure door to move backwards on its rail and away from the launch tube in the event of a real-world launch. We obviously would not use these same devices in a non-emergency situation, so what do maintenance teams use to roll the door on a normal day when maintenance needs to be accomplished at the LF?

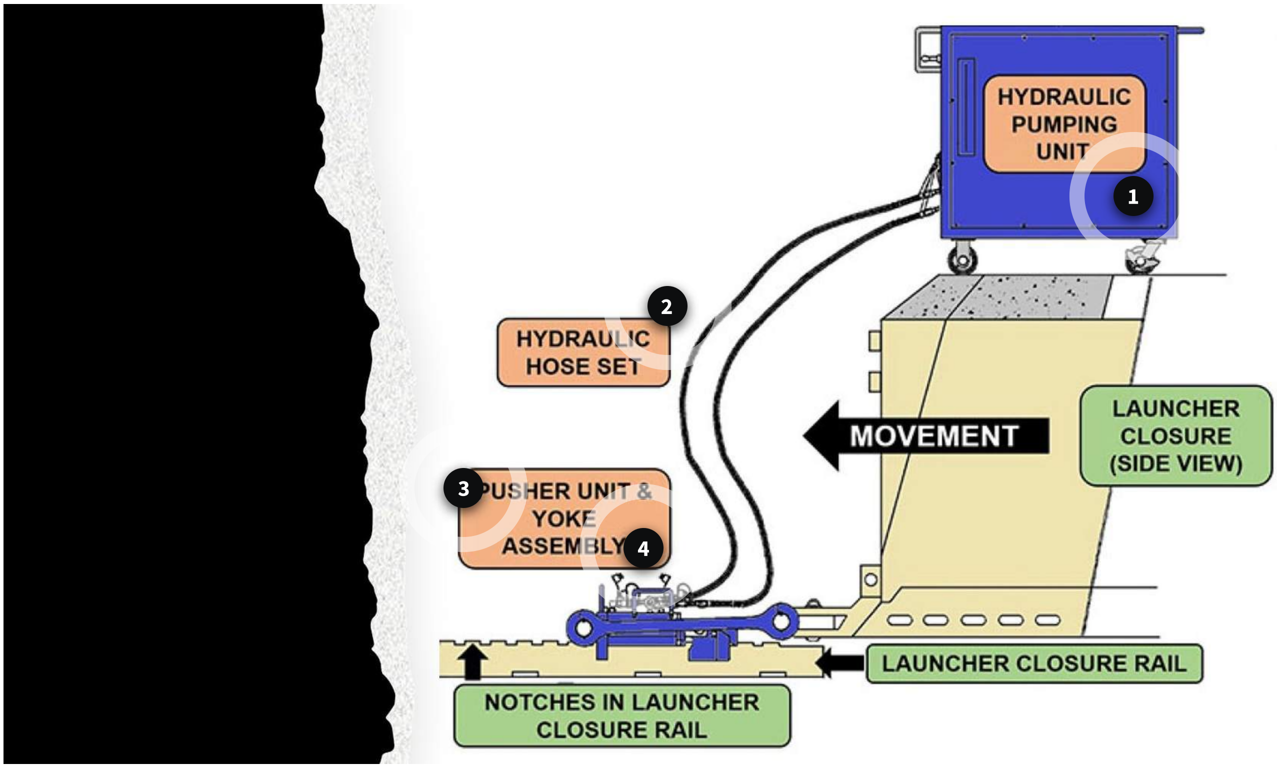
The hydraulic pusher set (HPS) (fig 2–18), or pipe pusher, is what MMT use to open and close the launcher closure on the LF. It remains in this position until maintenance is complete, and then the HPS is used in the opposite direction to close the launcher closure door.

As a technician in the PREL shop, you will sometimes have the opportunity to work on the HPS, but these opportunities are somewhat limited. Your main concern is the electrical system, but we will first break down the larger assemblies of the HPS to provide you with an understanding of how the device functions before focusing on the electrical system.

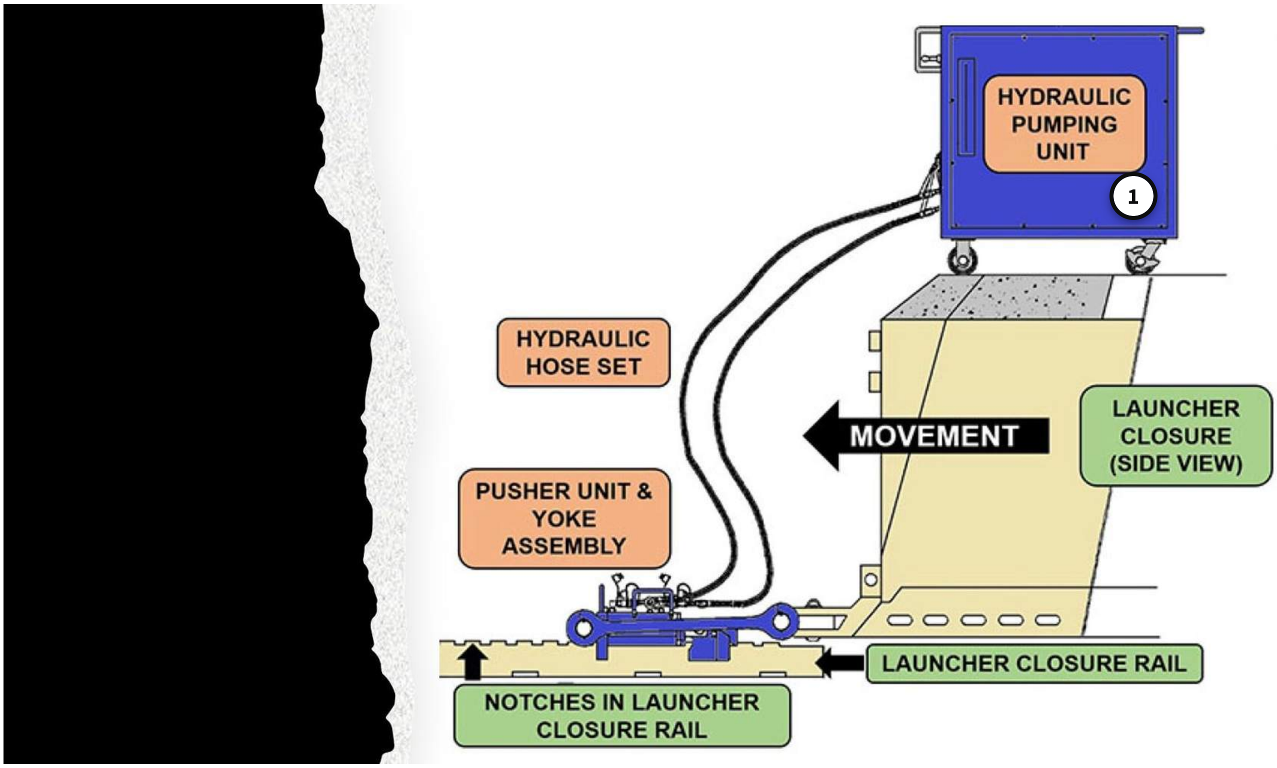
Description

The HPS consists of the following major components:

- Hydraulic pumping unit.
- Hydraulic hoses.
- Pusher unit.
- Yoke.

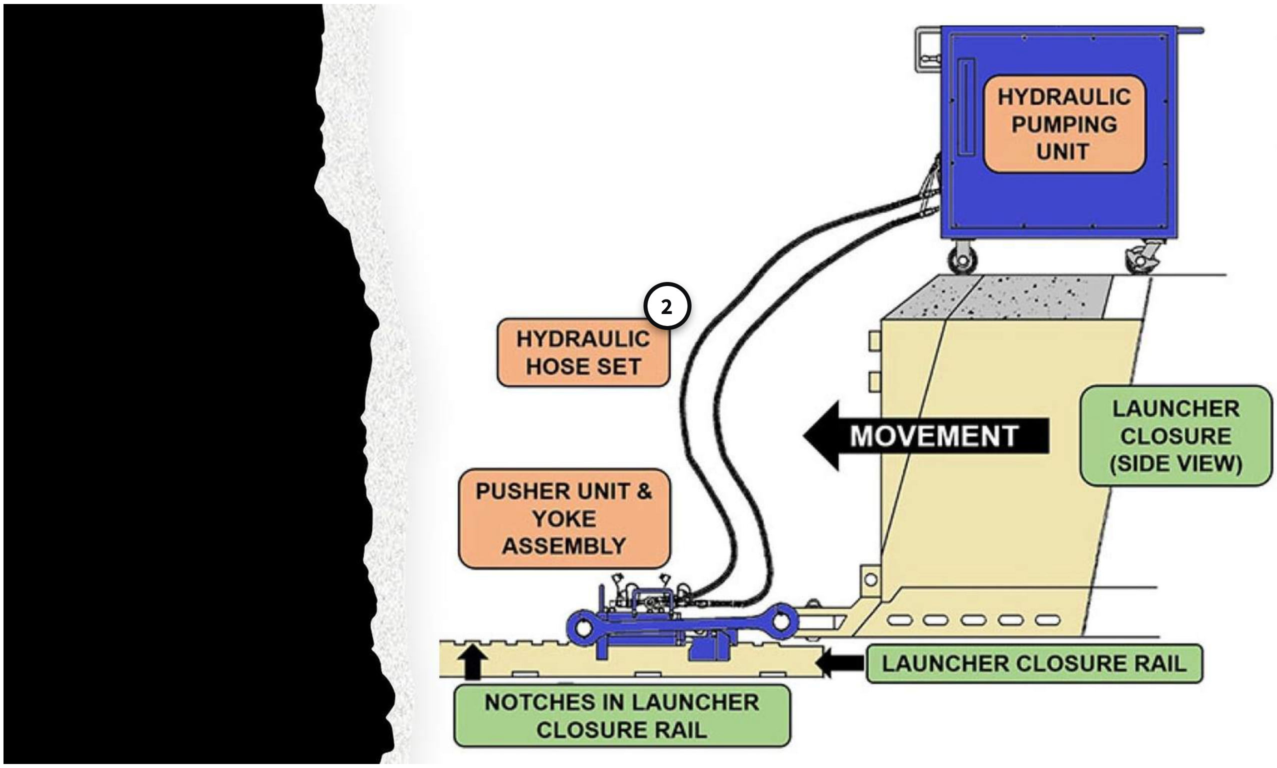


HYDRAULIC PUMPING UNIT
1
2
HYDRAULIC HOSE SET
MOVEMENT
LAUNCHER CLOSURE (SIDE VIEW)
3
PUSHER UNIT & YOKE ASSEMBLY
4
LAUNCHER CLOSURE RAIL
NOTCHES IN LAUNCHER CLOSURE RAIL



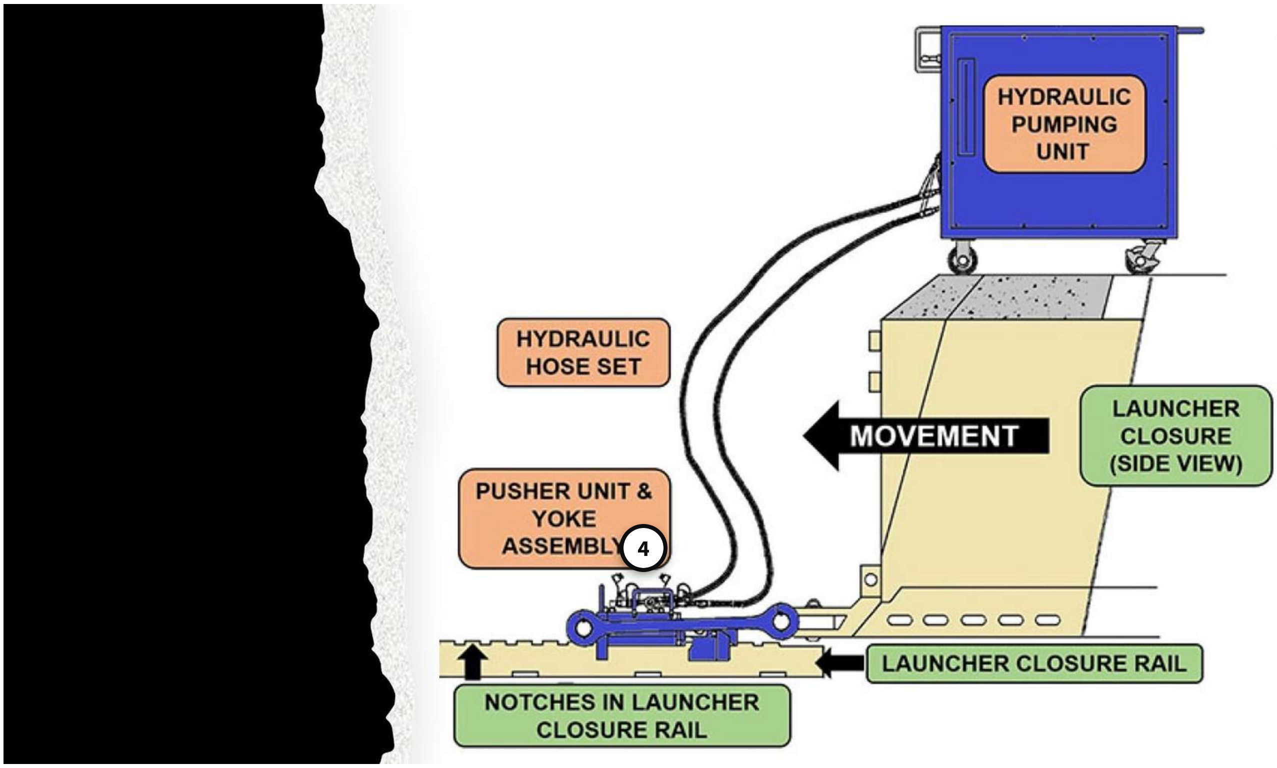
Pumping Unit

The hydraulic pumping unit (fig 2–18) is the central component of the HPS and the one you will see the most frequently as a technician in the PREL shop. The pumping unit uses a hydraulic pump to provide pressurized hydraulic fluid to operate the pusher unit. The electrical box assembly, which contains most of the components you will work on, is located on the pumping unit.



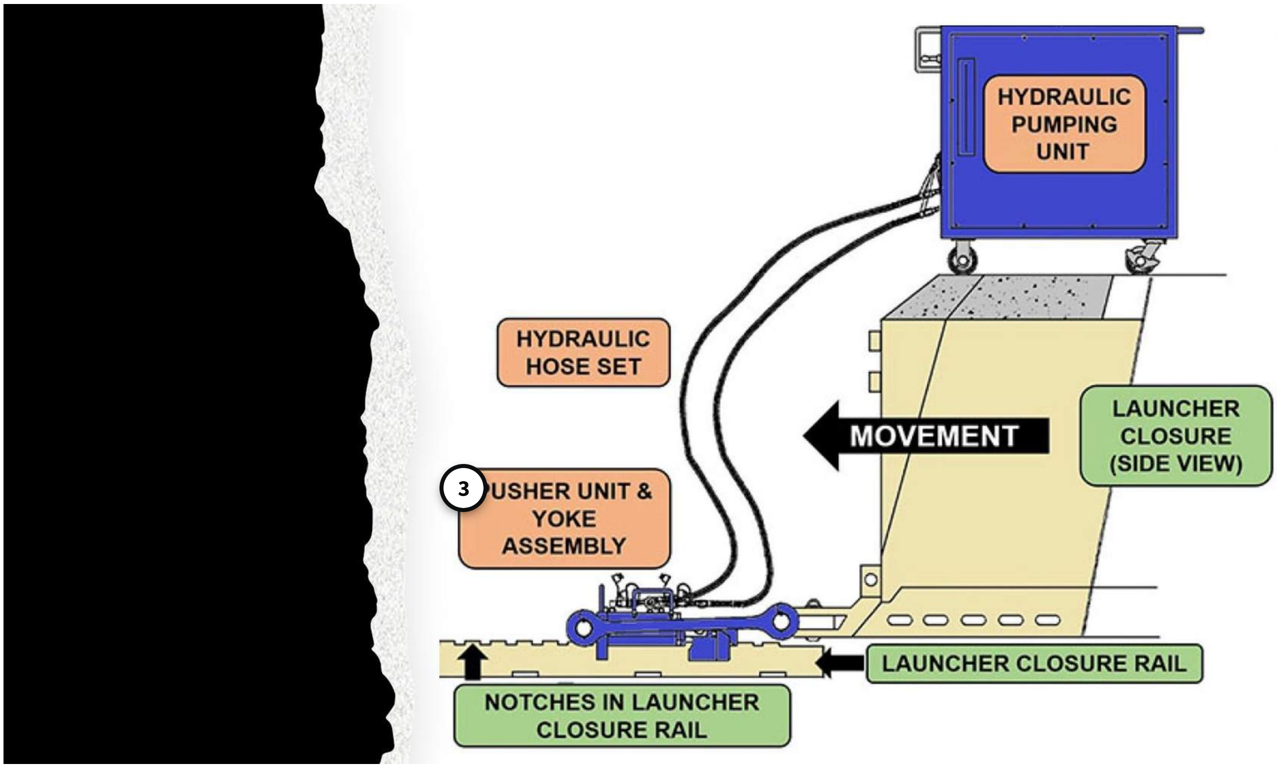
Hose Set

The hose set is responsible for transferring hydraulic pressure from the pumping unit to the pusher unit. The hoses are connected to the pusher unit and pumping unit by quick-disconnect fittings that are configured so that it is not possible to connect them incorrectly.



Yoke

The yoke (fig 2–20) is made of five machined steel parts and is the component responsible for transferring the 110,000 pounds of horizontal force from the pusher unit to the launcher closure door.



Pusher Unit

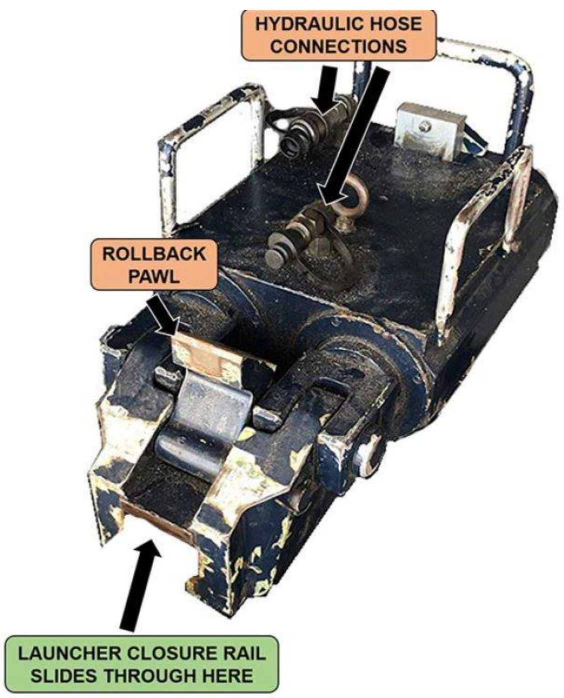


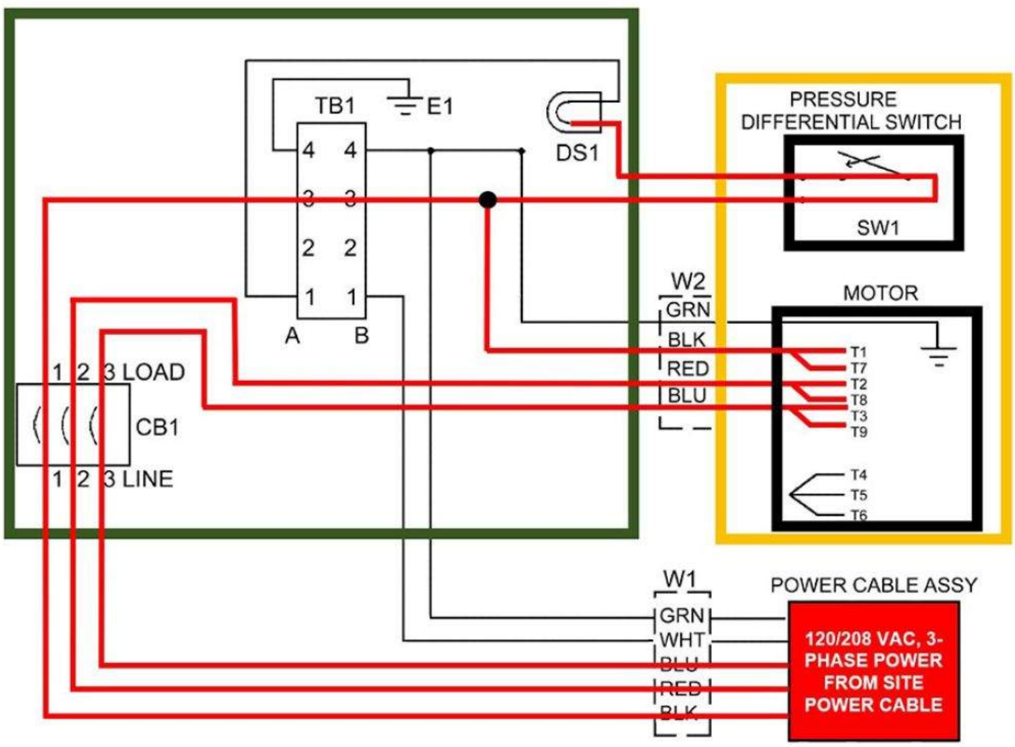
Figure 2–19. HPS hydraulic pusher unit.

The hydraulic pusher (fig 2–19) is the component of the HPS that is physically responsible for moving the launcher closure door open or closed. It mounts at ground level on the launcher closure rail, and the hose set relays hydraulic pressure between the pumping unit and the pusher unit. Hydraulic pressure causes the pusher unit's rollback pawl to engage with a notch in the launcher closure rail (fig 2–18) to either pull the door open or push it closed.

Click on each number before moving forward in the lesson.

Electrical System

The HPS electrical system (fig 2–21) is relatively simple. A site power cable to the electrical box assembly on the pump unit supplies 120/208 VAC, 3-phase power.



Electrical System

Hydraulic Pump Motor

120/208 VAC, 3-phase power flows through circuit breaker CB–1 and branches off into two different directions. Two phases of power flow directly to the hydraulic pump motor and a single phase of power flows to terminal board (TB)–1 and then to the electric hydraulic pump motor.

Electrical System

Pressure Differential Switch SW–1 and Indicator Light DS–1

The single phase of 120 VAC that flows through TB–1 flows to the hydraulic pump motor and flows to pressure differential switch SW–1. This switch is closed during normal operation and opens if the hydraulic fluid filter becomes clogged. Therefore, pressure indicator light DS–1 will always be illuminated as long as power is being supplied to the HPS and the hydraulic fluid filter is serviceable (not clogged).

Review the content above before moving forward in the lesson.

Function and Operation of the Guidance Section Liquid Cooler

The missile guidance set (MGS) of the Minuteman III missile is dedicated to orienting the missile and controlling its trajectory throughout its flight profile. Even in the silo, the electronics of the MGS are energized and at work 24 hours a day performing calculations, and these electronics must be maintained within a certain temperature range.

The guidance section liquid cooler is an entire electronic rack at the LF responsible for maintaining the proper temperature of the MGS. The rack is located on the side of the upper LER opposite the B-plug, near the distribution box where you install the key to remove the SAFETY CONTROL switch lock pin (safe the missile). As a 2M0X3, you will not perform maintenance on this rack or remove or install any of its components. As a technician in the PREL shop, however, you will perform maintenance and troubleshooting on many of its components, which are brought back to the MSB by EMT. The guidance section liquid cooler rack (fig 2–22) consists of these major components:

- Coolant chiller unit.
- Coolant tank.
- Coolant pump.
- Control valve.
- Electronic control amplifier.

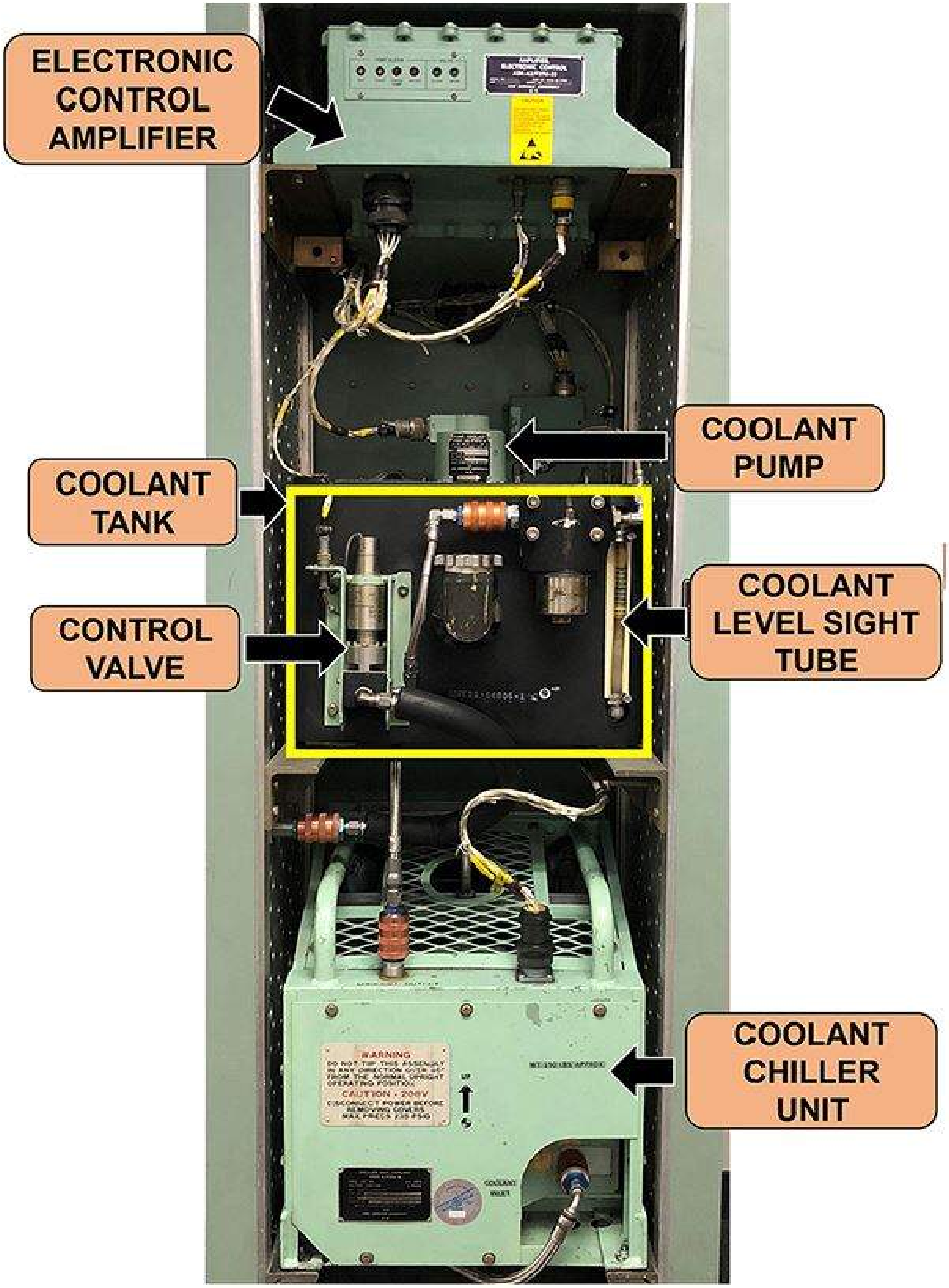

ELECTRONIC CONTROL AMPLIFIER
COOLANT PUMP
COOLANT TANK
COOLANT LEVEL SIGHT TUBE
CONTROL VALVE
COOLANT CHILLER UNIT

Figure 2–22. Guidance Section Liquid Cooler Rack.

Sodium Chromate Solution

Sodium chromate is the liquid that is cooled by the guidance section liquid cooler. It is then circulated to and from the MGS through supply and return lines. Sodium chromate has essentially the same job as the brine in the brine subsystem—it removes heat from the MGS and transfers it to the refrigerant subsystem of the coolant chiller unit.

Coolant Chiller Unit

The coolant chiller unit (fig 2–23) is located at the bottom of the rack, and operates continuously on 208 VAC, 3-phase power. The refrigerant system in the coolant chiller unit removes heat from the sodium chromate that is being circulated through the system by the coolant pump. The coolant chiller unit consists of the following familiar components:

- Compressor
- Evaporator
- Condenser
- Condenser fan
- Automatic expansion valve
- Filter-drier

The coolant chiller unit is simply a smaller version of the brine chiller unit. Heat-laden sodium chromate flows into the evaporator and transfers its heat to the liquid refrigerant, which causes the refrigerant to change state into a gas. The gaseous refrigerant is then drawn into the refrigerant compressor where it is converted into a high-pressure gas and sent to the condenser.

The built-in fan of the coolant chiller unit blows air across the condenser coil, which removes heat from the refrigerant and condenses it into a low temperature/high-pressure fluid. The heat removed from the refrigerant is ejected into the ambient air of the LER. The liquid refrigerant passes through a filter-drier and then through an automatic expansion valve, which acts exactly like the thermal expansion valve on the brine chiller unit to convert the liquid refrigerant into a low-pressure/low-temperature fluid.

The liquid refrigerant then flows to the evaporator to remove heat from the sodium chromate, which completes the cycle. The coolant chiller unit has a compressor and a thermal expansion valve that comprise the two pressure changing points in the system, and also has the condenser and evaporator that comprise the two points in the system where refrigerant changes state.

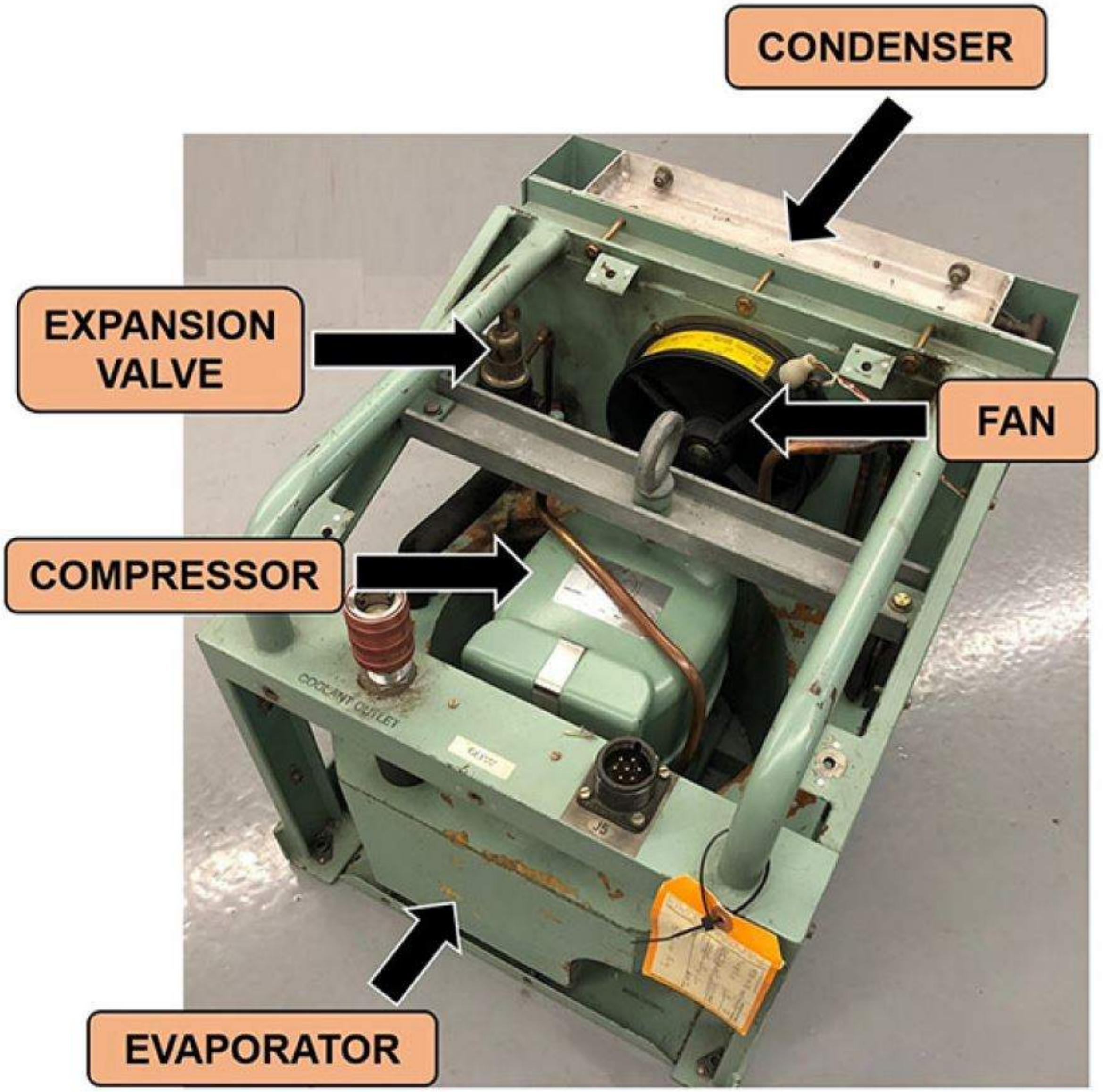


Figure 2–23. Coolant Chiller Unit.

Coolant Tank

The cool sodium chromate flows out of the coolant chiller unit and into the coolant tank, which is in the center portion of the guidance section cooler rack. The coolant tank holds 7 gallons of sodium chromate, and you will check the fluid level of the tank each time you enter the LER. Sodium chromate is drawn out of the tank and through a filter.

Coolant Pump

The coolant pump is positioned on the top of the coolant tank and requires 120/208 VAC, 3-phase power to circulate sodium chromate throughout the system.

Control Valve

The control valve (fig 2–24) is responsible for controlling the flow rate of sodium chromate through the system, and it repositions in response to signals it receives from the electronic control amplifier. Rather than a steady signal, the electronic control amplifier sends pulses that cause the motor in the control valve to reposition in small increments. The control valve allows more sodium chromate to flow through if the MGS is too hot, and less to flow through when the MGS is too cool.

Figure 2–24. Control Valve Assembly.

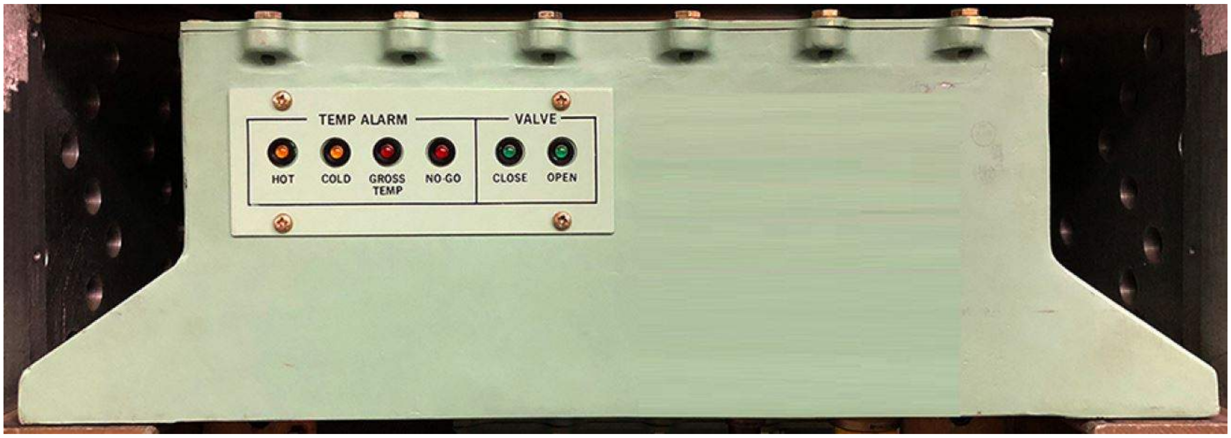


Figure 2–25. Electronic Control Amplifier.

Electronic Control Amplifier

The electronic control amplifier (fig 2–25) is responsible for modulating the control valve open or closed to increase or decrease the flow of sodium chromate to the MGS. It operates on 36 VDC power that is supplied through a nearby circuit breaker in the distribution box. A temperature sensor in the MGS called a thermistor sends signals to the amplifier to let it know how much cool sodium chromate needs to flow to the MGS. Normal operating temperature of the MGS is 71.2°F, and if the temperature exceeds 80°F, the GROSS TEMP indicator light on the control amplifier will illuminate. If the temperature continues to climb to 85°F, the NO-GO indicator light will illuminate, and the MGS will shut down.

Sodium Chromate Flow

Now that we've seen all the components that make sodium chromate flow, let's simplify it using figure 2–26. The coolant pump draws sodium chromate from the tank and pumps it through the filter. After being filtered, the sodium chromate flows through the control valve and out of the guidance section liquid cooler through hoses that run through the missile's umbilical cable and into the MGS. The thermistor in the MGS sends electronic signals to the electronic control amplifier that vary as the temperature of the MGS changes. The electronic control amplifier maintains the proper temperature of the MGS by sending pulses to modulate the control valve open or closed, which will increase or decrease the flow of sodium chromate.

The sodium chromate removes heat from the MGS, flows back through the umbilical, and makes its way through the return line and back to the guidance section liquid cooler rack. Heat from the sodium chromate is transferred to the liquid refrigerant in the evaporator. The cool sodium chromate then flows out of the chiller unit and into the tank, where the pump will circulate it through the system once again.

PREL technicians will troubleshoot and repair faulty coolant chiller units and control valves removed from the LF by EMT. The PREL shop cleans coolant filters using an ultrasonic cleaner and then performs a flow check to ensure they are serviceable.

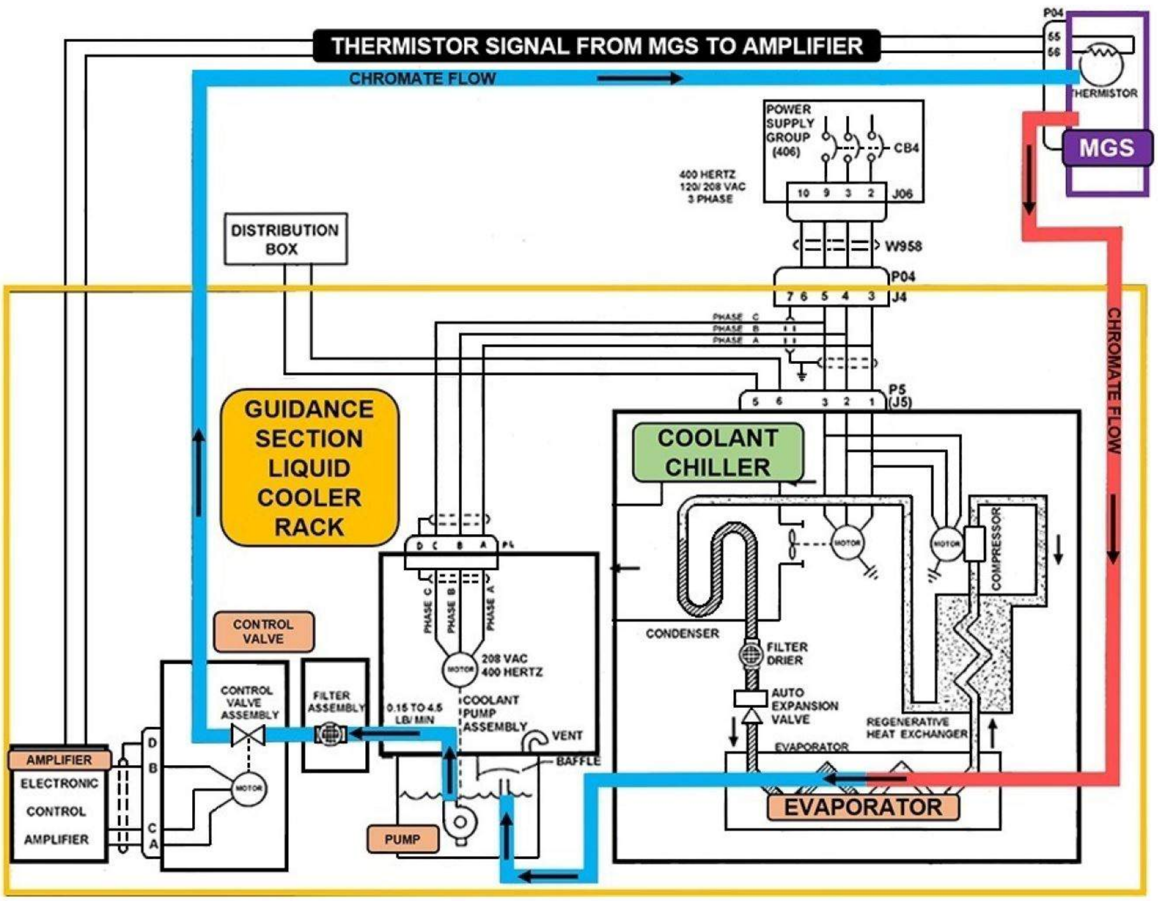
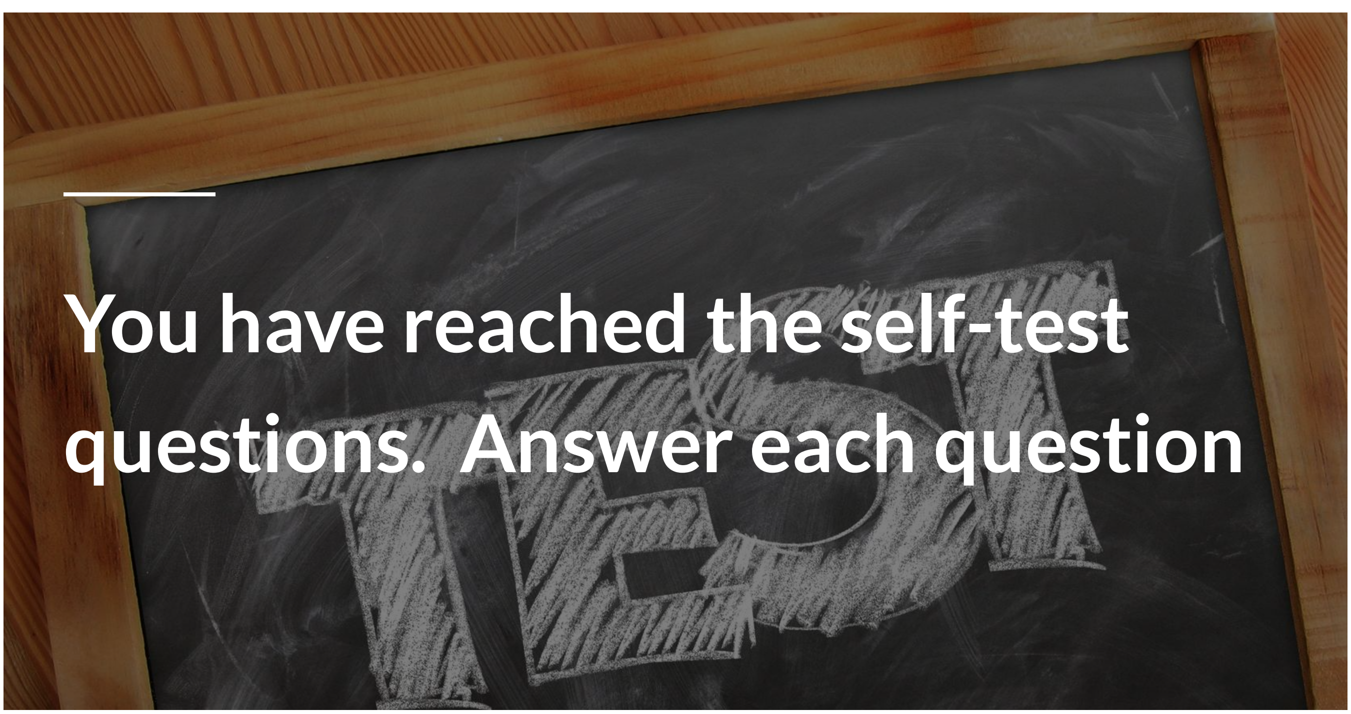


Figure 2–26. Sodium Chromate Flow Diagram.



You have reached the self-test questions. Answer each question

before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the function and operation of the hydraulic pusher set.

1. What feature of the hydraulic pusher set hoses makes it impossible to connect them incorrectly?

Type your answer here

SUBMIT

2. What is the purpose of the hydraulic pusher set yoke assembly?

Type your answer here

SUBMIT

3. Explain how indicator light DS–1 and hydraulic pressure differential switch SW–1 on the hydraulic pusher set operate.

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self test questions pertaining to the function and operation of the guidance section liquid cooler.

1. What is the purpose of the guidance section liquid cooler rack?

Type your answer here

SUBMIT

2. What purpose does sodium chromate solution serve?

Type your answer here

SUBMIT

3. Explain the interaction between the electronic control amplifier and the control valve in the guidance section liquid cooler.

Type your answer here

SUBMIT

4. Explain the interaction between the thermistor in the MGS and the electronic control amplifier in the guidance section liquid cooler.

Type your answer here

SUBMIT

Answer each question before moving on to the next section.

Function and Operation of the Portable Air Conditioner

The three boosters of the Minuteman III missile are stacked on top of one another to form the downstage, and the downstage is transported to the LF in a separate vehicle from the other missile components. Spare downstages awaiting processing or some other actions are stored in large trailers that do not have their own temperature or humidity controls.

The PAC (fig 2–27) provides environmental control for these large trailers at the missile handling section. Two flexible ducts are connected between the PAC inlet/outlet ports and the inlet/outlet ports on the trailer. Air is either warmed by electric heater elements or cooled by the PAC's refrigeration system. The air is circulated into the trailer in order to maintain the temperature inside the container between 60 and 100°F.

Figure 2–27. Portable Air Conditioner.

Functions

The PAC consists of the following systems:

- Electrical System
- Refrigeration System
- Heating System

Functions

Electrical System

Either an APU or an external facility power source supplies 120/208 VAC, 3-phase power to the major components in the PAC.

Functions: Electrical System

Auxiliary Power Unit

The PAC's APU (fig 2–28) uses the same technical order as the APU on the TE tractor, and the two are virtually identical in design. The engine utilizes a 12 VDC starting system and is equipped with a battery heater, since the unit is generally stored outdoors. A 100-gallon tank built into the base of the PAC supplies fuel to the APU.

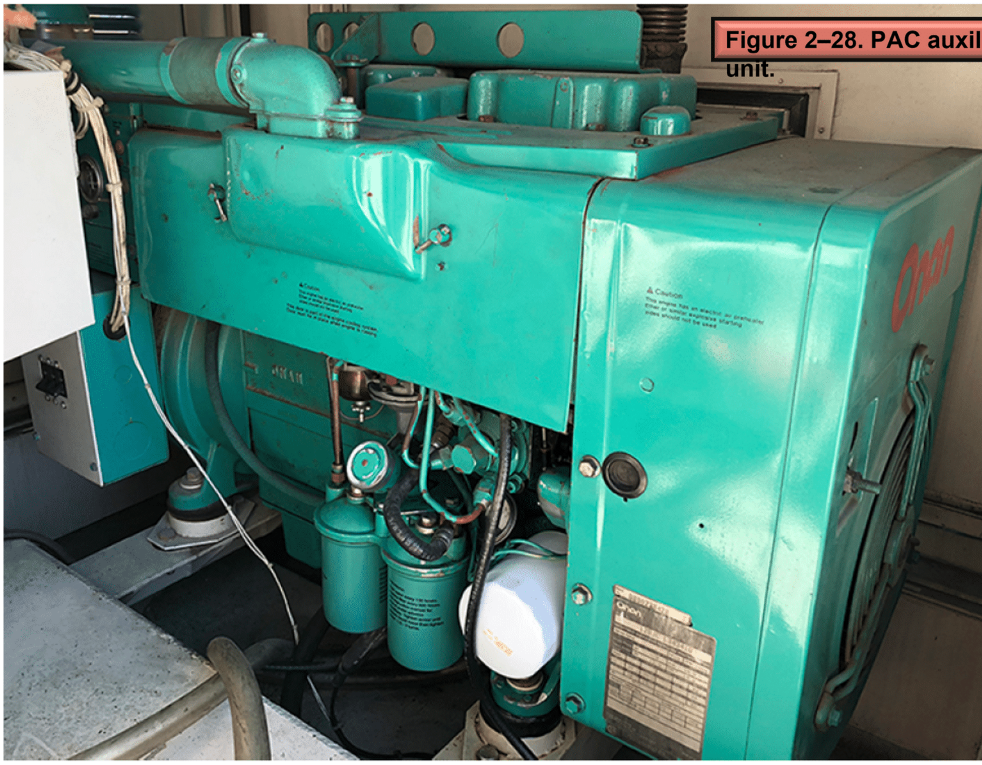


Figure 2–28. PAC auxiliary power unit.

Functions: Electrical System

External Power Source (Site Power)

The heating and air conditioning systems of the PAC can also operate on facility power, and the POWER CONTROL switch selects which source of power is used.

Functions

Refrigeration System

The PAC refrigeration system (fig 2–29) uses a semi-hermetic, reciprocating compressor that cycles 16.2 pounds of R–22 refrigerant throughout the unit. If the temperature sensed at thermostat S–2 is below 59°F, refrigerant will bypass the evaporator to limit cooling. If the temperature is above 59°F, refrigerant is allowed to enter the evaporator. Note that thermostat S–2 is different from the thermostat that senses the temperature in the inlet duct.

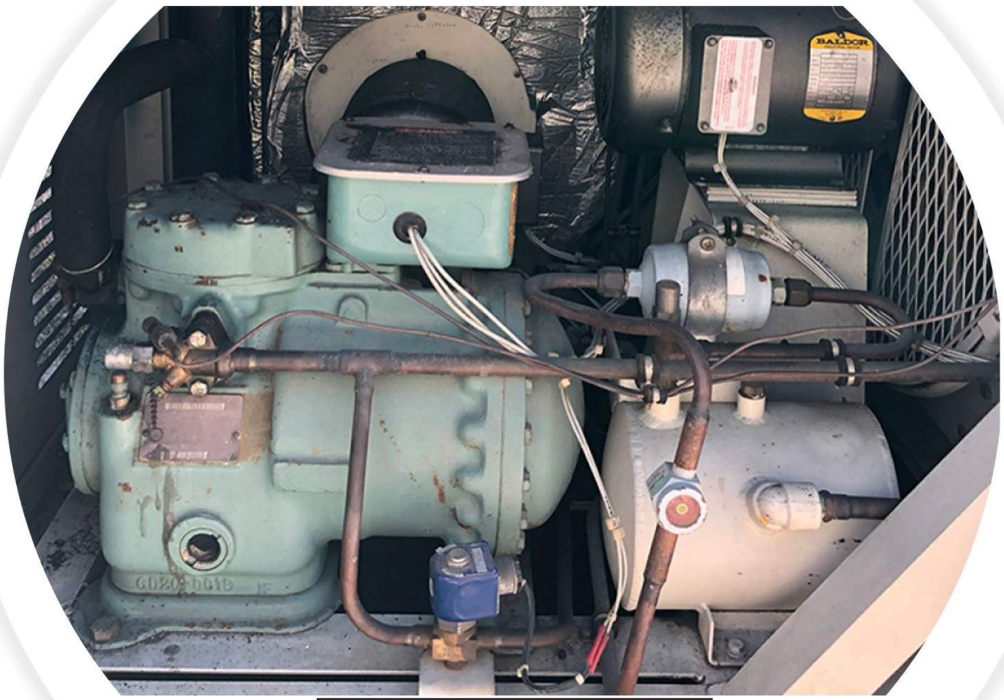


Figure 2–29. PAC refrigeration system.

Functions

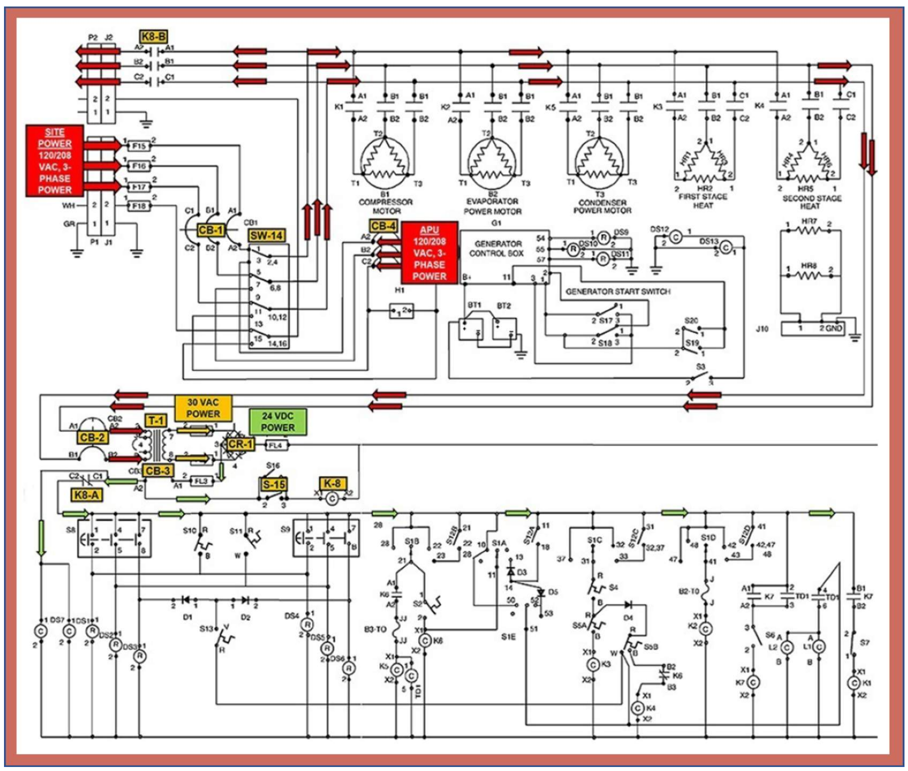
Heating System

The PAC provides hot air using two heater stages with two heater elements each. Two heater relays control which unit operates and a single thermostat determines whether one or both heater stages will be operating.

Functions

Portable Air Conditioner Electrical Schematic

The electrical schematic for the PAC is located in TO 35E9-270-1, *Portable Missile Transporter Air Conditioner*; it has been included in figure 2–30. It includes sources of power as well as several components. Being familiar with this schematic will help you tremendously in your troubleshooting efforts.



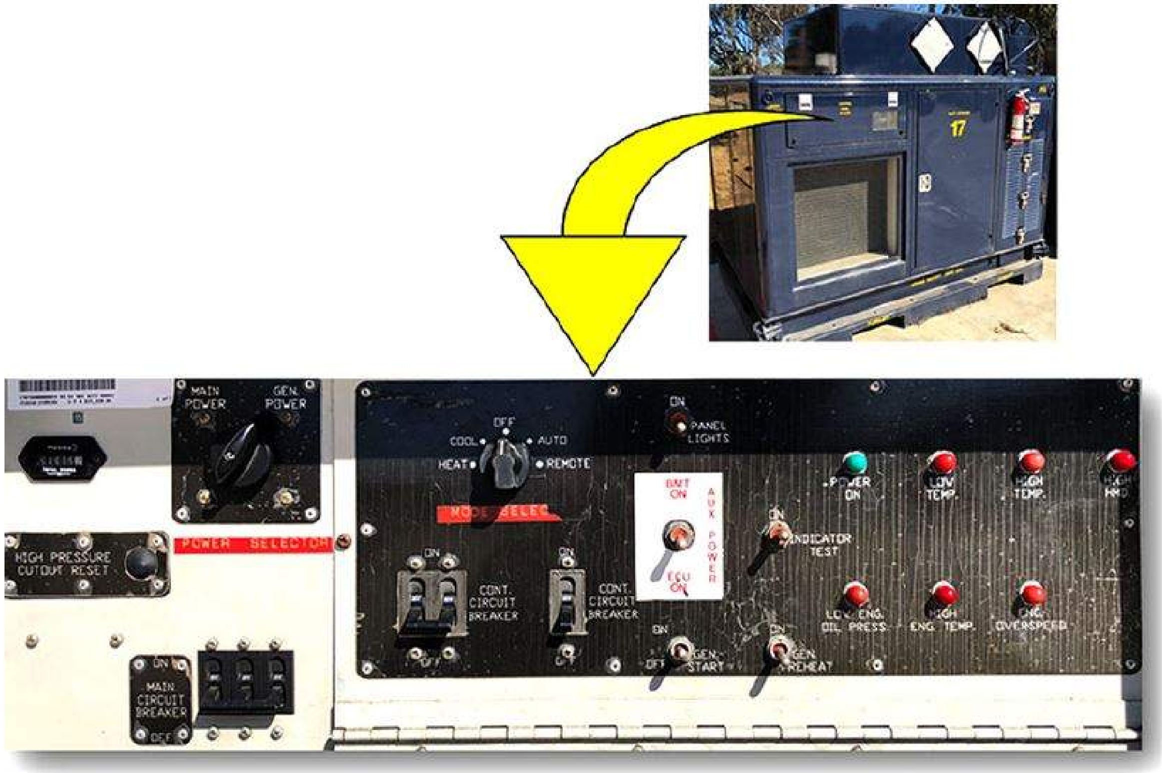


Figure 2–31. PAC Control Panel.

Operation

The PAC control panel can control and monitor all operations of the PAC (fig 2–31).

Indicators

The following table identifies each of the indicator lights on the PAC control panel and what causes each one to illuminate:

Indicator Light	Illuminates When
POWER ON	Power is applied through the MAIN and CONTROL circuit breakers.
LOW TEMP	Return air temperature to the PAC is below 59°F.
HIGH TEMP	Return air temperature to the PAC is above 95°F.
HIGH HMD	Humidity of air exiting the PAC evaporator coil is too high.
LOW ENG OIL PRESS	APU oil pressure is too low.
HIGH ENG TEMP	APU engine operating temperature is too high.
ENG OVERSPEED	APU engine speed is above 1,950 revolutions per minute.

Switches

The switches on the control panel allow the user to control the operation of the PAC. Click on each (+) sign below to learn about the switches on the control panel

Mode Selector Rotary Switch S-1

Mode selector switch S–1 is a rotary switch used to select the mode of operation. S–1 has five positions

1. AUTO – automatically uses the PAC heating and cooling systems to maintain an output temperature between 50 and 100°F.
2. HEAT – switches the PAC to manual heating.
3. COOL – switches the PAC to manual cooling.
4. OFF – turns the unit off and shuts down the APU if it is operating.
5. REMOTE – allows a technician to use the remote-control box to control PAC operation.

Power Control Rotary Switch S–14

Power control switch S–14 selects whether the PAC will be supplied with 120/208, 3-phase facility power or APU power. 3-phase power is distributed to the heating and cooling systems and two phases branch off to supply power to a transformer.

Auxiliary Power Toggle Switch S–15

If auxiliary power switch S–15 is closed, relay K–8 energizes to remove power from all components in the control panel except for the power ON indicator light. This will disable the PAC's heating and cooling systems. An auxiliary contactor of relay K–8 closes to allow 120/208 VAC, 3-phase power to flow through the auxiliary power connector J–2 and out to the missile trailer. Power still waits on the line side of relays K1 through K5, but cannot pass through to energize these components because there is no power being supplied to the PAC control panel.

Generator Preheat and Start Switches —

The generator preheat switch serves the same purpose as the one on the TE APU, which is to energize heating elements in the intake manifold of the APU. Intake air is heated prior to entering the engine cylinders to aid in starting the APU in cold weather conditions.
The generator start switch allows 12 VDC power from the APU starting batteries to flow to the starter, which will then crank the engine.

Indicator Light Test Switch —

The indicator light test switch is used to verify the operation of the seven indicator lights on the control panel. Misleading indications might be given if a light does not illuminate properly, which can possibly lead to misdiagnosed problems and unnecessary troubleshooting.

Click each + symbol above before moving on.

Control Panel Components

Many components enable proper operation of the PAC.

The list below is not all-inclusive, but these are important components to understand for general operation and troubleshooting of the PAC.

Main Circuit Breakers CB–1 and CB–4

CB–1 will open if the PAC systems are drawing too much current from the facility power source, and CB–4 will open if the PAC drawing too much current from the APU.

Control Circuit Breakers CB–2 and CB–3

CB–2 will open to prevent 120 VAC from flowing to transformer T-1 if current draw becomes too high. CB–3 will open to remove 24 VDC from the PAC's control circuits.

Transformer T–1

Transformer T–1 is used to step 120 VAC down to 30 VAC.

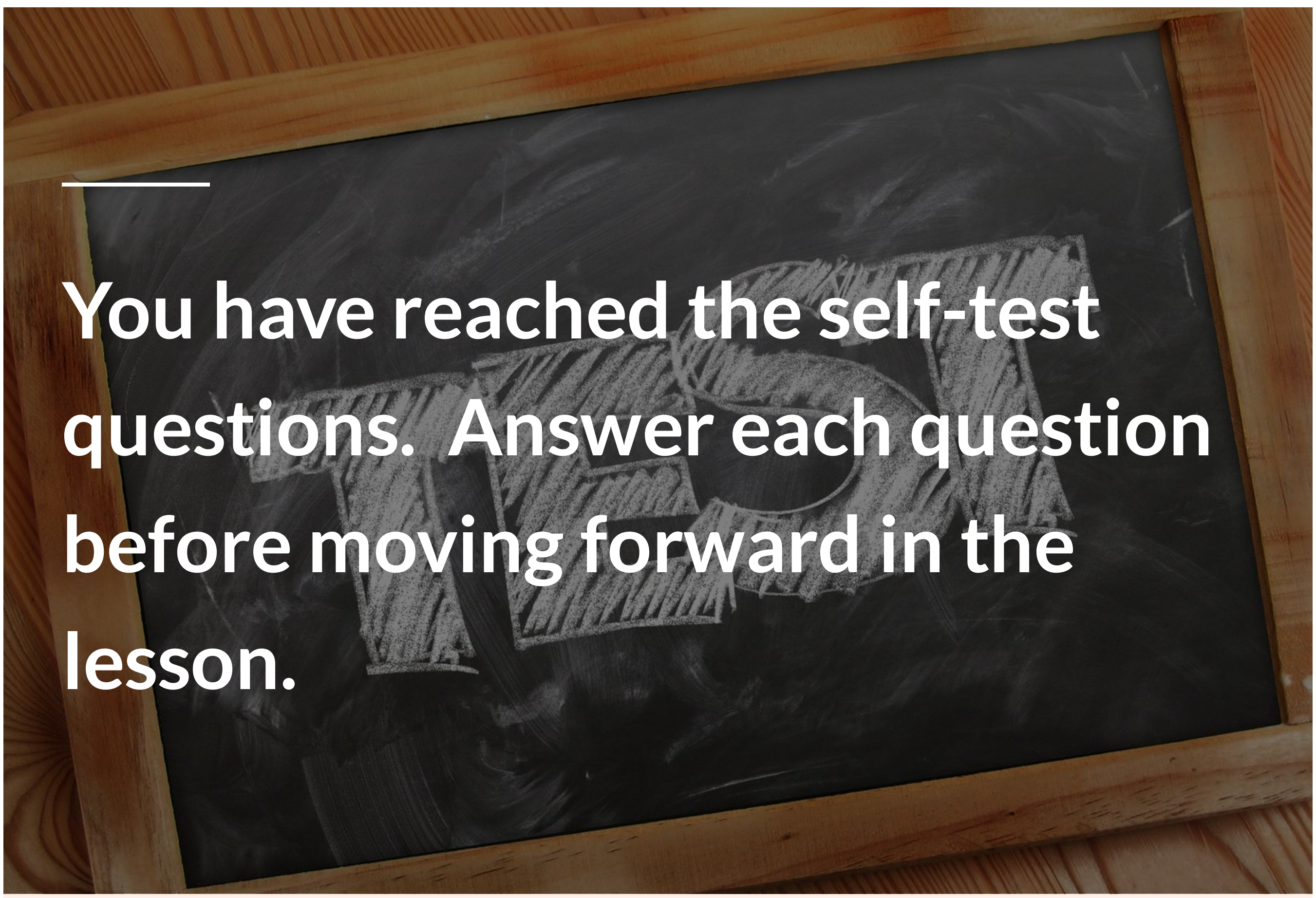
Rectifier CR–1

Rectifier CR–1 is used to convert the 30 VAC supplied by T–1 into 24 VDC that is used by the electronic components in the control panel.

Auxiliary Power Relay K–8

When auxiliary power switch S–15 is closed, 24 VDC power supplied by rectifier CR–1 energizes relay K–8. When this happens, auxiliary contacts K8–A open to remove power from the control circuits and auxiliary contacts K8–B close to allow the selected power source (facility or APU) to flow to the missile trailer through jack J–2.

Click each + symbol above before moving on.



KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the function and operation of the portable air conditioner.

1. What does the PAC supply environmental control do?

Type your answer here

SUBMIT

2. What action will occur in the PAC refrigeration system if the temperature of the air in the return duct is below 59°F?

Type your answer here

SUBMIT

3. What purpose does the HIGH TEMP indicator light serve on the PAC?

Type your answer here

SUBMIT

4. Explain the functions of circuit breakers CB–1 and CB–4 on the PAC.

Type your answer here

SUBMIT

5. What purpose does transformer T-1 serve on the PAC?

Type your answer here

SUBMIT

Click on each tab before moving forward in the lesson.

Brine Chiller Support Base Maintenance

In addition to maintenance on support vehicles, the GMMP, and the hydraulic pipe pusher, PREL technicians perform maintenance, troubleshooting, and repair of brine chillers removed from MAFs and LFs by FMS teams. Additionally, the PREL shop also prepares the brine solution that is circulated by the brine chiller, the sodium chromate solution that is circulated by the guidance section liquid cooler, and the antifreeze used in the DEUs on site.

Function and Operation of the Brine Chiller Test Stand

When a faulty brine chiller unit is removed from a MAF or LF by an FMS team, it is returned to the PREL shop for troubleshooting and repairs. Since the PREL shop is on the MSB, there must be a way to test the brine chillers in a configuration that simulates field conditions, or there would be virtually no way of knowing what had malfunctioned. In addition to this, all brine chillers that have been repaired by the PREL shop will undergo a rigorous checkout to ensure they are serviceable and ready to perform their duties in the field.

Description

The brine chiller test stand (BCTS) (fig 2–32) is a packaged unit that provides controls, a heat load for the brine, and condensing air required to perform operational checkouts of the MAF and LF brine chillers after they have been repaired or overhauled in the PREL shop. The BCTS is a large piece of equipment that features an operator's desk, control panel, load distribution panel, brine expansion tank, brine circulation heater, and duct extensions.

Figure 2–32. BCTS

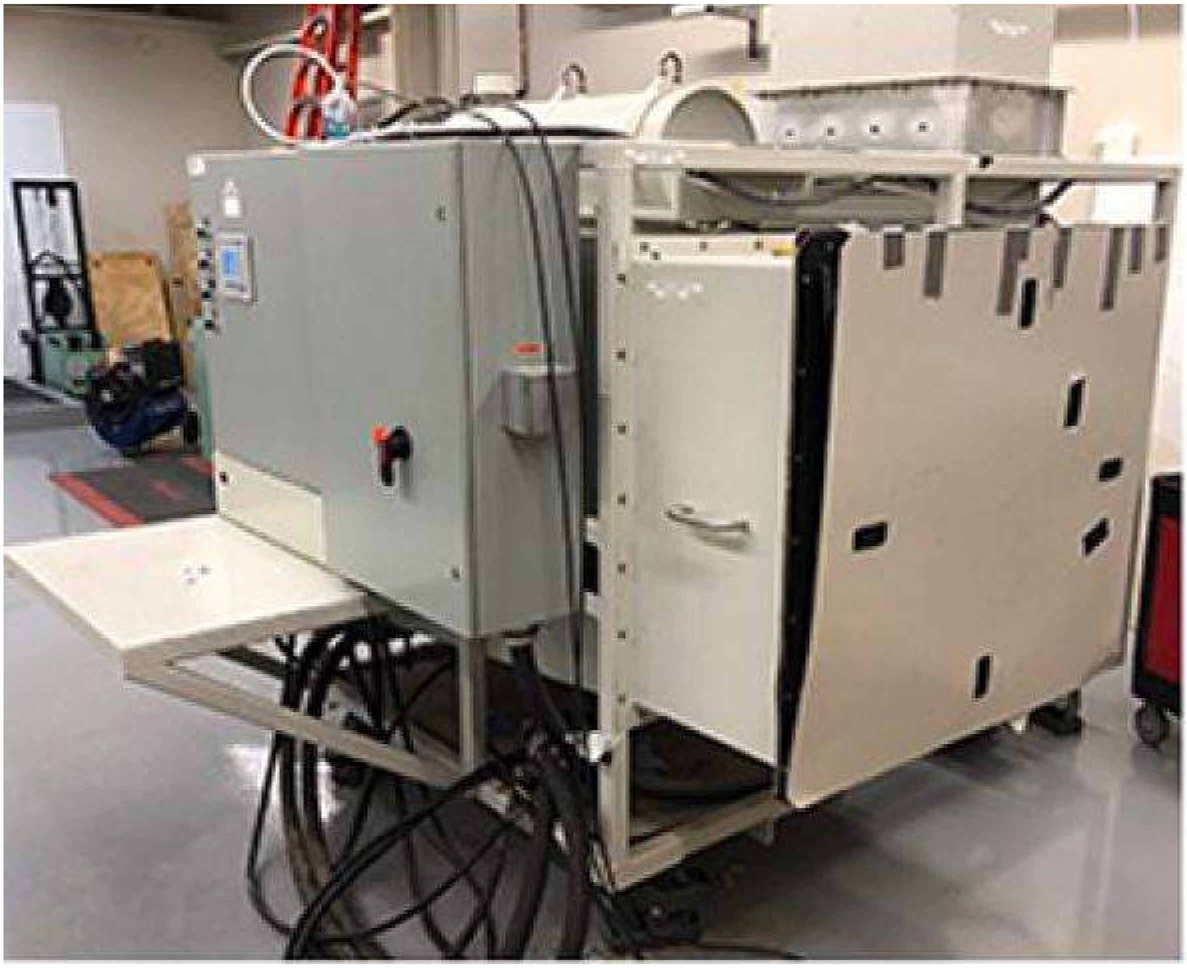


Figure 2–32. BCTS

Figure 2–32. BCTS

Figure 2–32. BCTS

Figure 2–33. BCTS Control Panel.

The control panel (fig 2–33) is located at the front of the BCTS and houses a panel display and four control switches that provide the following functions:

- LF chiller control – This ON/OFF switch controls LF brine chiller operation. Recall that the MAF brine chiller has its own control panel and ON/OFF switch, which is the reason one is not included on the BCTS.
- Fan control – This HAND/OFF/AUTO switch controls the ventilation fan that simulates the condenser fan on a MAF or LF.

- Heat load control – This LOW/OFF/HIGH switch controls the BCTS brine circulation heaters. This simulates a heat load from the launch control center at the MAF or LER at the LF.
- Hot gas valve – This OFF/AUTO switch controls the operation of the hot gas bypass valve solenoid, which routes gaseous refrigerant back into the evaporator in order to control the temperature of the brine.

The load distribution panel is located to the right of the control panel and houses the main disconnect switch for the BCTS. 200 amps of 120/208 VAC, 3-phase power is required to operate the BCTS. A special facility power outlet in the PREL shop provides this power. Power enters the BCTS load distribution panel; it is distributed throughout the BCTS and the brine chiller being tested.

The brine expansion tank is located in the top of the BCTS frame. There is a containment area immediately below the tank designed to catch any brine that might spill out of the brine system.

The brine circulation heaters are located at the rear-left end of the stand.

The chiller duct extensions on the left and right side of the test stand are used to connect the different brine chillers to the ducting; an LF brine chiller is connected on the left and the MAF brine chiller is connected on the right.

In order to simulate the brine on site properly, the BCTS utilizes a 50/50 mixture of ethylene glycol and demineralized water. Brine is routed through the circulation heater to apply adjustable heat loads to the brine chillers. Included in the brine system is an expansion tank and a liquid level indicator with two isolation valves. A brine strainer is used to remove solid particles from the brine, and a digital brine flow meter indicates the brine flow rate. The BCTS utilizes brine lines to connect a brine chiller under test to the test stand's brine system.

On each tab and (+) sign below are the switched on the BCTS control panel. Click on each tab before moving forward in the lesson.

ELECTRICAL SUBSYSTEM	HEAT LOAD CONTROL	VENTILATION SUBSYSTEM

The electrical subsystem begins at the load distribution panel. From there power is applied to various components, such as the test stand control panel, brine circulation heaters, and ventilation fan, as well the brine pump and refrigerant compressor on the brine chiller being tested.

ELECTRICAL SUBSYSTEM	HEAT LOAD CONTROL	VENTILATION SUBSYSTEM

The BCTS brine circulation heater contains three heating elements: one 1.5 kW heater and two 9 kW heaters. On the LF brine chiller, the low heat load uses the 1.5 kW heating element and the high heat load uses one 9 kW element. On the MAF brine chiller, the low heat load uses one 9 kW element and the high heat load uses all three elements (one 1.5 kW and two 9 kW).

ELECTRICAL SUBSYSTEM	HEAT LOAD CONTROL	VENTILATION SUBSYSTEM

The BCTS utilizes a two-speed fan to simulate the condenser fan on site and provide the required amount of airflow to the condenser coil of the brine chiller under test. The ductwork for the BCTS contains a pressure plate and uses damper actuator DA-1 that will automatically modulate in order to supply 3,000 cubic feet per minute (CFM) of air flow to the LF brine chiller or 6,000 CFM of air flow to the MAF brine chiller.

Controls

The BCTS and the missile field ECS contain many of the same controls and modules. At the heart of the system is a programmable logic controller (PLC) and control net daughtercard that control and monitor the functions of the BCTS and the brine chiller under test. The PLC continually scans the input data that it is receiving from the brine chiller and then adjusts outputs as required to get the input data to match the logic program.

You will recall that the LF brine chiller and its control panel are separate components. When the LF CHILLER CONTROL switch on the BCTS is set to ON, the BCTS acts as the brine chiller control panel. This switch will be set to OFF when working on a MAF brine chiller because it has its own control panel.

The BCTS contains the following familiar components:

Panel Display

A panel display is mounted on the front of the control panel and allows human-to-machine interface. A technician can obtain real-time operating status and control the operation of select components.

Power Components

Just like their counterparts on the MAF and LF, the components in the BCTS have certain power requirements. 26 VDC is supplied to the fiber optic components in the BCTS by a power supply, and 24 VAC is supplied to damper actuator DA–1 by a transformer.

Binary Modules

The PLC receives input data on system operation with the help of several binary input and output modules. Various devices in the system send either a 0 or 120 VAC signal to binary input modules, which process the signal and relay it to the PLC. The PLC controls system operation using the individual contacts inside of the binary output modules. Binary input and output modules inside the BCTS operate in exactly the same manner as their counterparts at the MAF and LF.

Analog Input/Output Module

The BCTS uses only one analog input/output (IO) module to receive input signals from pressure sensors as well as send and receive signals to and from DA–1. The analog IO module monitors the following parameters:

Input/Output Assignment	Function
IO1-I0	An input from pressure transducer PSR–1 that varies between 4 and 20 milliamperes based on airflow provided by the BCTS' condenser fan.
IO1-I1	An input from pressure transducer PSR–2 that varies between 0 and 10 VDC based on brine differential pressure at the flow Venturi on the brine chiller under test.
IO1-I2	An input from pressure transducer PSR–3 that varies between 0 and 10 VDC based on brine differential pressure in the BCTS.
IO1-I3	An input that varies between 0 and 10 VDC based on the feedback signal from DA–1 in the duct assembly of the BCTS.
IO1-O0	This is a variable *output* voltage between 0 and 10 VDC sent from the BCTS to control the position DA–1.

Analog Thermocouple/Resistance Temperature Detector Module

The resistance temperature detector module is unique to the BCTS and is not found at a MAF or LF. The resistance temperature detector module (fig 2–34) is capable of receiving up to eight signals from thermocouples or resistance temperature detectors that are measuring temperature, which the module then relays to the PLC.

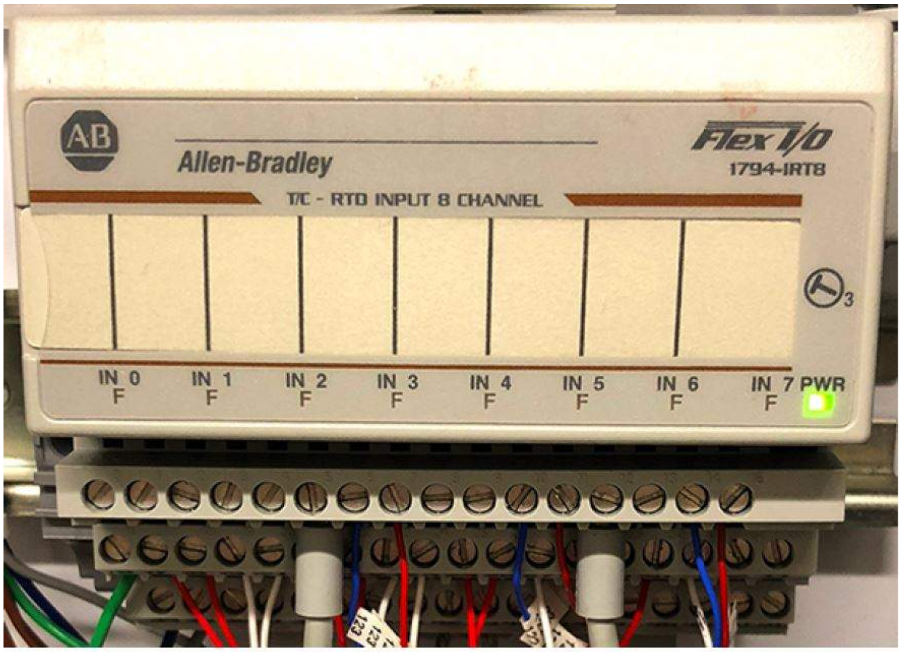


Figure 2–34. Analog thermocouple/resistance temperature detector module.

Thermocouple

A thermocouple is a device made up of two dissimilar metals butted together, such as gold and iron. Since the two metals are dissimilar, a small voltage is created at their junction, and this voltage changes depending on the temperature of the junction. A hotter temperature will cause the thermocouple to generate more voltage, and a cooler temperature will cause the opposite effect.

The BCTS uses thermocouples specifically for measuring the temperature of the brine being heated by the BCTS' heater elements. The minute voltage that is generated by the thermocouple is sent to the resistance temperature detector (RTD) module where it is amplified and then sent to the PLC.

Click each + symbol above before moving on.

Below is the procedural process for operating the brine chiller test

stand. Click on the "start" button to begin.

Brine Chiller Test Stand Operation

You will always operate the BCTS in one of two modes—MAF brine chiller testing or LF brine chiller testing. You will always begin your checkouts by connecting a brine chiller to the BCTS and then using the panel display to select which type of brine chiller you will be working with.

The following list is a sample derived from TO 33D9-61-84-11, *Brine Chiller Test Stand and Environmental Control System Support Equipment*, and do not include all steps required for determining if a brine chiller unit is serviceable or requires further troubleshooting or repair.

Once you have used the panel display to start the test, you will perform the following steps to verify the proper operation of the MAF or LF brine chiller:

Step 1

Refrigerant compressor crankcase heater is energized when the compressor is not operating, and de-energized when the compressor is operating.

Step 2

Brine pump is wired properly by observing the brine differential pressure reading.

Step 3

Brine pump energizes first, refrigerant compressor energizes second, condenser fan energizes last.

Step 4

System is charged with the proper amount of refrigerant by observing the small floating ball in the refrigerant receiver tank site glass.

Step 5

Proper amperage draw of brine pump and refrigerant compressor.

Step 6

Low brine temperature switches open at the correct temperature.

Step 7

High-pressure cutout and low-pressure cutout switches open at the specified refrigerant pressures.

Step 8

Brine chiller is capable of maintaining a brine temperature between 31 and 33°F with a LOW heat load, and that the brine temperature remains below 39°F with a HIGH heat load.

Step 9

NOTE MAF only: Components in the brine chiller control panel communicate properly with the BCTS PLC and daughtercard.

Finally

If the brine chiller under test did not display the proper indication for each of the checkouts, it will require further troubleshooting or repair. If all of the tests on the chiller matched the indications provided in the *Normal Indication* column of your technical order, the brine chiller is serviceable and can be returned to the inventory.

Complete the content above before moving on.

Preparing Brine and Sodium Chromate Solutions

Aside from maintaining many pieces of equipment used in the missile field, technicians in the PREL shop are also responsible for mixing the three liquid solutions that are used in the brine chiller, DEU, and guidance section liquid cooling system. This lesson will focus on the procedures necessary for mixing brine, antifreeze, and sodium chromate solutions.

NOTE: At some of missile wings, coolant for the DEU (antifreeze) is procured through the supply system instead of being mixed by the PREL shop.

Preparing Brine Solution

The LF and MAF brine systems, as well as the brine system for the BCTS are serviced with a solution that consists of different ratios of ethylene glycol, purified water, and rust inhibitor.

Brine solution is prepared on the MSB by the PREL shop and then stored in 55-gallon drums. FMS teams that dispatch to the field will receive smaller 5-gallon containers of brine so that they can add more brine to the brine chiller if necessary. Instructions for preparing brine solution can be found in TO 33D9-61-84-11.

All you need to know at this point is whether you are mixing a batch of brine for the LF brine chiller or BCTS, or a batch that will be used in the MAF brine chiller. The purified water and ethylene glycol are used in different ratios depending on the type of brine solution:

- LF brine chiller and BCTS brine solution is made up of .5 gallons of ethylene glycol to .5 gallons purified water (50/50 mixture), with 4 ounces of rust inhibitor per gallon.
- MAF brine is .25 ethylene glycol to .75 gallons of purified water (25/75 mixture), with 4 ounces of rust inhibitor per gallon.

Example: If you are preparing 50 gallons of LF brine solution, you will use 25 gallons of ethylene glycol, 25 gallons of purified water, and 100 ounces of rust inhibitor.

Below is the procedural process for testing the brine solution. Click on the "start" button to begin.

Testing Brine Solution

The final step in preparing brine solution is to test it for proper specific gravity and proper rust inhibitor concentration.

Step 1

Testing Specific Gravity

Since you've just mixed a batch of 50/50 ratio brine solution to be used in the LF brine chiller or the BCTS, draw a sample of the brine and ensure it is warmed or cooled (if necessary) to the temperature specified on the hydrometer. The specific gravity should be between 1.060 and 1.070. If the specific gravity is below 1.060, the concentration of water is too high. Conversely, if the specific gravity is higher than 1.070, the concentration of ethylene glycol is too high.

With 50 gallons of brine and 100 ounces of rust inhibitor, you still have room in your barrel to make adjustments. If the brine is too thin (specific gravity below 1.060), you will need to add ethylene glycol. If the brine is too thick (specific gravity above 1.070), you will need to add water. Since you have modified the ratio of ethylene glycol and water, be sure to mix the solution thoroughly before testing it again.

Step 2

Testing Rust Inhibitor Concentration

An inhibitor test kit (fig. 2–35) contains test strips designed to change color depending on the concentration level of rust inhibitor. Draw a sample of brine from the 55-gallon drum and ensure it is at the temperature specified in the test kit instructions. Use the following steps to test the rust inhibitor concentration:

1. Dip the strip into the brine solution and remove it quickly. Do not shake excess liquid off the strip.
2. Wait 15 seconds.
3. Match the color that appears on the strip to the list of colors on the bottle.

The corrosion protection of the brine solution is not adequate if the color that appears on the test strip is lighter than the appropriate block on the test kit. In this situation, the technical order will direct you to add .5 ounces of rust inhibitor for every gallon of brine solution. Since you have just mixed a 50-gallon batch, this means you will add 25 more ounces of inhibitor, mix thoroughly, and then test the solution again using a new test strip.

NOTE: The most current version of the technical order, as of the writing of this CDC, does not provide direction for situations where rust inhibitor concentration is too high. In this situation, common sense would dictate that you add more properly mixed brine solution to dilute the concentration of rust inhibitor.

You will repeat these steps until the color that appears on the test strip matches the appropriate color on the bottle. Once the specific gravity and the concentration of rust inhibitor are both correct, you have just created a properly mixed batch of brine solution!

Complete the content above before moving on.

Preparing Sodium Chromate Solution

Sodium chromate solution, simply known as chromate solution or chromate, is also prepared on the MSB by the PREL shop using instructions found in TO 33E9-35-22, *Guidance Section Liquid Cooler*. Sodium chromate solution is composed of:

- 48 gallons of distilled or deionized water.
- 356 grams of sodium chromate powder.
- 500 mL dimethoxane.
- 106.6 grams of sodium-hydroxide.

Sodium Chromate Composition Checkout

One of the final steps in preparing a batch of chromate solution is testing it to ensure it has the proper composition of the chemicals used to create it. The following steps summarize the testing process:

1. Add 1 mL of the prepared solution to the test tube, and then add demineralized water to the 5mL mark on the test tube.
2. Cap the test tube and then shake it thoroughly to mix the chromate and water.
3. Find the color on the chromate comparator (fig 2–36) that best matches the color of the chromate sample. A number is displayed near each color on the comparator's spectrum;

use the number of the color that best matches your chromate sample to determine the preliminary parts per million (PPM) concentration of the chromate solution.

4. Multiply the PPM number on the comparator by 5 to determine the actual PPM concentration.

The PPM concentration you derived in the step above must fall between 1,800 and 2,200. If the solution is below 1,800 PPM, it is too diluted; you will need to add more sodium chromate. If the solution is above 2,200 PPM it is too strong, you will need add more distilled or deionized water.

If you added more chromate or more water to the batch, you will need to allow it to thoroughly mix and then repeat the test. Continue to add sodium chromate or water until your batch falls within the 1,800-2,200 PPM requirement.

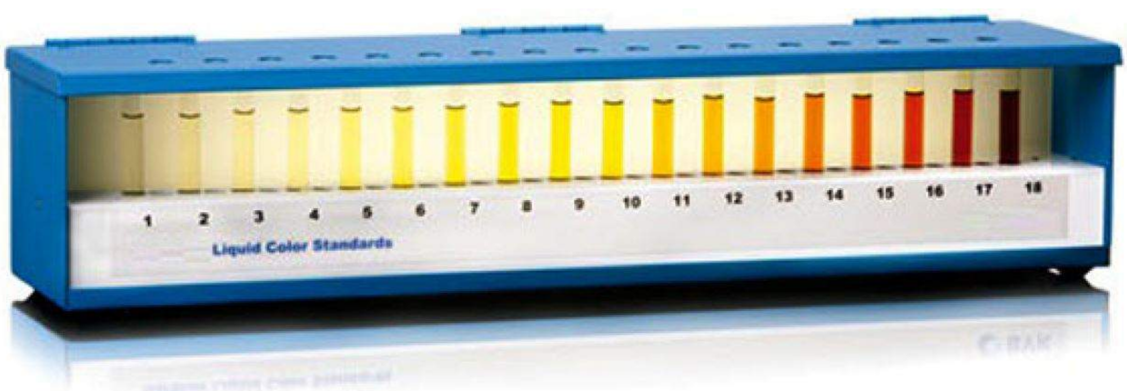
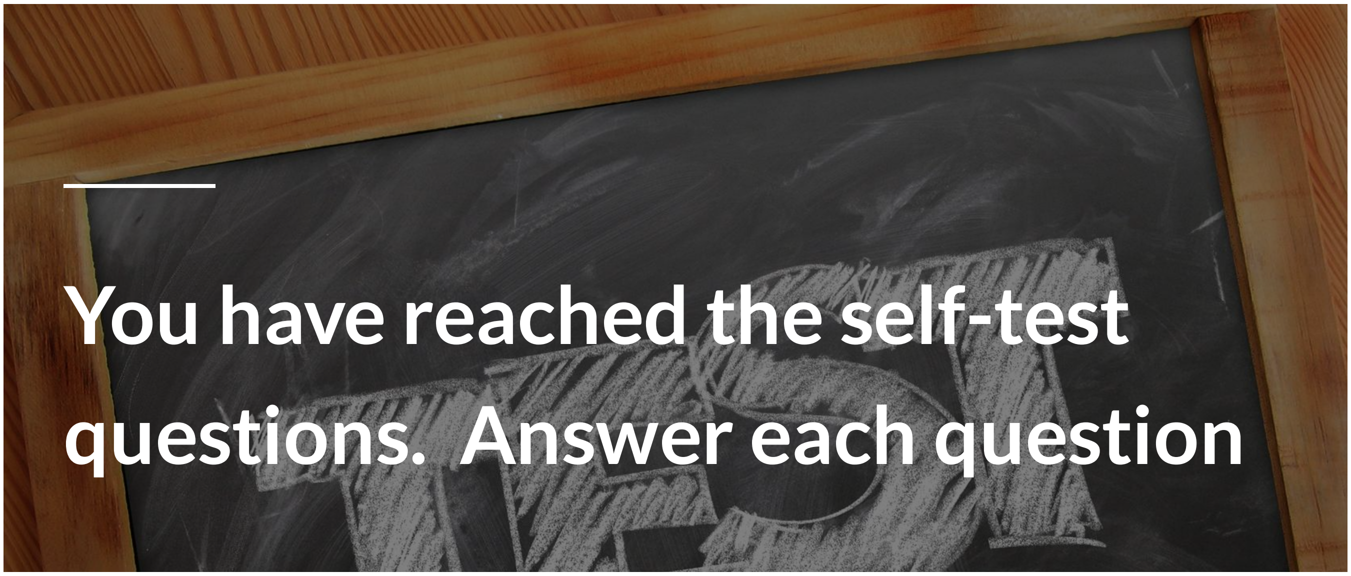


Figure 2–36. Liquid Color Comparator (typical).



You have reached the self-test questions. Answer each question

before moving forward to Lesson 3.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the function and operation of the brine chiller test stand.

1. What is the purpose of the brine circulation heaters in the BCTS?

Type your answer here

SUBMIT

2. What power requirements does the special facility power outlet in the PREL shop supply to the BCTS?

Type your answer here

SUBMIT

3. When testing a LF brine chiller, what component on the LF does the BCTS simulate?

Type your answer here

SUBMIT

4. What is the purpose of the IO assignment signal IO1-O0 in the BCTS control panel?

Type your answer here

SUBMIT

5. What function is verified on a MAF chiller being tested on the BCTS that is not tested on a LF brine chiller?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the preparing brine and sodium chromate solutions.

1. What ingredients and in what ratios are required to mix brine for the LF brine chiller unit?

Type your answer here

SUBMIT

2. What attributes are tested after a new batch of brine solution is mixed?

Type your answer here

SUBMIT

3. Why would more ethylene glycol be added to an already prepared batch of brine solution?

Type your answer here

SUBMIT

4. What ingredients and in what quantities are required to mix sodium chromate solution?

Type your answer here

SUBMIT

5. What action will you take if the batch of sodium chromate solution you have just mixed is above 2,200 PPM when you perform the composition checkout?

Type your answer here

SUBMIT

This completes Lesson 2. You can find the answers to the self-test questions in the Module 5 table of contents.

Lesson 3. Materiel Maintenance and Supply Discipline

Main Points

1. Supply System, Materiel Management, and Maintenance Data Collection
    a. Supply system and materiel management description
    b. Maintenance data collection
    c. Determining supply system priorities and standard reporting designators
2. Using Illustrated Parts Breakdowns and Preparing Supply Forms
    a. Using an illustrated parts breakdown
    b. Preparing the Air Force Form 2005, Issue/Turn-In Request
    c. Preparing the Department of Defense Form 1348-1A, Issue Release/Receipt Document

d. Preparing the Department of Defense Form 1348-6, DOD Single Line Item Requisition System Document (Manual-Long Form)

When the Air Force (AF) designed, built, and brought the Minuteman III ICBM weapon system on alert many decades ago, they were aware that it would be a long-term project. In order to maintain the facilities in serviceable condition and the missiles on alert, spare parts would need to be available for maintenance and repairs. In addition to this, technical data would need to be available to determine parts are needed and proper forms necessary to requisition new items and turn in old ones.

Supply System, Materiel Management, and Maintenance Data Collection

Performing hands-on maintenance and troubleshooting of the ICBM weapon system are important aspects of your job, but you must also have a general understanding of the AF supply system. It exists to ensure that spare parts are available to keep the entire maintenance operation up and running. It is important to note that you, as a 2M0X3 are not a supply technician. As such, there will be many terms and processes that you are not familiar with. It is likely you will need to ask your supervisor or another technician in your shop for assistance.

Click here to begin the last lesson in Module 5.

Supply System and Materiel Management Description

At this point in your career, you have just arrived to Malmstrom, Minot, or F.E. Warren Air Force Base (AFB), and your primary goal is to complete this 5-level CDC. It will not be long, however, before you may be given the opportunity to maintain and order items for an operating stock, shop stock, or bench stock.

Resource Stewardship

You may already be familiar with resource stewardship, but a key point going forward is that the supply system, materiel management, and resource stewardship all go hand-in-hand. You practice resource stewardship when you responsibly manage resources under your control. If you see an item being thrown away when it could be reused, or your shop is ordering more of an item than it needs, take action and notify your supervisor. The idea is to avoid wasteful actions—do not order more items than you need; reuse items to the greatest extent possible, and relinquish extra stock back to the supply system so that others can use it rather than needing to purchase more. A supply budget is limited and every Airman must do their part to stretch the dollars that we have as far as possible.

Figure 3–1. Grocery Store.

Supply System Description

Picture yourself walking through the aisles of your favorite grocery store (fig 3–1). When you go to this store to buy items, you expect fresh, unexpired goods on the shelves. This would not be possible if your grocery store did not have a supply system designed to keep fresh stock available for you to purchase. A supply system is defined as the methods, equipment, and facilities necessary to sustain a process, project, or program.

This same concept applies to the AF because it operates many different missions that all must be sustained, and this is not possible without the arrival of new items to replace those that have malfunctioned, become obsolete, or have been used to complete maintenance (fig 3–2). Different items will need to be on hand for different purposes, depending on which shop you are working in.

Figure 3–2. AF Supply Point (typical).

National Stock Number

A national stock number (NSN) is a number assigned to an item in the supply system that is commonly used in the federal supply system. There are several pieces of data attached to an NSN that describe the item, such as its name, manufacturer part number, cost, and physical characteristics. The NSN is an essential part of the supply system and is used in moving, storing, and disposing of AF materiel—the NSN identifies an item as a standardized materiel item of supply. The NSN is not only recognized by the United States government, but also all countries that are a part of the North Atlantic Treaty Organization (NATO). This means that an item will have the same NSN, regardless of whether an identical part is used on a Canadian, French, or

Italian fighter jet, for example. Items without an NSN must be procured using different documents and procedures.

Complete the content above before moving on.

Listed below are supply terms that you will need to become familiar with in the job to perform your duties as an X3.

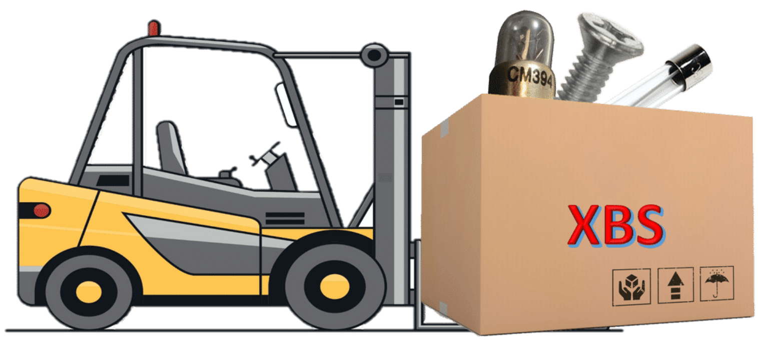
Figure 3–3. Drawer in a Bench Stock (typical).

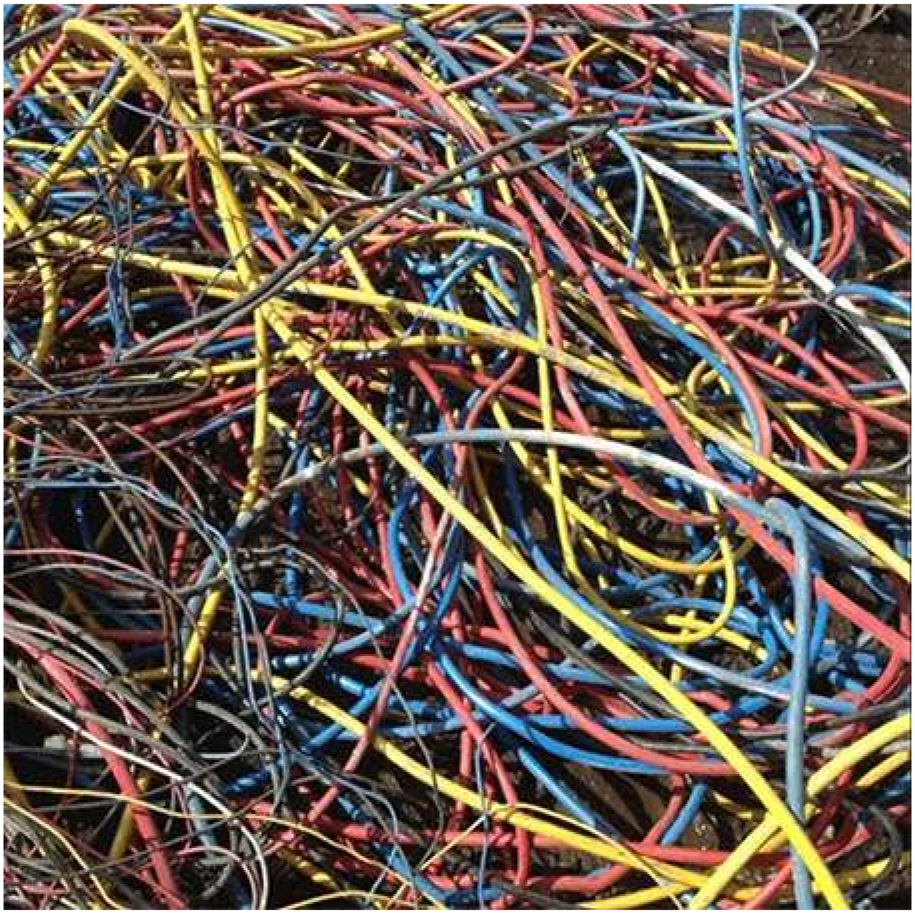
Bench stock

Bench stocks are stores of consumable items kept on hand in a work center to enhance maintenance productivity. When possible, bench stocks should also contain work order residue items, such as nuts, bolts, and screws in the maximum acceptable quantities (fig 3–3).

Consumable Items

A consumable item is any minor part, tool, or piece of hardware that is normally expended or used up beyond recovery during maintenance. For example, you will not be expected to bring used nitrile gloves, electrical tape, or non-skid tape back to be inventoried so that they can be issued to another technician. You will commonly hear consumable items referred to as ‘XB3’ items, and there is no accountability for these items after they are issued to a technician or team. Generally, these items are either thrown away, or recycled for environmental purposes, such as disposing of old alkaline batteries from a flashlight into a “recyclable” bin rather than tossing them in the garbage to end up in a landfill.





Work Order Residue

For this example, let's assume you have discovered that the brine chiller control panel cover is missing three screws. When you placed the order for replacement screws, you discovered that this type of screw could only be ordered in a pack of 50. After you took the three screws needed to replace the ones missing on the panel, the remaining screws are considered work order residue, because they are residual pieces not needed for that particular job. This remaining work order residue will be maintained so that it can be used later rather than ordering another pack of 50 screws.

Operating Stock

Examples of operating stock include connector dust covers, Minuteman power processor dust caps, plugs, and similar items are normally recovered after use and re-used. Operating stock is monitored to ensure that it does not become outdated and the level of stock does not become excessive. If it has become evident that an item or items have no forecasted use, identify, tag, and turn these items in using proper procedures. These items will be clearly labeled as operating stock using a noun (name of the item), NSN or part number, unit of issue, and shelf life, if applicable.

Shop Stock

Examples of shop stock include gas cylinders, electrical wire, and similar items that are not normally included in your bench stock, and should not exceed the amount you would be expected to use in 90 days. Clearly identify materials as shop stock and label them with noun (name of the item), NSN or part number, unit of issue, and shelf-life, if applicable.

Due-In From Maintenance Items (DIFM)

Some items belong to a more specific category called due-in-from-maintenance (DIFM) and you will hear this term frequently. DIFM items will be repaired at the base level or sent for depot maintenance and then returned to the supply system to be issued again later. Examples of DIFM items that you may have already worked with are A-circuits and sump pump motors. It is important to ensure that DIFM items are returned to your supply point as soon as possible so that they can be repaired and sent back to the field.

Only a certain number of a particular DIFM item exists at any given time—and these items are issued using a “1 in/1 out” concept. For example, if only 10 A-circuits exist throughout the whole missile field at all three missile wings, not turning even one back into the supply point in a timely manner could cause a severe shortage. There must be a smooth flow of DIFM items both in and out of the supply system, and you are an important part of ensuring that can happen.

DIFM LOC	STOCK NUMBER	DIFM DOCUMENT NBR	NOUN	DIFM QTY	DIFM CUR STA	STA DAYS	ISU/RLS DAYS	DIFM PRE STA	AWP DAYS	DLYD MX DAYS	CIC	ERRCD	STA PHRASE	NRTS IND	REPAIR SHOP
ELB	5820003605347AH	S242EM78710031	LL RECEIVER RADIO 25	1	AWP	4	2	AWM	8	000	7	XD2	ISU	N	242EL
ELB	6130015296222AH	S242EM77200003	POWER SUPPLY	1	AWP	53	57	INW	53		7	XD2	ISU	N	242EL

afi23-101_MATERIEL MANAGEMENT POLICY.pdf
2.4 MB

The attached AFI was pulled from e-Pubs. Always use the Air Force e-Publishing website to pull the most current technical references. Click here to move forward in the lesson.

Materiel Management

Materiel Management

You may already be wondering why the word materiel in the header of this paragraph is spelled -iel instead of -ial. Both spellings refer to equipment or hardware, but materiel specifically refers to military technology and supplies and supply chain management, and you will see this word commonly spelled this way.

Materiel management includes several functions, but all you are concerned with at this point in your career will be planning, procurement, and disposal of materiel. Although your supervision will play the roles of demand and supply planning and determining requirements, you will be responsible for ensuring the stock is replenished in a timely manner.

You will begin the process by performing an inventory of the stock currently available. Once you know which items are needed, it will be your duty to order them. This will include a combination of placing orders through the Integrated Maintenance Data System (IMDS) and submitting AF Form 2005, Issue/Turn-in Request, or Department of Defense (DD) Form 1348, DOD Single Line Item Requisition System Document (Manual), which you will learn about later in this unit.

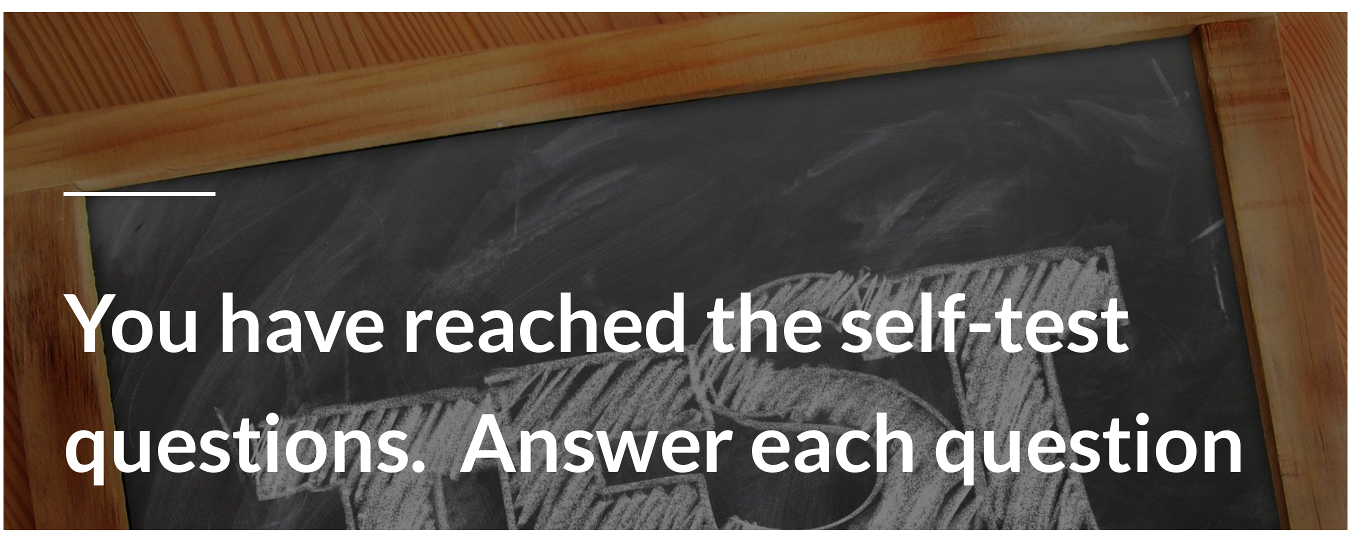
If you find that your shop stock contains more items than are authorized on the inventory, or you have bench stock items that have been deleted from your account that can no longer be used, you will need to return them to the supply system or dispose of them through the Defense Logistics Agency Disposition Services (DLADS). This lesson does not cover the process for doing so; however, your supervisor will be able to help you out.

You may be assigned as a vehicles and equipment section (VES) technician if the mission requires it. One of your responsibilities as a VES technician will be preparing equipment loads for maintenance teams that dispatch to the missile field. The VES is a large area, often encompassing an entire bay, that will have hundreds if not thousands of different types of tools and equipment. These items will each be kept on a shelf or in a drawer or cabinet marked with a designator.

This designator is also listed in IMDS, and aids technicians in quickly locating items of equipment so that loads can be built in a timely manner. When accomplishing your day-to-day duties, it is important to confirm that items are stored in the proper location, and that this data is accurate in IMDS.

If this location data is inaccurate, more time will be wasted locating items and less time dedicated to the mission. If you discover a problem that you can fix on the spot, be sure to do so. If the problem requires the help of your leadership, notify them as soon as possible.

Click here to move forward in the lesson.



You have reached the self-test questions. Answer each question

before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the supply system and materiel management description.

1. What is the purpose of avoiding wasteful actions?

Type your answer here

SUBMIT

2. What is a consumable item?

Type your answer here

SUBMIT

3. What is the objective of turning in DIFM items in a timely manner?

Type your answer here

SUBMIT

4. When working in the VES, why is it important to ensure that the location of items is accurate in the IMDS?

Type your answer here

SUBMIT

Answer each question before moving on to the next section.

Maintenance Data Collection

Without the data collected on each dispatch to the missile field or jobs completed on the MSB, there would be no way of determining which jobs still need to be accomplished and which jobs have already been accomplished. This is why maintenance data collection and maintenance data forms are important to the tasks you complete every day.

Maintenance Data Collection Description

The maintenance data collection (MDC) process includes collecting, storing, and retrieving the data.

Maintenance Data Collection Description

Collection

The process of data collection begins when it has been determined that an item is of enough interest to warrant the effort necessary to collect said data. Since the ICBM weapon system has existed for well over 50 years, the determination on what data is worth collecting was decided by many generations of Airmen before you.

Data is collected any time a serial number, tool kit number, date, time, or any of an infinite number of data parameters are documented in some way. You might annotate this data on a sheet of paper attached to a clipboard, enter it into the IMDS, or cut and paste it into a spreadsheet on your computer.

Teams dispatched to the missile field will document many types of data, such as what time they departed the MSB, what time they arrived to each site, and when they arrived home at the end of the day. While on site, teams will document the serial numbers of the DEU, Minuteman power processor (MPP), and the brine chiller unit, just to name a few.

Teams performing maintenance on the MSB will collect similar data on job start time, how long it took to complete the job, and when the job was completed.

Maintenance Data Collection Description

Storage

There would be no point in collecting data if it was not going to be stored somewhere to be analyzed or used later. There are still many physical areas where hardcopy data is kept, but most data is entered into a computer system of some kind to be maintained electronically. When data is kept electronically, it is stored on some form of electronic media, such as a hard disk drive on a server. This server may be in your building, or the data may travel over the internet to be stored on a central server somewhere else where decision makers can access it whenever necessary.

Maintenance Data Collection Description

Retrieval

As was already hinted above, there would be no reason to collect or store data if it was not going to be retrieved, or used, at some point in the future. Retrieving physical data is as simple as thumbing through a stack of papers in order to find what you're looking for or using your computer to access a spreadsheet or remote server.

For example, if you were tracking the fuel mileage of your car or truck, you would first make the decision that collecting this data was worth your while. After this, you would top off your fuel tank, reset the trip counter, and you would go about your daily routine. The first pieces of data you would likely start tracking would be the date you filled up the tank, how many gallons of fuel the tank held, and your starting mileage.

After you had used the first tank of gas, you would have more data to collect. You might document such data as the date that the tank ran out and what the ending mileage on your trip counter was. To get the vital piece of data that you are really looking for, you would divide the number of miles you traveled by the capacity of the fuel tank.

The more data you collected, the more reliable it would become. The first tank of gas you used may have been all highway miles or all stop-and-go city driving, so the miles per gallon of that tank would not necessarily reflect the average number of miles you would be able to travel from every tank of gas. Over months or years, you would average the number of miles per gallon to get a very close estimate of the number of miles you could expect to travel on every new tank of fuel. Carrying this a step further, you could look at the average cost per gallon of fuel and begin to formulate a budget to cover your fuel costs for the year.

Another piece to this simple story that also applies to the ICBM weapon system is the historical data you would gather over time. Why is this important though? Think about this; if your car or truck could normally travel 300 miles on a tank of fuel, and all of the sudden you only able to travel 250 miles on a tank, you would be alerted to the fact that the engine may be wearing out or experiencing mechanical issues.

In the same way that you would realize your fuel mileage had dropped significantly, users of the data that is collected on parts and subsystems within the larger weapon system can also see trends. What if a certain part suddenly began experiencing a higher-than-normal failure rate after the AF decided to start purchasing it from a different manufacturer? What if a job in the missile field or on the support base is only supposed to take two hours but routinely starts taking four hours after a new step is added to a technical order or civil engineering manual?

Leadership at all levels use the data collected each day to make many types of decisions. One of the most important is how and where funding will be allocated. This is another reason why data accuracy is very important—if inaccurate data is being supplied, it can cause funding to be distributed improperly on unneeded programs or items.
All data you collect begins to paint a living picture of the weapon system. Managers at all levels can refer to the data to identify trends in maintenance, establish new frequencies for conducting inspections, and aid in budget planning. This ensures that funding is available for parts, supplies, and manpower to sustain the system as it continues to age and receive upgrades. Remember, always provide the most accurate data that you possibly can.

Complete the content above before moving on.

Forms

You will become familiar with many types of MDC forms throughout your AF career. The purpose of a form in the data collection process is to outline what pieces of data that must be collected.

For example, if you were at a LF with only a pen and a sheet of paper, how would you know what data you needed to collect? Would you collect data that you did not need, or maybe spend too much time or effort collecting every piece of data on the site? Avoiding these pitfalls is one of the advantages of using a form to collect data—it provides you with a road map.

Listed below are different types of forms you may encounter in your work center. Click through each tab before moving forward in the lesson.

INVENTORY SHEETS	AFTO FORM 431, BATTERY SERVICING RECORD	IMDS WORK PACKAGES

A form that you will become familiar with early in your career is the inventory sheet, and you will find that nearly every asset in the AF is on some form of inventory. Inventory sheets serve a multitude of purposes above and beyond the actual tracking of an item.

Let's use a consolidated tool kit (CTK) as an example. Prior to dispatch, a member of the maintenance team will open and inspect each tool kit thoroughly to ensure that all of the items that are supposed to be in the tool kit are actually there. If a tool is missing, but not annotated on the inventory, the technician would let the team chief know so the maintenance team is not held accountable for the missing tool.

Another example is a tool documented as missing from a CTK on the inventory sheet. If this tool happens to be one needed for the maintenance that must be accomplished that day, actions can be taken to find a substitute so the team can still complete the task.

In a worst-case scenario, a team may return late from a site, notice a tool is missing, and decide to wait until morning before conducting a search for the tool. Not only is the lack of urgency to find the missing tool a violation that could result in foreign object damage to the missile system or component, but it also serves to demonstrate another use of the form–to verify the tools and equipment the team had when they dispatched came back with them when they returned home.

Inventories also provide historical data that might otherwise get lost in the day-to-day grind of completing maintenance. For example, if a tool has been annotated as broken, and the replacement was ordered weeks or months ago and not received. This scenario might indicate that the order was not properly placed or that the shop may need to find a new supplier for that item.

CTK NO				CTK TOOL CHECKLIST			
QTY IN KIT	NOMENCLATURE	CTK NO (IF DIFF)	QTY RMVD	DATE REMOVED	REASON REMOVED	INSP INITIALS	DATE REPLACED

AETC FORM 1042, 20070625 PREVIOUS EDITION IS OBSOLETE.
Prescribed by: AFI21-101_AETCSUP

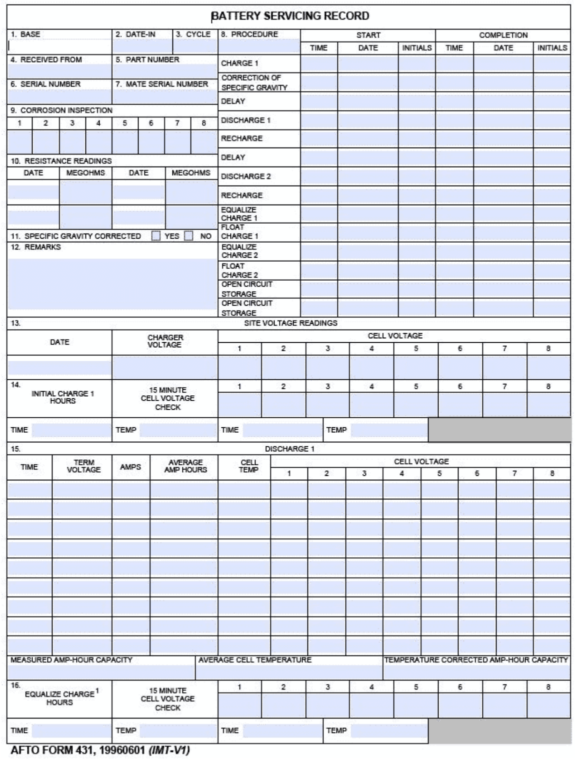
INVENTORY SHEETS

AFTO FORM 431, BATTERY SERVICING RECORD

IMDS WORK PACKAGES

An AFTO Form 431 (fig 3–4) is used to track a MAF or LF emergency storage battery during its entire journey through the PREL battery shop, from the day it arrived until the day it was loaded onto a flatbed trailer and sent to the missile field.

This form contains a multitude of information that you will gather from every step of the reconditioning process. If this data is not tracked correctly and accurately, more work could be generated for the technicians in the PREL shop, or an unserviceable battery might be sent to the missile field.



BATTERY SERVICING RECORD

1. BASE | 2. DATE-IN | 3. CYCLE | 8. PROCEDURE | START (TIME, DATE, INITIALS) | COMPLETION (TIME, DATE, INITIALS)

4. RECEIVED FROM | 5. PART NUMBER

6. SERIAL NUMBER | 7. MATE SERIAL NUMBER

9. CORROSION INSPECTION: 1 2 3 4 5 6 7 8

10. RESISTANCE READINGS: DATE | MEGOHMS | DATE | MEGOHMS

11. SPECIFIC GRAVITY CORRECTED ☐ YES ☐ NO

12. REMARKS

Procedures: CHARGE 1; CORRECTION OF SPECIFIC GRAVITY; DELAY; DISCHARGE 1; RECHARGE; DELAY; DISCHARGE 2; RECHARGE; EQUALIZE CHARGE 1; FLOAT CHARGE 1; EQUALIZE CHARGE 2; FLOAT CHARGE 2; OPEN CIRCUIT STORAGE; OPEN CIRCUIT STORAGE

13. SITE VOLTAGE READINGS: DATE | CHARGER VOLTAGE | CELL VOLTAGE 1 2 3 4 5 6 7 8

14. INITIAL CHARGE 1 HOURS | 15 MINUTE CELL VOLTAGE CHECK 1 2 3 4 5 6 7 8
TIME | TEMP | TIME | TEMP

15. DISCHARGE 1: TIME | TERM VOLTAGE | AMPS | AVERAGE AMP HOURS | CELL TEMP | CELL VOLTAGE 1 2 3 4 5 6 7 8

MEASURED AMP-HOUR CAPACITY | AVERAGE CELL TEMPERATURE | TEMPERATURE CORRECTED AMP-HOUR CAPACITY

16. EQUALIZE CHARGE 1 HOURS | 15 MINUTE CELL VOLTAGE CHECK 1 2 3 4 5 6 7 8
TIME | TEMP | TIME | TEMP

AFTO FORM 431, 19960601 *(IMT-V1)*

INVENTORY SHEETS	AFTO FORM 431, BATTERY SERVICING RECORD	IMDS WORK PACKAGES

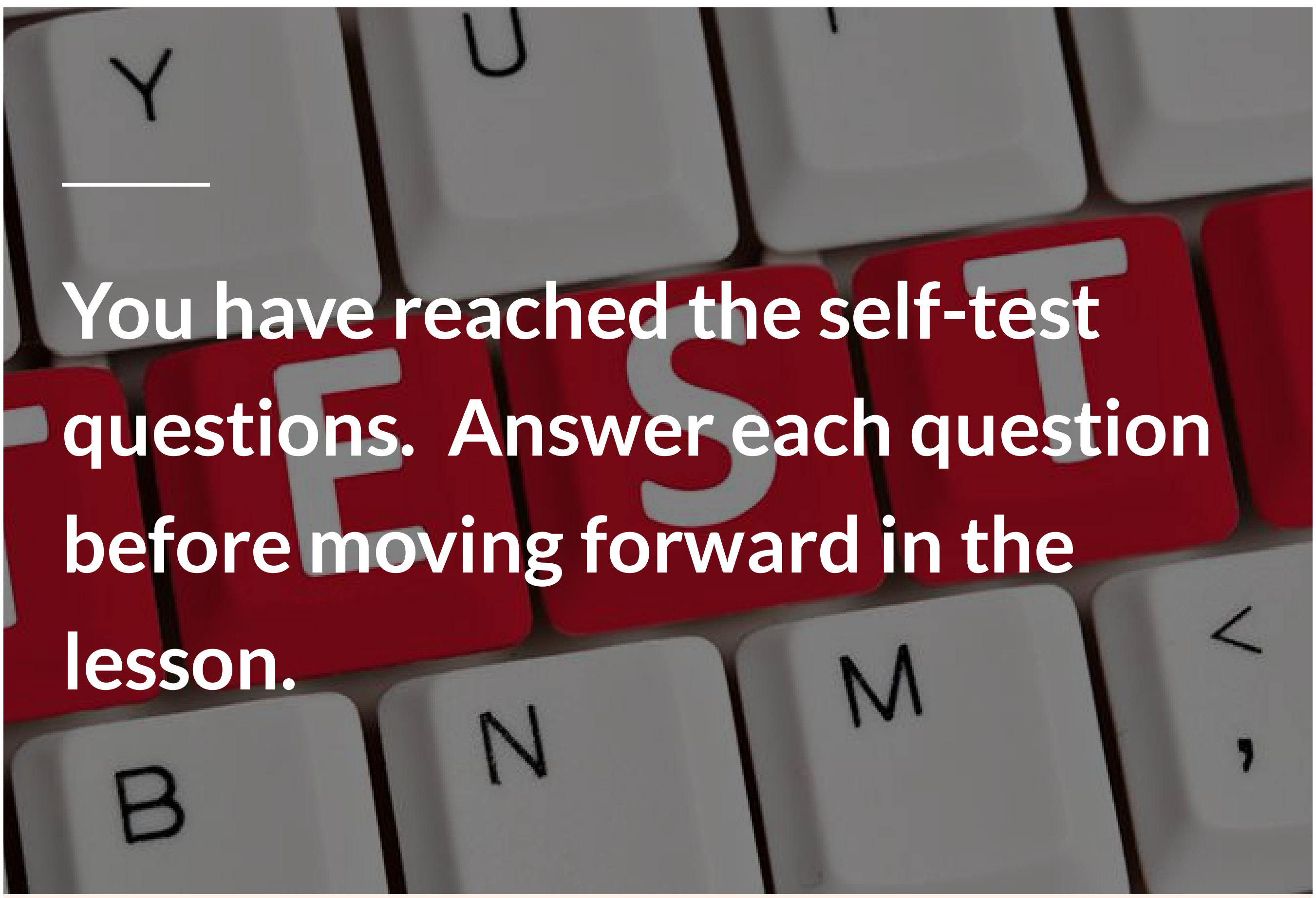
An IMDS work package is generated for nearly any work accomplished—from performing a DEU removal and replacement at an LF as a FMS technician, to performing the annual inspection on the cable air dryer as a hardened intersite cable system (HICS) shop technician, to adding refrigerant to a brine chiller unit as a PREL shop technician. Even standby shifts and site supervisor dispatches must be properly documented because they utilize manpower. There are many areas for data collection on the IMDS work package, to include the names of the team chief and team members and starting and ending time of the task.

Data Accuracy

Inaccurate data is of no use to anyone, and typically causes more rework and waste in the long run. If you are unable to accurately track data, it is often better to provide no data at all. For example, if you left site without recording the operating hours of the DEU on your IMDS work package, you would not create a false number. Again, it would be much better to not provide any number at all. This data is used to devise maintenance and engine overhaul schedules, and inaccurate data may cause an engine that is due for an overhaul to remain installed past its service life, or vice versa. A team will obviously need to record the data on the next trip to that site, but at least the IMDS system isn't tracking, scheduling, and erroneously sending a maintenance team to site using incorrect data. This is the reason that an individual in your shop is responsible for reviewing all data that is entered into IMDS each day.

It may not be easy to see the benefits of data collection now, but a large portion of both the monetary and manpower costs associated with MDC are returned through improved reliability, maintainability, and availability of the manning and equipment you need to accomplish your maintenance.

Complete the content above before moving on.



You have reached the self-test questions. Answer each question before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the maintenance data collection.

1. What action must occur in order for data to be collected?

Type your answer here

SUBMIT

2. What is the purpose of a form in the data collection process?

Type your answer here

SUBMIT

3. What might be indicated if an inventory shows that that a replacement item was ordered several weeks or months in the past and not received?

Type your answer here

SUBMIT

4. What might occur if required data on the AFTO Form 431 was not populated correctly or missing?

Type your answer here

SUBMIT

Answer each question before moving on to the next section.

Determining Supply System Priorities and Standard Reporting Designators

Different situations have different needs and varying levels of priority. For instance, paper for the copy machine in your shop will not have the same priority as a battery for an emergency light or supplies for a first aid kit. This lesson will focus on the basics of determining priorities within the supply system.

Determining Supply System Priorities

Different steps are necessary for determining priority depending on whether the item you are trying to procure is already at the base supply point or must be delivered from another off-base supply point. It is important to keep in mind that at this point in your career, you most likely will not know the urgency of the part or item you're trying to procure—and there's nothing wrong with this. In order to use the priority system as it was designed, be sure to talk to your supervisor or someone else in your shop that is familiar with the process if you are unsure of the priority level.

Priorities For Parts and Equipment Located On Base

In this example, you require an item already available at the base supply point. There is only a single step for this process, and that is to determine how urgent the need is based on how soon the item is needed. The priority identifies how expediently supply should deliver the item if the item is already on base or once it arrives on base. Keep in mind not everything should be requisitioned as top priority; otherwise, nothing has priority and supplies won't be delivered to the most important mission areas needing them most. You will base this urgency of need on the priority table below:

Priority	Urgency
02	Needed within 30 minutes; mission impacted
03	Needed within 1 hour; mission impacted
04	Needed within 4 hours
05	Needed within 8 hours
06	Can wait until the next workday

Priorities For Parts and Equipment Located Off Base

If the item you need is not at the base supply point, different steps are required to determine how urgently it is needed. This process uses a combination of the urgency of need designator (UND) and force activity designator (FAD) to determine what is known as the Uniform Materiel Movement and Issue Priority System (UMMIPS) designator. The UMMIPS ranges from 01 thru 15; 01 is the most important and 15 is the least important.

DETERMINING THE UND | DETERMINING THE FAD

The UND is expressed as A, B, and C. The first step in determining the UMMIPS designator is to determine the proper UND based on importance of the mission.

UND	Urgency
A	Mission essential; unable to perform the assigned operational mission.
B	Mission is impaired.
C	Mission not affected. Use this for routine requirements.

DETERMINING THE UND

DETERMINING THE FAD

The FAD is expressed in roman numerals I through V. The second step is selecting the FAD that your request falls under. The FAD indicates the level of combat readiness each activity must maintain, and expresses the relative importance of the unit placing the order. An explanation of each of the FADs is shown in the following table:

FAD	Urgency
I	The highest national priority designated by the President and the Secretary of Defense based on recommendations from the Joint Chiefs of Staff.
II	Is assigned to US combat, combat ready, and combat support forces deployed outside the continental United States (CONUS).
III	Is assigned to all other combat ready and direct combat support forces outside CONUS that do not fall under FAD II. Also assigned to other military service programs and projects of comparable importance. For example, technology or resources that are broad or generic in scope and operational in nature, but not directly combat related.
IV	Is assigned to United States (US) forces being maintained in a state of combat readiness.
V	Is assigned to all other US forces and programs including staff, administrative, and base supply type activities. Also, for foreign country forces not otherwise directed.

OFF-BASE PRIORITY; PUTTING IT ALL TOGETHER

Now that you have determined the UND and the FAD, the third and final step is to put them together to determine the UMMIPS designator. For this example, we will assume that the UND is C and the FAD is V. Using the table below, you can see that the part you are ordering has the lowest UMMIPS priority available, which is 15.

	FAD				
UND	I	II	III	IV	V
A	01	02	03	04	05
B	06	07	08	09	10
C	11	12	13	14	15

UMMIPS Designator

Complete the content above before moving forward in the lesson.

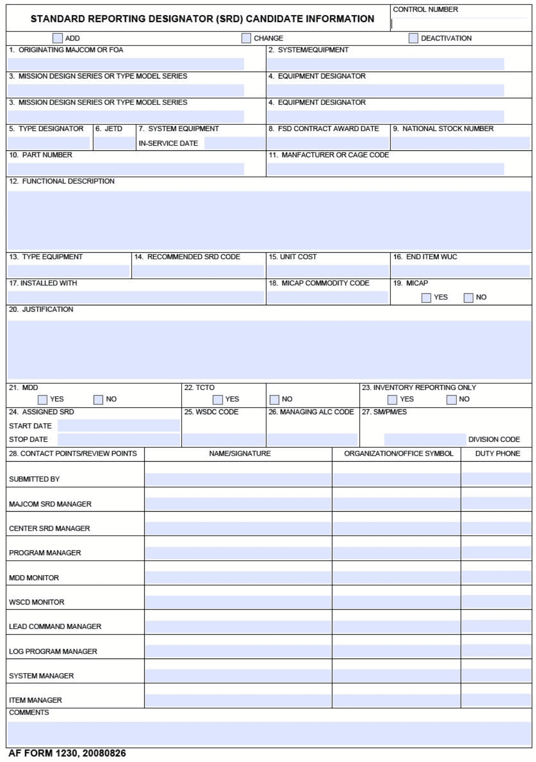
Determining The Standard Reporting Designator

A standard reporting designator (SRD) is a three-character code used in the supply system to collect usage data that ranges across different weapon systems or end-items of equipment. Other military branches or government organizations may use some of the same equipment, and each of these branches or organizations typically uses a different information system. The SRD will be the same for an identical piece of equipment no matter which information system is used.

SRDs are typically assigned during the acquisition of the item. However, in certain circumstances, an SRD may need to be added, changed, or removed altogether. There are only a few steps required to complete this process, and it will seldom occur at the technician level. If it does occur at the technician level, you will need the help of your supervisor to complete this process.

Requesting a new SRD

The only step for requesting a new SRD is to submit an AF Form 1230, Standard Reporting Designator (SRD) Candidate Information (fig 3–5) to the SRD manager at Air Force Global Strike Command (AFGSC) using data from the equipment data plate. Examples of this data are name of the item, manufacturer, model number, part number, serial number, and so forth.



STANDARD REPORTING DESIGNATOR (SRD) CANDIDATE INFORMATION | CONTROL NUMBER

☐ ADD ☐ CHANGE ☐ DEACTIVATION

1. ORIGINATING MAJCOM OR FOA | 2. SYSTEM/EQUIPMENT

3. MISSION DESIGN SERIES OR TYPE MODEL SERIES | 4. EQUIPMENT DESIGNATOR

3. MISSION DESIGN SERIES OR TYPE MODEL SERIES | 4. EQUIPMENT DESIGNATOR

5. TYPE DESIGNATOR | 6. JETD | 7. SYSTEM EQUIPMENT IN-SERVICE DATE | 8. FSD CONTRACT AWARD DATE | 9. NATIONAL STOCK NUMBER

10. PART NUMBER | 11. MANFACTURER OR CAGE CODE

12. FUNCTIONAL DESCRIPTION

13. TYPE EQUIPMENT | 14. RECOMMENDED SRD CODE | 15. UNIT COST | 16. END ITEM WUC

17. INSTALLED WITH | 18. MICAP COMMODITY CODE | 19. MICAP ☐ YES ☐ NO

20. JUSTIFICATION

21. MDD ☐ YES ☐ NO | 22. TCTO ☐ YES ☐ NO | 23. INVENTORY REPORTING ONLY ☐ YES ☐ NO

24. ASSIGNED SRD START DATE STOP DATE | 25. WSDC CODE | 26. MANAGING ALC CODE | 27. SM/PM/ES DIVISION CODE

28. CONTACT POINTS/REVIEW POINTS	NAME/SIGNATURE	ORGANIZATION/OFFICE SYMBOL	DUTY PHONE
SUBMITTED BY			
MAJCOM SRD MANAGER			
CENTER SRD MANAGER			
PROGRAM MANAGER			
MDD MONITOR			
WSCD MONITOR			
LEAD COMMAND MANAGER			
LOG PROGRAM MANAGER			
SYSTEM MANAGER			
ITEM MANAGER			

COMMENTS

AF FORM 1230, 20080826

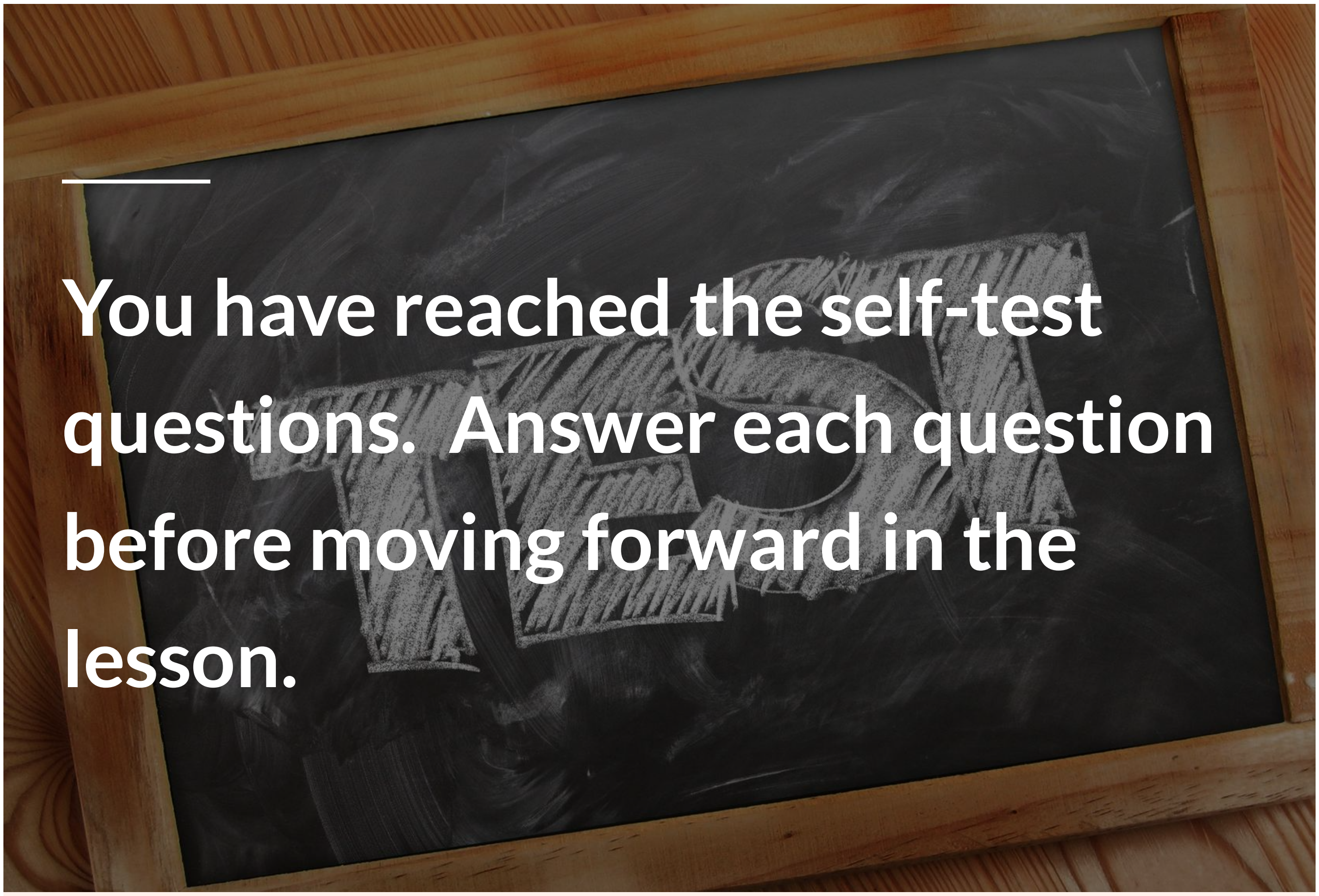
Problems with an existing SRD

If you encounter problems with an already established SRD, you only need to contact the database administrator for the particular information system that you use, which will likely be IMDS. You will likely need the help of your supervisor to locate the IMDS administrator.

Deactivation of an SRD

When equipment is no longer in the AF inventory, such as when the older DEU at Malmstrom AFB were replaced with the newer Cummins® generator sets, AFGSC will be responsible for coordinating the removal of the SRD from all applicable information systems.

Click each + symbol to read the material. Complete the content above before moving forward in the lesson.



KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to the determining supply system priorities and standard reporting designators.

1. When requesting an item through the supply system that is already on base, what factor determines the urgency of need?

Type your answer here

SUBMIT

2. What is the first step in determining the UMMIPS designator?

Type your answer here

SUBMIT

3. What is the only step for requesting a new SRD for a piece of equipment?

Type your answer here

SUBMIT

Answer each question before moving on to the next section.

Using Illustrated Parts Breakdowns and Preparing Supply Forms

You now know that the AF has a supply system that is designed to provide the parts and equipment that Airmen need to accomplish their respective missions, and now it is time to explore how to request a part through this system. This section will focus on the technical data you will need to use to locate the correct information for an item, and then show you how to add that information to several different forms to complete the process.


ASHCROFT
D103401
5"WC
4-20 mA
Span
Zero
PSR-4

Figure 3–6. Differential Pressure Sensor PSR-4.

Using An Illustrated Parts Breakdown

If you have a piece of equipment that breaks, and a replacement is not available on base, you will need to place a new order for the parts. If you do not have the necessary information to do so documented somewhere already, you will need some way of locating even the smallest nut, bolt, or washer for the assembly you are working with.

IPBs show exploded views of weapon system components that will aid in narrowing your search to the exact part that you need to order. For this lesson, we will use TO 21M-LGM30F-4-1, Minuteman Weapon System Introduction and Pictorial, Numerical, and Reference Designation Indices for 21M-LGM30F-4 Series IPBs, and TO 21M-LGM30F-4-2, IPB Minuteman Weapon System Operational Ground Equipment (Unique).

The purpose of an IPB is to assist you in identifying and ordering the parts you need to complete your maintenance. The following information will provide you with a step-by-step path to locating the information you will need to order differential pressure sensor PSR–4 (fig 3–6) in the LF ventilation control panel (VCP). Your search will take one of two different paths; one if you know the part number, and the other if you do not:

If the part number is known

Knowing the part number is the fastest way to find the part you need to order. If you know the part number for PSR–4, the first step is to turn to chapter 2, Numerical Index (fig 3–7), in the TO 21M-LGM30F-4-1 IPB. Note that different IPBs contain different subsystems, as it would be impossible to fit the entire weapon system into a single IPB. TO 21M-LGM30F-4-2 is used as an example since this is where ECS components are located.

Table 2–1, Numerical Index makes up the entirety of chapter 2. The index is in alphabetical order, and the part number for PSR–4 is DX7F0142ST-5IW. The figure shows that the differential pressure sensor is located in three different figures in the TO 21M-LGM30F-4-2. If you do not know which figure PSR–4 is in, you will need to reference all three to see which figure contained the breakdown of the LF VCP.
The part numbers are listed in alphabetical order, so all you need to do is flip through the pages until you find the one you are looking for. After you locate the part number in the TO 21M-LGM30F-4-1's numerical index, the next step is to proceed to the IPB listed in the "T.O." column. As you can see from figure 3–8, you will need to reference the TO 21M-LGM30F-4-2 IPB. Once you are there, the next step is to reference figure

161, then turn to sheet 2, and finally, locate index number 23. The next paragraphs will detail the steps of using the figure, sheet number, and index number. You can write these numbers down, or keep the TO 21M-LGM30F-4-1 open for reference.

T.O. 21M-LGM30F-4-1

Table 2-1. Numerical Index - Continued

PART NUMBER	T.O.	FIGURE	INDEX & SHEET NO.
DX7F0142ST-21W	4-2	172	12/2
DX7F0142ST-3IW	4-2	155	20/3
DX7F0142ST-3IW	4-2	189	6
DX7F0142ST-5IW	4-2	161	23/2
DX7F0142ST-5IW	4-2	166	21/3

Figure 3–7. IPB numerical index.

Understanding the figure number

The figure number of part you are looking for is located in the "FIGURE" column of the Numerical Index in TO 21M-LGM30F-4-1. All of the figures in TO 21M-LGM30F-4-2 are preceded by the number 2, which is assumed since the figures are in chapter 2—this is why TO 21M-LGM30F-4-1 does not include this number. In other words, the reference figure 161 will equate to figure 2–161 in TO 21M-LGM30F-4-2. The next step is to then turn to figure 2–161 in TO 21M-LGM30F-4-2 (fig 3–8).

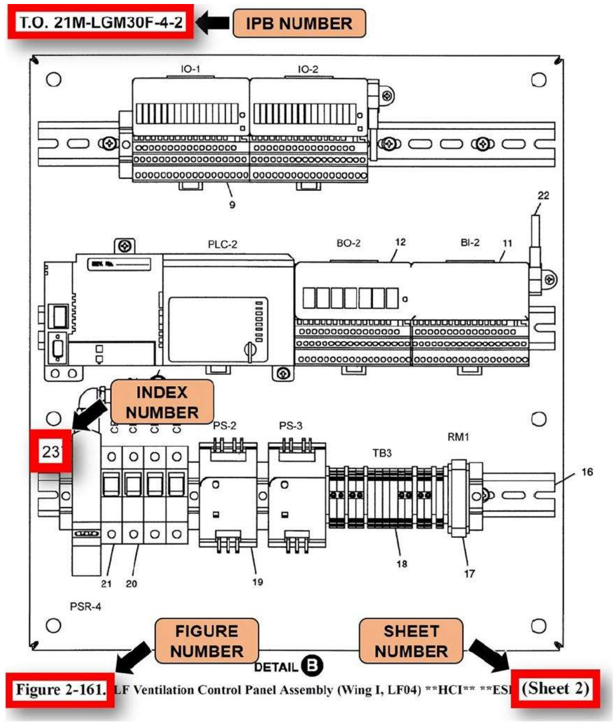


Figure 3–8. Example of a figure in an IPB.

Understanding the sheet & index numbers

The sheet and index numbers for the part you're looking for are located in the "INDEX & SHEET NO" column of the Numerical Index in TO 21M-LGM30F-4-1 IPB. Once you arrive at the figure, then locate the correct sheet number. The reason for this is because some figures are broken down into multiple sheets, and you will know this because it is mentioned in the name of the figure, i.e., (Sheet 1 of 3). If you are using the correct figure, but are on the wrong sheet, you may not be able to find the index number that you're looking for.

Once you have located the correct sheet within the figure, the next step is to locate the index number that points to the visual representation of the part you're looking for (fig. 3–8). Some figures are complex, so this may take a bit of searching.

Once you've located the index number within a figure in TO 21M-LGM30F-4-2, you are almost done. The final step is to locate your index number in the data table that is found immediately after the figure(s). This is where the information resides for ordering the part through the supply system (fig 3–9).

The data tables are always located after the figure that they correspond to, and will show the figure number at the top-left of the table. As you can see, next to the index number are columns that contain the part number, the commercial and government entity (CAGE) code, the description, the units per assembly, the usable on code, and the source, maintenance, and recoverability (SMR) code. It is a wise idea to record all of this information since you will need it to order the part using IMDS or an AF Form 2005.

T.O. 21M-LGM30F-4-2

FIGURE & INDEX/ SHEET NO.	PART NUMBER	CAGE	DESCRIPTION 1 2 3 4 5 6 7	UNITS PER ASSY	USABLE ON CODE	SMR CODE
2-161	EAS81786-117	90598	. . **ESD** PROCESSOR ASSEMBLY, ...	1	C	
22/2	1794-CEI	01121	. . CABLE, MODULE INTERCONNECT	1		PAOZZ
23/2	DX7F0142ST-5IW	38056	. . SENSOR, DIFFERENTIAL PRESSURE . . . . . (PSR-4) (90598 SPEC EAS81230-6)	1	C	
24/2	109P3-4-2	[illegible]	. . FITTING, TUBE ADAPTER . . . . (90598 SPEC EAS81426-3)	2	C	

Figure 3–9. Example of a data table in an IPB.

Click each (+) symbol above to read the material before moving on in the lesson.

If The Part Number Is Unknown

If you do not know the part number, the process of finding the information includes some additional steps. The first step is to reference chapter 2, Maintenance Parts List in TO 21M-LGM30F-4-2 IPB's table of contents to find the area of the MAF or LF where the part you are looking for is located. The LF VCP is listed explicitly in the table of contents (fig 3–10), and a page number is given.

If you did not know what panel pressure sensing relay PSR–4 was in, you could also start from a broader viewpoint by using the table of contents to start your search in the LF launcher support building. You would then continue to narrow down until you found PSR–4. The IPB is very versatile in the way that as long as you know what you are looking for, multiple paths can be taken to arrive at the same destination.

Regardless of whether you started at the launcher support building level, or went directly to the VCP, you would arrive at the same figure as you did if you already knew the part number. The rest of the process is the same; you would reference figure 2–161, sheet 2, where you will find PSR–4, whose index number is 23.

After you know which IPB contain what types of parts, you will more than likely find yourself going straight to that reference instead of beginning your search in TO 21M-LGM30F-4-1.

T.O. 21M-LGM30F-4-2

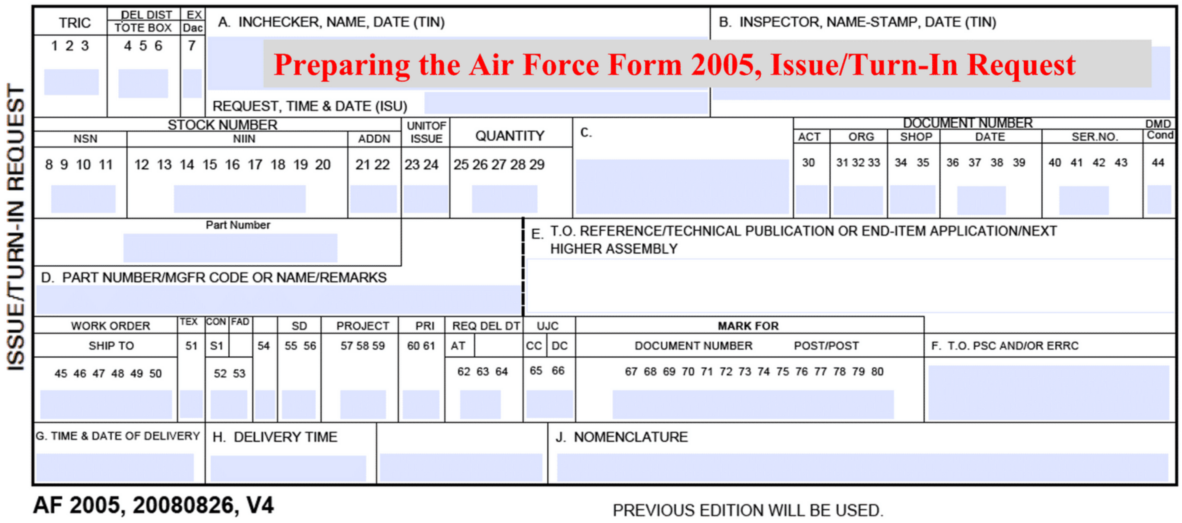
TABLE OF CONTENTS – Continued

Figure 3–10. Example of a table of contents in an IPB.

Figure 3–10. Example of a Table of Contents in an IPB.

Preparing the Air Force Form 2005, Issue/Turn-In Request

Now that you know how to locate the part numbers and other information you will need in the IPB, it's time to place that data into a form so that you can order the item you need through the supply system. This lesson will provide step-by-step instructions on how to prepare the AF Form 2005.


ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

Preparing the Air Force Form 2005, Issue/Turn-In Request

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNIT OF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

D. PART NUMBER/MGFR CODE OR NAME/REMARKS

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

WORK ORDER | SHIP TO 45 46 47 48 49 50 | TEX 51 | CON S1 52 53 | FAD 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR: DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.

Figure 3–11. AF Form 2005.

Description

The AF Form 2005 is used to order items through the supply system when the national stock number is known. You may have noticed that the IPB in the previous lesson did not provide you with an NSN, only a manufacturer part number. A separate website is used to cross-reference a manufacturer part number with an NSN.

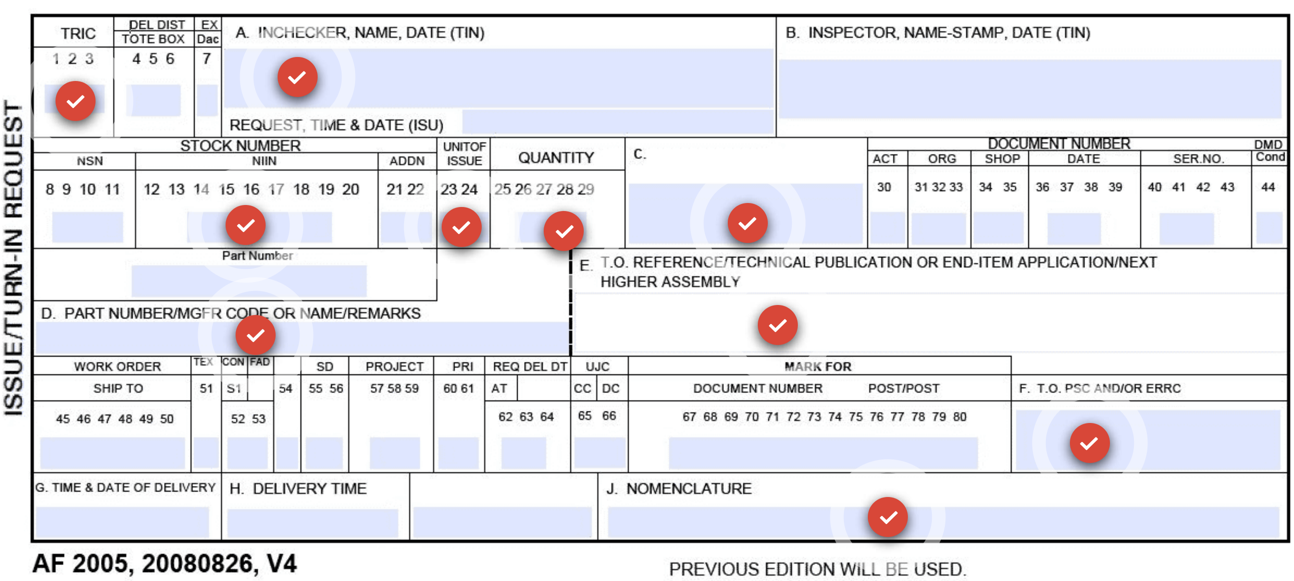
The NSN for PSR–4 is 6685-01-545-7094. Detailed instructions for preparing the AF Form 2005 (fig 3–11) are also available in Air Force Handbook (AFH) 23-123 Volume 2, Part 1, *Integrated Logistics System-Supply (ILS-S), Materiel Management Operations.*

Instructions

Normally, the part is ordered through IMDS, which automatically alerts your local materiel control. In the event that you need to use a digital or paper copy of the AF Form 2005, there are certain parts of the form that you will need to fill out in order for it to process properly. You should use the digital version of the form whenever possible.

Portions of the form will be completed by the requestor (you), and others will be completed by materiel control personnel. The following description lists only the fields that need to be completed by the requestor. It should also be noted that this process may differ slightly between organizations. If you've never prepared an AF Form 2005, it is best to ask if there is local training or a template available.

Below is a blank AF 2005 Form. Click on each icon to learn what each block means. To ensure you are completing the form properly, refer to a supervisor or a member working in the supply section.


ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNIT OF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

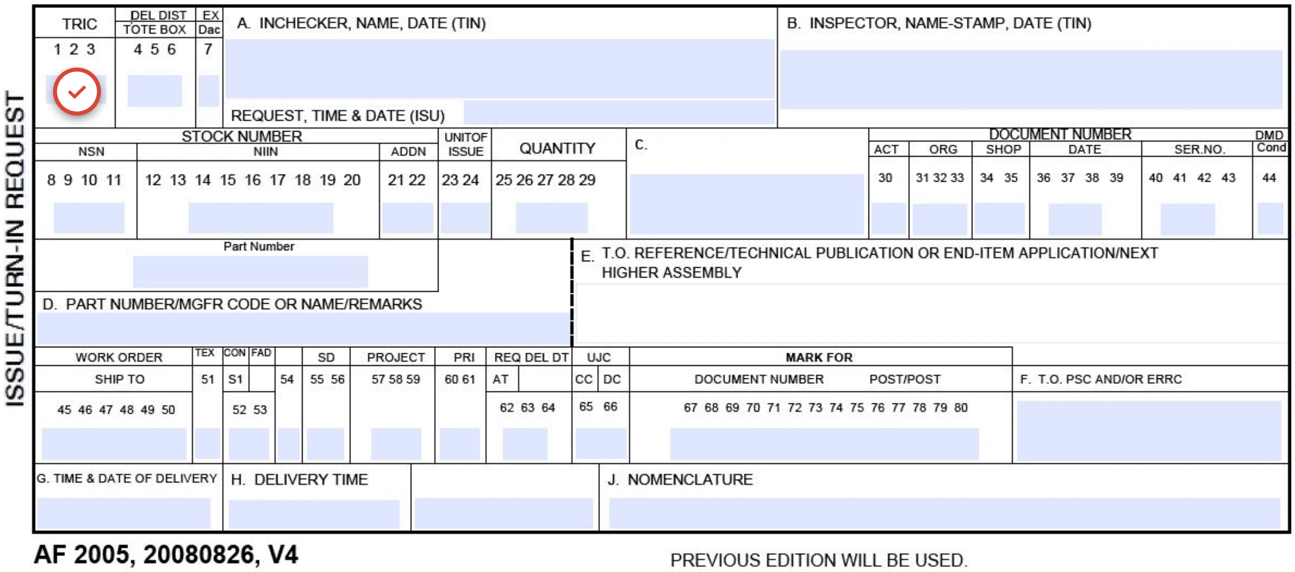
D. PART NUMBER/MGFR CODE OR NAME/REMARKS

WORK ORDER / SHIP TO 45 46 47 48 49 50 | TEX 51 | CON S1 52 53 | FAD 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR: DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.



ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNIT OF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

D. PART NUMBER/MGFR CODE OR NAME/REMARKS

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

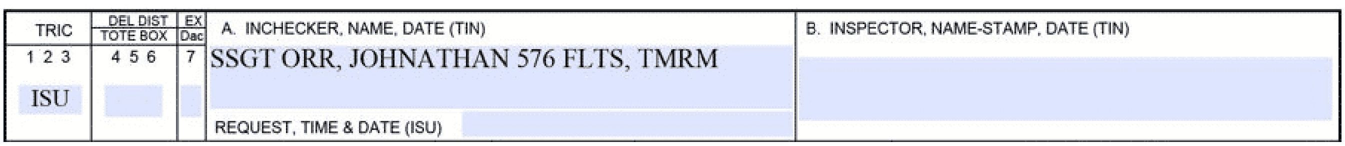
WORK ORDER | SHIP TO 45 46 47 48 49 50 | TEX 51 | CON FAD S1 52 53 | 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.

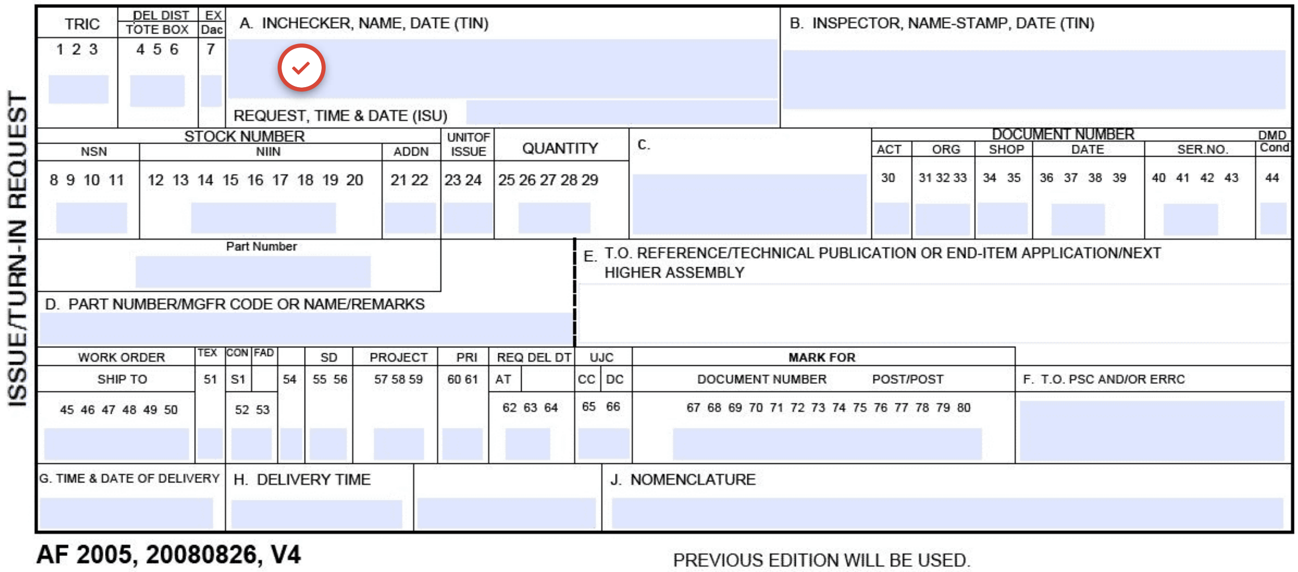
Blocks 1-3 – TRIC



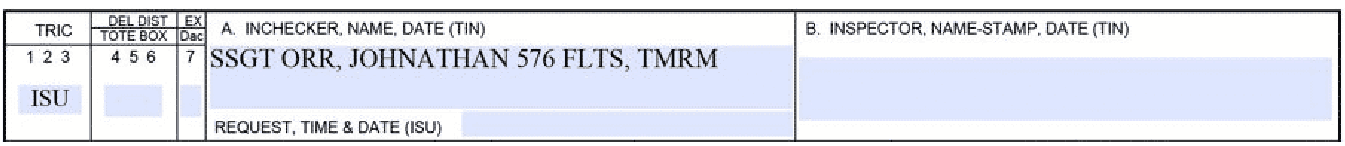
TRIC 1 2 3 ISU | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) SSGT ORR, JOHNATHAN 576 FLTS, TMRM | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

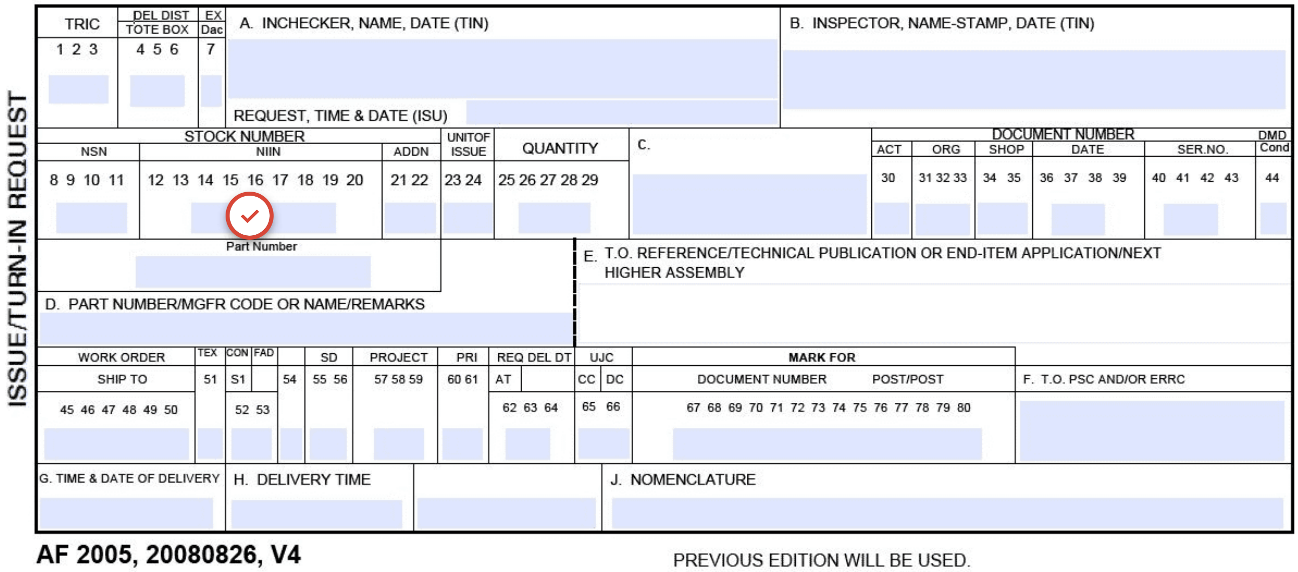
In this block, you simply need to enter ‘ISU’, which indicates that the parts or equipment need to be issued.


ISSUE/TURN-IN REQUEST
TRIC 1 2 3
DEL DIST TOTE BOX 4 5 6
EX Dac 7
A. INCHECKER, NAME, DATE (TIN)
REQUEST, TIME & DATE (ISU)
B. INSPECTOR, NAME-STAMP, DATE (TIN)
STOCK NUMBER
NSN 8 9 10 11
NIIN 12 13 14 15 16 17 18 19 20
ADDN 21 22
UNIT OF ISSUE 23 24
QUANTITY 25 26 27 28 29
C.
DOCUMENT NUMBER
ACT 30
ORG 31 32 33
SHOP 34 35
DATE 36 37 38 39
SER.NO. 40 41 42 43
DMD Cond 44
Part Number
D. PART NUMBER/MGFR CODE OR NAME/REMARKS
E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY
WORK ORDER
SHIP TO 45 46 47 48 49 50
TEX 51
CON S1 52 53
FAD
54
SD 55 56
PROJECT 57 58 59
PRI 60 61
REQ DEL DT AT 62 63 64
UJC CC DC 65 66
MARK FOR
DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80
F. T.O. PSC AND/OR ERRC
G. TIME & DATE OF DELIVERY
H. DELIVERY TIME
J. NOMENCLATURE
AF 2005, 20080826, V4
PREVIOUS EDITION WILL BE USED.

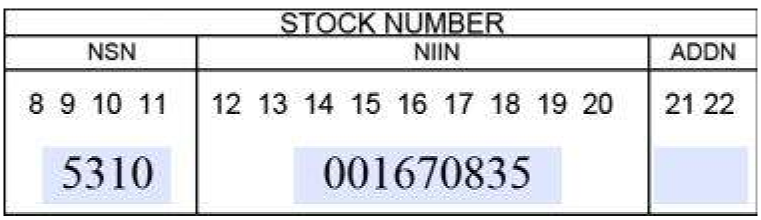
Block A – Request, Time & Date (ISU)


TRIC 1 2 3
ISU
DEL DIST TOTE BOX 4 5 6
EX Dac 7
A. INCHECKER, NAME, DATE (TIN)
SSGT ORR, JOHNATHAN 576 FLTS, TMRM
REQUEST, TIME & DATE (ISU)
B. INSPECTOR, NAME-STAMP, DATE (TIN)

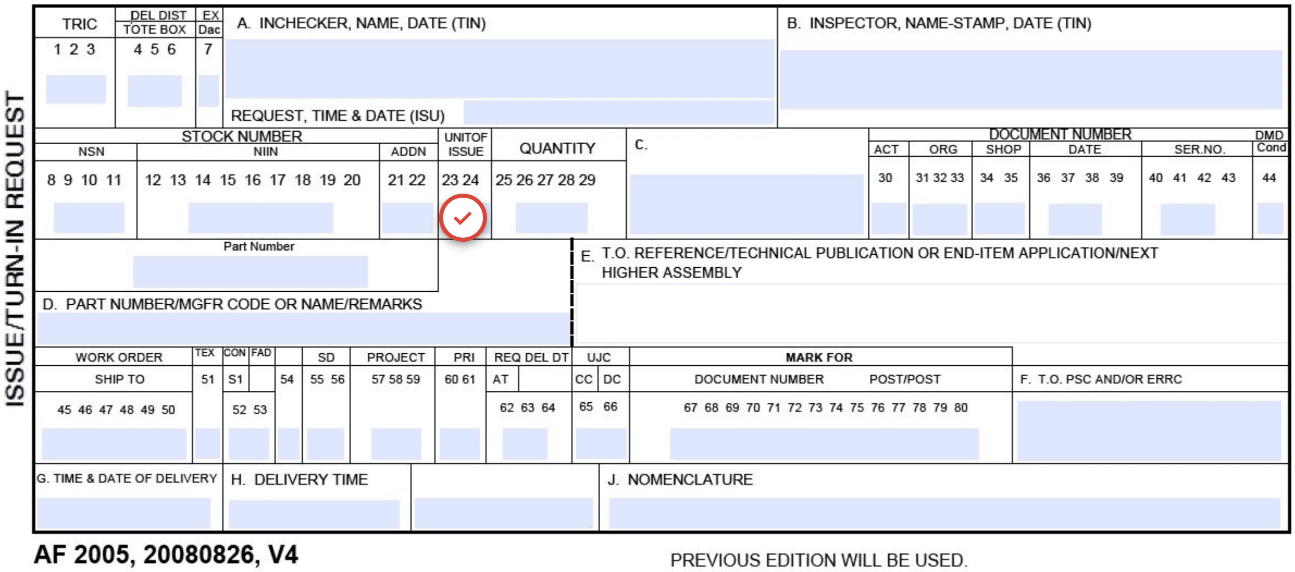
Here you will put your full name and rank, your shop's phone number, the date, and the time.



Blocks 8-22 – Stock Number



These blocks are where the NSN is populated.


ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST / TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNITOF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

D. PART NUMBER/MGFR CODE OR NAME/REMARKS

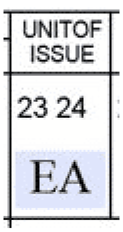
WORK ORDER / SHIP TO 45 46 47 48 49 50 | TEX 51 | CON S1 52 53 | FAD | 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR: DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

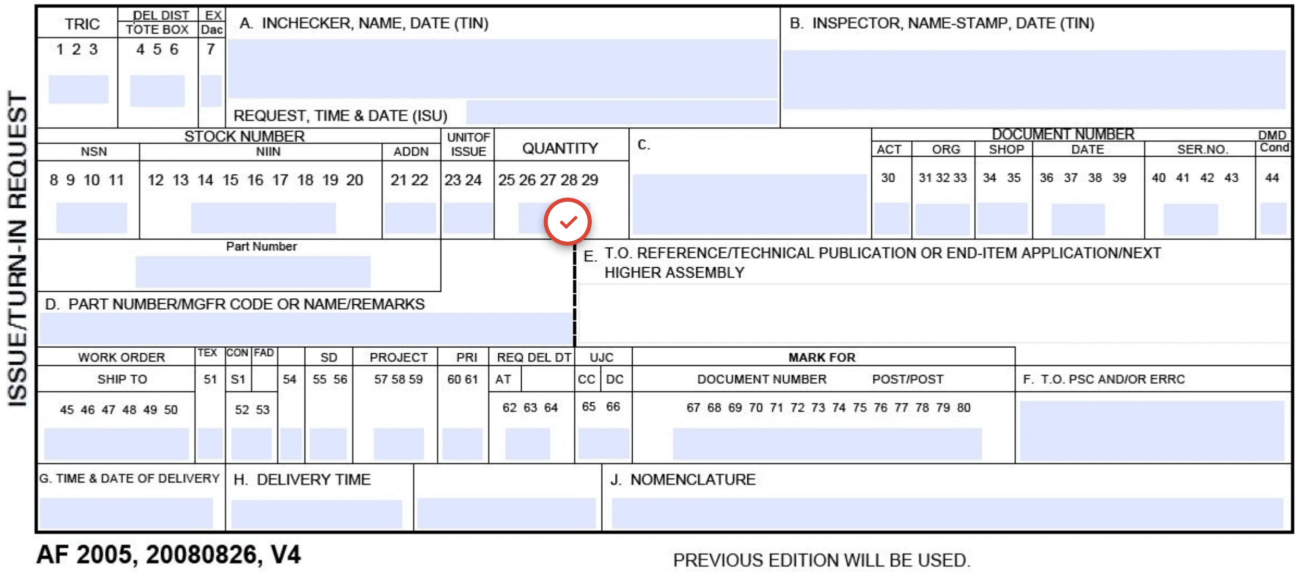
AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.

Blocks 23-24 – Unit of Issue



This block contains is the unit of issue. Example: ‘EA’ = each, ‘SE’ = set, ‘HD’ = hundred.



ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNIT OF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

D. PART NUMBER/MGFR CODE OR NAME/REMARKS

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

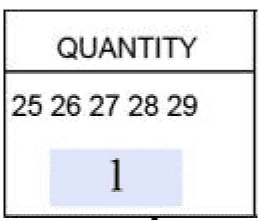
WORK ORDER / SHIP TO 45 46 47 48 49 50 | TEX 51 | CON S1 52 53 | FAD | 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR: DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

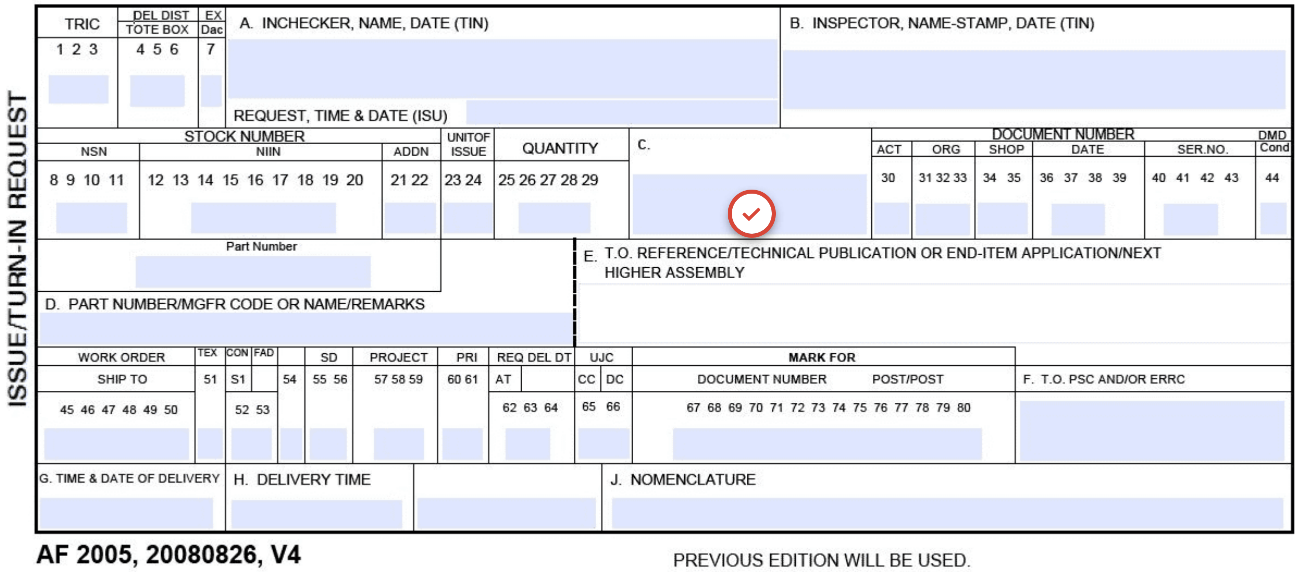
AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.

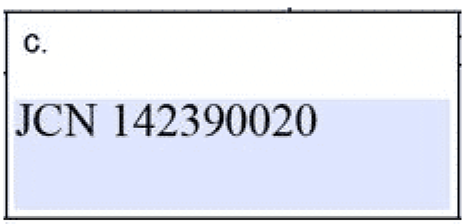
Quantity Block



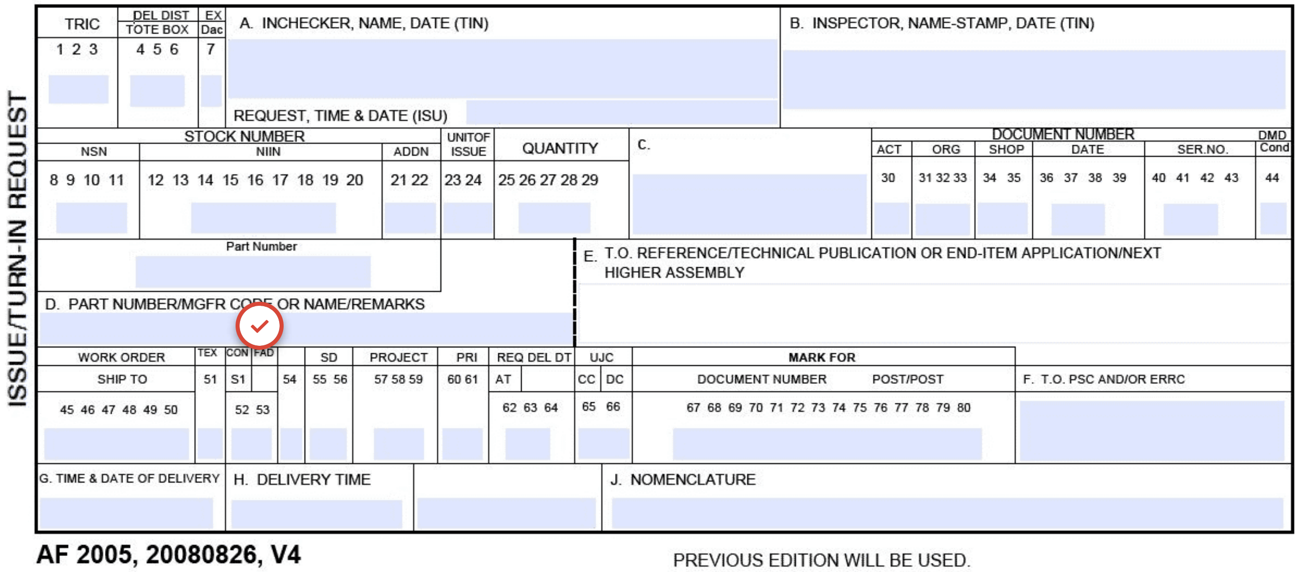
This is the number of the item you are ordering that you need to complete the job. Some items come in sets, so you must pay attention to the quantity in the IPB.



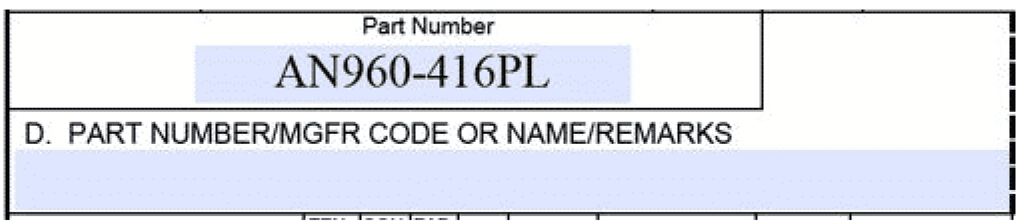
Block C



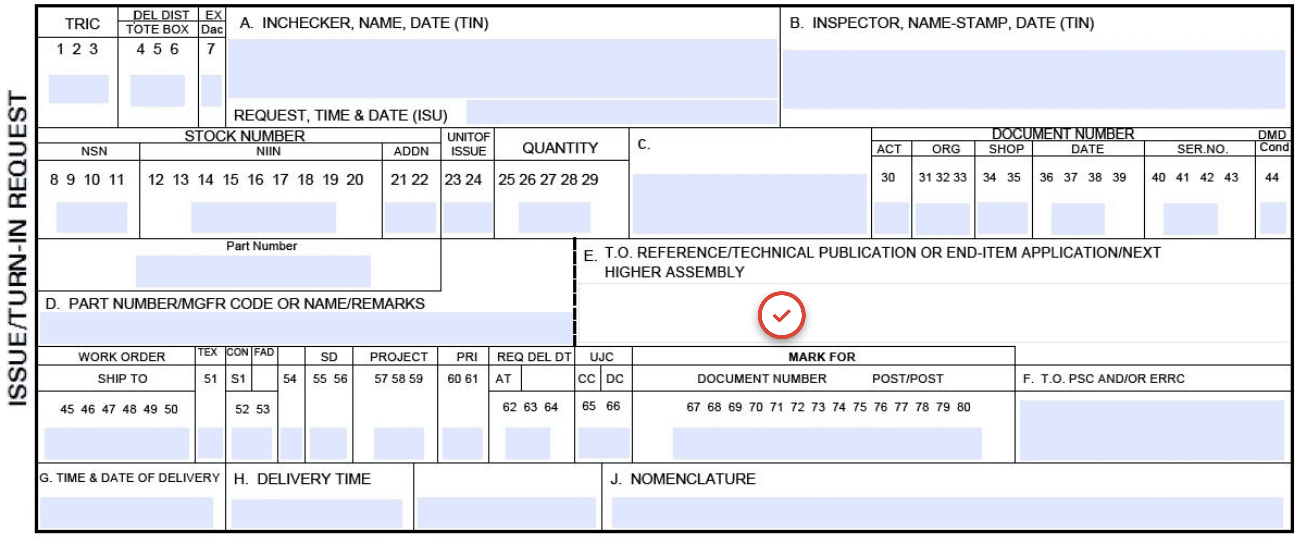
Although this block is not labeled, this is where the work unit code (WUC) is populated. There will be a manual that lists many of the WUC that are commonly used in your shop located either in your shop or at the technical order library.



Block D – Part Number/MGFR Code or Name/Remarks



Block D is where you'll begin to use the information that you located in the IPB. This might be a part number, NSN, or manufacturer code. It is important to provide as much information as possible here so that materiel control can reference the data in order to locate the correct item.



ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNIT OF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

D. PART NUMBER/MGFR CODE OR NAME/REMARKS

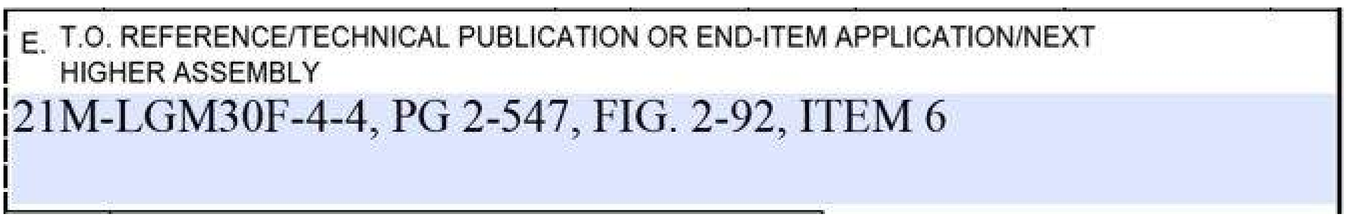
WORK ORDER / SHIP TO 45 46 47 48 49 50 | TEX 51 | CON S1 52 53 | FAD | 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR: DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.

Block E – TO Reference/Technical Publication or End-Item application/Next Higher Assembly



E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

21M-LGM30F-4-4, PG 2-547, FIG. 2-92, ITEM 6

Block E is where you will enter the technical order or civil engineering manual reference for the part you're trying to order. A further explanation is provided below using data from the IPB lesson and figure 3–8:

Technical order or civil engineering manual number

Example: TO 21M-LGM30F-4-2.

Page number

Example: Page 2-830.

Figure number

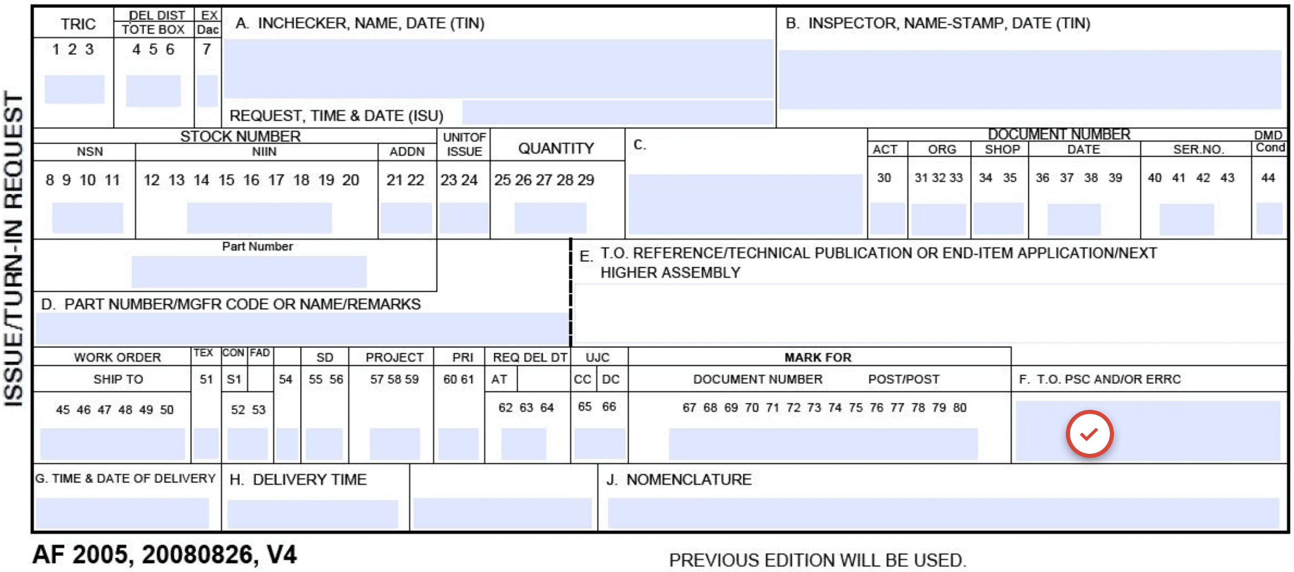
Example: Figure 2–161 (Sheet 2).

Index number

Example: Item number 23 (bottom-left of figure 3–8).

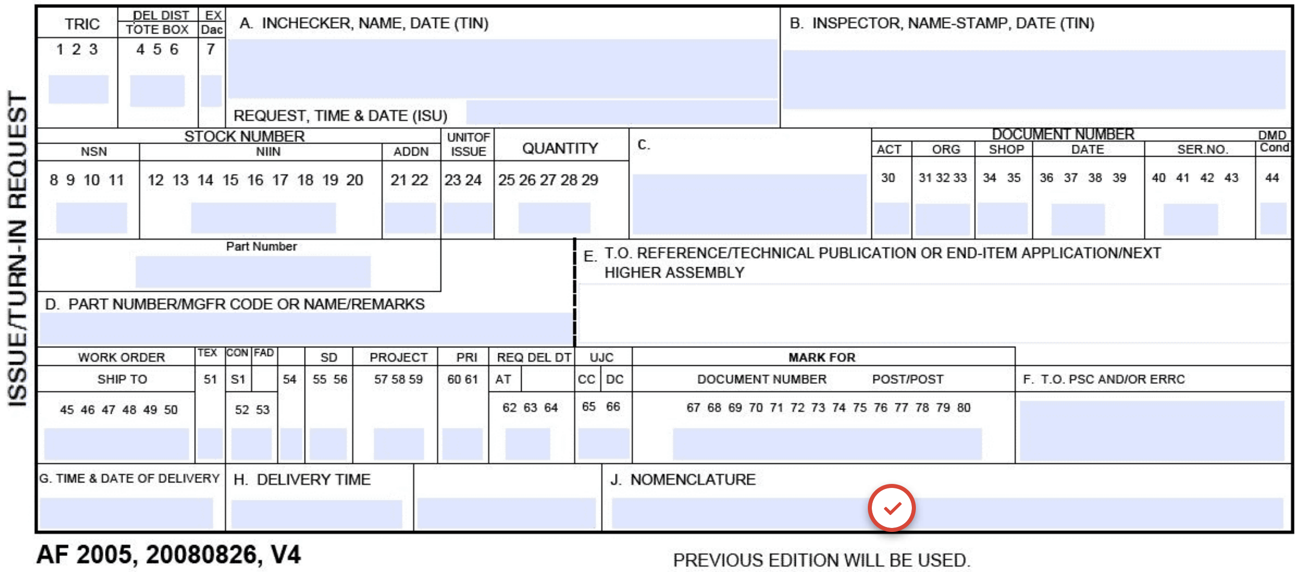
Data page

Recall from the IPB lesson that the data page was located after the figure that contained the item you were attempting to locate. The number of this data page is what should be populated in this block. Example: Page 2-833.



Block F: TO PSC and/or ERRC

This block's heading is also misleading, but this is where the job control number (JCN) is populated. This JCN is located in IMDS, and you may need to ask someone in your shop who is familiar with this process for help in locating the JCN.



ISSUE/TURN-IN REQUEST

TRIC 1 2 3 | DEL DIST TOTE BOX 4 5 6 | EX Dac 7 | A. INCHECKER, NAME, DATE (TIN) | B. INSPECTOR, NAME-STAMP, DATE (TIN)

REQUEST, TIME & DATE (ISU)

STOCK NUMBER: NSN 8 9 10 11 | NIIN 12 13 14 15 16 17 18 19 20 | ADDN 21 22 | UNIT OF ISSUE 23 24 | QUANTITY 25 26 27 28 29 | C. | DOCUMENT NUMBER: ACT 30 | ORG 31 32 33 | SHOP 34 35 | DATE 36 37 38 39 | SER.NO. 40 41 42 43 | DMD Cond 44

Part Number

E. T.O. REFERENCE/TECHNICAL PUBLICATION OR END-ITEM APPLICATION/NEXT HIGHER ASSEMBLY

D. PART NUMBER/MGFR CODE OR NAME/REMARKS

WORK ORDER / SHIP TO 45 46 47 48 49 50 | TEX 51 | CON S1 52 53 | FAD | 54 | SD 55 56 | PROJECT 57 58 59 | PRI 60 61 | REQ DEL DT AT 62 63 64 | UJC CC DC 65 66 | MARK FOR: DOCUMENT NUMBER POST/POST 67 68 69 70 71 72 73 74 75 76 77 78 79 80 | F. T.O. PSC AND/OR ERRC

G. TIME & DATE OF DELIVERY | H. DELIVERY TIME | J. NOMENCLATURE

AF 2005, 20080826, V4

PREVIOUS EDITION WILL BE USED.

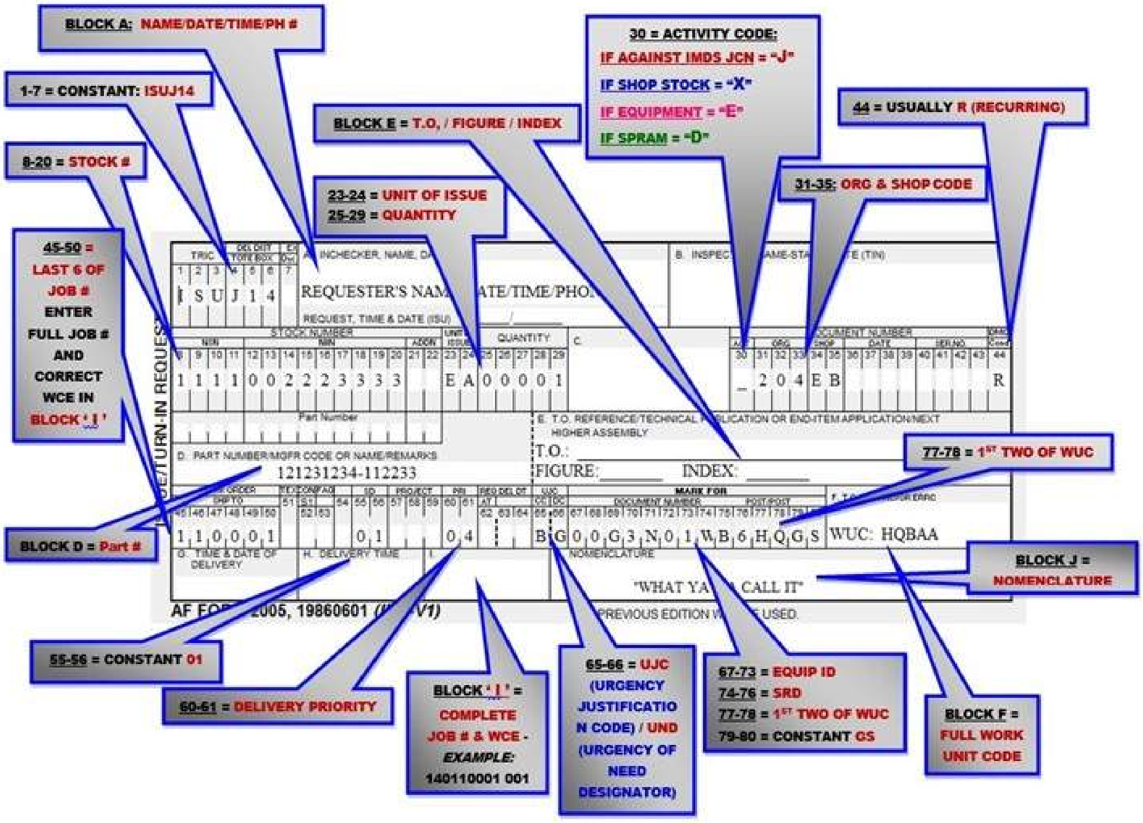
Block J: Nomenclature

J. NOMENCLATURE

WASHER, FLAT

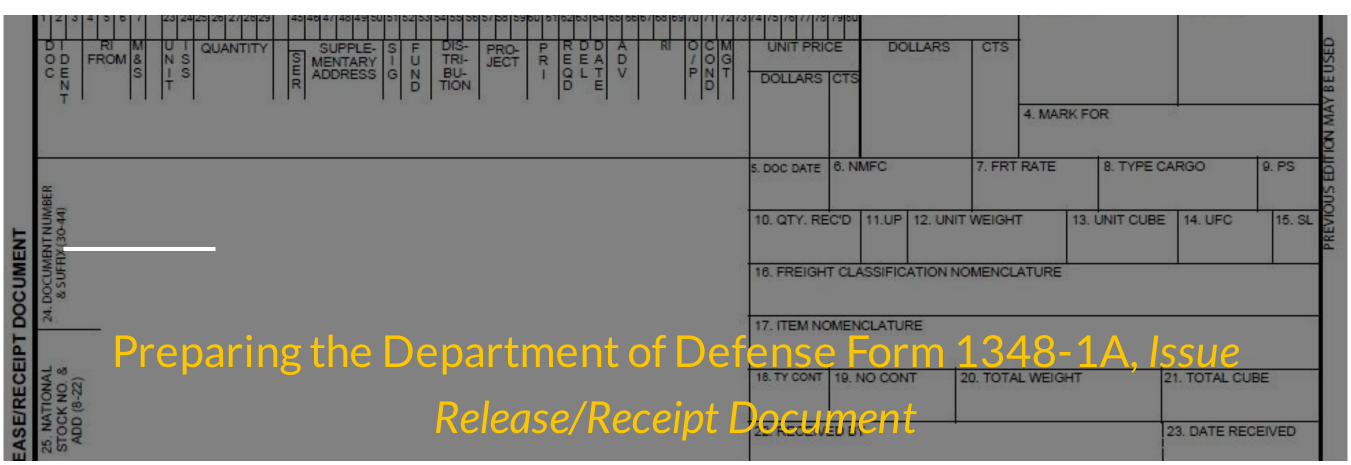
Block J is where you will list the name of the part. It is best to list this exactly the way that the IPB lists it, and it is best to spell out any acronyms. Remember, the individual processing your AF Form 2005 is likely not a 2M0X3.

Click on each check mark before moving forward in the lesson.



An Example of a Completed AF Form 2005.

Click here to learn about the Department of Defense (DoD) Form 1348-1A.



Preparing the Department of Defense Form 1348-1A, *Issue Release/Receipt Document*

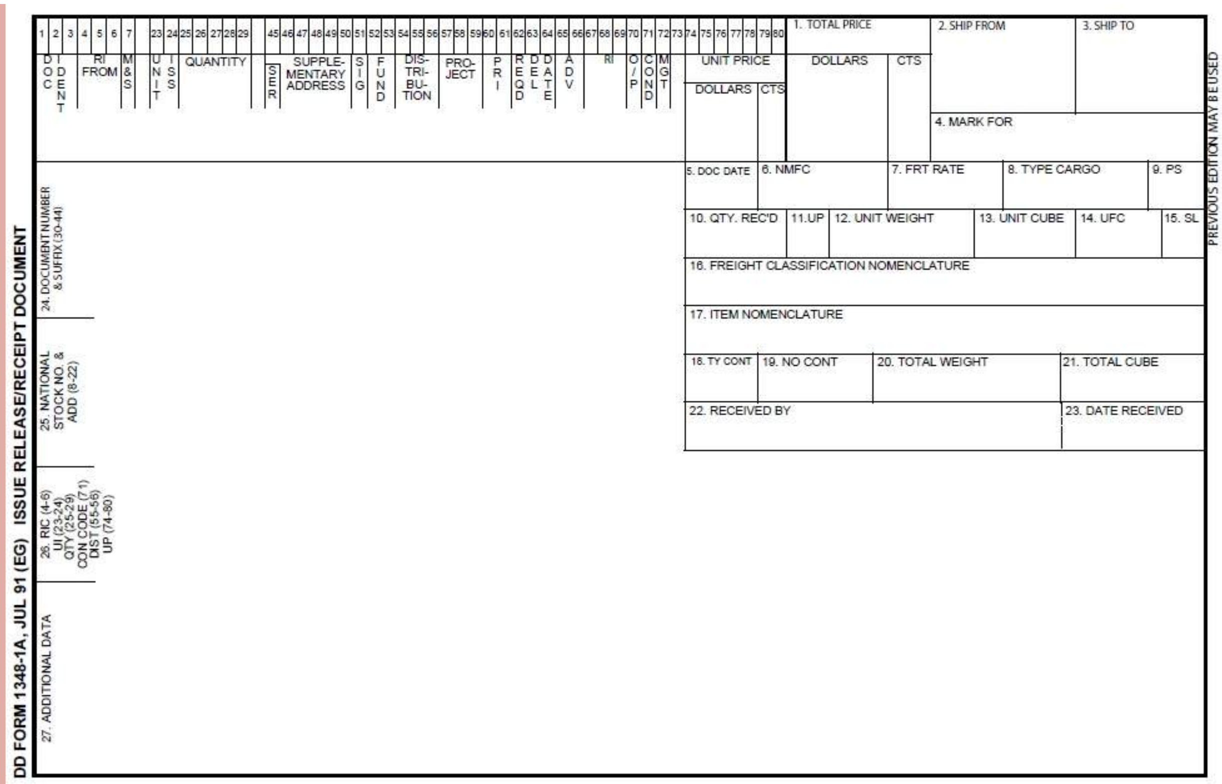
This lesson will focus on the DD Form 1348-1A. As implied, this form is used when items change hands.

Description

The DD Form 1348-1A is used for two purposes; to document the issue release of an item from supply to the customer, and to turn items into DLADS. If you have ever signed for a part or piece of equipment at materiel control, this is the document you signed. Also, if you have ever turned equipment into DLADS, you used the form to relinquish the items to them. The DD Form 1348-1A (fig 3–12) is considered a receipt. DD Form 1348-1A is made of three copies:

- Copy 1 is returned to supply to be turned in to document control after being signed by the receiving organization in receipt of the asset.
- Copy 2 is kept by the receiving organization to be stored for their records.
- Copy 3 is returned to the flight service center any time an unserviceable item is being turned in.

You should always prepare the form digitally on your computer and fill it out by hand only when it is not possible to complete it digitally. Some parts of the form will ask for information that you do not normally have access to—be sure to ask someone in your shop who is familiar with the form for help.



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOC | IDENT | RI FROM | M & S | UNIT | ISS | QUANTITY | SER | SUPPLE-MENTARY ADDRESS | SIG | FUND | DIS-TRI-BU-TION | PRO-JECT | PRI | REQD | DEL | DATE | ADV | RI | O/P | COND | MGT | UNIT PRICE DOLLARS CTS

1. TOTAL PRICE DOLLARS CTS

2. SHIP FROM

3. SHIP TO

4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11.UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

PREVIOUS EDITION MAY BE USED

Figure 3–12. DD Form 1348-1A.

Instructions

The DD Form 1348-1A may look a bit confusing at first, but you are not required to input information for every block and column. In this example, we will be turning in an expired can of paint, and it must be turned in as hazardous waste. Remember that the codes in the examples below will change depending on the type of item that you are turning in.

DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOC IDENT | RI FROM | M & S | UNIT | I S S | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD | DEL DATE | ADV | RI | O/P | COND | MGT | UNIT PRICE (DOLLARS, CTS)

1. TOTAL PRICE (DOLLARS, CTS)

2. SHIP FROM

3. SHIP TO

4. MARK FOR

5. DOC DATE

6. NMFC

7. FRT RATE

8. TYPE CARGO

9. PS

10. QTY. REC'D

11. UP

12. UNIT WEIGHT

13. UNIT CUBE

14. UFC

15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT

19. NO CONT

20. TOTAL WEIGHT

21. TOTAL CUBE

22. RECEIVED BY

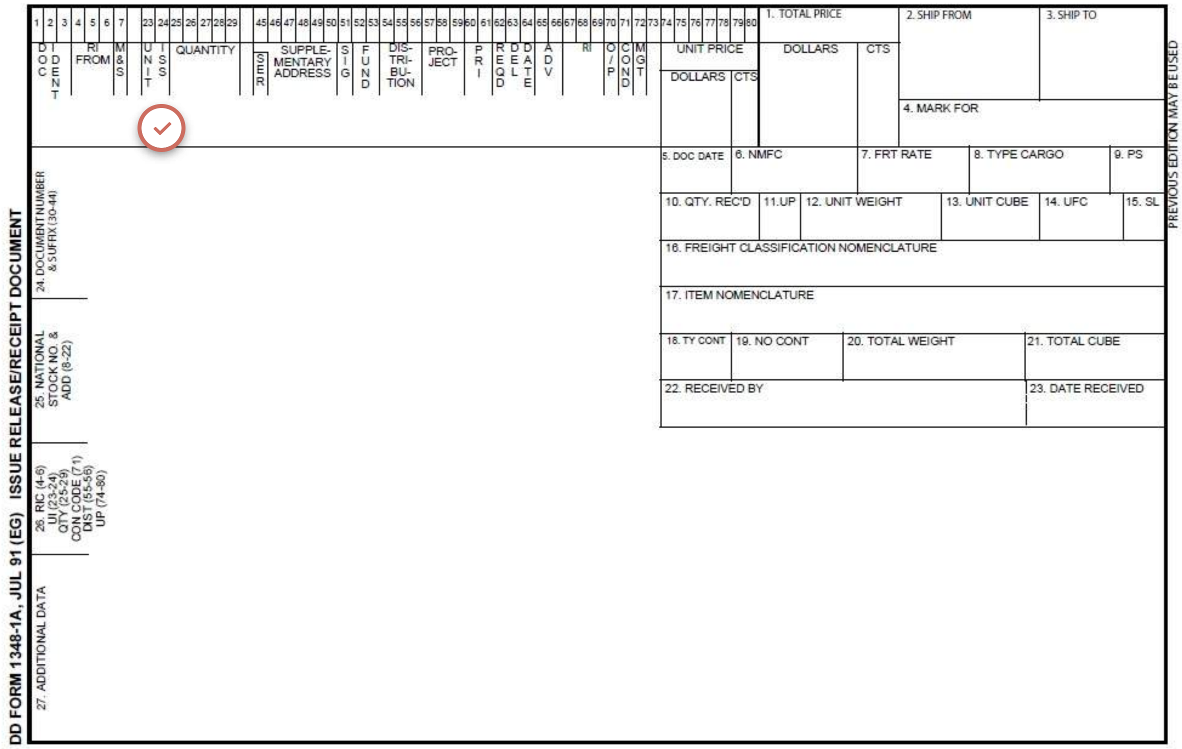
23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)

27. ADDITIONAL DATA

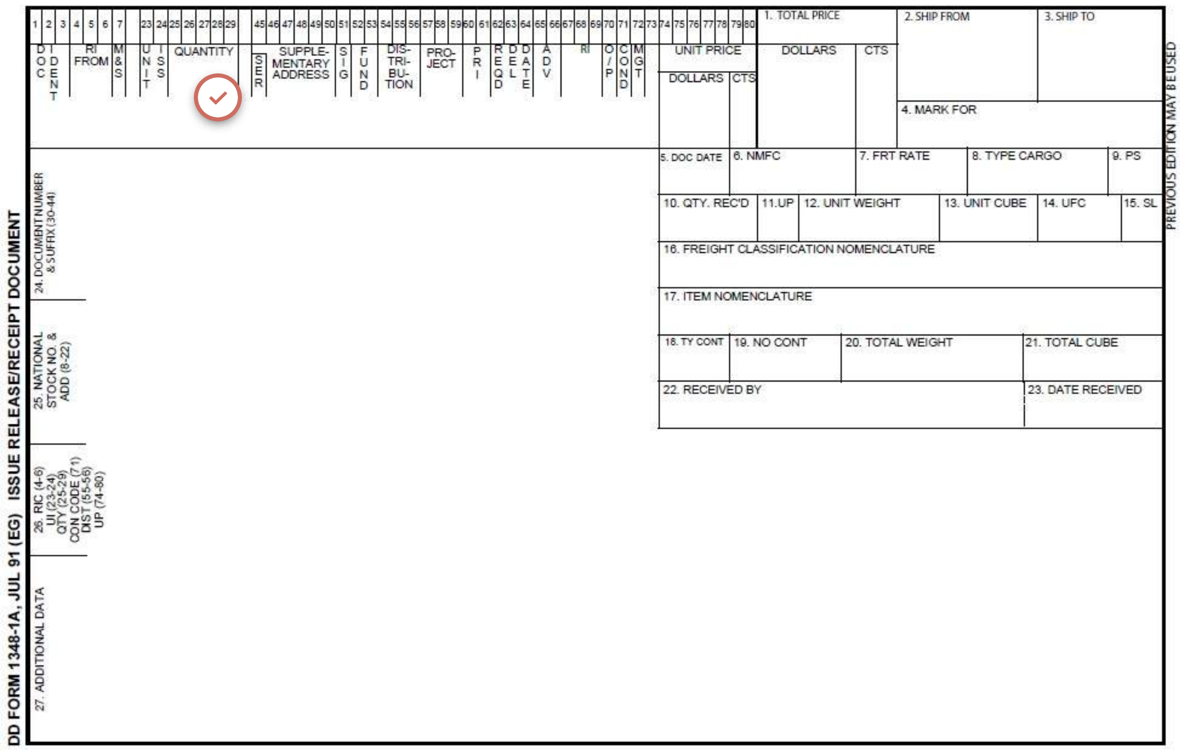


Columns 23-24 – Unit Iss (Unit of Issue)

In this step, you will enter the unit of issue with one of the following options:

- DR = Drum.
- BX = Box.
- CN = Container.
- EA = Each.

Unless you are specifically turning in a drum, box, or container, you will typically use "EA."



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOC | DI DENT | RI FROM | M&S | UNIT | ISS | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD | DEL DATE | ADV | RI | O/P | COND | MGT | UNIT PRICE DOLLARS CTS

1. TOTAL PRICE DOLLARS CTS | 2. SHIP FROM | 3. SHIP TO | 4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11. UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

25. NATIONAL STOCK NO. & ADD (8-22)

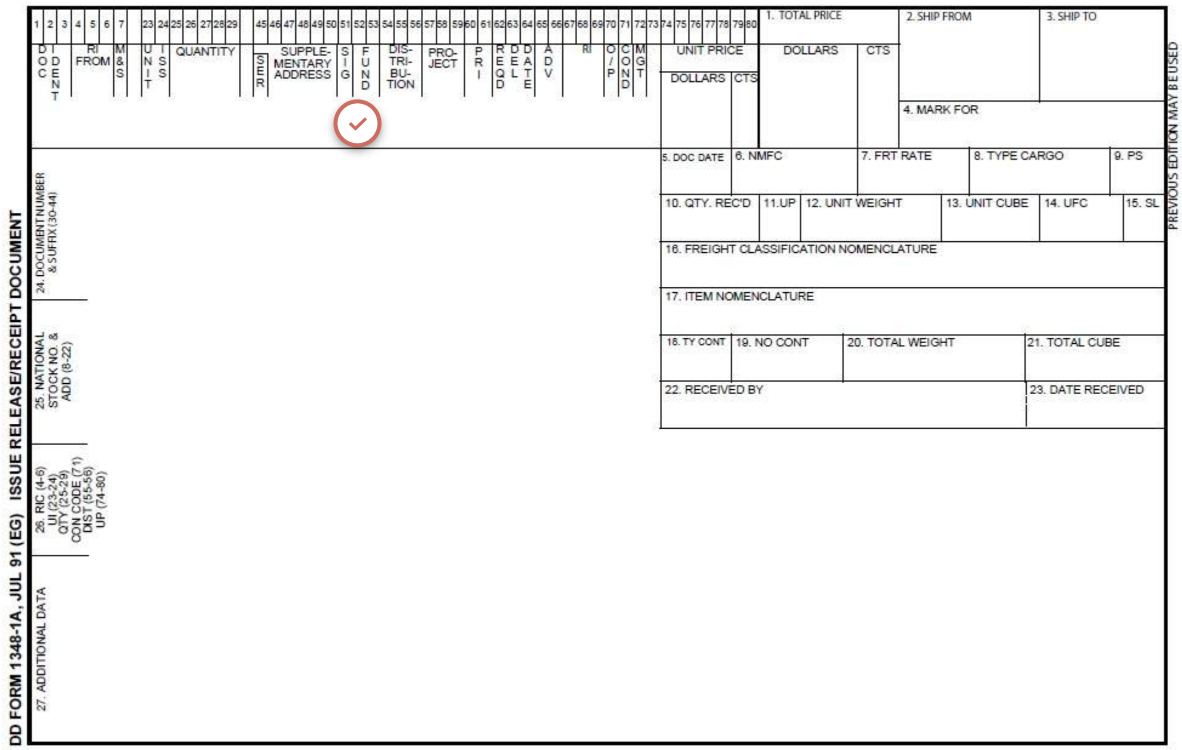
26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

PREVIOUS EDITION MAY BE USED

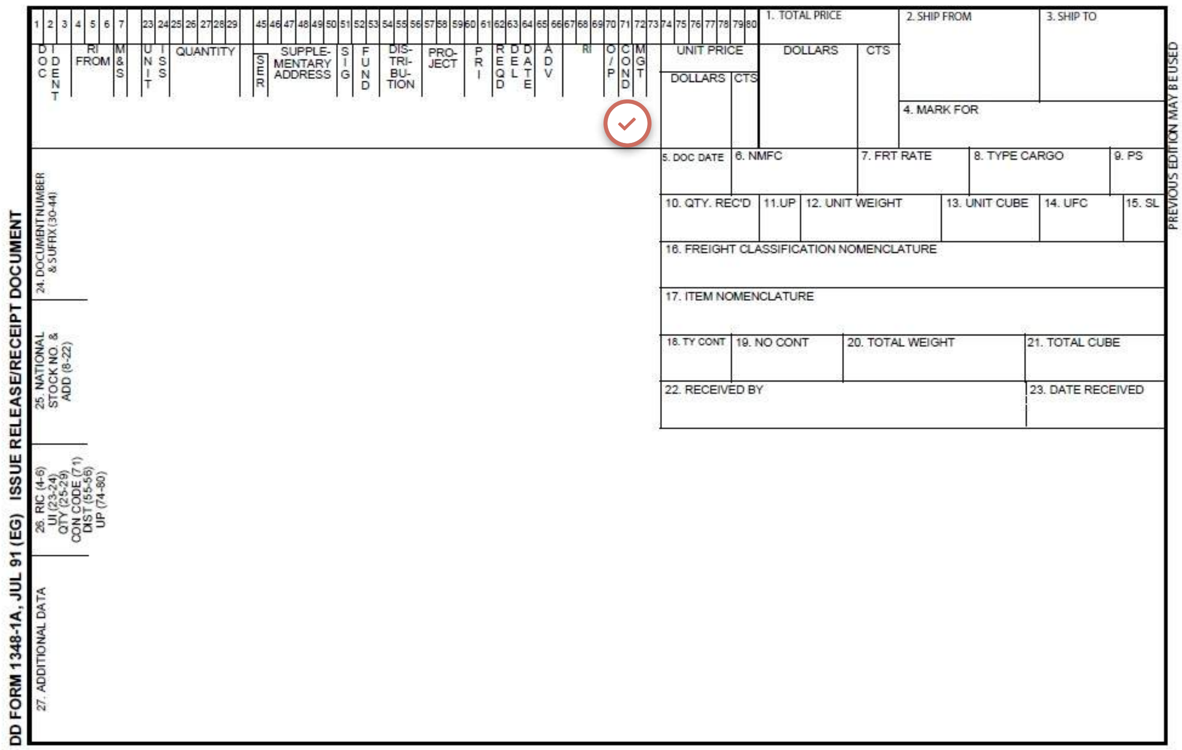
Columns 25-29 – Quantity

In this step, you will enter the total number of containers being turned in, and you must enter the leading zeros. Example “00001” or “00123.”



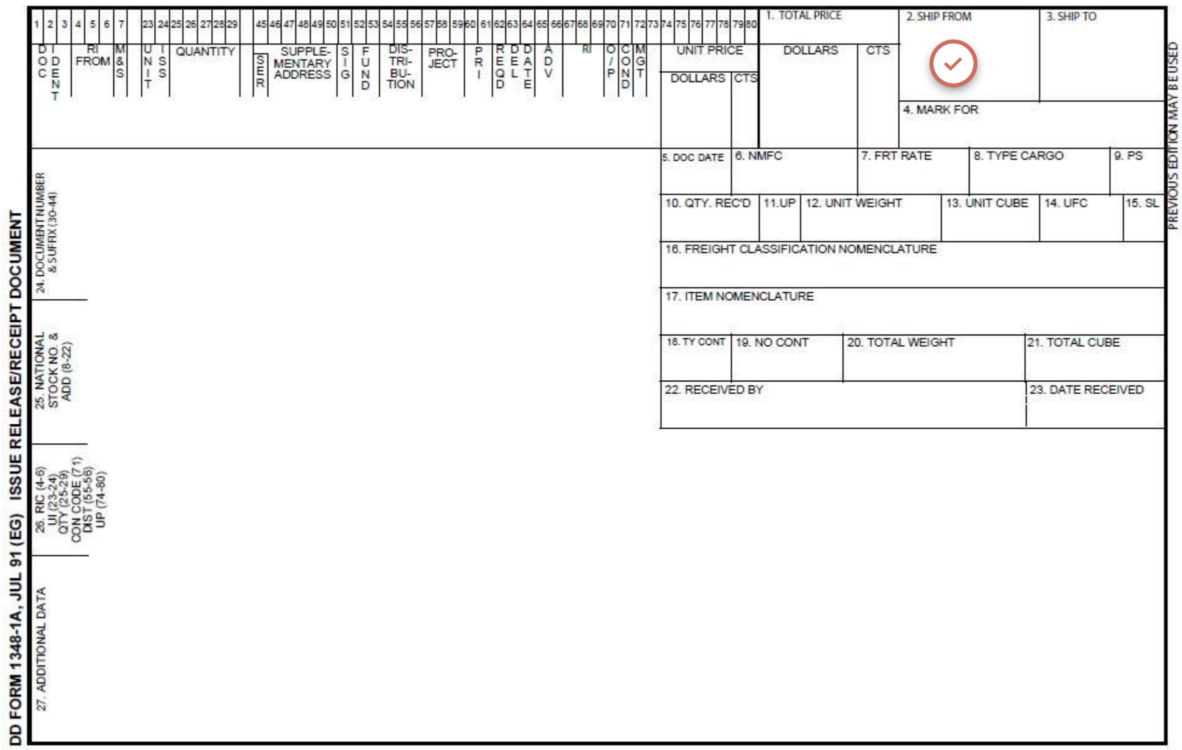
Columns 52-53 – Fund (Funding Source)

For our example, the standard code of “30” should be used, but this may be different under other circumstances.



Column 71 – Cond (Condition)

In this step, you will enter condition code “H” because the paint is unserviceable and cannot be repaired.



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOC, IDENT, RI FROM, M&S, UNIT, ISS, QUANTITY, SER, SUPPLEMENTARY ADDRESS, SIG, FUND, DISTRIBUTION, PROJECT, PRI, REQD, DEL DATE, ADV, RI, O/P, COND, MGT, UNIT PRICE (DOLLARS, CTS)

1. TOTAL PRICE (DOLLARS, CTS) | 2. SHIP FROM | 3. SHIP TO | 4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11.UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

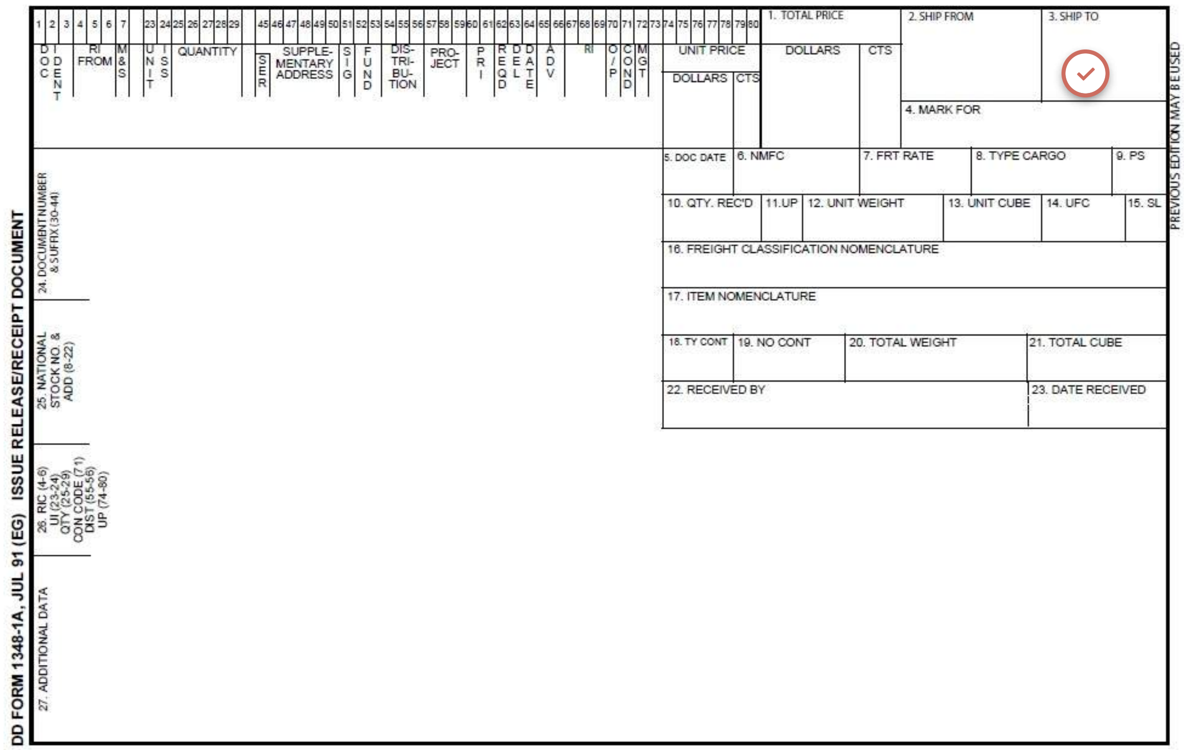
25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

Block 2 – Ship From

In this step, you will enter your organization's code, which you will likely need to obtain from someone in your shop.


DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

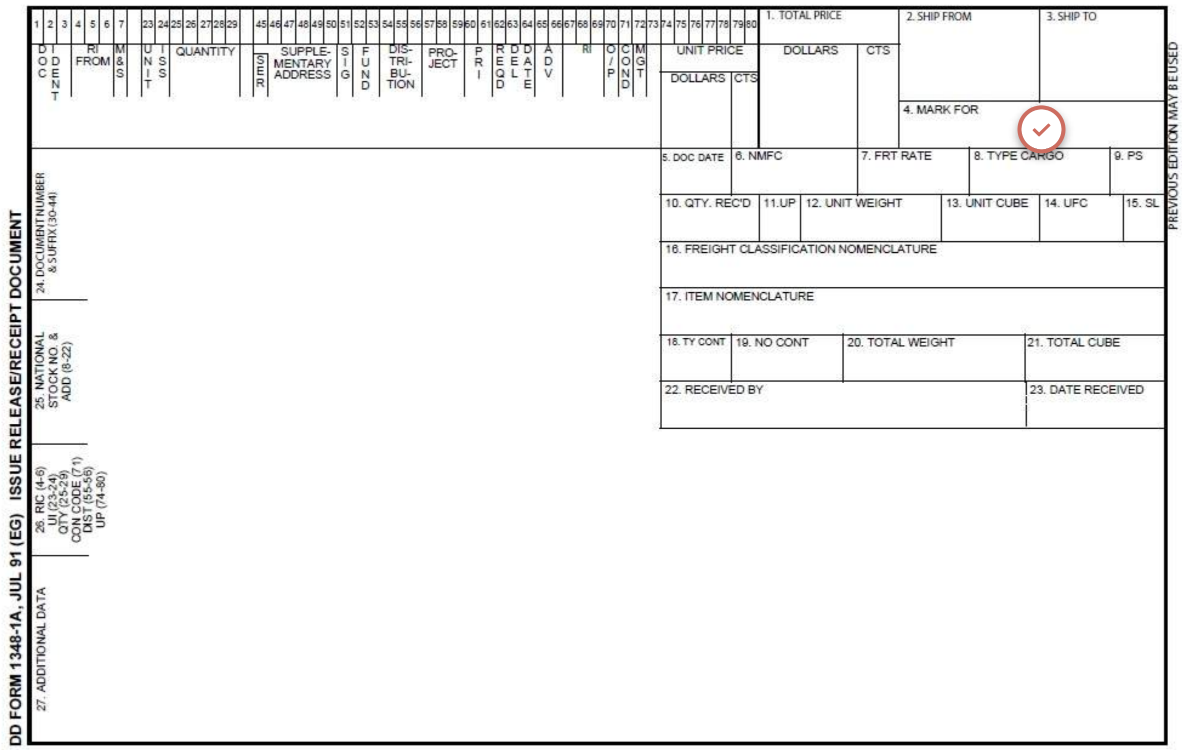
DOC | DI DENT | RI FROM | M & S | UNIT | ISS | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD | DEL | DATE | ADV | RI | O/P | COND | MGT | UNIT PRICE DOLLARS CTS

1. TOTAL PRICE DOLLARS CTS
2. SHIP FROM
3. SHIP TO
4. MARK FOR
5. DOC DATE
6. NMFC
7. FRT RATE
8. TYPE CARGO
9. PS
10. QTY. REC'D
11.UP
12. UNIT WEIGHT
13. UNIT CUBE
14. UFC
15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE
17. ITEM NOMENCLATURE
18. TY CONT
19. NO CONT
20. TOTAL WEIGHT
21. TOTAL CUBE
22. RECEIVED BY
23. DATE RECEIVED
24. DOCUMENT NUMBER & SUFFIX (30-44)
25. NATIONAL STOCK NO. & ADD (8-22)
26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)
27. ADDITIONAL DATA

PREVIOUS EDITION MAY BE USED

Block 3 – Ship To

In this step, you will enter “DLA-D”.



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

DOC IDENT | RI FROM | M&S | UNIT | ISS | QUANTITY | SER | SUPPLEMENTARY ADDRESS | SIG | FUND | DISTRIBUTION | PROJECT | PRI | REQD DEL DATE | ADV | RI | O/P | COND | MGT | UNIT PRICE DOLLARS CTS

1. TOTAL PRICE DOLLARS CTS

2. SHIP FROM

3. SHIP TO

4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11.UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

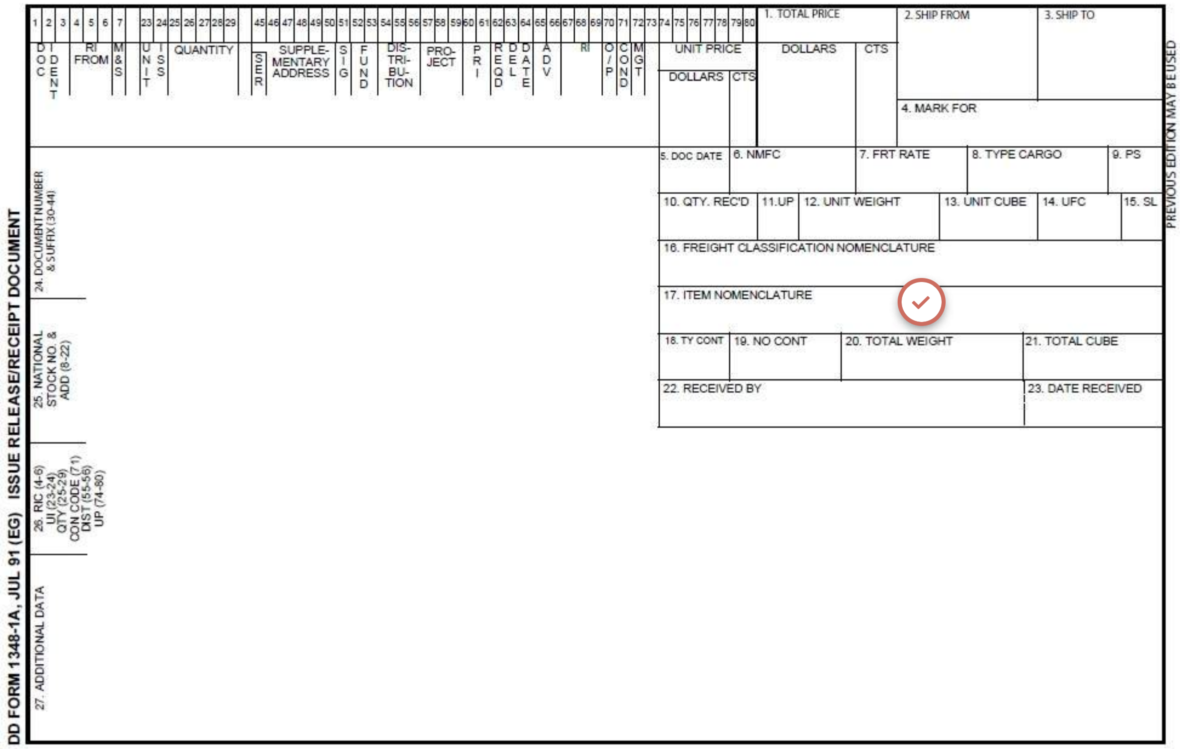
25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

Block 4 – Mark For

This block must contain "HW" because the paint is hazardous waste.



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

PREVIOUS EDITION MAY BE USED

1 2 3 4 5 6 7 23 24 25 26 27 28 29 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80

DOC | DI DENT | RI FROM | M & S | UNIT | UI SS | QUANTITY | SER | SUPPLE-MENTARY ADDRESS | SIG | FUND | DIS-TRI-BU-TION | PRO-JECT | PRI | REQD | DEL | DATE | ADV | RI | O/P | COND | MGT | UNIT PRICE DOLLARS CTS

1. TOTAL PRICE DOLLARS CTS | 2. SHIP FROM | 3. SHIP TO | 4. MARK FOR

5. DOC DATE | 6. NMFC | 7. FRT RATE | 8. TYPE CARGO | 9. PS

10. QTY. REC'D | 11. UP | 12. UNIT WEIGHT | 13. UNIT CUBE | 14. UFC | 15. SL

16. FREIGHT CLASSIFICATION NOMENCLATURE

17. ITEM NOMENCLATURE

18. TY CONT | 19. NO CONT | 20. TOTAL WEIGHT | 21. TOTAL CUBE

22. RECEIVED BY | 23. DATE RECEIVED

24. DOCUMENT NUMBER & SUFFIX (30-44)

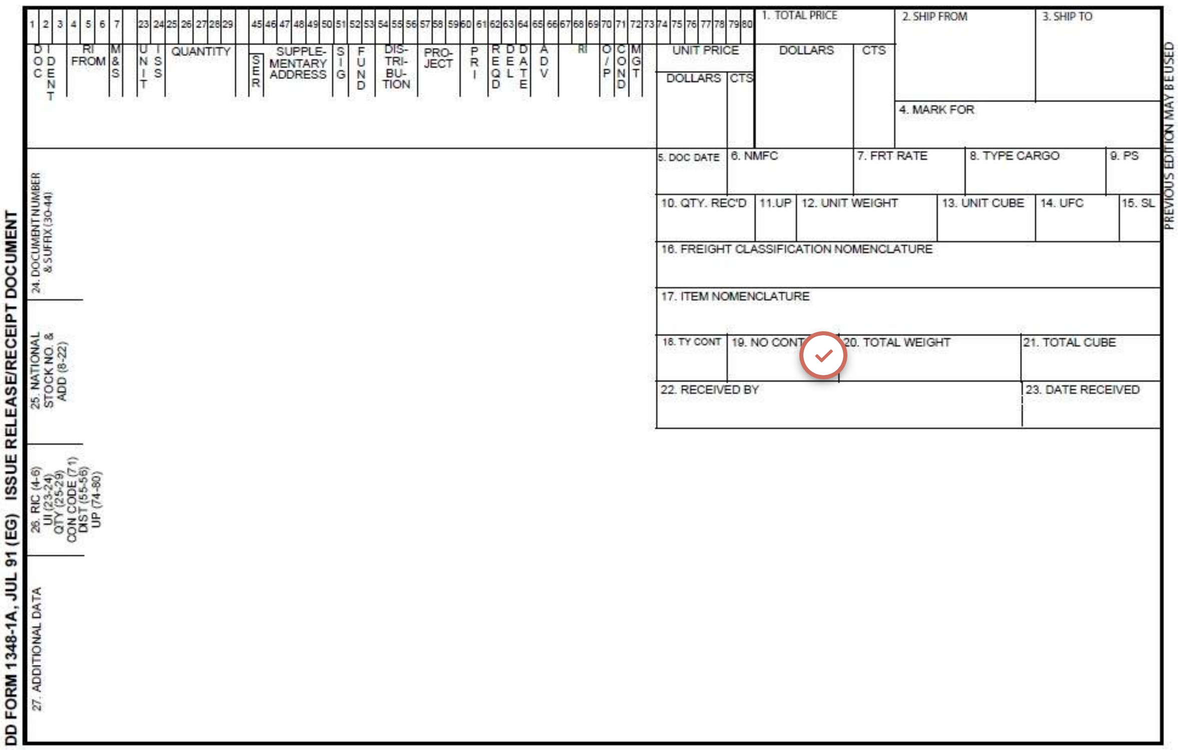
25. NATIONAL STOCK NO. & ADD (8-22)

26. RIC (4-6) UI (23-24) QTY (25-29) CON CODE (71) DIST (55-56) UP (74-80)

27. ADDITIONAL DATA

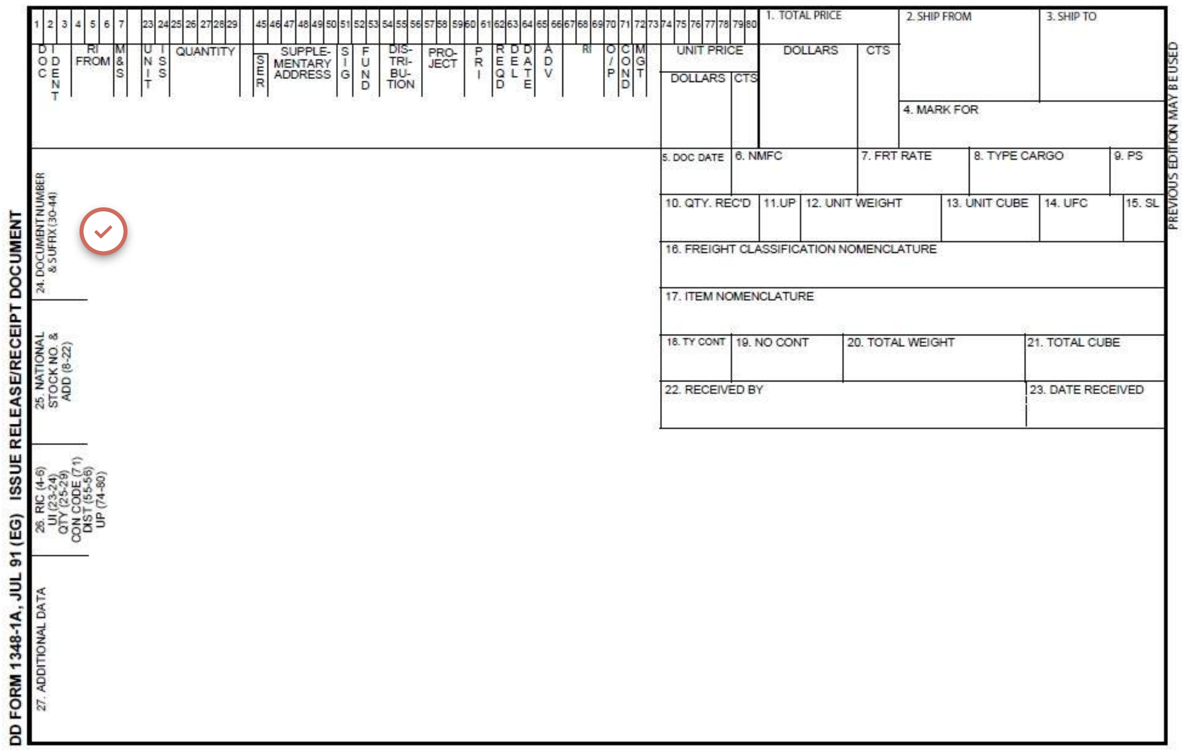
Block 17 – Item Nomenclature

In this step, you will enter the common name of the materiel. For example, “PAINT.” Be sure not to enter codes, NSN, hazard class, and so forth.



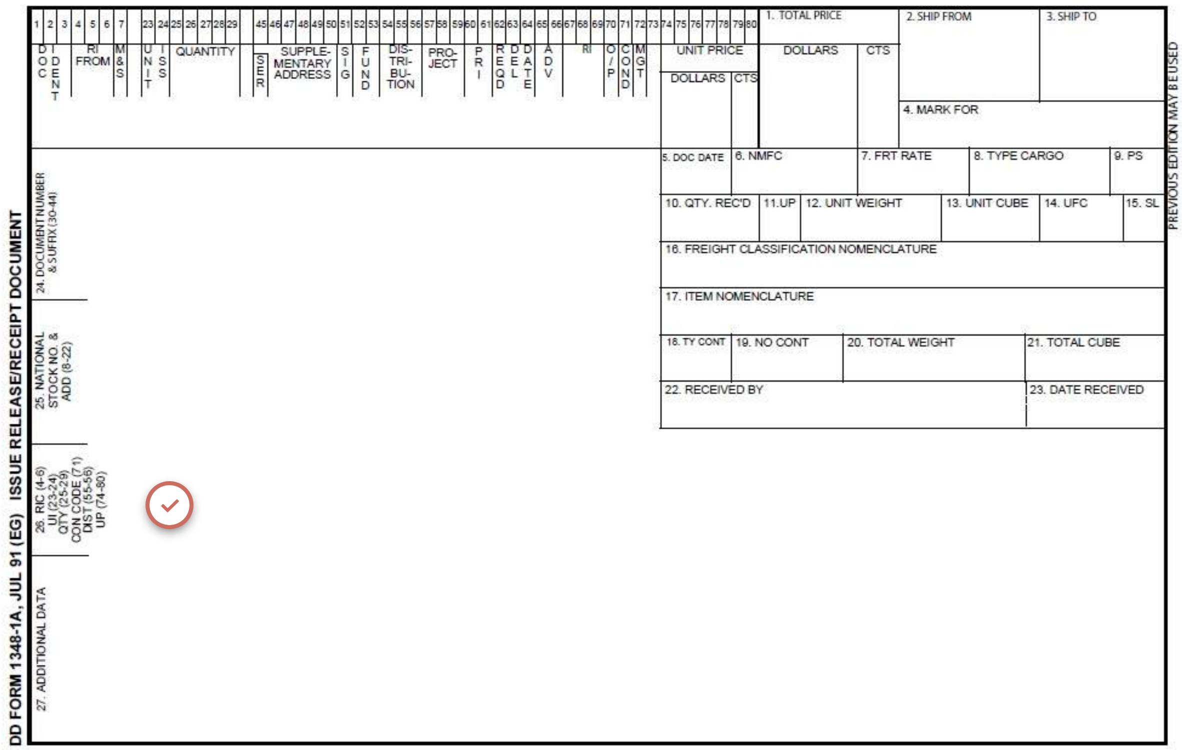
Block 19 – No Cont (number of containers)

This will be the same number that you entered in columns 25-29.



Block 24 – Document Number & Suffix

Enter your organization's code in the upper-left hand corner of the block, space down two spaces, and then enter the last four digits of the NSN.

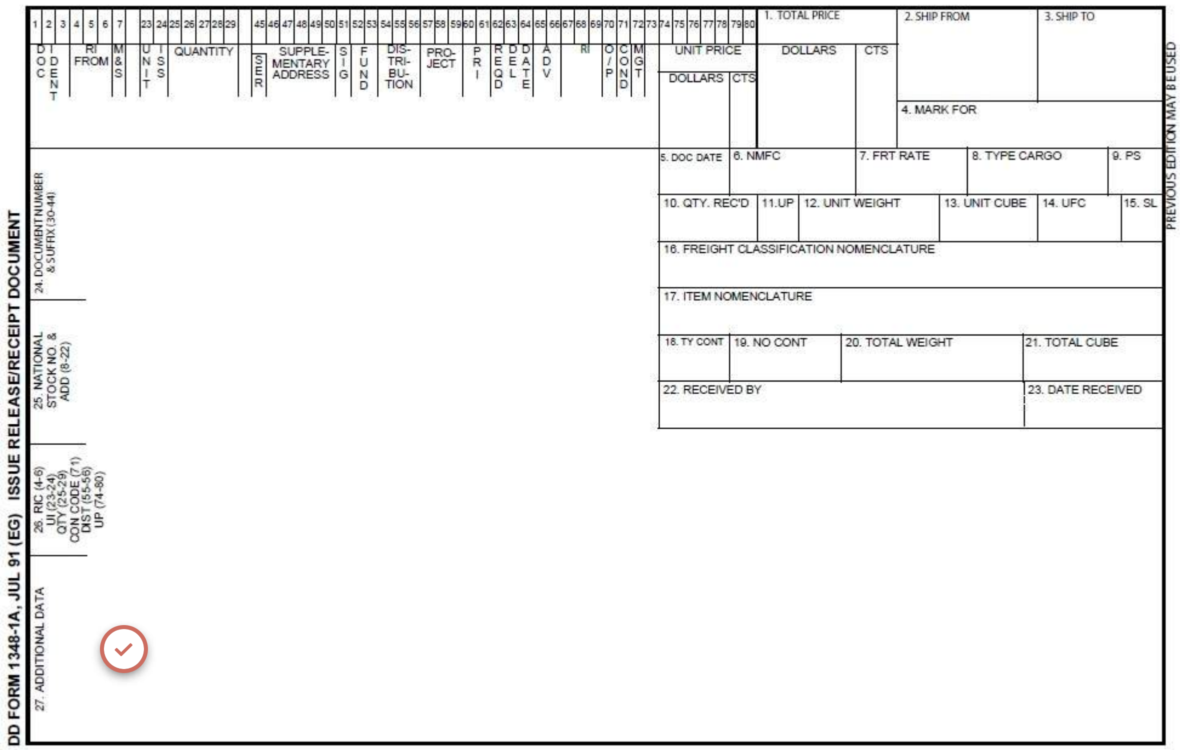


Block 26 – RIC (routing identifier code) UI (unit of issue) QTY (quantity)

Figure 3–13. Example of block 26 on DD Form 1348-1A.

For this step, you will enter the words "PROFILE:", "HIN:", and "ASD" (without quotation marks) into the form with the spacing shown in figure 3–13.

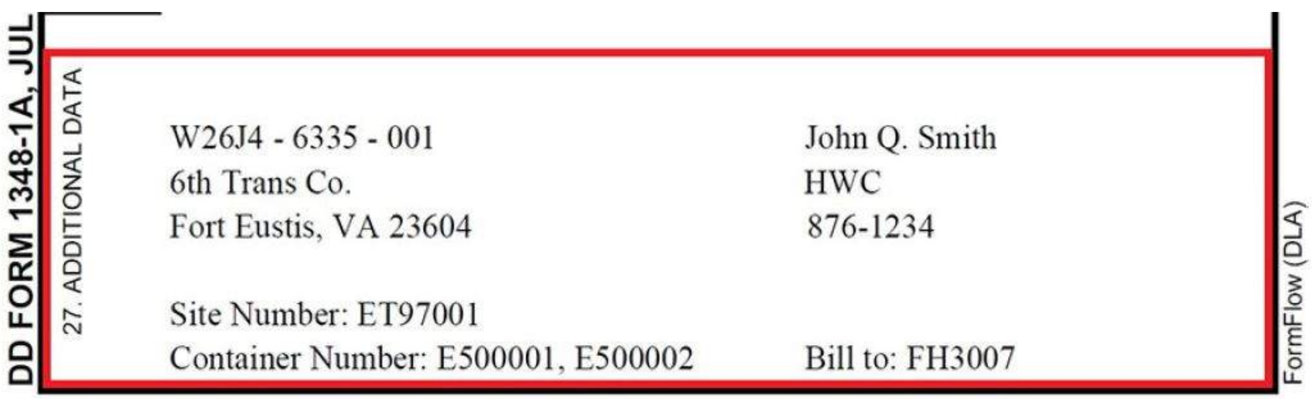
NOTE: Block 26 may be filled out differently than the example provided here. Be sure to check with someone in your shop who is familiar with the procedures for submitting the form before submitting it.



DD FORM 1348-1A, JUL 91 (EG) ISSUE RELEASE/RECEIPT DOCUMENT

1. TOTAL PRICE
UNIT PRICE
DOLLARS
CTS
DOLLARS
CTS
2. SHIP FROM
3. SHIP TO
4. MARK FOR
5. DOC DATE
6. NMFC
7. FRT RATE
8. TYPE CARGO
9. PS
10. QTY. REC'D
11.UP
12. UNIT WEIGHT
13. UNIT CUBE
14. UFC
15. SL
16. FREIGHT CLASSIFICATION NOMENCLATURE
17. ITEM NOMENCLATURE
18. TY CONT
19. NO CONT
20. TOTAL WEIGHT
21. TOTAL CUBE
22. RECEIVED BY
23. DATE RECEIVED
24. DOCUMENT NUMBER & SUFFIX (30-44)
25. NATIONAL STOCK NO. & ADD (8-22)
26. RIC (4-6)
UI (23-24)
QTY (25-29)
CON CODE (71)
DIST (55-56)
UP (74-80)
27. ADDITIONAL DATA
PREVIOUS EDITION MAY BE USED

Block 27 – Additional Data



DD FORM 1348-1A, JUL

27. ADDITIONAL DATA

W26J4 - 6335 - 001
6th Trans Co.
Fort Eustis, VA 23604

John Q. Smith
HWC
876-1234

Site Number: ET97001
Container Number: E500001, E500002

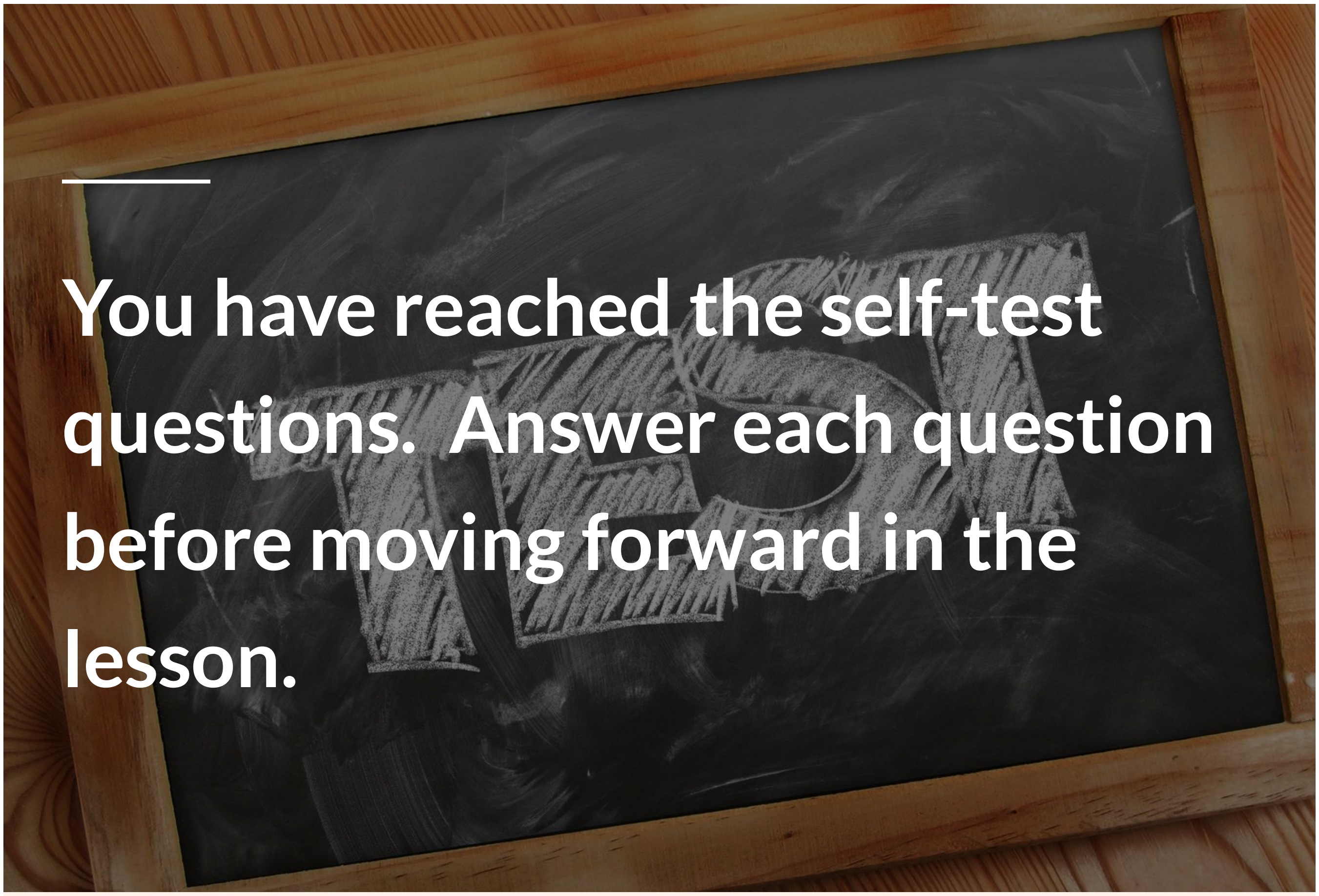
Bill to: FH3007

FormFlow (DLA)

Figure 3–14. Example of block 27 on DD Form 1348-1A.

This block may be filled out in several ways depending on what type of item is being turned in. However, a generic example is provided in figure 3–14.

Complete the content above before moving on in the lesson..



You have reached the self-test questions. Answer each question before moving forward in the lesson.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to using an illustrated parts breakdown.

1. When using TO 21M-LGM30F-4-1 to locate an item that you know the part number for, what step do you accomplish after you locate the part number in the numerical index of the IPB?

Type your answer here

SUBMIT

2. When using TO 21M-LGM30F-4-2, what step do you accomplish after locating the figure number if the figure has multiple sheets?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to the Preparing the Air Force Form 2005, Issue/Turn-In Request.

1. When preparing the AF Form 2005, what information is entered into Block C?

- Work Order Number.
- Job Control Number (JCN).
- Work Unit Code (WUC).
- ERRC,

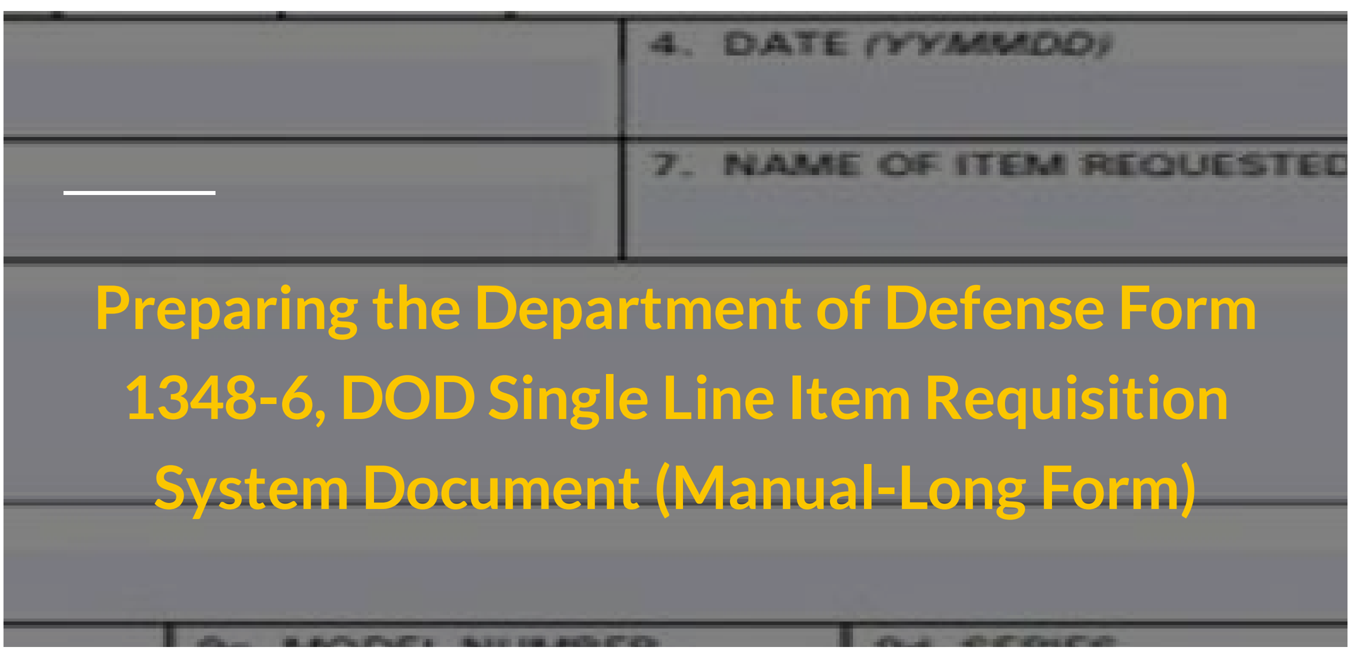
SUBMIT

2. When preparing the AF Form 2005, what information is entered into Block F?

- JCN.
- WUC.
- ORG #.
- ERRC.

SUBMIT

Answer each question before moving on to the next section.

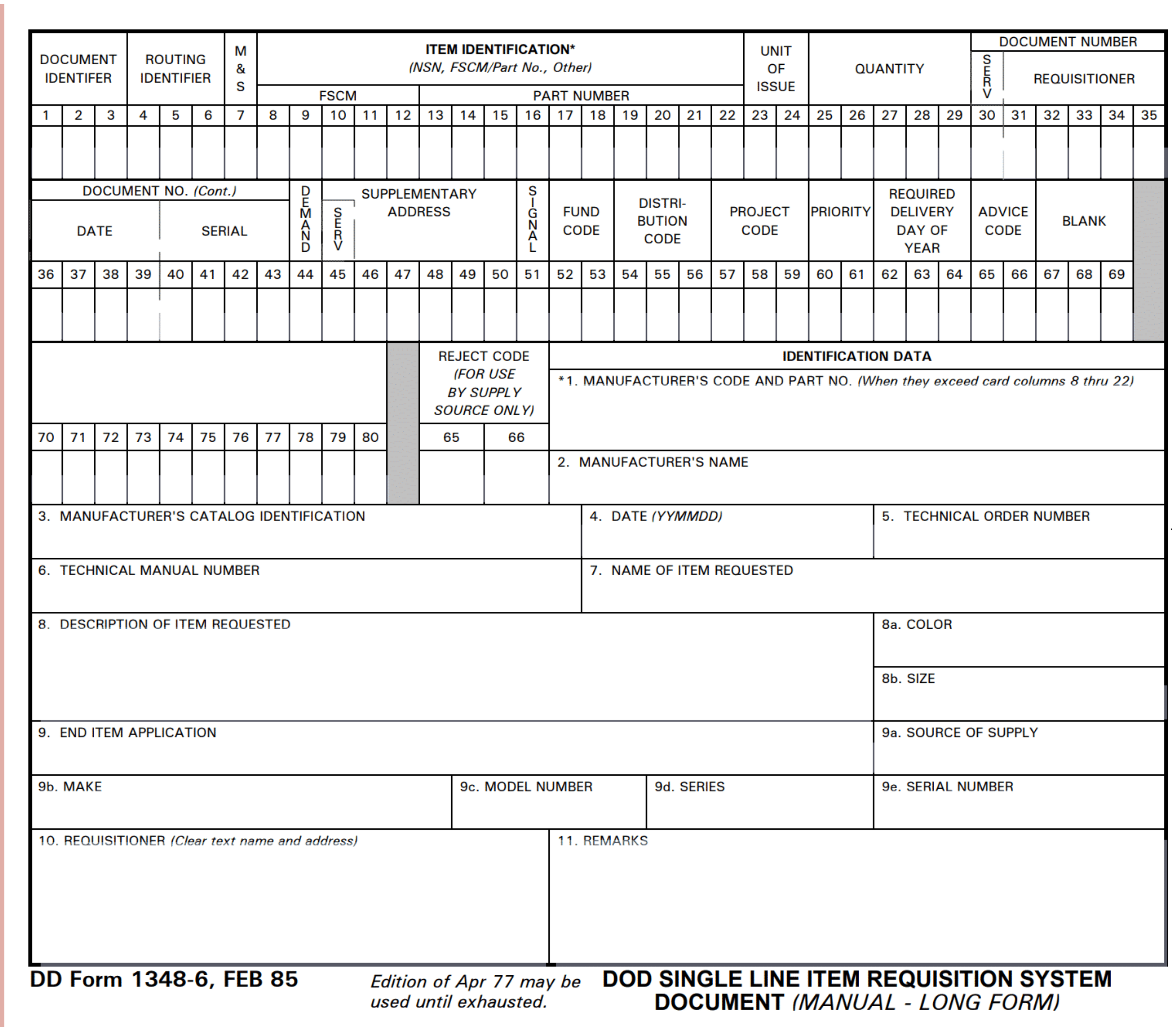


Preparing the Department of Defense Form 1348-6, DOD Single Line Item Requisition System Document (Manual-Long Form)

There are occasions when an item cannot be ordered through typical channels, and another process or form will need to be used to complete the job. This lesson will provide step-by-step instructions on how to prepare the form you will sometimes need to submit with the AF Form 2005—the DD Form 1348-6.

Description

The DD Form 1348-6 (fig 3–15) is used when your section needs to order an item from a local supplier, and also when an item you need to order does not have an NSN. This form is submitted in addition to the AF Form 2005 and allows you to provide the additional information needed to purchase an item from a vendor.



DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) FSCM / PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER: SERV / REQUISITIONER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

DOCUMENT NO. (Cont.): DATE / SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRI-BUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK

36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69

70 71 72 73 74 75 76 77 78 79 80

REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY) 65 66

IDENTIFICATION DATA

*1. MANUFACTURER'S CODE AND PART NO. *(When they exceed card columns 8 thru 22)*

2. MANUFACTURER'S NAME

3. MANUFACTURER'S CATALOG IDENTIFICATION

4. DATE *(YYMMDD)*

5. TECHNICAL ORDER NUMBER

6. TECHNICAL MANUAL NUMBER

7. NAME OF ITEM REQUESTED

8. DESCRIPTION OF ITEM REQUESTED

8a. COLOR

8b. SIZE

9. END ITEM APPLICATION

9a. SOURCE OF SUPPLY

9b. MAKE

9c. MODEL NUMBER

9d. SERIES

9e. SERIAL NUMBER

10. REQUISITIONER *(Clear text name and address)*

11. REMARKS

DD Form 1348-6, FEB 85 *Edition of Apr 77 may be used until exhausted.* **DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT** *(MANUAL - LONG FORM)*

Figure 3–15. DD Form 1348-6.

Instructions

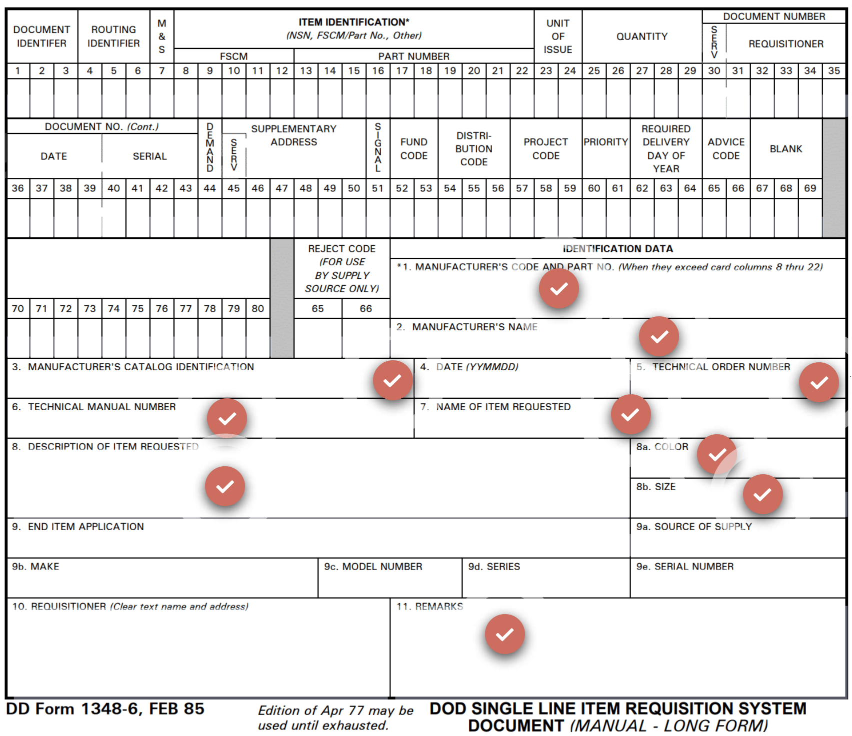
This form is not currently located on the AF publications website, so be sure to locate the newest version of the form from the General Services Administration website or from your local shared drive. As with any other form, you should always prepare the DD Form 1348-6 digitally wheneverpossible. The following instructions can also be located in

AFH 23-123, Volume 2, Part 1, *Materiel Management ILS-S, Materiel Management Operations.*

Location 1

Click the link to go to the Air Force e-Publication website so search for the most current publication of Air Force Handbook (AFH) 23-123 Volume 2, Part 1, *Materiel Management ILS-S, Materiel Management Operations.*

AF E-PUBS SITE


DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) | FSCM | PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER | SERV | REQUISITIONER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

DOCUMENT NO. (Cont.) | DATE | SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRI-BUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK

36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69

70 71 72 73 74 75 76 77 78 79 80

REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY) | 65 | 66

IDENTIFICATION DATA

*1. MANUFACTURER'S CODE AND PART NO. (When they exceed card columns 8 thru 22)

2. MANUFACTURER'S NAME

3. MANUFACTURER'S CATALOG IDENTIFICATION

4. DATE (YYMMDD)

5. TECHNICAL ORDER NUMBER

6. TECHNICAL MANUAL NUMBER

7. NAME OF ITEM REQUESTED

8. DESCRIPTION OF ITEM REQUESTED

8a. COLOR

8b. SIZE

9. END ITEM APPLICATION

9a. SOURCE OF SUPPLY

9b. MAKE

9c. MODEL NUMBER

9d. SERIES

9e. SERIAL NUMBER

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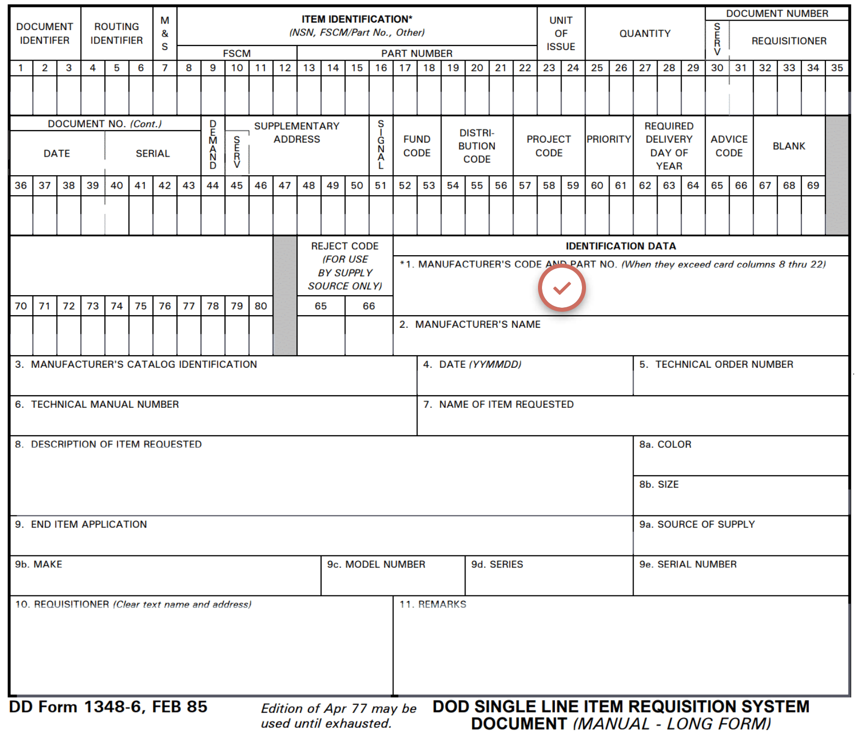
11. REMARKS

DD Form 1348-6, FEB 85

Edition of Apr 77 may be used until exhausted.

DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT *(MANUAL - LONG FORM)*


DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) FSCM PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER SERV REQUISITIONER
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36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY)
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*1. MANUFACTURER'S CODE AND PART NO. (When they exceed card columns 8 thru 22)
70 71 72 73 74 75 76 77 78 79 80 65 66
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DD Form 1348-6, FEB 85
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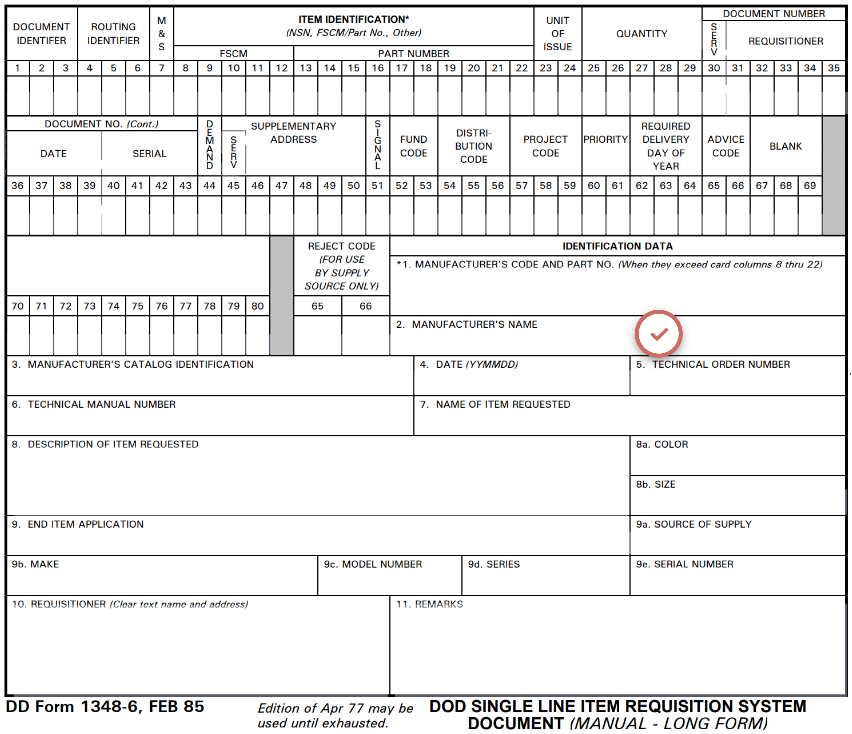
DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Block 1 – Manufacturer’s Code and Part No

In this step, you will fill in the manufacturer’s code and part number, which is located in the catalog or on the website where you’ve found the part.


DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) | FSCM | PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER | SERV | REQUISITIONER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

DOCUMENT NO. (Cont.) | DATE | SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRIBUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69

70 71 72 73 74 75 76 77 78 79 80

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65 66

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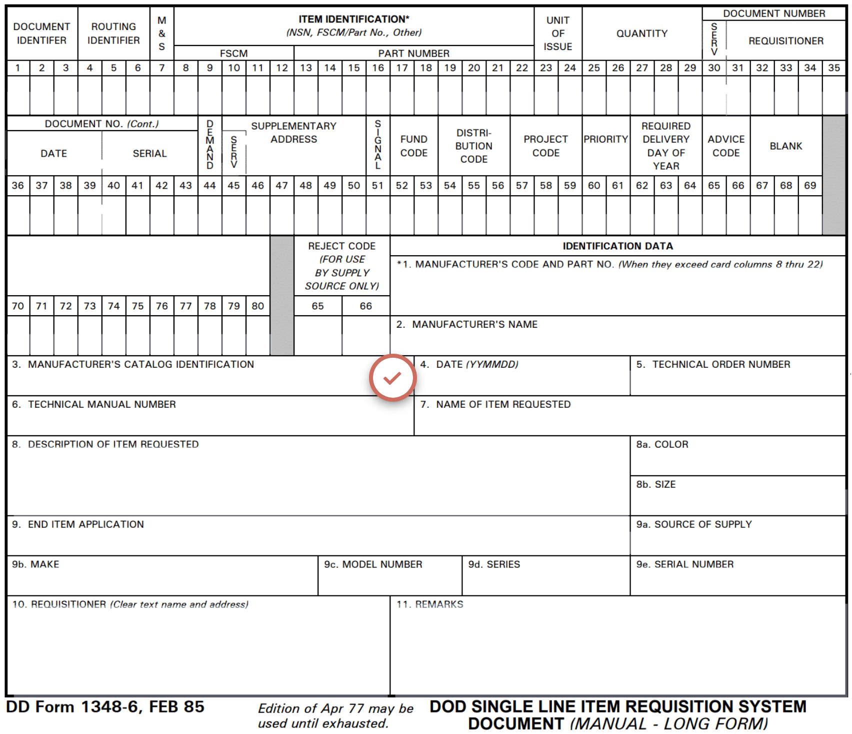
DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Block 2 – Manufacturer's Name

This is the name of the manufacturer, which should be self-explanatory.



DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) | FSCM | PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER | SERV | REQUISITIONER

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DOCUMENT NO. (Cont.) | DATE | SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRI-BUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK

36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69

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8b. SIZE

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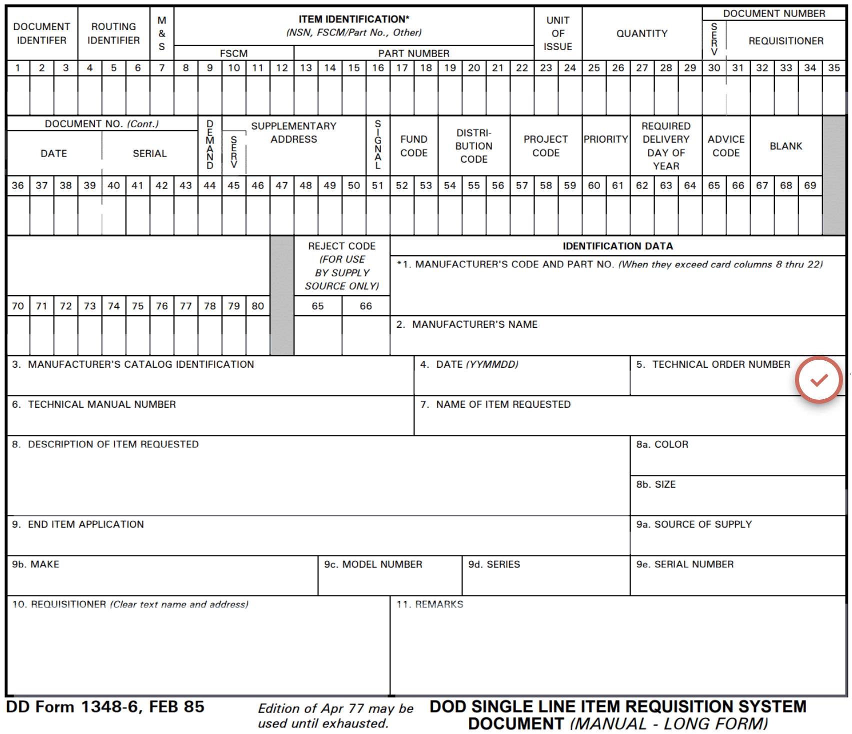
11. REMARKS

DD Form 1348-6, FEB 85 — *Edition of Apr 77 may be used until exhausted.* — **DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT** *(MANUAL - LONG FORM)*

Blocks 3 & 4 – Manufacturer's Catalog Identification and Date

This is also typically self-explanatory if you have found the item you need to order in a manufacturer's catalog. Also enter the date that the catalog was published, which should be located on the outside of the catalog or on the first leading pages.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DOCUMENT NO. (Cont.) | DATE | SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRIBUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK

36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69

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11. REMARKS

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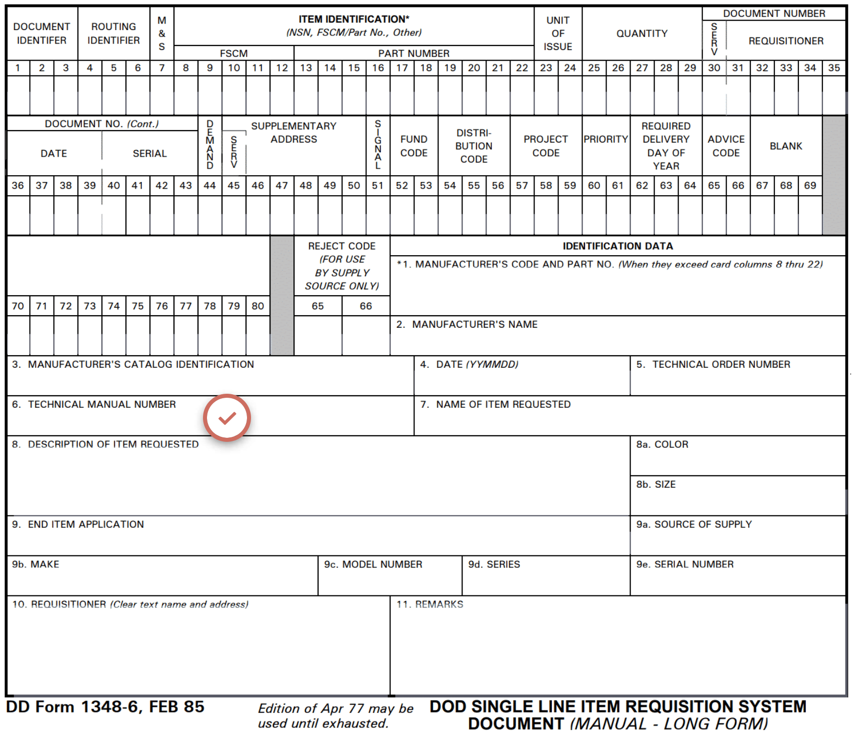
Block 5 – Technical Order Number

Enter the technical order number, figure, and index of the technical order that directs you to use thispart. If you are using a technical manual, you will fill this information into block 6 instead.


DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) FSCM PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER SERV REQUISITIONER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
DOCUMENT NO. (Cont.) DATE SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRI-BUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
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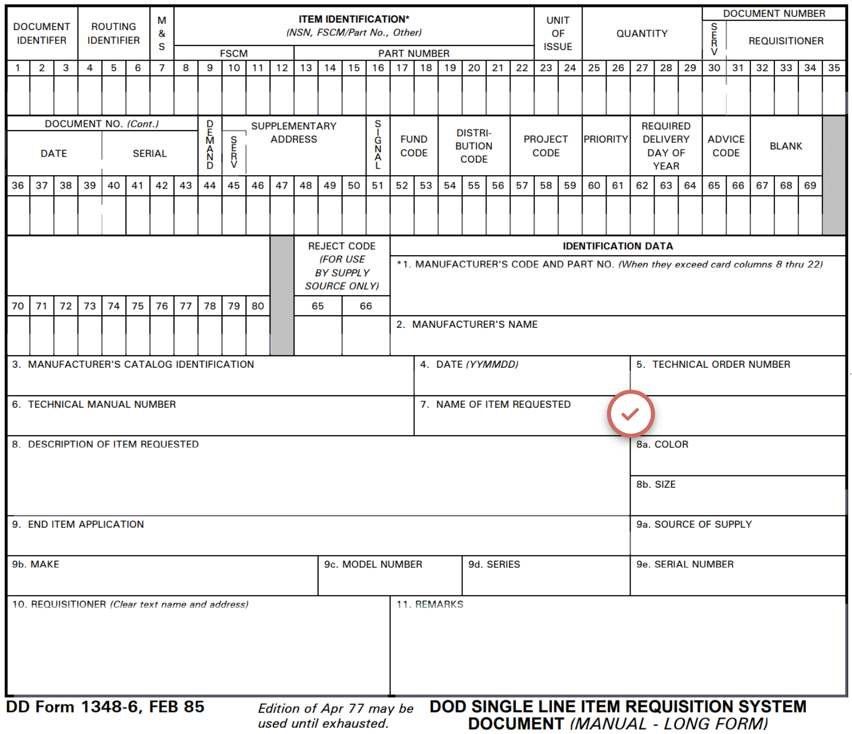
11. REMARKS
DD Form 1348-6, FEB 85
Edition of Apr 77 may be used until exhausted.
DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Block 6 – Technical Manual Number

Enter the technical manual number, figure, and index that directs you to use this part. If you're using a technical order, you will populate this information into block 5 instead.



DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) FSCM, PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER: SERV, REQUISITIONER

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35

DOCUMENT NO. (Cont.): DATE, SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRIBUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK

36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69

70 71 72 73 74 75 76 77 78 79 80

REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY) 65 66

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11. REMARKS

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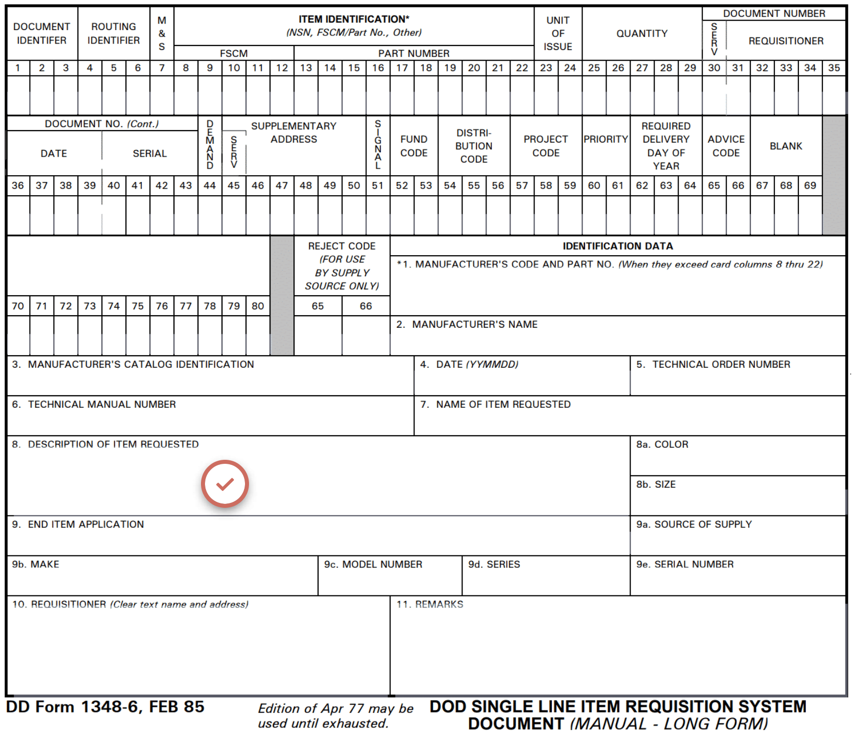
Edition of Apr 77 may be used until exhausted.

DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT *(MANUAL - LONG FORM)*

Block 7 – Name of Item Requested

Enter the name of the item in this step, which is typically self-explanatory.


DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) FSCM PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER SERV REQUISITIONER
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
DOCUMENT NO. (Cont.) DATE SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRI-BUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69
REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY) | IDENTIFICATION DATA
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70 71 72 73 74 75 76 77 78 79 80 | 65 66
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DD Form 1348-6, FEB 85 | Edition of Apr 77 may be used until exhausted. | DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Block 8 – Description of Item Requested

Use common commercial terms in this block, and always try to use off the shelf items instead of specialized items if possible because this will keep prices down.

Price

Include the price, if known, and enter a price tolerance so that personnel at materiel control or the base supply point do not purchase items that are unreasonably priced. You typically will not make this decision, so be sure to ask someone else in your shop who is familiar with the procedure.

Commercial Description

What is the item? You should enter a proper noun here, when possible. You would never order cookies through the supply system, but as an example, instead of saying cookie, say Oreo®.

Material

What type of material is the item made of? Paper, wood, steel, aluminum, or plastic?

Critical Elements

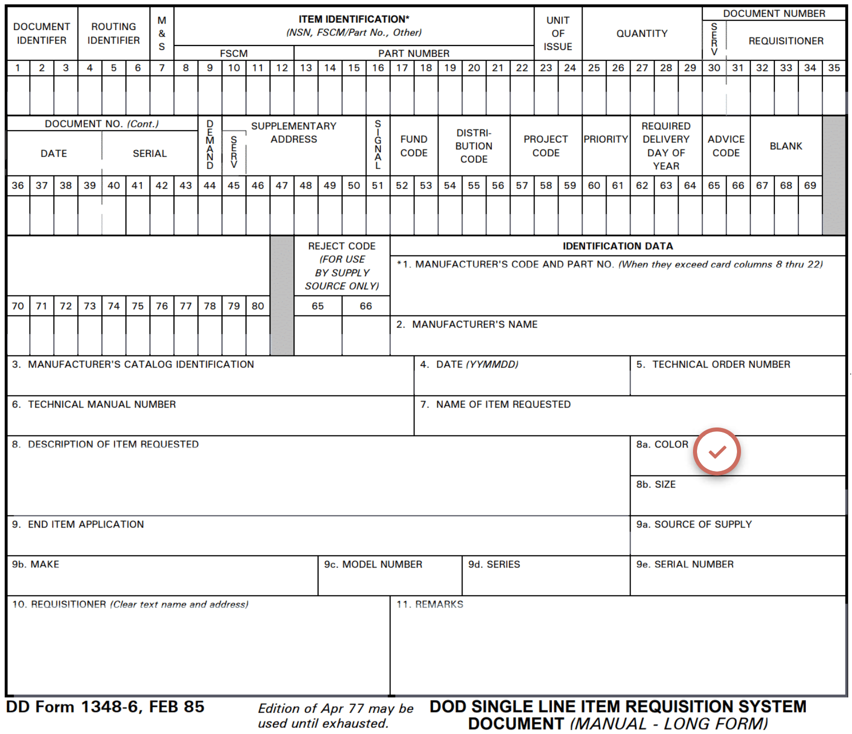
List pertinent shapes, sizes, colors, outside diameter, inside diameter, height, length, etc.

Principal Characteristics

In this step, list descriptors such as nontoxic, chemically pure, high grade, commercial grade, military grade, construction grade, etc.

What The Item Does

What does the item do? Does it secure, drive, separate, connect, etc.?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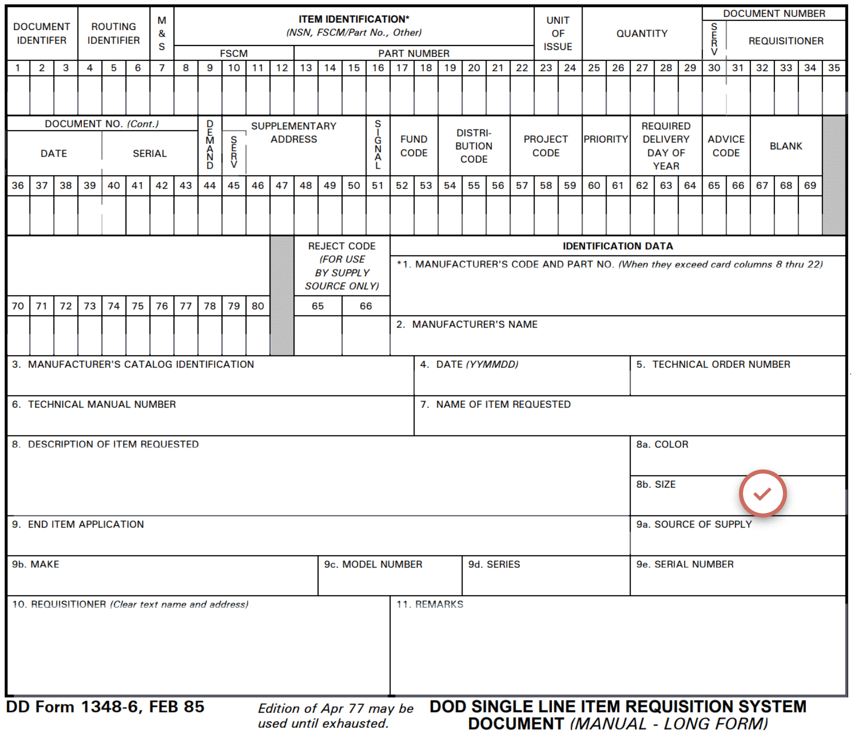
DD Form 1348-6, FEB 85

Edition of Apr 77 may be used until exhausted.

DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Block 8a – Color

Here is where you will list the color of the item, which is typically self-explanatory.



DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER

FSCM | PART NUMBER | SERV | REQUISITIONER

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DOCUMENT NO. (Cont.) | DATE | SERIAL | DEMAND | SERV | SUPPLEMENTARY ADDRESS | SIGNAL | FUND CODE | DISTRI-BUTION CODE | PROJECT CODE | PRIORITY | REQUIRED DELIVERY DAY OF YEAR | ADVICE CODE | BLANK

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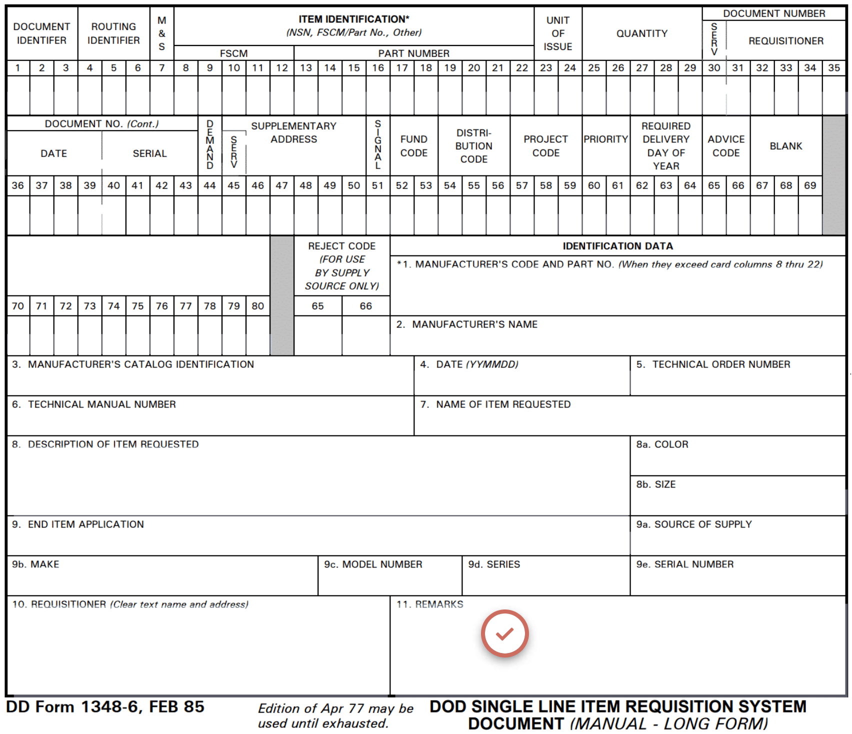
Block 8b – Size

Here is where you will list the size of the item, which is typically self-explanatory. Be specific. For example, sizes such as large, medium, and small are subjective, and may mean different things to different people–large compared to what? Dimensions such height, width, and depth are preferable, and be sure to use recognizable terms, such as inches, feet, yards, or centimeters, for example.



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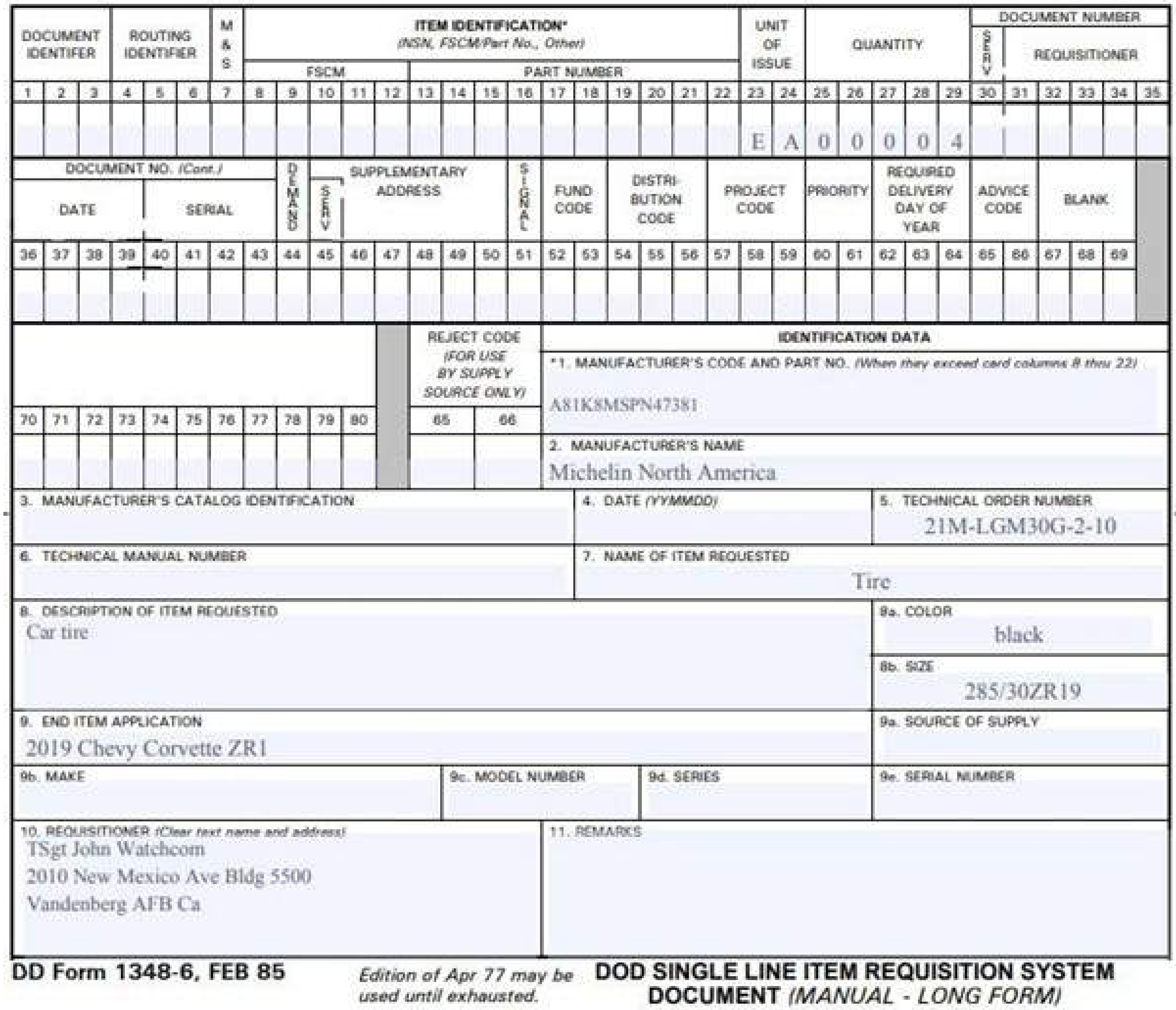
DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Block 11 – Remarks

Enter your organization, your name, and your telephone number. As with any form that your organization fills out regularly, this process may be quicker if there is already an established template for you to use to help you out. Once you have completed the form, it is always best to have someone in your shop who is familiar with the process check the form prior to submitting it.

Click on each item before moving forward in the lesson.



DOCUMENT IDENTIFER | ROUTING IDENTIFIER | M & S | ITEM IDENTIFICATION* (NSN, FSCM/Part No., Other) FSCM PART NUMBER | UNIT OF ISSUE | QUANTITY | DOCUMENT NUMBER SERV REQUISITIONER

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REJECT CODE (FOR USE BY SUPPLY SOURCE ONLY)

IDENTIFICATION DATA

*1. MANUFACTURER'S CODE AND PART NO. (When they exceed card columns 8 thru 22)
A81K8MSPN47381

2. MANUFACTURER'S NAME
Michelin North America

3. MANUFACTURER'S CATALOG IDENTIFICATION

4. DATE (YYMMDD)

5. TECHNICAL ORDER NUMBER
21M-LGM30G-2-10

6. TECHNICAL MANUAL NUMBER

7. NAME OF ITEM REQUESTED
Tire

8. DESCRIPTION OF ITEM REQUESTED
Car tire

8a. COLOR
black

8b. SIZE
285/30ZR19

9. END ITEM APPLICATION
2019 Chevy Corvette ZR1

9a. SOURCE OF SUPPLY

9b. MAKE

9c. MODEL NUMBER

9d. SERIES

9e. SERIAL NUMBER

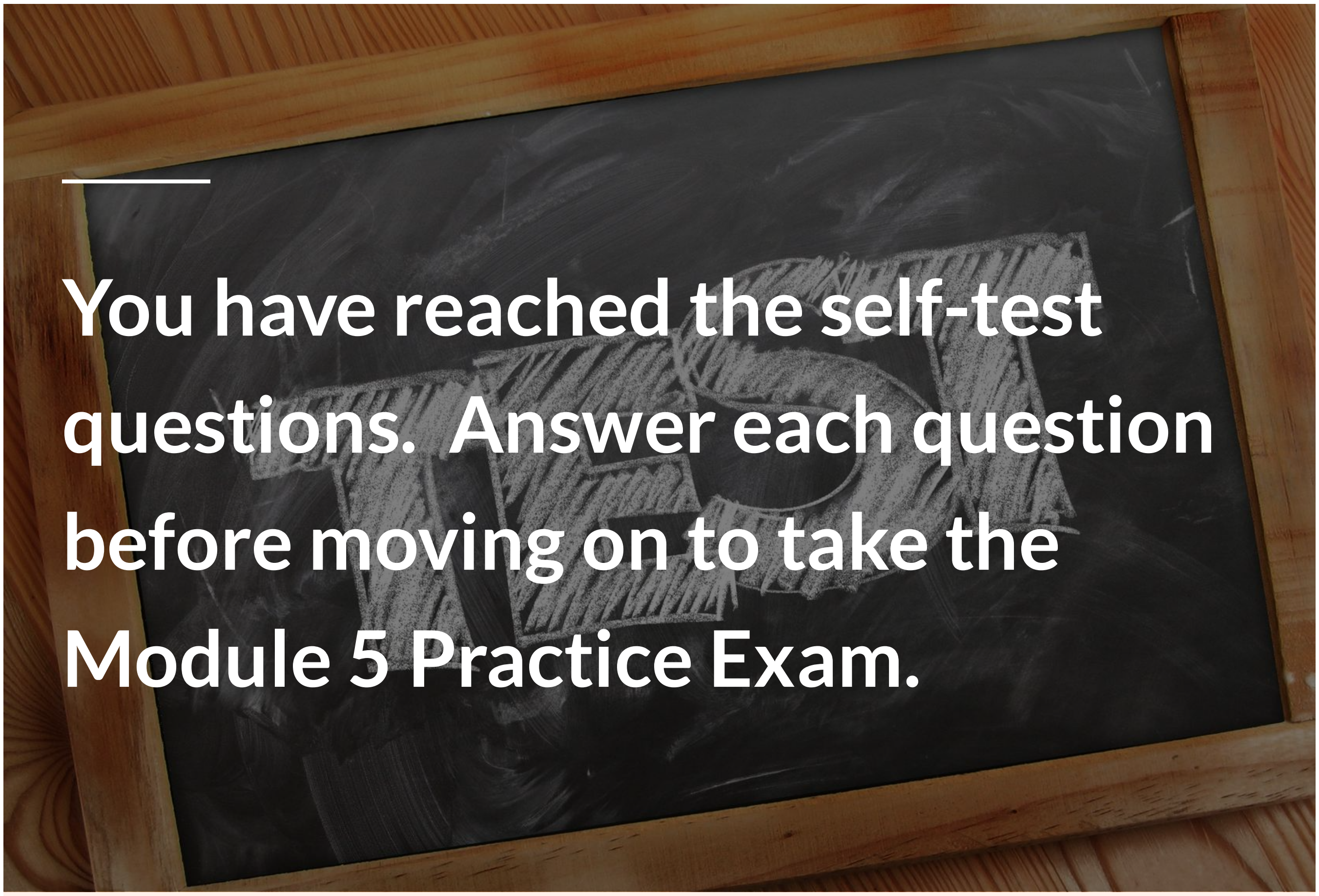
10. REQUISITIONER (Clear text name and address)
TSgt John Watchcom
2010 New Mexico Ave Bldg 5500
Vandenberg AFB Ca

11. REMARKS

DD Form 1348-6, FEB 85 — Edition of Apr 77 may be used until exhausted. — DOD SINGLE LINE ITEM REQUISITION SYSTEM DOCUMENT (MANUAL - LONG FORM)

Figure 3–15. DD Form 1348-6. An Example of a Completed Form.

Click here to move on to the self-test questions.



You have reached the self-test questions. Answer each question before moving on to take the Module 5 Practice Exam.

KNOWLEDGE CHECK TIME!

For the fill-in the blank questions, you will need to add (.) period to the end of the sentences.

Click here to answer the self-test questions pertaining to preparing the Air Force Form 1348-1A, Issue Release/Receipt Document.

1. Prior to completing any of the steps to prepare a DD Form 1348-1A, what format of the form should you ensure you are using?

Type your answer here

SUBMIT

2. When preparing a DD Form 1348-1A, what should you be sure not to use when completing block 17?

Type your answer here

SUBMIT

Answer each question before moving on to the next set of questions.

Click here to answer the self-test questions pertaining to preparing the Air Force Form 1348-6, DOD Single Line Item Requisition SystemDocument (Manual-Long Form).

1. What other form is submitted with a DD Form 1348-6?

- AFTO Form 431
- DD Form 1348-1A
- AF Form 2005

SUBMIT

2. When preparing a DD Form 1348-6, why do you list a price tolerance when completing block 8?

Type your answer here

SUBMIT

3. When preparing a DD Form 1348-6, what information do you populate in block 11?

Type your answer here

SUBMIT

CONGRATULATIONS!

You have completed the last lesson in Module 5. Proceed to myLearning to complete Module 5 practice exam. Ensure to inform your supervisor and unit training manager (UTM) to be scheduled for your end-of-course exam.

You have completed Module 5 instructional material.

Module 5: Self-Test Question Answers

Lesson 1: Support Vehicles

801. Periodic maintenance semitrailer auxiliary power unit and power distribution system

1. Off.

2. Manually by a technician using a 12 VDC starting system.

3. Next to the power transfer switch in the upper compartment of the trailer.

802. Periodic maintenance semitrailer environmental control system

1. Manually by a technician.

2. The unit will blow cold air until the internal temperature of the trailer reaches the temperature set on the manual thermostat. It will automatically restart when the temperature is above the thermostat setting.

3. The rear heater in the lower compartment of the trailer.

803. Mechanical maintenance truck electrical, hoist, and rear lift gate systems

1. Hoist, rear floodlights, and heater.

2. The hoist only provides lowering and raising functions.

3. DC power from the truck's batteries.

804. Transporter-erector auxiliary power unit and electrical and environmental control systems

1. It transports the downstage of the missile in a horizontal position and then erects it to the vertical position to be lowered into the missile silo at the LF.

2. Between 60 and 100°F.

3. Two banks of three (six total) heating elements.

4. The 50°F low temperature thermostat.

805. Payload transporter auxiliary power unit and electrical system

1. Behind the cab of the tractor that pulls the PT trailer.

2. It allows power to flow to the trailer distribution panel.

3. By a battery charger whenever AC power is applied to the trailer.

806. Payload transporter semitrailer environmental control system

1. Inside of a compartment with a swing-open door on the driver side of the PT trailer

2. VDC from the battery in the forward compartment of the PT trailer.

3. Red and green indicator lamps in the cab of the PT tractor.

4. - 75°F.

807. Payload transporter semitrailer hoist system

1. To select between FAST or SLOW speeds and OFF.

2. Launch tube control pendant is set to OFF or is disconnected.

3. The PT trailer hoist control pendant is used for maneuvering objects within the trailer. A second team positioned in the launch tube can use the launch tube hoist control pendant to maneuver loads into position on the missile.

Lesson 2: Missile Support Base Maintenance

808. Function and operation of emergency storage batteries

1. Lead sulfate back is converted back into lead dioxide and lead.

2. Two batteries are paired together in series.

3. When the battery is under a heavy charge or discharge cycle.

4. The battery draws less amperage, and this is the step where the battery will regain the final 30 percent of its charge.

5. The maximum amount of energy that a battery will produce while being discharged.

809. Reconditioning emergency storage batteries

1. MAF is RN148. LF is RN145.

2. Reject the battery and initiate a DR.

3. The negative cell voltage test point should be in the semi-circular side of the spade shape, and the positive cell voltage test point should be in the tip of the spade.

4. The terminal nuts could be over-torqued causing the terminals to break.

5. Add 50 mL of 1.400 specific gravity sulfuric acid. Place it back on a charge and continue to observe it.

6. The emergency storage battery was in a discharged state for a short period of time before being recharged by the battery charger.

7. Once the batteries drop to 28 VDC, record the current draw and the time, immediately turn the fan and load switches OFF and turn the Vernier load dial to zero. Place the batteries on an equalization charge.8.Place it on a float charge and mate it with another battery that has similar cell voltage characteristics.

810. Function and operation of the guided missile maintenance platform

1. Allows the GMMP to traverse left and right and move up and down in the launch tube.

2. It houses a cable that allows electrical signals to move between the GMMP support structure and bucket assembly.

3. Allows power to flow between the power and communication distribution box and the GMMP power distribution box.

4. Semiannual inspections and any time a GMMP has malfunctioned and requires troubleshooting.

811. Function and operation of the hydraulic pusher set

1. The configuration of the quick-disconnect fittings.

2. Transfers horizontal force from the pusher unit to the launcher closure door.

3. Switch SW–1 is closed during normal operation; therefore, indicator light DS–1 is illuminated if the hydraulic pusher set has power and the hydraulic fluid filter is not clogged.

812. Function and operation of the guidance section liquid cooler

1. Maintaining the proper temperature of the MGS.

2. Removes heat from the MGS and transfers this heat to refrigerant in the chiller unit.

3. The electronic control amplifier sends electrical pulses that cause the control valve to reposition in small increments.

4. The thermistor sends signals to the electronic control amplifier that vary as the temperature of the MGS changes.

813. Function and operation of the portable air conditioner

1. It provides environmental control for the missile downstages housed in trailers in the missile handling section.

2. Refrigerant will bypass the evaporator to limit cooling.

3. Illuminates when air returning to the PAC is above 95°F.

4. CB–1 will open if too much current is being drawn from the site power source. CB–4 will open if too much current is being drawn from the APU.

5. Steps 120 VAC down to 30 VAC.

814. Function and operation of the brine chiller test stand

1. Simulate a heat load from a launch control center or launcher equipment room.

2. 200 amps of 120/208 VAC, 3-phase.

3. Acts as the brine chiller control panel since the LF brine chiller does not have one.

4. This is a variable output voltage between 0 and 10 VDC sent from PLC to control the position of DA–1.

5. Components in the brine chiller control panel communicate properly with the BCTS PLC and daughtercard.

815. Preparing brine and sodium chromate solutions

1. 0.5 gallons of ethylene glycol, 0.5 gallons of purified water, 4 ounces of rust inhibitor.

2. Specific gravity and concentration of the rust inhibitor.

3. Specific gravity was too low.

4. 48 gallons of distilled or deionized water, 356 grams of sodium chromate powder, 500 mL dimethoxane,106.6 grams of sodium-hydroxide.

5. The solution is too strong. Add more water, mix thoroughly, and retest.

Lesson 3: Materiel Maintenance and Supply Discipline

816. Supply system and materiel management description

1. Do not order more items than are needed, reuse items to the greatest extent possible, relinquish extra stock back to the supply system.

2. Minor part, tool, or hardware that is normally expended or used up during maintenance actions.

3. The faster these items are turned in, the faster they'll be repaired and available in the supply system for use.

4. So that time is not wasted trying to locate items that are not where they should be.

817. Maintenance data collection

1. It must be documented in some way.

2. Outline what pieces of data that must be collected.

3. That part might not have been ordered properly or that the current supplier is inadequate.

4. Battery reconditioning might have to be re-accomplished; an unserviceable battery might be sent to the field.

818. Determining supply system priorities and standard reporting designators

1. How soon the item is needed.

2. Determine the UND.

3. Submit an AF Form 1230 to the SRD manager at AFGSC using data from the equipment data plate.

819. Using an illustrated parts breakdown

1. Proceed to whatever technical order is listed in the “T.O.” column.

2. Find the correct sheet number of the figure.

820. Preparing the Air Force Form 2005, Issue/Turn-In Request

1. WUC.

2. JCN.

821. Preparing the Department of Defense Form 1348-1A, Issue Release/Receipt Document

1. Digital.

2. Codes, NSN, hazard class, etc.

822. Preparing the Department of Defense Form 1348-6, DOD Single Line Item Requisition System Document (Manual-Long Form)

1. AF Form 2005.

2. So that personnel at materiel control or the base supply point do not purchase items that are unreasonably priced.

3. Your organization, name, and telephone number.

You have reached the end of the answers to the self-test questions.